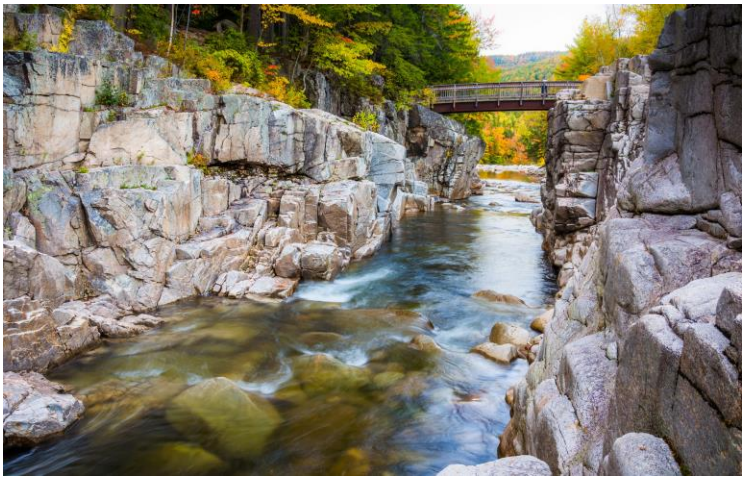
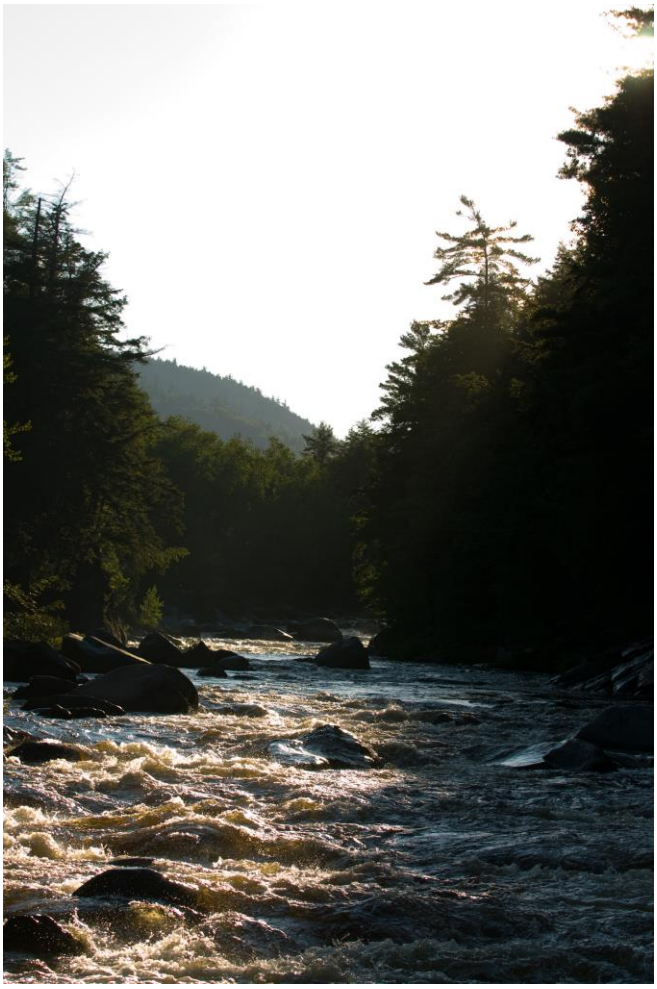
SACO RIVER AND SWIFT RIVER

CORRIDOR MANAGEMENT PLAN

JULY 2023





PREPARED FOR:

Town of Hart's Location

In partnership with

The Saco-Swift Rivers Local Advisory Committee and Saco Headwaters Alliance

PREPARED BY:

FB Environmental Associates
97A Exchange Street, Ste. 305
Portland, ME 04101

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FUNDED BY: Clean Water State Revolving Fund
ADMINISTERED BY: The New Hampshire Department of Environmental Services

Cover photos: top left: the Saco headwaters (Native Fish Coalition); right: the Swift River (photo: Joe Klementovich); Bottom: Rocky Gorge on the Swift River (Photo: USFS).

ACKNOWLEDGMENTS

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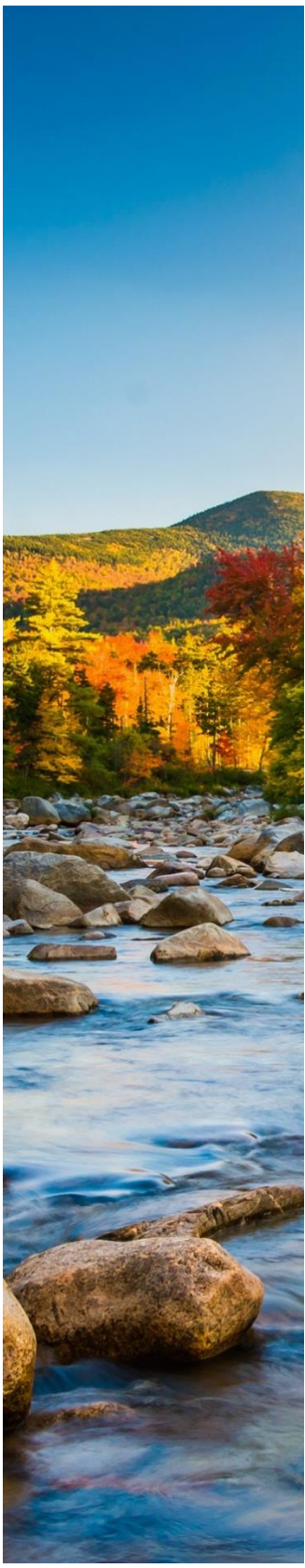
I. EXECUTIVE SUMMARY

The Saco and Swift rivers' headwaters both start in the White Mountains of New Hampshire, draining clear, cold mountainous streams as they flow to their confluence in the Town of Conway, where the Saco River continues on to the Maine border and eventually discharges to the Atlantic Ocean. The river corridors of the Saco and Swift in the state of New Hampshire offer the region a wealth of resources. This Saco-Swift Corridor Management Plan (CMP) was developed by the Saco-Swift River Local Advisory Committee (LAC) to manage these resources, with technical support from FB Environmental Associates (FBE) and the New Hampshire Department of Environmental Services (NHDES).



An assessment of natural, managed, cultural, and recreational resources informed the management issues of the river corridor and the action plan presented in this document. Natural resources in the corridor include high-quality rivers and a unique landscape of rugged mountains and cliffs. All the resources present within the river corridors are impacted, managed, and utilized in some way by the communities that surround them. The rivers have been impounded for recreation, confined for safe passage, and used to dilute and transport pollutants. Water resources in the area are managed for drinking water and waste management. Historically, the Saco-Swift Corridor and the surrounding landscape was home to a rich population of indigenous peoples, the Abenaki People. As settler communities grew in the 1600s, English settlers claimed ownership of Abenaki ancestral lands, and inflicted harm, violence, disease, and environmental degradation through the process of land dispossession. Over the subsequent centuries, rapid industrial expansion and development surrounded the Upper Saco River region, altering the rivers' landscape.

In recent decades, as the current and historical land use assessment in this document presents, forested land, forested wetlands, and row crops have been steadily cleared and replaced by open fields and residential development. Though these land use changes are slight, they indicate the larger trend of low-density urban sprawl and increased development in the region. This highlights the importance of land use planning and regulation within the river corridors in order to protect valuable riparian resources into the future. A land use ordinance and regulation assessment was conducted and identified key threats and challenges for riverside communities, especially optimizing use of natural resource setbacks, low impact development and green infrastructure, and regulatory protections of groundwater, aquifers, and all surface waters.

In summary, the resource assessment, land use regulations and ordinance review, and current and historical land use assessment identified the **key threats to the Saco-Swift River Corridor as flooding, development, riverbank erosion, water quality degradation, and recreational overuse**. Compounding the impacts of these threats, the population of the region has grown and spurred additional development and use of the region's natural resources. In addition, community input during the planning process identified recreational overuse and development in the corridor as top concerns and pressing issues for the river management.

Ultimately, the overall goal of the Saco-Swift CMP is to balance the multiple uses of the Saco and Swift rivers. As part of a region that places high importance on its natural resources and its many values, including for economic and recreational purposes, ecosystem and habitat purposes, and utility services, the management and protection of the Saco-Swift Corridor must balance multiple uses while not compromising the quality of its unique resources. Specifically, **key goals are to (1) manage the resources of the Saco-Swift Corridor, with a particular focus to manage flooding, recreational resources, and natural habitats, and (2) to protect the resources of the Saco-Swift Corridor, with a particular focus on protecting natural habitats, water quality, in-stream flow, and building climate resiliency.**

Photo: Swift River along the Kancamagus Highway in the WMNF (Credit: Windows10).

II. INTRODUCTION

The New Hampshire Rivers Management and Protection Program (RMPP), established by the Rivers Management and Protection Act of 1988 (RSA 483), has designated the Saco and Swift rivers as significant rivers with unique resources and values that require a cooperative approach at the state and local level to manage and protect them. Rivers designated under the RMPP require a Corridor Management Plan (CMP), which includes the assessment of the river's resources, values, threats, and the creation of an action plan to insure future protection of the rivers corridor.

Separate corridor management plans for the Saco and Swift rivers were published in 1994 and included detailed assessments of the resources present in the river corridors at that time. The updated resource assessment presented in this plan provides a current and combined summary of resources in both the Saco and Swift corridors, referred to as the Saco-Swift Corridor in this plan. This management plan builds on the work presented in the 1994 corridor management plans and other recent reports, including the Watching Our Waters report (SHA & FBE, 2020) for the Saco headwaters watershed and the recent alternative watershed plan for the Kearsarge Brook-Saco River watershed.

River corridors are biologically diverse areas, representing aquatic, wetland, and terrestrial habitats all in close proximity, consisting of rapid geological and ecological transitions. These areas are critical habitats for plants and wildlife and provide a source of drinking water, water purification, flood control, recreation, and fertile soils. Managing the impacts to these important resources while balancing a communities economic and social development can be a major challenge. The Saco-Swift River Local Advisory Committee (LAC) was formed to guide the management of uses along the Saco and Swift rivers while providing leeway for natural processes and preparing for impacts of climate change. Key management issues that have been identified in the Saco-Swift Corridor include (1) lack of local regulations protecting the land area around the corridor, (2) lack of floodplain protections, (3) flood and flow mitigation, and (4) recreational overuse (including lack of regulated public access for recreation). This plan is intended to help guide management of both rivers over the next ten years from 2023-2033.

Left: Confluence on the Swift (Credit: Joe Klementovich). Right: Looking west at the Saco River Valley in North Conway from the summit of Black Cap (Credit: FBE).

III. RESOURCE ASSESSMENT

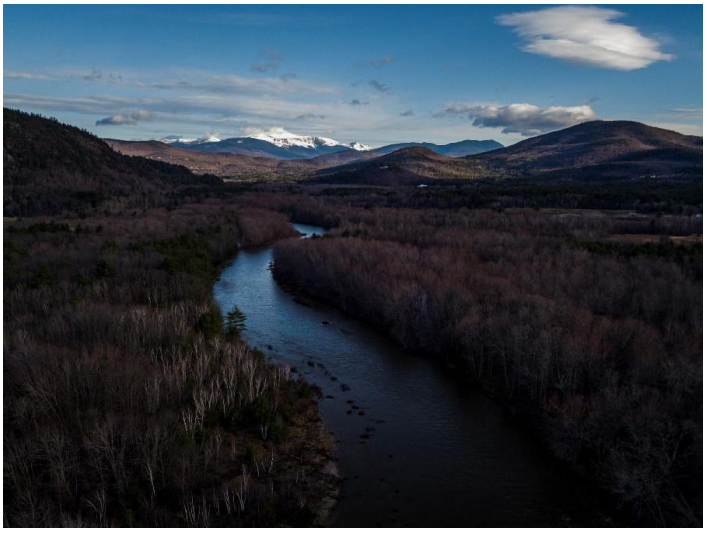
RIVER & CORRIDOR CHARACTERISTICS

THE SACO RIVER

The Saco River flows from its headwaters in the White Mountains of New Hampshire to the Gulf of Maine where it empties into the Saco River estuary in the Maine towns of Saco and Biddeford. Along the 136-mile journey from source to sea, the Saco flows past forested landscapes, agricultural areas, village centers, and urban areas, draining a watershed of over 1,700 square miles – an area larger than Rhode Island. The Saco's waters support diverse aquatic ecosystems and provide innumerable opportunities for fishing, boating, wildlife viewing, and other recreational and educational activities to local community members and visitors.

In New Hampshire, the Saco has over 40 miles of river channel. The Saco River originates at Saco Lake (at an elevation of 1,887 feet) on the southeastern border of the Town of Carroll, and then passes through the Towns of Hart's Location, Bartlett, and Conway before reaching the Maine border (at an elevation of 395 feet). In this 40-mile journey, the Saco River drops almost 1,500 feet in elevation, transforming from a small, steep, mountain stream to a broad, meandering river with outstretched floodplains in the lower elevations. Over 77% of the elevation drop in the Saco River takes place in the first 12 miles of river channel. The river drops less than 350 feet as it flows the next 27 miles through the Towns of Bartlett and Conway.

There are numerous tributaries that feed the Saco River, including the Dry River, Sawyer River, Rocky Branch, Ellis River, East Branch of Saco River, and the Swift River. Several tributaries are important drinking water supplies (e.g., the Ellis River) and many of their headwater streams support cold-water fisheries. The Swift River is the largest tributary to the Saco River in New Hampshire and is also a focus of this CMP, as a designated river by the RMPP.



Left: View of the Saco River in North Conway with a snow-capped Mount Washington in the background (Credit: Joe Klementovich, riversforchange.org) Right: The Saco winding through Conway just after its confluence with the Swift River (Credit: Wise Guy Creative).

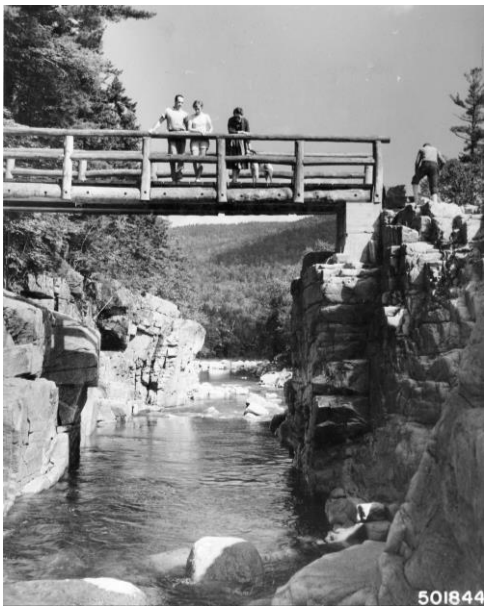
SWIFT RIVER

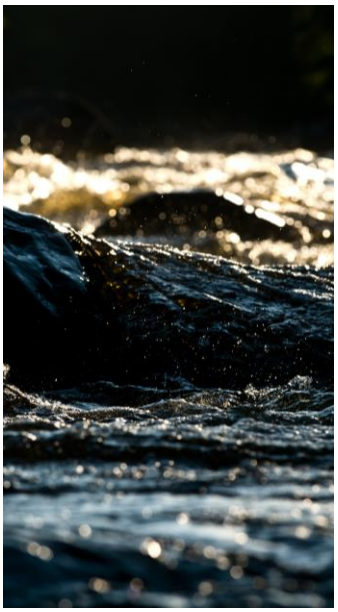
The Swift River originates on Mt. Kancamagus in Livermore over 2,700 feet above sea level and flows through the forested landscapes of Livermore, Waterville Valley, and Albany until it converges with the Saco River in Conway approximately 26 miles later. The Swift River drops 1,300 feet in the first four miles as it flows through steep rock slopes. The gradient of the river lessens as it flows through Albany and approaches the broad Saco River floodplain. The Swift merges with the Saco just before the river takes a sharp turn from flowing southward to flowing eastward and into Maine.

The Kancamagus Highway (NH Rt. 112), a National Forest Scenic Byway, follows the Swift River along its journey from Mt. Kancamagus to Conway and provides many scenic views and access points to the river. The Swift River provides many recreational opportunities including swimming, fishing, whitewater boating, and sight-seeing. The forested and wild landscape surrounding the Swift River and its tributaries are home to some of the most visited hiking, rock climbing, fishing, and camping destinations in New Hampshire.

More than 23 miles of the Swift River (~89% of its total length) are located within the White Mountain National Forest (WMNF). There are no dams or other impediments on the main channel of the Swift River, a rare occurrence for any stream of comparable size in New England. The water quality of the Swift River and its tributaries is generally very good, with very little sign of degradation from commercial, industrial, or residential development.

Notable tributaries that feed the Swift River include Meadow Brook, Ledge Brook, Pine Bend Brook, Sabbaday Brook, Downes Brook, Douglas Brook, and Red Eagle Brook. Many of these mountain streams are utilized for fishing, sight-seeing, and hiking trails up their drainages. Sabbaday Brook and Downes Brook drain from Mount Whiteface in Waterville Valley, New Hampshire at the southern extent of the Swift River watershed.





Top photos: Visitors enjoy the Rocky Gorge on the Swift River in the 1960s (Credit: USFS). Bottom: The Swift River is well known for its scenic beauty, particularly in autumn (Credit: Left – Joe Klementovich, Right – USFS).

THE RIVER CORRIDOR

As defined by RSA 483:4, a designated river corridor includes the river channel and the land area located within the distance of 1,320 feet (1/4 mile) of the normal high-water mark, or to the landward extent of the 100-year floodplain as designated by the Federal Emergency Management Agency (FEMA), whichever distance is larger (**Figure 1**). In order to define the Saco-Swift Corridor with detailed geospatial information, FBE created a geographic information system (GIS) database that combines the New Hampshire Department of Environmental Services designated river corridor dataset, the National Hydrography Dataset (NHD)- NHDPlus V2 dataset, and the FEMA Flood Insurance Rate Map (FIRM) digital flood maps. The normal high-water mark along the Saco and Swift rivers was defined using NHDPlus data where possible and supplemented with NHDES designated river corridor data and aerial imagery.

The Saco River corridor follows the quarter-mile buffer from the high-water mark on each riverbank in Hart's Location and most of Bartlett. As the river approaches the Bartlett-Conway town line, and the gradient of the river lessens, the 100-year floodplain begins to extend beyond the quarter-mile buffer in places. Throughout Conway, the Saco's 100-year floodplain exhibits a pattern of expansion beyond the quarter-mile buffer alternated with contraction to a smaller area where the topography of the adjacent land area dictates. At the state line, the corridor reaches its widest point, as the 100-year floodplain expands horizontally to become over two miles wide.

The Swift River corridor lacks a large 100-year floodplain for most of its length and is thus defined by the quarter-mile buffer, only becoming wider just upstream of the confluence with the Saco River in Conway.

River corridors are unique natural areas, because they are biologically with aquatic, wetland, and terrestrial habitats all in close proximity. In addition, rapid geological and ecological transitions continually shape and transform the ecosystems and land. Furthermore, river corridors provide critical habitats for plants and wildlife and provide a source of drinking water, water purification, flood control, recreation, and fertile soils.

The Saco River corridor is separated into two sub-designations, natural and rural (**Figure 2**). The natural segment of the Saco River extends from the headwaters to the southern terminus of the Crawford Notch State Park in Hart's Location. The remaining portion of the Saco River from the end of Crawford Notch State Park to the New Hampshire-Maine border in Conway is designated as rural.

The Swift River has natural and rural designations, similar to the Saco River, designated as natural in the upper reaches and changing to rural near Conway Village.

Above: The Swift River corridor is largely characterized by rocky streambeds and pools (Credit: USFS).

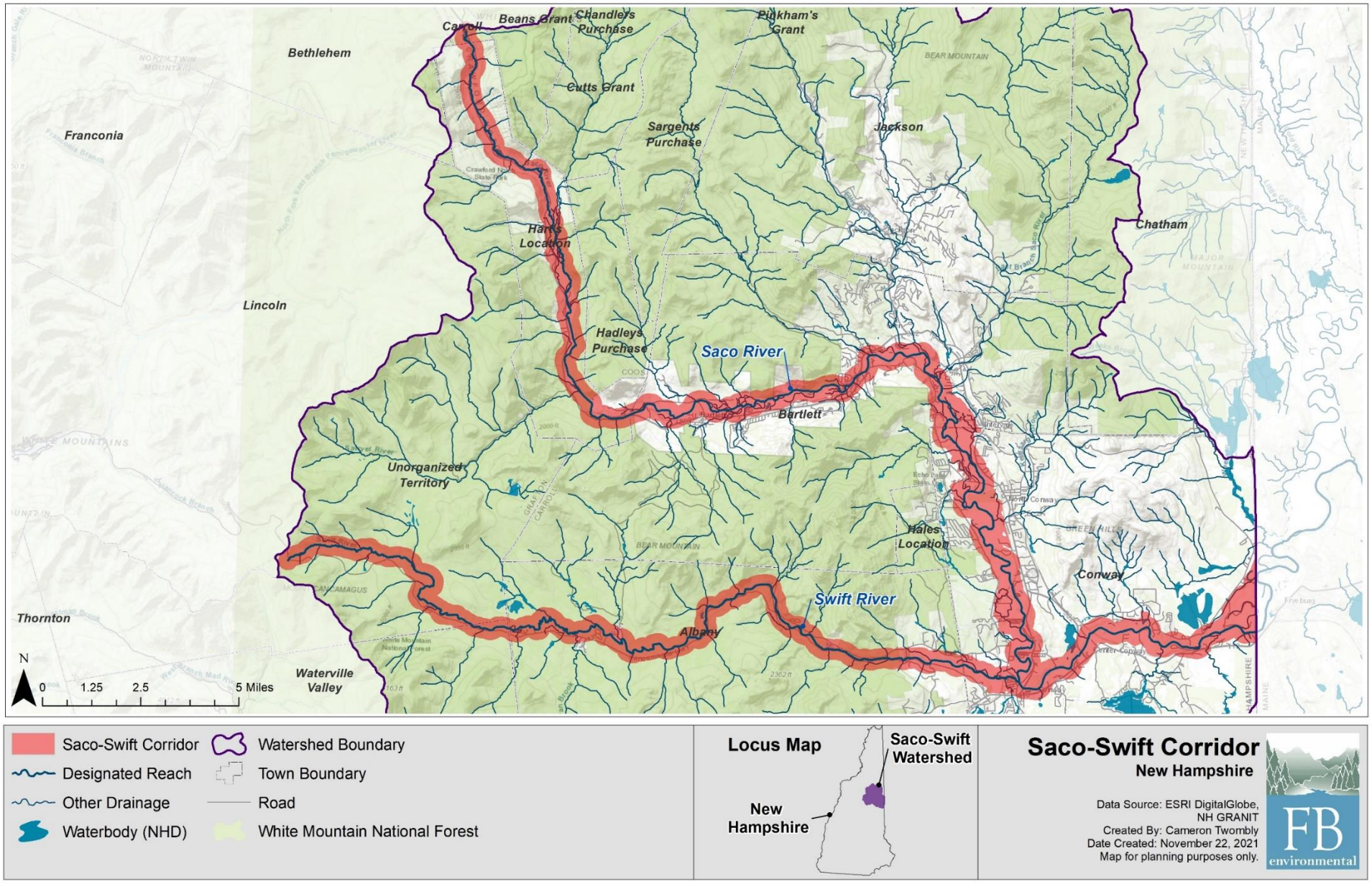


Figure 1. Map of the Saco-Swift Corridors in the state of New Hampshire.

Figure 2. Map of the designated reaches of the Saco and Swift rivers in New Hampshire.

NATURAL RESOURCES

The Saco-Swift Corridor is home to many natural resources that people travel from all around New England to come enjoy. The region contains high quality rivers and lakes and a unique landscape of rugged mountains and granite cliffs. This section describes the geologic conditions and water, plant, and wildlife resources present within the corridor.

GEOLOGIC CONDITIONS

The Saco and Swift rivers are located in the White Mountain region within the New England physiographic province, characterized by steep, forested mountains and narrow valleys with granite bedrock. The surficial geology of the watershed consists of exposed bedrock and silt, sand, and gravel deposited by glacial retreat during the Pleistocene epoch (**Figure 3**). Glacial till tends to be thicker at lower elevations (i.e., valleys) and shallower at higher elevations (i.e., mountain tops). Sand and gravel deposited by glacial meltwater formed the large, stratified drift aquifer in the region that contains high quality groundwater. The igneous bedrock, formed through subterranean cooling of magma, lacks significant fracture networks, storing little groundwater in fractured bedrock aquifers.

The Saco River headwaters flow through Crawford Notch, a narrow valley with steep walls, characterized by fast moving water and cascades. Lower in the Saco River Valley, the corridor is characterized by flat sand terraces at the base of steeper-gradient hillslopes. The historic Glacial Lake Pigwacket deposited a thick layer of sands in much of the Saco River Valley, forming the broad alluvial surfaces adjacent to the river (Goldsmith, 1999). This unique historical formation is made apparent by the large sand terraces located along the banks of the Saco River in North Conway. The post glacial movement and redistribution of glacial deposits in the Saco-Swift Corridor has been significant and has resulted the current structure of the river corridor. In addition to the large stream terraces, new channels, alluvial fans, floodplain deposits, and modern deltas have been formed by the rivers. Alluvial fans, which increase the infiltration and recharge of the stratified drift aquifer, are located along the Saco and Swift rivers in the upper mountains reaches, such as at the foot of the Dry River in Hart's Location (Moore and Medalie, 1995).

There is soil data for 64% of the Saco-Swift Corridor (NRCS). Soils data is missing in areas of the WMNF, mainly the upper reaches of the Swift River. Generally, the floodplains surrounding the Saco and Swift rivers consist of soils favorable for farmland, having designations of prime farmland and farmland of local importance (**Figure 4**). As the floodplain broadens in the lower valley, in the Town of Conway, the soils designated as favorable for farmland also broaden.

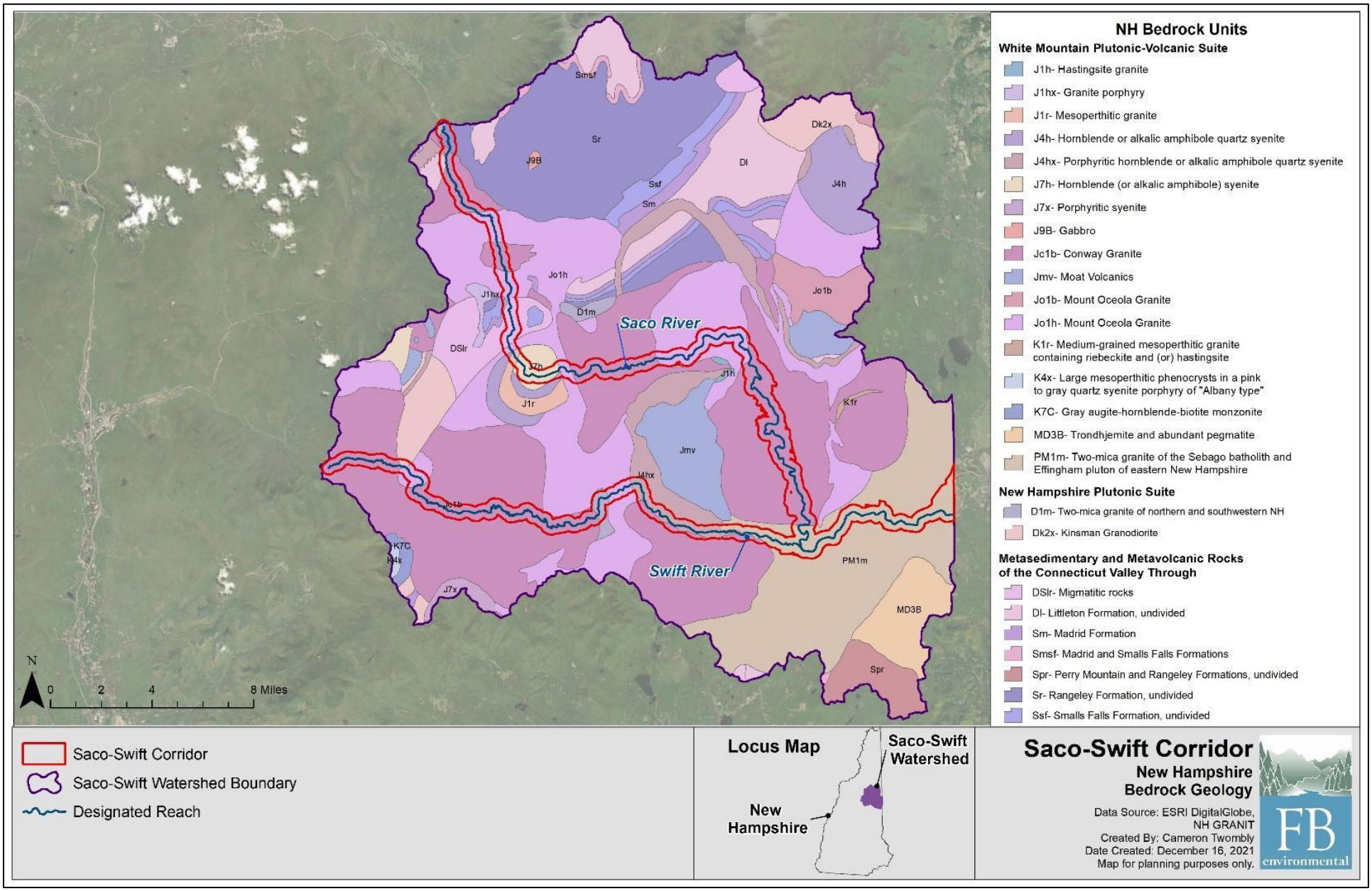


Figure 3. Map of the bedrock geology (i.e., New Hampshire bedrock units) within the Saco River watershed.

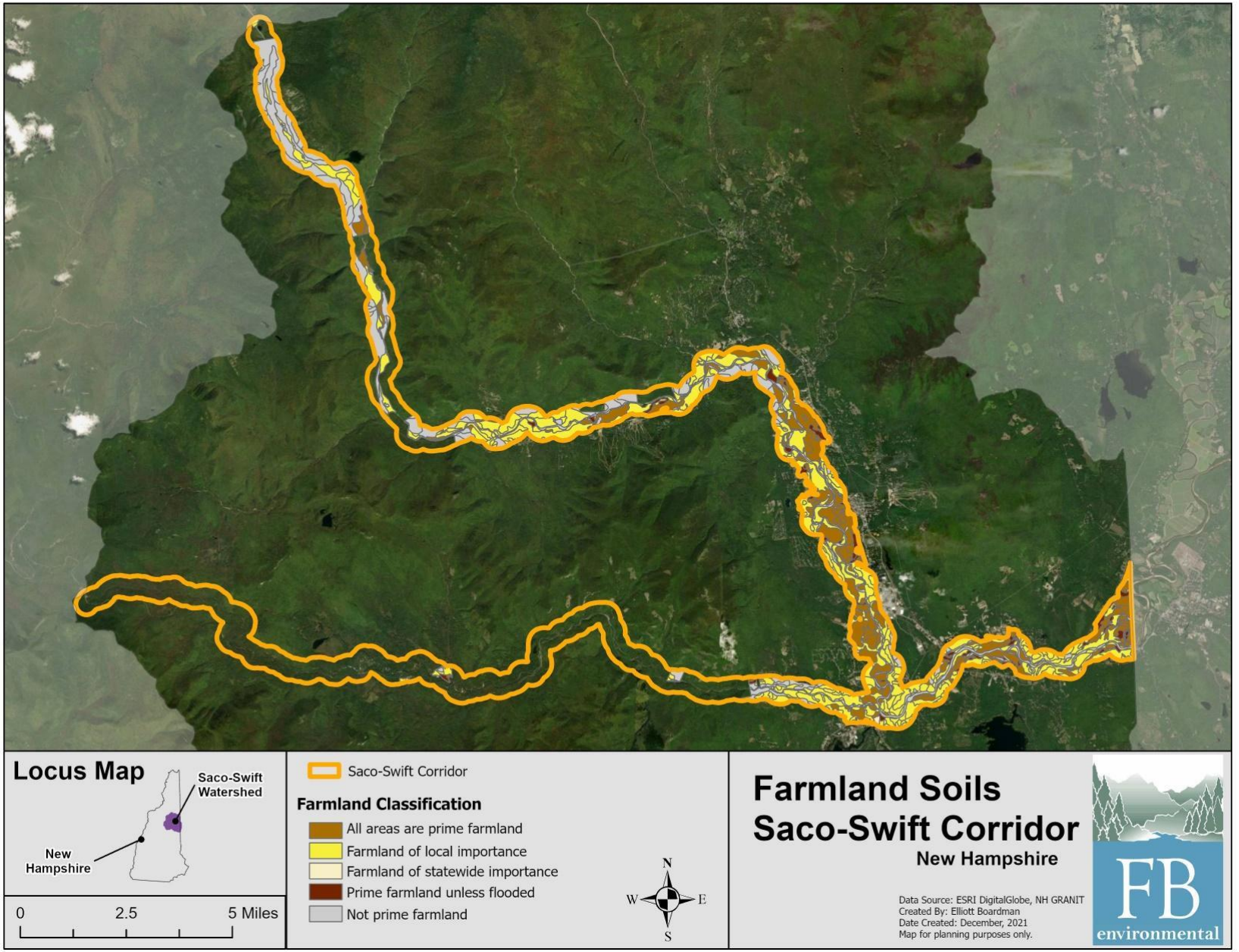


Figure 4. Map of farmland soils in the Saco-Swift Corridor.

WATER RESOURCES

Watersheds

The contributing watersheds to the Saco and Swift rivers are important areas of land within which management decisions directly impact the flow, flood storage capacity, and water quality of the rivers and their floodplains. The land use (i.e., forested, agriculture, residential) and amount of impervious cover (i.e., buildings, roads, parking lots) within the watershed are two factors that have a significant impact on the receiving waterbodies, both surface water and groundwater. The watershed area of the New Hampshire portion of the Saco River is approximately 440 square miles and includes the Swift River and its watershed. The watershed area is dominantly forested with areas of residential development and agriculture. Approximately 80% of the Saco River watershed is within the White Mountain National Forest (**Figure 7**).

Saco River Watershed

The watershed of the portion of the Saco River running from its headwaters (Carroll, New Hampshire) to the New Hampshire-Maine border extends from Thompson and Meserve's Purchase (Presidential Mountain range) in the northeast, west to the township of Livermore, and over to Conway in the southeast. NHD data divides watersheds within the United States into progressively smaller hydrologic units, classified as hydrologic unit codes (HUC). The Saco River watershed consists of the Headwaters Saco River (HUC 0106000201), the Conway Lake-Saco River (HUC 0106000203), and the Swift River (HUC 0106000202) HUC-10 watersheds.

Swift River Watershed

The Swift River watershed (HUC 0106000202) is approximately 73,077 acres (114 square miles) and extends from Livermore (unorganized territory) in the west to the Town of Conway in the east. The highest point in the Swift River watershed is approximately 4,130 feet with a basin average slope of 19.3% (computed from a 30-meter Digital Elevation Model). The watershed is dominated by forest with over 38% of the land covered by mixed deciduous and coniferous forest. Less than 4% of the watershed is classified as "urban" in the 2011 National Land Cover Database (NLCD).

Natural Flow Characteristics

Mean annual precipitation in the Saco and Swift River watersheds is approximately 50 inches with a mean annual snowfall of around 77 inches. On average, Conway gets precipitation 137 days of the year, with an average of 200 sunny days.

Two United States Geological Survey (USGS) stream gages exist on the Saco River in New Hampshire – one at the River Street Bridge in Bartlett (USGS 010642505) and one in Conway (USGS 01064500) just upstream (i.e., east) of the Route 302 (Eastman Road) Bridge (**Figure 5**). The USGS Gage on the Saco River in Conway reports stage-discharge data for the periods of 1903-1909 and 1929-2021, totaling 97 years of cumulative record. The USGS gage in Bartlett began collecting discharge data in 2010.

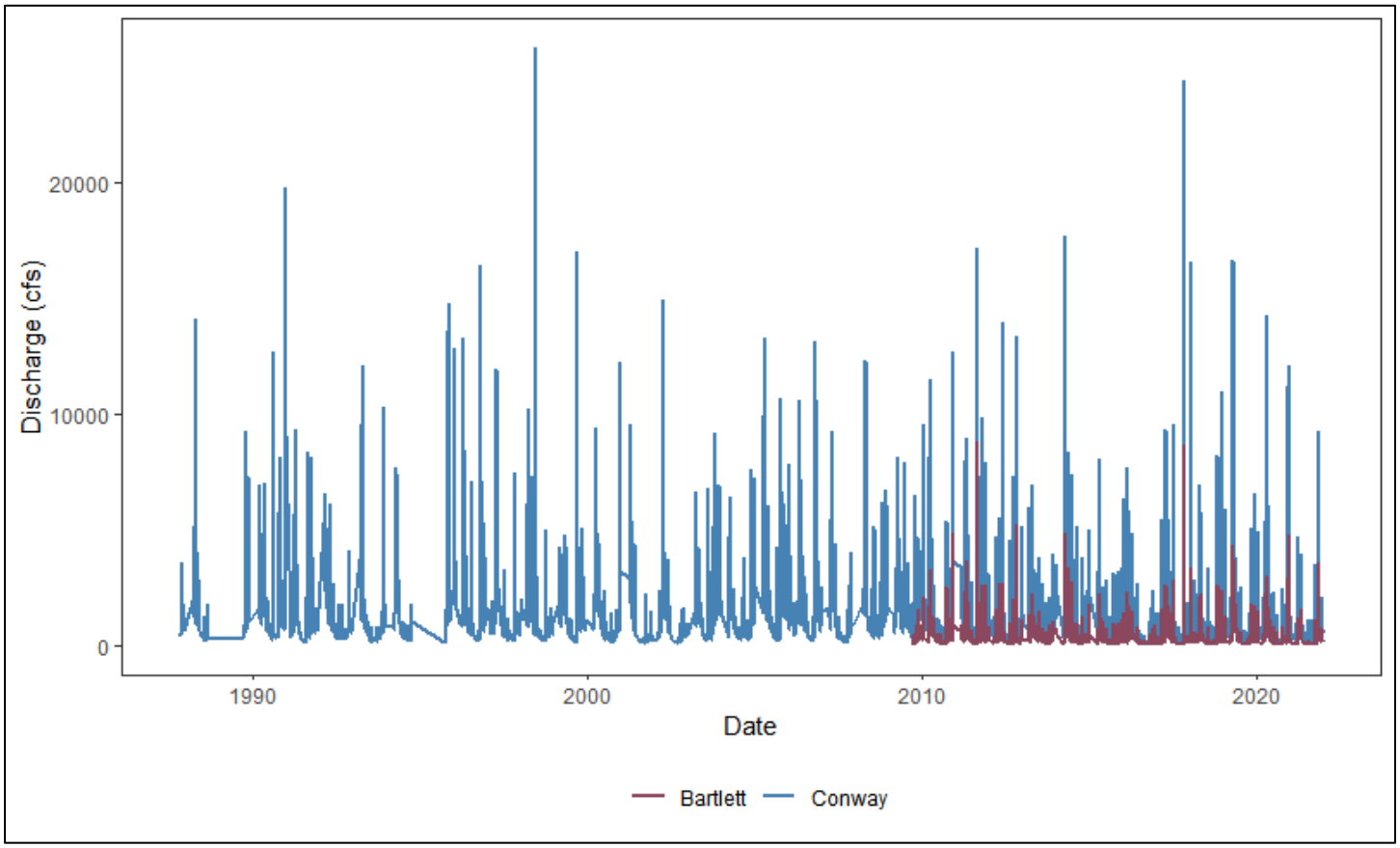


Figure 5. Daily mean discharge calculated for the Conway (Route 302) and Bartlett (River Street Bridge) USGS gage stations on the Saco River.

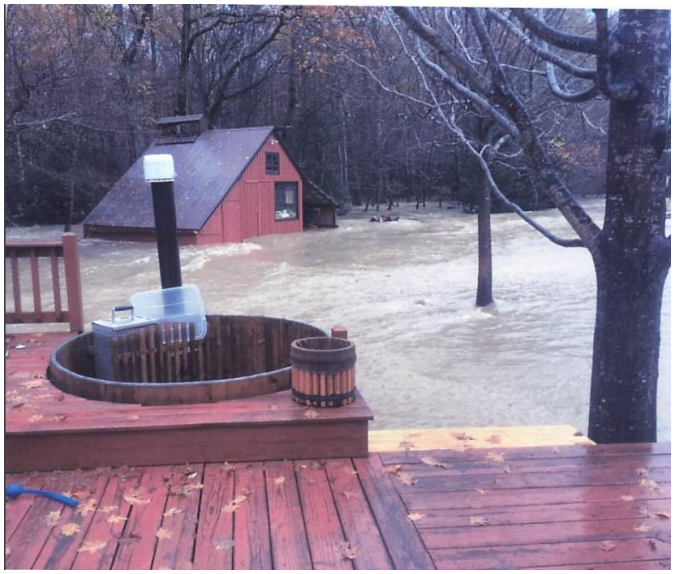
There are no gage stations currently present on the Swift River. A USGS gage station recorded discharge on the Swift River, approximately 0.5 miles downstream of the Hobbs Brook confluence in Conway, from August 2009 until August 2011. The gage was located at a local swimming spot known as "Big Eddy". At the time of the writing of this report, reactivation of this historical gage is being considered by the state of New Hampshire to aid in the development of an in-stream flow study for the Swift River.

Flooding and Climate Change Effects on Precipitation

Two of the most recent major flooding events to hit the Saco-Swift Corridor were Hurricane/Tropical Storm Irene and an October 2017 (October 30-31, 2017) flooding event. The flooding in October of 2017 was a result of a storm on October 24- 27 causing saturated conditions, followed by Tropical Storm Phillipe (October 29-30). The peak discharge (48,700 cfs) observed at the USGS gage in Conway during the 2017 storm occurred on October 30th. The peak discharge estimated at the Conway gage during Hurricane Irene occurred on August 28, 2011 and was 58,200 cfs. Hurricane Irene was downgraded to a tropical storm by the time it reached the region, but still resulted in damage to over 100 homes, several businesses, bridges, and trails in the Mount Washington Valley (Conway Daily Sun, 2017). Refer to Section VII, Resource Threats, for additional discussion and photo documentation of flooding effects within the corridor.

Photo at right: Floodwaters on the Saco during Hurricane Irene (Credit: Nancy Ritger).


Above: Highwaters during Hurricane Irene, 2011, in Crawford Notch (Credit: Left – Nancy Ritger, Right – Mark Dindorf).

Above: Floodwaters in Bartlett along Cobb Farm Road during the October 2017 storms (Credit: Bill Fabrizio).


Above: Floodwaters in Hart's Location during the October 2017 storms (Credit: Mark Dindorf).

Based on current research, the northeastern U.S. will continue to experience more frequent severe storms resulting in flooding along the Saco-Swift Corridors. Severe flooding in developed areas, such as the portion of the Saco River in Conway, can mobilize contaminates from floodplains when infrastructure is damaged and severe erosion and sedimentation occur. Despite the greater annual precipitation and streamflow predicted to occur in the northeast, shortened winters and increased winter precipitation falling as rain will likely continue to result in earlier spring runoff and lower summertime peak flows (National Climate Assessment, 2018).

In addition, increasing storm frequencies will flush more nutrients to surface waters for algae to feed on and flourish under warmer air temperatures. These high flows pose implications for water quality that should be considered and incorporated into management plans such as this one. Climate change models predict a 10-40% increase in stormwater runoff by 2050, particularly in winter and spring and an increase in both flood and drought periods as seasonal precipitation patterns shift. Adding to this stress is population growth and corresponding development in New Hampshire. The Saco-Swift Corridor region is at serious risk for sustained water quality degradation because of new development in the watershed unless climate change resiliency and low impact development strategies are incorporated to existing zoning standards. New development increases impervious cover through new roads, roofs, driveways, and parking areas. Resiliency must be built and designed into public stormwater infrastructure based on temperature changes, precipitation, water levels, wind loads, soil moisture, and ground water levels (Ballestero et al., 2017).

Above: High flood waters at the Saco River Covered Bridge, located just below the confluence of the Saco and the Swift (Credit: Dragonfly Aerials).

Floodplains

Floodplains are the flat areas of land adjacent to river channels that become saturated when the rivers banks are overtopped during flood events. The size and shape of floodplains depend on the flow characteristics of the river, the topography of surrounding area, and the presence of impoundments and other obstructions to flow. Floodplains allow water to spread out across the land during large flow events, lessening the energy of the river channel, reducing erosion and damage to infrastructure downstream, and settling out sediments and other pollutants. Disconnecting a river from its natural floodplain or altering the land use of the floodplain, reducing its capacity to store water, can result in major

flooding and erosion issues downstream. Restoring a rivers natural floodplain can be one of the most cost-effective ways of reducing flood damage.

Floodplain maps and flood hazard data in the U.S. are managed by the National Flood Insurance Program administered by FEMA. FEMA undertakes or supports flood studies nationwide that contribute to the National Flood Hazard Layer database, which feature 100-year floodplain extents. A 100-year flood event can also be described as a 1% annual chance flood event, or a flood event that has a 1% chance of occurring in any given year.

The FEMA 100-year floodplain maps for the Saco River in New Hampshire extend from the Maine border and end at the border of the towns of Bartlett and Hart's Location (**Figure 6**). In 2021, 100-year floodplain boundaries were produced for the southern portion of the Saco River in Hart's Location, extending from the Bartlett border to the Route 302 bridge, upstream of the Saco River's confluence with the Dry River (FBE, 2021). In 2022, the floodplain boundaries were mapped for the northern portion of the Saco River in Hart's Location. However, these maps have not yet been reviewed and accepted as maps of record by FEMA. Generally, the 100-year floodplain and the stratified drift aquifer boundaries have significant overlap in the Saco-Swift Corridor. The aquifers cover a greater swath of the valley bottoms by virtue of having been deposited over centuries by meandering glacial meltwater streams, rather than being confined to only the active floodplains along today's river channels.

FEMA 100-year floodplain maps for the Swift River extend from the Saco-Swift confluence to a point approximately 1.5 miles upstream of the Conway-Albany border, near Moat View Drive, Albany. There are 7,278 acres of 100-year floodplain mapped within the Saco-Swift Corridor. The existing mapped area of 100-year floodplain is over 30% of total corridor land area.

The upper Saco River in Hart's Location during normal flow levels (left), and during high flow levels during a fall storm (right), expanding to use the full width of its banks and some of its floodplain (visible upstream) (Credit: M. Kelly-Boyd).

Wetlands

Wetlands are areas of land where the soil is saturated for part of the year and are defined by their hydrology, vegetation, and soils. Wetlands support both aquatic and terrestrial species of plants and contain hydric soils (i.e., soils that are formed under saturated, anerobic conditions). Wetlands serve many critical functions within a watershed including the storage and treatment of stormwater, groundwater recharge, wildlife habitat, flood mitigation, and carbon storage. Protection of wetlands is crucial for maintaining the health and function of the Saco-Swift Corridor ecosystem.

There are numerous types of wetlands which are unique based on the soils, topography, climate, vegetation, and hydrology of the site. Wetlands tend to occur in flat, low-lying areas, particularly surrounding other surface waterbodies such as rivers and lakes. The majority of the wetlands present within the Saco-Swift Watershed are located within the Saco-Swift Corridor, making protection of the corridor critical for wetlands in the region. There are approximately 904 acres of forested/shrub wetlands and 81 acres of emergent wetlands within the Saco-Swift Corridor mapped on the National Wetland Inventory (using NWI+ data) (**Figure 7**).

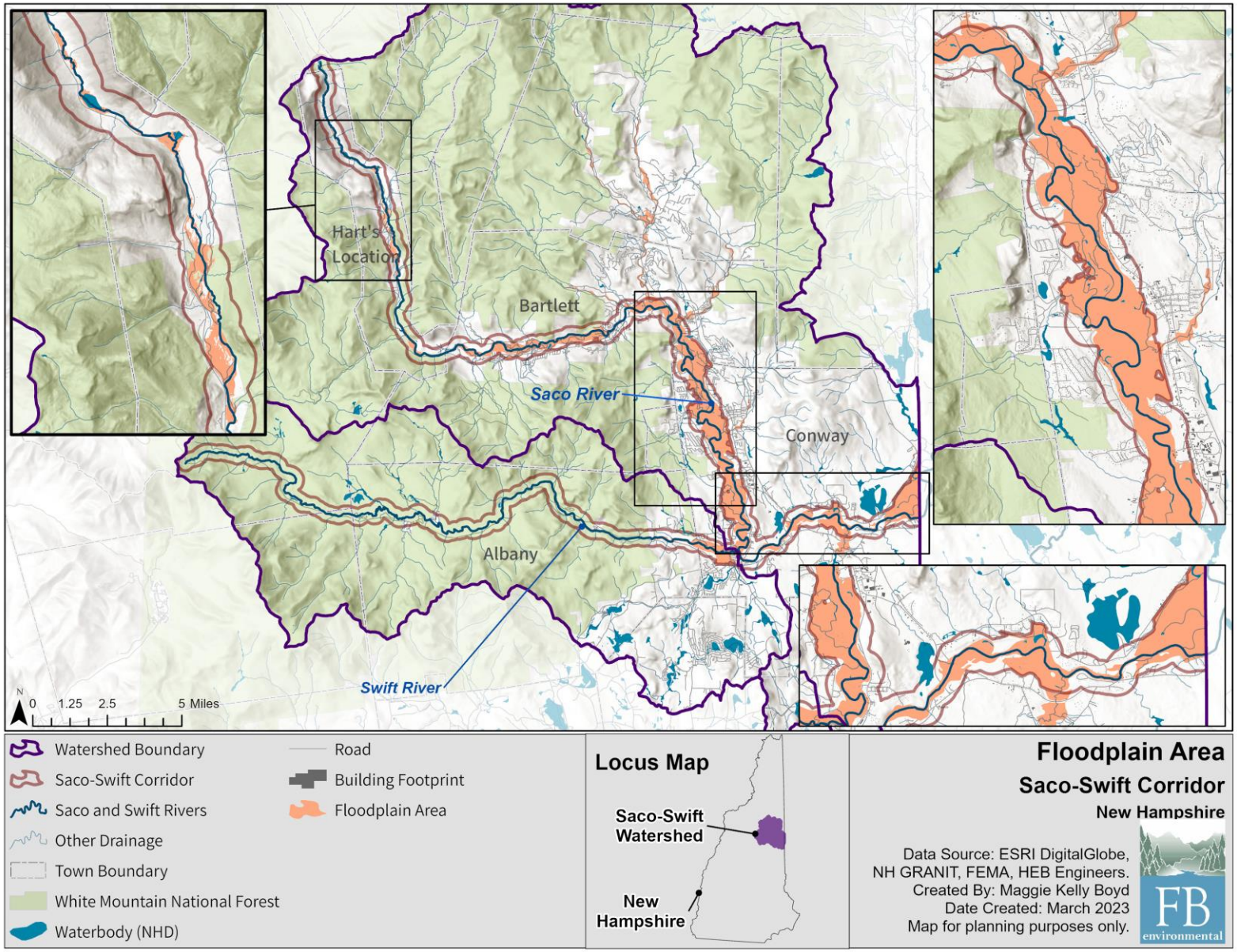


Figure 6. Floodplains within the Saco-Swift Corridor and watershed. Data within Hart's Location is from the Hart's Location Floodplain Mapping project, phases I-II (completed by FB Environmental and HEB Engineers). The remaining data is from the Federal Emergency Management Agency floodplain data.

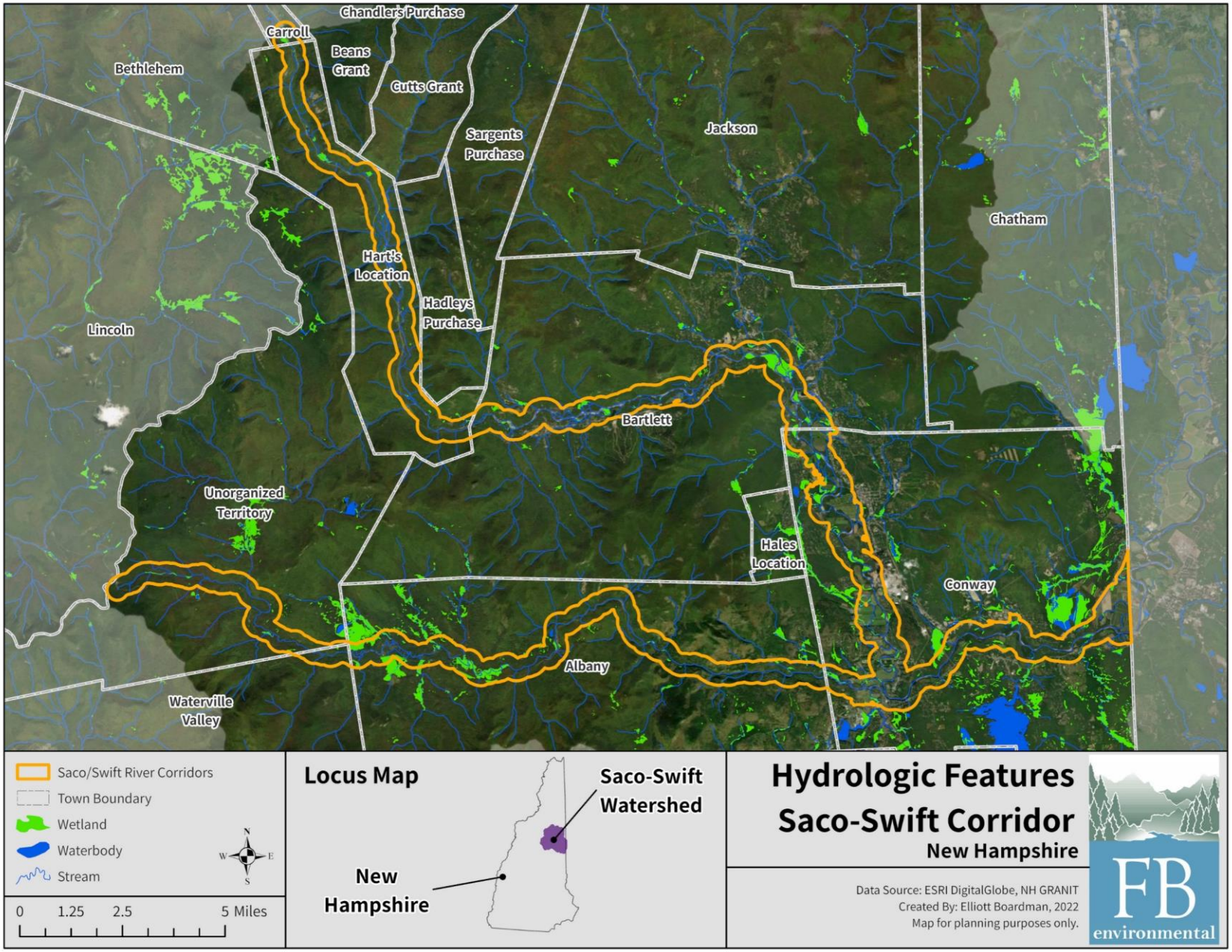


Figure 7. Map of surface water resources in the Saco River watershed.

Water Quality

The Saco and Swift River's water quality, or the ability of the rivers' waters to support healthy aquatic ecosystems and human uses such as drinking and recreation, is protected at the federal level by the Clean Water Act by state law in New Hampshire. State agencies, principally NHDES, are responsible for writing and enforcing regulations that carry out the law, and collectively make up a framework for designated uses of the river and managing activities on the landscape. NHDES conducts surface water quality assessments aimed at measuring how well waterbodies are attaining their designated uses. NHDES submits the results of these assessments to the U.S. Environmental Protection Agency (EPA) every two years in the state's Section 303(d)/305(b) Integrated Report.

According to the NHDES 303(d) list for 2020-2022, four sections of the Saco River are impaired for aquatic life in New Hampshire (**Table 1**). Six sections of the Swift River are impaired for aquatic life. Additionally, some tributaries to the Saco and Swift rivers are also listed as impaired in the 2020-2022 report. Sections of Kearsarge Brook, the East Branch of the Saco River, the Ellis River, and Rocky Branch are listed as impaired for aquatic life. The 303(d) list is based on water quality data, and some of the issues on the list can be attributed to natural sources not necessarily related to development or human activities. Specifically, water quality data from the WMNF for the Swift River indicates that low pH, low alkalinity, and high aluminum are known water quality characteristics, but are likely due natural conditions. These water quality characteristics are enhanced partially by acid deposition.

For impaired or threatened sections, NHDES encourages the development of full Watershed Based Management plans, often funded in part through Clean Water Act Section 319 funds. A watershed plan for Kearsarge Book and a stretch of the Saco River was recently completed in 2022 (discussed more on page 38). Results of this plan were used to inform components of the CMP.

Table 1. Impaired waterbodies within the Saco-Swift Corridor included in the 2020-2022 303(d) list.

Waterbody	Assessment Unit ID (AUID)	Town(s)	Length (miles)	Parameter
Rocky Branch	NHRIV600020103-02	Bartlett	2.180	pH
Ellis River - Unnamed Brook	NHRIV600020105-07	Bartlett	4.587	Lead, pH
Meadow Brook - Saco River - Unnamed Brook - Bartlett Brook - Stony Brook	NHRIV600020106-08	Bartlett, Hart's Location	11.848	Aluminum, pH
Saco River	NHRIV600020106-09	Bartlett	1.435	pH
East Branch Saco River - Unnamed Brook	NHRIV600020301-04	Bartlett, Jackson	9.215	Lead
Saco River	NHRIV600020302-02-01	Conway, Bartlett	11.033	Lead, pH
Saco River	NHRIV600020305-02	Conway	3.451	Aluminum, pH
Swift River - Unnamed Brook - Deer Brook - Big Brook	NHRIV600020203-01	Albany, Bartlett	18.259	Aluminum, pH
Swift River - Allard Brook - Dry Brook - Hobbs Brook	NHRIV600020203-02	Albany	8.150	pH
Swift River	NHRIV600020203-06	Albany, Conway	3.379	Aluminum
Swift River	NHRIV600020203-07	Conway	0.403	Aluminum, Lead, pH
Swift River - Unnamed Brook	NHRIV600020202-05-01	Albany	8.133	Aluminum, pH

Waterbody	Assessment Unit ID (AUID)	Town(s)	Length (miles)	Parameter
Swift River - Meadow Brook	NHRIV600020201-01	Livermore (Unorganized Territory)	17.715	Aluminum, pH
Kearsarge Brook - Unnamed Brook - Artist Brook	NHRIV600020302-05-02	Conway, Bartlett	13.588	Benthic-Macroinvertebrate Bioassessments (Streams), pH

When a waterbody does not meet its designated uses, it is considered impaired under the Clean Water Act. When a waterbody is listed as impaired, NHDES prepares a plan for restoring the waterbodies quality back to attainment. Types of plans implemented to restore impaired waterbodies include Total Maximum Daily Loads (TMDLs) and watershed-based management plans. Generally, TMDLs focus on cleaning up point source pollution via National Pollution Discharge Elimination System (NPDES) permits. In contrast, watershed-based management plans focus on addressing non-point sources of pollutants through the implementation of structural and non-structural Best Management Practices (BMPs). The Saco River-Kearsarge Brook Watershed Management Plan, completed in 2022, provides and in-depth geomorphic and habitat assessment of the Saco River segment between lower Bartlett and Upper Conway as well as its main tributary, Kearsarge Brook (discussed more on page 38).

In addition to NHDES bureaus and programs (i.e., Watershed Management Bureau, Subsurface Systems Bureau, Drinking Water and Groundwater Bureau, and the Dam Bureau) that help to collect and maintain data related to water quality in New Hampshire, there are also local organizations aimed at protecting New Hampshire's water quality. The Saco River Corridor Commission (SRCC) is a regional planning board headquartered in Cornish, Maine that regulates the use of land and water within the Saco River Corridor in Maine. The SRCC conducts surface water grab sampling at over 50 locations throughout the Saco River watershed, on the Saco River and tributaries.

There are three SRCC monitoring locations in New Hampshire on the Saco River, where the river has been sampled for water quality parameters since 2001. A long-term water quality trend analysis was done on the entire SRCC dataset in 2020. According to the SRCC 2020 Water Quality Analysis (FBE, 2020) pH has been significantly decreasing (more acidic) since 2001 at the Saco Pines Landing in Conway on the Saco River. The long-term average temperature readings at the three New Hampshire SRCC sites are less than 19°C, a temperature above which is lethal for some aquatic vegetation and fish species. However, two of the sites are significantly increasing in water temperature, likely due to increased development and urban runoff. Long-term levels of nutrients (i.e., phosphorus and nitrogen), turbidity, and the fecal indicator bacteria *Escherichia coli* (*E. coli*) at the three SRCC sites are below recommended state standards.

Groundwater

Groundwater in much of New Hampshire exists in fractured bedrock and stratified drift aquifers (e.g., saturated layers of permeable rock). Stratified drift aquifers are formed by the deposition of layers of sand and gravel by the meltwater of retreating glaciers. These deposits are widespread in large river valleys and form moderate to steep sloping hills on the landscape. The sand and gravel layers below the land surface have large pore spaces that are readily saturated with water by precipitation and snowmelt. The large pore spaces also allow for a relatively short groundwater residence time, meaning water is transported quickly in and out of the aquifer. These aquifers are quickly recharged with water through precipitation, infiltration, and stream seepage. This allows for these aquifers to yield large quantities of water to wells and public water supplies. However, it also makes these aquifers vulnerable to contamination from the transport of pollutants from the land surface.

A large, stratified drift aquifer exists within the Saco-Swift Corridor, occupying approximately 20.4 square miles of area within the corridor. The aquifer is an important resource in the Mount Washington Valley for many municipalities, homes, and businesses. The aquifer has a transmissivity rate up to 8,000 square feet/day. Protection of the aquifer is pertinent to the supply of clean drinking water in the region.

The Town of Hart's Location has local regulation, the Model Groundwater Protection Ordinance, which follows the NHDES model ordinance and specifically protects the boundaries of the stratified drift aquifer and the surfaces waters fed by groundwater within the Town. The Towns of Conway, Jackson, and Bartlett have mention of the protection of groundwater in their zoning ordinances or have well-head protection, but do not specifically regulate the protection of the aquifer.

PLANT & WILDLIFE RESOURCES

The Saco and Swift rivers provide critical habitat for a plethora of plant and animal species. With 49% of the corridor being conserved land, the area is a large expanse of unfragmented habitat. Unfragmented habitat is integral to the ecology of the area because it allows wildlife ease of access to conserved critical resources. The WMNF is the largest conserved area within the corridor. Crawford Notch State Park and the Albany Town Forest are also significant conservation areas. There are many other public and private conserved areas that also promote a healthy ecosystem within the Saco-Swift Corridor.

The Saco River Valley is a globally unique landscape with rare mountainous and coastal plain ecosystems occurring adjacent to one another. Some of these unique ecosystems include alpine and subalpine areas, sugar maple floodplain forests, jack and red pine rocky ridges, Hudsonia – silverling river wash gravel barrens, pitch pine barrens, and fens with Long's bulrush. This section explains the importance of protecting wildlife and fish habitat and other significant open space and natural areas.

WILDLIFE

Fish Species

The Saco-Swift Corridor is home to the native Brook Trout and non-native Brown and Rainbow Trout. Abiotic factors within both river systems, such as fast moving, cold water and rocky substrate, make the Saco and the Swift Rivers significant cold-water fish habitat. High demand and usage within both the Saco and Swift rivers recreational cold-water fisheries have surpassed the reproductive capacity of native trout populations within both rivers. According to the New Hampshire Department of Fish and Game's 2021 stocking report, the Saco River was stocked with Brook and Brown Trout, totaling approximately 10,900 and 9,000 Brook and Brown Trout, respectively. The Swift River was stocked with approximately 240 Brown Trout and about 8,400 Brook Trout.

There are multiple dams within the Corridor. Not all these dams feature fish passage measures. Lack of adequate fish passage measures make the Saco-Swift Corridor unpassable by anadromous fish species, which migrate upriver to spawn before returning to the ocean. Examples of these species in New Hampshire include Atlantic Salmon, American Eel, and American Shad.

Above: Fishing on the Swift River (Credit: Joe Klementovich).

Protected Wildlife Species

The New Hampshire Division of Forest and Lands- New Hampshire Natural Heritage Bureau (NHB), in collaboration with New Hampshire Fish and Game, documents New Hampshire's rare species and exemplary natural communities. Table 2 lists species documented in the corridor riverfront Towns.

Table 2. Recorded observations of protected wildlife species in the river front Towns (NHB, 2022).

Species	Location(s)	NH Status
Saco River		
Insects		
Hermit Sphinx (*Lintneria eremitus*)	Bartlett, Conway	Historical
Lake Emerald (*Somatochlora cingulate*)	Carroll, Hart's Location	Imperiled
Pygmy Snaketail (*Ophiogomphus howei*)	Conway	Imperiled
Southern Pygmy Clubtail (*Lanthus vernalis*)	Conway	Imperiled
Mammals		
American Marten (*Martes americana*)	Bartlett, Hart's Location	Threatened, Imperiled
Birds		
Peregrine Falcon (*Falco peregrinus anatum*)	Bartlett, Hart's Location	Threatened, Imperiled
Purple Martin (*Progne subis*)	Conway	Critically imperiled, breeding area
Swift River		
Insects		
Ocellated Emerald (*Somatochlora minor*)	Albany	Critically imperiled
Southern Pigmy Clubtail (*Lanthus vernalis*)	Conway	Imperiled
Mammal		
Northern Long-eared Bat (*Myotis septentrionalis*)	Albany	Threatened, Critically imperiled

WILDLIFE HABITAT

The New Hampshire Department of Fish and Game developed a Wildlife Action Plan (2015), which identifies significant wildlife habitat throughout the state. The Wildlife Action Plan (WAP) includes a characterization of different habitat types and gives significant habitat a ranking based upon its ecological condition (**Table 3**, **Figure 8**, **Figure 9**).

The Wildlife Action Plan has ranked 30% of the corridor as the highest ranked ecological condition in the state (Tier 1) (**Table 3**, **Table 2**). 7% of the corridor is the highest ranked ecological condition in the biological region (Tier 2), as determined by the Nature Conservancy. The majority of the habitat within the corridor falls under the rank of supporting landscape (Tier 3). Supporting landscapes are critical to the ecological wellbeing of an area as the habitat quality of higher ranked tiers will deteriorate if the land surrounding them is degraded.

The Wildlife Action Plan factors in a variety of wildlife and habitat threats including development, invasive species, pollution, and climate change. More information about specific threats within the Saco-Swift Corridor can be found in Section VII: Resource Threats.

Table 3. WAP wildlife habitat rankings in the Saco-Swift Corridor.

Tier of Ranked Habitat	Area within Corridor (Acres)	Percent of Corridor
1	6,897	30%
2	1,737	7%
3	8,840	38%
Total:	**17,474**	**75%**

VEGETATION AND NATURAL COMMUNITIES

The NHB also works closely with other agencies such as the Department of Natural and Cultural Resources to maintain a database of protected plants and vegetative communities (**Table 4**). This database assigns species and communities a local status based on threat levels and susceptibility to said threats. Specific observation locations are not publicly available.

Table 4. Plant and Natural Communities within towns within the Saco-Swift Corridor (NHB, 2022).

Species	Location	NH Status
Saco River		
Terrestrial Natural Community		
Dry red oak – white pine forest	Hart's Location	Imperiled
Rich red oak rocky woods	Bartlett, Hart's Location	Imperiled
Hemlock – beech – oak pine forest	Hart's Location, Conway	Widespread and secure
Red pine – white pine forest	Bartlett	Imperiled
Sugar maple – beech – yellow birch forest	Hart's Location	Widespread and secure
Red pine rocky ridge	Bartlett	Imperiled
Wetland Ecological System		
Sand plain basin marsh system	Bartlett	Imperiled
Terrestrial Ecological System		
Montane cliff system	Bartlett	Rare or uncommon
Plant		
American ginseng (*Panax quinquefolius*)	Hart's Location	Threatened, Imperiled
Back's Sedge (*Carex backii*)	Bartlett	Endangered, Critically Imperiled
Buttons Sedge (*Carex bullata*)	Carroll	Endangered, Critically Imperiled
Canada Mountain-rice Grass (*Piptatheropsis canadensis*)	Bartlett, Conway	Endangered, Critically Imperiled
Douglas' Knotweed (*Polygonum douglasii*)	Hart's Location	Threatened, Imperiled
Glaucous Blue Grass (*Poa glauca*)	Hart's Location	Endangered, Historical
Green Adder's-mouth (*Malaxis unifolia*)	Bartlett, Conway	Threatened, Imperiled
Hairy Hudsonia (*Hudsonia tomentosa*)	Bartlett, Conway	Threatened, Imperiled
Lance-leaved Arnica (*Arnica lanceolata*)	Hart's Location	Threatened, Imperiled
Mountain Firmoss (*Huperzia appressa*)	Hart's Location	Endangered, Critically Imperiled
Northern Neglected Reed Grass (*Calamagrostis stricta ssp. Inexpansa*)	Hart's Location	Threatened, Imperiled
Parasol Sedge (*Carex umbellate*)	Carroll, Hart's Location	Endangered, Critically Imperiled
Rough-leaved Goldenrod (*Solidago patula*)	Bartlett, Hart's Location	Endangered, Historical
Silverling (*Paronychia argyrocoma*)	Bartlett, Conway, Hart's Location	Threatened, Imperiled
Three-birds Orchid (*Triphora trianthophora*)	Bartlett, Conway	Threatened, Imperiled
Violet Butterwort (*Pinguicula vulgaris*)	Hart's Location	Endangered, Critically Imperiled
Swift River		
Wetland Ecological System		
Medium level fen system	Albany	Rare or uncommon

Species	Location	NH Status
Moderate-gradient sandy-cobble riverbank system	Albany, Livermore, Waterville Valley	Rare or uncommon
Terrestrial Community Type		
Rich red oak rocky woods	Albany	Imperiled
Hemlock – spruce northern hardwood forest	Albany	Rare or uncommon
Semi-rich mesic sugar maple forest	Albany, Livermore, Waterville Valley	Rare or uncommon
Mixed pine – red oak woodland	Conway	Critically imperiled
Wetland Community Type		
Meadowsweet alluvial thicket	Albany	Rare or uncommon
Montane heath woodland	Albany	Imperiled
Balsam fir floodplain/sit plain	Albany	Imperiled
Plant		
Dwarf Blueberry	Albany, Livermore, Waterville Valley	Threatened, critically imperiled
Lance-leaved Arnica (*Arnica lanceolata*)	Albany	Threatened, Imperiled
Northern Neglected Reed Grass (*Calamagrostis stricta ssp. Inexpansa*)	Albany	Threatened, Imperiled
Wiegand's Sedge (*Carex wiegandii*)	Albany	Endangered, critically imperiled

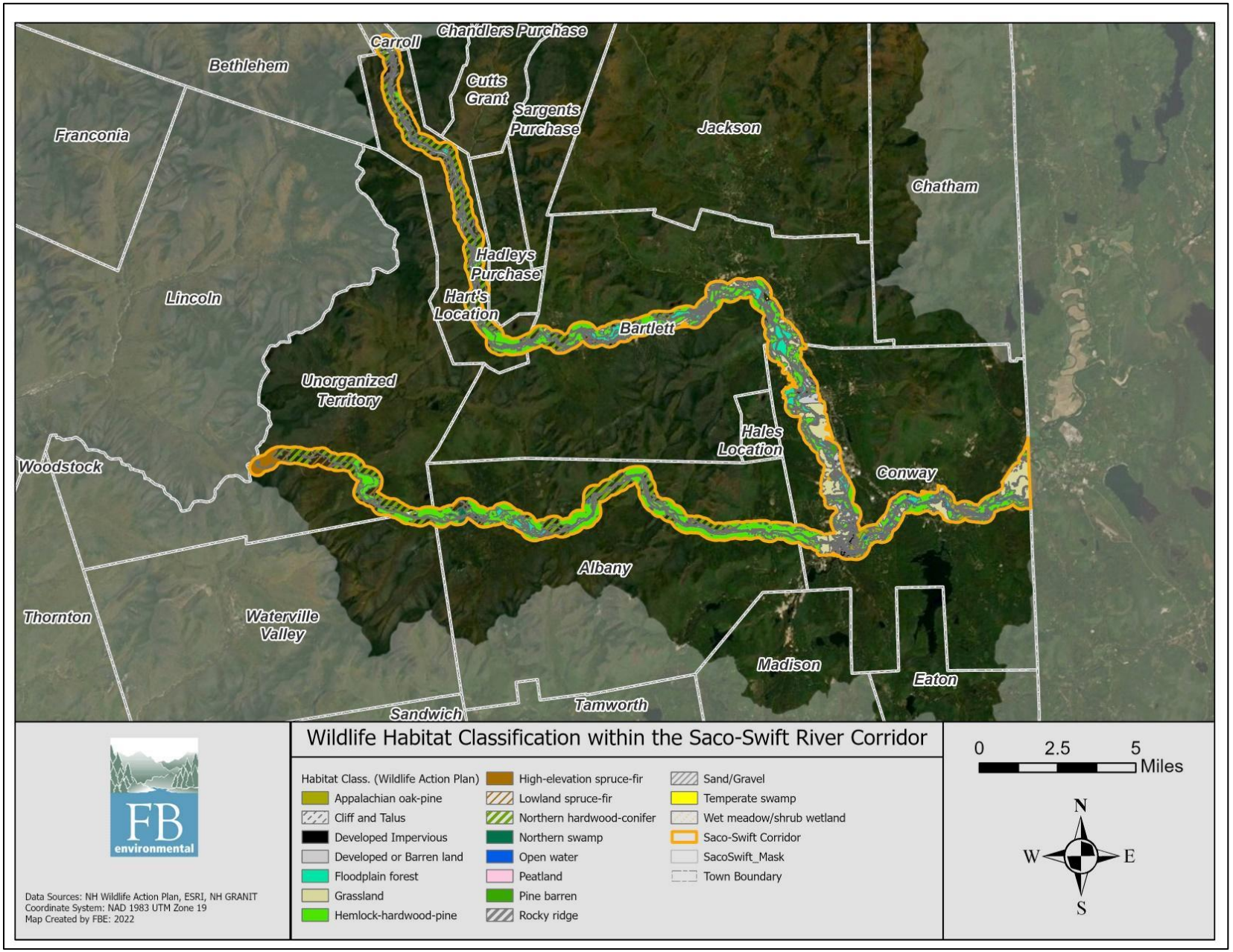


Figure 8. Wildlife Action Plan wildlife classification within the Saco-Swift Corridor.

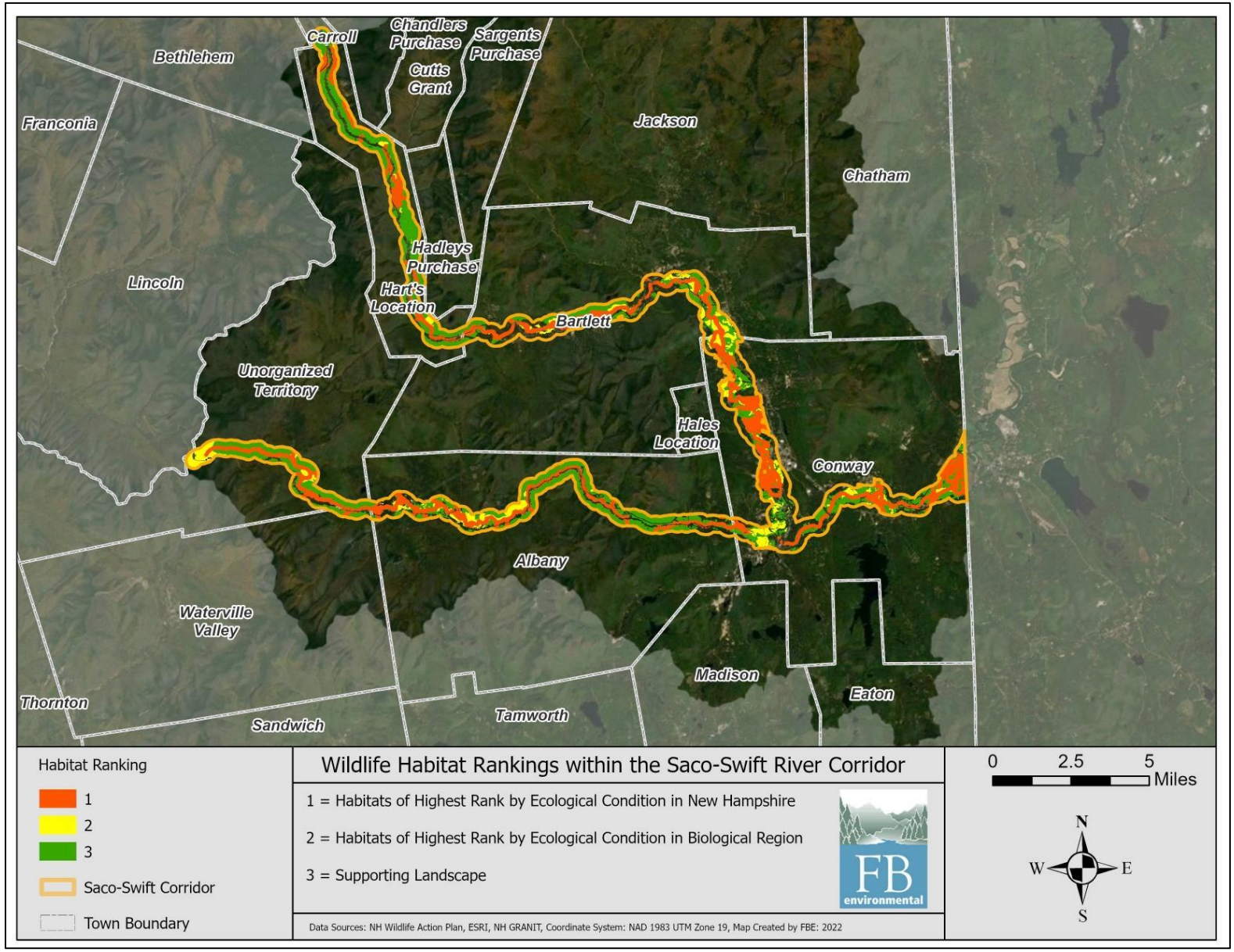


Figure 9. Wildlife Action Plan, wildlife habitat rankings within the Saco-Swift Corridor.

MANAGED RESOURCES

While much of the Saco-Swift Corridor remains uninhabited and is within the WMNF, many of the resources are managed and utilized in some way by the communities that surround them. Indeed, when entering the WMNF, the sign reads "Land of Many Uses". The rivers have been impounded for recreation, confined for safe passage, and used to dilute and transport pollutants. Water resources are managed for drinking water and waste management.

DAMS

There are three dams on the Saco River that are listed in the NHDES Dam Inventory (**Table 5**). The first dam is at the origin of the Saco River in Carroll at Saco Lake. Moving downstream, the second dam is in Hart's Location at the Willey House, creating a reflection pond off Route 302 (Crawford Notch Road). The third dam is the Mill Theater dam in Conway Village, which is classified as "Ruins". There are five dams on tributaries to the Saco River that lie within the Saco River corridor.

An additional impediment on the Saco River is located off of Kalil's way in lower Bartlett. The partial dam or dike exists at the confluence of the East Branch of the Saco River and the main stem of the Saco River and is approximately 215 feet long, composed of boulders, and does not currently cross the entire length of the Saco River (**Figure 10**). The dike appears to have been built in 1988 under a NHDES and Army Corp of Engineers permit by a private landowner in an effort to protect their property. The dike is an example of a hard infrastructure change to a river that has likely played a role in impacting the downstream geomorphology of the Saco River, documented by a geomorphic assessment completed during the Kearsarge Brook – Saco River Watershed Protection Plan in 2022. Impacts are also visible from aerial imagery where sediment has shifted around, and downstream of, the dam.

Figure 10. Google Earth Imagery of Kalil Dike in 1994 (left, approximately eight years after installation) and 2018 (right, approximately 30 years after installation). The two time points show how the river geomorphology has shifted and how sediment has accumulated downstream of the dike.

There are no dams on the channel of the Swift River. Three dams are located on tributaries within the Swift River Corridor, the Hatch Dam and the Conway Reservoir Dam both in Albany and the Tannery Dam in Conway.

None of the dams within the Saco-Swift Corridor are listed in the National Inventory of Dams.

Table 5. Dams within the Saco-Swift Corridor (New Hampshire Dam Inventory).

Dam	River	Town	Status	Height (ft)	Length (ft)	Intended Use
Conway Reservoir Dam	Swift River tributary	Albany	Exempt	3	40	Conservation/Agriculture
Hatch Dam 1	Unnamed stream	Albany	Active	12.5	78	Recreation
Hatch Dam 2	Unnamed stream	Albany	Active	17	171	Recreation

Dam	River	Town	Status	Height (ft)	Length (ft)	Intended Use
Meadow Brook Dam	Saco River tributary	Bartlett	Ruins	8	90	Mill
Kalil Dam	Unnamed stream	Bartlett	Active	12	300	Recreation
Drew Recreation Pond	Unnamed stream	Bartlett	Active	12	20	Recreation
Summit Hotel Pond 1	Runoff	Bartlett	Active	6	50	Detention
Summit Hotel Pond 2	Runoff	Bartlett	Exempt	8	200	Detention
Summit Hotel Pond 3	Runoff	Bartlett	Exempt	4	450	Detention
Summit Hotel Pond 4	Runoff	Bartlett	Exempt	4	75	Detention
Saco Lake	Saco River	Carroll	Exempt	5.5	25	Recreation
Tannery Dam	Swift River tributary	Conway	Active	10	97.5	Recreation
Mill Theater Dam	Saco River	Conway	Ruins	10	0	Mill
Willey House Dam	Saco River	Hart's Location	Active	9	290	Recreation

STREAM CROSSINGS

Stream crossings are points where roads intersect waterbodies, usually rivers or wetlands, and the water flows under the road via a culvert or bridge opening. Stream crossings need to be adequately designed and constructed to allow for peak flows and aquatic organisms to pass through. Many old, poor condition, or poorly designed stream crossings block the channel flow and Aquatic Organism Passage (AOP). Undersized culverts are a common occurrence that restrict flow and change natural erosion, transportation, and deposition processes. Stream crossings using inappropriately sized or installed culverts often cause erosion upstream and downstream. Failure of stream crossings is also a significant risk with the abundant mobilization of fill material and the potential failure of adjacent banks.

The NHDES Aquatic Restoration Mapper identifies stream crossings structures that have undergone a detailed assessment for geomorphic compatibility, fish passage, and condition. The geomorphic compatibility score produced by NHDES measures how well the crossing is suited for the natural form of the river and if it alters the hydrology or sediment transport. The AOP score measures the ability of fish and other aquatic organisms to pass through the crossing. The structural condition score used visual observations to measure the integrity of the crossing.

The NHDES dataset is not a comprehensive list of all stream crossing within the state, just the ones that have been assessed by certified stream crossing assessment teams and then reviewed by NHDES (**Table 6**). Within the Saco and Swift River watersheds in New Hampshire (Headwaters Saco River, Conway Lake-Saco River, and Swift River HUC 10 watersheds), 208 stream crossings have been assessed for structural condition and 198 have been assessed for AOP and geomorphic compatibility, at the time of writing this document. The U.S. Forest Service also maintains a database of aquatic organism passage for the White Mountain National Forest, which details habitat miles improved within the National Forest. Within the WMNF, of which much of Saco-Swift Corridor Watershed is within, over 12 miles of aquatic organism passage have been improved since 2011. Improvements to habitat include road crossing improvements and aquatic organism passage barriers removed.

Table 6. Geomorphic compatibility, aquatic organism passage, and structural condition scores for assessed stream crossings within the Saco and Swift River watersheds.

Geomorphic Compatibility		Aquatic Organism Passage		Structural Condition	
Score	*Number of Crossings*	*Score*	*Number of Crossings s*	*Score*	*Number of Crossings*
Fully Compatible	50	Full Passage	74	Good	61
Mostly Compatible	72	Reduced Passage	54	Fair	124
Partially Compatible	31	No Passage	59	Poor	17
Mostly Incompatible	16	Not Surveyable	7	Undefined	6
Not Surveyable	11	Undefined	4	---	---
NA	18	---	---	---	---

Stream crossings can present an array of problems for geomorphic, habitat, or structural reasons. Top left: Within the Saco-Swift watershed (but not in the river corridor directly), this culvert on Kearsarge Brook has a perched outlet, blocking the passage of native fish species at certain life stages. The perched outlet is also a sign that the crossing is undersized, resulting in increased flood flows, scouring at the culvert outlet, backwatering upstream of the crossing, and increased risk of overtopping the road. Top right: Further down Kearsarge Brook, this open bottom stream crossing is closer to the current standard for organism passage, allowing for many organisms to cross under the road. However, the unnaturally large boulders placed in the stream bed limit the passage of some fish species and disrupts the natural transport of sediment and bed material through the river system resulting in geomorphic instability. A natural streambed design would be preferred here. Bottom: The 1st Bridge River Road crossing of the Saco River in Conway effectively allows a natural river bottom habitat, organism passage, and can accommodate higher flows. The tree jam exhibits a potentially dangerous problem that can occur during high flows. Photos: FBE (during the Saco River – Kearsarge Brook rapid geomorphic assessment – refer to page 38 for additional details).

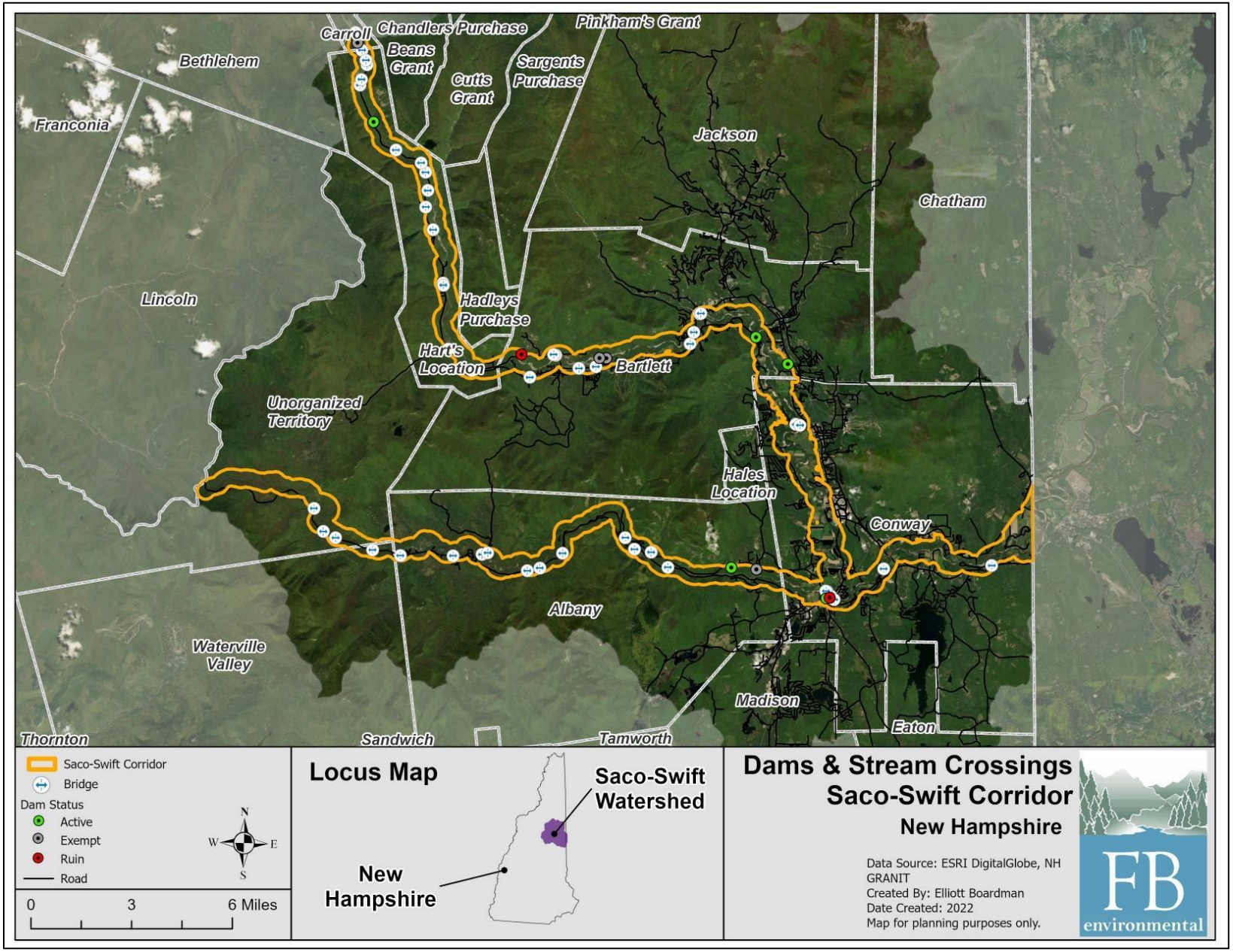


Figure 11. Map of dams and stream crossings within the Saco-Swift Corridor.

FLUVIAL EROSION HAZARDS

River channels are constantly in flux, balancing stream flow with erosion and sedimentation processes, trending towards a stable equilibrium. Erosion is a natural process where soil, vegetation, and rock are transported downstream via stream flow. Natural and human induced changes to a river corridor causes changes to the rivers discharge, erosion, and sedimentation processes. Large storm events, alteration of riparian vegetation, changes in natural infiltration and runoff patterns, and physical changes to the land within the floodplain can rapidly change the rate of erosion within a river channel (NHDES, 2008). Practices such as land clearing, new development and roads, logging, and soil disturbance on uplands can increase the threat of polluted runoff through increased erosion, ultimately carrying sediment and nutrients into surface waters.

There are four sand and gravel mines within the Saco-Swift Corridor that may contribute to increased erosion and runoff. One of these is Glen Aggregates in Bartlett, and the other three are from unknown origin in Bartlett and Conway (NHFG, 2017).

Extensive armoring of a stream channel with hard surfaces (i.e., rip-rap) and manipulation of floodplains can result in channel alteration and artificially high flows that can cause severe erosion and damage to infrastructure within the floodplain. The areas of the floodplain that are prone to excessive erosion and flooding during large storm events are sometimes called fluvial hazard areas or zones. In New Hampshire, NHDES designated Fluvial Hazard Zones as areas “along river corridors that present high risks of erosion” (NHDES, 2008). These areas are identified using data from geomorphic assessments of river reaches, stream crossing data, and other geologic and infrastructure data. According to NHDES, there are no Fluvial Hazard Zones within the Saco-Swift Corridor. Despite this, riverbank erosion is an identified threat to the corridor. The following case study section describes geomorphic assessment completed for a portion of the corridor under a Watershed Based Plan.

Fluvial Erosion and Geomorphic Instability Affecting Stream Habitat: Case Study in the Kearsarge Brook – Saco River Watershed

In 2021-2022, a geomorphic assessment and habitat assessment of the Saco River was completed by FB Environmental Associates and Streamworks, PLLC. While only covering a few miles of the Saco-Swift Corridors full drainage network, this work under a Watershed Management Plan provides a detailed site-specific assessment that provides a greater understanding of the fluvial geology of the region and local threats to the Saco-Swift river system. The assessment delineated reaches of the river and tributary based on landscape controls (processes that influence the stream morphology, including channel dimensions, substrate, and bedforms), which informs the habitat restoration potential of the rivers and streams. The geomorphic assessment identified generally that the river is actively changing forms in response to watershed and reach-scale factors. Sediments from the Saco River are being deposited into expansion zones or the inside of meandering bends in the river. As these depositional features accumulate beneath the river alluvial surface that is currently occupied for recreational (golf, camping) or agricultural land uses, the flow of the river changes. Flows will be deflected or concentrated along the streambank, in turn resulting in increased erosion of the streambank. This may ultimately cause hillslope failures and eroded sandy material may smother downstream habitat substrates (Woidt, 2021; FBE, 2022).

The habitat assessment of these segments of the Saco River found that the assessed reaches had good connectivity with very few obstructions blocking AOP, a good amount of large woody debris, and exhibited good hydrologic characteristics of a riffle-pool stream type. Some sections of the Saco River were unnaturally straight and shallow, lacking stream bed heterogeneity and organism refuge. Heterogeneity means dissimilarities or diverse qualities, referring to aquatic streambed diversity in this context. Heterogeneity is an important component of complex aquatic habitats that provide substrate for a diverse array of macroinvertebrates and fish species. Heterogeneity is also tied to stream stability because geomorphically stable reaches retain material such as woody debris during high flows, which also forms useful cover for aquatic organisms (Vermont Agency of Natural Resources, 2009). A few large eroding sand banks were observed along some reaches of the Saco River, highlighting the sensitivity of the reach and the potential for habitat degradation due to severe scour and deposition and loss of bank canopy (FBE, 2022).

Ultimately, the Saco River is responding to changes and restrictions due to centuries of human activity in the river corridor that has increased exponentially in recent decades. **Figure 12** illustrates how within this watershed study area, the Saco River takes a winding path through the valley, historically progressing between a single-thread channel to a multi-thread channel and back in several locations as progressive meander migration occurs. Sediment deposits are building up a changing floodplain that is constrained by adjacent land uses. As the floodplain develops around a constrained channel, flows are being pushed and concentrated along the streambanks, exacerbating bank erosion.

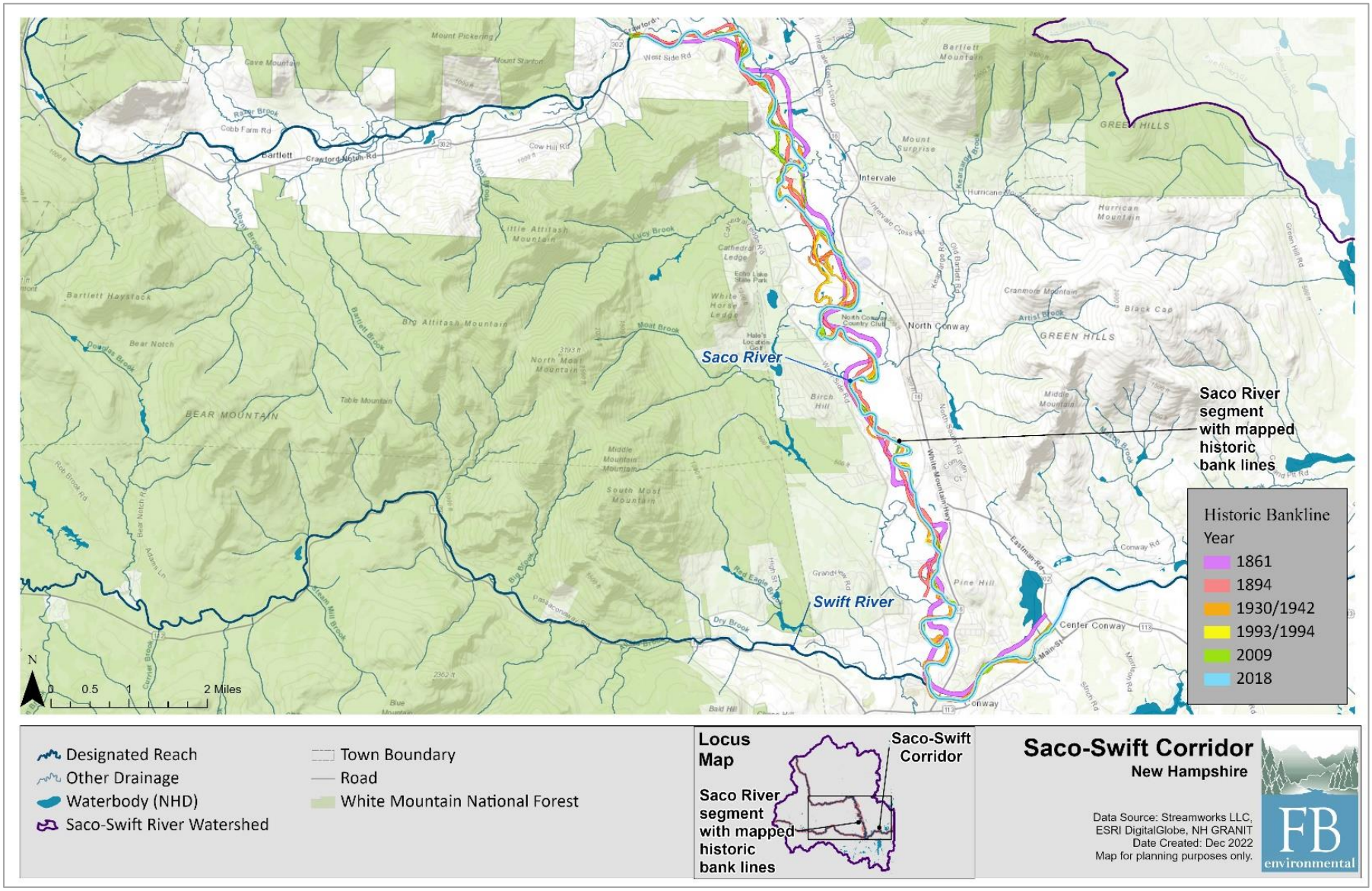


Figure 12. Historic Saco River bank lines within the Kearsarge Brook - Saco River watershed. This watershed includes a segment of the Saco River between lower Bartlett and upper Conway. Fieldwork and mapping completed during the development of this watershed plan – such as mapping of historic bank lines shown here and completed by Streamworks, PLLC – provide a greater understanding of the fluvial geomorphology of the region and local threats to the Saco-Swift River system (Woidt, 2021; FBE 2022).

WATER WITHDRAWALS

All facilities which withdraw or discharge more than 20,000 gallons of water per day, averaged over a seven-day period, or more than 600,000 gallons of water in any given 30-day period are required to register as a water user by the NHDES Water Use Registration and Reporting Program (WURR). A registered water user is required to report monthly incoming and outgoing water volumes. The source could be groundwater, surface water, or water transferred from another facility while a destination may be the environment, a facility, or a product that water is incorporated into.

Within the Saco-Swift Corridor Region, there are a total of 30 registered water users, with 14 in Bartlett and 16 in Conway. Though registered water used data from NHDES cannot be publicly mapped, in general, the majority of the water withdrawal users in the corridor are located along Route 302 in Bartlett, in downtown North Conway, and a few in downtown Conway. Water withdrawals can impact groundwater levels (potentially affecting private wells) and seasonal stream flow levels. Refer to page 60 for additional information on the New Hampshire instream flow program - the Saco and Swift rivers currently do not have an instream flow program or management plan from NHDES, but these should be developed in the future for both rivers.

WELLHEAD PROTECTION AREAS

Wellhead Protection Areas (WHPA) are the surface and subsurface areas surrounding a well that supplies a public drinking water system. WHPA are also areas in which contaminants are likely to move toward such drinking water systems. This specific data, provided by NHDES, represents WHPA for community and non-community drinking water supplies as well as watershed delineations for surface water intakes and groundwater sources directly influenced by surface water. Areas are identified by NHDES based on existing hydrologic data or advanced studies. NHDES uses a 500–foot radius around water sources for protection activities. For example, suggested protection activities include removing/preventing underground or aboveground storage tanks, prohibiting using or storing herbicides, pesticides, and herbicides, prohibiting storage of hazardous substances, and not locating septic systems or parking areas within the protection area.

There are a total of 34 WHPA within the Saco-Swift Corridors covering approximately 6,830 acres, located mostly in Bartlett along Route 302 and in Upper North Conway. While the state assessed the vulnerability of public drinking water supplies and developed source assessment reports, municipalities play a crucial role in protecting the aquifers and rivers used as drinking water in New Hampshire through land use planning, zoning, and public education. The Town of Conway has a groundwater protection overlay district to protect groundwater sources and municipal drinking water around municipal wells.

ANTHROPOGENIC SOURCES OF POLLUTION

While surface runoff from the landscape (i.e., non-point sources) can add a significant load of sediment and nutrients to rivers, lakes, and wetlands, direct discharges of pollution from pipe outfalls (i.e., point sources) can make up a large portion of the pollutant load. Point sources of pollution are easier to track and regulate than non-point sources and the U.S. EPA, through the Clean Water Act, requires a National Pollutant Discharge Elimination System (NPDES) permit for any point-source discharge to a waterbody. The NPDES permit regulates the quantity of pollutants that you can discharge to a waterbody.

Locations of permitted NPDES discharges in New Hampshire are often wastewater treatment plants, hydroelectric facilities, aquaculture facilities, and facilities with groundwater seepage. There are only three registered NPDES outfalls within the Saco River watershed in New Hampshire. Two of the NPDES outfalls are within the Saco-Swift Corridor. One of the outfalls within the corridor is inactive, located on Mill Brook in Conway. This outfall was discharging from a laundry facility. The other two outfalls are from wastewater treatment facilities. The Conway Village Fire District discharges wastewater lagoon effluent into the Saco River in Conway. The Jackson Water Precinct discharges into the Ellis River outside of the Saco-Swift Corridor.

The NHDES database has locations of potential contamination sources (PCS) in New Hampshire. According to NHDES a PCS is "…human activities or operations upon the land surface that pose a reasonably foreseeable risk of introducing regulated substances into the environment in such quantities as to degrade the natural groundwater quality" (RSA 485-C:7). There are 19 PCS listed in the Saco-Swift Corridor. **Table 7** lists the types of PCS located within the corridor.

Table 7. Potential Contamination Types within the Saco Swift Corridor.

PCS Activity Types and Type Codes		
Potential Contamination Type	**Type Code**	**Number Of PCS**
Vehicle service and repair shops	VSR	2
General service and repair shops	GSR	3
Manufacturing facilities	MAN	1
Underground and aboveground storage tanks	UST/AST	1 UST, 1 AST
Transportation corridors	NT (no type available)	1
Laboratories and certain professional offices (medical, dental, veterinary)	LAB	4
Salt storage and use	SALT	1
Cleaning services	CLN	2
Fueling and maintenance of earth moving equipment	EEE	3

HISTORICAL & CULTURAL RESOURCES

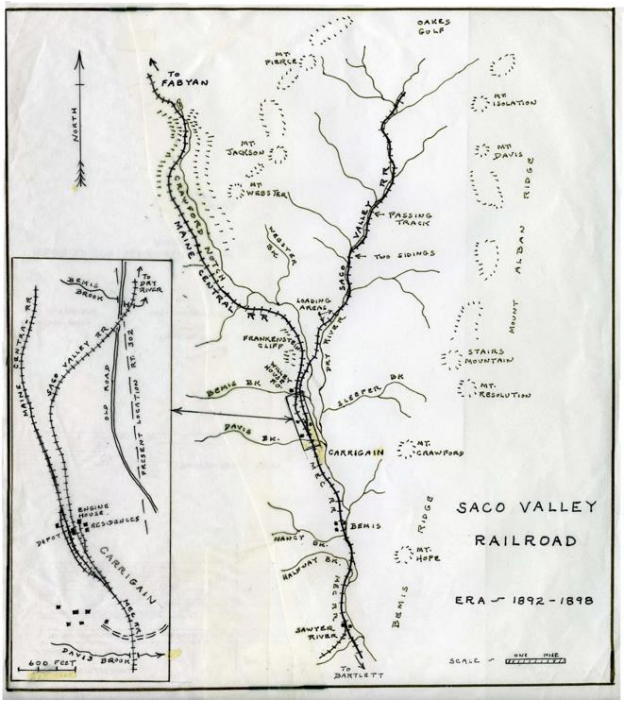
SACO RIVER WATERSHED HISTORY

The Saco-Swift Corridor and the surrounding landscape was home to a rich population of indigenous peoples. People who are indigenous to the northeast are collectively known as the Abenaki but are comprised of many different tribes all speaking a related dialect. The name "Saco" is derived from the Eastern Abenaki word "Sakóhki," which means "land where the river comes out" (Bright, 2004). The Abenaki people lived on the rich natural resources of the Saco River watershed, and for over 13,000 years, the Abenaki peoples gained a deep and complex understanding of the landscape including the planting of corn on the riverbanks in the spring, harvesting fish in warmer months, and hunting game further upstream on the Saco River (Saco River History/Visit Maine, n.d.). Before colonization, land was not owned privately – instead it was used according to custom, season, and need. Villages were often constructed along rivers or lakes where access to the water and food was available. The Saco River is identified as a historical fishing ground of the Abenaki. There is evidence of early Native American inhabitance in archeological excavations of terraces of the Swift River. A settlement of approximately 200 wigwams in the floodplain area at the confluence of the Saco and Swift rivers was documented in 1642.

In the early 1500s, European explorers observed the indigenous use of the river for agriculture, fishing, and hunting and determined it a favorable location to settle permanently in 1631 (Hardiman, n.d.). As settler communities grew in the 1600s, English settlers claimed ownership of Abenaki ancestral lands, N'dakinna, and inflicted harm, violence, disease, and environmental degradation through the process of land dispossession (Indigenous NH Collaborative Collective, 2022; Cronon, 1983). Over the subsequent centuries, rapid industrial expansion and development surrounded the Saco River Headwaters region, altering the river's landscape. By the early 1800's the river corridor was populated by European settlers, with small homesteads spread out across the landscape. One example of an early farmstead, now owned and operated as a museum by the U.S. Forest Service, is the Russell-Colbath House, located along the Swift River in Albany. Two covered bridges that were built in the mid 1800's still exist over the Swift River; the Albany Bridge, restored in the 1990's, and the Swift River Bridge in Conway.

The development of the Saco's first sawmill in the mid-1650s marked the start of the profitable trade of lumbering. By 1800, nearly 17 sawmills stood at Saco Falls in Saco and Biddeford, Maine (Saco River History/Visit Maine, n.d.). Each spring, the highly skilled river drivers would conduct log drives, moving thousands of logs downstream towards the lumber yards. Loggers would use a tool called a "peavey" to keep the logs moving down the river and to break up dangerous log jams (W.H. Parish Publishing Company, 1894). Logging also took place in the Upper Saco watershed but was short-lived in comparison to the sawmills located along the Southern Saco River. In 1891, a logging railroad called the Saco Valley Railroad (SVRR) began construction up the Dry River to transport spruce logs to a large sawmill in Bartlett New Hampshire. The SVRR ran only from 1892 to 1898 and covered a little under seven miles, originating from the old Fred Garman Mill in current day Hart's Location, New Hampshire and continuing up the Dry River towards Oaks Gulf and Mount Washington. The railroad operations centered at the settlement and logging community of Carrigain Village in which several hundred

persons resided during peak logging. After timber operations ceased in 1898, the once-thriving logging village disappeared. Very little of the Carrigain Settlement remains today, not far from the current day Notchland Inn in Hart's Location. Most of the Saco River Valley, where logging railroads once ran, is now a designated federal wilderness area situated in the White Mountain National Forest (Dickerman, 2013).



Left: Map of the Saco Valley railroad with the Carrigain Settlement 1891-1898. Source: WhiteMountainHistory.org. Right: Maine log drive on the Saco River in Hiram, ME (Credit: Arthur Griffin, 1903).

To aid the thriving local lumber industry, hydropower stations were developed along the Saco River in the late 1600s, which harnessed the river's waterpower from the natural rapids such as Hiram Falls in Hiram, Maine. The Saco River also played an immense role in transportation, including the use of the river's wide canals for construction of ships to transport excavated granite in the quarries nearby in Biddeford and Saco, Maine. Before the first bridge in Maine was built on the river in 1758, small boats and ferries traversed the Saco River (Saco River History/Visit Maine, n.d.). For the ease of transportation, dams and channels were constructed in the early 1800s. The opening of the Boston and Maine (B&M) Railroad passenger service in 1896 transformed the tourism industry in New England, bringing accessibility to the delights of the Saco River watershed (Nowell, 2016). Although the popularization of the private automobile eventually ended the B&M passenger service (and is now the Pan Am Railways), the Conway Scenic railroad continues to run routes through the Upper Saco watershed providing an old-fashioned railroading experience that departs from an 1874 train station in North Conway Village (Conway Scenic Railroad). The Saco River watershed has a rich legacy of Indigenous use, agriculture, fishing, hunting, lumbering, manufacturing, transportation, hydropower, drinking water, and recreation, which has shaped and transformed the watershed we know of today (FBE, 2022).

HISTORIC AND CULTRUALLY SIGNIFICANT LOCATIONS

The National Parks Service maintains a National Register of Historic Places (NRHP), which is aimed to preserve historically significant places. This list was authorized by the 1966 National Historic Preservation Act. The database allows for individuals to nominate properties which are then reviewed. Within the Saco-Swift Corridors specifically there are two buildings registered under the NRHP. The first building is the Russell-Colbath House. This historic site is located off the Kancamagus Highway (NH Route 112) and includes the house proper, a timber frame barn, the Albany Town Cemetery, and the Rail N' River Trail. The other registered historic building within the Corridor is the Crawford Depot. The Crawford Depot is a passenger railroad station was built in 1892, which now serves as a reminder of the area's history as a tourist destination. Additional historic buildings located within the Saco and Swift River watersheds are the William K. Eastman House, the Eastern Slope Inn, the North Conway 5 and Ten Cent Store, and the Eagle Mountain House.

The NRHP also maintains an inventory of cultural resource districts. There are no documented cultural resource districts within the corridor, but within the watershed there are multiple. The first district is the Abenaki Indian Shop and Camp, which is a 3.8-acre, forested area that served as a camp for the Abenaki people to sell hand crafted items to tourists in the late 19th into the late 20th centuries. The district is located in the Intervale area of Conway. The next district within the Saco and Swift River watersheds is the North Conway Depot and Railroad Yard, which was built in 1874, and is the terminus for the Conway Scenic Railroad. Lastly, the Jackson Falls National Register Historic District which encompasses the historic village center of Jackson and has multiple historic buildings within it.

RECREATIONAL RESOURCES & PUBLIC ACCESS

The Saco-Swift Corridor is located in one of the most pristine and heavily conserved areas in the state. With approximately 68% of the Saco and Swift River watersheds and 5% (10,556 acres) of the corridor proper being conserved land, recreational opportunities within the river corridors are endless. The corridor boasts numerous water access points, miles of trails, and unique natural features, making this the most revered outdoor recreation area in New Hampshire. The following section describes the permitted recreational uses and activities in the Saco-Swift Corridor.

WATER-BASED RECREATION

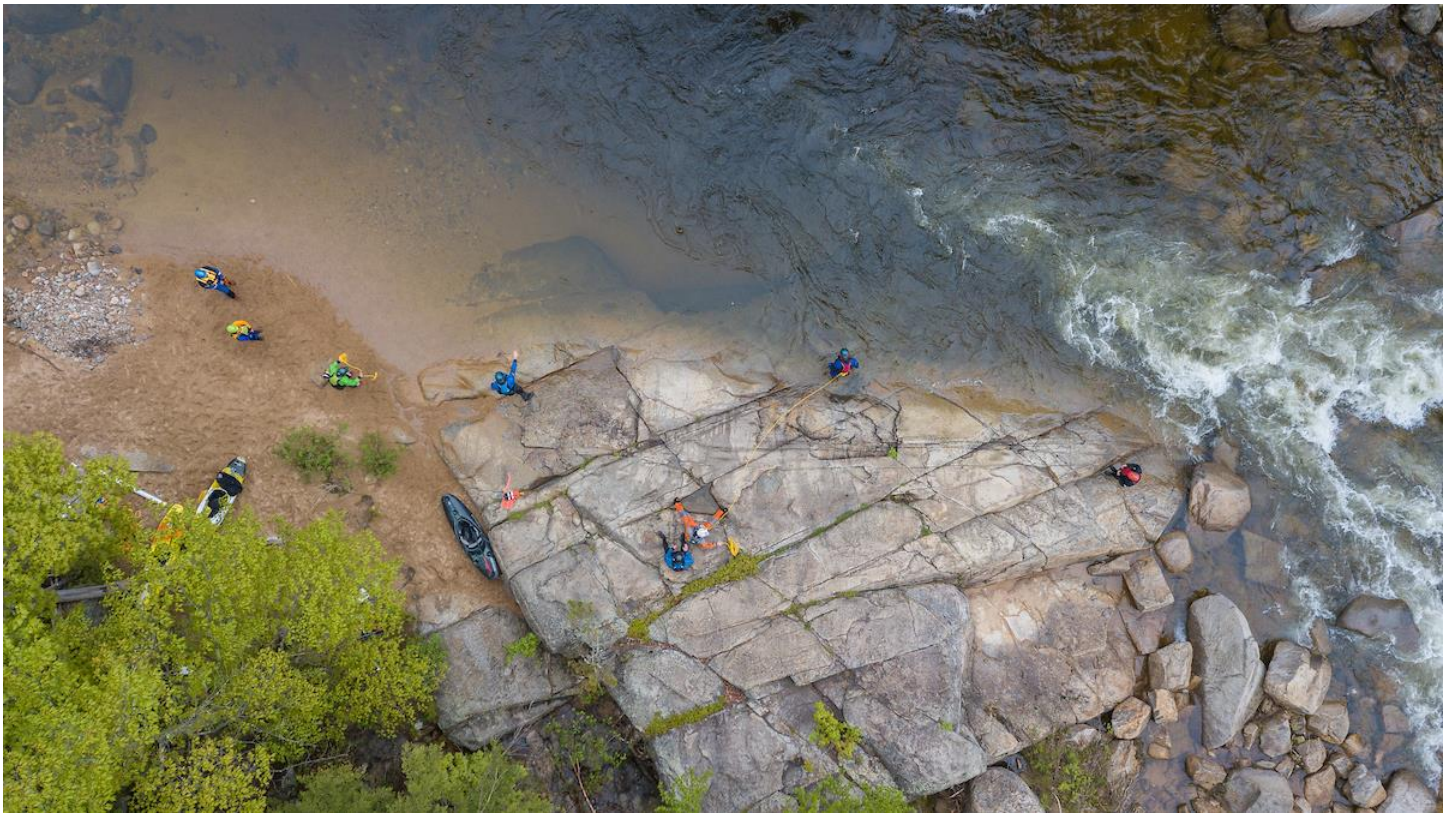
As mentioned in the above Plant and Wildlife Resources section, the Saco-Swift Corridor is home to all three trout species found in New Hampshire (Brook, Brown, and Rainbow). The presence of these species coupled with the rocky and sandy composition of the riverbed and the clear water creates opportunity for a thriving cold-water fishery. Fishing within the corridor consists of both fly and spin-fishing. According to New Hampshire Fish and Game Department (NHFG), the only section of water within the corridor that is designated as fly-fishing only is on the Saco River in North Conway, specifically from a marked sign at Lucy Brook to a similar sign at the confluence with Mill Brook.

Due to the depth and proximity of the Saco and Swift rivers to conserved lands motorized boating access is limited. The river corridor does however provide excellent canoeing, kayaking, and rafting. These activities attract thousands of tourists to the area during warmer summer months. The whitewater of both the Saco and Swift rivers is revered by highly experienced and novice paddlers alike. The rapids are largest and most sought after in the spring as both rivers swell from snowmelt runoff. Both rivers offer varying difficulties of whitewater, from leisurely raft floats along the Saco to a 6-mile whitewater run below the Lower Falls segment of the Swift River, which provides some of the most difficult whitewater in New Hampshire. The Appalachian Mountain Club programs, along with open boaters will enjoy whitewater runs on the Swift River from the Bear Notch Road to Rocky Gorge (a class 1-2 section), and whitewater paddlers enjoy runs from Rocky Gorge south to the roadside area along Kancamagus Highway closer to Conway (known locally as near the previous Darby Field Inn sign). Additional whitewater paddling opportunities near and along the Swift include upper sections high in the notch, including downhill from Lilly Pond, Downs Brook, Oliverian Brook, Hobbs Brook, and Sabbaday Falls.

Photos at right: Whitewater paddlers on the Swift River enjoying springtime runs (Credit: Wise Guy Creative).

In the Saco River and its tributary drainages, the Ellis River starting at Glen Ellis Falls, the East Branch of the Saco River, Slippery Brook, the Rocky Branch, the Dry River, and the Sawyer River are popular for whitewater paddling. These sections of whitewater draw expert paddlers from all over New England and further to the area. Indeed, some of these whitewater runs, such as along the Sawyer River and the Ellis River, are considered "New England Classics". On the Saco specifically, popular runs start in Crawford Notch and downstream, such as the gorge located near the Notchland Inn. The Saco hosts a section of contiguous rapids from Notchland to the center of Bartlett. The rapids calm between Bartlett and Conway, providing moderate whitewater. From North Conway to the Maine border the Saco is primarily smooth water. The draw of the Saco and Swift River whitewater runs (particularly in the spring) has led many paddlers to have a unique connection to the river, sometimes hiking boats miles up the steep creeks and tributaries. While different (and more transient) than some of the Saco's commercial summer boating operations (tubing, etc.), whitewater paddling recreation is an important part of the history and current use of both rivers. The Swift was rafted commercially previously, but inconsistent and unpredictable flow levels are not amenable to a commercial operation (especially as compared to the Saco). The Swift River did historically host a downriver slalom below Lower Falls that was attended by several nationally ranked paddlers.

Another popular recreational activity along the Saco River is tubing, which involves floating down the river in an inner tube until you reach the desired output point. There are multiple businesses within the corridor that offer tubing and canoe equipment rentals. From June to September, there are approximately 1,000 users during the week of the Saco River from Bartlett to Redstone and similar from Redstone to the Maine border. On the weekends, these numbers can increase to 2000 or more (estimated by Peter Gagne, Saco River Tubing Center/Beach Camping Area). While these high usage numbers are bringing money into the region, it is also impacting the river corridor in many ways including the degradation of river access locations and parking areas, increased littering and pollution of the river (including the fecal inputs due to a lack of accessible public restrooms), and increased erosion of riverbanks due to human traffic.



Above: The Sawyer River Rescue Group practicing on the Swift River during spring flows (Credit: Wise Guy Creative).

There are a total of 13 water access points in the Saco-Swift Corridor (**Table 8**). These access points range from easy to access, leisurely picnic locations along the river to strenuous, hike-in fishing areas. The access points mentioned above are only those that are formally regulated. There are many more locations by which one can access the river along the

corridor's numerous hiking trails. There are also many roads in close proximity to the Saco and Swift rivers, such as Route 302, creating even more opportunity for informal water access.

Table 8. Water Access Points Within the Saco-Swift Corridors.

Public Access Site	Access
Albany	
Rocky Gorge Scenic Area	Shore/ Riverbank
Dugway Picnic Area	Fishing Access
Lower Falls Scenic Area	Shore/ Riverbank
Albany Covered Bridge Fishing Pier	Fishing Access
Bartlett	
Saco River Conservation Easement	Walk-in
Conway	
Smith-Eastman Rec. Area	Park/Picnic
Swift River Bridge	Fishing Access
Davis Park	Beach/Picnic
First Bridge Conservation Area	Cartop
Harts Location	
Davis Path	Shore/ Riverbank
River Access	Shore/ Riverbank
Saco Lake Trail	Shore/ Riverbank
Crawford Notch State Park	Shore/ Riverbank

LAND-BASED RECREATION

There are approximately 560 miles of recreational trails within the Saco and Swift River Watersheds, with about 41 of those miles being in the Saco-Swift Corridor (**Figure 13**, **Table 9**). Trails within lands designated as WMNF comprises the majority (78% or 31.7 miles) of those. Prominent trails on WMNF designated land are the Boulder Loop Trail in Albany, Champney Falls Trail in Albany, and the Mount Tremont Trail in Hart's Location. Many of the hiking trails within the corridor follow either the Saco or Swift Rivers before eventually making their way outside of the corridor and up one of the many adjacent mountains. There are also a total of six campgrounds within the corridor, the largest of which being the Glen-Ellis Campground (approximately 62 acres). These campgrounds offer hundreds of sites, and with additional commodities such as the Village Motel and timeshares at Attitash Mountain resort, thousands of visitors are attracted each week during the recreational season, most of whom are recreating within the corridor during their stay (estimated by Peter Gagne, Saco River Tubing Center/Beach Campground Area).

Photo at right: The Dry River campground is located near the top of the Saco River corridor within Crawford Notch State Park, and suffered some damage from Hurricane Irene (Credit: Nancy Ritger).

The numerous trail systems in the Saco-Swift Corridor are not only used by hikers. Many of these trails lead to world-class rock-climbing areas. The high-quality granite cliffs and boulders of the area allow for every conceivable type of climbing. Notable climbing areas located in close proximity to the Corridor are White Horse and Cathedral Ledges, Sundown Ledge located off of the Boulder Loop Trail, and Frankenstein Cliffs which forms excellent ice formations for ice climbing in winter months. Additionally, certain trails may be used by cross-country skiers and snow mobiles when snow cover is present. Hunters are permitted to use WMNF land in compliance with state hunting regulations.

Other recreational activities present in this area include skiing, mountain biking, ice skating, wildlife observation such as birding, and dog walking. The White Mountains are home to numerous ski resorts and bring people from all over the world to the area during the winter months. Cross-country skiing and snowshoeing along trails within the corridor are popular activities for visitors and residents alike. The Saco-Swift Corridor provides an incredible recreational resource. The reputation of this area for recreation, whether it be skiing, hiking, climbing, or camping, entices people worldwide.

Table 9. Mileage of trail systems within the Saco-Swift Corridor.

Trail System	Miles
Albany	
White Mountain National Forest	16.23
Undefined	1.95
Bartlett	
White Mountain National Forest	0.86
Undefined	0.01
Carroll	
Crawford Notch State Park	0.24
White Mountain National Forest	1.38
Conway	
Dahl Wildlife Sanctuary	1.43
Echo Lake State Park	0.12
Hart's Location	
Undefined	0.02
Appalachian Trail	0.76
Crawford Notch State Park	4.43
White Mountain National Forest	5.30
Livermore	
White Mountain National Forest	7.69
Waterville Valley	
White Mountain National Forest	0.27
Total	**40.69**

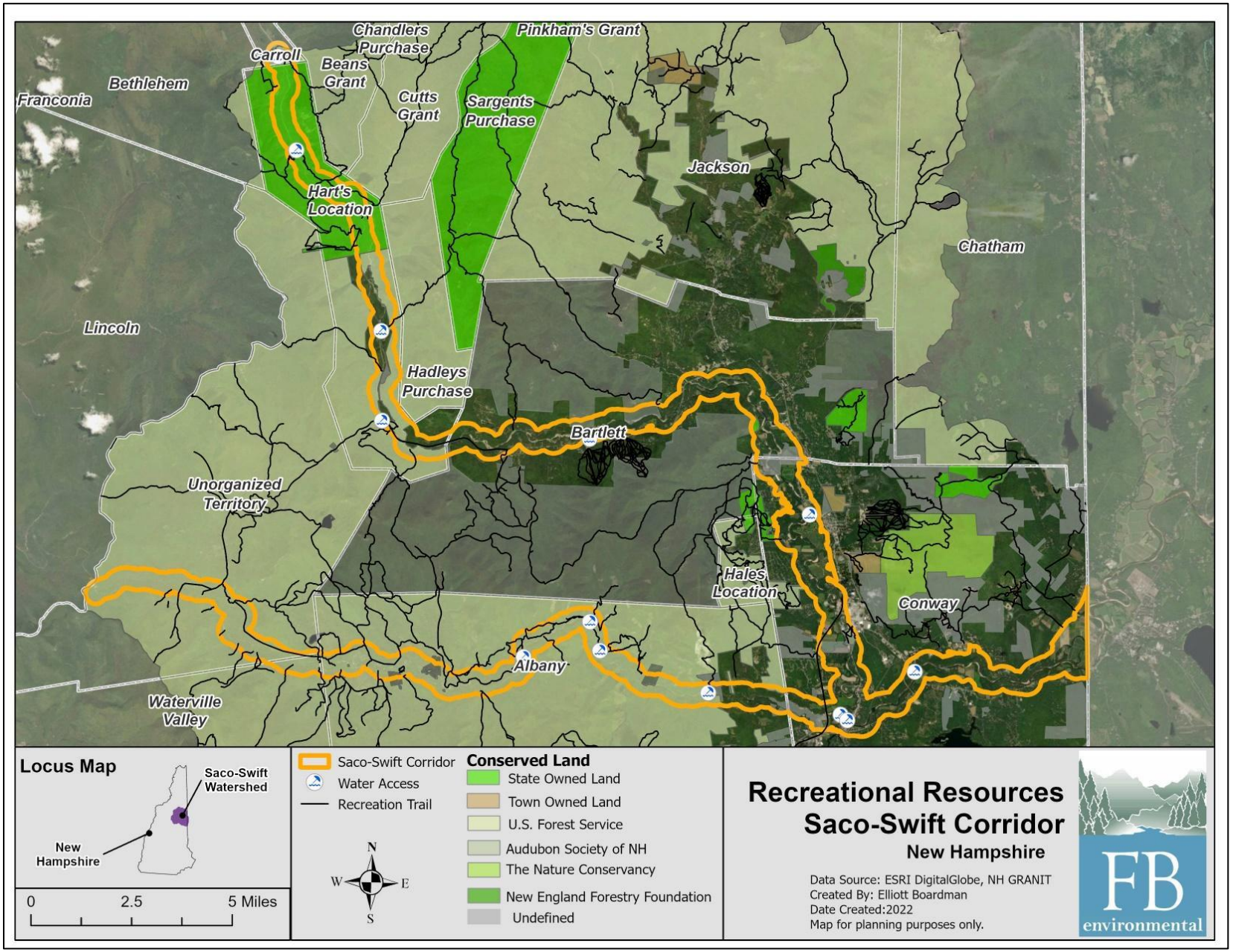


Figure 13. Recreational resources in the Saco-Swift Corridor.

IV. LAND USE AND DEVELOPMENT

In development of the Saco-Swift Corridor Plan, FB Environmental completed a land use assessment for the corridor, discussed in the following section.

LAND USE ASSESSMENT

The Land Use Assessment is a geographic information system (GIS)-based assessment of current and historical land use within the corridors, used to identify development patterns. Using geospatial technology and aerial imagery, FBE reviewed land use within the Saco-Swift Corridor occurring at different time periods. Land use analysis was completed for three separate time points. First, an assessment was completed using the most recent robust aerial imagery available (2018). Next, imagery from 2012 and 2003 and were analyzed as historical timepoints. Ideally, land use analysis would have been completed every 10 years exactly, but the available imagery did not allow for this. The New Hampshire Land Use Mapping Standards (2017) document was used as a template for land use classifications and for methodology.[1] The following sections provide additional detail on the methodology used (including data constraints), results, and key findings.

METHODOLOGY

The land use assessment was completed using geospatial technologies and aerial imagery. First, a base land use file from 2001 for the State of New Hampshire was obtained and processed using additional data sources (described below). Next, FBE updated the 2001 land use file for three future timepoints: 2003, 2012, and 2018, based on aerial imagery. Lastly, to further improve the 2018 dataset, FBE completed field checks of key areas where imagery was not sufficient to determine current land use.

The 2001 New Hampshire Land Use (NHLU) Assessment was used as the initial landcover dataset for this analysis, as this is the most recent comprehensive land use file available for the state. This landcover dataset maps and categorizes types of land use within the state and was completed using remote sensing technology, which detected patterns in image-based data. However, due to limitations in the remote sensing technologies used in the 2001 assessment, the accuracy of the data does not meet the requirements for accurately assessing land use at finer scales. To achieve as accurate a representation of land use within the Saco-Swift Corridor during the selected time points as possible, FBE used aerial imagery to update the land use categories for each year.

FBE used additional data sources to update the 2001 NHLU data; intended to verify and delineate land use categories to update the accuracy of the land cover file. These other sources include:

- NH Department of Transportation Road centerlines
- NH Department of Transportation railway centerlines
- NH National Hydrography Plus (NHD+) Dataset
- US Fish & Wildlife National Wetlands Inventory Plus (NWI+)

Next, to determine the land use categories for the three selected timepoints, FBE overlayed aerial imagery on top of the updated 2001 land use file. The 2003 and 2012 timepoints were chosen based on available aerial imagery quality. Once all three timepoints were analyzed, the total acreage of each land use classification was calculated using GIS.

Lastly, areas where land use could not be determined through desktop analysis were checked in the field, where field access was possible. For example, the photo at right shows an area classified as wetland under the National Wetland Inventory that was determined to be upland when field checked.

[1] GRANIT, UNH, NH OEP. (2008) updated (2017). NH Land Use Mapping Standard.

Examples of two locations within the river corridor that were field checked to determine land use. Both locations were classified as wetland by geospatial data but were determined to be upland when field checked (Credit: FBE).

Limitations

For the sake of this analysis, land use type classification was determined to the most descriptive degree that was able to be discerned from the available aerial imagery. For example, the 2001 NHLU classifies forest types to a specificity that is not able to be confirmed using aerial imagery (deciduous forest vs mixed forest, etc.). In these areas, a broad classification of "Forest Land" was assigned.

Additionally, the quality of aerial imagery used for the 2018 analysis was higher than that used in the two historical analyses due to advancements in the technologies. These discrepancies in image quality likely resulted in the 2018 land use analysis being more detailed than the historical analysis (2012 & 2003). The different imagery sets were also captured at different times of year, which presents further error when comparing land use change among time periods.

The results presented in this report are based upon available data and imagery. There may be discrepancies in the size of land use assessment categories across the different imagery years because of these limitations.

RESULTS

Results of the analysis are displayed in **Table 10** and **Table 11**. During all three time points, forested land composed nearly two-thirds of the land use classified within the corridor, at 66.7%, 66.2%, and 65.9% in 2003, 2012, and 2018, respectively (**Table 10**). The other largest land use categories (>1% of the corridor), in order of largest to smallest during all three timepoints, include open field, river/stream, residential, road/transportation, and forested wetlands. Between 2003 and 2018, these categories remained as the top land use categories.

The greatest changes in land use (i.e., change greater than 80 acres) from 2003 to 2018 are summarized by the following bullets and in **Table 11**.

- Forested land decreased by approximately 180 acres (1.2% decrease)
- Open fields increased by approximately 127 acres (6.4% increase)

- Row crops decreased by approximately 110 acres (55.0% decrease)
- Forested wetlands decreased by approximately 94 acres (11.2% decrease)
- Other cleared land increased by approximately 91 acres (41.7% increase)
- Residential land increased by approximately 85 acres (7.2% increase)

Key Findings

In summary, these land use changes indicate a slight decrease in forested land in the corridor and an increase in cleared and developed land (**Figure 14**). However, it is important to note that these changes are likely due in part to error presented by differences in the quality of the aerial imagery used for the three timepoints. While the exact error of these limitations has not been quantified, the results of this analysis are still beneficial for informing threats to the Saco-Swift Corridor.

Based on the findings of this analysis, it appears that over the past 15 years forested land, forested wetlands, and row crops have been steadily cleared and replaced by open fields and residential development. Part of this change is likely due to the decreased market for small dairy producers in New England, resulting in a regional shift in agricultural land away from corn silage and into grazing or non-productive lands. However, the development of forested and historically agricultural lands within the Mount Washington Valley appears to be having a quantifiable impact on land use within the river corridors. This highlights the importance of land use planning and regulation within the river corridors in order to protect valuable riparian resources into the future.

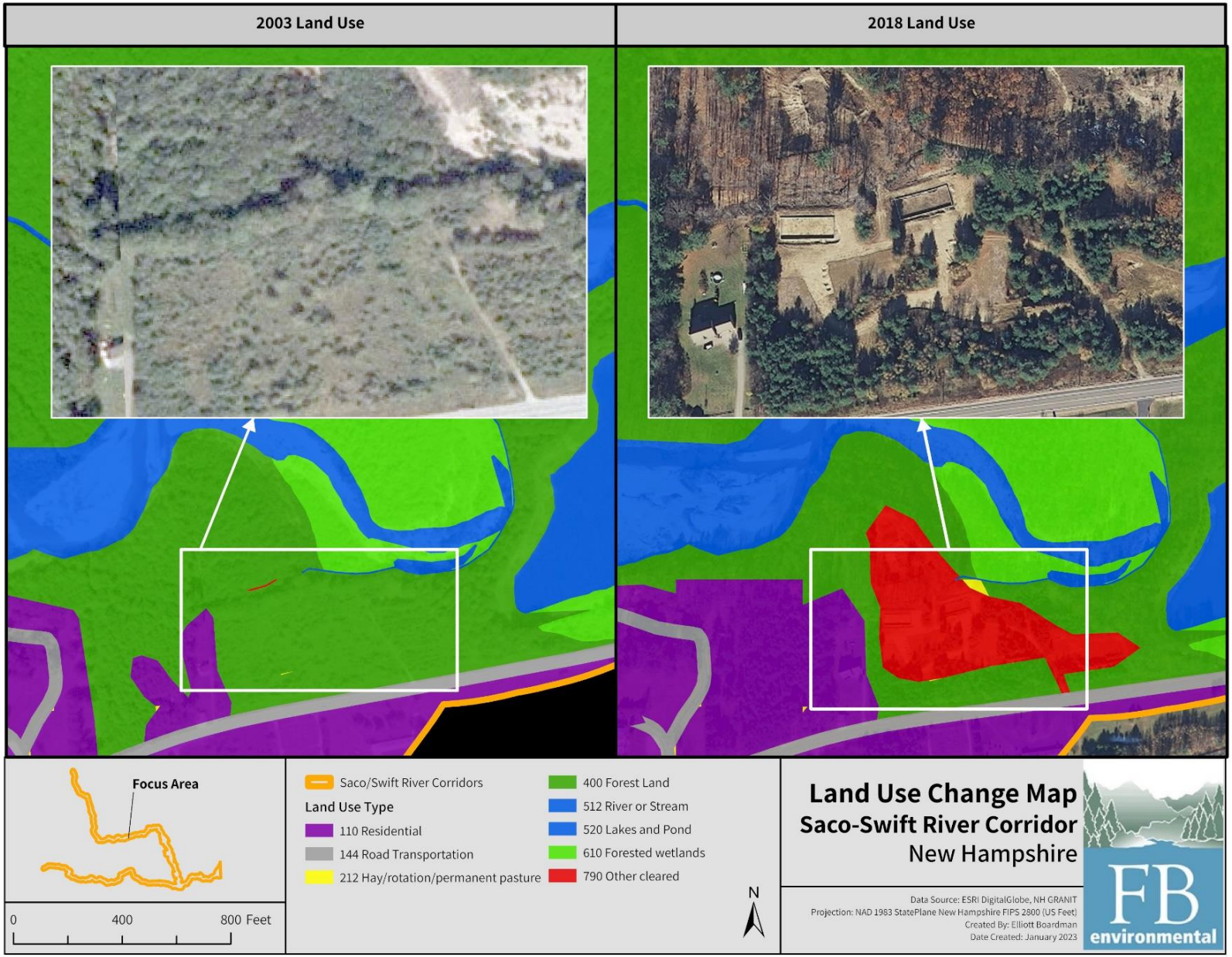


Figure 14. An example of land use change within the Saco River Corridor between 2003 and 2018. An area that was sparsely forested in 2003 has since been developed as is reflected in the 2018 land use assessment.

Table 10. Current area (in acres), and percent of the corridor, for each land use classification type at each of the three timepoints used in the analysis; 2003, 2012, and 2018.The data is presented in order of land use classification with the greatest area in 2018, largest to smallest.

Land Use Classification	2003		2012		2018	
	Area (acres)	Percent of Corridor	Area (acres)	Percent of Corridor	Area (acres)	Percent of Corridor
Forest Land	15,611	66.7%	15,512	66.2%	15,431	65.9%
Open Field	1,984	8.5%	1,988	8.5%	2,111	9.0%
River or Stream	1,662	7.1%	1,663	7.1%	1,663	7.1%
Residential	1,182	5.0%	1,242	5.3%	1,267	5.4%
Road Transportation	813	3.5%	822	3.5%	819	3.5%
Forested Wetlands	839	3.6%	839	3.6%	745	3.2%
Other Cleared	218	0.9%	242	1.0%	309	1.3%
Lakes and Pond	130	0.6%	130	0.6%	132	0.6%
Non-Forested Wetlands	123	0.5%	117	0.5%	125	0.5%
Campground	70	0.3%	70	0.3%	114	0.5%
Golf Course	111	0.5%	111	0.5%	111	0.5%
Disturbed	104	0.4%	108	0.5%	110	0.5%
Row Crops	200	0.9%	200	0.9%	90	0.4%
Commercial, Services, and Institutional	89	0.4%	90	0.4%	86	0.4%
Rail Transportation	84	0.4%	84	0.4%	84	0.4%
Parking Structure/Lot	67	0.3%	68	0.3%	65	0.3%
Sports Area	34	0.1%	34	0.1%	34	0.1%
Water and Wastewater Utilities	39	0.2%	39	0.2%	32	0.1%
Beaches and Riverbanks	23	0.1%	23	0.1%	32	0.1%
Transportation, Communications & Utilities	10	0.0%	10	0.0%	24	0.1%
Industrial	22	0.1%	24	0.1%	22	0.1%
Educational	3	0.0%	3	0.0%	3	0.0%
Total Acreage*	**23,419**	**100%**	**23,420**	**100%**	**23,409**	**100%**

**Discrepancies in total acreage between timepoints are due to minor differences between datasets but are within an acceptable margin of error (0.05%).*

Table 11. Difference in acreage between 2003 and 2018, and the percent difference based on 2003 and 2018 acreage. Increases in acreage are shown in blue, decreases are shown in red. Data is sorted by difference in acreage, largest to smallest.

Land Use Classification	Difference in Acreage 2003-2018	Percent Change 2003-2018
Forest Land	-180	-1.2%
Open Field	127	6.4%
Row Crops	-110	-55.0%
Forested Wetlands	-94	-11.2%
Other Cleared	91	41.7%
Residential	85	7.2%
Campground	44	62.9%
Transportation, Communications & Utilities	14	140.0%
Beaches and Riverbanks	9	39.1%
Water and Wastewater Utilities	-7	-17.9%
Road Transportation	6	0.7%
Disturbed	6	5.8%
Commercial, Services, and Institutional	-3	-3.4%
Lakes and Pond	2	1.5%
Non-forested Wetlands	2	1.6%
Parking Structure/Lot	-2	-3.0%
River or Stream	1	0.1%
Golf Course	0	0.0%
Rail Transportation	0	0.0%
Sports Area	0	0.0%
Industrial	0	0.0%
Educational	0	0.0%
Total Acreage*	-10	0.0%

** Discrepancies in total acreage between timepoints are due to minor differences between datasets but are within an acceptable margin of error (0.05%).*

MAJOR LAND OWNERSHIP IN THE CORRIDOR

The upper reaches of the Saco River corridor has a mixture of ownership between the U.S. Forest Service as part of the WMNF, and the State, as part of Crawford Notch State Park (**Figure 13**). Overall, the majority of land within the Saco-Swift Corridor is owned by the U.S. Forest Service as a part of the WMNF. The lower reaches of both the Saco and Swift corridors are owned by private landowners, as well as some conserved land easements (for example, the Albany Town Forest in the Swift River Corridor or River Road Park in the Saco River Corridor). Development within the Saco-Swift Corridor is mostly concentrated in the Town of Conway. Conway serves to be the largest tourist destination of all the towns the corridor passes through, providing majority of the campgrounds, outdoor recreation rental shops, and other businesses. Both the Saco and Swift rivers have roads that run along the extent of waterway, with just over 40 bridges total to allow vehicles to cross the rivers.

In the privately owned portions of the Saco-Swift watershed, development within the corridor and specifically on its floodplains have created stream crossing restrictions, poor or limited riparian buffers, increased stormwater runoff, and the loss of floodplain or floodplain encroachment, ultimately affecting sediment mobility and stream bank erosion. As the floodplain develops around a constrained channel, flows are being pushed and concentrated along the streambanks, exacerbating bank erosion. In turn, landowners are experiencing threats to the land (residential, recreational, and/or

agricultural land) due to bank destabilization and both rivers' response to centuries of human activity in the river corridor. While transformation and shifts in the path of a river are a natural occurrence, where the Saco River is now constrained within the bounds of development, the natural ebb and flow is restricted. The Swift River has experienced less development in the corridor than the Saco but has still experienced some impacts. The resulting changes in flow concentrations and erosion will continue to make managing impacts to land uses (agricultural, residential, recreational) uses along the Saco and Swift rivers challenging to balance with natural processes.

STATE-OWNED LANDS

The two most prominent state-owned sections of land within the corridor are Crawford Notch State Park and Humphrey's Ledge Natural Area, though numerous smaller state-owned parcels exist throughout the Saco Swift corridor and larger Saco Swift Watershed. Within the corridor, there are approximately 970 acres of state owned land. Crawford Notch State Park, shown in **Figure 13** in Hart's Location, covers 5,775 acres. This land is used for recreation including camping (Dry River Campground), cross-country skiing, hiking, mountain biking, snowshoeing, and more. It is pet-friendly and provides restrooms and showers for visitors. Humphrey's Ledge Natural Area is a much smaller section of land adjacent to a bend in the Saco River between Bartlett and Hales Location (**Figure 13**). This area is characterized by an approximately 500-foot-tall granite cliff adjacent to the nearby White Horse and Cathedral Ledges. Though there are no well documented hiking trails on the preserve, it is a popular rock climbing destination with a long history of climbing development. **Figure 15** displays the state-owned lands within the Saco Swift Corridor and larger watershed. Though several parcels are permanently protected (either as state parks or as part of the White Mountain National Forest) there are smaller state-owned parcels that are not permanently protected, such as roadside pull-offs along Route 302 along the Saco. The LAC and the statewide River Management Advisory Committee have influence over the sale of state-owned lands, and small parcels such as pull-offs along Route 302 that are unprotected can be important access points for river-based recreation. **Table 12** lists the state-owned land parcels within the river corridor, as well as if the parcel is conserved, if it provides direct river access, the town it is located within, and any other notable features. There are no state-owned lands alongside the Swift River.

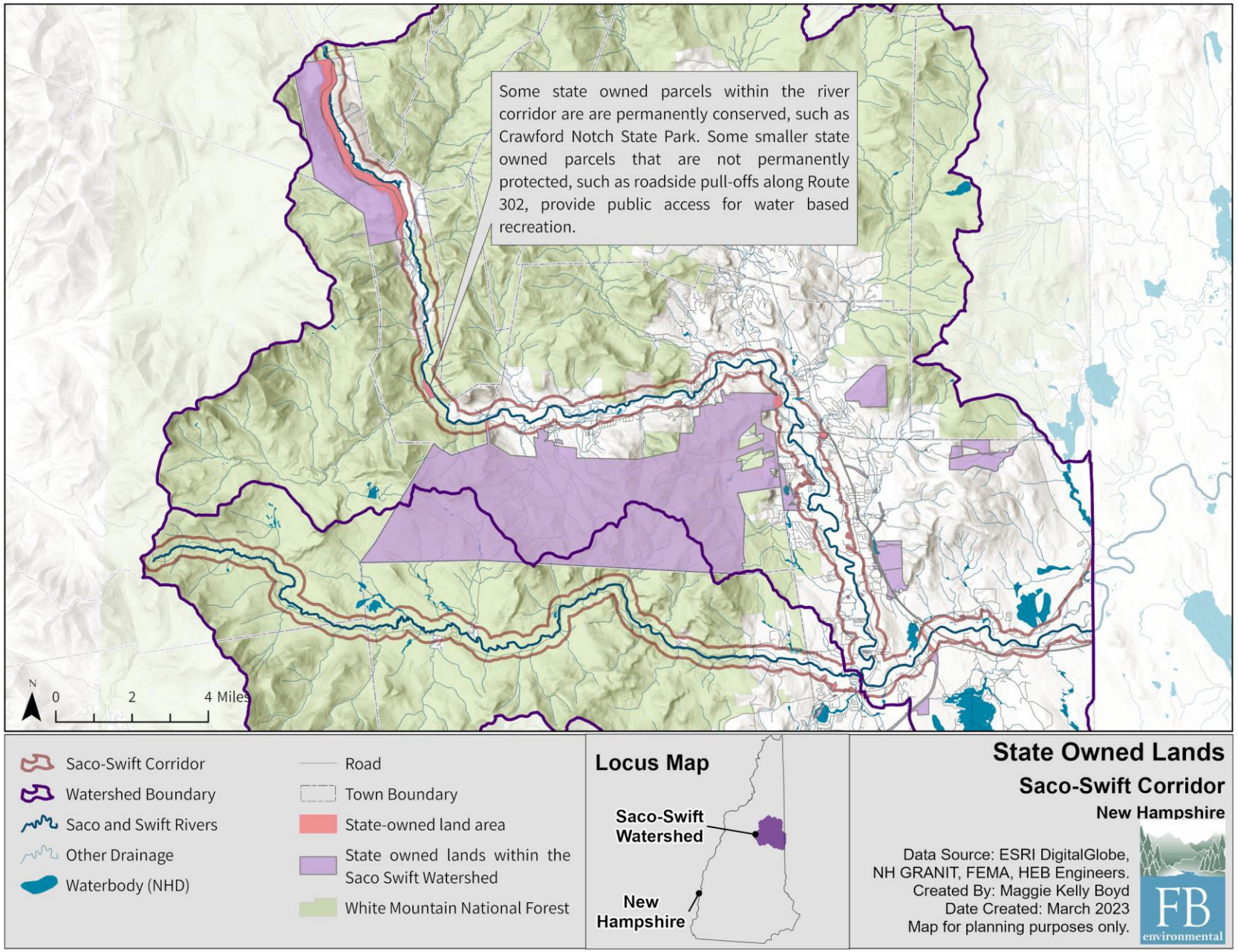


Figure 15. State owned lands within the Saco Swift Corridor and larger watershed.

Table 12. List of parcels that are state owned land within the Saco Swift River Corridor.

Town	Parcel ID (Map Block Lot)	Notable features (conservation status if conserved, riverfront features; etc.).
Bartlett	02015-0STATECATHDR0LEDGE	Humphrey's Ledge Natural Area; Conserved land - overlaps with WMNF
Bartlett	02015-2RT3020000ST0000NH	
Bartlett	02015-5VILLG000MAI000RRR	
Carroll	04035-211-002-000	Roadside land along Route 302 near Saco Lake, Conserved land - overlaps with WMNF and Crawford Notch Property
Conway	02047-258-50	Railroad line
Conway	02047-261-40	
Conway	02047-261-43	
Conway	02047-261-44	
Conway	02047-261-45.001	
Conway	02047-261-53	
Conway	02047-261-54	
Conway	02047-262-59	
Conway	02047-263-46	Conserved land - overlaps with WMNF
Conway	02047-264-32	
Conway	02047-264-48	Conserved land - overlaps with WMNF
Conway	02047-265-41	
Conway	02047-202-29	Conserved land - DOT Conway Scenic Easement
Conway	02047-215-108	
Conway	02047-215-51	
Conway	02047-215-56	
Conway	02047-215-57	
Conway	02047-215-58	
Conway	02047-216-71	Conserved Land - Echo Lake State Park
Conway	02047-252-59.002	
Conway	02047-219-211	Railroad line
Conway	02047-261-53	State owned land that borders the Saco (does not appear to be used publicly, locatio of Conway Policy and Northern Carroll District Court, adjacent to Smith Eastman Park).
Harts Location	02098-01-001-000	Conserved Land - Crawford Notch State Park
Harts Location	02098-01-001-00A	Conserved Land - Crawford Notch State Park
Harts Location	02098-02-010-000	
Harts Location	02098-02-010-000	
Harts Location	02098-02-010-000	
Harts Location	02098-04-069-000	Roadside state-owned land parcel along Route 302 and the Saco River (where Nancy Brook outlets to the Saco)
Harts Location	02098-04-069-000	
Harts Location	02098-04-069-000	
Harts Location	02098-06-093-000	Roadside state-owned land parcel along Route 302 and the Saco River (across from Sawyer River Road)

V. OTHER RIVER CORRIDOR AND WATERSHED WORK

"Non-profit organizations focused on environmental conservation and protection that do work within the Saco-Swift Corridor region include the Upper Saco Valley Land Trust (USVLT), the Greater Lovell Land Trust (GLLT), and the Saco Headwaters Alliance (SHA). The USVLT conserves land for farming, forestry, public recreation, scenic enjoyment, and wildlife habitat and protects land that is rich in natural resources from development by owning and managing land preserves and by holding conservation easements on privately-owned property. The USVLT works in all four towns that contain the Saco-Swift Corridor. The GLLT is a non-profit conservation organization with an interest in protecting the Saco Headwaters region which lies partially in its service area. GLLT partners with the communities they serve and other groups in the region to conserve areas with significant natural, recreational, and climate change values and sustainably manage their resources for all. The SHA aims to strengthen the resilience of the Saco Headwaters watershed through education, community development, and connecting municipalities to state and federal funding opportunities to improve water quality. The SHA has collaborated with FBE on multiple projects including an assessment of ground and surface water monitoring systems and data in a report called “Watching our Waters” and floodplain mapping for Hart’s Location. Each of these organizations provides an opportunity for collaboration for future river corridor work.

In 2022, a Watershed-Based Protection Plan was created by FBE for the Kearsarge Brook-Saco River area. Kearsarge Brook is a tributary to the Saco River and drains into the Saco River in North Conway. This Plan examined the existing conditions of the watershed, identified sources of pollution, and suggested management strategies to improve the water quality and ecology of the watershed (FBE, 2022).

Above: Covered bridge on the Swift River just off of the Kancamagus Highway (Credit: USFS).

VI. REGULATION REVIEW

Land use regulations for towns within the Saco-Swift Corridor were assessed in the development of this CMP. Applicable regulations discussed come in the form of municipal ordinances and state-wide regulations. The municipalities discussed are Albany, Bartlett, Conway, and Hart's Location. Applicable state regulations are also featured in this document.

STATE REGULATIONS

The following state enforced regulations were implemented with the goal of protecting water resources and are applicable to the Saco-Swift Corridor.

RIVERS MANAGEMENT AND PROTECTION PROGRAM (RSA 483)

The RMPP was created in 1988, with the goal of conserving the outstanding value and diversity of New Hampshire's River systems. The program is cooperative, with the state designating significant rivers and protecting the value of instream features, while local municipalities are responsible for the development and adoption of a river corridor management plan to protect the shorelines and adjacent areas of the state designated waterbody.

When a river is designated as significant it is classified into four characteristic types: natural, rural, rural-community, and community. Each classification requires different state enforced protection measures for instream resources (**Table 13**). These protection measures are highlighted below. The Saco and Swift rivers are both classified as "natural" in the headwaters and upper reaches and "rural" in the lower reaches to the New Hampshire-Maine border.

Table 13. Protection measures for designated river classifications under RMPP. Note: RL= Reference line, which is the ordinary high-water mark for rivers.

Protection Measure	Natural	Rural	Rural-Community	Community
Dams and Channel Alterations				
Reconstruction of Breached Dams	No	Yes- Within 6 years	Yes- Within 6 years	Yes
Construction of New Dams	No	No	No	Yes
Channel Alterations	No- Excluding repairs to bridge, road, and riprap	Yes- with conditions	Yes- with conditions	Yes- with conditions
New Hydroelectric Facility	Not Addressed in Stature	Yes- with conditions	Yes- with conditions	Yes- with conditions
Water Quality / Quantity				
Water Quality	Class A or B	Class B	Class B	Class B
Interbasin Transfers	No	No	No	No
Protected Instream Flow	Yes	Yes	Yes	Yes
Recreational Use				
Motorized Watercraft	No	Yes- Only headway speed within 150' of shoreline	Yes- Only headway speed within 150' of shoreline	Yes- Only headway speed within 150' of shoreline
Waste Disposal				
New Landfills	None within 1/4 mile	None within 1/4 mile	None within 100' or 500yr floodplain	None within 100' or 500yr floodplain
Expansion of Landfill	None within 100' or 500yr floodplain	None within 100' or 500yr floodplain	Yes	Yes

Protection Measure	Natural	Rural	Rural-Community	Community
New Hazardous Waste Facility	None within 1/4 mile	RMPP does not address hazardous waste facilities		
Other New Solid Waste Facility	None within 250'	None within 250'	None within 250'	None within 250'
Sludge and Septic	None within 250'	None within 250'	None within 250'	None within 250'
Fertilizers				
Limestone	Within 25' of RL	Within 25' of RL	Within 25' of RL	Within 25' of RL
Slow or Controlled-Release	Not within 25' of RL	Not within 25' of RL	Not within 25' of RL	Not within 25' of RL

SHORELAND WATER QUALITY PROTECTION ACT (RSA 483-B)

When a river system is designated as significant under the RMPP it also falls subject to the Shoreland Water Quality Protection Act (SWQPA) and its associated rules (Env-Wq-1400). The SWQPA applies to all rivers that are 4th order or higher regardless of designation status (**Table 14**). Both the Saco and Swift rivers are 4th order or higher. The act additionally applies to smaller 1st, 2nd, and 3rd order streams that have been designated. It should be noted that 1st through 3rd order streams that were designated before 2015 fall under the full 250-foot jurisdiction of the SWQPA, while 1st through 3rd order streams designated after 2015 only fall under a 50-foot jurisdiction, known as the waterfront buffer.

Table 14. SWQPA regulations (RSA 483-B:9) that are applicable to the Saco-Swift Corridor

Activities	All 4th Order or Higher Streams (Saco & Swift)
Waste Disposal and Storage	
New Hazardous Waste Facility	Natural class rivers: None within 1/4 mile All others: None within 250'
Sale of Waterfront Property with Septic System	Waterfront Property Site Assessment Study of septic required for sale of properties within 200'
New Auto Junk Yards or Salt Storage Yards	None within 250'
Fertilizer Application	
Slow or Controlled Release	None within 25'
All Other Fertilizers	None within 50'
Pesticide and Herbicide Application	
All Pesticides and Herbicides	None within 50' unless with applicator license
Development within 250' of River	
Primary Structures	Setback 50'
Accessory Structures	Setback 20'
Impervious Surface Cover	>20% requires Stormwater plan, >30% requires stormwater plan developed by engineer
River Frontage	150' minimum frontage for new lots
Land Disturbance (new or existing)	Shoreland Permit required within 250', Alteration of Terrain Permit also required if >50,000 sq. ft.
Removal of Vegetation within Waterfront Buffer (0-50')	
Trees & Saplings	Limited within 50'
Natural Ground Cover & Shrubs	None within 50' except 6' path
Stumps, Roots, and Rocks	Permit required within 50'
Removal of Vegetation within Woodland Buffer (50-150')	
Natural Woodland	Native vegetation present on 25% of land is unaltered

NEW HAMPSHIRE INSTREAM FLOW PROGRAM

The New Hampshire Instream Flow Program (NHIFP) was created in 1990 with the goal of protecting the variable, seasonal flows of designated rivers. River levels naturally vary greatly season-to-season, with much of the local ecology adapting and relying on these changes. The program operates within the RMPP statute, section 9-c (RSA 483-9:3) and in accordance with this program's associated rules (Env-Wq 1900). While flows are seasonal, wetlands and other water storage areas ensure that some flow is maintained in particularly dry periods. With the human withdrawal of water comes a drastic alteration to the above-mentioned river dynamics. Human use and alteration can lead to a situation where large rivers become completely dry during periods of drought.

The NHIFP starts with NHDES calculating critical flow conditions in a stream for aquatic life. Next, management plans are created to address how water users can and will operate to balance their water use needs with the required stream flow conditions set by NHDES. This plan also implements surface water quality requirements for flow. Under this program large scale water users, such as dams, are required to reduce their withdrawals during periods of drought. The omission of dammed water over a few days during periods of critically low flows can provide relief to aquatic life.

This program requires a detailed study of each regulated river, development of protected instream flow amounts for each season, and a written water use management plan. Due to the abundance of resources and time needed to complete these aspects only two rivers are processed at a time. The Saco and Swift rivers currently do not have an instream flow program or management plan, but this will be developed in the future as both rivers have been designated under the RMPP.

MUNICIPAL ORDINANCES AND REGULATIONS

On top of the over-arching state regulations summarized above, municipalities have the option to further protect water resources within their jurisdiction. This can be done through the increase and/or addition of the minimum setbacks and regulations implemented at the state level. Currently, the only town within the Saco-Swift Corridor that has surpassed state minimum standards is Conway, with its Wetland and Watershed Protection Overlay District.

The following section describes regulations enforced at the municipal level, primarily through zoning ordinances and subdivision regulations. **Table 15** displays a summary of the current state of ordinances in Albany, Bartlett, Conway, and Hart's Location.

Table 15. Ordinance overview for all four towns in the Saco-Swift Corridor.

Ordinance	Albany	Bartlett	Conway	Hart's Location
Shoreline Zoning beyond state minimum	✓ Comprehensive Shorelands Protection Act		✓ Shoreline Protection Overlay District (additional protections for all land within 300' from the edge of all Great Ponds) Restricts density of development within 300' of buffer, additional setbacks, and 50' vegetated buffers along the waterfront.	
Open space regulations	N/A	✓ Required to have at least 5 acres or a min. of 15% of open space in residential zoning	✓ 25% of land must be open space.	N/A
Floodplain protection regulations or overlay	✓ Floodplain Development Ordinance Construction shall not occur below 100-year floodplain elevation or be approved by an engineer	✓ Floodplain Development Ordinance Restricted development within floodplain areas; no specific setbacks are given. Do not have Regulatory Floodway	✓ Floodplain Conservation Overlay District (Areas determined to be Special Flood Hazard Areas by FEMA) No specific setbacks are given.	✓ Floodplain Conservation District Ordinance No specific setbacks given; permits required to develop in special flood hazard area.
Fertilizer and/or pesticide ordinance	✓ Prohibits all fertilizers, except for lime or wood ash, in the shoreland. (Comprehensive Shorelands Protection Act)		✓ Application of chemical fertilizer, pesticide, or herbicide is prohibited in the Shoreline Protection Overlay District	
Green space requirements			Recommended that green space shall comprise 25% of the total lot area in the master plan.	
Watershed protection regulations or overlay	No activity that threatens air or water quality within the town is permitted.	✓ Swift River Conservation District (additional protections for the watershed to protect the health and safety of residents). Restrictions on impervious surface cover and permanent open space in this district.	✓ Wetland and Watershed Protection Overlay District (all land within 100' of a waterbody or wetland, excluding Great Ponds, and all year-round watercourses) No septic facilities are permitted within 100' of wetland area.	

Groundwater protection regulations or overlay			✓ Groundwater Protection Overlay District (additional protections for current and future sources of municipal drinking water; 400' buffer around each well)	
Mountain protection regulations or overlay			✓ Mountain Conservation Overlay (all land north and east of the Saco River that is above 800ft in elevation) No new building is permitted.	
Hillside and ridgeline protection regulations or overlay		✓ Ridgeline and hillside Overlay District		
Low impact development requirements and standards				
Required consideration and regard for all natural features in subdivisions	✓	✓	✓	
Subdivision regulations in Special Flood Hazard Areas	✓	✓	✓ Additional regulations requiring all public utilities in proposed subdivisions are constructed to be flood resistant and provide 100-year flood elevation data.	
Additional setbacks of septic tanks and leach areas from surface waters and wetlands			✓	
Additional setbacks of structures from high-water marks of watercourses	✓	✓		
On-site stormwater retention requirement more stringent than state requirements				
Phosphorous loading analysis required for freshwater bodies				
Prohibition of salt storage, hazardous waste facilities, and auto junk yards in shoreland	✓		Prohibited to privately operate facility that deals mainly in hazardous waste	
Open space plan				

Stormwater utility district				
Conservation Impact Fees				
Land Trust	✓ Upper Saco Valley Land Trust	✓ Upper Saco Valley Land Trust	✓ Upper Saco Valley Land Trust	✓ Upper Saco Valley Land Trust
Incentive-based programs for stormwater reduction efforts				
Incentive-based programs to reduce the application of chemical fertilizers, pesticides, and herbicides				
Open space plan				
State approved comprehensive plan	✓ Master plan of 2014	✓ Master plan of 2016	✓ Master plan of 2003 (updated periodically)	Outdated existing master plan

ALBANY

Master Plan (2014):

As established in the town Master Plan (2014), Albany is home to many integral natural resources. Over 85% of the town is within White Mountain National Forest land. Additionally, the town has a large amount of water resources, boasting 1.5 miles of frontage along the Swift River. This 1.5 miles includes the Albany Town Forest with over 8,000 feet of conserved land along the Swift River. This portion of the Swift River maintains a cold-water fishery, protects critical wildlife habitat, and maintains floodplain forest. Albany also sits upon an aquifer.

Despite its abundance of unique natural features, Albany currently does not have any water inventory data, as the town relies primarily on state regulations for aquifer and watershed protection. Another potential limiting factor in Albany's conservation of water resources is that there is no current public water infrastructure. The town relies mainly on private wells and sewers, making continued monitoring and maintenance of these systems challenging. Lastly, in the future land use section of the Master Plans (2014) it is mentioned that 2-acre lot sizes for residential development could be utilized to further support sustainable and clean water and septic. No indication of the adoption of these lot size requirements was found.

Zoning (2020):

Albany's Zoning Ordinance (2020) includes:

- Statement that construction shall not occur below available 100-year floodplain elevation.
- Comprehensive Shorelands Protection Act (1995)
- Floodplain Development (2012)
- Swift River Conservation District (1995)

Table 16. Albany's zoning districts and requirements

Zoning District	Min. Lot Acres or Dimensions	Front / Side / Rear Setbacks	Max. Building Coverage / Height	Open Space Regulations
Residential	2 acres	25' / 25' / 25'	2.5 stories from top of foundation	N/A
Commercial/Residential	2 acres and 200' of frontage on Rt. 16	25' / 25' / 25'	N/A- Not in zoning	N/A
Light Industrial	2 acres and 200' of frontage on a road	25' / 25' / 25'	N/A- Not in zoning	N/A

Subdivision and Site Plan Regulations (2012):

The town of Albany's subdivision and site plan review regulations establishes that land that is unfit to be constructed upon due to flood hazard, poor drainage, or inadequate soil is not to be subdivided. These regulations also state that due regard be shown for all natural features. Further, an effective erosion and sediment control plan is required for all subdivisions. This plan requires that the development is fitted to the topography and soils present to mitigate erosion potential, that natural vegetation is retained and protected, and that natural drainage ways are left open to remove excess surface water.

Subdivisions that involve land designated as Special Flood Hazard Areas by the National Flood Insurance Program require special permitting and approval by State and Federal regulatory agencies. Developments larger than 50 lots or five acres (whichever is lesser) are required to include Base Flood Elevation data in their subdivision proposal.

Each subdivision is classified as major or minor. Minor subdivisions require that water courses and other natural features, topographic contours, and soil types and slopes are included in the application. Major subdivisions require all the above-mentioned provisions as well as engineering plans for all drainage structures, sanitary sewers, and water infrastructure. Approval is also required from the state Special Board on Dredging and Filling, and the Water Supply Pollution Control Commission for major subdivisions.

Key Vulnerabilities:

Identified vulnerabilities to Albany's regulations include conservation of water resources, including the protection of Albany's stratified drift aquifers and continued conservation of the WMNF, and building climate resiliency. In addition, the implementation of 2-acre lot sizes for residential development, development of an open space plan and the development of low impact development regulations are areas of Albany's ordinances that could be strengthened to help protect the Saco-Swift Corridor (**Table 17**).

Table 17. Vulnerabilities and recommendations for future ordinances for the Town of Albany.

ALBANY		
Vulnerabilities or Challenges	**Recommendations**	**Example Ordinance Language (if applicable)**
Conservation of water resources, including the protection of Albany's stratified drift aquifers; the implementation of 2-acre lot sizes for residential development; Continued conservation of the WMNF; open space plan; low impact development; climate change resiliency	Establish a new shoreland overlay district. Further amend the shoreland zoning ordinance to specify permitted uses and development standards in the new district (i.e., protective buffers, development setbacks, green infrastructure).	
	Designate areas with vulnerable resources as a "Resource Protection district."	
	Further limit vegetation clearing around resources - prohibit the removal of native vegetation within the shoreland setback areas to preserve natural protection from flooding and stormwater runoff.	*Example Ordinance language: No person shall remove native vegetation in setback areas of the Resource Protection District, except that which is necessary for uses expressly authorized in the District.*
	Promote green buildings and low impact development; include climate change impacts in stormwater management.	
	Encourage or require green building performance elements, including incorporation of on-site retention, detention, and low impact development (LID) measures for the treatment of stormwater runoff. Encourage or require on-site and off-site stormwater drainage sized to accommodate the effects of climate change impacts, including flooding, and increased frequency and intensity of storm events.	*Example Ordinance Language: "To the maximum extent practicable, the applicant shall use low impact development and/or green infrastructure to treat stormwater. Stormwater components shall be designed and sized to accommodate, at a minimum, impacts of flooding from the [STORM FREQUENCY AND DURATION] rainfall event."*
	Freeboard: Requiring structures to be elevated above projected flood levels	*Example Ordinance Language: "For residential and manufactured homes: New construction or substantial improvement any residential structure located within: Zones A1-30 and AE: shall have the lowest floor (including basement) elevated at least [X FEET] above the base flood elevation or at least [2 + X FEET] above the highest grade adjacent to the structure if no depth is specified on the Flood Insurance Rate Map. (Municipal Guidance Document, FBE)*

ALBANY		
Vulnerabilities or Challenges	**Recommendations**	**Example Ordinance Language (if applicable)**
	Require key natural resources areas and areas vulnerable to flood hazards and climate impacts, as shown on appropriate maps, to be removed from the total land area available for development during calculations to determine density and/or lot coverage	
	For proposed subdivisions, require that open space is the first consideration in the development design, with priority given to conservation of important natural resources; habitat; connectivity of conserved lands; water quality protection; recreation opportunities; public access; protection of areas vulnerable to existing and future flooding; and areas identified as being able to support landward migration of significant coastal habitat.	*Example Ordinance Language: The first meeting with the [NAME OF REVIEWING BODY] shall be a conceptual design review and shall precede submission of a preliminary review application. The open space shall be designed first, and the built environment shall be constructed in the remaining area. During the conceptual design review process, the [NAME OF REVIEWING BODY] shall determine whether the open space layout, design, and configuration are appropriate based on purposes to be achieved as part of [NAME OF MUNICIPALITY'S OPEN SPACE/CONSERVATION SUBDIVISION ORDINANCE/SECTION]*
	Require on-site retention and infiltration of stormwater	*Example Ordinance Language: Stormwater standards: Stormwater runoff from impervious surfaces shall be retained on site.*
	Impact fee for funding natural resource conservation and climate change resilience. Require applications to pay an impact fee, based on an established amount or formula (i.e., cost per square foot or acre of development).	
	Develop a comprehensive open space plan	
	Amend current master plans to include sections on climate change resiliency and prioritizing the town's adaptation and mitigation efforts.	

BARTLETT

Master Plan (2016):

The Town of Bartlett's Master Plan (2016) places a great deal of focus on land use within the Town's floodplain areas. Development within floodplain areas is not prohibited but is restricted by a town Floodplain Ordinance (1979). About 5.5% of the town is located within the 100-year floodplain of the Saco River and its tributaries. Additionally, within this floodplain lies about 20% of Bartlett's commercial district and approximately 12% of the town's residential zoning district. Most of the currently existing development in the floodplain predates the ordinance. 70% of the currently undeveloped land in Bartlett is WMNF land, therefore harvesting and development is restricted in about two-thirds of this land.

Also identified in the Master Plan (2016) are limitations to both future land use and the continued protection of natural resources. Land use is constrained by Bartlett's lack of septic capacity, as 77% of the land area within the town (not including WMNF) consists of soils that limit the installation of septic systems. The town does not have a centralized water or sewer system, meaning that all sewage is treated by on-site septic systems. Current lot size requirements are based upon adequate septic disposal regulations, leach field and well setbacks. The Master Plan also states that expansion into areas with hydric soils or difficult topography has the potential to negatively impact the environment of the town. Protecting the Saco River Shoreline areas is identified as a challenge of Bartlett's town planning.

Floodplain Development Ordinance (2012):

This ordinance regulates construction within special flood hazard areas as designated by the FEMA Flood Insurance Rate Maps (FIRM) and Flood Boundary and Floodplain Map for the town of Bartlett. Per the ordinance, the town building inspector is to review all permit applications to ensure that all construction is concurrent with the following regulations: all construction is to occur with materials that are resistant to flood damage and in a manner that reduces the risks associated with building in a flood area to the highest degree possible.

In cases where proposed construction involves riverine features the applicant must notify the NHDES Wetlands Bureau. If a watercourse is to be altered or relocated, a professional engineer must certify that the flood carrying capacity of the watercourse is maintained. Along watercourses that have a Regulatory Floodway no encroachments or development is permitted within the floodway unless it is demonstrated by a professional engineer that proposed development will not increase flood levels within in the community during base flood discharge. In areas where there is no regulatory floodway designated, no construction or other development is to occur within zones A and AE on the FIRM, unless the proposed development will not cumulatively increase water surface elevation of the base flood by more than one foot within any part of the community.

Zoning (2018):

Bartlett's Zoning Ordinance (2018) includes:

- Any structure will have a setback of 20 feet from the normal high-water mark of any watercourse.
- All structures within the Saco-Swift Corridor must have a minimum setback of 50 feet from the normal high-water mark.
- No activity that adversely threatens air or water quality to a significant degree will be permitted.
- Minimum lot sizes are regulated based upon soil type. Additionally, the minimum lot size for commercial and industrial zoning is regulated further at greater than 40,000 square feet and no more than 75% septic capacity utilization.

Table 18. Bartletts zoning districts and requirements

Zoning District	Min. Lot Acres or Dimensions	Front / Side / Rear Setbacks	Max. Building Coverage / Height	Open Space Regulations
Town Commercial District	Commercial/Industrial = 40,000 square feet, Residential = soil ruling	Industrial/commercial = 115'/ 50'/50', Residential= 115'/15'/15'- 40' from centerline of streets	25,000 square feet / 38'	Residential = 5 acres or more, min. of 15%
Town Residential District B	Determined by soil type	Industrial/commercial = 115'/ 50'/ 50', Residential = 115'/15'/15'- 40' from centerline of streets N/A	25,000 square feet / 38' Cannot be tall enough to have the sky as a	Residential = 5 acres or more, min. of 15%
Town Industrial District	Commercial/Industrial = 40,000 square feet, Residential = soil ruling			

Town National Forest District	N/A		backdrop as viewed from Rt. 16 or 302	
Town Residential District A	Determined by soil type	60'/15'/15'- 40' from internal streets		
Ridgeline and Hillside Overlay District	N/A	20' from stream, not direct visibility from Rt. 16 or 302		

Subdivision and Site Plan Regulations (2012):

The Town of Bartlett shares similar subdivision and site plan requirements as its neighboring towns. The subdivision regulations state that all land that is unfit to be built upon due to hydrologic, soil, or flood conditions is not to be subdivided and that to the extent feasible steps should be taken to preserve natural features. These regulations also ensure that storm drainage is sufficient to accommodate peak rate of stormwater runoff without causing erosion.

Subdivision regulation for projects that are to occur in special flood hazard areas are consistent with those of Albany, mentioned in the above Subdivision and Site Plan Regulations section.

Requirements when first submitting a subdivision application include mapping of natural features, existing topographic conditions, soil survey data, and floodplain boundaries if applicable. Additionally, a Stormwater Management and Erosion Control Plan must be submitted unless waived by the planning board. These shall be designed to accommodate a 25-year storm event.

Key Vulnerabilities:

Identified vulnerabilities to Bartlett's regulations include a lack of septic capacity and centralized water or sewer system, protection of natural resources, including the Saco River shoreline, and building flood resiliency and climate resiliency. In addition, development of an open space plan and the development of low impact development regulations are areas of Bartlett's ordinances that could be strengthened to help protect the Saco-Swift Corridor (**Table 19**).

Table 19. Vulnerabilities and recommendations for future ordinances for the Town of Bartlett.

BARTLETT		
Vulnerabilities or Challenges	**Recommendations**	**Example Ordinance Language (if applicable)**
Lack of septic capacity and centralized water or sewer system; flood resiliency & mitigation; protection of natural resources, including the Saco River shoreline; open space plan; low impact development; climate change resiliency	Establish a new shoreland overlay district. Further amend the shoreland zoning ordinance to specify permitted uses and development standards in the new district (i.e. protective buffers, development setbacks, green infrastructure).	
	Designate areas with vulnerable resources as a "Resource Protection district."	
	Further limit vegetation clearing around resources - prohibit the removal of native vegetation within the shoreland setback areas to preserve natural protection from flooding and stormwater runoff.	*Example Ordinance Language: No person shall remove native vegetation in setback areas of the Resource Protection District, except that which is necessary for uses expressly authorized in the District.*

BARTLETT		
Vulnerabilities or Challenges	**Recommendations**	**Example Ordinance Language (if applicable)**
	Promote green buildings and low impact development; include climate change impacts in stormwater management.	
	Encourage or require green building performance elements, including incorporation of on-site retention, detention, and low impact development (LID) measures for the treatment of stormwater runoff. Encourage or require on-site and off-site stormwater drainage sized to accommodate the effects of climate change impacts, including flooding, and increased frequency and intensity of storm events.	*Example Ordinance Language: "To the maximum extent practicable, the applicant shall use low impact development and/or green infrastructure to treat stormwater. Stormwater components shall be designed and sized to accommodate, at a minimum, impacts of flooding from the [STORM FREQUENCY AND DURATION] rainfall event."*
	Freeboard: Requiring structures to be elevated above projected flood levels	*Example Ordinance Language: "For residential and manufactured homes: New construction or substantial improvement any residential structure located within: Zones A1-30 and AE: shall have the lowest floor (including basement) elevated at least [X FEET] above the base flood elevation or at least [2 + X FEET] above the highest grade adjacent to the structure if no depth is specified on the Flood Insurance Rate Map. (Municipal Guidance Document, FBE)*
	Require key natural resources areas and areas vulnerable to flood hazards and climate impacts, as shown on appropriate maps, to be removed from the total land area available for development during calculations to determine density and/or lot coverage	
	For proposed subdivisions, require that open space is the first consideration in the development design, with priority given to conservation of important natural resources; habitat; connectivity of conserved lands; water quality protection; recreation opportunities; public access; protection of areas vulnerable to existing and future flooding; and areas identified as being able to support landward migration of significant coastal habitat.	*Example Ordinance Language: The first meeting with the [NAME OF REVIEWING BODY] shall be a conceptual design review and shall precede submission of a preliminary review application. The open space shall be designed first, and the built environment shall be constructed in the remaining area. During the conceptual design review process, the [NAME OF REVIEWING BODY] shall determine whether the open space layout, design, and configuration are appropriate based on purposes to be achieved as part of [NAME OF MUNICIPALITY'S OPEN*

BARTLETT		
Vulnerabilities or Challenges	**Recommendations**	**Example Ordinance Language (if applicable)**
		SPACE/CONSERVATION SUBDIVISION ORDINANCE/SECTION]
	Require on-site retention and infiltration of stormwater	*Example Ordinance Language: Stormwater standards: Stormwater runoff from impervious surfaces shall be retained on site.*
	Impact fee for funding natural resource conservation and climate change resilience.	
	Require applications to pay an impact fee, based on an established amount or formula (i.e., cost per square foot or acre of development).	
	Develop a comprehensive open space plan	
	Amend current master plans to include sections on climate change resiliency and prioritizing the town's adaptation and mitigation efforts.	

CONWAY

Master Plan (2003, revised periodically):

The Conway Master Plan (2003) provides a great deal of information about land use and natural resources within the town. Conway consists of approximately 42,780 acres, with the largest use of land within the town being undeveloped property (57%). Roughly 24% of land within the town is used for residential purposes. About 8,610 acres or 20% of the towns total land area is conserved. Most of this conserved land falls within the White Mountain Conservation Overlay District.

There are a total of 289 wetlands within the town boundaries according to the National Wetland Inventory. This Master Plan also establishes that portions of the Saco and Swift rivers that run through Conway are designated as rural by the RMPP. Additionally, some modifications have been made to both the Saco and the Swift including low dams and diversion work. Hazardous material contamination sites pose a great threat to water quality in Conway, as NHDES has identified 132 sites that contain or may contain hazardous material. The main source of contamination from these sites is leaking from underground storage tanks or heating oil tanks. Flooding in Conway has been reported in every season and floods occur over a relatively short period of time.

The main natural factors that constrain growth in Conway are the town's numerous floodplain areas and the varied topography. The topography of the town creates a situation where most of the developable land is situated on flat, gently sloping areas. Many of these areas are located where wetlands are also present, limiting development potential.

Encouraging the permanent protection of environmentally significant land is identified as a goal of Conway's future land use.

Relevant Municipal Code:

Conway's relevant municipal code, not including zoning, is as follows:

- Sewers: setback of 75' and leach areas setback a minimum of 125' from surface waters
- Prohibited to privately operate facility that deals mainly in hazardous waste.
- All approved excavation shall reclaim any disturbed earth or vegetation.

Zoning (2018):

Conway's Zoning Ordinances (2017) includes:

- Mountain Conservation Overlay District: Consists of all land north and east of the Saco River that is above 800' in elevation.
- Floodplain Conservation Overlay District: Areas determined to be special flood hazard areas by FEMA.
  - No specific setbacks are given.
  - Limited allowable uses for land within this district. No new septic systems or residential dwelling construction is permitted.
- Shoreline Protection Overlay District: All land within 300' from the edge of all Great Ponds.
  - All lots on a Great Pond must have 150' of water frontage.
  - Each structure must have a 100' setback from the normal high-water elevation, boat storage sheds must have a 50' setback from normal high-water elevation.
  - Coverage of a lot with structures and impervious surfaces shall be no more than 65% in commercial districts and no more than 25% in all other districts.
  - A 50' vegetated buffer is required along water frontage.
  - Application of chemical fertilizer, pesticide, or herbicide is prohibited in this district.
- Wetland and Watershed Protection Overlay District: Comprised of all land within 100' of waterbody or wetland, excluding Great Ponds. All year-round watercourses are included in this district.
  - No septic facilities are permitted within 100' of wetland area.
- Groundwater Protection Overlay District: Creates a 400' buffer around each well serving Conway and North Conway.
  - Only permitted land use within this buffer is open space, gravel driveways, and structures related to water distribution.

Table 20. Conway's zoning districts and requirements

Zoning District	Min. Lot Acres or Dimensions	Front / Side / Rear Setbacks	Max. Building Coverage / Height	Open Space Regulations
Residential/Agricultural	Served by municipal water system = 0.5 acres / unit, Not served by municipal water = 1 acre / unit	25'/15'/15'	45'	25%
Center Conway Village Residential		25'/15'/15'	45'	25%
Conway Village Residential		25'/15'/15'	45'	25%

North Conway Village Residential		25'/15'/15'	45'	25%
Center Conway Village Commercial		25'/10'/10'	45'	25%
Conway Village Commercial		5'/10'/10'	45'	25%
North Conway Village Commercial		5'/10'/10'	45', buildings on Rt. 16 shall not exceed 25'	25%
Highway Commercial District		25'/10'/10'	45'	25%
Regional Commercial District	All lots shall have at least 0.5 acres for the first unit	25'/10'/10'	45'	25%
Industrial District	2 acres	50'/30'/30'	45'	25%
Residential Resort	Served by municipal water system = 0.5 acres / unit, Not served by municipal water = 1 acre / unit	25'/15'/15'	45'	25%
Mountain Conservation Overlay	No new building is permitted			25%
Floodplain Conservation Overlay	No new building is permitted			25%
Shoreland Protection Overlay	No development within 300' of Great Ponds			25%
Wetlands and Watershed Protection Overlay	Min. 75' setback from wetlands, 50' for boat storage			25%
Groundwater Protection Overlay	400' radius around wells where no development besides that to transport water is permitted			25%

Subdivision and Site Plan Regulations (2012):

Conway's subdivision requirements are consistent with those of the other towns within the corridor. Additional subdivision regulations are given for flood hazard areas, such as the assurance that all public utilities in the proposed subdivision are constructed to be flood resistant and that 100-year flood elevation data is provided.

For subdivision and site plans to be reviewed, the applicant is required to provide the following maps and provisions: setback lines, watercourses, flood prone areas, water mains, sewers, stormwater drainage lines, soil maps, a statement of land condition to soil suitability for development, 2-foot contours to indicate stormwater drainage, watershed areas, and a test pit with description of soil layers.

Key Vulnerabilities:

A key identified challenge to Conway's regulatory framework is to build flood resiliency and climate change resiliency. In addition, development of an open space plan, the development of low impact development regulations, and managing or mitigating effects of potential contamination sources for source water are areas of Conway's regulatory framework that could be strengthened to help protect the Saco-Swift Corridor (**Table 21**).

Table 21. Vulnerabilities and recommendations for future ordinances for the Town of Conway.

CONWAY		
Vulnerabilities or Challenges	**Recommendations**	**Example Ordinance Language (if applicable)**
Flood resiliency & mitigation; 132 sites that contain or may contain hazardous materials that qualify as Potential Contamination Sources for source water; open space plan; low impact development; climate change resiliency	Further limit vegetation clearing around resources - prohibit the removal of native vegetation within the shoreland setback areas to preserve natural protection from flooding and stormwater runoff.	*Example Ordinance Language: No person shall remove native vegetation in setback areas of the Resource Protection District, except that which is necessary for uses expressly authorized in the District.*
	Promote green buildings and low impact development; include climate change impacts in stormwater management.	
	Encourage or require green building performance elements, including incorporation of on-site retention, detention, and low impact development (LID) measures for the treatment of stormwater runoff. Encourage or require on-site and off-site stormwater drainage sized to accommodate the effects of climate change impacts, including flooding, and increased frequency and intensity of storm events.	*Example Ordinance Language: "To the maximum extent practicable, the applicant shall use low impact development and/or green infrastructure to treat stormwater. Stormwater components shall be designed and sized to accommodate, at a minimum, impacts of flooding from the [STORM FREQUENCY AND DURATION] rainfall event."*
	Freeboard: Requiring structures to be elevated above projected flood levels	*Example Ordinance Language: "<u>For residential and manufactured homes:</u> New construction or substantial improvement any residential structure located within: Zones A1-30 and AE: shall have the lowest floor (including basement) elevated at least [X FEET] above the base flood elevation or at least [2 + X FEET] above the highest grade adjacent to the structure if no depth is specified on the Flood Insurance Rate Map. (Municipal Guidance Document, FBE)*
	Require key natural resources areas and areas vulnerable to flood hazards and climate impacts, as shown on appropriate maps, to be removed from the total land area available for development during calculations to determine density and/or lot coverage	

CONWAY		
Vulnerabilities or Challenges	**Recommendations**	**Example Ordinance Language (if applicable)**
	For proposed subdivisions, require that open space is the first consideration in the development design, with priority given to conservation of important natural resources; habitat; connectivity of conserved lands; water quality protection; recreation opportunities; public access; protection of areas vulnerable to existing and future flooding; and areas identified as being able to support landward migration of significant coastal habitat.	*Example Ordinance Language: The first meeting with the [NAME OF REVIEWING BODY] shall be a conceptual design review and shall precede submission of a preliminary review application. The open space shall be designed first, and the built environment shall be constructed in the remaining area. During the conceptual design review process, the [NAME OF REVIEWING BODY] shall determine whether the open space layout, design, and configuration are appropriate based on purposes to be achieved as part of [NAME OF MUNICIPALITY'S OPEN SPACE/CONSERVATION SUBDIVISION ORDINANCE/SECTION]*
	Require on-site retention and infiltration of stormwater	*Example Ordinance Language: Stormwater standards: Stormwater runoff from impervious surfaces shall be retained on site.*
	Impact fee for funding natural resource conservation and climate change resilience.	
	Require applications to pay an impact fee, based on an established amount or formula (i.e., cost per square foot or acre of development).	
	Develop a comprehensive open space plan	
	Amend current master plans to include sections on climate change resiliency and prioritizing the town's adaptation and mitigation efforts.	

HART'S LOCATION

Master Plan:

Hart's Location does have an existing master plan, but it is not accessible online.

Zoning (2009):

Hart's Location Zoning Ordinance (2009) includes:

- No land less than 2.5 acres is inhabitable.
- No land or water is to be used for an activity that is "obnoxious or offensive".
- All sanitary systems must meet state regulations.
- Wetlands and Flood Plains Ordinance of the Soil Conservation Service of the U.S.D.A. (1977) are in effect.

Table 22. Hart's Location zoning districts and requirements

Zoning District	Min. Lot Acres or Dimensions	Front / Side / Rear Setbacks	Max. Building Coverage / Height	Open Space Regulations
Rural/Residential	2.5 acres	75'/25'/25'	2.5 stories / 40'	N/A

Note: The entirety of the town is zoned as rural/residential.

Key Vulnerabilities:

Key identified vulnerabilities to Hart's Location's regulations include lack of subdivision requirements and shoreline and watershed zoning and regulations. In addition, an updated master plan (or the development of an open space plan) may provide additional regulations to help protect the Saco-Swift Corridor (**Table 23**).

Table 23. Vulnerabilities and recommendations for future ordinances for the Town of Hart's Location.

HART'S LOCATION		
Vulnerabilities or Challenges	**Recommendations**	**Example Ordinance Language (if applicable)**
Updated master plan; additional subdivision requirements; additional shoreline and watershed zoning & regulations; open space plan; climate change resiliency	Establish a new shoreland overlay district. Further amend the shoreland zoning ordinance to specify permitted uses and development standards in the new district (i.e., protective buffers, development setbacks, green infrastructure).	
	Designate areas with vulnerable resources as a "Resource Protection district."	
	Further limit vegetation clearing around resources - prohibit the removal of native vegetation within the shoreland setback areas to preserve natural protection from flooding and stormwater runoff.	*Example Ordinance Language: No person shall remove native vegetation in setback areas of the Resource Protection District, except that which is necessary for uses expressly authorized in the District.*
	Promote green buildings and low impact development; include climate change impacts in stormwater management.	
	Encourage or require green building performance elements, including incorporation of on-site retention, detention, and low impact development (LID) measures for the treatment of stormwater runoff. Encourage or require on-site and off-site stormwater drainage sized to accommodate the effects of climate change impacts, including flooding, and increased frequency and intensity of storm events.	*Example Ordinance Language: "To the maximum extent practicable, the applicant shall use low impact development and/or green infrastructure to treat stormwater. Stormwater components shall be designed and sized to accommodate, at a minimum, impacts of flooding from the [STORM FREQUENCY AND DURATION] rainfall event."*

HART'S LOCATION		
Vulnerabilities or Challenges	**Recommendations**	**Example Ordinance Language (if applicable)**
	Freeboard: Requiring structures to be elevated above projected flood levels	*Example Ordinance Language: "For residential and manufactured homes: New construction or substantial improvement any residential structure located within: Zones A1-30 and AE: shall have the lowest floor (including basement) elevated at least [X FEET] above the base flood elevation or at least [2 + X FEET] above the highest grade adjacent to the structure if no depth is specified on the Flood Insurance Rate Map. (Municipal Guidance Document, FBE)*
	Require key natural resources areas and areas vulnerable to flood hazards and climate impacts, as shown on appropriate maps, to be removed from the total land area available for development during calculations to determine density and/or lot coverage	
	For proposed subdivisions, require that open space is the first consideration in the development design, with priority given to conservation of important natural resources; habitat; connectivity of conserved lands; water quality protection; recreation opportunities; public access; protection of areas vulnerable to existing and future flooding; and areas identified as being able to support landward migration of significant coastal habitat.	*Example Ordinance Language: The first meeting with the [NAME OF REVIEWING BODY] shall be a conceptual design review and shall precede submission of a preliminary review application. The open space shall be designed first, and the built environment shall be constructed in the remaining area. During the conceptual design review process, the [NAME OF REVIEWING BODY] shall determine whether the open space layout, design, and configuration are appropriate based on purposes to be achieved as part of [NAME OF MUNICIPALITY'S OPEN SPACE/CONSERVATION SUBDIVISION ORDINANCE/SECTION]*
	Require on-site retention and infiltration of stormwater	*Example Ordinance Language: Stormwater standards: Stormwater runoff from impervious surfaces shall be retained on site.*
	Impact fee for funding natural resource conservation and climate change resilience.	
	Require applications to pay an impact fee, based on an established amount or formula (i.e. cost per square foot or acre of development).	
	Develop a comprehensive open space plan	

HART'S LOCATION		
Vulnerabilities or Challenges	**Recommendations**	**Example Ordinance Language (if applicable)**
	Amend current master plans to include sections on climate change resiliency and prioritizing the town's adaptation and mitigation efforts.	

VII. RESOURCE THREATS

During the development of the Saco-Swift Corridor Management Plan, threats to the corridor were identified based on the results of the resource assessment and land use assessment. As a result of these assessments and through a work session with the Saco-Swift River LAC, the key threats identified in the corridor include flooding, development, riverbank erosion, water quality degradation, recreational overuse, and invasive species. Compounding the impacts of these threats, the population of the region has grown and spurred additional development and use of the region's natural resources. More specifically, the population of Carroll County declined between the mid-1800s and mid-1900s before climbing steeply over the last several decades. In addition, the COVID-19 Pandemic caused intense increases in recreational use of the region. As one local stakeholder described the increased use on the Saco River, "every weekday is now like a weekend, and every weekend is like the Fourth of July".

FLOODING

Flooding was identified as a top threat to the Saco-Swift Corridor, as discussed under the Resource Assessment (Page 18). Past flooding events in the corridor have damaged homes, business, infrastructure, and recreation resources. Hurricane Irene damaged over 100 homes, several businesses, bridges, and trails in the Mount Washington Valley. More frequent storms predicted due to climate change will increase flooding, resulting in infrastructure damage, more severe erosion and sedimentation, and the mobilization of contaminants from adjacent land uses. Repetitive flooding has been noted in numerous places within the corridor, such as near the Conway Scenic Railroad behind Kennett Junior High.

Historically, berms have been constructed along the banks of the Saco to minimize flooding in critical and populated areas that exist within the Saco's floodplain. While these berms can mitigate flood damage during many storm events, they require continued maintenance and commonly fail during the largest flood events, resulting in enhanced damage within the floodplain. During the recent storm events, Hurricane Irene and the October 2017 storms, berms in the Town of Bartlett were breached and surrounding infrastructure was damaged. One of these berms stretches from Tir Na Nog Lane east to the River Street bridge and is intended to protect Tir Na Nog Lane, Forest Street, Birch Street, George Street, and River Street, and Bartlett Village from flooding. A second berm is located east of the dugway on Cobb Farm Road and runs north to south at the 90-degree curve in Saco River. This berm is intended to protect the residents and property on the north side of the Saco from Hart's Location to Stanton Farm Road. Overtopping of these berms during Hurricane Irene and the October 2017 storms resulted in impassable roads, which prevented emergency services from reaching houses in the area. A third berm is located at the mouth of the Rocky Branch River before it's confluence with the Saco. Overtopping of this berm during the October 2017 storm resulted in flooding along Route 302 from Jericho Road to the Glen fire station, effectively cutting off much of Bartlett west of the fire station from emergency vehicles and personnel. In order for berms to adequately protect floodplain areas, they need to be properly engineered, requiring large, hardened structures with a finite life span. Process based restoration techniques that provide geomorphic stability to the river system and result in long term flood mitigation should be prioritized where possible. These techniques may include things like floodplain reconnection, construction of floodplain benches, natural grade controls, and the strategic addition of large woody debris.

The best method of flood protection is to avoid building within flood prone areas. Therefore, floodplain development regulations and quality data to back them up are critical for future flood protection. The development of accurate and up to date floodplain maps is essential to a community's flood resiliency. Some communities within the Saco-Swift Corridor are recognizing the importance of updated floodplain maps and are investing in their development. Indeed, floodplain mapping in Hart's Location was recently completed between 2021 and 2023. Though not yet adopted into the FEMA mapping dataset, floodplain boundaries will help the Town better prepare and plan for future flooding impacts.


Damage from Hurricane Irene on Route 302 along the Saco River (Credit: Conway Daily Sun).

CLIMATE CHANGE

The prediction of more frequent and severe storm events in the northeastern US, resulting in flooding within the Saco-Swift Corridor, will continue to become an increasingly prominent threat to the resources and communities with the region. Higher temperatures and more frequent storms will likely intensify flooding, infrastructure damage, and water quality degradation. The increase in acute stormwater and nutrient runoff events have the potential to overwhelm existing stormwater infrastructure and result in increased nutrient exports to surface waterbodies. Extreme temperature conditions are predicted to increase and become more frequent, resulting in widespread impacts to native ecosystems, increased drought during the summer months, and increased flooding during the winter and spring. Riverine flooding is expected to increase in response to increases in extreme precipitation events (New Hampshire Coastal Flood Risk Summary, 2019). This is partly due to the projected increase in short, heavy precipitation events – when excess rain falls within a short period of time (i.e., several inches within a few hours).

Population growth and corresponding expansion of development could put the Saco-Swift Corridor and Upper Saco Valley region at risk for sustained water quality degradation unless climate change resiliency and low impact development strategies are incorporated to existing zoning standards. New development increases impervious cover through new roads, roofs, driveways, and parking areas. Resiliency must be built and designed into public stormwater infrastructure based on temperature changes, precipitation, water levels, wind loads, soil moisture, and ground water levels (Ballestero et al., 2017).

DEVELOPMENT

Development in close proximity to the Saco and Swift rivers and within their floodplains can cause geomorphic instability (see riverbank erosion, below) and increase impervious cover causing pollutants to wash into the river (see impervious cover and clearing of riverbank erosion, below). For example, development in the floodplain can alter or disconnect the historic floodplain, causing higher flows downstream and exacerbating stream bank destabilization. In addition, development in or close to the riparian zone can reduce the riparian buffer, also contributing to bank destabilization and reduce a stream's natural shading and pollutant filtering. Development in riparian areas - including residential, agricultural, or recreational - often spurs human interventions such as hard armoring and rip-rap along the stream bank, intended to reduce erosion and other geomorphic instabilities.

IMPERVIOUS COVER AND WATER QUALITY

Given the mountainous areas of much of the Saco-Swift Corridor, much of the development in the corridor is focused within the flat river valleys such as in Bartlett and Conway. Dense areas of impervious cover within the Saco-Swift Corridor include where Route 302 runs alongside the Saco River inside the corridor and some areas of Conway that area adjacent to the confluence of the Saco River and the swift River.

Impervious areas are roadways, parking lots, driveways, and rooftops that inhibit water from infiltrating directly into the ground. The more impervious cover there is in an area, the less direct recharge to groundwater there is from infiltration, and the more overland surface flow occurs. During large storms in areas with high impervious cover, stormwater runoff can become channelized and create more erosion as it builds speed traveling over land. In addition to risks to water quality, impervious surfaces can also exacerbate flooding and pose significant risks to human safety, buildings, stream crossings and roads, natural geomorphology, and wildlife habitat. Furthermore, buildings and other structures located in floodplains, including grandfathered or otherwise nonconforming structures, constitute a threat for water quality in the form of untreated wastewater contained in septic systems, home heating oil, and any other substances with the potential to contaminate water if floodwaters overwhelm the vicinity.

EXCESSIVE FLOODPLAIN DEVELOPMENT AND CLEARING OF SHORELINE VEGETATION

Encroachment of the floodplain through development can lead to the Saco River, Swift River, or its tributaries to have constrained channels resulting in increased flows, exacerbating erosion. Furthermore, the development of a floodplain reduces its capacity to store water and dampen flooded river energy. Restoring a river's natural floodplain can be one of the most cost-effective methods to reduce flood damage.

Low-density residential sprawl, a development pattern exhibited in the Saco-Swift Corridor over the past several decades as illustrated by the Land Use Assessment, can limit riparian buffers and increase stormwater runoff. A lack of a riparian buffer of vegetation can allow nonpoint source pollution to enter surface waters without being filtered and reduce shading of the river channel, threatening aquatic life. In addition to loss of shoreline vegetation due to development, the clearing of shoreline vegetation to improve views was an identified threat to the river corridor during the development of this plan.

Riverbank on the Saco cleared of vegetation, likely for aesthetic purposes (Left), development perched close to the river's edge. Although this property likely isn't in the floodplain, it is in close proximity to steep eroding banks (Right) (Credit: FBE).

RIVERBANK EROSION

While there are no fluvial erosion hazard zones identified by NHDES in the Saco-Swift Corridor, riverbank erosion was still observed as a threat to the corridor during the development of this plan. Changes and restrictions to the river corridor can cause or exacerbate erosion in the riparian zone. Causes include:

- Floodplain alterations or disconnections by development or roads, causing higher flows downstream during storm events that overtop banks and/or erode riverbanks.
- Rip rap or bank armoring to protect development, agriculture, or recreational uses in the river corridor or floodplain.

The photos below show an armored section of the Saco River, which protects an adjacent agricultural land against erosion. However, the deflection of stream energy by hard armoring such as this, results in increased erosion elsewhere within the river system. This is evident in the pictures below showing the eroded bank and exposed tree roots upstream of the rip rap, caused by armoring upstream and downstream of this location. Additional examples of notable hard armoring in the river corridor include rip rap adjacent to River Road Park and adjacent to Jellystone Campground.

Left: Photo of a hard armored bank with erosion directly above it, likely a result of the Saco's erosive power being directed upstream. Right: The eroded banks continue approximately 800 feet upstream (Credit: FBE).

Ultimately, as the floodplain develops around a constrained channel, flows are being confined and increased, resulting in greater streambank erosion and channel incision. Erosion affects anthropogenic resources as well as natural habitats – eroded materials can smother and impair downstream aquatic habitats. River restoration and management best practices are moving away from hard infrastructure and armoring and instead encouraging larger restoration efforts such as protecting and re-connecting floodplains to allow high flows to effectively be managed with minimal erosion and damage.

WATER QUALITY DEGRADATION

As the Saco and Swift River watersheds are further developed and native ecosystems are impacted by human activities, the good water quality currently present within the river corridors is at risk of degradation. Many of the threats discussed in this plan could contribute to changes in water quality. For example, increased development causes more urban runoff and higher water temperatures which can become lethal for some aquatic vegetation and fish species. Increased temperatures and drought due to climate change will further impact water quality and instream temperatures. Streambank erosion and the clearing of vegetation along riparian areas reduce the capacity for the landscape to naturally filter out pollutants and reduces the natural shading of streams via tree canopies. Other contaminants, such as chloride from road salt or microplastics could also threaten water quality in the Corridor. Erosion and sediment inputs from development can result in poor water clarity, increased nutrient concentrations, and altered fluvial processes. In addition, historical or current dumping of waste along the Saco River was identified as a threat and can result in long term water quality impacts.

While development within the Saco-Swift Corridor is minimal relative to other places within New Hampshire and across the county, the land management activities within the Corridor, such as agriculture, stormwater management, public transportation, and residential development can negatively impact both surface and groundwater quality. The natural riparian buffers along the Saco and Swift rivers have been reduced drastically over the past few hundred years due to agricultural and residential development. Management within these riparian areas, along the river corridor is critical to the conservation of the water quality of the Saco and Swift rivers.

Four sections of the Saco River and six sections of the Swift River (as well as several tributaries) are impaired for aquatic life by the state under the Clean Water Act Section 303(d) (shown in Table 1), meaning the water quality conditions threaten the habitat for in-stream organisms. Management activities such as riparian buffer restoration and green

stormwater infrastructure can mitigate the negative impacts of development on water quality and should be prioritized within the Saco-Swift Corridor to reduce further impairment.

RECREATIONAL OVERUSE

Heavy tourism use can impact safe and sustainable recreational use of the Saco and Swift rivers. Recreational boating is popular on both the Saco and Swift rivers, but is especially prominent on the Saco. For example, the Saco River stretch from Humphrey's Ledge to the First Bridge can experience 300-500 people per day tubing or boating. The Glen Ellis Campground to Davis Park stretch can experience 700-1,200 people using the river on a weekday, and 2,000 people per day on a weekend. Parking to support this heavy recreational use has been an issue in the corridor and region.

In addition, high demand and usage of recreational cold-water fisheries threaten to surpass the reproductive capacity of native trout populations within both rivers. Non-native fish populations stocked into lakes can alter the native ecosystem. Lastly, recreational use (swimming) in waters also introduces microcontaminants, though typically this impact is not considered as threatening as other recreational uses.

Left: Aerial image of tubers on the Saco adjacent to River Road Park (Credit: Joe Klementovich.).Right: Kayakers using the river (Credit: FBE).

INVASIVE SPECIES

Invasive species pose a significant threat to both the ecology and communities within the Saco-Swift Corridor. Invasives are able to outcompete their native counterparts leading to lasting repercussions within the affected ecological environments. Invasives can include insects, plants, and animals alike.

In 2015 the New Hampshire Fish and Game Department and the New Hampshire National Heritage Bureau (NHB) along with over 120 other collaborators developed a statewide *Priority Areas for Management Map* and corresponding *Guide to Planning Successful Invasive Plant Management Projects* (2015). The data from said mapping was used to create customized invasive plant control strategies for each New Hampshire Community. These customized strategies include a map of priority areas for invasive plant management and a list of invasive plant species by which management would be most effective. These species lists are comprised of species that have not entirely taken root within the town and therefore early response and control measures would be most effective. In addition, the U.S. Forest Service (USFS) maintains a national invasive plant data layer, accessible online. Between the 2015 list of invasive plants and the current USFS data mapped, the specific species in each town within the Corridor are:

Bartlett

- Autumn Olive (*Elaegnus umbellata*)
- Japanese Barberry (*Berberis thunbergii*)
- Perennial Pepperweed (*Lepidium latifolium*)
- Bishop's Goutweed (*Aegopodium podagraria*)
- Black Locust (*Robinia pseudoacacia*)
- Burningbush (*Euonymus alatus*)
- California Privet (*Ligustrum ovalifolium*)
- Celandine (*Chelidonium majus*)
- Coltsfoot (*Tussilago farfara*)
- Common Reed (*Phragmites australis*)
- Common Sheep Sorrel (*Rumex acetosella*)
- Common Tansy (*Tanacetum vulgare*)
- Common Wormwood (*Artemisia vulgaris*)
- Glossy Buckthorn (*Frangula alnus*)
- Honeysuckle (*Lonicera*)
- Japanese Knotweed (*Polygonum cuspidatum*)
- Lesser Knapweed (*Centaurea nigra*)
- Morrow's Honeysuckle (*Lonicera morrowii*)
- Multiflora Rose (*Rosa multiflora*)
- Norway Maple (*Acer platanoides*)
- Oriental Bittersweet (*Celastrus orbiculatus*)
- Purple Loosestrife *(Lythrum salicaria)*
- Reed Canarygrass *(Phalaris arundinacea)*
- Spotted Knapweed *(Centaurea stoebe ssp. micranthos)*
- Tree Of Heaven *(Ailanthus altissima)*
- Witch's Moneybags *(Hylotelephium telephium ssp. telephium)*

Albany

- Autumn Olive (*Elaegnus umbellata*)
- Japanese Barberry (*Berberis thunbergii*)
- Perennial Pepperweed (*Lepidium latifolium*)
- Bishop's Goutweed *(Aegopodium podagraria)*
- Black Locust *(Robinia pseudoacacia)*
- Coltsfoot *(Tussilago farfara)*
- Common Tansy *(Tanacetum vulgare)*
- European Alder *(Alnus glutinosa)*
- Glossy Buckthorn *(Frangula alnus)*
- Honeysuckle *(Lonicera)*
- Japanese Barberry *(Berberis thunbergii)*
- Japanese Knotweed *(Polygonum cuspidatum)*
- Morrow's Honeysuckle *(Lonicera morrowii)*
- Multiflora Rose (*Rosa multiflora)*
- Norway Maple (*Acer platanoides)*
- Oriental Bittersweet *(Celastrus orbiculatus)*
- Purple Loosestrife (*Lythrum salicaria)*
- Scots Pine *(Pinus sylvestris)*
- Spotted Knapweed *(Centaurea stoebe ssp. micranthos)*
- Tatarian Honeysuckle *(Lonicera tatarica)*
- Witch's Moneybags *(Hylotelephium telephium)*

Conway

- Black Swollow-wort (*Cynanchum louiseae)*
- Garlic Mustard (*Allaria petiolata*)
- Spotted Knapweed (*CeAutumn Olive (Elaeagnus umbellata)*
- Black Locust *(Robinia pseudoacacia)*
- Burningbush *(Euonymus alatus)*
- Glossy Buckthorn *(Frangula alnus)*
- Honeysuckle *(Lonicera)*
- Japanese Barberry *(Berberis thunbergii)*
- Japanese Knotweed *(Polygonum cuspidatum)*
- Morrow's Honeysuckle *(Lonicera morrowii)*
- Multiflora Rose *(Rosa multiflora)*
- Norway Maple *(Acer platanoides)*
- Oriental Bittersweet *(Celastrus orbiculatus)*
- Privet *(Ligustrum)ntaurea biebersteinii*)
-

Hart's Location

- Black Swollow-wort (*Cynanchum louiseae)*
- Garlic Mustard (*Allaria petiolata*)
- Spotted Knapweed (*Centaurea biebersteinii*)
- Bishop's Goutweed *(Aegopodium podagraria)*
- Black Locust *(Robinia pseudoacacia)*
- Burningbush *(Euonymus alatus)*
- Coltsfoot *(Tussilago farfara)*
- Common wormwood *(Artemisia vulgaris)*
- Glossy buckthorn *(Frangula alnus)*
- Honeysuckle *(Lonicera)*
- Japanese barberry *(Berberis thunbergii)*
- Japanese knotweed *(Polygonum cuspidatum)*
- Norway maple *(Acer platanoides)*
- Oriental bittersweet *(Celastrus orbiculatus)*
- Purple loosestrife *(Lythrum salicaria)*
- Rugosa rose *(Rosa rugosa)*


Left: Japanese Barberry (Credit: US Park Service). Right: Autumn Olive. (Credit: The Nature Conservancy)

The New Hampshire Wildlife Action Plan (WAP) (2020) identifies invasive plant species that are particularly problematic in floodplain habitats due to particularly rich soil and frequent disturbance. These species are Asian bittersweet (*Celastrus orbiculatus*), Japanese knotweed, and black swallowwort (*Cynanchum louiseae*). Aquatic invasive species are also of particular concern for a river corridor, the WAP identifies Eurasian milfoil (*Myriophyllum spicatum*) and water chestnut (*Trapa natans*) as being especially concerning due to their ease of spread and ability to choke out native vegetation. Intense flooding events, like those that are predicted to become more frequent with climate change, have the ability to spread and disperse invasive species into new areas and to create a habitat that is favorable for invasives due to the level of disturbance associated with these events.

In addition to invasive plant species, invasive animal species can have a devastating impact on the areas that they inhabit. Aquatic invasives include Zebra Mussels and the Asian Clam (*Corbicula fluminea*), which can be introduced to water bodies on boats or through bilge and bait bucket water as larvae. Zebra Mussels are able to outcompete native mollusks for food while Asian Clams have been shown to alter freshwater ecosystems through the large scale consumption of zooplankton. Lastly, introduced fish species, such as Bass, pose a serious threat to an area's cold-water fishery and have the ability to completely eliminate said fishery.

ADDITIONAL THREATS

Other threats to the Saco-Swift Corridor identified during the development of this plan include:

- Low water in the Saco or Swift River or a lack of instream flow, threatening aquatic organisms, habitats, groundwater recharge, and other anthropogenic uses such as drinking water supply. Drought and decreased snowpack can also contribute to reduced water levels in the corridor.
- Septic system pollution to surface waters from malfunctioning or failing systems, discharging excess nutrients or pollutants to surface waters.
- Groundwater extraction, threating aquifer viability.
- A lack of public education on the values and importance of the river.
- In-stream impediments, including berms, levees, dikes, dams, or undersized road crossings. Hydrologic impediments can restrict or alter natural stream flow and hydrology.

VIII. COMMUNITY ENGAGEMENT RESULTS

A community survey was completed as a component of the Saco-Swift Corridor Management Plan update. The survey was open to public input between March and April 2023. The goal of the online public survey was to gather and document the thoughts and opinions of community members and a cross section of stakeholders. Survey respondents were asked a series of questions about their important values of the Saco-Swift River Corridor and threats or management issues to the corridor. The public survey was advertised through a press release in the Conway Daily Sun, Outside TV, WMWV's Drive Time News hour, and a feature article in the Spring edition of the Mount Washington Valley Vibe magazine.

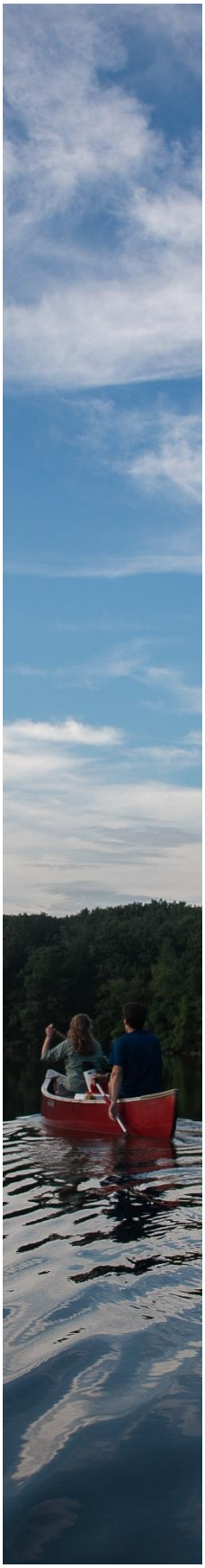
109 residents and visitors of the Saco-Swift River Corridor participated in the survey. The survey asked questions about values, recreation, threats, goals, and willingness to support certain efforts regarding the Saco-Swift River Corridor. The majority of respondents reside within the towns that make up the corridor, and about a quarter of respondents live in other towns but recreate within and visit the corridor.

Overall, the respondents from all towns say the most important aspects of the corridor to them are that it is a place to enjoy nature, scenic views, and swimming, and it is a place for wildlife. The highest ranked threats are development and recreational overuse, followed by riverbank erosion, flooding, and climate change; these rankings varied between towns. Following a similar trend, the most pressing management issues according to all respondents are management of recreational overuse and lack of local regulations protecting the land around the corridor. Again, these rankings varied by town – for example, when the most pressing management issue was ranked by town, flood damage prevention was a top ranked concern for both Bartlett and Hart's Location.

When asked about potential efforts by the towns and the Local Advisory Committee (LAC) to protect and manage the Saco and Swift River Corridors, the majority of respondents are likely to support these efforts. Efforts asked about in the survey include: green infrastructure, improving river access, long-term water quality monitoring, stricter shoreland zoning requirements, supporting climate change assessment work, implementing septic system ordinances to improve regulations, and permanent protection of floodplains. For each effort, between 63% and 78% of respondents were "likely" to support these efforts. Many open-ended questions were included in the survey to gather additional perspectives and thoughts by survey respondents. Open-ended answers indicated many re-occurring observations and concerns, with the most notable themes being: the importance of the natural beauty of the Saco and Swift Rivers, and the need to preserve the rivers' health; recreational overuse causing pollution (including human waste), trash, and excessive noise; lack of municipal management over the rivers regarding recreation, use, campgrounds, and development (including prevention of development too close to the rivers or adjacent wetlands). Results are summarized fully in Appendix B.

Above: The most common responses displayed as a word cloud in response to "What are your most important values of the river(s)?"

IX. GOALS, PRIORITIES & MANAGEMENT ISSUES



Ultimately, the overall goal of the Saco-Swift Corridor Management Plan is to balance the multiple uses of the Saco River and Swift River. As part of a region that places high importance on its natural resources and their many values, including human enjoyment purposes, ecosystem and habitat purposes, and utility services, the management and protection of the Saco-Swift Corridor must balance these uses while not compromising the quality and function of the river corridors.

The following goals outline the priorities of balancing multiple uses of the Saco-Swift Corridor and are grouped as two key goals for (1) managing the corridor, and (2) protecting the corridor. The goals were developed based on the resource assessment, identified threats, historical goals of the Saco and Swift River CMP, a work session with the Saco-Swift River LAC, and results of the community survey. In addition, identified management issues were used to inform goal setting. The committee identified key management issues as:

(1) lack of local regulations protecting the land area around the corridor

(2) lack of floodplain protections

(3) flood and flow mitigation, and

(4) recreational overuse (including lack of regulated public access for recreation).

The community survey results echoed many of the LAC's identified threats, concerns, and management issues, particularly related to heavy recreational overuse in the corridor and development adjacent to the corridor impacting the rivers. Many survey respondents also indicated that the lack of municipal management of recreation and development was concerning and impacting the river as they know it.

Goal #1: Manage the resources of the Saco-Swift Corridor, with a particular focus to manage flooding, recreational resources, and natural habitats. Objectives include:

a. Manage future development in the floodplain to reduce any additional disconnection of the floodplain or encroachment of the floodplain, ultimately to allow floodplains to use their full capacity to store floodwaters.
b. Manage existing development in the floodplain and plan and prepare for floodwaters to reduce damage. Mitigate stormwater runoff and peak flows using low impact development and/or green stormwater infrastructure, acknowledging that not all existing development in floodplains can be removed, but that using techniques to reduce damage, reconnect floodplains, and reduce nonpoint source pollution, erosion, and sedimentation will help protect infrastructure and the rivers' health.
c. Mitigate bank erosion where possible using bioengineering and green stormwater infrastructure techniques and by restoring streamside (riparian) buffers.
d. Manage recreational resources to ensure sustainable recreational use of the river, while also acknowledging the importance of recreation in sustaining the local and regional economy.
e. Manage recreational resources to ensure sustainable and safe public access while also acknowledging any concerns of local landowners.
f. Maintain in-stream flow, preventing the Saco and Swift Rivers from becoming dry during periods of drought, and to protect aquatic organisms and natural geomorphic and hydrologic function.

Goal #2: Protect the resources of the Saco-Swift Corridor, with a particular focus on protecting natural habitats, water quality, in-stream flow, and building climate resiliency. Objectives include:

a. Protect the water quality of the Saco and Swift rivers and their tributaries against future water quality degradation.
b. Protect the rivers' resources against negative impacts of climate change by building resiliency.

c. Protect the regional aquifers and groundwater against depletion and degradation, in part to ensure a sufficient drinking water supply.
d. Protect natural habitats of the river corridors, including in-stream habitats, such as for cold water fisheries, streamside (riparian) habitats, and the wetlands, waters, and associated natural areas of the Saco and Swift rivers.
e. Protect riverside land strategically in partnership with local organizations and river corridor communities. Conserve lands that preserve floodplains for floodwater storage, protect natural habitats, and meet the evolving needs of the river corridors.
f. Ensure a vibrant economy by maintaining the unique character of the river corridors.

X. ACTION PLAN AND FUNDING MECHANISMS

Action items to achieve the goals and objectives of the CMP are listed in **Table 24** and include responsible party, estimate cost information, and timeframe.

In addition, developing a strategy for funding acquisition is pertinent to accomplishing the goals in the Saco-Swift Corridor Action Plan. Funding to cover ordinance revisions and third-party review could be supported by municipalities through tax collection (as approved by majority vote by residents). Monitoring and assessment funding could come from a variety of sources, including state and federal grants, municipalities, or donations. Funding to improve septic systems, roads, and shoreland zone buffers would likely come from property owners. As the plan evolves into the future, the establishment of a funding subcommittee will be a key part in how funds are raised, tracked, and spent to implement and support the plan. Listed in Appendix A are state and federal funding sources that could assist with future management and restoration work in the Saco-Swift Corridor.

Table 24. Action table for implementation of the Saco Swift River Corridor Management Plan. Short term action items are 12-18 months, medium term action items are 3-5 years, and long-term action items are 5+ years to implement. Refer to Appendix A for potential funding sources.

Objective	Action Item(s)	Responsible Parties	Estimated Costs	Timeframe
Goal #1: Manage the resources of the Saco-Swift Corridor, with a particular focus to manage flooding, recreational resources, and natural habitats.				
a. Manage future development in the floodplain to reduce any additional disconnection of the floodplain or encroachment of the floodplain, ultimately to allow floodplains to use their full capacity to store floodwaters.	Coordinate collaboration with municipalities in the corridor to manage development, identify and prioritize action items, determine feasibility, and identify funding opportunities. Establish key municipality contacts and consider setting up a task force or subcommittee related to managing flooding, development, and floodplains within or across municipalities.	Municipalities, with SSRLAC input and/or assistance	NA	Short-term, Ongoing
	Encourage permanent protection of flood storage areas abutting the rivers and their tributaries through land use protection tools such as conservation easements.	SSRLAC in collaboration with municipalities, USVLT	Volunteer time + land acquisition funds	Ongoing, long-term
	Require key natural resource areas and areas vulnerable to flood hazards and climate impacts, as shown on appropriate maps, to be removed from the total land area available for development during calculations to determine density and/or lot coverage.	Albany, Bartlett, Conway	NA	Medium-term
	Encourage mapping of important flood storage areas abutting the rivers and their tributaries to factor into future permit reviews. Future work could build off existing maps (such as the Hart's Location floodplain mapping) and could map areas at a smaller landscape scale.	SSRLAC, municipalities, consultant	Volunteer/in-house time, $10k-$20 for additional flood mapping studies	Medium-term
	Educate members of the corridor communities on the hazards and costs of allowing people to build in the mapped floodplain. For example, provide educational materials on how the loss of floodplain storage capacity in one area increases flood levels in another (typically downstream) area.	SSRLAC in collaboration with municipalities	Volunteer time + $500 printing costs or online material publishing costs	Short-term
	Develop and provide informational materials on current and future impacts of development in floodplains and in the river corridor to developers.	SSRLAC in collaboration with municipalities		Short-term

Objective	Action Item(s)	Responsible Parties	Estimated Costs	Timeframe
b. Manage existing development in the floodplain and plan and prepare for floodwaters to reduce damage. Mitigate stormwater runoff and peak flows using low impact development and/or green stormwater infrastructure, acknowledging that not all existing development in floodplains can be removed, but that using techniques to reduce damage, reconnect floodplain, and reduce nonpoint source pollution, erosion, and sedimentation will help protect infrastructure and the rivers' health.	Promote green buildings and low impact development (Refer to Section VI Regulation Review for example ordinance language). These techniques can slow runoff, reducing flooding.	Albany, Bartlett, Conway, Hart's Location.	In-house	Ongoing, long-term
	Identify accessible and highly visible locations for demonstration projects, such as parks or schools, that model best management practices for landscaping including buffers and rain gardens.	SSRLAC in collaboration with municipalities.	NA	Ongoing, medium-term
	Engage property owners in the corridor communities in monitoring flood events and impacts. Document and report rain event flooding to local officials. Consider building a flood event reporting system into the SSRLAC website.	SSRLAC in collaboration with municipalities	Volunteer time + $500 printing costs or online material publishing costs	Ongoing, short-term
	Conduct a hotspot analysis of high development areas (impervious cover) within the river corridor to consider for retrofit analyses for installing Best Management Practices. For example, reference EPA's National Menu of Best Management Practices for Stormwater to select appropriate BMP options based on site characteristics, such as bioretention practices and grass swales in parking areas.	Consultant (potentially in collaboration with similar work intended to be completed under the Kearsarge Brook - Saco River Watershed Plan implementation).	$25,000 - $50,000	Medium-term
	Track impervious surface data from new development within the corridor.	SSRLAC	NA	Short-term
	Support modification of building standards based on FEMA flood maps.	SSRLAC	NA	Medium-term

Objective	Action Item(s)	Responsible Parties	Estimated Costs	Timeframe
	Freeboard: Require structures to be elevated above projected flood levels (Refer to Section VI Regulation Review for example ordinance language).	Albany, Bartlett, Conway, Hart's Location	In-house	Medium-term
c. Mitigate bank erosion where possible using bioengineering and green stormwater infrastructure techniques and by restoring streamside (riparian) buffers.	Encourage communities to work with NHDES to pursue opportunities for fluvial erosion hazard (FEH) mapping. While there are currently no Fluvial Erosion Hazard Zones identified by NHDES within the corridor, riverbank erosion was identified as a threat to the corridor. FEH mapping will help identify serious erosion problem areas and possible solutions. This work would also continue the geomorphic assessment completed in the Kearsarge Brook - Saco River watershed where site specific recommendations were developed for identified eroded areas. Use any mapping results to help educate communities about costs of building in fluvial erosion hazard areas.	SSRLAC, NHDES, Consultant	In-house NHDES work with assistance from consultant ($25-$50,000 depending on scope of study and mapping)	Medium-term
	Remove excessive riprap along shorelines and use green infrastructure and current bioengineering best management practices for bank stabilization efforts.	Consultant/ Engineer	Depends on site	Ongoing, medium-term
d. Manage recreational resources to ensure sustainable recreational use of the river, while also acknowledging the importance of recreation in sustaining the local and regional economy. *and* e. Manage recreational resources to ensure sustainable and safe public access while also acknowledging any concerns of local landowners.	Coordinate collaboration with municipalities in the corridor to manage recreation, identify and prioritize action items, determine feasibility, and identify funding opportunities. Establish municipality contacts and consider setting up a task force or subcommittee related to managing recreation that includes relevant stakeholders.	Municipalities, with SSRLAC input and/or assistance	NA	Short-term, Ongoing
	Conduct an assessment of public access (formal or informal) to the rivers and create site-specific recommendations. Assess sufficient parking, if public access points are appropriately sloped and maintained to minimize runoff, safety, and if access points are accessible to people with mobility impairments. Assess if signage provides alternative suggestions (for example, if lot is full) and appropriate guidelines for use.	Municipalities, SSRLAC, potentially with help from consultant	Volunteer time, in-house municipal time, and/or $10k-$20k depending on scope of assessment.	Short-term
	Develop an addendum to the CMP that focuses solely on sustainable recreational management of the river.	SSRLAC	NA	Medium-term
	Use “river hosts,” similar to Lake Hosts or campground hosts, at busy public access points for education and oversight.	SSRLAC, with collaboration from municipalities	Consistent funding from grants and/or municipalities.	Short-term

Objective	Action Item(s)	Responsible Parties	Estimated Costs	Timeframe
	Use public service opportunities such as scouts or schools to help with river stewardship (such as trash cleanup, public access maintenance, etc.)	SSRLAC, local schools, scouts, or other volunteer organizations	volunteer time + $500 trash cleanup or other stewardship materials.	Short-term
	Use local boat rental businesses as an opportunity to build river stewardship culture.	SSRLAC, local boat rental companies	volunteer time	Short-term
	At appropriate public access points, take steps to reduce any detrimental impacts to the river, including bathroom access, stormwater infiltration, invasive species removal from watercrafts, etc.	Municipalities, SSRLAC.	Municipalities in-house	Short-term
	Provide trash containers and trash removal.	Municipalities	Municipalities	Short-term
	Explore the possibility of grant funding, such as through NH Fish and Game, if additional managed public access and/or modification of existing access is needed.	SSRLAC, in collaboration with NHFG or other funding agencies	NA	Long-term
	Assess landowner issues resulting from public access (such as trespass or encroachment) and work with municipalities and landowners to appropriately manage these access points. Use this opportunity to exchange information and concerns with private or commercial landowners, such as through focus groups or other targeted stakeholder involvement efforts. Consider ways to decrease trespassing on private lands. For example, increased availability of boating/fishing access maps might decrease trespassing.	Municipalities, with assistance from SSRLAC.	NA	Short-term
f. Maintain in-stream flow, preventing the Saco and Swift Rivers from becoming dry during periods of drought, and to protect aquatic organisms and natural geomorphic and hydrologic function	Work with NHDES' In-stream Flow Program staff to establish and maintain a stream gage on the upper reach of the rivers. NHDES has confirmed that both the Saco and Swift are in the queue for updated plans, particularly the Swift River.	SSRLAC, NHDES.	NHDES in-house	Long-term
	Collaborate with the North Conway Water Precinct to continually assess and manage drinking water levels.	SSRLAC, NCWP.	NA	Medium-term
	Implement water-saving irrigation methods during drought and/or seasonal low water periods (likely August).	Community members	Volunteer time + $500 printing costs or online material publishing costs	Ongoing, short-term

Objective	Action Item(s)	Responsible Parties	Estimated Costs	Timeframe
Goal #2: Protect the resources of the Saco-Swift Corridor, with a particular focus on protecting natural habitats, water quality, in-stream flow, and building climate resiliency.				
a. Protect the water quality of the Saco and Swift rivers and their tributaries against future water quality degradation.	Establish a new shoreland overlay district. Further amend the shoreland zoning ordinance to specify permitted uses and development standards in the new district (i.e., protective buffers, development setbacks, green infrastructure).	Albany, Bartlett, Hart's Location	NA	Medium-term
	Work with NHDES to establish participation in the NHDES Volunteer River Assessment Program (VRAP). VRAP " coordinates a regular volunteer-driven water quality sampling program to assist NHDES in evaluating river water quality throughout the state." Building a volunteer network for consistent monitoring will take time, but can grow to expand sites and frequency of monitoring.	SSRLAC with support from NHDES	Volunteer time + sampling costs, dependent on NHDES support and scope of parameters and sampling frequency.	Ongoing, short-term
	Support implementation of water quality monitoring in the Saco and Swift rivers as outlined in the 2020 "Watching our Waters" Action Plan. Actions include the following:			
	a. Install continuous water quality sensors that record temperature, conductivity, dissolved oxygen, and turbidity. The Kearsarge Brook - Saco River WMP recommends installing a minimum of two sensors, one before the confluence with the Swift River, and one at the outlet of Kearsarge Brook. If funds allow, install an additional sensor at the outlet of the East Branch of the Saco River. The number of sensors could be increased to additional locations in the Saco and Swift rivers.			
	b. Begin routine monitoring for a core list of water quality parameters at the same sites with continuous sensors. Core parameters should include: major anions (chloride, sulfate, nitrate), cations (sodium, potassium, magnesium, calcium), ammonia/ammonium, total dissolved nitrogen, dissolved organic carbon, soluble reactive phosphorus, total phosphorus, and total nitrogen.			
	c. Encourage local adoption of protective standards for fertilizer and pesticide application, such as application setbacks.	SSRLAC, municipalities	NA	Medium-term
	d. Require on-site retention and infiltration of stormwater. (Refer to Section VI Regulation Review for example ordinance language).	Albany, Bartlett, Conway, Hart's Location	NA	Short-term

Objective	Action Item(s)	Responsible Parties	Estimated Costs	Timeframe
b. Protect the Rivers' resources against negative impacts of climate change by building resiliency.	In addition to the many management and protective measures mentioned elsewhere in the action table that will build climate resiliency: Amend current Master Plans to include sections on climate change resiliency and prioritizing the town's adaptation and mitigation efforts.	Albany, Bartlett, Conway, Hart's Location. *Note: Conway is currently in the process of updating their Master Plan.*	NA	Ongoing, term depending on Town
	Include climate change impacts in all assessment work and advocacy to municipalities, such as for stormwater management, setback and zoning changes, flood risk mitigation, etc.	Albany, Bartlett, Conway, Hart's Location	NA	Ongoing, short-term
	Implement and use an impact fee for funding natural resource conservation and climate change resilience.	Albany, Bartlett, Conway, Hart's Location	NA	Medium-term
c. Protect the regional aquifers and groundwater against depletion and degradation, in part to ensure a sufficient drinking water supply.	Establish aquifer protection ordinances in towns that do not have existing measures. The Town of Hart's Location has local regulations, the Model Groundwater Protection Ordinance, which follows the NHDES model ordinance and specifically protects the boundaries of the stratified drift aquifer and the surfaces waters fed by groundwater within the Town. The Towns of Conway, Jackson, and Bartlett have mention of the protection of groundwater in their zoning ordinances or have well-head protection, but do not specifically regulate the protection of the aquifer.	Municipalities	NA	Medium-term
d. Protect natural habitats of the river corridor, including in-stream habitats, such as for cold water fisheries, streamside (riparian) habitats, and the wetlands, waters, and	Designate areas with vulnerable resources as a "Resource Protection District".	Albany, Bartlett, Conway	NA	Medium-term

Objective	Action Item(s)	Responsible Parties	Estimated Costs	Timeframe
associated natural areas of the Saco and Swift Rivers.	Develop a program similar to the Lake Champlain Basin "Streamwise" Program that rewards streamside properties with a certification/award if a buffer is properly maintained. This program is intended to facilitate the involvement of private landowners or businesses in good stream/river shoreline practices.	SSRLAC, in collaboration with consultant and/or other watershed organizations such as SHA, GLLT	$5,000 - $20,000 depending on program scope.	Long-term
	Use shoreland or resource protection zoning to further limit vegetation clearing around resources and to prohibit the removal of native vegetation within the shoreland setback areas to preserve natural protection from flooding and stormwater runoff.	Albany, Bartlett, Conway, Hart's Location	NA	Medium-term
	Consider septic system ordinances that require regular pump-outs and inspections to ensure proper functioning. Require a septic system to be fixed before the property is sold, and require full evaluations, not brief assessments. Costs would be the responsibility of property owner.	Municipalities	NA	Medium-term
e. Protect riverside land strategically in partnership with local organizations and river corridor communities. Conserve lands that preserve floodplains for floodwater storage, protect natural habitats, and meet the evolving needs of the river corridor.	Use the information presented in the CMP to assist with reviewing permits. For example, based on the resources assessment completed in this CMP and the identified goals, create a list of areas to be prioritized for protection when reviewing permits (based on habitat, safe public access, etc.).	SSRLAC	NA	Short-term
	Support local regulations such as open space or conservation within subdivisions to preserve key wetlands and uplands within the river corridor and watershed.	SSRLAC	NA	Short-term
	For proposed subdivisions, require that open space is the first consideration in the development design, with priority given to conservation of important natural resources; habitat; connectivity of conserved lands; water quality protection; recreation opportunities; public access; and protection of areas vulnerable to existing and future flooding. (Refer to Section VI Regulation Review for example ordinance language).	Albany, Bartlett, Conway	NA	Medium-term
	Provide educational materials to property owners about incentives for conserving land.	SSRLAC	Volunteer time + $500 printing costs or online material publishing costs	Short-term

Objective	Action Item(s)	Responsible Parties	Estimated Costs	Timeframe
f. Ensure vibrant economy by maintaining the unique character of the river corridor.	Recruit volunteers to help educate the community about the rivers and their protection. For example, participate in community events, particularly those that may revolve around the Saco or Swift rivers, have municipal planning boards host training workshops, include educational materials in the newspaper or sewer/water bills, and develop school educational programs.	SSRLAC	Volunteer time, $500 printing/material costs, $5k+ for educational programing	Short-term
	Develop a comprehensive open space plan.	Albany, Bartlett, Conway	$40k - $80k	Long-term
ADDITIONAL STEPS				
Revisit the goals of the Saco Swift Corridor Management Plan every 10 years.		SSRLAC	NA	Long-term
Revisit objectives every two years.		SSRLAC	NA	Short-term
Establish a funding mechanism, including grant funds, donations, and collaborations with other local organizations and municipalities.		SSRLAC	NA	Ongoing
Collaborate with local projects, such as watershed management plan implementation grants or conservation easement funding.		SSRLAC	NA	Ongoing

XI. REFERENCES

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XII. APPENDIX A: FUNDING OPPORTUNITIES

Funding Options:

- **EPA/NHDES 319 Grants (Watershed Assistance Grants)** – This NPS grant is designed to support local initiatives to restore impaired waters (priorities identified in the NPS Management Program Plan, updated 2014) and protect high quality waters. 319 grants are available for the implementation of watershed-based plans and typically fund $50,000 to $150,000 projects over the course of two years.
- **NH State Conservation Committee (SCC) Grant Program (Moose Plate Grants)** – County Conservation Districts, municipalities (including commissions engaged in conservation programs), and qualified nonprofit organizations are eligible to apply for the SCC grant program. Projects must qualify in one of the following categories: Water Quality and Quantity; Wildlife Habitat; Soil Conservation and Flooding; Best Management Practices; Conservation Planning; and Land Conservation. The total SCC grant request per application cannot exceed $24,000.
- **Land and Community Heritage Investment Program (LCHIP)** – This grant provides matching funds to help municipalities and nonprofits protect the state's natural, historical, and cultural resources.
- **Aquatic Resource Mitigation Fund (ARM)** – This grant provides funds for projects that protect, restore, or enhance wetlands and streams to compensate for impacted aquatic resources. The fund is managed by the NHDES Wetlands Bureau that oversees the state In-Lieu Fee (ILF) compensatory mitigation program. A permittee can make a payment to NHDES to mitigate or offset losses to natural resources because of a project's impact to the environment.
- **New England Forest and River Grant (NFWF NEFRG)** – This grant awards $50,000 to $200,000 to projects that restore and sustain healthy forests and rivers through habitat restoration, fish barrier removal, and stream connectivity such as culvert upgrades.
- **Aquatic Invasive Plant Control, Prevention and Research Grants (NHDES AIPC)** – Funds are available each year for projects that prevent new infestations of exotic plants, including outreach, education, Lake Host Programs, and other activities.
- **Clean Water State Revolving Fund (NHDES CWSRF)** – This fund provides low-interest loans to communities, nonprofits, and other local government entities to improve and replace wastewater collection systems with the goal of protecting public health and improving water quality. A portion of the CWSRF program is used to fund NPS pollution prevention, watershed protection and restoration, and estuary management projects that help improve and protect water quality in NH.
- **Drinking Water State Revolving Fund (NHDES DWSRF)** – This fund provides low-interest financing for community public water systems and non-transient nonprofit water systems infrastructure projects. Primary project types include replacement of aging water pipes and meters, installation of new wells, pumphouse and treatment system upgrades, interconnections, and construction of storage tanks.
- **Regional Conservation Partnership Program (RCCP)** - This NRCS grant provides conservation assistance to producers and landowners for projects carried out on agricultural land or non-industrial private forest land to achieve conservation benefits and address natural resource challenges. Eligible activities include land management restoration practices, entity-held easements, and public works/watershed conservation activities.
- **Agricultural Conservation Easement Program (ACEP)** - This NRCS grant protects the agricultural viability and related conservation values of eligible land by limiting nonagricultural uses which negatively affect agricultural uses and conservation values, protect grazing uses and related conservation values by restoring or conserving eligible grazing land, and protecting, restoring, and enhancing wetlands on eligible land. Eligible applicants include private landowners of agricultural land, cropland, rangeland, grassland, pastureland, and non-industrial private forestland.
- **Conservation Stewardship Program (CSP)** - This NRCS grant helps agricultural producers maintain and improve their existing conservation systems and adopt additional conservation activities to address priority resource concerns. Eligible lands include private agricultural lands, non-industrial private forestland, farmstead, and associated agricultural lands, and public land that is under control of the applicant.

- **Environmental Quality Incentives Program (EQIP)** - This NRCS grant provides financial and technical assistance to agricultural producers and non-industrial forest managers to address natural resource concerns and deliver environmental benefits. Eligible applicants include agricultural producers, owners of non-industrial private forestland, water management entities, etc.
- **National Fish and Wildlife Federation (NFWF) Five Star and Urban Waters Restoration Grants (NFWF 5-Star)** - Grants seek to address water quality issues in priority watersheds, such as erosion due to unstable streambanks, pollution from stormwater runoff, and degraded shorelines caused by development. Eligible projects include wetland, riparian, in-stream and/or coastal habitat restoration; design and construction of green infrastructure BMPs; water quality monitoring/assessment; outreach and education.
- **North American Wetlands Conservation Act (NAWCA) Grants** - The U.S. Standard Grants Program is a competitive, matching grants program that supports public-private partnerships carrying out projects in the United States that further the goals of the North American Wetlands Conservation Act (NAWCA). These projects must involve long-term protection, restoration, and/or enhancement of wetlands and associated uplands habitats for the benefit of all wetlands-associated migratory birds.
- **National Park Service** - Land and Water Conservation Fund Grant Program (LWCF) - Eligible projects include acquisition of parkland or conservation land; creation of new parks; renovations to existing parks; and development of trails. Municipalities must have an up-to-date Open Space and Recreation Plan. Trails constructed using grant funds must be ADA-compliant.
- **Open Space Institute (OSI) Climate Catalyst Program** - The OSI assists land trusts and other groups that protect and steward land in developing effective approaches to conserving land in a rapidly changing climate with grants ranging from $5,000-$15,000. This program aims to address the climate issues of habitat resilience, forest carbon storage and sequestration, and community resilience to climate impacts such as flooding.
- **Local Source Water Protection Grant Program** - NHDES provides up to $30,000 grants to water suppliers, municipalities, and other local organizations for the purpose of protecting drinking water sources. Projects have included delineation of wellhead protection areas, inventorying potential contamination sources, development of local protection ordinances, groundwater reclassification, shoreline surveys, drinking water education and outreach activities, and controlling access to sources.
- **Water System Sustainability Grant Program -** NHDES supplies a group of grants intended to assist Community Water Systems in developing programs that will ensure sustainable operations and identify possible improvements in technical, managerial and/or financial operations. This program includes grants for drinking water asset management, green projects such as water audits, energy audits and energy audit implementation, and strategic planning projects. These grants range from $50,000 to $200,000.
- **Water Quality Planning 604(b) Grants -** NHDES provides grants up to $160,000 for conducting water quality planning. These projects may include NPS identification, implementation plan development, POTW planning, water quality monitoring, stormwater and green infrastructure planning, and more.

XIII. APPENDIX B: COMMUNITY SURVEY RESULTS

Question 1: Do you live in a Town within the Saco Swift River Region, or elsewhere?
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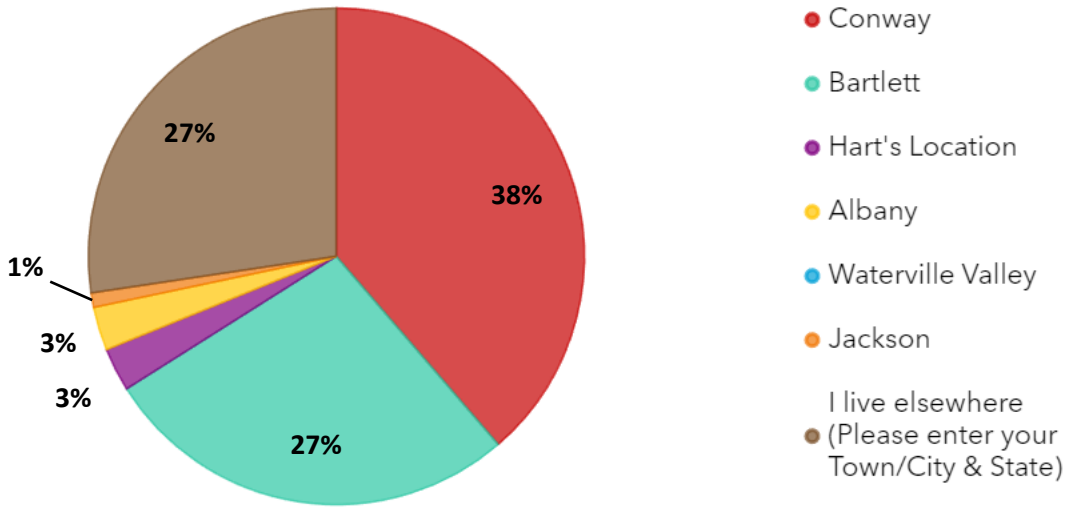
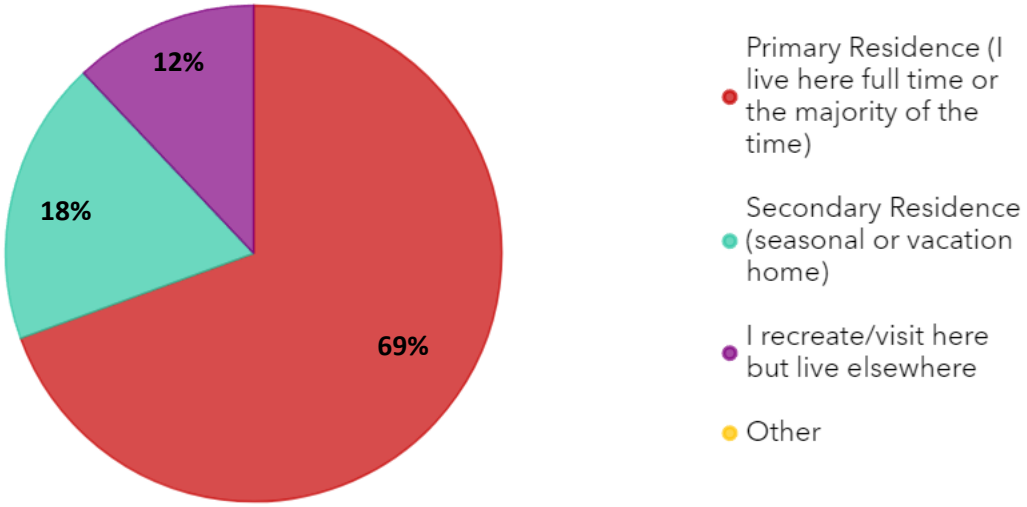


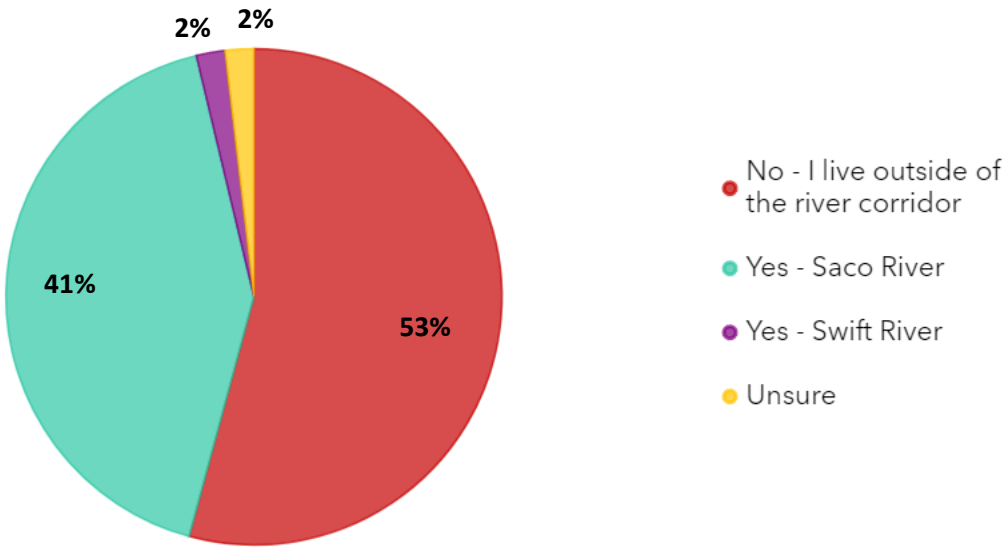
I live elsewhere (Please enter your Town/City & State) - Do you live in a Town within the Saco Swift River Region, or elsewhere?

- Alton, NH (1)
- Berlin, NH (1)
- Chocorua, NH (1)
- Eaton Center, NH (1)
- Freedom, NH (3)
- Hollis, NH (1)
- Loudon, NH (1)
- Madison, NH (6)
- Manchester, NH (1)
- Meredith, NH (1)
- North Sandwich, MA (1)
- Shelburne, NH (1)
- Tamworth, NH (1)
- Brownfield, ME (1)
- Denmark, ME (1)
- Fryeburg, ME (2)
- Greenwood, ME (1)
- Portland, ME (1)
- Newbury, MA (1)
- Cimarron, NM (1)

Question 2: To elaborate on the above question, which one of these options best describes your connection to the Saco and Swift River region?
Skipped: 1



Question 3: The River Corridor is 1/4 mile from either side of the river and within the 100-year floodplain. Do you live in the Corridor?
Skipped: 2



Question 4: Why is the Saco and/or Swift River important to you?

(Survey respondents selected all that apply. For example, 86% of respondents checked that "a place to enjoy nature" was a reason why the Saco and/or Swift River is important to them.)
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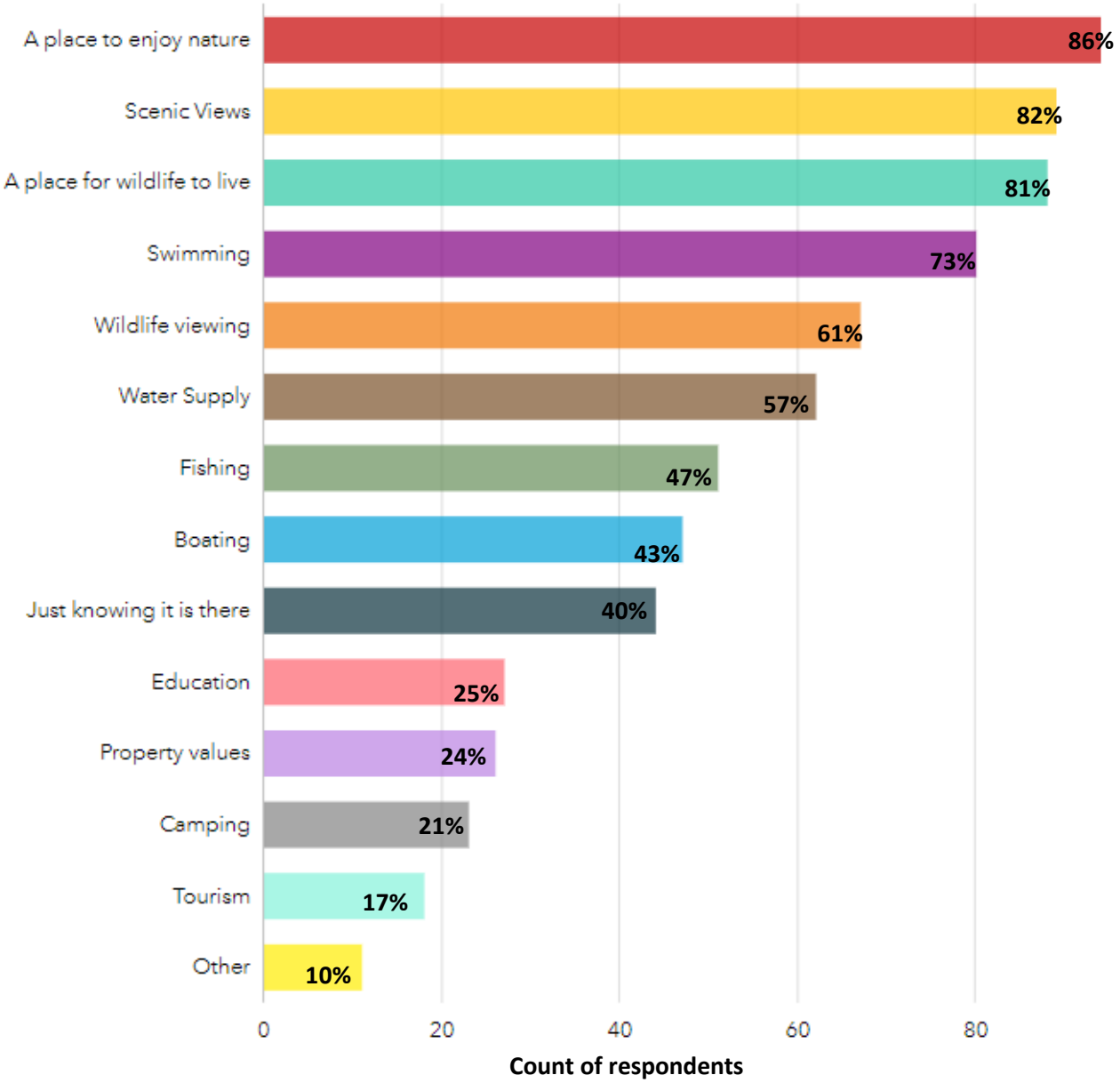


"Other" Responses

- Economy, community, nature require commitment for long term resilience. (1)
- We live right on the Saco in Conway on Route 16 and are blessed with the opportunity to see the amazing river every day. I find it a tragedy to find that the town will let someone put over 400 apartments only 75' from the riverbanks. (1)
- Sustains many different businesses in the area. (1)
- Recreational use. (1)
- Connection with indigenous history. (1)

- Agriculture. (1)
- Teaching Swiftwater Rescue courses to local agencies and regional outfitters and paddlers. (1)
- Whitewater kayaking. (2)

Question 5: Based on all the reasons you selected above, what are your most important values of the river? Please use a few of your own words.

Skipped: 18

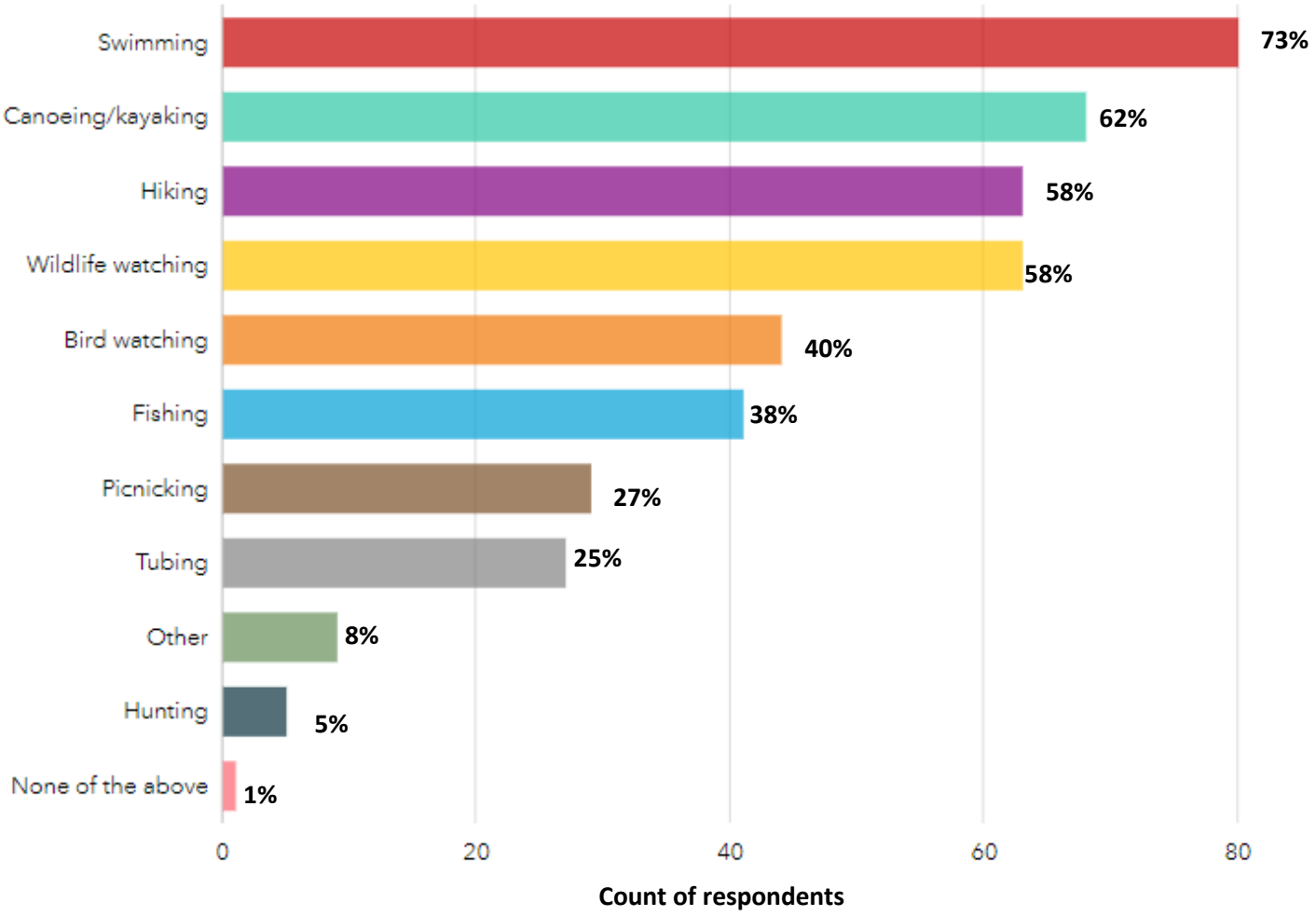
- My wife and I enjoy hiking along the Rocky Branch.
- Protecting the natural beauty and wildlife.
- Natural spaces.
- Probably its natural beauty resource.
- Fishing is an economic driver.
- The river is beautiful. I live a 1/4 mile from where the Swift and Saco Rivers meet. I go swimming, have picnics, and paddleboard down the Saco River. I bring my dog swimming there as well.
- Swimming, wildlife, recreation.
- Preserving natural places for habitat, clean water, enjoyment (meaning, enjoying it as is...undeveloped and clean).
- Clean, accessible place to take my family.
- A place to enjoy nature and to support wildlife.
- Sustainable fishing and clean water.
- Natural, beautiful habitat, water supply, local recreation.
- Water quality, habitat protection, swimming.
- Fishing and a place for wildlife.
- The river brings me joy and peace, knowing that it was, is, and (with proper care) will be the backbone of our community - humans, animals, and plants.
- Nature. Wildlife. A pristine place to walk.
- It's important to have a natural water resource very close to home.
- We just walk out the back door and make it a part of our everyday lives.
- It is a beautiful place - peaceful and yet always exciting.
- A place for wildlife, especially birds.
- To preserve its scenic and natural beauty, including water quality and wildlife.
- Just like the mountains, it is one of the key reasons to live here. A resource to be protected at all costs.
- Peaceful place to enjoy nature.
- Must maintain to keep flooding from wearing away the banks. The ecosystem is stressed enough so we need to be good stewards of what has been given us!
- Critical water supply, natural beauty that my family has enjoyed for 150 years.
- Its natural beauty.
- Fly fishing and kayaking (boating).
- Keeping them clean, flowing, and free of detritus.
- Clean, not overused, local access.
- The Saco River soothes my soul and provides me with a daily multi-sensory experience knowing full well this river is under constant threat.
- Water supply, wildlife habitat.
- Water quality and fishing as they go together.

- Protection of water resources is the most important, followed by maintaining the natural environment and minimizing development so that the river can be enjoyed in a natural setting.
- Water quality is paramount.
- Keeping it clean and quiet.
- The river makes the location what it is. Water gives life to the habitat, the wildlife, humans.
- My family and I enjoy both the Swift and the Saco Rivers while we swim, kayak, fish, and hang out.
- I enjoy walking along the Swift River enjoying observing nature, the birds, wildlife signs and the scenery. Oftentimes, I will swim in the Swift which is half a mile down the hill from my home.
- The natural beauty is there for everyone to view, enjoy and protect. Born and raised in NH.
- The river has potential to be a world class angling destination if it was managed better.
- The Saco is the anchor of the white mountain region.
- Keeping it clean.
- Both rivers offer outdoor valued recreational opportunities, but, like anywhere, overuse results in adverse impact. Use needs to be managed.
- That river, and the place around it, are one of the easiest places I know to find wildness. It is rarely far off trail, even on the busiest days.
- Being able to exercise while enjoying the natural beauty of the river.
- Paddling and fly fishing.
- I see it mainly as a rich ecosystem for wildlife and an important aspect of the natural environment of the region.
- It's a great natural resource and environment that provides many opportunities for recreation.
- The clean, free flowing nature of the river provides significant value to my life here in the Saco River Valley.
- Natural Beauty.
- Natural state and recreation.
- Natural habitat for wildlife.
- Water supply (aquifer), property values, scenic views, and wildlife habitat and viewing.
- A place to live in and enjoy nature.
- Scenic views, property values.
- Water quality, beauty, and natural resource.
- Recreation.
- The Saco River is a beautiful place to appreciate nature.
- Keeping it clean and healthy.
- The clean clear cold water is precious as a place of beauty and balm for the soul, for wildlife to live, water supply for flora and fauna and respectful recreation and enjoyment.
- The beauty and relaxing sound.
- We watch all the wildlife right from our kitchen window every day and night.
- Clean, access for everyone, and balanced, thoughtful, planning for the future.
- Protecting the efficacy of the river for generations to come.
- Views from our property and wildlife support.
- That the rivers support our wildlife and human life is important. To be able to educate people on the importance of preserving nature. It is also important to enjoy its beauty.
- My most important values of the river are its natural beauty which I greatly enjoy, wildlife habitat which animals enjoy, and clean water for our aquifers.
- Good access for fishing.
- Childhood memories, recreation.
- A place to enjoy nature.
- Peaceful spot to relax.

- Habitat, swimming and drinking water.
- Clean water.
- Rivers are my favorite places to simply just exist in nature. Management of these rivers is important to me because of the high use we see in this valley.
- Saco is the jewel of the valley. People come to the area to recreate on the river. It also has one of the largest aquifers for drinking water.
- Water quality and personal recreation.
- We love to sit on the banks or on a tube and just relax on the river. It is an awesome natural resource we should respect & protect.
- Water supply and scenic views.
- It is a place to relax, recreate, spend time with friends, and I appreciate how quiet, clean, and undeveloped it is.
- It's important to let the river be a river and allow it space to flood and shrink. We must provide safe access for recreation and slow the development of sprawl near the river and its tributaries.
- A place to enjoy nature.
- Boating - and boating as a vehicle to enjoy nature and my paddling social circle.
- I use the river most frequently for recreation. I spend many days kayaking on it during the spring and fall when it is running. Swim and play in the water during the summertime.
- Clean, clear, refreshing, brisk water and excellent water quality and wildlife.
- Primary value is of course as wildlife habitat, but a close second (and the reason I visit the area) is to whitewater kayak. These are very fun rivers to paddle and are known to be relatively safe.
- It is most important to be able to access the river for kayaking and swimming in clean water.
- Clean, unspoiled water.

Question 6: If you recreate on the Saco and/or Swift River, what do you do?

(Survey respondents selected all that apply. For example, 73% of respondents checked that "swimming" was a way they recreate.)
Skipped: 1



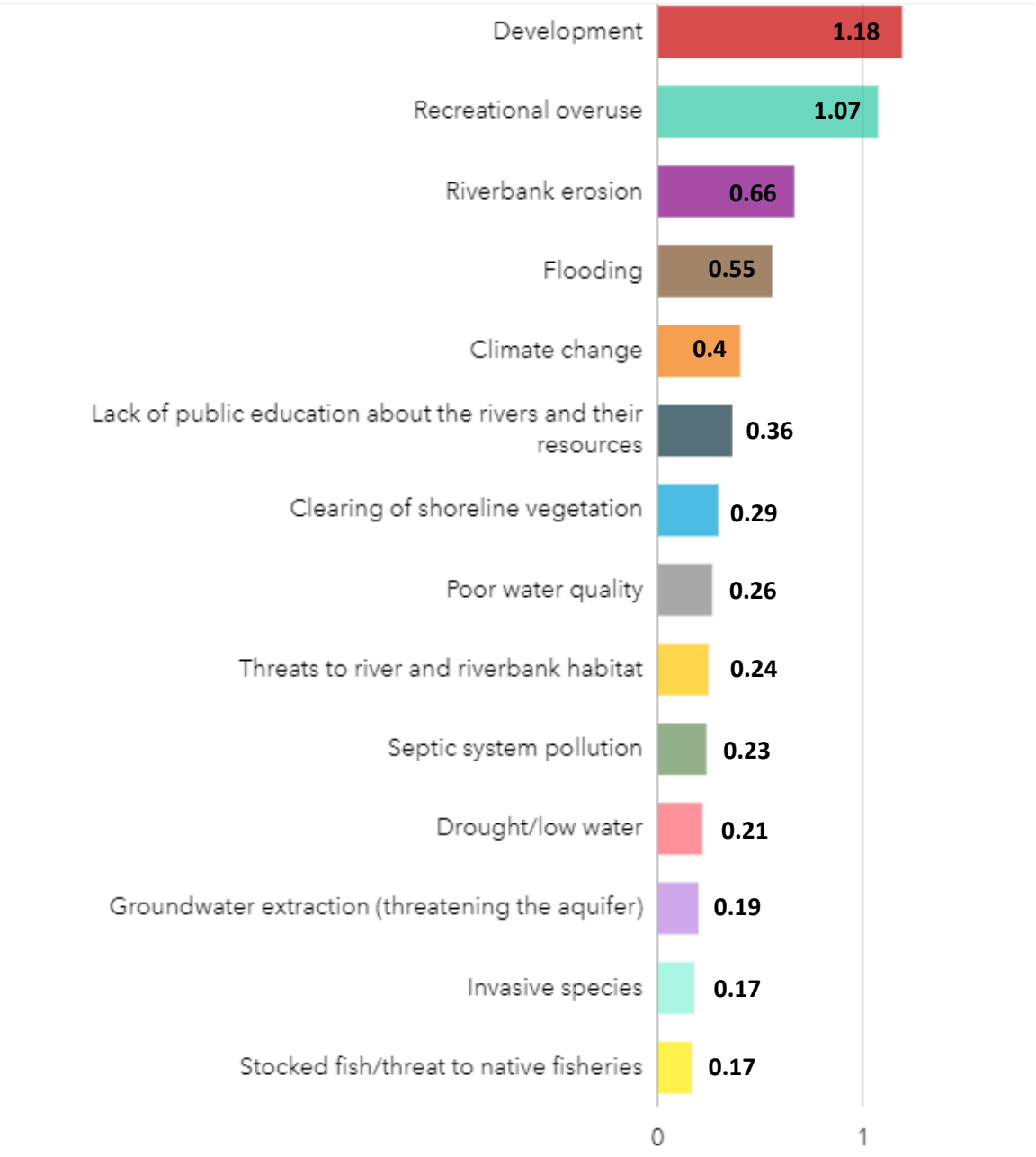
"Other" Responses

- Paddleboarding. (2)
- Snowshoeing and cross-country skiing. (1)
- Relax. (1)
- Hike. (1)
- Bike. (1)
- Teaching swiftwater rescue courses, teaching whitewater kayaking and whitewater canoeing. Recreational whitewater rafting (floating mostly). (1)
- Canoeing with family. (1)

Question 7: In your opinion, what are the greatest threats in the Saco-Swift River corridor?

Skipped: 6

Only the top 3 rankings were used in these results. Items ranked #1 were given 3 points; items ranked #2 were given 2 points; and items ranked #3 were given 1 point. The results reflect the average of the total scores for each item, with higher scores indicating a higher ranked threat.



Question 8: If you have any additional threats to add, please list them here and what rank you give them.

Skipped: 71

- Other than overuse, the biggest threat is not having these discussions. Just to have these discussions happening is a major step in the best direction for everyone. We also have concerns over the dumping/spreading of raw sewage in the fields off of West Side. This is not a natural happening and certainly cannot be good for water quality.
- This was tough because so many are interrelated!
- Litter in the river from overuse; can we somehow encourage/enforce carry in/carry out kind of policies? It seems like so much is left in the river.
- Trash.
- It's most annoying to see all the aluminum cans in the river. Also, refrigerators, punctured tubes, furniture. Top 5 on my list.
- Overdevelopment of natural floodplain.
- Noise pollution is also sometimes an issue on the river. Many come up to the mountains or river to relax and listen to nature. Noise pollution such as large speakers blasting music disturb that peace, and I'd assume disturb local wildlife as well. As mentioned earlier in the survey I live on the river and can attest it can get very loud with either tubers or AirBnB parties.
- High impact on the river with tubers, boaters, etc. is an increasingly obvious problem. Where are all the people going to the bathroom? Swim with a mask and see all the beer cans on the bottom! If the MWV continues to welcome tourists, then we need to pay for services to accommodate the visitors.
- The plan recommendation to address recreational overuse doesn't address the overuse due to volume of users. I don't know how to limit use on a public waterway, but unless there is some creative way to limit the daily volumes of users during peak season, this problem will not be addressed. Maybe the town can charge a user fee for local canoe, kayak, and tube rentals. Also there needs to be some way to address littering - some kind of patrolling during peak season to fine people for littering, disorderly conduct, etc. We have had beavers that are taking down a lot of vegetation along the riverbank. Not sure what if anything can or should be done about that.
- Trash from the tube floats and general overuse and trash in the corridor from first bridge to Davis Park in Conway.
- I've lived in Bartlett next to the river for 16 years. My biggest complaint/threat to the Saco is the continued lack of accountability and cleanup of the old town dump that once existed in the village of Bartlett next to the river. I lived 1/4 mile downstream from the dump. The river bottom to this day is littered with copious pieces of metal, glass, auto parts, rusty metal containers, and who knows what chemical contaminants lurk beneath the soil leaching into the river. Years of worsening flood erosion have eroded the riverbank exposing dump contaminants. This needs to be cleaned up now. It's an outrage that it has lasted this long. If you are going to put out a document like this, at least have an aggressive action plan to clean up known and future pollution sites. If not, this environmental work is in vain. Clean up the Bartlett dump site. [This answer was paraphrased for clarity].
- Jellystone Park, Glen Ellis, Bartlett NH: This park is an absolute NIGHTMARE for the Saco River and all entities nearby. The methods and intensity of development are ridiculous and unsustainable. Inevitable (eventual) flooding will result in extremely angry downriver landowners' reactions. It is a very frightening scenario.
- Posting of land along the corridor, which therefore reduces any access points in order to use. Acquiring some of the parcels of land adjoining the corridor for future access to ease overuse.
- Recreational overuse, specifically the ease of access and overuse by commercial recreation and rental companies that flood the river with people who do not know or understand how to treat the rivers properly and with respect. There are specific companies along the river corridor which have illegally developed the riverfront without proper State and Town approvals and have gone so far as to alter the riverbank. The Municipal governments have been notified and done nothing.

- The tubers. The volume of them brings noise pollution, repelling the animals. They leave garbage, bodily waste, and erosion on the shoreline. They damage plants in trudging to find a place to use the bathroom. How many pee in the river and dump out beverages?
- Liveries have flooded the river with too many visitors to a degree that being on the river is less enjoyable for me and my family.
- Littering, which is separable from, but I'm sure related to, overuse.
- Invasive species should be a major sub section of the climate change and riverbank erosion threats from page 78.
- Tubing should be banned on the river.
- Pollution- we clean so many cans bottles and trash by our home. A lot of people don't respect the river.
- Yogi Bear's Jellystone campground is an abomination on the Saco River in Bartlett with no regulation.
- Flooding causes a public safety concern as emergency vehicles and personnel cannot gain access to residents and residents cannot get in or out of areas. Flooding also causes property damage.
- Environmental activism should never restrict current uses.
- I grew up in the White Mountains and the excessive increase in trash and pollutants, human waste, plant/brush/tree clearing, general overuse of tourism hot spots, overfishing by those who do not obey fish and game laws and regulations, etc. continues to be incredibly concerning. The town has been pushing to increase tourism out of greed while destroying the land and pushing out the long-time residents (high-housing costs, no long-term rental options, an excessive number of hotels and Airbnb's, big chain fast food businesses moving in, etc.). The small town we once knew is slipping away. And while progress can be positive in many ways, it can also be incredibly damaging. I worry about the land, the White Mountain National Forest, the most.
- Businesses providing tube/kayak/canoe rentals need to be held accountable for the negative impact they have on the Saco. There do not appear to be any limitations as to how many people they send down the river and/or how frequently. It's just one long traffic jam of floats. The noise pollution from people moving down the river is awful, especially as the day goes on and people drink more. There is broken glass and trash in the river. People relieve themselves in the river and along its banks. Some leave toilet paper behind. These are hazards to all life. The last time I ever tubed the Saco (and ever will), the campground areas reeked of urine. Businesses selling river float trips need to be held accountable and regulated for the impact they have on this valuable resource. The beauty and health of the river have been damaged by overuse that ultimately lines their pockets.
- Clearing of river debris. The excess of many downed trees is prohibiting the river from flowing and therefore creating a blockage. The blockage causes further dangerous floods due to water levels needing to rise. The river is unable to properly flow in the riverbed, and therefore it overflows the banks. Downed trees and excess river gravel are creating a MAJOR problem. The gravel and stumps need to be addressed. The river is an artery. The artery is blocked by stumps and gravel. We cannot give it a pill to destroy the buildup, we need to pay some attention to it and give it a stent.
- Allowing people to build 75' from the riverbanks.
- The number of people tubing on the river is out of control. It used to be just kayaks and canoes. Now it is huge groups of people drinking alcohol. Many throw their trash in the river. Since there are no bathroom facilities, they use the river or nearby woods as a bathroom. Also concerned about the amount of sewage that is dumped by septic pumping companies in the nearby fields which are in the flood plain! In recent years the banks of the river have changed considerably. Hurricane Irene had a very large impact on many parts of the river. Campgrounds located in the flood plain have been seen bringing in fill, stones, and dirt to build up the roads and campsites.
- Natural debris buildup (fallen trees) blocking natural river flow (no removal plan). Insects killing trees, leading to their falling into the river (squishy moths). Tourism/failure to manage trash, spray painting graffiti on the river rocks.

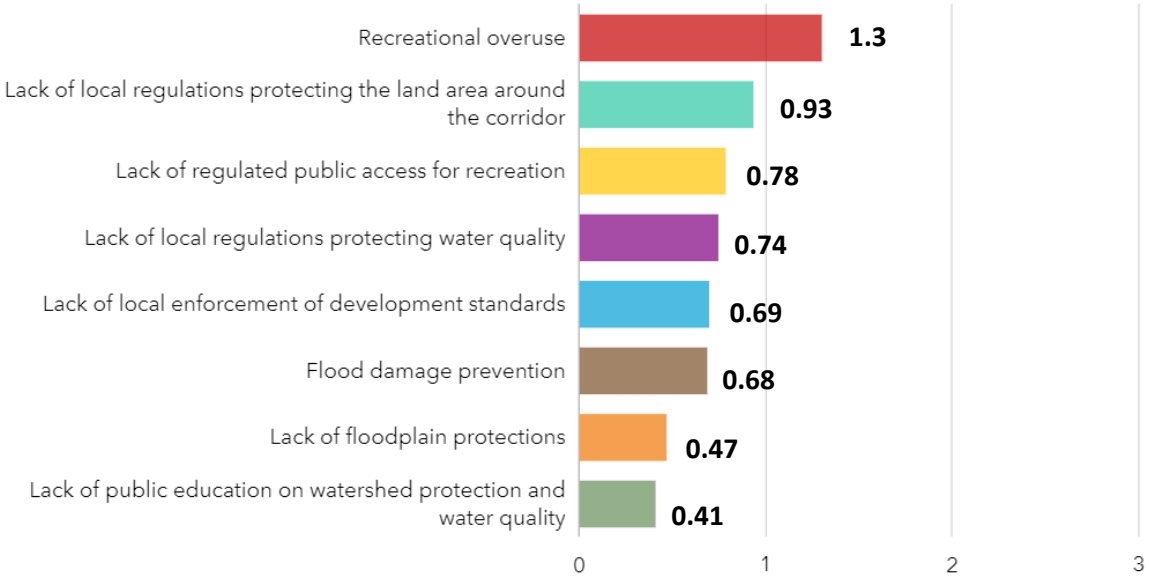
- Flooding and erosion caused by human interventions (some well-meaning) and also caused by human neglect to fix obvious issues like the mass of trees in the river south of Mt. Attitash which is rerouting the river's course. Many of the property owners in Bartlett Place voice concerns about erosion each year at the annual meeting. One of the owners wants to lay some fabric on the riverbank to prevent further erosion, but is that really a good idea? Over the past 30 years, the riverbank has changed quite a bit.
- The Saco River needs to be dredged. Only the rich can rip rap. [Landowner] was brilliant protecting his land. He would have never gotten a permit and it was cheaper to pay the fine. Erosion at Valley View Road. Huge sand cliff behind ski House. Humphrey's ledge. A campground with 100 cabins along the riverbank. [Local landowner names removed for privacy in public document].
- Poorly designed stream bank stabilization projects.
- Loss of topsoil from water born erosion. Crop loss.
- Paddling creeks and tributaries to the Swift and Saco - I see trash, camps, debris, junk, etc. "thrown over the back" that migrates into the river during high water events. An Ellis River homeowner draped metal fencing down their back bank to fight erosion, it's migrating into the river to create a large and lethal hazard to recreational paddling. Homeowners overlooking the Swift and the Kancamagus have been discreetly felling a few trees at time into the river to improve the view. This parcel is between the river and the road, to the river's edge. Canoe/tube liveries - who fund cleanups and make an effort to be stewards of the river, are facing a challenge of guests who are leaving human waste and trash along the river. Human waste is a real issue on banks and water quality as the unburied piles often make it into the river when it rains. Development along shoreline resulting in debris like pipes, cables, and infrastructure that ends up in the river after flooding.
- There is an enormous amount of trash left behind by tourists in and along the rivers.

Question 9: Photo submission (results not included here).

Question 10: In your opinion, what are the most pressing management issues in the corridor?

Skipped: 8

Only the top 3 rankings were used in these results. Items ranked #1 were given 3 points; items ranked #2 were given 2 points; and items ranked #3 were given 1 point. The results reflect the average of the total scores for each item, with higher scores indicated a higher ranked management issue.



Question 11: If you have any additional management issues to add, please list them here and what rank you give them.

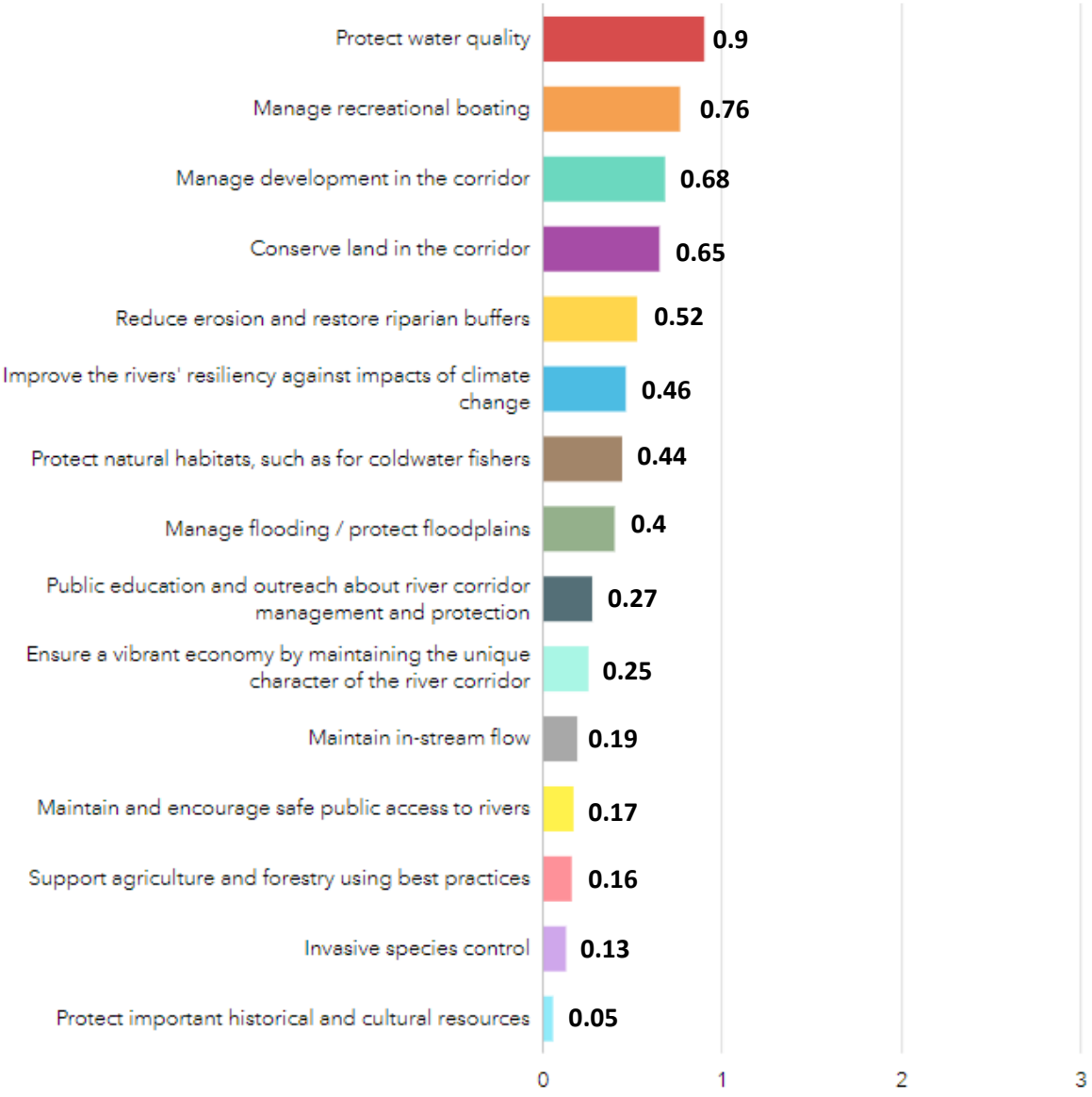
Skipped: 91

- More an example than an additional item - the town of Bartlett has done a terrible job of protecting the river corridor. The Yogi Bear campground development (the cabins, the riverbank work, the water park) are an absolute atrocity. They are about to repeat this again by allowing a driving range and bowling alley in wetland adjacent to the river.
- I've seen many stairs/docks entering the river and I doubt many have gotten permits. My main concern is just protecting erosion as I am unsure how many trees/vegetation are removed for this. My assumption is if someone from the city went down the river and took note of new stairs into the river, they'd find a lot of development that was never approved.
- Liveries running tubes along the Saco could do a better job instructing responsible recreational behavior. They are profiting from these customers who have no idea of proper legal and ethical behavior on the river. For example, these customers are dropped off at access points without ANY understanding of private land boundaries, lack of water, bathrooms or emergency exiting.
- There are myriad protections in place for the floodplain and shore lands. Local government is the first line. The Conway government allowed the filling of the floodplain last year at Conway Elementary. Neither of the Town employees in charge of permitting and overseeing the project did anything when informed that this was illegal. There is a campground in Bartlett that continues to build within the floodplain and alter the riverbank. There are specific commercial landowners that do not receive any repercussions for development in the flood plain/shore lands in Bartlett & Conway. Additionally, there is a need for funding and education to be provided to the agricultural operations along the river corridor to assist with fertilizer, pesticide and erosion issues.
- “Grandfathered” housing along the Swift and the Saco Rivers. And, of course, the canoeists, tubers, etc. recreation along the Saco all summer.
- Need more, better access points for people who recreate – parking, launching, access points, and beaches. As more people recreate the pressure will be too much for the current tourist infrastructure (Diana’s Baths as an extreme example).
- Invasive Species, especially knotweed. Please see https://www.ecologicallandmanagement.com/s/Colleran-Lacy-Retamal-2020.pdf for why this species should be of special note along the river.
- The town of Bartlett selectmen and woman have taken very little or no action in controlling the rampant expansion of the Jellystone campground in Glen.
- I'm not sure how it would be possible to solve the "recreational overuse" issue. Many locals that I personally know love to use the river for many different summertime activities, but are VERY respectful––cleaning up their trash (and other's trash), not destroying riverside vegetation/brush, and having lots of experience in those recreational activities (experienced kayakers, hikers, swimmers, etc.). I've watched tourists leave trash, break down brush and trees, crowd riverbanks, flip boats, pop river tubes, fish where they shouldn't be fishing, etc.
- Lack of regulations managing tube/kayak/canoe rental companies as to the number of people/floats they can send down the river at a time. This I consider a subsection of recreational overuse.
- Lack of planning and support for riverbank erosion mitigation.
- No, I read the latest draft of the corridor management plan, and it's quite comprehensive and lists the management issues already. Thank you!
- Flood management. The Swift River needs to activate river gauge to help communities prepare for flooding.
- Road Salt use and subsequent increased salination of bodies of water.
- Litter!

Question 12: After identifying the values, threats, and highest priority management issues in the Saco-Swift River corridor, what do you think should be the main goals of the corridor management plan?

Skipped: 13

Only the top 3 rankings were used in these results. Items ranked #1 were given 3 points; items ranked #2 were given 2 points; and items ranked #3 were given 1 point. The results reflect the average of the total scores for each item, with higher scores indicating a higher ranked goal.



Question 13: Please list and rank any additional goals you want to add.

Skipped: 98

- I strongly support protecting floodplains from all sources of harm, but you cannot meaningfully protect a river corridor from big floods. If you riprap one corner to protect it, it just moves that water downstream with the same force, and it will adversely impact the next one. That goes on and on. This has been going on as long as the river has been here, and we're not going to change that. It is a dynamic water course, and its many meanders and old water courses demonstrate that. [Re: Reduce erosion and restore riparian buffers]: When I say try to reduce erosion, I am thinking primarily of restoring the riparian buffers with natural appropriate vegetation where possible. Not using riprap unless at that particular point, something of major value will be impacted (as above).
- Stop floodplain development.
- Noise pollution is the only additional item I can think of. Along the lines of educating people on the river perhaps even signs or notices stating the area is delicate and to keep trash and contaminates that enter the river to a minimum.
- These are all #1's and all deserve prompt attention as it would seem that not acting on even one of the points compromises the overall objective.
- I am unable to rank these goals as they are all extremely important and interconnected!
- We like putting band aids on flooding problems (rip rap). We need long term management solutions.

Question 14: Are there any specific action items you think are important to include in the plan?

Skipped: 83

- Get rid of the granite rip rap that continues to destroy the river.
- Outreach to all landowners in the corridor about conservation easements. Review of zoning and master plans for each town to identify opportunities to protect the river.
- Enforce development setbacks.
- If there was an opt in tax or even donation funded projects to manage and protect the river, please advertise that as I would be more than willing to do my part.
- Public access to the river and access enabled by local outfitters are not the same thing (in my mind). I'd prefer to see them identified as two separate entities and action plans developed accordingly. Given the importance of these two rivers, permitting outfitters to continue to jam the river and riparian areas with an endless stream of tourists seems hypocritical at a minimum. Profiting from overuse of a public waterway seems fundamentally wrong.
- Stabilizing erosion, water quality.
- Again, to control volume of users to address overuse of rivers, we need more solutions. User fees, licensing fees to commercial entities that provide canoes, kayaks, tubes, etc. There also needs to be some sort of enforcement presence patrolling during high peak usage times (Memorial Day through Labor Day) for public intoxication, littering, disorderly conduct, trespassing, etc.
- Improve prevention for residential sewage flows due to flooding by passing stricter local control regulations if you live in or near the flood plain or a tributary. Improve pollution/contamination control from road salt use during winter. Improve pollution/contamination controls from ski area runoff during spring melt off from fuel spillage etc. Improve cleanup from past and future pollution sites including old dump sites and industrial sites like the old superfund site off Hobbs Street in Conway. Apply stricter regulations and management from overuse activities during summer months such as tubing as a function of increased *E.coli* levels. Improve water quality monitoring stations along each river.
- Streamside canopy (trees and greenery) need to be preserved.
- Please work to regulate the number of people who use the rivers, particularly for tubing, swimming, and even fishing.

- Knotweed control would move forward nearly every goal. It is low hanging fruit that is difficult by invasive control standards, and very cheap and easy compared to many of these larger topics.
- Keep river within its banks.
- Strict regulation of commercial development in the corridor.
- The river has too many boaters and floaters during the busy season. They dump trash and pee/poop near and in the river. There is a ton of alcohol consumption and noise on the river.
- More signage about NO LITTERING and respecting recreational space along the river could be helpful. Working with kayak and tube rental businesses to educate tourists on how to maneuver their boats and floats properly, and explain what they should NOT bring on the river (i.e. anything glass, excess clothing, loose shoes such as flip flops, high-value items such as wedding rings, oversized coolers and too much weight in boats, etc.).
- Impact study on the quantity of tubes/kayaks/canoes rented on the Saco.
- Stabilizing shorelines and cleaning debris would make a major impact.
- Planning ahead for climate change-induced storms such as Hurricane Irene.
- Stabilize eroding shorelines. Institute a parking permit program, expand parking violation fines, use funds to staff compliance control officers.
- Stabilize eroding shorelines. Clear out blockages (e.g., tree dams) along the corridors. A "measurement plan" to measure the impact of any specific actions in the plan, so we know what is working and what is not working. Create boards or committees in corridor towns that focus on governing and protecting the corridor and implementing the actions in the plan.
- Partner with USVLT.
- Dredging. The river continues to silt in and push water out of the river and into the surrounding areas.
- Remove knotweed and buckthorn. Plant scrub willow where it may survive. Baby steps.
  spatial analysis of impermeable surfaces. How well are retention ponds working for initial storm flow?
- I would love to see easements that provide a natural buffer between the river and development. Preservation of robust riparian areas will control erosion, help with runoff, protect visual landscapes and soundscapes for river users.

Question 15: How likely are you to support the following efforts by your town and the LAC to protect and manage the Saco and Swift River Corridor?

Green infrastructure and low impact development building requirements

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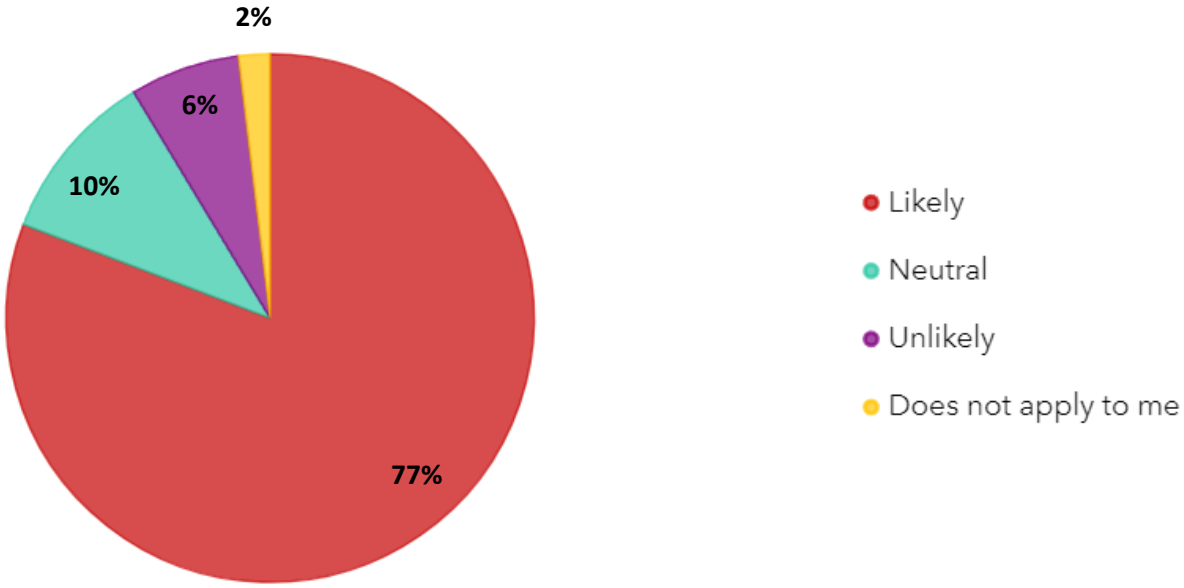

Use town resources to improve river access, such as trash cans, bathrooms, improve safety, etc.

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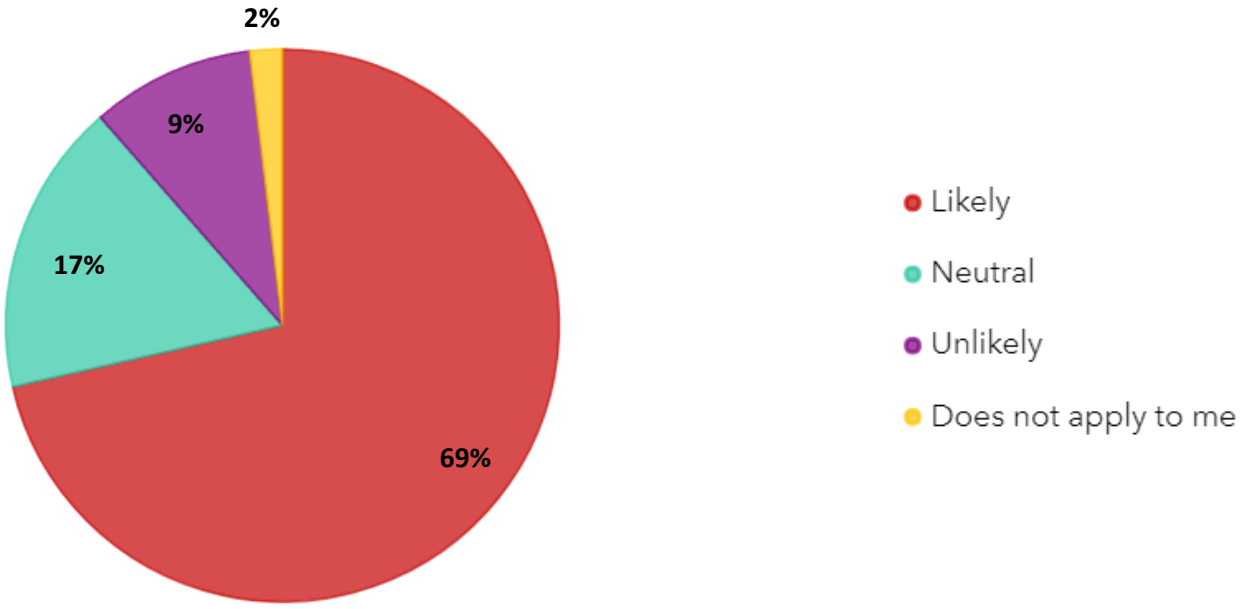

Launch long-term water quality monitoring program using mainly volunteers
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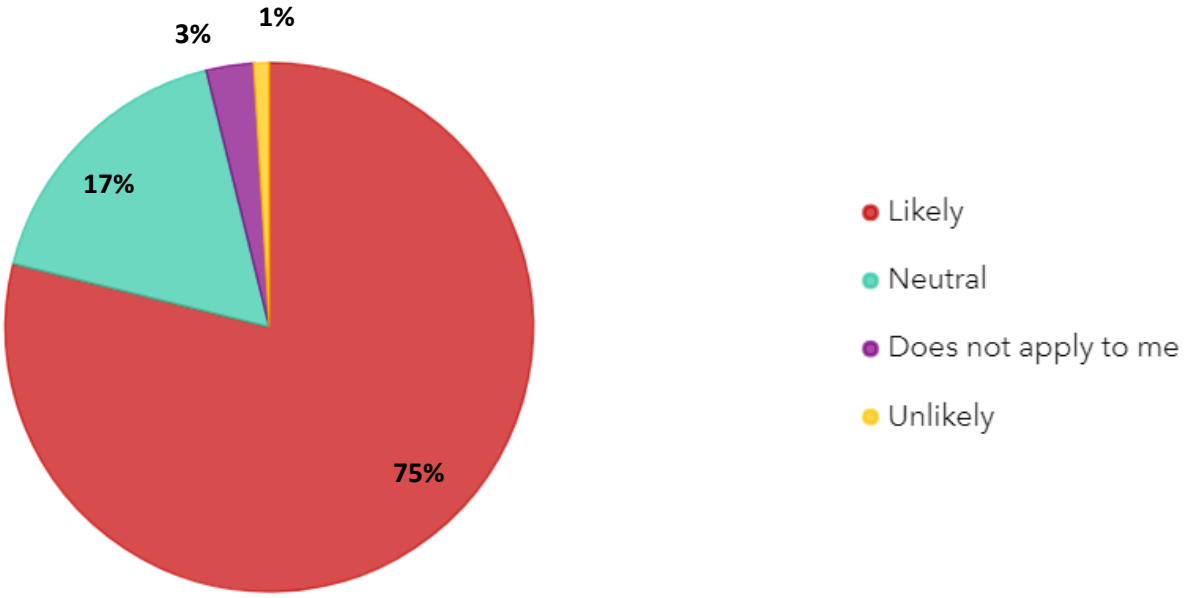

Develop stricter shoreland zoning requirements
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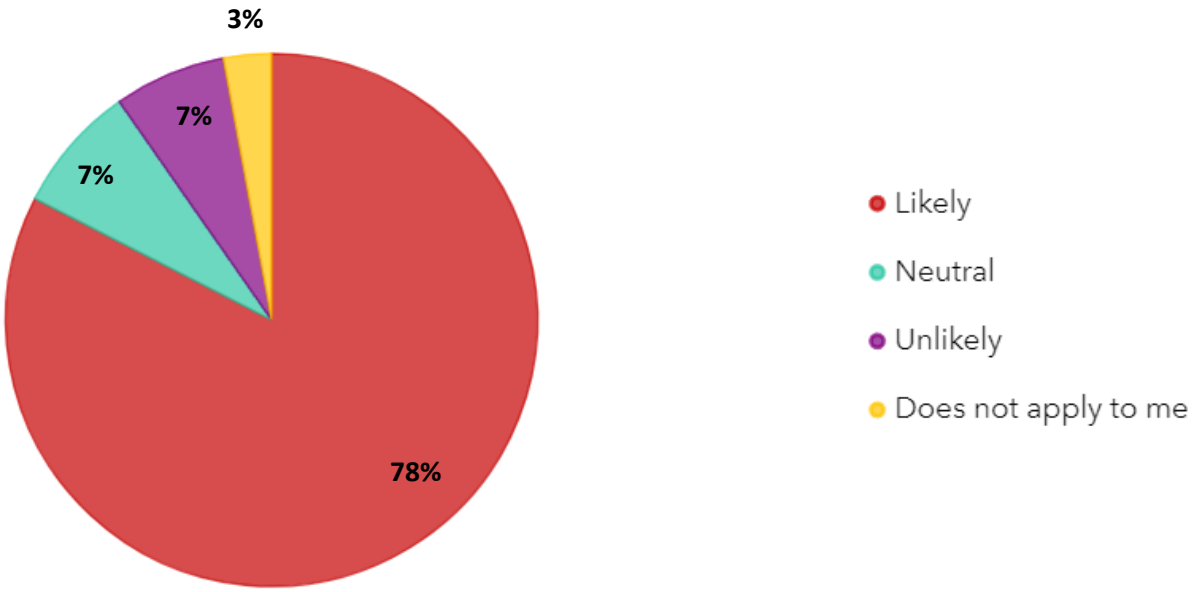

Include climate change impacts in all assessment work/municipal work, such as for stormwater management
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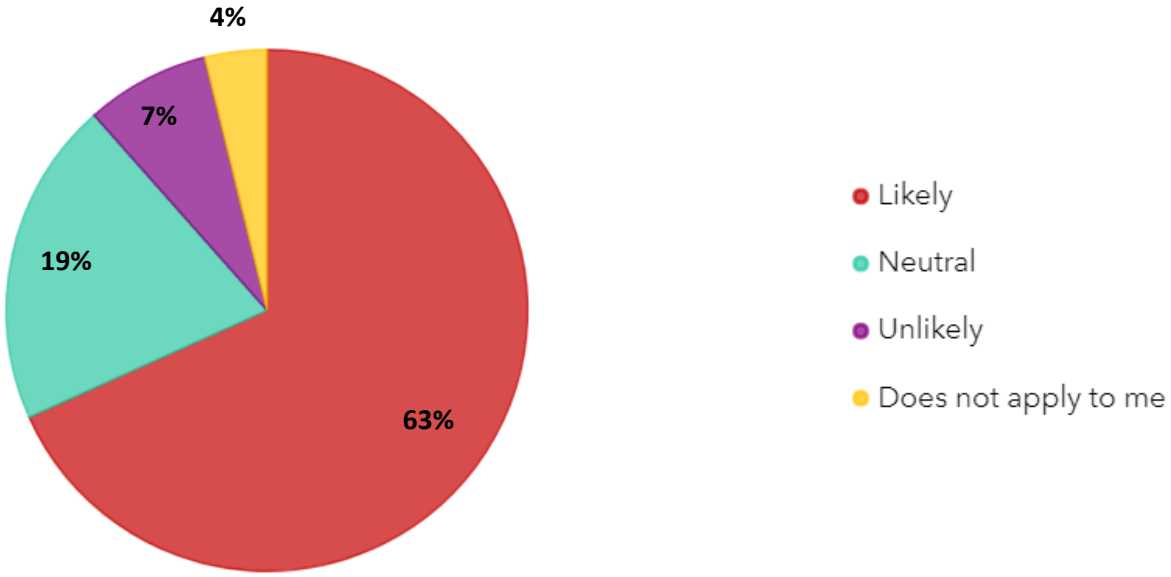

Implement a septic system ordinance that requires pump-outs/inspections
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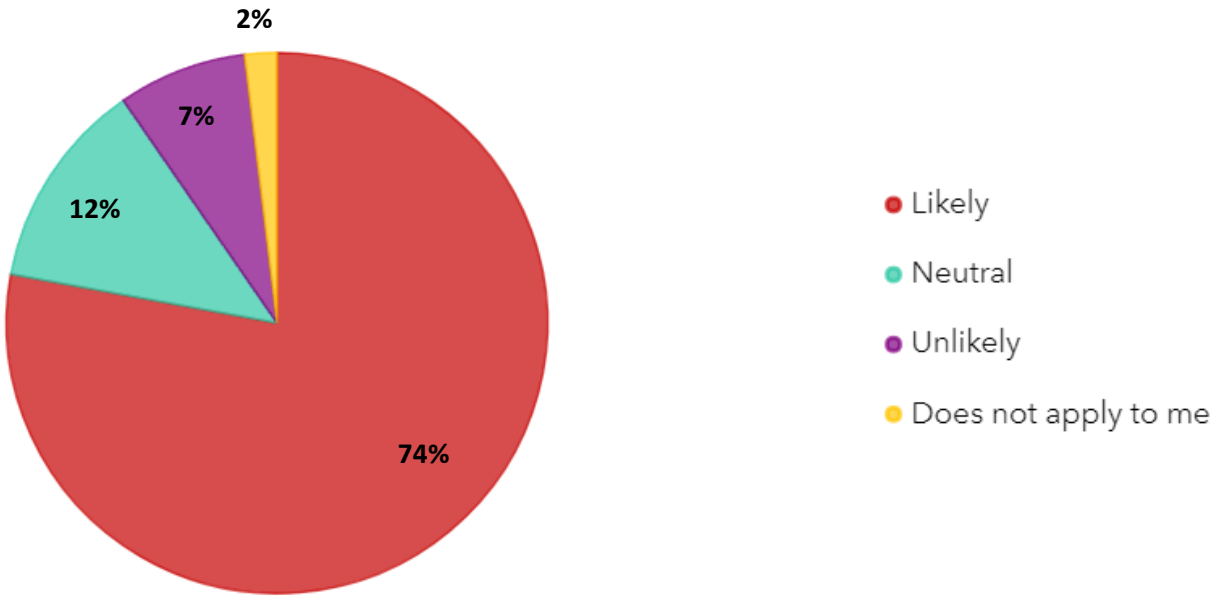

Permanent protection of floodplains
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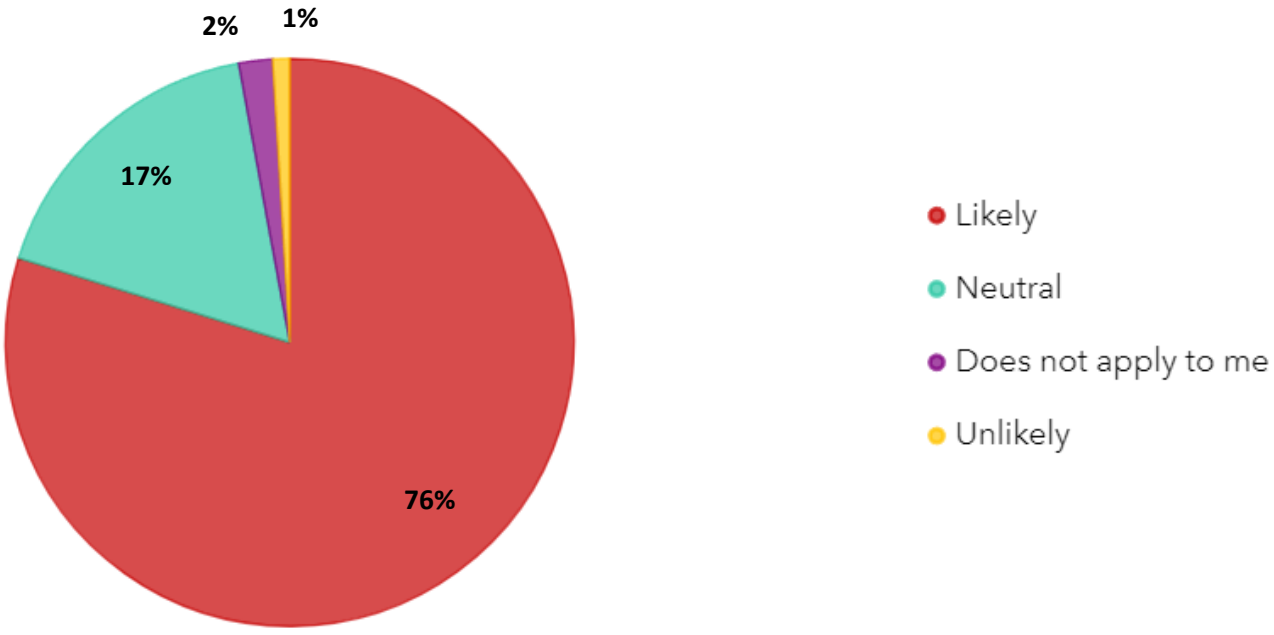

Question 16: Please use this space to provide any additional comments or information related to the threats, management issues, or goals relating to the Saco and Swift Rivers Corridor Management Plan.
Skipped: 88

- Thank you for this important work; keep the community education coming! We need to protect these precious resources. It's very disheartening to see the number of people on the river increasing each year with seemingly little regard for its beauty and delicate nature.
- Too many drunken tubers in the river are ruining the experience for the rest of us. It's no longer fun for those of us who respect the environment and wildlife.
- A clean, free flowing Saco, with an adjacent agriculture or wooded terrain, relatively undisturbed riparian area, (building setbacks of about 250' or more) should be the goal. A very attractive amenity for visitors and residents alike.
- The number of homes and campground structures being built along the Saco River in Bartlett and Conway is unacceptable.
- How does this plan integrate with the new Town of Conway Master Plan?
- I hate to see this natural resource and others in the area being lost/changed so quickly. While not a big fan of regulations and restrictions (The live free NH way), pressure from overuse and development seems to require large changes to preserve.
- I would be happy to support any of the above topics listed. However, my town of Albany is very difficult to change.
- As a child we took annual canoe/kayak trips down the Saco, in my teens and early twenties there were several great spots for swimming and hanging out. In the last fifteen years or so, the usage has gotten completely out of control to the point that trying to visit in the summer never crosses my mind. Some tourism is good, but it has reached the point where this resource can no longer be enjoyed by local and semi-local residents. Many of the users show no regard for this as an important natural resource or appear to care about protecting it.

- I recognize the value of the rivers to tourism in the area, and the economic value of that tourism; however, it seems that the rivers are owned by tourists during the summer months, particularly in those areas where tubing and kayaking are popular, and as a local I never have any desire to go near it as a result. Many of those tourists are loud, drunk, littering, and generally not respecting the river and land around it. This is sad because the natural environment is the reason I live here. It ends up that I just admire it from a distance because I don't want to get too close to the ugliness that takes over during the warm months. The other issues mentioned in the survey are all very important as well; generally, we need a comprehensive approach to protecting the river from all threats.
- When flood controls were in place, allow those structures (berms, levees) to be repaired and restored when damaged. When serious bank erosion happens, allow corrective measures.
- Follow the money!
- I would be willing to volunteer in any or all areas.
- I grew up on the Saco. It was once a great place to tube and swim. It is now overcrowded and polluted. I am hopeful for its future with the work being done to improve the health of and preserve the corridor.
- During hurricane Irene, many levees/berms were destroyed. They need to be repaired and replaced. We need to have the ability to protect our homes and our towns. If everyone who had damage were to take a FEMA buy out, the towns would be losing too much money in property taxes and would lose townspeople. We need to protect our people and towns. This work should be done when the river is lowest, and equipment would not have to be placed in the river. Vermont had a lot of damage, and they fixed a lot of riverbed area, why can't we? It needs to be addressed.
- The only additional thought I have is: How do we make sure this plan is acted upon by the towns and other governing bodies that hopefully adopt this management plan into their master plans? Thank you for leading this effort! This evening I read the draft plan and greatly appreciate the time, effort, and research required to create such a comprehensive and thoughtful plan.
- The towns already have pretty strict rules and regulations building in the flood plain. However, towns like Bartlett do not have inspections or much enforcement.
- The Saco River from Bartlett Village down to Conway has essentially become a grand natural water park. Much safer, four times wider (no more strainers), plenty of sandy beaches, and much tidier in terms of litter. A wonderful, wholesome, and safe tourist attraction!
- Thank you. This is important work for the community today, and the community in the future.
- I hope the municipalities along the river corridors will adopt the recommendations laid out in this plan