

Water Resources: Strategy

Human activity, both on the land and the water, must consider its impact on the delicate and intricate balance and relationships between land and water resources. Increasingly, Vermonters are placing more and more consumptive demands upon the state's water resources for development and recreation. Demands for commercial and residential developments, transportation and utility corridors, and water withdrawals have the potential to impact both the quantity and quality of these valuable resources. At the same time, we are becoming more appreciative of these resources for their beauty and quality. The competing values and demands placed on the County's water resources must be balanced through the planning process. Planning at the local level has both the responsibility and power to ensure water resource's long-term protection. Planning at the regional level should ensure water resource protection efforts are coordinated, comprehensive, and completed in a way that ensures limited resources are distributed evenly.

The following strategies are proposed for the continued enjoyment and protection of our water resources.

Lamoille County has abundant high quality water resources that support a variety of recreational, ecological, and economic uses. At the heart of recreational Vermont are Lamoille County's water resources. Water resources take on a variety of forms and functions. They include rivers and lakes that support many important recreational uses including boating, fishing, swimming, wildlife observation, hunting, and the enjoyment of aesthetic values; water for snow-making; groundwater for private and public water supply; and wetlands to store flood waters and filter natural and man-made contaminants. Surface waters and wetlands provide numerous habitats for a variety of aquatic and riparian plant and animal communities, and support numerous economic and recreational activities.

Healthy riparian areas are restored and maintained. Maintaining vegetated buffers along our rivers and streams will help to stabilize the stream banks and thereby improve flood resilience, will benefit fisheries and wildlife by providing natural shade and cover, and will enhance scenic and recreational uses.

Water resources that provide public recreational opportunities or are areas of significant historical, scenic, and recreational value are protected. A coordinated planning effort at the local and regional level ensures that current and future development retains rather than impairs the value of our water resources.

Wetlands and floodplains are restored and protected. Rivers should have access

to floodplains wherever possible to establish and maintain stability. Wetlands and floodplains serve valuable functions including flood water storage, sediment trapping, nutrient filtering, and aquifer recharge. These functions benefit flood resilience as well as fish and wildlife.

Lamoille County's groundwater and surface waters are uniformly of high-quality. A coordinated regional and local effort to monitor water quality and address impairments, to develop and implement appropriate wastewater treatment systems, and to implement green stormwater infrastructure wherever possible, will improve and protect the water quality in Lamoille County watersheds as well as in the Lake Champlain Basin.

POLICIES & ACTION ITEMS

Policy: *Preserve the quality of the region's lakes and rivers as a resource for human recreation and wildlife.*

Action Items:

- Support efforts by lake associations, watershed associations, and other water-related groups to protect water resources and recreational experiences.
- Support adopt-a-river campaigns and annual river clean ups.
- Support sustainable fisheries management.
- Support state water quality regulations

Policy: *Healthy riparian areas are critical to stream bank stabilization and fisheries and wildlife habitats; therefore, riparian areas should be restored and protected.*

Action Items:

- Strongly encourage restoration of riparian buffers of at least 50 feet along all surface waters.
- Existing riparian and shoreland vegetation should be protected through such tools as management zones, river corridor, riparian buffer, and shoreline zoning.
- Support riparian corridor education efforts.
- Winter snow piles should be located an adequate distance from any riparian buffers according to current State standards.
- Assist lake associations and watershed groups in obtaining grant funding to support their efforts.
- Support the intent of State water quality rules.

- Support educational trainings on knotweed and other invasive species

Policy: *Future growth should not significantly impair the public recreational opportunities of waters or destroy or threaten areas of significant historical, scenic, or recreational value.*

Action Items:

- If a development impacts an important water resource identified in a municipal plan, the developer is encouraged to coordinate layout of the development to retain locally defined values.
- Work with developers and municipalities to protect regionally significant waters and water resources of historical, scenic, or recreational value.
- Encourage communities to protect significant water resources that provide public recreational opportunities or are areas of significant historical, scenic, or recreational value as determined by this regional plan and applicable municipal plans.
- Work with developers and municipalities to protect very high quality rivers, lakes, ponds, and wetlands identified as high-priority in the DEC Tactical Basin Plan.
- Encourage the use of ANR's online mapping tools such as Biofinder and the Natural Resource Atlas to identify significant water resources.
- Support State land-use regulation to further the protection of important scenic and recreational water resources as determined by this regional plan and applicable municipal plans.

Policy: *Public access to the region's rivers should be improved and made safe.*

Action Items:

- Support local efforts to acquire and/or improve river access points.
- Safe and accessible river access points should be made available at strategic locations in order to give the general public access to the region's rivers.
- Educational signage should be provided for recreationists about water and other hazards.

Policy: *Wetlands play an invaluable role in storing large volumes of water during flood events and by filtering and purifying surface waters as they make their way to other water bodies and therefore need to be protected.*

Action Items:

- Support federal and state wetland protection rules.
- Encourage municipalities to protect wetlands through zoning and subdivision regulations, shoreland protection bylaws, health ordinances, and flood hazard regulations.
- Support efforts to map and verify vernal pools.

Policy: *Rivers should have access to floodplains wherever possible to establish and maintain stability in order to minimize stream bank erosion and avoid conflicts with human infrastructure.*

Action Items:

- Identify flood hazard areas and river corridors, based on maps provided by the Secretary of Natural Resources pursuant to 10 V.S.A. § 1428(a) or maps recommended by the Secretary.
- Mitigate floodplain encroachments wherever and whenever possible. Mitigation may include “compensatory storage,” removal of infrastructure, floodplain reconnection/re-vegetation, and/or implementation of projects identified in a river corridor plan or local hazard mitigation plan.
- Complete the remaining geomorphic assessments as identified by LCPC and the Vermont Department of Environmental Conservation.
- Work with State partners, communities, and community partners to further refine and revise the statewide river corridors map to better reflect actual on-the-ground conditions.
- Assist municipalities in implementing wetland, river corridor, and riparian buffer protections to preserve these resources.
- Work with municipalities, developers, and regional partners to encourage land use practices that use appropriate erosion control techniques.
- Stabilization of eroded stream banks is encouraged in accordance with appropriate professionally accepted standards.
- Support State stream alteration regulations.

Policy: *For the safety and protection of human resources and infrastructure, new construction within floodplains should be avoided or mitigated and measures should be taken to protect existing structures within the floodplain.*

Action Items:

- Flood hazard mapping (Flood Insurance Rate Maps) should be updated.

- Provide technical assistance to communities wishing to explore or enroll in the National Flood Insurance Program (NFIP).
- Support flood mitigation projects such as flood proofing, property acquisitions, removal of floodplain encroachments, and the development of flood storage space to reduce damage to property in flood hazard areas.
- Compatible land use activities within floodplains, such as agriculture and recreation, are encouraged.
- Encourage communities to adopt bylaw standards above and beyond the minimum National Flood Insurance Program (NFIP) and river corridor standards, to encourage existing buildings in hazardous locations be made safer from flood damage and less costly to insure.

Policy: *All potable water sources should be protected in accordance with State and municipal regulations.*

Action Items:

- Support regional and local coordination to identify potential sources of groundwater contamination.
- Work with municipalities to develop and implement long-term groundwater protection measures.
- Support municipalities acquiring title or easements to the wellhead protection areas and recharge areas serving municipal and community water supplies.
- Support State drinking water regulations.
- Wastewater systems and stormwater discharge should be directed away from Source Protection Areas and installed according to appropriate State standards.

Policy: *Water quality in Lamoille County should meet Vermont Water Quality Standards. Efforts should be made to reduce point and non-point sources of water pollution.*

Action Items:

- Work with regional and state partners to monitor water quality, particularly in an effort to determine impaired waters and remediate impaired waters.
- Work with ANR and municipalities to implement actions required under the new Water Quality rules.

- Municipalities are encouraged to have and maintain back-up plans and treatment systems for protecting the water resources.
- Work with municipalities to conduct periodic wastewater facilities analysis to determine the remaining capacity of systems based on projected growth and to determine if any system weaknesses exist.
- Municipalities are encouraged to provide tertiary treatment of wastewater.
- Work with municipalities to develop and maintain a capital facilities plan for wastewater facilities.
- The use of tested and approved alternative septic systems in place of traditional systems is encouraged; especially in areas of marginal land/soil.
- Land uses that contribute to non-point sources of pollution should be adequately buffered from surface waters.
- Required Agricultural Practices (RAPs), Acceptable Management Practices (AMPs) and Best Management Practices (BMPs) should be used.
- Encourage landowners to participate in State and Federal cost share programs that reduce non-point source pollutants.
- Planning and implementation of water quality remediation projects should engage the local community where the problems are occurring.

Water Resources: Background and Inventory

Watersheds, Rivers, and Water Bodies

A watershed, or basin, is a distinct land area that drains into a particular waterbody either through channelized flow or surface runoff. A watershed is defined by topography instead of traditional political boundaries. Lamoille County primarily overlaps the Lamoille watershed, but also contains portions of the Winooski and Mississquoi watersheds (Figure 4-9). All three watersheds flow into Lake Champlain, making them part of the larger Lake Champlain Basin. While the Regional Plan focuses on Lamoille County, water resource planning ideally should be at the watershed level. The Agency of Natural Resource's planning efforts to improve or maintain water quality at a watershed level has been conducted since the 1970s. The state is divided into seventeen planning basins for this purpose. The Agency is responsible for preparing basin plans for each of the 17 major basins and updating them every five years after the plan is originally approved. Much of the information presented in this chapter was derived from the assessment reports and basin planning documents available on the Agency's website (<http://www.vtwaterquality.org>).



Rivers

The Lamoille River, the state's third longest, bisects the county from east to west on its way to Lake Champlain. Within the region, major tributaries to the Lamoille River include the Wild Branch (39 square miles), Green River (22 square miles), Gihon River (66 square miles), North Branch (37 square miles), Brewster River (21 square miles), and Seymour River (21 square miles). The Little River in the town of Stowe is a major tributary in the Winooski River Basin to the

Figure 4-9. Lamoille County Watersheds

south. There is also a small portion of the Missisquoi River Basin in the towns of Belvidere and Eden.

The County's rivers and streams and the lands adjacent to them provide numerous recreational opportunities in addition to important fish and wildlife habitats. The region's rivers and streams also provide several important non-recreational functions including assimilation of properly treated wastewater, drinking water, water for agricultural and industrial uses, aquifer recharge, and hydroelectric use. Water resources including rivers, lakes, floodplains, fluvial erosion areas, ground and surface water source protection areas, wetlands, boating and fishing accesses are shown in ensuing maps.

The rivers and streams of the region also have played an important role in the region's history and settlement patterns. Indigenous cultures depended upon the rivers as an important transportation network as well as for water and fisheries. For over 10,000 years, these river basins defined community and hunting territories, and provided geographic markers and access to the region. There are over 1,300 prehistoric and historic archaeological sites listed on the Vermont Archeological Inventory, and 390 river miles with known archaeological sensitivity in the state. Approximately 45 river miles in Lamoille County, all within the Lamoille River Basin, are of expected moderate to high archaeological sensitivity.

European settlers first used the rivers for access routes into the wilderness and later cleared the riverbanks and flood plains for agriculture during the eighteenth century. The early industrial period of the nineteenth century harnessed the river's power to supply local mills, water systems, tanneries, forges, and furnaces. Statewide, there are over 364 historic sites located within 1/4 mile of a river, including historic districts, mills, and covered bridges. In Lamoille County, 23 historic sites – of which 16 are on the National Historic Register – are located close to a river.

Riparian Areas

A riparian zone or riparian area is the interface between land and a river or stream. Undisturbed, vegetated riparian areas can prevent water pollution and preserve wildlife habitat, as well as provide open space and scenic beauty, minimize erosion, and provide access to public waters. Riparian vegetation is a key biological component in water quality functions of a riparian area.

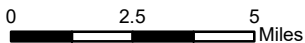
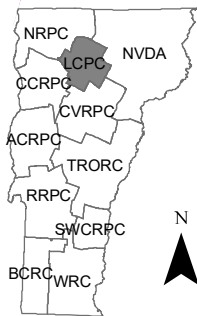
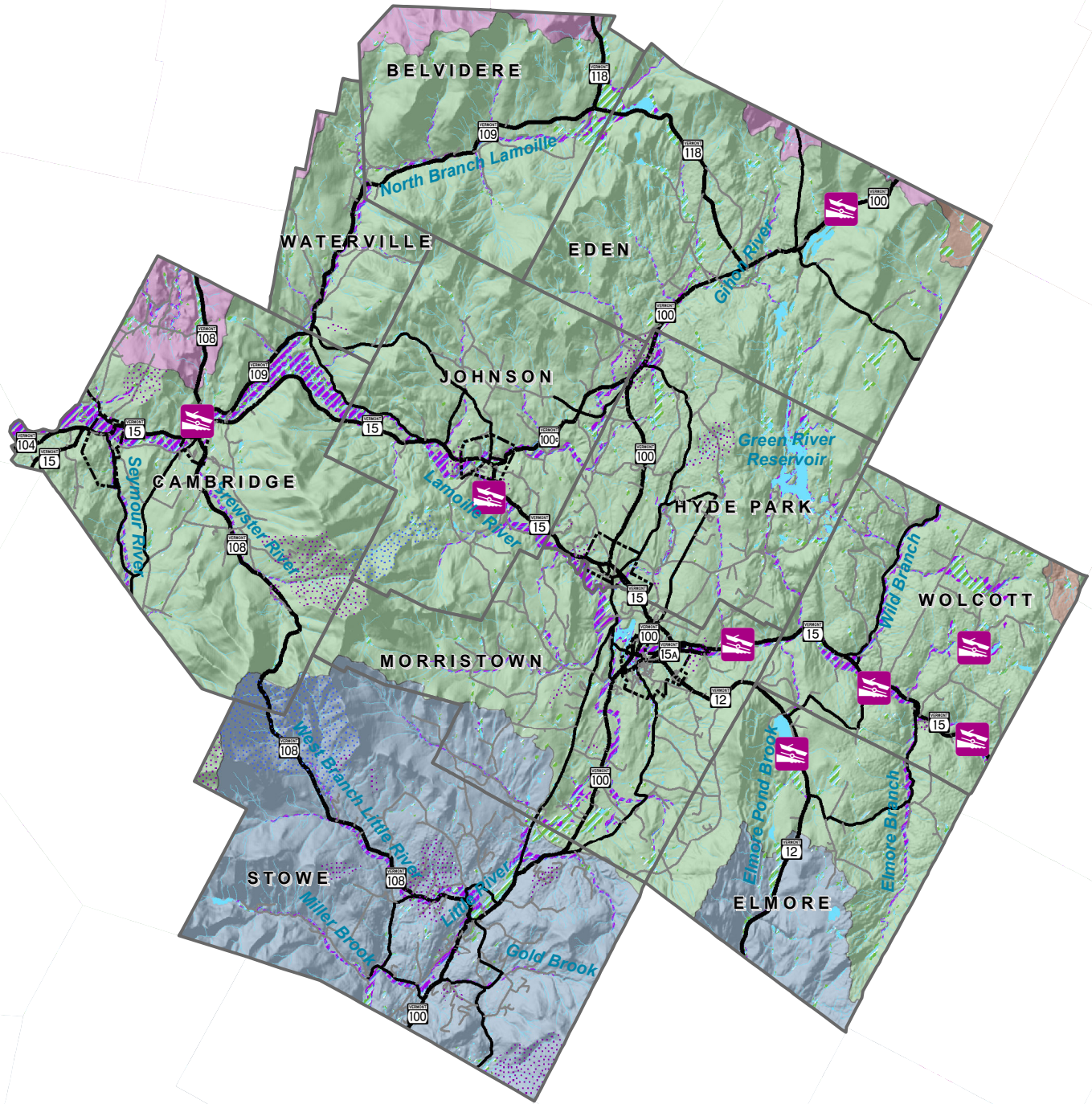
Vegetation reduces the amount of erosion along a riparian buffer, filters runoff before it reaches a stream, provides habitat, and regulates water temperature, which is essential for fish species such as trout. Lamoille County has over 97 miles of game fish habitat in 26 stream segments. These segments provide an important cold-water fish habitat primarily for rainbow, brown, and brook trout. Riparian areas also play an important role in the habitats of deer, moose, beavers, otters, mink as well as smaller mammals, waterfowl, and other birds and amphibians. In order to maximize the effectiveness of riparian areas, a buffer of undisturbed soil and vegetation should be maintained in these areas. LCPC, in partnership with the Lamoille County Conservation District, has engaged in a process to identify stream segments that could benefit from re-vegetation and to implement riparian restoration projects along these segments.








Lakes and Ponds






Lamoille County is within the Lake Champlain Basin, which, in 1990 received national attention through the Lake Champlain Special Designation Act as part of the Great Lakes Critical Programs Act. The Act added Lake Champlain to a list of 10 water bodies eligible for the establishment of a lake water quality demonstration program. The Act also authorized the establishment of the Lake Champlain Management Conference to coordinate activities between federal, state and local governments in Vermont, New York, and Quebec. The Management Conference is charged with developing a comprehensive pollution prevention, control, and restoration plan for the lake. Many of the associated activities directly involve land use and resource management issues throughout the Basin.

Water Resources

Lamoille County



-  Fishing Access Areas
-  Groundwater Source Protection Area
-  Surface Water Source Protection Area
-  Lakes/Ponds
-  Streams
-  Wetlands
-  Floodplains and River Corridors

- ### Major Watersheds
-  Lamoille
 -  Missiquoi
 -  Winooski
 -  St. Francois
 -  Town Boundary

Data Sources:

Political Boundaries: VCGI, 1991.
 Roads: 1:5000 E-911 Road Data, 2021.
 Surface Water: VCGI for VHD-USGS, 2001.
 Source Protection Areas: Vermont Department of Environmental Conservation, Water Quality Division, 2022.
 Floodplains: Digitized from FEMA Flood Insurance Rate Maps. DEC, Water Quality Division, 1983.
 River Corridors: VT ANR, 2018.

Created 1/10/23 by LCPC. Map is for planning purposes only, not for regulatory interpretation.

There are 55 lakes and ponds within Lamoille County. Of these, 13 are lakes or ponds 20 acres or greater in size, and thus considered public waters subject to state protection. These lakes and ponds are listed in the table below. In addition, a small portion of Waterbury Reservoir is located in Lamoille County. While less than 20 acres in size, Sterling Pond is notable due to the fact that it is the highest elevation trout pond in the State of Vermont.

These lakes and ponds provide a variety of benefits to county residents and visitors, including boating, swimming, fishing, hydroelectric power, snow-making, water for fire suppression and wildlife, plant, and fisheries habitat. Several of these ponds, notably the Green River Reservoir, Wolcott Pond, and Zack Woods Pond, also form an important network that provides habitat for migrating waterfowl such as loons. While a great majority of these lakes and ponds are supporting their designated uses (see the section on Water Quality) and have generally good water quality, they are threatened by sources of pollution including erosion and sedimentation, adjacent land use activity, aquatic nuisances such as Eurasian milfoil, and by those who use them for recreational purposes. The removal of vegetative buffers, leaching septic systems, over development of the shoreline, and erosion and sedimentation, all inhibit our ability to use and enjoy these resources.

Table 4-4. Lamoille County Waterbodies 20 Acres or Greater

Lake	Town (Outlet)	Lake Area (Acres)	Watershed Area	Public Land /Access
Lake Eden	Eden	194	2,347	Mun/State
Lake Elmore	Elmore	219	5,574	Mun/State
Green River Reservoir	Hyde Park, Eden	653	9,075	State
Hardwood Pond	Elmore	44	284	None
Lake Lamoille	Morristown	148	142,100	None
Little Elmore Pond	Elmore	24	316	None
Long Pond	Eden	97	723	None
Lake Mansfield	Stowe	35	1,557	None
Schofield Pond	Hyde Park	39	936	None
South Pond	Eden	103	1,382	None
Wapanacki Lake	Wolcott	22	285	None
Wolcott Pond	Wolcott	74	920	State
Zack Woods Pond	Hyde Park	23	36	State

On the local level, there is a need to develop means to protect these resources through local planning. These include information on the resource and the

threats to it, and the implementation of measures that encourage the maintenance and improvement of the water quality and the many uses they sustain. Similar to riparian areas, establishing and protecting vegetated shoreland buffers is an important measure now regulated through the Vermont Shoreland Protection Act (see above) that will improve habitat and water quality.

Recreation

There are numerous recreational uses of Lamoille County waters, including whitewater and quiet water boating, swimming, fishing, hunting, and canoe camping. Lamoille County also contains many scenic water features such as gorges, waterfalls, wetlands, and pristine ponds. Some of the most well-known and significant features are described here.

Boating

A number of locations in Lamoille County are good whitewater boating stretches. The Lamoille main stem is used extensively for flat water canoeing and kayaking by several local outfitter businesses as well as the general public (Table 4-5). Motorized boats are regulated by the individual local water body regulations.

The Lamoille River from Pottersville to Wolcott is a nice 1.4 mile stretch of whitewater called the “Wolcott Ledges.” It is considered “highly important” in part because the Class III rapids can be run in wet summers and fall. The North Branch of the Lamoille River is a challenging and noteworthy stretch of whitewater enjoyed by many boaters, which is described as pristine and having “excellent to outstanding” scenery. Another whitewater section in the watershed is a 1.5 mile stretch on the Gihon River, which is a Class IV and Class V reach used by only expert paddlers. The Wild Branch, although it can only be paddled during snowmelt or periods of high water, is considered an important local whitewater resource.

Table 4-5. Recreational Boating Locations in Lamoille County

Location	Documentation	Rating	Characteristics that support use	Put in	Take out
Lamoille River - Wolcott Ledges (1.4 miles)	<i>Vermont's White Water Rivers</i>	Highly important	Class III can be run in wet summers and fall	Behind the Pottersville Dam powerhouse	Downstream of Wolcott Village
Lamoille River (3.4 miles) Morristown to Fairfax	<i>Vermont's White Water Rivers</i>	Highly important	Class II-IV, whitewater and general touring	Duhamel Road, Morristown below Cadys Falls	Upstream of Fairfax Falls (manportages)
North Branch (9 miles)	<i>Vermont's White Water Rivers</i>	Not rated	Class II-IV, excellent to outstanding scenery and pristine	Bog Road Bridge, Belvidere	Church Street covered bridge, Waterville
Gihon River (1.5 miles)	<i>Vermont's White Water Rivers</i>	Not rated	Serious Class IV and V used by expert paddlers	Whitcomb Island Road, Johnson	Pearl Street, Johnson
Wild Branch (7 miles)	<i>Vermont's White Water Rivers</i>	Important	Fast, twisty and highly technical Class II-III	North Wolcott Road upstream of Wolcott Craftsbury line	Route 15 at State bridge
Waterman Brook	<i>Let it Rain</i>	Not rated	Class IV and V used by expert paddlers	Waterman Road covered bridge, Johnson	River Road East, town bridge, Johnson
Kenfeld Brook	Vermont Paddlers Association recommendations	Not rated	Class IV, outstanding scenery	Tyndal Road, Morristown	Duhamel Road, Morristown

Swimming

There are a number of popular swimming holes both on the Lamoille River mainstem and its tributaries. The locations described in the table at right are also generally some of the most scenic and aesthetically pleasing spots on the river and are enjoyed by picnickers, photographers, and anglers. Dog's Head Falls and Sloping Falls in Johnson are well-used recreation areas, as is Picnic Ledges in Wolcott. A number of swimming holes also exist on various tributaries to the Lamoille. Many culturally important swimming holes are also identified in the Vermont Swimming Hole Study (1992) and The Waterfalls, Cascades and Gorges of Vermont (1991).

Fishing

People fish throughout the Lamoille River and its tributaries. Some notable fishing sites include many of the same sites listed as swimming holes. The Vermont Department of Fish and Wildlife owns 25 different riverbank segments totaling 62,000 linear feet (almost 12 miles), which provide riparian zone protection and direct public access for fishing. The Department's acquisition program assures continued access for fishing in the face of increasing residential development.

Wetlands

The term wetland is used to refer to areas that are, or seasonally are, inundated or saturated with water. They are commonly known as swamps, marshes, bogs, or fens. Wetlands comprise 9,154 acres, or 3%, of Lamoille County's land area. All wetlands share three basic characteristics: the presence of water at or near the surface (wetland hydrology); the presence of water loving plants (hydrophytic vegetation) occurring on the site; and common types of soil (hydric soils) that

Swimming Site Name	Town	Location
Dogs Head Falls,- lower pool - Lamoille River	Johnson	Patch Road
Picnic Ledges - Lamoille River	Wolcott	Route 15 east of village
Lamoille River, Wolcott Village	Wolcott	Route 15 in village
Terrill Gorge - Kenfield Brook	Morristown	Duhamel Road - F&W parking
Elmore Branch	Wolcott	East Elmore Road
Sheep's Hole - Foote Brook	Johnson	Foote Brook Road
The Ledges - Foote Brook	Johnson	Cherry Hill Road
Power House Bridge Falls - Gihon River	Johnson	School Street
Rogers Bridge - Seymour River	Cambridge	Lower Pleasant Valley Road
Brewster River Gorge	Jeffersonville	Canyon Road by covered
Codding Hollow Covered Bridge - North Branch	Waterville	Codding Hollow Road
Clavale Brook Cascades	Eden	Route 118

have formed as a result of the presence of water. Wetlands serve a variety of important functions including storm and floodwater retention, surface and groundwater protection, fisheries and wildlife habitat, timber, recreation, and erosion control. Wetlands comprise an important element in Lamoille County's landscape, habitats, and ecosystem that must be protected. State and federal regulations govern wetlands, which are categorized as Class I and Class II. Class III wetlands are regulated at the Federal but not at the State level.

The Vermont landscape has undergone vast changes over the past 200 years. These changes have seen the deforestation of the state for agriculture and, as sheep and dairy farming declined, subsequent reforestation to the 78% forested landscape of today. Growth and development over the past twenty to thirty years have also played a role in the destruction of Vermont's wetlands. Historically, some loss of wetlands has been due to draining and filling for agricultural purposes.

According to the Vermont Significant Wetlands Inventory (VSWI) completed by the Department of Environmental Conservation, there are a total of approximately 300,000 acres of wetlands in Vermont, accounting for approximately 5% of the state's land area. It is estimated that over 90% of Vermont's wetlands are privately owned. Over half of the state's wetlands are forested with nearly equal amounts of broad-leaved deciduous and evergreen tree species. Less than one third are classified as scrub-shrub wetlands, with the remainder comprising emergent wetlands (marshes and wet meadows).

The significance of any one wetland in Vermont is not based on its size, but rather the degree to which it serves various wetland functions. A variety of values and functions can be directly attributed to the presence of wetlands. Many of these functions provide direct and indirect economic benefits to landowners and communities, as well as many social benefits such as ecological diversity and aesthetic value. While some wetlands may provide only one or two functions, others may fulfill several at one time. Even though only one specific function may be supported, that function may be very important to the area. Regardless of the wetland's size and the functions it may provide, the determination of any one wetland's value must be done on a case-by-case basis.

Wetlands associated with rivers and streams (riverine wetlands) provide for the storage of floodwaters by acting as a sponge to absorb the runoff and release it slowly over time. It is often assumed that wetlands with a surface area of 1% or more of the total drainage basin may be important for storm water retention. Wetlands also play an important role in erosion control by trapping sediments, absorption of storm flow, and dissipation of wave and current energy along shorelines.

Many wetlands are important to the recharge of groundwater aquifers and serve to filter impurities and nutrients from surface water sources. This function is very important in helping to ensure and protect potable water supplies. In some areas, the filtering abilities of wetlands are being harnessed to perform limited wastewater treatment functions.

Finally, wetlands provide an important habitat for several game and non-game wildlife species, as well as critical habitat for several threatened or endangered plant and animal communities. Many large mammals utilize wetlands during their seasonal cycles, while many fish, reptile, amphibian, and bird species are entirely dependent on wetlands for food, shelter, and spawning. Wetlands provide habitat for over 43% of the federally recognized threatened and endangered plant species found in Vermont. Wetlands are also used extensively for agriculture and silviculture.

The implementation of state and federal wetland programs have been responsible for creating incentives for reducing, or mitigating, wetland loss. The Vermont Wetland Rules were adopted by the Water Resources Board in 1990 to implement the statutory requirements of the Vermont Wetlands Act (10 VSA §905 7-9). These rules classify all wetlands in the state according to their importance in fulfilling one or more wetland functions. Some wetlands (Class 3) are not protected under the Vermont Wetland Rules but may still be subject to federal regulation. Certain activities, such as most agricultural and some silvicultural activities, are permitted in a wetland without any review. All other development in or near a wetland requires a Conditional Use Determination from the Secretary of the Agency of Natural Resources ensuring no undue adverse impacts on protected functions.

Vermont's wetlands also receive state review and protection under Act 250. In addition to state protection, the U.S. Army Corps of Engineers has the responsibility of administering Section 404 of the Clean Water Act which regulates the dredging or placing of fill into any wetland over one acre in size. The Environmental Protection Agency and the U.S. Fish and Wildlife Service have review authority over any Army Corps permit. Several other federal agencies, including the National Park Service and the USDA Soil Conservation Service, administer grant programs, which encourage the protection of wetlands. Finally, town plans and local land use regulations may also provide additional protection and consideration of wetlands.

Vernal Pools

Vernal Pools are seasonal wetlands, filling with snowmelt and spring rains, but often drying up by summer, creating a cycle of flooding and drying that prohibits permanent fish populations. These pools provide critical habitat for many salamanders, including some “medium” priority Species of Greatest Conservation Need, such as the Blue-Spotted, Spotted, Jefferson, and Four-toed salamanders, and other vernal pool-dependent invertebrates such as fairy shrimp, and several freshwater snails and dragonflies. The loss of a single vernal pool in any given area could easily cause the demise of the local wood frog population, along with any pool-breeding salamanders, and would certainly cause the extirpation of the pool’s fairy shrimp.

Vernal pools are critical habitats of incredible diversity and productivity. However, vernal pools often receive little or no protection under federal regulations. In Vermont, vernal pools are recognized as Class II wetlands under the current Vermont Wetlands Rules. While they may qualify for protection as “wildlife habitat” under Act 250, they are not considered critical wildlife habitat, a designation necessary for legal protection. As a result, vernal pools are not currently protected if a development is not subject to Act 250 review. This could become an issue in the future as there are over 100 vernal pools in Lamoille County.

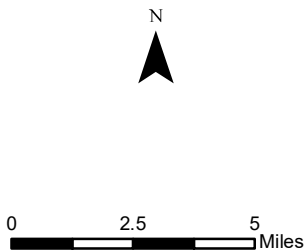
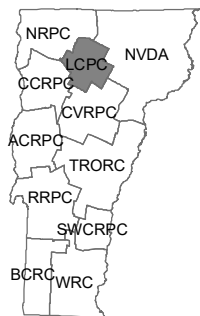
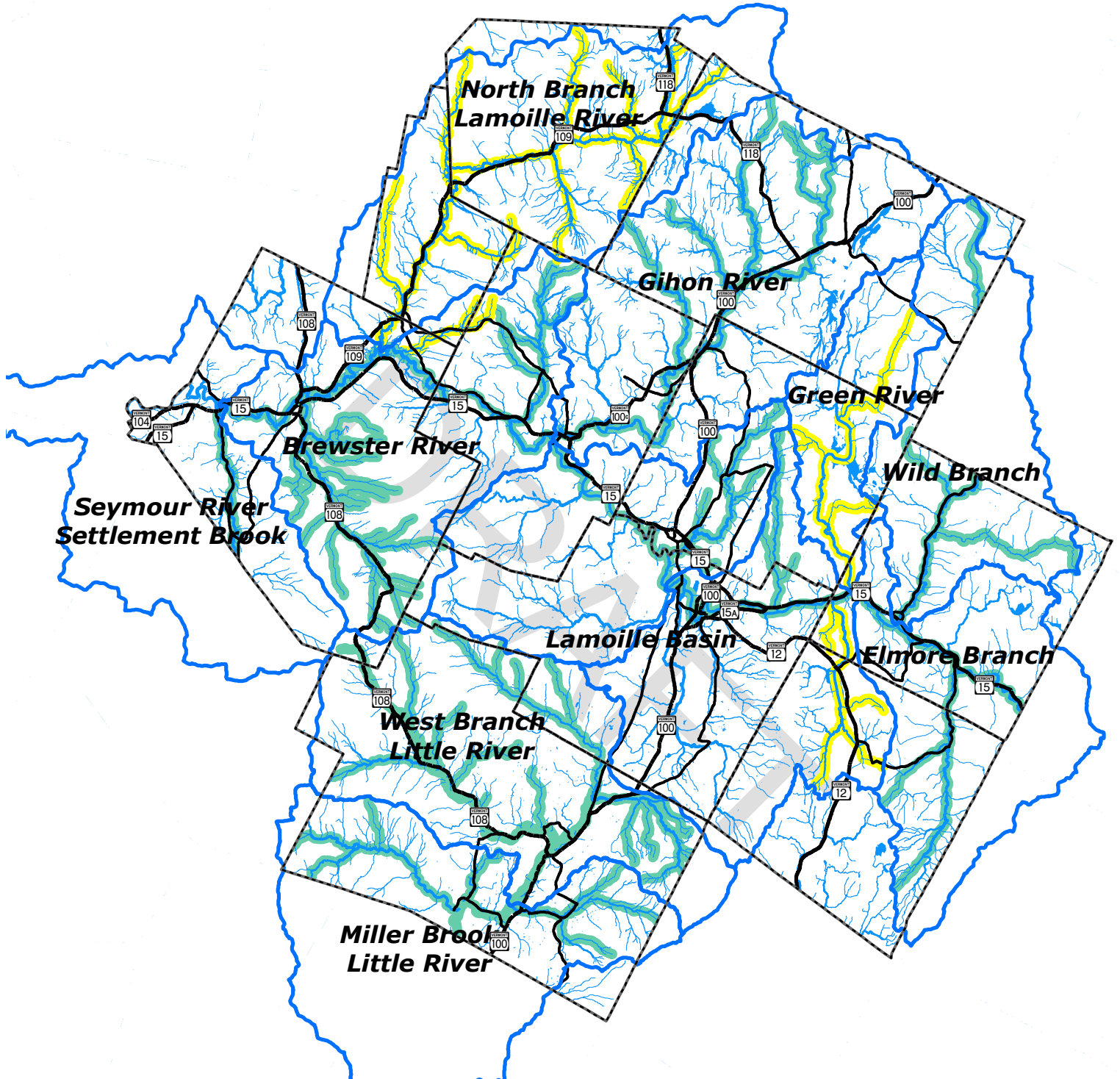
Floodplains and River Corridors

Floodplains are lowlands along rivers, streams, and lakes which periodically become inundated with water during times of high rainfall or spring runoff.

Floodplains serve valuable ecological functions, including flood water storage, sediment trapping, nutrient filtering and aquifer recharge. Infrastructure within the floodplain poses both a direct hazard to the inhabitants and an indirect hazard to those living downstream of that infrastructure. Vermont statutes governing the use of areas within the floodplain have been developed to protect people as well as natural resources. Two types of areas have been defined, flood hazard areas and floodways. Flood hazard areas (Title 10 VSA Chapter 32) are areas that have a 1 in 100 chance of being inundated by flood in any given year. If the flood hazard area is improperly used and unprotected, a flood can create a serious threat to the public, private investments can be destroyed, and significant natural resources can be damaged. A floodway (Title 10 VSA Chapter 32) is the channel of a river or other watercourse and the adjacent land area that must be reserved to discharge the 100-year floods without cumulatively increasing the water surface elevation more than one foot. The floodway is the most hazardous section of a flood hazard area. Developments in a floodway are likely to increase the flood height and velocity and probably would be damaged in the event of a flood. Flood hazard areas have been designated by both federal and state governments. New development in these designated flood hazard areas should be discouraged, and existing development should be secured and flood-proofed in accordance with FEMA guidance.

By providing space to dissipate flood waters, floodplains serve an important function in maintaining the stability of river systems, where there is minimal erosion and a balance between water and sediment moving downstream through the system. Modification of watersheds and stream channels through natural processes (landslides, severe storms, fires) and human alterations (de-forestation, ditching, dredging, and armoring), causes an imbalance in water and sediment loads that leads to adjustments in river and floodplain geometry until balance is re-established. Since European settlement, repeated watershed and stream channel modification related to intensive land use has caused widespread loss of floodplain function. Nearly every Vermont watershed has streams “in adjustment.” Streams and rivers have become confined to deeper, straighter channels and no longer have access to historic floodplains. Rivers that have down cut and lost access to their floodplains will erode their banks until new floodplains are formed. Without floodplains and meanders, rivers deposit the eroded soil and nutrients into the lakes and reservoirs.

River Corridor Planning Lamoille County



- Town Boundary
- Watersheds
- River/Stream
- STREAM**
- Phase 1 Assessment
- Phase 2 Assessment
- Seymour River
- Waterbody

Data Sources:

Political Boundaries: VCGI, 1991.
 Surface Water: VCGI for VHD-USGS, 2001.
 Assessed Streams: LCPC, 2020.
 Watershed Boundaries: DEC, 2003.

Created 1/17/23 by LCPC. Map is for planning purposes only, not for regulatory interpretation.

As was evident in 2011 during Tropical Storm Irene, catastrophic changes in river channel location and dimensions can occur during a large flood event (Municipal Guide to Fluvial Erosion Hazard Mitigation). Most flood related damage in Vermont is caused by fluvial erosion rather than inundation. The increased power of larger floods, contained within the channel, has led to higher rates of bed and bank erosion. The average \$18-\$20 million being spent annually in Vermont to keep rivers disconnected from their floodplains and static in the landscape has become unsustainable. Erosion hazards and flood losses are increasing. (Floodplains Key to the Health of Lake Champlain White Paper, DEC).

The Vermont Department of Environmental Conservation seeks to better understand river behavior through the science of fluvial geomorphology, the physical interrelationship of flowing water and sediment in varying landforms. Since the late 1990s, the Vermont River Management Program has been working with Towns and Regional Planning Commissions to conduct stream geomorphic assessments throughout the State. There are many reasons to do a stream geomorphic assessment, ranging from learning about the natural environment and the effects humans have had on the landscape over time, to identifying high quality aquatic habitats, to characterizing erosion and flood hazards. Part of this process involves delineating river corridors- identifying the area the stream needs for physical adjustment, so that it can attain/maintain a stable equilibrium condition. Limiting the number of new structures placed in defined river corridors prevents unnecessary threats to life and property and reduces the need for flood control measures.

The Vermont Department of Environmental Conservation and LCPC have completed 10 geomorphic assessments in Lamoille County. The completed Geomorphic Assessments are in: Little River (Stowe), West Branch (Stowe), Elmore Branch (Elmore, Wolcott), Gihon River (Johnson, Hyde Park, Eden), Centerville Brook (Hyde Park), Foote Brook (Johnson), Green River (Hyde Park), Lamoille River Mainstem (Johnson, Hyde Park, Morrisville, Wolcott), Wild Branch (Wolcott, Eden), and Rodman Brook (Morristown, Hyde Park). In addition to mapping river corridors, the assessments identify and prioritize restoration opportunities. The identified projects will reduce sediment and nutrient loading to downstream receiving waters such as the Lamoille River and

Lake Champlain, reduce the risk of property damage from flooding and erosion, and enhance the quality of in-stream biotic habitat. Many of these projects involve conservation and re-vegetation of riparian areas. Since many of these areas are privately owned property, coordination and collaboration with property owners will be especially important to implement these projects. The Vermont Department of Environmental Conservation has an up to date statewide map of river corridors. This map can be viewed via the online [ANR Natural Resources Atlas](#) (see map on next page).

Groundwater

Groundwater is a precious and essential resource -- one that is critical to the day-to-day activities of rural Vermonters. Groundwater is used for domestic, commercial, and industrial uses and for irrigation of crops. According to the Vermont Department of Health, 3 out of 10 Vermonters, roughly 193 thousand people, obtain their domestic water from groundwater sources. On average, every day we require 75 gallons of water per person for domestic use – toilets, bathing, cooking, drinking, etc. In Lamoille County, this translates into nearly 1.9 Mgal/d – nearly all of which comes from groundwater sources.

Groundwater contamination can come from any number of sources including land use activities and air and surface water pollution. Land use activities have the potential of seriously impacting both the quality and the quantity of groundwater in a given area. The presence of leaking underground storage tanks, road salt application, leachate from landfills, domestic wastewater and sewage, industrial wastes, and agricultural applications of pesticides and fertilizers all pose a potential threat to groundwater sources.

Groundwater in Vermont is protected by the Groundwater Protection Law (10 VSA Chapter 48). The law provides for the classification of groundwater into four types based on existing and future use, and required the Agency of Natural Resources to develop a Groundwater Protection Rule and Strategy. The purpose of this strategy was to develop a process for the identification and delineation of the four classes of groundwater and to protect these sources through existing regulatory programs and the coordination of groundwater management statewide.

Class I groundwater: 1) is suitable for public water supply, 2) has a character that is uniformly excellent, and (3) is not exposed to activities that pose a risk to its current or potential use as a public water supply. Class II groundwater is the same as Class 1 with the exception that it may be exposed to activities that pose a risk to its current or potential use as a public water supply. Class III is suitable as a source of water for individual domestic water supply, irrigation, agricultural use, and general industrial and commercial uses. Finally, Class IV groundwater is not suitable as a source of potable water but suitable for some agricultural, industrial, and commercial use. By statute, all groundwater in Vermont is designated Class III unless specific areas are reclassified to Class I, II, or IV. The purpose of reclassification to Class I or II is to delineate areas of groundwater requiring extra protection for current or future public drinking water supplies. The purpose of reclassification to Class IV is to prevent people from accidentally drinking non-potable groundwater and to prevent spreading of subsurface contamination.

Protection measures for groundwater at the state level include identification and monitoring, and the prohibition of certain land uses, namely landfills, injection

Table 4-6. Delineated wellheads in Lamoille County

Water Source Name	Number of Wellheads
Birch Hill Water System	1
Cadys Falls Water Coop	1
Cambridge Village Water System	2
Covered Bridge Highland	1
Elmore Water Co-Op	1
Hyde Park Water System	1
Jeffersonville Water System	2
Johnson Village Water Dept	1
Mansfield View Water Company	2
Morristown Corners Coop.	2
Morrisville Water & Light	2
Mountainside Resort	1
North Hyde Park F.D. #1	1
Pinecrest Mhp	1
River Road Apartments	1
Smugglers' Notch	7
Sterling View Mhp	1
Stowe F.D. #2 Gold Brook Circle	1
Stowe F.D. #4	1
Stowe Village Water System	1
Stowe Water Dept	1
Village of Johnson	1
Waterville Water Coop	1

wells, and leach fields, within each Groundwater Classification Area with the most stringent restrictions placed in Class I areas. Where private property is included in a Class I area, the Agency must go to the Legislature for approval for permanent protection.

In addition to the Groundwater Protection Strategy, the Agency is also responsible for the implementation of the state's Wellhead Protection Program pursuant to the requirements of the Federal Safe Drinking Water Act (SDWA). In Vermont, a wellhead protection area is the surface and subsurface area that serves a public drinking water supply, which is defined as serving fifteen or more connections or 25 or more people. The Vermont Wellhead Protection Program is designed to coordinate various state and local agencies and drinking water providers in the long-term protection of their wellhead protection areas from potential sources of contamination. Within this effort, water systems (both municipally and privately owned) must delineate their wellhead protection areas, identify potential sources of contamination, and develop plans and programs to minimize the risk of contamination. Lamoille County has 34 delineated wellheads, which are listed in Table 4-6.

A 2002 study funded by the Clean Water Act and prepared by LCPC identified land uses within the region's wellhead protection areas and made recommendations for their protection through municipal planning. While many of these water sources are undeveloped and relatively protected for the short term, recent growth rates and patterns of development suggest that many will need to adopt more long-term protection measures over the coming years. Large areas within the rural forested landscape areas support critical public water supply protection areas, including groundwater and surface water protection areas for local municipalities.

The Vermont Department of Environmental Conservation has developed a manual, *An Ounce of Prevention; A Groundwater Protection Handbook for Local Officials*. This handbook outlines a variety of tools ranging from public education to model groundwater protection ordinances, which can be employed to protect groundwater. Whatever the situation or approach to groundwater protection, the loss of this precious resource will be a limiting factor in the continued growth and prosperity of any community. It remains up to the local communities in the region to adequately protect groundwater sources from contamination. At the local level, this effort translates into land use planning and municipal coordination. Rather than the traditional approaches to groundwater protection –

control, monitoring, and clean-up – there must be a much more proactive and cost-effective approach to preventing contamination. The first of these is learning the location of wellhead protection areas and Class 1 & 2 groundwaters, and identifying potential sources of contamination. Secondly, through public involvement, long-term protection measures for these sources should be developed and implemented.

Surface Water Quality

The Agency of Natural Resources is charged with the assessment of water quality in the state through the requirements of the Federal Clean Water Act. The water quality of Vermont’s surface waters is assessed by evaluating the ability of water bodies to support a set of designated uses. Water uses include, but are not limited to, drinking, aquatic life, recreation, fish consumption, and agriculture. For each use, the waterbody or stream segment is evaluated to determine whether the use is fully supported, stressed, altered, or impaired. Fully supported and stressed waters are those that meet the goals of the water quality standards. Impaired waters do not meet goals of the water quality standards because of one or more particular pollutants. Altered waters do not meet water quality standards because of non-pollutant effects (e.g., alteration of flow to generate electricity). The four use support categories are described in greater detail as follows:

Full Support - This assessment category includes waters of high quality that meet all use support standards for the water’s classification and water management type.

Stressed - These are waters that support the uses for the classification but the water quality and/or aquatic biota/ habitat have been disturbed to some degree by point or nonpoint sources of pollution of human origin and the water may require some attention to maintain or restore its high quality; the water quality and/or aquatic habitat may be at risk of not supporting uses in the future; or the structure or integrity of the aquatic community has been changed but not to the degree that the standards are not met or uses not supported.

Altered - These are waters where human activity has altered the natural hydrologic flow and/or has modified the river channel, OR where the occurrence of exotic species has had negative impacts on designated uses.

Impaired - These are surface waters where reliable data collected through monitoring efforts reveals 1) an ongoing violation of one or more of the criteria in the Water Quality Standards and 2) a pollutant of human or human-induced origin is the most probable cause of the violation. In accordance with EPA guidelines, Vermont DEC reports a List of Impaired Waters determined to be impaired and needing a pollution budget determination otherwise known as a Total Maximum Daily Load (TMDL) determination.

A determination of use support is made by following the Vermont Surface Water Assessment Methodology and using information gathered and provided to the Department of Environmental Conservation by water resources personnel, fish and wildlife biologists, aquatic biologists, lake and river organization members, and other qualified individuals or groups (*State of Vermont 2018 Water Quality Integrated Assessment Report*).

Each of Vermont's 17 basins is assessed on a rotating schedule. The most recent *Lamoille Basin Water Quality Assessment* (2016-2020) found that all the rivers and streams in Lamoille County either partially or fully supported their uses, and all lakes and ponds, with the exception of Lake of the Clouds, either partially or fully supported their uses. In this lake, water quality is impaired due to high acidification. In addition to Lake of the Clouds, a tributary to the Brewster River is identified as impaired due to iron seepage from an inactive leachfield. Remediation via lime treatments has been applied to this tributary. In the most recent Winooski Basin Water Quality Assessment (2022-2023), the West Branch Little River in Stowe is identified as undergoing active adjustment processes. On the majority of the West Branch, historic fluvial erosion has lowered the elevation of the riverbed leaving the floodplain inaccessible. As a result, high flows that would normally access the floodplain are contained within the channel; causing extensive bank erosion, channel widening, loss of aquatic habitat, and general channel instability. Highly erodible soils are a major contributor to these dynamics of the channel adjustment process.

The map at the end of the chapter shows the impaired and priority surface waters in Lamoille County. For a detailed listing of these surface waters, see the Vermont Water Management's "Assessment of the Condition of Vermont Waters" webpage at http://www.vtwaterquality.org/mapp/htm/mp_assessment.htm.

Vermont Tactical Basin Plans

Every 5 years the VT DEC updates Tactical Basin Plans to serve as a guide for watershed health. The Plans identify strategies to maintain high quality surface waters and to improve the quality of stressed or impaired waters in accordance with the Vermont Surface Water Management Strategy. The majority of Lamoille County falls within the Lamoille Watershed guided by the [Lamoille River Tactical Basin Plan](#). Meanwhile, the Town of Stowe and portions of Elmore fall

within the Winooski Watershed guided by the [Winooski River Tactical Basin Plan](#). Each Basin Plan links to the [Vermont Watershed Projects Database](#) to identify and track priority water quality projects implemented to meet Tactical Basin Planning Goals and reduce phosphorus to meet the Lake Champlain TMDL requirements. For more information on Tactical Basin Planning visit the Vermont Department of Environmental Conservation website at <https://dec.vermont.gov/water-investment/watershed-planning/tactical-basin-planning>.

Stormwater

Stormwater runoff is generated when precipitation from rain and snowmelt flows over land or impervious surfaces and does not percolate into the ground. As the runoff flows over the land or impervious surfaces (paved streets, parking lots, and building rooftops), it accumulates debris, chemicals, sediment, or other pollutants that can adversely affect water quality. Rapid discharges of stormwater can also adversely impact the hydrology of a water body, leading to erosion or flooding downstream and damage to the built environment. Sediment carried in stormwater can adversely affect aquatic wildlife, and may also be bound with pollutants such as phosphorus.

The State of Vermont regulates stormwater impacts from developments which create more than half an acre of impervious surfaces. However, much of the development occurring in Lamoille County falls under this threshold. Therefore, management of stormwater is largely left to local municipalities. In some cases “Low Impact Development” can be used to address stormwater impacts. Low Impact Development techniques include reducing the width of roads and driveways, directing runoff away from impervious surfaces and into vegetated areas, and infiltrating runoff into soil before it reaches surface waters through use of rain gardens or similar techniques. Both Eden and Elmore Lakes have Watershed Action Plans.

The 3 Acre Rule was adopted by DEC in February of 2019. Three-acre sites are defined by DEC as "existing sites with three or more acres of impervious surface that lack a stormwater permit based on the 2002 Stormwater Management Manual." It includes standards applicable to the general permit, as well as all stormwater permitting. Per Act 64 (Vermont Clean Water Act) and Lake

Champlain TMDL Plan requirements, the Vermont Department of Environmental Conservation (DEC) is required to adopt a new rule and general permit for stormwater management from “three-acre sites.”

Lake Champlain TMDL Plan

In 2016, the Lake Champlain TMDL Plan was adopted. Section 303(c) of the Clean Water Act requires states to establish water quality standards that identify each waterbody’s designated uses and the criteria needed to support those uses. Such water quality standards must be sufficient to ensure, wherever attainable, a level of water quality that provides for the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water. Section 303(d) of the Clean Water Act requires states to develop lists of impaired waters that fail to meet Water Quality Standards set by jurisdictions even after implementing technology-based and other pollution controls. The Environmental Protection Agency’s regulations for implementing CWA section 303(d) are codified in the Water Quality Planning and Management Regulations at 40 CFR Part 130. The law requires that states establish priority rankings and develop Total Maximum Daily Loads (TMDLs) for waters on the list of impaired waters (40 CFR 130.7). A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet applicable water quality standards.

Lake Champlain Action Plan

The 2022 Action Plan brought stakeholders together to outline steps that will be used over the next 5 years in order to protect and restore Lake Champlain and the basin. The focus will be on climate change and invasive species.

In 2019, the Vermont legislature passed Act 76, the Clean Water Service Delivery Act establishing the Clean Water Service Providers (CWSP) and a framework to support Vermont’s clean water goals. Lamoille County is largely served by the Lamoille Basin Clean Water Service Provider, and partially served by the Winooski Basin Clean Water Service Provider for the Towns of Stowe and portions of Elmore that are within the Winooski River Watershed. The CWSP plays an important role in prioritizing non-regulatory water quality projects for funding to help meet Lake Champlain TMDL phosphorus reduction targets. For more information on Act 76 and CWSPs serving Vermont visit <https://dec.vermont.gov/water-investment/statutes-rules-policies/act-76>.