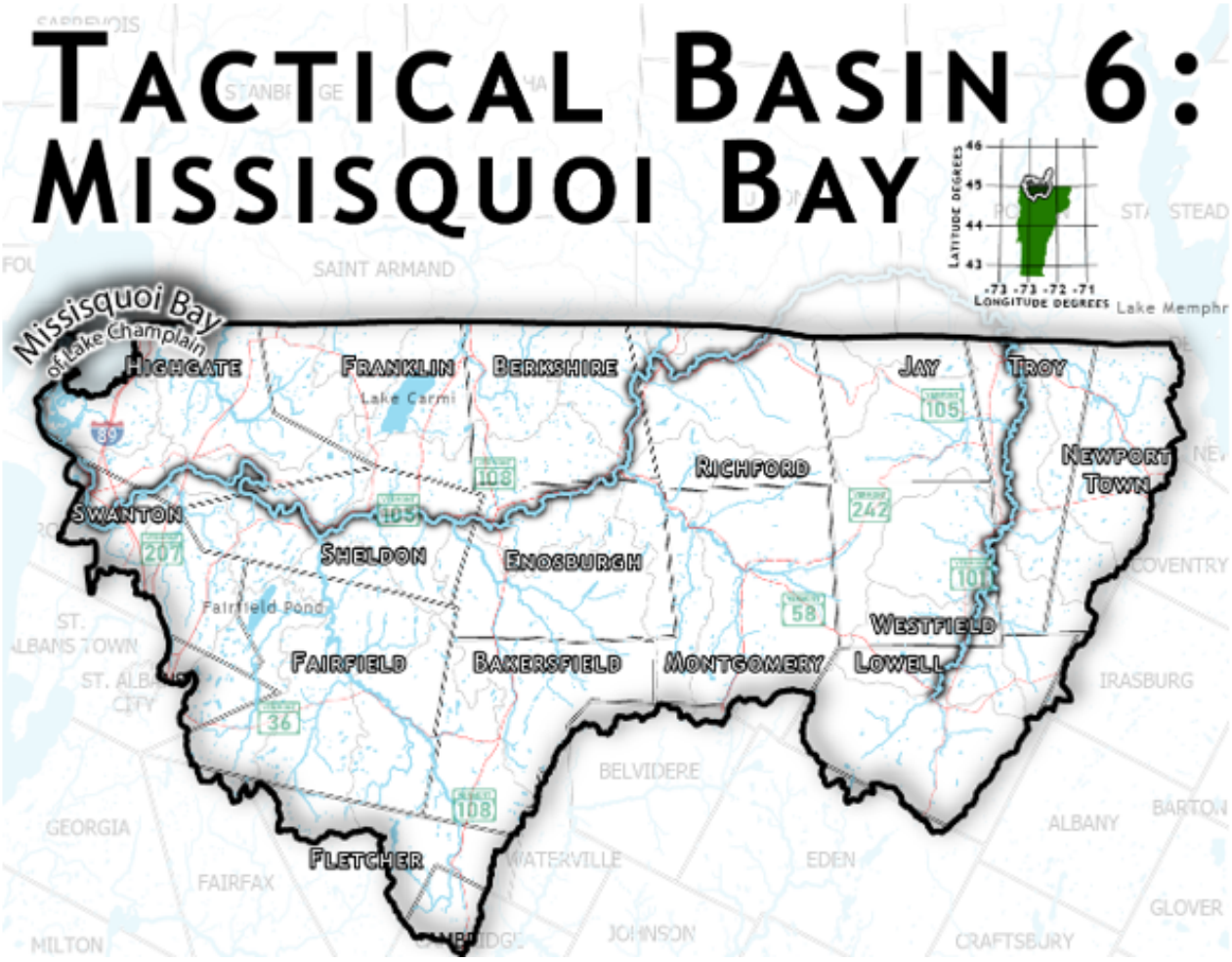
Draft of Chapter 4 and 5 of the Missisquoi Bay Tactical Basin Plan for discussion with NWRPC 4/1/2026

For background information about health of the surface waters in the basin, see the Basin 6 Assessment Report_final.pdf

Basin 6 Towns

Alburgh*	Fairfax*	Lowell	Swanton
Bakersfield	Fairfield	Montgomery	Troy
Belvidere	Fletcher	Newport Town	Waterville*
Berkshire	Franklin	Richford	Westfield
Cambridge	Highgate	Sheldon	
Eden*	Irasburg*	St. Albans	
Enosburg	Jay	Town*	

A small area of the municipalities is in the watershed



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Chapter 4 – Strategies to Address Pollution by Sector

ANR's approach to remediation of degraded surface waters and protection of high-quality waters includes the use of both regulatory and non-regulatory tools with associated technical and financial assistance to incentivize implementation. Tactical basin plans address water quality by land use sector (Figure 15). Ongoing protection and restoration efforts and recommendations to meet water quality objectives are

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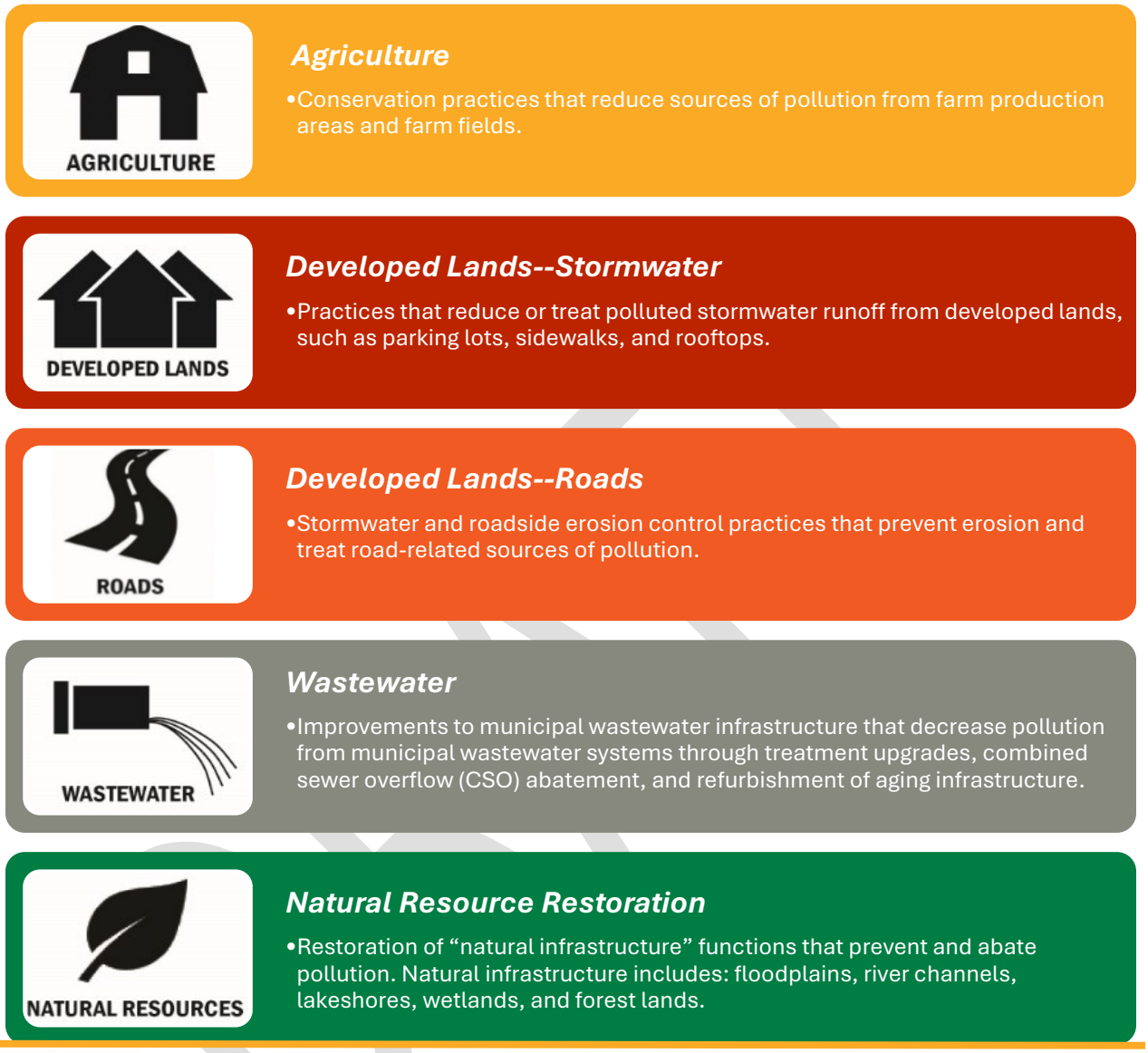
developed for each sector. These recommendations support the development of the strategies in the Chapter 5 Implementation Table.



5. Land Use Sector Framework

A. Agriculture

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B. Developed Lands

Stormwater runoff from developed land contributes pathogens, sediment, nutrients, and toxins to waterways, as well as driving stream channel erosion if stormwater is not managed to reduce volume and pollutant loads. Concentrated stormwater discharges may also lead to erosion and sedimentation by initiating or exacerbating slope instability resulting in gullies and landslides.

Most stormwater management is achieved through State and federal regulations. Areas developed prior to stormwater rules and permitting often lack effective stormwater management practices. These areas are a focus in the plan.

Developed lands comprise 6% of the basin and include the urban areas in Richford, Enosburgh and the villages in the basin as well as Jay Peak Resort and the shoreline of Lake Carmi.

Stormwater

The tactical basin planning approach engages local, regional, state, and federal partners in the development of strategies needed to accelerate adoption and monitoring of stormwater-related Best Management Practices (BMPs) to meet the State's clean water goals and TMDL targets. Basin stakeholders have been actively participating in voluntary actions and implementing priority projects, landowners and municipalities are working on meeting regulatory requirements

Regulatory requirements ensure proper design and construction of stormwater treatment and control practices as well as construction-related erosion prevention and sediment control practices necessary to minimize the adverse impacts of stormwater runoff to surface waters throughout Vermont. Stormwater permits for developed lands in this basin include:

Operational Stormwater Permits

Construction Stormwater Discharge Permits

Multi-Sector General Permit (Industrial)

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General Permit 3-9050 for Operational Stormwater Discharges

General Permit 3-9050 addresses stormwater runoff from impervious surfaces. This permit covers all operational stormwater permitting, including new development, redevelopment, expansion, and permit renewal. Two additions to the permit serve to enhance stormwater management in Vermont: the permit threshold decreased from one acre to a half acre under specific circumstances and it also serves as the permit for "three-acre sites" (see: Operational Stormwater Discharge Permits | Department of Environmental Conservation.

The permit now covers three-acre sites, becoming effective as soon as 2022 for some parcels in Basin 6. A three-acre site includes three acres or more of impervious surface that has never had an operational stormwater permit, or was permitted to standards in place prior to the 2002 Vermont Stormwater Management Manual. A calculation of all the untreated acres within 3-acre parcels in the basin shows that an additional 210 impervious acres over 33 lots could receive treatment. The majority of these lots are located in Swanton, Richford, Enosburgh, and Jay.

Resources

DEC has partnered with regional planning commissions, natural resource conservation districts and watershed groups to offer training, technical assistance, outreach, and funding to assist community with regulatory compliance as well as voluntary efforts to improve management of stormwater. The focus of partnerships includes development of stormwater master plans and design and implementation of priority projects, technical assistance to increase use of Green Stormwater Infrastructure and use of social marketing practices to facilitate adoption of environmental stewardship practices. For three-acre sites, DEC provides financial support to schools, individuals and municipalities through the Green School Initiative and Developed Lands and Municipal Stormwater Implementation Programs, respectively. Program support includes Three-Acre General Permit obtainment and compliance through design and implementation.

Green School Initiative

DEC has funded a Green Schools Funding Initiative to assist public schools in the Lake Champlain and Lake Memphremagog basins to meet compliance with the state's Three-acre permit. During Phase 1, the funding program administrator, GreenPrint Partners, worked to help participating schools obtain permit coverage and complete stormwater

designs. Of the roughly 63 schools seeking three-acre permit obtainment, all are successfully moving towards obtaining permits, with 62 issued and 1 under review. Phase 2 is currently underway and is focused on supporting construction with DEC's $30.21 million dollars. GreenPrint Partners is helping the majority of schools, who have requested funding, implement permitted designs. Although the schools' authorized permits have a construction deadline of October 1, 2033 to construct the permitted stormwater management practices, it's the goal of the Green Schools Initiative to construct the stormwater management practices before the end of 2027. See the GreenPrint Partners website.

In the Missisquoi Basin, Swanton Elementary, Missisquoi Valley High School and Enosburg Falls Central School are eligible to participate in DEC's Green School Initiative. DEC and LCBP are supporting work through the Clean Water Fund to complete stormwater design and permitting work on behalf of schools in the Lake Champlain basin.

DEC's Green School Stormwater Initiative will also partner with Lake Champlain Sea Grant to provide schools with watershed and stormwater lesson plans and teacher trainings. In addition, Lake Champlain Sea Grant will help schools identify ways to maximize the additional benefits of green stormwater projects, such as creating pollinator habitat and outdoor classrooms. An additional educational opportunity would include the initiative by the MRBA and Abenaki Council to rename a stream beginning at the Missisquoi Valley Union to reflect the community's Abenaki heritage.

Stormwater Master Planning

Stormwater infrastructure mapping projects are completed for municipalities (Table 11) by the Clean Water Initiative Program to supplement any existing drainage data collected by towns. The intent of this work is to provide a tool for planning, maintenance, and inspection of the stormwater infrastructure.

Stormwater master plans provide a list of prioritized projects that property owners could adopt to improve stormwater management voluntarily. These planning processes use information from the mapping projects where available and municipal and public involvement to create a comprehensive listing of identifiable problems. Plans result in a prioritized list of projects offering a strategic approach to address stormwater runoff. Additionally, TBPs use recommendations from the Vermont Nonpoint Source (NPS) Management Program Plan which summarizes the causes and sources of NPS pollution and identifies strategies to protect and restore waters impacted by NPS pollution (DEC, 2020).

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Towns with plans are identified in Table 6. The NRPC and FNLC have been instrumental in assisting towns with SWMP development and project implementation. Completed projects can be found in the Watershed Projects Database. Additional plans could be considered for Bakersfield, Lowell, Montgomery, Jay, and Troy. Where appropriate, these plans could also identify sources of runoff from agricultural landscapes that intersect with developed land. The need for additional stormwater master plans will be assessed by the Agency upon request.

Table 1. Municipality progress in addressing stormwater

Municipality	Streams of focus	Stormwater Mapping	Stormwater Master Plan
Bakersfield		2015	
Belvidere		NA	
Berkshire		2018	Proposed
Cambridge		2012/2018	2022
Enosburgh	Giddings Brook	2009/2021	2013
Fairfield		2015	2014. Also 2025 Fairfield Pond Lake Watershed Action Plan
Fletcher		NA	
Franklin	NA	NA	2015. Also 2024 Lake Carmi BMP Scoping Final Report
Highgate		2009/2021	2013
Jay	Jay Branch and tribs	2020	Ski Area has a WQRP Proposed for town

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Municipality	Streams of focus	Stormwater Mapping	Stormwater Master Plan
Lowell		2017	Proposed
Montgomery		2009/2019	Proposed
Newport Town		2015	
Richford		2009	2018
Sheldon		2018/2021	2014
Swanton		2009	2013
Troy		North Troy (2009) and Troy Village (2019)	Proposed
Westfield		NA	

Illicit Discharge Detection & Elimination Studies

Illicit discharges are discharges of wastewater or industrial process water into a stormwater-only drainage system. The Agency has supported studies to identify these discharges in all towns with stormwater infrastructure. In Basin 6, all towns but Fletcher were covered in Six IDDE studies that sampled 180 sites. Of the 180 site samples, only 13 still require follow up by the towns.

The Agency expects to focus additional studies in developed areas with two or more catch basins. Areas under consideration include Fletcher. The reports are available on the following webpage: https://dec.vermont.gov/water-investment/cwi/solutions/developed-lands/idde . The link to the most recent report is here: https://dec.vermont.gov/document/statewide-5-idde-final-reportpdf

Outreach Efforts

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Collaborative outreach efforts in the basin have focused on stream (StreamWise) and lake shore (LakeWise) protection to date, see lakes section of the plan. Recently, the Lake Champlain Basin Program (LCBP) developed the Unifying Stormwater Technical Assistance Programs for Private Properties (SSAP) in the Lake Champlain Basin. The program was developed and implemented collaboratively with 20 practitioners, including Basin 6 partners and DEC staff. The actions of the SSAP are designed to increase the education, awareness, and engagement of landowners in learning about land management and its benefits, resulting in a shared sense of stewardship among all community members and an increase in the implementation of stormwater best practices.

In 2025, the LCBP supported the following partners to bring the above-mentioned programs to their communities: Franklin County NRCD: Streamwise and SSAP; Friends of Northern Lake Champlain: Lake Wise and SSAP; Missisquoi River Basin Program: StreamWise and Franklin Watershed Committee: LakeWise.

There are several local resources that can support landowners and communities in addressing water quality concerns related to stormwater runoff. These include the Green Infrastructure Round Table which supports the use of Green Stormwater Infrastructure. Other resources include the Lake shore stabilization handbook led by NRPC (DEC and Lake Champlain Sea Grant assistance,) The Landslide Handbook by USGS, and Regenerative Stormwater Conveyance designs.

Roads

It is estimated that more than 75% of Vermont roads were constructed prior to any requirements for managing stormwater runoff. Where road networks intersect stream networks, roads and their ditches effectively serve as an extension of the stream system. Roads can increase stormwater runoff, and, in this basin, unpaved roads are an important source of sediment to receiving waterbodies.

Stormwater runoff from roads is a source of sediment and nutrients to streams, lakes, and wetlands as well as a driver of stream channel erosion if roads are not designed or maintained to shed stormwater. Road infrastructure can impinge on stream floodplains and be a barrier to aquatic organism passage (AOP) when bridges and culverts are not adequately sized. In addition, improper winter management practices contribute excessive Chlorides in the form of winter deicing salts that degrade aquatic habitat.

Roads are included with developed land in basin comprising 6% of the basin's land cover. The transportation network includes state and municipal roads, private roads and driveways. Private roads can comprise a significant percentage of the road network in some towns. The roads most likely to contribute sediment and nutrients are hydrologically connected[1] to surface waters.

The Agency primarily addresses public road-related discharges through regulation. Working with partners, the Agency also provides guidance and financial assistance to facilitate compliance. Partners have helped the community reduce use of winter road salt as well as improve stormwater management on private roads and reduce natural resource conflicts with culvert crossing.

The Lake Champlain Sea Grant provides most of the outreach on winter road management in the basin. They note in their outreach that reducing chloride use at municipal level includes Investing in technology that economically addresses winter road management. The LCSG's online Story Map provides technical assistance to towns and partners to help support adoption of these practices

State resources are directed towards hydrologically connected roads, and priority road segments identified in road erosion inventories.

Municipal Roads General Permit

The Municipal Road General Permit (MRGP) is a stormwater permit for Vermont cities and towns and is intended to achieve significant reductions in stormwater-related erosion from paved and unpaved roads. All municipal roads are expected to meet the MRGP standard by 12/31/2036.

To meet the MRGP, towns improve surface and drainage issues to bring road segments into compliance. Towns identify non-compliant segments and necessary improvements from a town-wide Road Erosion Inventory (REI), or by assessing a suspect road segment in the field. While the surface work, including road crowning and shaving down berms are part of annual maintenance, adding features like ditches will protect improved protection of the road infrastructure during significant precipitation events. This work enhances community's flood resilience as well as improves water quality of adjacent waterbodies. In addressing undersized culverts that move stormwater or intermittent streams, the Stormwater Program encourages further enhancing flood resilience by

[1] **Hydrologically-connected road segments**: a road segment, equal to 100 meters in length, where the Secretary has determined that road and drainage characteristics indicate a likelihood of discharges to surface waters or wetlands. This definition includes those road segments identified as hydrologically connected on the ANR Atlas. The Secretary has developed a hydrologically-connected road segment layer using GIS analysis of roadway distance to waters.

adding ditches adjacent to the culvert. This would catch flows that would otherwise overtop road and divert it instead to the next culvert crossing. Towns road assessments results, modeled erosion rates and subsequent road work is available on the Drainage Infrastructure Resource Tool (DIRT). The map provides a visualization of towns' progress in terms of recorded drainage upgrades.

The permit, reissued in 2023 and effective through 2028, requires towns to upgrade at least 7.5% of non-compliant road segments annually to meet MRGP standards. The permit also requires a reassessment of all hydrologically connected segments by the Fall of 2027. After the updated Road Erosion Inventory (REI) is completed, 20% of *Very High Priority* segments need to be upgraded each year as part of the 7.5% annual requirement. The reissued MRGP now requires that new and replaced intermittent stream crossings cover the active channel width.

As of 2023, all towns in the basin conducted a first round of Road Erosion Inventory (REI) of hydrologically connected roads to determine if they meet MRGP standards. These road segments can be viewed using the Stormwater - Road Segment Priority layer onthe ANR Natural Resource Atlas and REI results by town can be viewed in the MRGP Implementation Table.

DEC and VTrans provide technical and financial assistance to towns to complete REIs, including funding the RPCs and other partners to assist towns. Towns that may either need to update their work to the DIRT map or may benefit from additional support of drainage upgrade includes Bakersfield.

While grants are available to implement projects (see below), the plan recommends support of towns in their development of capital budget plans to finance road upgrades to meet the MRGP. Priority projects are those drainage projects that are "*very high priority*" and are in sub-basins with known impairments or with lakes that have increasing nutrient trends related to road stormwater runoff. Completion of these projects may be counted towards meeting the requirements of the MRGP.

VTrans Municipal Grants in Aid & Vermont Local Roads

The VTrans Municipal Grants In Aid Program provides technical support and grant funding to municipalities to promote the use of erosion control and maintenance techniques that save money, while ensuring best management practices are completed in accordance with the MRGP. The Vermont Local Roads team provides training, technical assistance, communication tools and opportunities for information exchange to assist municipalities in improving their road networks. The River Management Program

provides technical and regulatory assistance for those activities that involve construction or excavation in rivers and streams. The resources found on the River Management Training Opportunities website, help implement the strategies described here and listed in Chapter 5.

Clean Water funding is also available through the VTrans Better Roads grants to assist with development of designs, capital budgets, cost estimates and implementation of road projects.

Transportation Separate Storm Sewer System General Permit – TS4

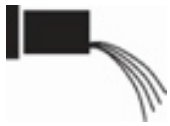
The Transportation Separate Storm Sewer System General Permit (TS4) covers stormwater discharges from all Vermont Agency of Transportation (VTrans) owned or controlled impervious surfaces. The TS4 general permit combines the stormwater requirements for VTrans associated with its designated regulated small MS4s; industrial activities, commonly regulated under the Multi-Sector General Permit; and previously permitted, new, redeveloped, and expanded impervious surface, commonly regulated under State Operational Stormwater permits.

As required by the permit, VTrans has an approved Phosphorus Control Plan (PCP) that achieves on average 25% of the total phosphorus reduction to Lake Champlain in each four-year period. The plan meets the requirements of the Lake Champlain Phosphorus TMDL as well as ensuring water quality protection across the entire state. The VTrans Phosphorus Control Plan Power BI describes the types of BMPs used as well as tracking progress.

Over the next five years, VTrans also anticipates continued pursuit of emerging and innovative strategies, including enhanced correction of gullying or large areas of culvert outlet erosion and implementation of floodplain restoration and other natural resource restoration projects.

Vermont Transportation Resilience Planning

VTrans has also developed the Vermont Transportation Resilience Planning Tool as a web-based application that assesses the risk to bridges, culverts, and road segments based on their vulnerability to damage from floods and the criticality of their location in the roadway network, and then identifies potential mitigation measures based on the factors driving the vulnerability. The use of this tool to prioritize projects is part of VTrans Resilience Improvement Plan.



C. Wastewater

Wastewater discharges to surface waters or ground waters represent a regulated and readily measurable and controlled source of pollutants, including pathogens and nutrients. Vermont addresses these discharges primarily through implementation of the National Pollutant Discharge Elimination System (NPDES), the Indirect Discharge, and other state permit programs. DEC provides financial assistance and technical assistance to municipalities and other permittees to upgrade wastewater treatment infrastructure and along with partners supports the community's development of community on-site systems and maintenance of residential on-site systems.

Direct Discharges from Wastewater Treatment Facilities

Most municipal wastewater, originating from a combination of domestic, commercial, and industrial activities, is collected and conveyed with a wastewater collection system to a wastewater treatment plant, and treated to established standards identified in permits before being directly discharged into a receiving water. Collectively the wastewater collection system and the wastewater treatment plant are the wastewater treatment facility (WWTF). There are 7 direct discharge facilities in the Missisquoi Bay basin (Table 7).

Table 2. Wastewater Treatment Facilities

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Facility (permit[2] ID)	Permit effective date	Permit Expiration Date[3]	Permitted flow MGD[4]	TMDL WLA (mt P/yr)	Current % of Design Flow	Treatment type	# of CSOs	Receiving water
WestRock Converting (Sheldon) (3-1118)	11/1/18	6/30/23	1.500	0.691	13.7%	Aerated lagoon	0	Missis-quoi River
Sheldon Springs (3-1108)	8/1/18	6/30/23	0.054	0.373	16.9%	Extended aeration	0	Missis-quoi River
Swanton Village (3-1292)	8/1/18	6/30/23	0.900	0.249	48.2%	Aerated lagoon	0	Missis-quoi River
Enosburg Falls (3-1234)	8/1/18	6/30/23	0.450	0.124	48.9%	Extended aeration	1	Missis-quoi River
Richford (3-1147)	8/1/18	6/30/23	0.380	0.105	32.3%	Aerated lagoon	0	Missis-quoi River
North Troy (3-1139)	8/1/18	6/30/23	0.110	0.122	64.7%	Extended aeration	0	Missis-quoi River
Troy/Jay (3-1311)	9/1/18	6/30/23	0.400	0.221	21.5%	Sequential batch reactor	0	Missis-quoi River

[2] *For information on the requirements for the issuance of wastewater discharge permits or to view an individual permits go to National Pollutant Discharge Elimination System (NPDES) Permits section of the Discharge Permits website*

[3] Expired permits remain in effect per Title 3 Section 814 until renewed

[4] *MGD= million gallons per day*

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An overarching consideration for the Agency's issuance of NPDES permits (discharge permits) is the 2016 Lake Champlain Phosphorus TMDL (LC TMDL). The LC TMDL altered the allowable phosphorus discharge loads from wastewater treatment facilities that contributed a significant portion of the total phosphorus load to Lake Champlain.

Since August 1, 2018, DEC has issued wastewater discharge permits incorporating the LC TMDL phosphorus allocations according to the five-year tactical basin planning schedule.

The Wastewater Management Program provides regulatory oversight for and technical assistance to Vermont's wastewater treatment facilities in cooperation with State, regional and national organizations. Permit issuance documentation can be viewed on the Wastewater Program's discharge permit database.

Facility–specific information

Facilities in the basin are subject to customary operations and maintenance requirements, and periodic performance engineering analyses as described below:

WestRock- Converting - The WestRock Converting facility is engaged in the production of recycled boxboard using corrugated and non-corrugated furnishes. The discharges are treated process wastewater combined from paper process wastes and miscellaneous cooling waters. The wastewater treatment system includes a 120-foot diameter primary clarifier, two aerated tanks, a secondary clarifier and a Dissolved Air Flotation (DAF) unit.

Sheldon Springs - The Sheldon Springs WWTF is an extended aeration plant which provides secondary treatment of domestic wastewater. Disinfection is completed by the addition of chlorine. The latest twenty-year evaluation was done in 2020 with only minor issues to address.

Swanton Village - WWTF consists of two partially aerated facultative lagoons followed by phosphorus removal in two solids contact clarifiers. Disinfection is accomplished by ultraviolet light. A CSO elimination/combined sewer separation project was completed in the 1990's resulting in no known sewer overflow points in the collection system. A 7 million dollar upgrade to the Swanton facility to provide advanced phosphorus control is nearing completed.

Enosburg Falls - The facility serves the village and includes an extended aeration/activated sludge treatment system. The facility discharges secondary treated, chlorinated/dechlorinated wastewater. There is one CSO discharge at the Route 108 Bridge. In December 2011, Enosburg installed an offline emergency tank, upgraded the

headworks, and added a second chlorine contact chamber at the WWTF to handle the peak flows. A Long-Term Control Plan (LTCP) was completed in 2020 and included several projects that were completed, including replacing sewer lines on Tower Road and Orchard Street and disconnecting roof drains. A new LTCP was completed in 2024 that included projects to install new sewers on Church Street and Maple Park, rehabilitate sewer sections on Main Street and Elm Street, and continue disconnecting roof drains, these projects were completed in 2024 and 2025 respectively. Two events occurred recently during the July 2023 flooding, which caused CSO events throughout the state.

Richford - Aerated lagoon process of biological treatment used to achieve secondary treatment of domestic wastewater via two lagoons. Disinfection is achieved through a chlorination and dechlorination process. Richford is utilizing a cerium-based chemical to precipitate phosphorus and is working through system optimization issues. The Town is currently working on an aeration upgrade project funded through CWSRF loan that will result in sludge removal and improved effluent phosphorus loads.

Newport Town – The indirect treatment process is initiated in a 60,000-gallon septic tank. From the septic tank, effluent flows to the effluent filter tank and then the dosing siphon tank. In the dosing tank, effluent is stored until a specified volume is reached whereby it is then released to one of two sand filters. Within the sand filter beds is where the final effluent treatment is performed prior to distribution to the disposal fields. Ultimately, effluent is released to the groundwater and in turn Mud Creek. This facility has operated under Indirect Permit ID-9-0335 since October 12, 2021.

North Troy - utilizes an extended aeration process which is a modification of the conventional activated sludge treatment process and chlorine is used for disinfection. The treated sludge is pumped to drying beds and eventually the dried solids are landfilled.

Troy/Jay - WWTF consists of headworks with a mechanical fine screen and aerated grit chamber, two Sequencing Batch Reactors (SBRs) with a fine bubble aeration system, chemical precipitation with polyaluminum chloride for total phosphorus removal, and an ultraviolet light disinfection system. The sludge handling consists of an aerated sludge storage lagoon with a new mixer, centrifuge, and solar greenhouse for sludge dewatering/drying.

To ensure that all facilities are operating as efficiently as possible, all reissued wastewater discharge permits under the 2016 TMDL require facilities to develop a Phosphorus Optimization Plan (POP). The intent of these plans is for WWTFs to

maximize phosphorus removal efficiency by implementing optimization techniques that achieve phosphorus reductions using primarily existing facilities and equipment. Facilities are given 12 months following permit issuance to engage in optimization techniques for the removal of TP.

With support from the Lake Champlain Basin Program and grant funding from the EPA, DEC implemented a wastewater optimization and technical assistance project from 2018-2025. In addition to the POP, all permits require facilities' phosphorus discharge to be evaluated by the Agency Secretary relative to the 80% threshold after the optimization period and based on the prior 12 months. The 80% evaluation continues on a rolling 12-month basis thereafter. If a facility is at, or reaches, 80% of its annual mass limit, the permittee must develop a Phosphorus Elimination/Reduction Plan (PERP) to ensure that the facility will comply with its annual mass limit. Through the project, Richford received assistance with their Phosphorus Elimination and Reduction Plan (PERP), which concluded that the Town should proceed with a sludge removal project.

The 2018-2025 project supported important cost-effective WWTF optimization efforts to increase phosphorus removal at these facilities. To maintain this level of phosphorus removal, facilities need to maintain the stability of their operations through asset management. Funding was obtained from the Lake Champlain Basin Program and EPA to initiate a project in 2026 for asset management plan development at small facilities in the basin that are unlikely to have the municipal resources to establish and maintain asset management plans. These plans will lead to consistent and maintained phosphorus removal from the Lake Champlain watershed that is well below the wasteload allocation under the current TMDL.

Eliminating Combined Sewer Overflows

Occasionally, because of precipitation events that surpass the capacity of the sewer collection system, combined sewer overflows (CSOs) may occur. The Agency is working with communities to eliminate CSOs. Communities with CSOs have been issued §1272 orders directing them to prepare a Long-Term Control Plan (LTCP). A guidance document that provides additional detail beyond the existing EPA guidelines and the requirements of the CSO Rule is available and the LTCPs prepared by municipalities are evaluated against it. DEC works cooperatively with the communities to ensure that comprehensive plans with a high probability of success will be created.

The Village of Enosburg Falls is the only municipality in the Missisquoi Basin (see Table 13) with a collection system that includes CSOs. Richford eliminated its CSO noted in the 2016 TBP. Enosburg Falls prepared an updated CSO LTCP in 2024 and was

issued a new 1272 order in 2025 that includes deadlines for CSO abatement project implementation. Projects included in the order include installation of new sewers on Church Street and Maple Park which was completed in 2024, rehabilitating sewer sections on Main Street and Elm Street which was completed in 2025, and coordinating with private property owners to disconnect roof drains from the combined sewer. The roof drain disconnections have the potential to redirect a volume of water approximately equal to the existing CSO tank but present a significant funding and coordination challenge.

Technical and Financial Assistance

The DEC and partners assist municipalities in discharge permit compliance by providing access to funding and technical assistance. Vermont Water Investment Division provides technical support through the Design and Construction Engineering Section. Vermont provides financing assistance by way of loans and grants to support municipal WWTF and associated infrastructure upgrades through the Clean Water State Revolving Fund, Vermont Pollution Control State Revolving Fund, and the Vermont Engineering Planning Advance Program; and grants via the Vermont Pollution Control Grants and the Clean Water Fund (created via Act 64: the Vermont Clean Water Act). The US Department of Agriculture also provides loans via USDA Rural Development Water and Environmental Loans and Grants.
The DEC Wastewater Management Program works cooperatively with local organizations, such as Vermont Rural Water Association and Vermont Energy Investment Corporation, to facilitate technical assistance related to optimization of nutrient removal and energy efficiency at WWTF.

Soil Based Wastewater Disposal Systems (Septic Systems)

In Vermont's mostly rural landscape, the majority of wastewater is treated through soil-based wastewater disposal systems (septic systems). If not installed or maintained appropriately, wastewater may reach groundwater that enters surface waters or be discharged to surface waters.

The State of Vermont has regulatory jurisdiction over the design, permitting, and installation of all new wastewater systems and potable water supplies including septic systems. All new wastewater systems and potable water supplies under 6,499 gallons per day must obtain a Wastewater System and Potable Water Supply Permit.

Larger systems of 6,500 gallons per day and over are permitted through Vermont's Indirect Discharge Program, a NPDES permit. Indirect discharge systems are soil-based disposal systems, which also include primary treatment, and may include secondary or tertiary treatment levels depending on discharge requirements. Water quality related indirect discharges are monitored. Systems can be municipally or privately owned.

Financial and Technical Assistance

For residential systems under 6,449 gallons, state financial assistance is available to qualifying homeowners and homeowners associations for system upgrades. Technical assistance and education are provided by Town Health Officers, including investigating citizen concerns about failed septic systems.

The WSMD Lakes and Ponds Management and Protection Program and the Drinking Water and Groundwater Protection Division support outreach to homeowners during neighborhood gatherings organized by partners. At these wastewater workshops, homeowners learn about the options for a well-functioning on-site wastewater system and good maintenance practices for wastewater systems on lakeshores. Lakes in the basin that would benefit from wastewater workshops include Lake Carmi and Fairfield Pond. More information can be found at the Wastewater Workshop website.

Village Wastewater Solutions

Many historic villages do not have municipal treatment facilities. Closely spaced on-site septic systems adjacent to waterways can be the source of elevated levels of contamination. Failed or poorly functioning systems can contribute *E. coli* and other pathogens, phosphorus, or nitrogen to surface waters. Additionally, failed systems can cause cross-contamination of nearby drinking water wells.

Momentum has been growing in rural villages to explore options to deal with concerns about pollution from septic systems and the need for economic growth in village centers that is limited by the lack of centralized shared wastewater systems.

DEC provides direct funding and technical assistance to small communities without municipal treatment to help evaluate and plan for wastewater needs. It is anticipated there will be a steady demand by small communities for wastewater evaluations and planning in the coming years. Small lots and older on-site sewage systems, without municipal treatment infrastructure, re-development or the re-sale of property may require expensive upgrades. Another factor is the economic viability of small communities which cannot support commercial or residential growth due to the lack of wastewater treatment options. Alternative treatment systems are available to

communities not wishing to build large waste treatment facilities, including several advanced technologies for small community scale systems that have been approved for use in Vermont.

Resources available for assisting municipalities include the Clean Water State Revolving Fund and the Village Water and Wastewater Initiative grant funding. For Basin 6 towns seeking funding, see the draft Clean Water State Revolving Fund Project Priority List articulated in the draft FFY25/FFY26 "Intended Use Plan" as developed by the DEC Water Investment Division.

Assistance in planning for on-site systems as well as connections to existing sewer is also available through the Vermont Engineering Planning Advance Program. The loan program is available to municipalities without existing municipal water or sewer systems for conducting a feasibility study for community-based drinking water and/or wastewater solutions. Consulting engineers assess the town's needs and goals offering treatment options.

The Village Wastewater Solutions Initiative offers these resources for further information:

Organizing Village Wastewater Solutions

Wastewater Solutions for Vermont Communities

Building public support is also an important part of the planning process to ensure community acceptance and funding. A recent Vermont report identifies the need for significant commitments of time and money to build public support[5] In addition to the CWSRF planning fund, the Tactical Basin Support grant could provide additional fund to bring in community partners to assist with this aspect of the planning process.

Municipalities that have considered community systems and progress to date are listed below:

Montgomery

2020 funding from NBRC - Town of Montgomery Project: New centralized wastewater project serving the Village Center. Small lot sizes and existing old malfunctioning septic systems are an economic limitation to Montgomery. The project supports retaining and

[5] Leahy Institute for Rural Partnerships, "Advancing Municipal Wastewater Infrastructure Strategies for Building Public Support" by Chris Shaheen, Finley Selzer, Cam Winter | Summer 2025 |) Advancing Municipal Wastewater_FINAL.pdf.

development of jobs within the Town and new development of affordable housing. Construction is anticipated to start in 2026.

Greensboro

Greensboro's project's land was removed from consideration and this has been a major setback. The town has worked to form a new wastewater committee. The committee is working to find a suitable site.

Highgate

2025 grant NBRC -Spring Award to: Town of Highgate Project: NBRC funds will be used to construct a community wastewater system, enhancing infrastructure for residents, businesses, and public spaces in Highgate Center. Designed to treat 20,000 gallons per day, this project will support economic growth by enabling senior housing, a new public library, and increased business capacity. With engineering phases nearing completion, funding will support construction of the wastewater disposal field, pump stations, and sewer connections, ensuring long-term sustainability and community development. Location of Project: Franklin County (CD-01) Grant Amount: $1,000,000.00 Total Project Amount: $6,839,130.00

D. Natural Resources

Forests, lakes, ponds, rivers, floodplains, and wetlands are all examples of natural systems that provide continuing benefits both socially and ecologically. Natural resource restoration and protection projects help to prevent and reduce pollution, improve flood resiliency by mitigating flood hazards, enhance habitat function, and support Vermont's outdoor recreational opportunities. These projects are also the most economical and have a long-term benefit with little to no maintenance requirements. Vermont's Resilience Implementation Strategy includes these nature-based solution as one of the components of the framework for organizing climate resilience efforts and guiding action over time.

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While Agency regulatory programs protect natural resources, the Agency's also works to support landowner interest in natural resource protection and restoration and depends on partners to provide some of this assistance.

Water Infrastructure Sponsorship Program (WISPr)

The Water Infrastructure Sponsorship Program (WISPr) provides a funding source to support natural resource restoration and protection projects that have water quality benefits. This program provides municipalities with savings on their Step III Clean Water State Revolving Fund (CWSRF) loans when they support WISPr natural resource projects implemented by partner organizations or municipalities.

In Basin 6 , the Village of Swanton has an active Step III loan that is eligible to sponsor WISPr natural resource projects. The Town of Westfield and Village of North Troy have Step I loans and could be potential future sponsors. The Village of Swanton has agreed to sponsor WISPr natural resource projects within Swanton Town limits. Watershed partners in the area are working to develop WISPr natural resource projects which could be sponsored through this program.

Rivers

Many Vermont rivers are actively adjusting their shape, size, and course as they seek to re-establish equilibrium after centuries of human impacts. Equilibrium is the condition in which a persistent stream and floodplain shape is created by the processes associated with the inputs of water, sediment, and woody material from the watershed. When achieved at a watershed scale, equilibrium conditions are associated with minimal erosion, watershed storage of sediment, organic material and nutrients, and aquatic and riparian habitat diversity.

Human activities can disrupt equilibrium by changing watershed inputs to the channel, restricting flow in the stream channel or river corridor, or by changing the wood and sediment regime. Previous and ongoing channel management, floodplain and river corridor encroachment, watershed-wide land use and land cover changes have contributed to a loss of stream equilibrium state-wide.

Improving all forms of connectivity, upstream-to-downstream and river-to-floodplain, encourages river equilibrium. Enhanced connectivity will reduce sedimentation, a source of nutrients, and will help to achieve climate resilience by moderating excessive water.

The Agency manages toward equilibrium conditions using multiple statewide and municipal regulatory and financial incentive programs together with voluntary restoration and protection projects.

Municipal and State Regulatory Frameworks

ANR administers several regulatory programs that guide human activity within river corridors and streams.

- The River Management Program administers the Vermont Stream Alteration Rules to regulate activities that occur in or along streams like bank stabilization, wood or gravel removal, and bridge work.
- Activities in floodplains and river corridors may be regulated by municipalities through their enrollment in the National Flood Insurance Program, by the State through Act 250 land use permitting, or by the State through the River Corridor & Floodplain Protection Rule for activities exempt from municipal regulation.
- The Dam Safety Program administers the Vermont Dam Safety Rules to protect public safety and provide for the public good through the inventory, inspection, and evaluation of dams in the State.
- The Streamflow Protection Program oversees activities like surface water withdrawals, hydroelectric power generation, and flood control. Beginning in 2026, the program's understanding of the extent and magnitude of surface water withdrawals will be enhanced through user reporting of withdrawal data (Act 135). This data supports the program's work to remediate flow altered waters (see Basin 6 Assessment Report). For hydroelectric facilities, the Agency's regulatory oversight includes certification pursuant to Section 401 of the federal Clean Water for FERC-regulated facilities, or for State-owned generating facilities, Act 161 of 2018. Hydroelectric dams and their current licensing status are described in the Basin 6 Assessment Report

While most of these regulatory programs are enacted by the State, watershed partners can support municipalities in strengthening floodplain and river corridor protections as described below. Additionally, in response to a recent history of catastrophic flooding events, the Vermont Legislature passed Act 121 (the Vermont Flood Safety Act). Act 121 will introduce new statewide regulations and protections regarding river corridors, dams, and wetlands. Key updates to Act 121, especially as they relate to tactical basin planning, are provided below.

Flood Safety Act (121) Updates

The Flood Safety Act (Act 121) was enacted in 2024 after widespread flood damage in 2023. By using a watershed-wide approach to mitigating flood risk across the state, the

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Flood Safety Act will build statewide flood resilience, protect public safety, prevent further damage to homes and infrastructure, and lessen the cost-burden of flood damage on municipalities and individuals. The Rivers Program maintains a Flood Safety Act website providing updated information on the Act, frequently asked questions, and an opportunity for the public to comment on the Act.

Further recommendations to increase flood resiliency across Vermont include:

- Seek to make permanent the Flood Resilient Communities Fund (FRCF) that was created through an ARPA funding allocation in 2021 and has been a successful flood mitigation program. Additionally, evaluate expanding eligibility for the FRCF program to maximize the impact of federal hazard mitigation funding and coordinate flood resilience work at the statewide level across state agencies.
- Consider additional conservation practices and incentives for agricultural lands that are in river corridors and low-lying floodplains that would increase their abilities to provide ecosystem services in major flood events.
- Increase funding for private property buyouts and slope stability mitigation to protect public health and safety and build longer term flood resilience.

The Flood Safety Act reduces flood risk and vulnerability to flood damage through:

- Establishing state regulation of proposed development in mapped river corridors.
- Requiring stronger municipal floodplain management standards for no adverse impact.
- Increasing floodwater storage by establishing a “net gain” rule of 2:1 for wetland restoration to wetland loss.
- Improving dam safety through increased oversight and maintenance requirements and enabling the removal of dams that are a public safety risk.

Recent accomplishments by the state programs that implement these actions within river settings include enabling the Unsafe Dam State Revolving Loan Fund; onboarding staff and establishing partner relationships to begin statewide corridor mapping, technical guidance development, and Act-related education and outreach activities; piloting the development of corridor in-fill methods.

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The Flood Safety Act also requires that tactical basin planning identifies opportunities to mitigate impacts of severe precipitation events on communities through implementation of nature-based restoration projects or practices that increase flood water attenuation and storage. Nature-based practices that achieve flood resilience goals often overlap water quality practices and include protecting and restoring streamside forests, floodplains, and wetlands; removing disused dams and other obstructions in the river corridor or stream channel; and upsizing culverts that constrain the passage of water, sediment, and wood. As further described in the voluntary opportunities section below and highlighted as a strategy in the implementation table, DEC will continue to coordinate with partners to identify and prioritize such nature-based practices based on their multiple co-benefits.

All Vermont towns are susceptible to the impacts of flood damage caused by both inundation and especially fluvial erosion and therefore should be supported in building long term flood resilience within and beyond Act 121. Partners and DEC staff should continue to coordinate as new information and resources to prioritize flood mitigation efforts emerge.

Emergency Relief and Assistance Fund

Financial incentives for municipalities are established through the Emergency Relief and Assistance Fund (ERAF) to encourage the adoption and enforcement of zoning bylaws that protect river corridors, shorelands, and buffers. To qualify, communities must adopt a suite of mitigation activities such as:

- participating in the National Flood Insurance Program,
- adopting Town Road and Bridge Standards
- approving a Local Emergency Management Plan each year
- adopting a FEMA-approved Local Hazard Mitigation Plan
- protecting river corridors or flood hazard areas from new encroachments through local bylaws
- participating in the FEMA Community Rating System

Municipalities that adopt these measures become eligible for ERAF, which provides State matching funds for Federal Public Assistance after federally declared disasters. The level of State funding depends on the number and type of mitigation activities adopted above.

Currently 3 communities in the basin have already adopted protections for River Corridors (Enosburg Falls Village, Fairfield, and Montgomery) allowing those

communities to maximize financial support under the Emergency Relief and Assistance Fund after a federally declared disaster. Detailed information on municipal protections can be found at Flood Ready Vermont.

Regional Planning Commissions and ANR can provide resources and assistance to accomplish the mitigation activities and increase towns' match rates, such as by providing model language for bylaw updates or by updating Local Hazard Mitigation Plans.

FEMA Mapping Updates and Flood Hazard Area Bylaws

The Federal Emergency Management Agency (FEMA) is currently updating the Flood Insurance Rate Maps in Vermont for the National Flood Insurance Program. Flood Insurance Rate Maps are the basis of floodplain regulations and the National Flood Insurance Program. When the new maps go into effect, FEMA requires that town bylaws meet current standards for participation in the National Flood Insurance Program.

Work maps have been reviewed by town officials. Preliminary maps are anticipated in the spring of 2026 and will be posted on the Flood Ready Atlas: bit.ly/floodatlas

Most town bylaws will need to be updated to meet or exceed the standards for the National Flood Insurance Program before the Prep Deadline – now estimated to be in spring 2027. bit.ly/fema-map-update. If regulations are not adopted by then, the residents and business owners of that municipality will no longer be able to obtain flood insurance through the NFIP.

In preparation for these map updates, DEC is supporting Regional Planning Commissions, with financial and technical support from DEC's floodplain managers, to provide targeted outreach to towns to support their timely adoption of flood hazard bylaws that meet FEMA's standards. Planners at Northwest Regional Planning Commision are working with municipal officials, and VT DEC floodplain managers, to support bylaw updates.

As additional support DEC has provided a model bylaw that meets or exceeds the National Flood Insurance Program requirements, addresses river corridors consistent with Act 250 review, and ensures municipal eligibility for the maximum amount from the Emergency Relief and Assistance Fund. Three basin 6 communities have already completed their bylaws ahead of the Prep deadline

The Northeastern Vermont Development Association (NVDA) has developed a flood hazard regulation review checklist and reviewed municipal bylaws for towns in the

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Upper Connecticut River Basin that participate in the NFIP program. Based on this checklist review some communities have minimal updates, while other communities have not updated by-laws for many years, and in these cases, bylaws may require more extensive updates to remain compliant with the minimum NFIP standards as part of the map update process. With funding support from ANR, regional planning commissions will target municipalities needing updates for outreach and technical assistance.

Voluntary River Restoration and Protection Opportunities

When issues or opportunities fall outside the scope of regulatory action, the Agency supports river restoration and protection practices that account for the natural dynamics of rivers and promote their gradual return to equilibrium. Effective non-regulatory projects begin with river corridor planning. The following sections describe the planning process and commonly used practices. See the Report Card (Appendix A) in the Clean Water Initiative 2025 Performance Report for a summary of projects implemented since the 2021 plan.

River Corridor Plans

A River Corridor Plan (RCP) is a synthesis of the physical data collected during Phase I and II Stream Geomorphic Assessments (SGAs). These plans identify causes of channel instability and make recommendations for restoration and protection projects. All SGAs and RCPs can be found at: Stream Geomorphic Assessment Final Reports and are linked in Table 5.

Table 5. Stream Geomorphic Assessments

Date	Stream Reach	Sub Watershed	Title [6]	Priority Actions for TBP
12/01/2005	Wanzer Brook	Black Creek Head	Wanzer Brook Watershed Phase 2	Protect, riparian buffer planting
4/01/2009	Black Creek	Black Creek Mouth	Black Creek Corridor Plan	Riparian buffer planting, protect floodplain access, reduce sediment input from upland sources (cropland)

[6] Stream Geomorphic Assessment ~ Final Reports

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Date	Stream Reach	Sub Watershed	Title [6]	Priority Actions for TBP
4/01/2008	Hungerford Brook	Hungerford Brook	Hungerford Brook Corridor Plan	Restore hydrology: restore floodplain and wetlands
10/01/2006	Hungerford Brook	Hungerford Brook	Hungerford Brook Phase 2 Report	See above
3/01/2008	Missisquoi	Missisquoi - Canada to Trout	Missisquoi River Mainstem Phase 2	Riparian buffer protection, control urban stormwater
1/26/2007	Rock River	Rock River	Rock River Phase 2 Report	Restore floodplain and wetland, reduce sediment input from upland sources (cropland)
Expected 2023	Rock River (Canada)	Rock River	Rock River Phase 2 Update and Phase 2 report for Canada	
4/01/2007	Trout River Watershed Towns of Berkshire, Enosburg, Richford,Montgomery	Trout River Head	Trout River Watershed Phase 2	Increase woody riparian buffer, control sediment from upland sources (roads), protect river corridors
3/01/2007	Tyler Branch	Tyler Branch	Tyler Branch Corridor Plan	Increase woody riparian buffer, Protect, or increase areas for attenuation of sediment; control sediment from upland sources
6/02/2009	Tyler Branch	Tyler Branch	Tyler Branch Corridor Plan	See above
3/27/2008	Missisquoi Mainstem, Jay Branch, Mud Creek	Upper Missisquoi	Missisquoi Mainstem, Jay Branch, Mud Creek Phase 2	Reduce sediment and stormwater inputs from upland sources. Protect river corridor in upper Missisquoi.
9/30/2011	Upper Missisquoi	Upper Missisquoi	Upper Missisquoi River Corridor Plan	Allow channel to regain planform by protecting river corridor. Increase woody riparian buffer.
2020/2021	Marsh Brook	Pike River	Marsh Brook Stream walk – Phase 2 lite	Protection and crossing enhancement
2024	Pike River Main stem	Pike River	Pike River Phase 2 on US and Canadian side	

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Where funding, local support, and interest exists, priority projects and objectives identified in RCPs and SGAs should be pursued, see Table 5. SGAs or RCPs have not been completed on some stream segments and where they have been completed many of these are outdated and require updated field assessments due to significant floods and expected geomorphic change. The Planner and partners coordinate with the Rivers Program to prioritize sub-watersheds for SGA where previous assessments don't exist .

River Corridor and Wetland Easements

Through its River Corridor and Wetlands Easement Program, the Rivers Program promotes the protection of river corridors as the primary voluntary tool to restore stream equilibrium. This program provides financial incentives to landowners who allow for passive restoration of channel stability, enabling natural river processes to shape the channel into its least erosive form over time. Through an easement, landowners sell their river channel management rights within the meander belt width corridor of sensitive and erosive streams along with associated wetlands.

Priority is given to projects identified in river corridor plans that protect or restore areas for flow, sediment, and nutrient attenuation. Priority areas for exploring potential for a RCE with landowners include neighboring properties of existing easements. The Upper Missisquoi, Trout Rivers and Tyler Branch are good candidates because of disequilibrium (high level of sensitivity and incision rates). Soils are also not as cohesive as in other areas, allowing for stream channel movement over a shorter time-period than in areas with finer soils. Providing protection to the river corridor through property easement will support the movement of these streams towards an appropriate planform over time.

Technical assistance is available through the River Corridor and Wetland Easement Program webpage. In 2025 the Rivers Program released additional guidance and mapping for partners interested in scoping and developing easement projects.

Riparian Buffers

Riparian buffers filter pollutants from upland runoff, provide shoreland and shallow-water habitat, stabilize streambanks, slow overbank streamflow, and increase lake and river aesthetics. Partners have implemented projects to restore buffers where landowners express interest but significant opportunities for riparian buffer plantings remain. Technical resources available to Vermont partners are listed in the Watershed Forestry Partnership's online library. One of the most significant challenges is managing invasive species before and after planting to ensure the long-term project success of the

planting. The MRBA is currently supporting projects to remove Japanese knotweed, a terrestrial invasive using community volunteers.

Floodplain Reconnection

Over time, human activities have disconnected rivers from their floodplains through physical encroachments and land uses that lowered the streambeds relative to their adjacent floodplain. Restoration practices can re-establish vertical and lateral connection of a river channel to its floodplain. Depending on local conditions, approaches may include removing historic streamside berms installed during channel dredging and straightening, excavating floodplain sediments to lower floodplain elevation, or installing in-channel structures that trap coarse sediment and gradually raise streambeds. These are generally large projects that require significant design, permitting, and construction with heavy equipment. Potential reconnection sites are identified through River Corridor Plans.

In Vermont, practitioners are also adopting low-tech restoration approaches that are less costly, rely on on-site materials, require simpler designs, and can be installed without heavy machinery. Much of this work focuses on adding large wood to streams, which has been depleted due to historic river channel and riparian management as well as the long-term absence of beaver populations. When appropriately sited, practices such as strategic wood addition, beaver dam analogs, and post-assisted log structures can initiate stream channel evolution toward more complex, connected, resilient conditions.

Viable lLTPB projects may be identified basin-wide by targeting initial field assessments on streams that adhere to the general stream slope and width recommendations of the Vermont Rivers Program's Policy on Wood and Structure Addition as a Restoration Strategy and the FWD's Strategic Wood Addition Handbook. Partners should consult with the Rivers Program and Vermont Fish and Wildlife early in project development to assess suitability.

The Franklin County NRCD has been actively working to apply low tech process-based restoration techniques where smaller streams have been straightened or ditched. These projects have the potential to restore wetland and floodplain habitats that are critical to maintaining water quality and supporting fish and wildlife.

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Stream Crossings (Aquatic Organism Passage Workgroup)

Properly sized and installed bridges and culverts are essential for protecting water quality, maintaining fish and wildlife passage, and reducing flood impacts. Undersized or poorly designed structures can cause erosion, scouring, and infrastructure damage. However, most existing crossings were constructed before modern design standards accounted for sediment transport, streamflow needs, and changing climate, especially more frequent and intense flooding.

While the Stream Alteration Permit sets design requirements for new, repaired, and replaced crossings, thousands of older structures remain that could be upgraded to improve water quality, habitat connectivity, and flood resilience. There are several projects that have already been completed over the last planning cycle but many more opportunities across the basin. The US Fish and Wildlife Service has collaborated with partners in the Missisquoi River region, including DFW, Upper Missisquoi Wild and Scenic, MRBA, NRPC and the FCNRCD and OCNRCD to address AOP. In 2022, OCNRCD and DFW identified and designed 8 culvert upgrades in Westfield, Lowell and Jay. The NRPC and DFW identified and designed 5 culvert upgrades in Montgomery, Richford and Bakersfield. These groups continue to target projects with multiple co-benefits given the high cost of upgrades and the cost share opportunities among fish, transportation, and water quality-focused funding programs.

Dam Removal

Dam removal is a priority basin-wide where it can restore stream equilibrium, improve habitat and fish passage, enhance flood resilience, and reduce public safety risks. Opportunities for dam removal continue to grow as aging and deteriorating dams pose increasing liability and safety concerns.
Dam owners are encouraged to contact the Vermont Dam Safety Program and their Watershed Planner if they are interested in discussing dam removal.

The basin includes 29 known dams of different types, sizes, and co. There are likely many more that have not been documented. Of the 29 inventoried dams, 23 are in-service, 3 are fully breached, 3 are partially breached, and 2 have been removed. Only 1 of 29 inventoried dams are considered a high or significant hazard, indicating that either direct loss of life is probable from an incident, uncontrolled release, or dam failure (high hazard) or that major property losses, disruption of critical services, and environmental losses are probable (significant hazard). Additional dam information can be found in Appendix X and the Vermont Dam Inventory. (also ANR GIS open data Dams | VTANR Open Data>

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Recently completed or in progress dam removals include Trout River dam, Berkshire, on a Missisquoi River tributary, and Johnson Mills, Brogue Branch, all by the FCNRCD and Mud Pond, aka Sleepers Pond by MRBA.

Statewide, the Vermont Dam Task Force is an interdisciplinary team of natural resource professionals that collaborate to share and investigate current dam removal protocols, watershed science, funding, and dam removal opportunities. Coordinated by the Vermont natural Resource Council with LCBP funding, the group meets bi-monthly to collaborate on projects and maintains a list of priority dams in the state for removal. The Nature Conservancy also provides statewide support, including the 2023 publication of the Scaling Up Dam Removal Guide.

This plan recommends that the remaining dams of Appendix A are prioritized for scoping to determine the need for, feasibility of, and owner interest in removal. Wetland protection is required as part of dam removals. The Wetlands Program prefers prioritizing dams on high gradient streams like the Bakersfields dam removal where a braided stream is reverted to a wetland forest. In contrast, a dam removal along a flatter stretch of stream that protects peatland, like the Fairfield dam would need to protect the peatland.

Fish Communities and Habitat

Fish populations in the basin are threatened by barriers, thermal modification, loss of naturally vegetated riparian areas, and a lack of instream woody habitat. The Fish and Wildlife Department's state-level population and habitat management objectives and strategies are available in the 2018 VT Management Plan for Brook, Brown, and Rainbow Trout.

NOAA's fisheries program states that "dam removal and fish passage improvement efforts will go a long way toward restoring these sea-run fish populations" and "improving and adding fish passage at the three [FERC] licensed dams, along with the previous dam removals, will allow fish to reach 43 river miles of high-quality upriver spawning and rearing habitat to many species of sea-run fish, including American shad."[1]

Longitudinal stream temperature studies by VDFW has noted that groundwater coming from wetlands and forested seeps is critical for maintaining cold water and base river flows protecting fisheries, especially during drought conditions.

Restoration projects are ongoing through partnerships at the local, state, and federal levels. These include dam removals, culvert upgrades, in-stream habitat improvements,

and riparian protection and restoration- all of which provide co-benefits for flood mitigation, nutrient reduction, and habitat enhancement.

Lakes

A lake's physical characteristics are driven by its watershed size, topography, geology, soil fertility and erodibility, and vegetation. A lake's water quality is impacted by human activities, and the land uses on the immediate shoreland and farther up into the watershed. The loss of native vegetation along the shoreline, the locations of roads, the development pressures around the shoreline and along tributaries, and into the watershed, and activities such as agriculture and forestry all contribute to overall lake and pond health. All these activities impact how water moves across the landscape and ultimately into the lake and ponds.

Preventing and mitigating water quality degradation, preserving and enhancing lake habitat and shoreline stability and ensuring recreational uses of lakes and ponds are priorities for the Basin. Recommendations included are guided by data from the VT Inland Lakes Scorecard depicting the condition of lakes and ponds, along with input from the Lakes and Ponds Management Program and Basin stakeholders.

Protecting and Improving Lakeshore Condition

Shoreland disturbance contributes to degraded lake water quality and lakeshore habitat. The Shoreland Protection Act (Chapter 49A of Title 10, §1441 et seq.), regulates shoreland development within 250 feet of a lake's mean water level for all lakes greater than 10 acres in size. The intent of the Act is to prevent degradation of water quality in lakes, preserve habitat and natural stability of shorelines, and maintain the economic benefits of lakes and their shorelands. The Act seeks to balance good shoreland management and shoreland development. The Shoreland Best Management Practices guidance helps property owners protect and restore lakeshore properties. It is comprised of multiple Best Management Practice documents highlighting different shoreland management activities to improve water quality and the health of lakeshore habitat.

The Lake Wise Program encourages lakeshore owners to implement practices that improve and protect lake water quality conditions and habitat. A Lake Wise Award certifies a property is well managed, using shoreland Best Management Practices, and is maintained to protect the lake. Lake Wise assessments review shoreland practices for their benefit to water quality and wildlife habitat and suggest actions if improvements

are needed. Lakes with a Fair shoreland score will benefit from implementing Lake Wise Program best management practices.

Three lakes in the Basin are rated as having fair or poor shoreland habitat conditions on the VT Lake Scorecard and have substantial shoreland development. Both Fairfield Pond and Lake Carmi have Lake Watershed Action Plans or similar and have been a focus of Lake Wise assessments. Metcalf Pond would be a candidate for either of these with community interest. The Franklin County NRCD and Franklin Watershed Committee have supported work on Lake Carmi. The Friends of Northern Lake Champlain has conducted a LWAP on Fairfield Pond and is continuing work to support Lake Wise outreach.

Lake users interested in becoming involved in the health of their favorite lake or pond can find information on the VDEC Lakes and Ponds website as a first step to moving toward a healthier lake or pond.

Lake Watershed Action Plans

Lake Watershed Action Plans (LWAPs) are assessments to identify pollution sources in the lake watershed that result in water quality and habitat degradation. Vermont DEC LPMPP uses the following metrics to determine priority lakes for Lake Watershed Action Plans:

- increasing phosphorus trends,
- disturbed shoreline/watershed, and
- an engaged lake association or other watershed group.

Sources of data for these metrics include data from the Lake Scorecard, Next Generation Lake Assessments Reports (NGLA), Lake Wise, LaRosa Partnership Program tributary monitoring data and AIS program Engagement. LWAPs result in a prioritized list of projects and strategies to address the sources of pollution and habitat degradation identified in the assessment. The plan may also contain recommendations to preserve natural features and functions, encourage use of low impact green stormwater infrastructure, and maintain the aesthetic and recreational uses of lakes. In Basin 6, Lake Carmi is the only lake with sufficient data collection that shows a statistically significant increasing nutrients trends. Planning and project implementation is described on the DEC website for Lake Carmi. See Lake Carmi TMDL in Chapter 3 for additional information on progress.

The Fairfield Pond LWAP by the Friends of Northern Lake Champlain Essex County NRCD has led to the identification of project that will be considered for implementation by the group.

No lakes in basin have had LPMPP's NGLAs (see NGLA Reports.) This survey is intended to provide a snapshot of the lake's water quality, aquatic habitat potential, and physical conditions which, when assessed along with long- data, provide an understanding of a lake's ability to support recreational and habitat uses and identify principal stressors to a lake's water quality. Data collected from NGLA's can help to inform future LWAPs and create a baseline for assessing the watershed. They may also help identify priority catchments within a lake watershed for project identification, outreach, and development without needing a full LWAP process.

Cyanobacteria

Cyanobacteria, also known as blue-green algae, are naturally found in fresh water in the U.S., and Vermont waters. Cyanobacteria grow well in water that has high amounts of nutrients like phosphorous and nitrogen. Cyanobacteria can multiply quickly to form surface scums and dense populations known as blooms, especially during the warm days of late summer and early fall. Some types of cyanobacteria can release natural toxins(called cyanotoxins) into the water, especially when they die and break down.

The LPMPP and the VT Department of Health, work with trained volunteers to monitor the frequency and magnitude of cyanobacteria blooms and assess spatial and temporal trends in bloom occurrence. Volunteer monitors, along with staff from the Vermont Department of Health and LPMPP, file weekly online reports that are then displayed on the Cyanobacteria Tracker Map. The program helps citizens, and health, environmental, and recreational officials, assess the safety of our beaches and waters. It also provides important data to better understand when and why blooms occur. No consistent cyanobacteria monitoring is in place in the Basin however, blooms have been documented on Basin lakes. Annual reports on long-term chemical and biological monitoring programs including cyanobacteria blooms are available on the DEC LPMPP website.

Preventing Aquatic Invasive Species

Aquatic invasive species (AIS) can affect water quality by degrading shoreline habitat, generating imbalance in lake food webs, and altering chemical and physical factors important to aquatic systems (e.g., hydrology, nutrient transport, and oxygen concentration). Populations of AIS are present in Metcalf Pond, Fairfield Swamp, Fairfield Pond, Bullis Pond and Lake Carmi, including Eurasian watermilfoil for all but Bullis Pond. The complete list of AIS for each waterbody can be found on their lake scorecard under "lake information" in the Vermont Lake Data site as well as the WSMD AIS map. Additional aquatic invasive species populations may exist but have not been confirmed with recent lake surveys.

New AIS introductions occur mainly in waterbodies that have launch sites for watercraft, are near infested waters, and lack spread prevention programs. Incoming boats from AIS infested waters are a high risk for introducing AIS in and on motors, propellers, trailers, ballast tanks and other boating equipment. Vermont Fish and Wildlife Department (FWD) manages seventeen lake access areas in the basin. The VT Public Access Greeter Program, Vermont Invasive Patrollers, and Vermont Invasive Patrollers for Animals, are spread prevention programs that incorporate AIS identification training, surveying and monitoring, watercraft inspection, and decontamination programs. VT Public Access Greeter Programs are supported by DEC's Aquatic Nuisance Control Grant-in-aid funding. Greeters interact with boaters at boat access areas, inspect watercraft, identify and remove any suspicious matter, and collect and report AIS data. Greeters also distribute educational material about aquatic invasive species. Vermont Invasive Patrollers Program trainings are offered on an annual basis.

The Aquatic Nuisance Control Grant-in-aid Program provides financial assistance to municipalities and agencies of the state for aquatic invasive and nuisance species management programs. A map of active greeter and control efforts is available online.

Wetlands

Wetlands cover at least thirteen percent of the Basin and are important for safeguarding many of its high-quality surface waters. As recently as the 1980s, wetlands were seen as obstacles to development, agriculture, and transportation, and consequently, were systematically drained and altered. These losses and alterations diminish the important ecosystem services provided by wetlands such as sediment and nutrient attenuation, wildlife habitat, and flood water storage. Protecting the remaining wetland resources is an important strategy in the basin. Additionally, restoring degraded wetlands is essential to improving water quality. Wetland conservation and restoration and identifying sites with the greatest potential for improving water quality are priority recommendations.

Wetland Assessment and Protection

The Wetlands Program regulates wetlands in accordance with the Wetlands Rules which are focused on protecting wetland functions and values. The Program also monitors and assesses wetland conditions. The Program relies on wetland mapping to help preliminarily identify the locations of regulated wetlands (Class II and Class I). Enhanced wetland mapping is being developed but Current maps can be found at Wetland Inventory Map.

Wetland mapping update

The Wetlands Inventory Map is a web-based mapping tool designed to help the public research wetland locations and features. The tool shows known wetland areas on the Vermont Significant Wetlands Inventory (VSWI), as well as wetland indicators including hydric soils, flood hazard zones, standing water, and vernal pools. The Wetland Screening Tool can be used as a guide to interpret mapping on specific properties.

A complete overhaul of the VSWI is underway, and improved mapping of the Missisquoi basin occurred in 2023. The entire state is anticipated to be available by the end of 2026. Until then a draft interactive map of the revised National Wetlands Inventory (NWI) is available.

The DEC now has wetland function predictions in each Basin in Vermont using National Wetlands Inventory (NWI) mapping and codes. Wetland functions refer to a process or series of processes that happen within a wetland (flood storage etc). In performing a Wetland Functional Assessment, the NWI codes are correlated to established wetland functions. Wetland Functional Assessments (WFAs) are valuable to resource managers, local stakeholders, tribal governments, and the general public. The power of this type of WFA is its allowance for landscape-level coverage where site visits are not possible due to access, time, or funding. WFAs can provide a more targeted approach for landscape managers. Although this type of WFA is valuable it does not replace site visits that may more definitively identify the likelihood of a particular function at a specific time and location. A statewide interactive map of wetland functions will be made available by 2027. The public may access it from the Wetlands Program Mapping webpage when it is completed.

Wetland Restoration

Wetland restoration is the process of returning a degraded wetland to an approximation of its pre-disturbance condition. The United States lost over half of its wetlands through ditching and filling between 1780 and 1980, and Vermont has lost as much as 35 percent. While conservation and protection of wetlands are critical for preventing continued loss of remaining intact wetlands, wetland restoration is essential for rehabilitating those that have historically been degraded or lost. The Wetlands Program recently published a Wetland Restoration Manual, a how-to manual for designing and implementing voluntary wetland restoration projects in Vermont.

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Clean water goals for wetland restoration include assessing areas of degraded and prior converted wetlands and areas of hydric soils for restoration potential and implementing restoration as sites and opportunities are identified. This plan recommends that wetland restoration and conservation be explored where water pollution reduction and flood protection would benefit most from wetland restoration. For this basin the most extensive opportunities for restoration are along the Missisquoi River as well as smaller tributaries or drainages as they reach the Missisquoi River Floodplain. Areas with high phosphorus concentrations in soils should have those concentrations reduced with appropriate agronomic and NMP practices before restored to reduce phosphorus loading. High elevation forested seep wetlands where soils include a sand/clay interface may include opportunities for restoration as well as protection. In these areas, concentrated flows from trails or roads should be managed to avoid gullying within the wetland.

Wetlands can also be protected through easements or other conservation programs that restrict certain uses within the easement area. Such conservation programs include the Farm Service Agency's Conservation Reserve Program, Natural Resource Conservation Service's Wetland Reserve Easement program, and Vermont's River Corridor Easement program. For the latter, VT Wetlands and Rivers Programs have developed a template so that river corridor easement footprints can be readily expanded to protect wetlands adjacent to the river corridor. Identifying areas that are often missed as priority is an important part of protection as well. In northern Franklin county, lake/peatland complexes could be included in the DFW nongame Natural Heritage database.

Wetland restoration and protection have the potential to reduce downstream nutrient loading, improve water quality, reduce flooding, enhance aquifer recharge, and mitigate climate change through carbon storage. In small headwater and lowland streams, growing interest among multiple partners in process-based restoration techniques like beaver dam analogues and stage zero floodplain restoration is also likely to enhance wetland restoration in the Basin.

Forests

Forest lands cover approximately 66% of the Basin and are the dominant land cover. As such, forests play a critical role in protecting high-quality surface waters. However, nutrient runoff can originate from forestlands, particularly where logging practices are

poorly managed or reflect legacy conditions. Reducing runoff and erosion from forested areas is essential to meeting the state's clean water goals.

Forest management activities provide multiple benefits, including maintaining healthy forest ecosystems, improving wildlife habitat, addressing non-native invasive species, supporting the working landscape economy, and remediating legacy road infrastructure. Improving the management and oversight of harvesting activities through adherence to Acceptable Management Practices, along with educational outreach and technical assistance for forest landowners and managers, are Basin priorities. Targeted funding to implement improvement practices will expand good stewardship and strengthen water quality protection.

Forestry AMPs and Skidder Bridge Programs

Acceptable Management Practices for Logging Jobs are scientifically proven methods designed for loggers, foresters, and landowners to prevent soil, petroleum products, and excessive logging slash from entering the waters of the State and to minimize the risks to water quality.

Stream crossings can significantly impact water quality if not properly designed and installed. These impacts can be minimized by ensuring that stream crossing structures are appropriately sized and correctly installed prior to operating logging equipment in or near streams. The Department of Forests, Parks, and Recreation (DFPR), in partnership with Natural Resources Conservation Districts, offers portable temporary bridge rental opportunities for use during timber harvests. These skidder bridges reduce sedimentation, channel alteration, and degradation of aquatic habitat, allowing timber harvest activities to comply with AMPs. When properly installed, used, and removed, skidder bridges provide greater protection to stream banks and streambeds than culverts or poled fords.

Skidder bridges are reusable, cost-effective, easy to install, and can be transported between job sites. Specifications for building skidder bridges are available in Temporary Wooden Skidder Bridges, and information on the bridge rental program is available in Temporary Bridge Rentals. Use of skidder bridges is recommended basin-wide, particularly on steep slopes and in areas with erodible soils adjacent to surface waters. The Franklin County NRCD supports a rental program for two skidder bridges they own.

Additional guidance is available from DFPR in the Vermont Voluntary Harvesting Guidelines to Protect Forest Health and Sustainability, and through support for local skidder bridge programs, and forest land conservation efforts.

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Use Value Appraisal Program & AMPs

Vermont's Use Value Appraisal Program (UVA) enables eligible private landowners who practice long-term forestry or agriculture to have their land appraised for tax purposes based on the property's value for the production of forest or agricultural products rather than on its residential or commercial development value. Compliance with UVA requires that the AMPs be employed to the maximum practicable extent. If AMPs are not employed on the UVA parcel resulting in a discharge, it may affect parcel eligibility in UVA and be a water quality violation.

While there is overlap between requirements of the AMPs and UVA, they should be viewed as distinct from each other. UVA allows forest land conservation through subcategories such as Reserve Forestland and Ecologically Significant Treatment Areas (ESTAs). to accelerate the development of old forest conditions and protect important natural communities, vernal pools, or rare species, while preserving working lands as the primary focus of the Managed Forestland category of the UVA program. More information is available on the UVA Reserve Forestland website. County Foresters are available for consultation when questions arise about UVA, AMPs, and other practices to protect water quality.

About % of the land in the basin (acres) is enrolled in Vermont's Use Value Appraisal Program (UVA) and/or owned by the State (Figure 12).

In Basin 6, 336 acres in UVA and of those Forest and wetlands make up ~78% of UVA acres, with ~19% in agriculture. The remaining area is spread among other land use at <1%.

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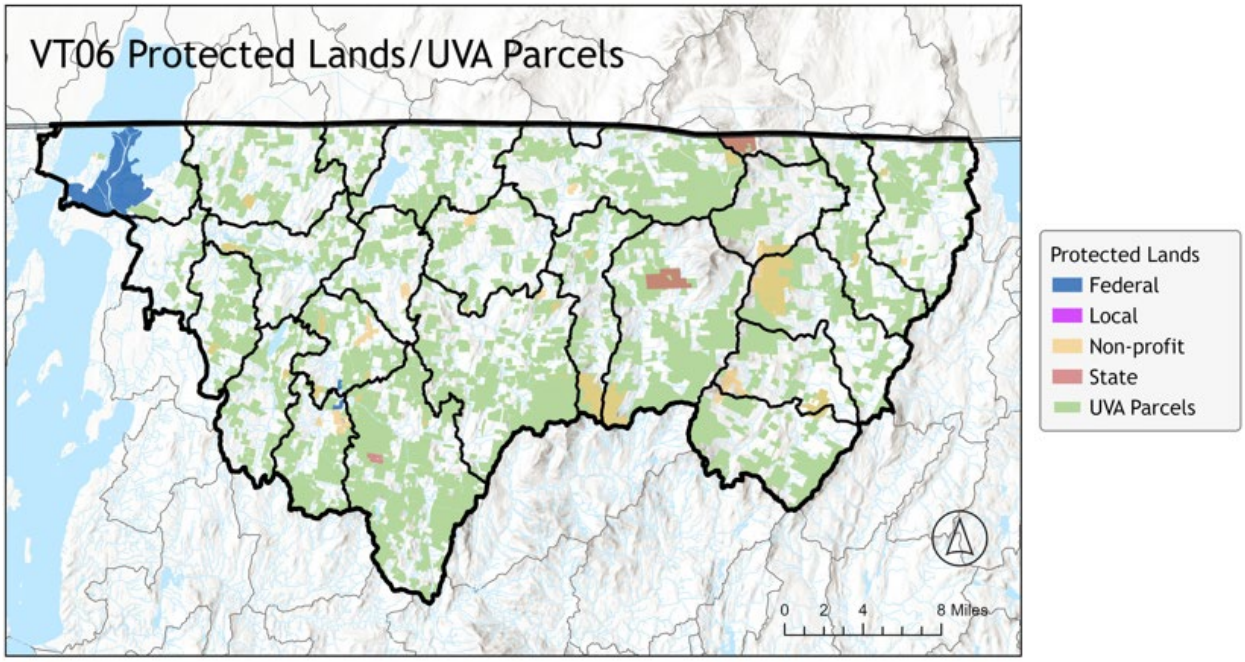

Figure 1. Protected Forest Lands in Basin 6.

Forest Road Assessments and Management

The Agency has assessed and is prioritizing erosion issues along hydrologically connected forest roads on ANR-owned lands to address through water quality restoration efforts.

The Agency has expanded this approach with the release of the Private Forest Road and Skid Trail Erosion Inventory that can be used to assess private forest roads and trails. A Private Forest Road and Skid Trail Erosion Inventory user manual and trainning are available online on the project tracking and accounting webpage. The downloadable app can be used to assess and prioritize forest road and trail segments in the field for restoration. The Agency can support basin partners to work with landowers to assess and address private forest road and trail water quality issues

Watershed Planning and Social Equity

Vermont's natural resources are held in trust for everyone and should be a source of inspiration and enjoyment for all. The Agency of Natural Resources is committed to

ensuring that everyone living in and visiting Vermont has meaningful access and equal opportunity to participate in Agency programs, services, and activities and that everyone feels safe and welcome on Vermont's public lands. The Agency's Office of Civil Rights and Environmental Justice, advances this mission.

ANR is committed to the work needed to engage our state's diverse population in shaping our shared work. As an Agency, we strive to be inclusive, both leading and supporting important work needed around diversity, equity, and inclusion – in our land management practices, in our environmental policies and permitting, and in ensuring our public processes are accessible, equitable and transparent.

Ensuring clean surface water for consumptive and recreational uses, ensuring fish caught in Vermont are safe for consumption, ensuring access to waters for all abilities and in all communities, providing open space availability in more densely populated areas and ensuring clean water projects are equitably implemented in all communities are areas where tactical basin planning can work toward equity and environmental justice.

Focus areas for the basin include:

- Clean surface water for consumptive and recreational uses
- Safe consumption of fish caught in Vermont for subsistence anglers
- Access to waters for recreation for all abilities and economic levels in all communities
- Equitable implementation of clean water projects in all communities, for example through explicit consideration of environmental justice in grant funding decisions.

For background information about health of the surface waters in the basin, see the Basin 6 Assessment Report_final.pdf

Chapter 5 – Implementation Table

A. Progress in the Basin

The 2021 Basin Plan identified 51 strategies to address protection and restoration of surface waters. Thirty-nine strategies (or 76%) have been implemented or are in progress by ANR and its watershed partners. The 2026 Report Card, posted online, provides the status for each strategy identified in the 2021 Plan. Several strategies will be carried over to this plan.

The TBP addresses all impaired and altered waters in the Basin as well as protection needs for high quality waters. The list of strategies in the Implementation Tables (Tables 6-13) and the Monitoring and Assessment Table posted online cover future assessment and monitoring needs, as well as projects that protect or restore waters and related education and outreach.

The process for identifying priority strategies is the result of a comprehensive review and compilation of internal ANR and external watershed partner monitoring and assessment data and reports. The monitoring and assessment reports include Stormwater Master Plans and stormwater mapping reports, Stream Geomorphic Assessments, River Corridor Plans, bridge and culvert assessments, Hazard Mitigation Plans, flood modeling, agricultural assessments, Road Erosion Inventories, biological and chemical monitoring, lake assessments, wetland assessments, fisheries assessments, natural communities and biological diversity mapping.

The Clean Water Initiative Program coordinates funding, tracking, and reporting of clean water efforts for state partners, (AAFM); Agency of Commerce and Community Development; Agency of Transportation (Vtrans), and other ANR Departments (FWD and FPR), and federal partners including the NRCS and the US Fish and Wildlife Service (USFWS), Partners for Fish and Wildlife Program.

The Water Investment Division's reporting on financial investments made and projects completed occurs annually. Progress made in addressing the strategies in this plan will be reported in the 2031 TBP and annually in CWIP Performance Reports.

B. Public Participation

Public input is key to the development of the TBP, and the strategies included in the Implementation Table. Public participation is sought throughout the planning process with guidance from the Watershed Planning Program Communication Plan.

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The Upper Connecticut River Tactical Basin plan was discussed at several public meetings to gather community input. These meetings were hosted by the Essex County NRCD, and by the Connecticut River Joint Commission Headwaters and Riverbend subcommittees. Additionally, Basin specific questions were included in an Essex County NRCD survey that was widely distributed across the basin.

Key concerns identified include, water quality of the Connecticut River, development pressure, road-related and stormwater runoff causing sediment discharge, flooding, and invasive species.

Recommendations offered by respondents include river restoration projects, riparian buffer plantings, expanding outreach and education efforts to the public and municipalities on water quality issues and restoration options, and working on flood mitigation.

C. Coordination of Watershed Partners

There are several active organizations undertaking watershed monitoring, assessment, protection, restoration, and education and outreach projects in the Basin in coordination with the Agency of Natural Resources. These partners are non-profit, private, municipal, state, federal, or other organizations working on both private and public lands. Partnerships are crucial in carrying out non- regulatory projects to improve water quality. The Franklin and Orleans County Natural Resources Conservation District (NRCD), USDA Natural Resource Conservation Service (NRCS), UVM Extension Service, US Fish and Wildlife Service (USFWS), AAFM, Vermont Agency of Transportation (VTrans), Vermont Land Trust (VLT), Vermont River Conservancy (VRC), The Nature Conservancy (TNC), Trout Unlimited (TU), Northwest Regional Planning Commission, the Northeastern Vermont Development Association (NVDA), Friends of Northern Lake Champlain and the Franklin Watershed Committee, and municipal governments and groups are active in:

- Providing outreach and education to local stakeholders, private landowners, and municipalities.
- Developing and implementing stream and floodplain protection and restoration projects (e.g., river corridor easements, tree plantings, culvert and bridge upgrades, dam removals, stream channel habitat restoration).
- Developing stormwater projects (e.g., SWMPs, road erosion inventories, implementation of town road BMPs).
- Working with farms in the basin developing and implementing BMPs for water quality.
- Monitoring water quality (e.g., lay monitoring program on lakes and rivers).

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The work necessary to meet water quality goals in this basin requires collaboration among all these groups to maximize the effectiveness of the watershed partners and the funding investments. Without funding and partners, little of this work would be possible. The Agency is grateful for the active engagement and long-term commitment of so many partner organizations and interested citizens.

D. Implementation Table

The Implementation Table (IT) (Tables 6 - 13) provides a list of 40 priority strategies created as the go-to implementation guide for watershed action. The Table provides specificity for where each strategy should focus by identifying priority sub-basins and towns. A list of related individual project entries is found in the online Watershed Projects Database (WPD). Projects in WPD vary in level of priority based on the strategies outlined in the table. All projects in WPD are not expected to be completed over the next five years, but each strategy listed is expected to be implemented and reported upon in future TBPs.

As projects are developed, priority for Clean Water funding is given to those projects that achieve the highest water quality benefits. Projects that provide cumulative benefits (i.e., flood resiliency, water quality improvement, water resource protection, aquatic organism passage) receive additional consideration for prioritization. The Vermont ANR relies on collaboration with partners and stakeholders to help carry out the strategies identified in the basin plan and achieve implementation priorities.

For background information about health of the surface waters in the basin, see the Basin 6 Assessment Report_final.pdf

Table 6. Agricultural Strategies. See Acronyms on page 84

Strategies	Priority Area	Partners	Funding
Reestablish meetings of the Caledonia and Essex agricultural workgroup to support the development of local funding pool applications and to guide BMPs, workshops and outreach efforts to address water quality issues.			TBPSG, AGCWIP
1. Provide technical support to farmers, including pre-sidedress nitrate testing (PSNT) and corn stalk nitrate testing (CSNT), to maintain and implement Nutrient Management Plans (NMPs) and support participation in AAFM Pay for Performance Program.			EQIP, CSP, AAFM, AGCWIP
2. Develop a list of locally available equipment necessary for BMP implementation and assist farmers in accessing this equipment through local rental programs, cost-shares, or cooperative applications to funding programs.			RCPP, AGCWIP, CEAP
3. Provide technical assistance and educational opportunities to support soil health and water quality improvements through Soil Health Assessments, the development and implementation of grazing plans, and pasture and hay land BMPs.			AGCWIP, EQIP, CSP, AAFM, PSWF
4. Identify farms with potential natural resource protection opportunities including floodplain restoration, river corridor protection, or wetland restoration and provide outreach and			TBPSG, AGCWIP, LISFF, Enhancement, AAFM, CREP

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Strategies	Priority Area	Partners	Funding
technical assistance to develop and implement potential projects.			
5. Initiate a discussion of agricultural partners and service providers on how to provide support to farmers to optimize nitrogen application to reduce nitrogen loss and maintain crop yields.			AGCWIP, LISFF, TBPSG

Table 7. Developed Lands - Stormwater Strategies. See Acronyms on page 84

Strategies	Priority Area	Partners	Funding
6. Complete a stormwater Master Plans.	Discuss interest with ANR		CWIP
7. Design and implement stormwater treatment practices identified in stormwater mapping reports and the Stormwater Master Plans.			CWIP, LISFF
8. Promote campaigns to raise awareness of simple residential stormwater management solutions.			TBPSG

Table 8. Developed Lands - Roads Strategies. See Acronyms on page 84

Strategies	Priority Area	Partners	Funding
9. Assist municipalities in updating REI inventories and prioritizing and implementing roads projects to meet the Municipal Roads General Permit (MRGP).	Basin Wide		TBPSG, BRP,
10. Provide support for towns in developing capital budget plans and applying for Better Roads grants and Grant-in-Aid funding to maximize the effectiveness of projects for improving water quality.	Wallace Pond, Miles Pond and Maidstone Lake Watersheds		TBPSG

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Strategies	Priority Area	Partners	Funding
Provide support to new road commissioners on MRGP requirements, completing REI's and updates and clean water funding opportunties to address road erosion issues.	Basin Wide		TBPSG
Host beaver baffle conflict training and provide technical assistance to towns to manage beaver road conflicts.	Basin Wide		VT Beaver Collective, TBPSG
11. Complete private road erosion inventories and address private road erosion issues that are identified	Wallace Pond, Miles Pond and Maidstone Lake Watersheds		Ag CWIP
12. Support municipal investment in technology to reduce use of salt, including ability to adjust salt distribution, measure pavement temperature and plows with multiple sort segments. 13.			

Table 9. Wastewater Strategies. See Acronyms on page 84

Strategies	Priority Area	Partners	Funding
14. Provide support and materials to lake communities to host Wastewater Workshops.			TBPSG

Table 10. Natural Resources – Lakes Strategies. See Acronyms on page 84

Strategies	Priority Area	Partners	Funding
15. Complete an LWAP for lakes with increasing nutrient trends.			CWIP

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Strategies	Priority Area	Partners	Funding
16. Complete Lake Wise assessments on priority lakes with fair to poor shoreland condition.			CWIP
17. Implement lakeshore restoration projects identified through LWAPs and Lake Wise assessments			CWIP
18. Complete outreach to lakeshore owners on lakeshore BMPs			CWIP, TBPSG
19. Complete private road and forest road assessments.			CWIP

Table 11. Natural Resources – Rivers Strategies. See Acronyms on page 84

Strategies	Priority Area	Partners	Funding
20. Complete Phase 2 SGA of streams prioritized by the DEC Stream Program			CWIP
21. Develop and prioritize potential floodplain restoration locations in the basin including areas where existing buffers can be expanded to restore functional floodplain or wetlands.			TBPSG, CWIP
22. Implement priority floodplain and wetland restoration projects.			TBPSG, CWIP
23. Establish and enhance riparian buffers.			AgCWIP, CWIP, TFS, LISFF

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Strategies	Priority Area	Partners	Funding
Support adoption of innovative approaches to enhance buffers by increasing speed and success of projects, addressing tree stock shortages, invasive species concerns, piloting direct seeding of tree and shrub species.			CWIP, LISFF
24. Develop and implement low tech, process-based restoration projects (e.g., strategic wood addition, beaver dam analogs, post-assisted log structures) to restore fluvial processes in small drainages.			CWIP, LISFF
25. Identify, develop and implement strategic wood addition projects on large private landownerships or where landowners are interested in fish habitat improvement, sediment storage and floodplain connection following ANR technical guidance.			CWIP
26. Remove obsolete dams in the watershed.			CWIP
27. Scope, design, and implement high priority culvert replacements prioritized by the Upper Connecticut River AOP work group.			CWIP, BRP, GIA, EBTJV, NFPP, Vtrans Structures grants.
28. Provide outreach to towns and assist them in adopting new FEMA flood maps using state model inundation bylaw or similarly protective language and consider state model river corridor bylaws.			TBPSG

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Strategies	Priority Area	Partners	Funding
29. Support recreational access to water resources through the establishment and maintenance of stable access areas, portage trails and river campsites.			CWIP, VOREC
Support a communcation effort on benefits of wetland and restoration projects.			TBPSG

Table 12. Natural Resources – Wetlands Strategies. See Acronyms on page 84

Strategies	Priority Area	Partners	Funding
30. Support outreach to local communities around updated wetland maps as these are finalized.			TBPSG, AgCWIP
31. Identify potential wetland restoration sites and support partner outreach to landowners to develop projects.			TBPSG, LCBP, CWIP
32. Design and implement priority wetland restoration projects in the watershed.			TBPSG, LCBP, CWIP
33. Increase local capacity for designing and implementing low tech wetland restoration projects.			TBPSG, LISFF

Table 13. Natural Resources – Forest Strategies. See Acronyms on page 84

Strategies	Priority Area	Partners	Funding
34. Provide education and technical support to landowners and loggers on AMPs to protect water quality.	Basin Wide	NRCDs	TBPSG, SLoCamp
35. Complete outreach to private landowers to identify properties with forest roads	Basin Wide	NRCDs,	TBPSG

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Strategies	Priority Area	Partners	Funding
and trails that would benefit from restoration practices.			
36. Complete forest road and trail erosion inventories on priority properties.	Basin Wide	NRCDs,	CWIP
37. Implement forest road and trail practices identified through inventories	Basin Wide	NRCDs,	CWIP, SLoCamp

List of Acronyms

604(b)	Federal Clean Water Act, Section 604b
A(1)	Class A(1) Water Management
A(2)	Class A(2) Water Management
AAFM	Agency of Agriculture, Food and Markets
AgCWIP	Agricultural Clean Water Initiative Grant Program
AIS	Aquatic Invasive Species
AMP	Acceptable Management Practice
ANR	Agency of Natural Resources
AOP	Aquatic Organism Passage
B(1)	Class B(1) Water Management
B(2)	Class B(2) Water Management
BMP	Best Management Practice
BRP	Better Roads Program
CEAP	Capital Equipment Assistance Program
CISMA	Cooperative Invasive Species Management Area
CREP	Conservation Reserve Enhancement Program
CWIP	Clean Water Initiative Program
CWSRF	Clean Water State Revolving Fund
DEC	Department of Environmental Conservation
EBTJV	Eastern Brook Trout Joint Venture
EQIP	Environmental Quality Incentive Program
ERAF	Emergency Relief and Assistance Fund

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FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FOVLAP	Federation of Vermont Lakes and Ponds
GIA	Grant in Aid Program
GIS	Geographic Information System
HUC	Hydrologic Unit Code
IDDE	Illicit Discharge Detection and Elimination
IUP	Intended Use Plan
LFO	Large Farm Operation
LiDAR	Light Detection and Ranging
LPMPP	Lakes and Ponds Management and Protection Program
LPP	LaRosa Partnership Program
MFO	Medium Farm Operation
MRGP	Municipal Roads General Permit
MS4	Municipal Separate Storm Sewer System
NFIP	National Flood Insurance Program
NFPP	National Fish Passage Program
NGLA	Next Generation Lake Assessments
NMP	Nutrient Management Plan
NFWF	National Fish and Wildlife Foundation
NOAA	National Oceanic and Atmospheric Administration
NOFA	Northeast Organic Farming Association of Vermont
NPDES	National Pollution Discharge Elimination System
NPS	Non-point source pollution
NRCC	Natural Resource Conservation Council
NRCD	Natural Resource Conservation District
NRCS	Natural Resources Conservation Service
ORW	Outstanding Resource Water
PCP	Phosphorus Control Plan
PFAS	Per- and Polyfluoroalkyl Substances
PFW	Partners for Fish and Wildlife
PSFW	Pasture and Surface Water Fencing Program
R,T&E	Rare, Threatened and Endangered Species
RAP	Required Agricultural Practice
RCWE	River Corridor and Wetland Easement
RCP	River Corridor Plan
RCPP	Regional Conservation Partnership Program
REI	Road Erosion Inventory

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RP	Rivers Program
RPC	Regional Planning Commission
SEP	Supplemental Environmental Program
SFO	Small Farm Operation
SGA	Stream Geomorphic Assessment
SHPO	State Historic Preservation Office
SWG	State Wildlife Grant
SWMP	Stormwater Master Plan
SWA	Strategic Wood Addition
TFS / T4S	Trees for Streams
TBP	Tactical Basin Plan
TBPSG	Tactical Basin Planning Support Grant
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TS4	Transportation Separate Storm Sewer System Permit
TU	Trout Unlimited
USACE	United States Army Corp of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UVA	Use Value Appraisal program, or Current Use Program
UVM Ext.	University of Vermont Extension
VACD	Vermont Association of Conservation Districts
VAPDA	Vermont Association for Planning and Development Agencies
VDFPR	Vermont Department of Forests, Parks and Recreation
VDHP	Vermont Department of Historic Preservation
VDOH	Vermont Department of Health
VEM	Vermont Emergency Management
VFW	Vermont Fish and Wildlife Department
VGS	Vermont Geological Survey
VIP	Vermont Invasive Patrollers
VLT	Vermont Land Trust
VNNHP	Vermont Nongame and Natural Heritage Program
VOREC	Vermont Outdoor Recreation Economic Collaborative
VRC	Vermont River Conservancy
VSA	Vermont Statutes Annotated

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VTrans	Vermont Agency of Transportation
VWQS	Water Quality Standards
WG	Watershed Grant
WID	Water Investment Division, VT DEC
WISPr	Water Infrastructure Sponsorship Program
WQS	Water Quality Standards
WSMD	Watershed Management Div., VT DEC
WUV	Watersheds United Vermont
WWTF	Wastewater Treatment Facilit

Table of Contents expected for the complete plan

Draft of Chapter 4 and 5 of the Missisquoi Bay Tactical Basin Plan for discussion with NWRPC 4/1/2026

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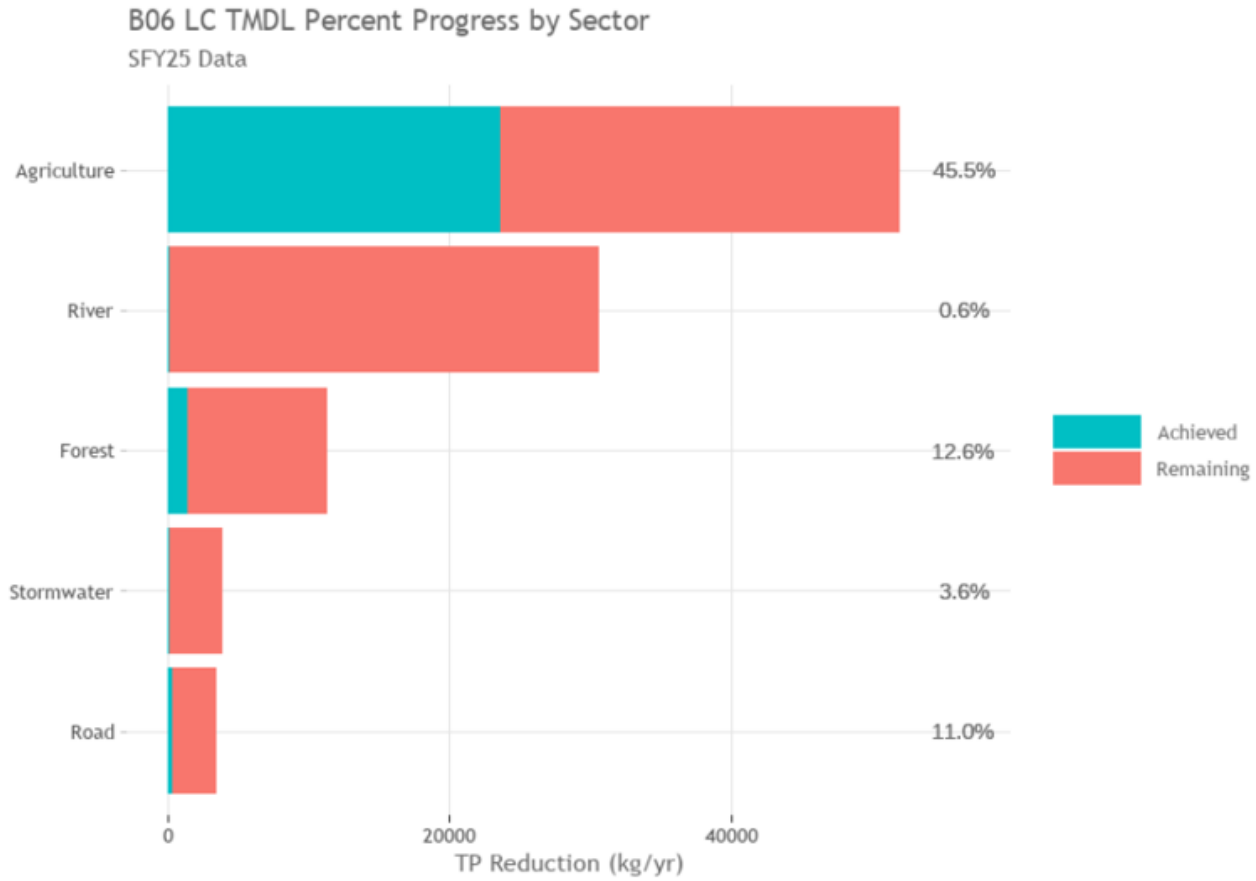
For background information about health of the surface waters in the basin, see the Basin 6 Assessment Report_final.pdf

Figure 1. Estimated TP reduction (kg/year) and remaining TMDL goal by general sector, Missisquoi tactical basin.



A. Agriculture

Agricultural land use makes up approximately 25% of the land cover in the Basin (Figure 16). The agricultural landscape in the Missisquoi Basin is managed predominantly by livestock and dairy operations to raise animals and grow corn and hay.

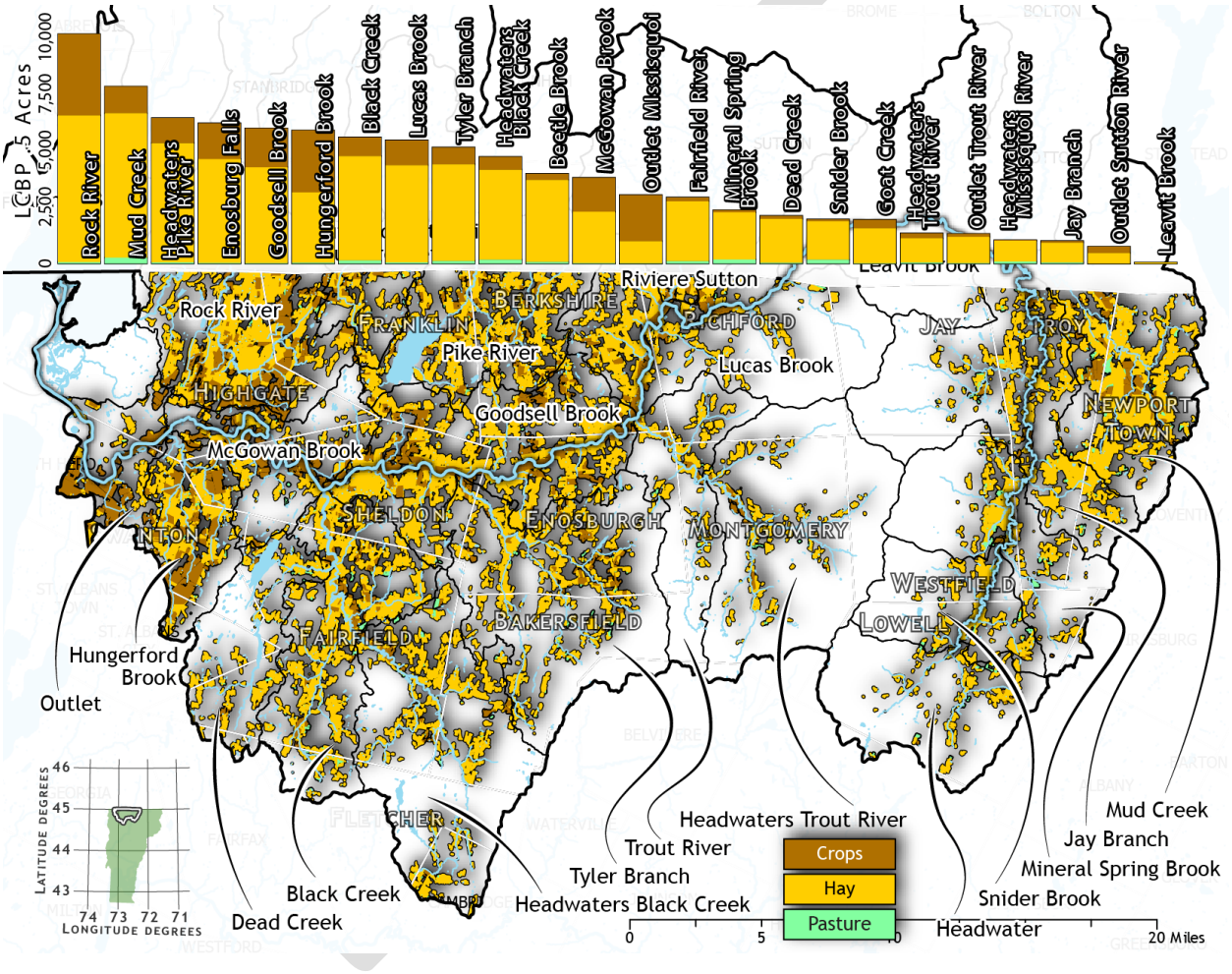


Figure 16. Agricultural Lands in the Missiquoi Bay Basin

Without proper management of fields and farmsteads, agricultural land use can be a source of nutrients, sediment, pathogens, and toxins to surface waters, and can also impact floodplain and riparian habitat. Improving the soil health of fields as well as managing application of nutrients through use of Agricultural Best Management Practices (BMPs) help address water quality concerns and protect surface waters.

Examples of field BMPs that improve soil health are reduced tillage and the use of cover crops to increase organic matter, reduce compaction, promote biological activity, and reduce erosion. On farmsteads, BMPs such as improved waste storage facilities, clean water diversions, and improved barnyard production areas can help reduce nutrient laden runoff to nearby surface waters.

The Agency and AAFM address agricultural water resource impairments by collaborating with federal, local, and regional partners to target agricultural BMP implementation in the watershed to achieve greatest pollutant load reduction for dollars spent.

Through state and federal cost share programs, cover crop adoption has resulted in the most P reduction in the Basin, followed by manure injection, conservation tillage and conservation crop rotation. Cover cropping and manure injection supported through State cost share programs cover the most acres.

The Phase 4 report for the LC P TMDL included in Chapter 3 provides a summary of those accomplishments in terms of progress towards meeting phosphorus reduction targets. This section will focus on success of programs towards facilitating the adoption of BMPs that led to reductions as well as expected improvements to programs.

Regulatory Programs

Vermont Agency of Agriculture, Food, and Markets (AAFM) regulatory programs play a significant role in protecting surface waters by setting required farm management practices to ensure environmental stewardship. In addition to the Required Agricultural Practices (RAPs), Vermont farms are regulated by additional sets of rules promulgated by the AAFM based on farm animal numbers (see Table 3) including

the Large Farm Operation (LFO) and Medium Farm Operations (MFO) and the Certified Small Farm Operations (CSFO) .The CSFO certification expands farm operation oversight and regular inspections to farms that meet the CSFO threshold. The adoption of the RAPs in 2017 also expanded requirements for Small Farm Operations (SFOs), although they do not need to certify. As of 2025, the AAFM has identified x agricultural operations ranging in size from SFOs to MFOs in the Basin that need to comply with the RAPs.

Table 3. Number of Farms by Size as of 2025 (Source: AAFM)

Farm size	Animal Units	Inspection Schedule	# Facilities / Operations
Large Farm Operation (LFO)	700 or greater mature dairy cows or equivalent	Annually	
Medium Farm Operation (MFO)	200-699 mature dairy cows or equivalent	Every 3 years	
Certified Small Farm Operation (CSFO)	50 -199 mature dairy cows or equivalent; or growing more than 50 acres of annual cropland; or growing more than 50 acres of vegetable	Every 7 years	
Small Farm Operation (SFO)	Operate 4 or more acres for farming; or annual gross income more than $2,000; or have filed a 1040(F)tax form once in the last 2 years	N/A	

Information regarding AAFM farm inspections, compliance, and enforcement actions can be reviewed on the AAFM Water Quality Division – Interactive Data Report.

Technical and Financial Assistance

Outreach, education, and technical assistance, and financial assistance are available for farmers to implement both field Best Management Practices (BMPs), such as cover cropping, crop rotation, and reduced tillage practices, and farmstead BMPs, such as waste storage facilities or clean water diversion practices. These agricultural assistance and outreach programs are essential tools in promoting BMPs that protect water quality, improve soil health, and increase farm viability.

Technical assistance throughout the Basin is provided by technical service providers and partner organizations including the Franklin and Orleans County Natural Resources Conservation Districts, UVM Extension, the USDA Natural Resources Conservation Service (NRCS), and the Farmers Watershed Alliance, all of whom promote the voluntary adoption of conservation practices. In addition, the Franklin and Grand Isle Farmers Watershed Alliance and Friends of Northen Lake Champlain support farmer-led discussions and collaboration to address gaps in funding and technical assistance. Partners have found that one-on-one assistance is most effective.

The Missisquoi Bay (Basin 6) TMDL Implementation 2026 Progress Report included as Appendix B in the Vermont Clean Water Initiative 2026 Performance Report describes the educational events and technical assistance provided by partners between SFY 2021 and 2025.

The AAFM assists with funding and coordinating agricultural partners throughout the watershed to streamline outreach to farmers where multiple resources may be available. One tool includes the Multi-Partner Agricultural Conservation Practice Tracking and Planning Geospatial Database (Partner Database).

Partner coordination is also supported by the Vermont Agricultural Water Quality Partnership (VAWQP). The coalition of state and federal organizations is dedicated to improving agricultural water quality in Vermont by coordinating partner efforts to provide education, technical and financial assistance to the farming community. The Partnership collaborates to strategically leverage unique resources, funding mechanisms, technical expertise, outreach techniques, and more.

Partner and resource coordination, like Franklin County Natural Resource Conservation District's Guide to Assistance for Agricultural Producers and Farm Teams model, play an important part in farm's accessing programs promoting BMP implementation.

Partners are also developing resources for new farmers, small-scale farmers, and under-served and marginalized farmers to improve equity in agricultural funding opportunities in the basin. The challenge is identifying and targeting them for outreach on available programs. A capacity building project to support diverse and new farming audiences, spearheaded by UVM Extension's New Farmer Project and the Women's Agricultural Network, is an example effort addressing this need via the participation of 24 agricultural service providers.

The Act 76 formula grant provides additional funding to address non-RAP farms or natural resource restoration and protection projects on agricultural land, see more about Clean Water Service Providers in the Lake Champlain P TMDL Phase 4 section. Non-RAP farms are generally farms that are less than 4-acres, or do not file a 1040(F), or make less than $2,000 annually from the sale of agricultural products.

In addition to providing or supporting technical assistance, the AAFM and NRCS provide financial assistance to farmers to implement BMPs. NRCS also supports a significant funding initiative to reduce the agricultural P loading within the Rock River and Hungerford Brook watershed. The National Water Quality Initiative (NWQI) receives prioritized financial assistance to direct funding to these watersheds.

Since the 2021 Missisquoi TBP, the agricultural community has implemented field BMP to achieve its interim phosphorus reduction target (see Lake Champlain P TMDL Phase 4 in Chapter 3 and the WID's online agricultural PowerBI). Most of the reduction is due to implementation of cover crop, manure injection, NMP and crop rotation.

The majority of the BMPs are associated with farms enrolled in the Vermont Pay for Performance Program (VPFP) The VPFP program is …. In 2022 – X PFP enrolled farms implemented field BMPs on 21300 acres in Basin 6. Enhanced precision application of manure to meet NMPs has also helped to reduce P loading. The financial support to farmers to buy conservation equipment with CEAP funds, including manure injection and the technical assistance supported through AgCWIP has facilitated farmers' adoption of precision technology.

The large acreage associated with farms provides opportunities to restore or protect natural resources. Farmers are most likely to receive the best compensation through riparian buffer restoration with CREP funding. Multiple partners in the basin are already involved in assisting farmers identify and implement these projects.

Reduced pollutant loading from agricultural lands will continue with the support of the following:

- NRCD, UVM extension and other agric partners to continue to support farmers by providing technical assistance often in collaboration with other partners with AGCWIP funds
- Precision agriculture technology and innovation to improve nutrient management planning and implementation
- Vermont Pay for Performance Program
- Whole farm assessments to direct resources to achieve best P reduction and over all outcome
- CREP provides compensation for loss of arable land to restore natural resources.
- End of tile drain treatment practices – studies supported by the LCBP, and outreach helps to support implementation, but additional strategies to encourage implementation are needed

The Tactical Basin Plan also supports priorities identified through VAWQP strategic planning process as well as the FCNRCD and OCNRCD's Locally led Conservation planning supported by agricultural partners and the community. In turn the Watershed Planning Program assists planning processes and prioritization of projects by providing water quality data and other information to support prioritization.

The NRCDs planning set priorities for a regional Conservation Action Plan and to identify priority NRCS practices and resource concerns to inform future EQIP local funding pools in their regions. In 2024 and 2025, the priorities for soil and water identified by each of the NRCDs supported many of the above objectives and provided specific approaches.

An area of interest in The OCNRCD plan includes prioritizing the reduction and management of flows over fields, ditches, gullies and roads to reduce erosion. Conservation solutions included In field soil health and precision ag tools tools and offer key line plow, rock picker for rotations, lime/woodash spreader as equipment rentals.

In addition to soil health and conservation issues, the FCNRCD plan addresses a lack of readily accessible funding for infrastructure projects that are too large or complex for field-based EQIP practices, but too small or specialized to qualify for sufficient funds from state infrastructure programs. The proposed solution is targeted investments towards farmstead infrastructure.

Priority Geographic Areas in Basin 6

Agricultural strategies in Chapter 5 will support work identified as a priority. Projects that address strategies are provided additional importance when leading to activity in geographic areas identified as a priority in other plans, or in watersheds of agriculturally impaired watersheds. Priority geographic areas include:

- Agricultural impaired streams (see Table x): Rock River, Berry Brook, Godin Brook, Trout Brook, Mud Creek, Wanzer Brook, Saxe River, Morrow Brook, Samsonville Brook, and Coburn Brook.
- Lake Carmi Watershed as a Vermont Lake in Crisis and with a Phosphorus TMDL (see Chapter 3).
- NRCS National Water Quality Initiative (NWQI) supported rivers – Rock, Pike, Hungerford

Draft Basin 6 Strategies	Funding
Hold at least 4 meeting annually of the Northwest regional VT Ag. water quality partnership meetings	TBPSG, AGCWIP
1. Provide technical support to farmers requesting assistance to maintain and implement Nutrient Management Plans (NMPs) and Increase acre of field BMPs implemented on farms enrolled in VPFP from 21300 to 25,000 acres.	EQIP, CSP, AAFM, AGCWIP

Draft Basin 6 Strategies	Funding
2. Provide technical and financial assistance to increase use of equipment that leads to increased use of precision technologies farmers, in implementation of BMPs such as Nutrient management plans and use of manure injection.	RCPP, AGCWIP, CEAP
3. Provide technical assistance and educational opportunities to support soil health and water quality improvements through Soil Health Assessments, the development and implementation of	AGCWIP, EQIP, CSP, AAFM, PSWF

Draft Basin 6 Strategies	Funding
grazing plans, and field agronomic BMPs	
4. Identify farms with potential natural resource protection opportunities including floodplain/wetland restoration or river corridor protection and provide outreach and technical assistance to develop and implement projects	TBPSG, AGCWIP, LISFF, Enhancement, AAFM, CREP
5. ?Implement priority projects that address significant sources of nutrient inputs with a focus on cover cropping, manure injection, and agricultural	AGCWIP, LISFF, TBPSG

Draft Basin 6 Strategies	Funding
production-area BMPs.	
6. Support use of tile drain treatment practices and additional development of practices.	

Figure 1. Estimated TP reduction (kg/year) and remaining TMDL goal by general sector, Missisquoi tactical basin.