Missisquoi Bay
Basin 6 - Tactical Basin Plan

August 2026 - Draft

VERMONT
WATER INVESTMENT DIVISION

Tactical Basin Plan was prepared in accordance with 10 VSA § 1253(d), the Vermont Water Quality Standards, the Federal Clean Water Act and 40 CFR 130.6, and the Vermont Surface Water Management Strategy.

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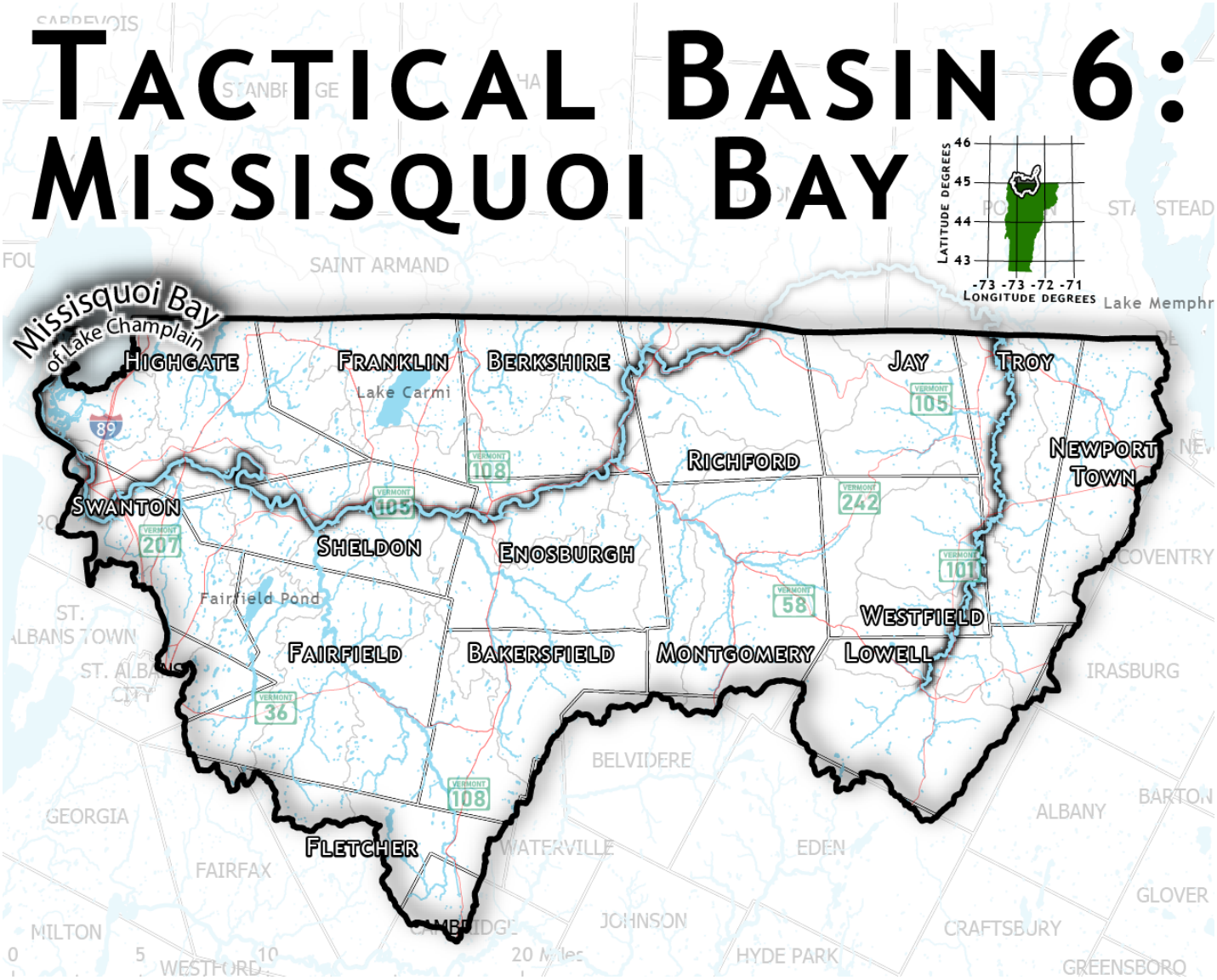
Cover Photo: The Trout Brook in its restored river corridor within the former impoundment of the Trout Brook Reservoir Dam, Berkshire. The Franklin County Natural Resources Conservation District removed the dam with Clean Water Funds in 2025 with engineering services from SLR Consulting. Photo credit: SLR Consulting

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 municipality is in the watershed



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Executive Summary

Vermont's Missisquoi Bay Basin, Basin 6, encompasses 58% of Lake Champlain's Missisquoi Bay watershed with the remaining 42% located in the Canadian Province of Quebec. Basin 6 is comprised of the Missisquoi River, and the Vermont portion of the Rock and Pike River subbasins. Located in Northwest Vermont, it drains most of Franklin County and lesser amounts of Orleans and Lamoille County. The basin's landcover is predominantly forest followed by agricultural lands. The villages and towns of the basin are primarily clustered along the Missisquoi River or tributaries. Developed land also includes a ski resort in the Jay Branch subbasin.

The Basin 6 Tactical Basin Plan (TBP) details current basin conditions and identifies water quality focused strategies to protect and restore the basin's surface waters. The assessment results of the Agency's monitoring describe the current conditions. They are the basis for the 2024 biennial statewide 303(d) List of Impaired Waters and List of Priority Surface Waters Outside the Scope of 303(d) (Figures 14-17) as well as the priority waters for protection for aquatic life support and fishing (Chapter 2). Additionally, the Vermont Lake Score Card summarizes the basin's lakes and pond assessments.

The majority of the basin's surface waters exceed Vermont Water Quality Standards (VWQS). A handful are candidates for reclassification or designation based on their excellent conditions. One stream is a candidate for reclassification from B(2) to B(1) for aquatic biota use; and 10 streams from B(2) to B(1) for fishing. Biological monitoring data suggests another 11 stream segments have better water quality than their current class, but additional data are needed to evaluate whether they meet A(1) or B(1) criteria for aquatic biota use. While the basin contains no Class I wetlands, Missisquoi Delta, Franklin Bog and Fairfield Swamp are candidate for Class 1 wetland designation.

Based on the assessments, five lakes and 17 stream segments are identified for restoration. Sources of impairments in lakes include phosphorus, acid and mercury deposition or alterations by aquatic invasive species. River impairments are primarily nutrients, sediments and E. coli with the remainder including temperature, Mercury, and Asbestos as well as insufficient flows.

Strategies are proposed to meet overall protection and restoration goals, as well as implement TMDLs. The plan's focus is placed on voluntary project implementation, facilitated by watershed partners. The plan's 41 detailed strategies in addition to monitoring priorities are recommended for the next five years. Monitoring priorities have

been identified to fill data gaps, track changes in water quality condition, and identify waters eligible for reclassification or an enhanced designation.

The Chapter 5 strategies to restore and protect the basin's surface waters are summarized below, organized by land use sectors:

- Agriculture - focused on agricultural impaired streams, Lake Carmi Watershed as a Vermont Lake in Crisis with a Phosphorus TMDL (see Chapter 3), and NRCS National Water Quality Initiative supported rivers – Rock, Pike, Hungerford. Strategies support partner collaboration to assist farms in nutrient management planning, cover cropping, manure injection, rotational grazing, and production area BMPs as well as natural resource protection opportunities.
- Stormwater - focused on the developed areas and support the installation of stormwater practices identified through stormwater master plans as well encourage residential stormwater management solutions throughout the basin.
- Roads - focused on priority projects in road erosion inventories, as well as those located in subbasins with known impairments or lakes with increasing nutrient trends. Strategies include assisting municipalities and road commissioners to identify priority road segments, applying for grants and implementing projects. Strategies also support best winter management strategies to reduce chloride contamination and private road management to reduce erosion issues.
- Wastewater- include outreach through lake associations to enhance onsite wastewater management as well as supporting village wastewater solutions.
- Lakes - includes Lake Wise assessment and project implementation support focused on Fairfield Pond and Lake Carmi.
- Rivers - focused on river segments with stream geomorphic assessments, including the Upper Trout River Hydraulic study. Strategies support riparian planting, low tech process-based restoration, strategic wood addition, and other stream channel restoration and floodplain reconnection projects. In addition, strategies support obsolete dam removals and outreach to towns on the updated FEMA flood maps as well as changing regulations for River Corridors and Floodplains under the Flood Safety Act.
- Wetlands - apply basin wide but call out high-elevation seeps and include outreach to local communities on updated wetland maps, support wetland restoration projects.
- Forests - support forest road and trail erosion inventories and restoration projects with a focus on state lands and outreach to enhance understanding of

Acceptable Management Practices and benefits of the Use Value Appraisal Program.

The 2021 Basin Plan identified 43 strategies to protect and restore surface waters. Of these, x are complete. The remaining x were not completed due to ……
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The 2021 report card provides the status for each strategy identified in the 2021 Plan. General information on progress in the Missisquoi Bay Basin is included in the 2026 Vermont Clean Water Initiative Performance Report.

The 41 priority strategies identified in this plan reflect input from the public, state and federal water quality staff, sector-based workgroups, watershed groups, and regional planning commissions.

What is a Tactical Basin Plan?

Figure 1. Five-year basin planning cycle.

A Tactical Basin Plan (TBP) is a strategic guidebook produced by the Vermont Agency of Natural Resources (ANR) to protect and restore Vermont's surface waters. The Agency develops watershed plans for each of the 15 major basins in the State of Vermont every five years. The TBPs function as DEC's planning, management, and implementation tool for non-point source remediation efforts and translate the results of integrated basin water quality assessments into specific geographical areas for project-level intervention. This work is to target strategies and prioritize resources to those actions that will have the greatest influence on surface water protection or restoration (Figure 1).

The TBPs are integral to meeting both state and federal requirements including the U.S Environmental Protection Agency's 9-element framework for watershed plans (Environmental Protection Agency, 2008), US Clean Water Act Section 303(e) for state-level water quality planning, and state statutory obligations including those of the Vermont Clean Water Act, and 10 VSA § 925 and 10 VSA § 1253.

Tactical basin planning is carried out by the Water Investment Division in collaboration with the Watershed Management Division and in coordination with other state agencies and collaboration with a broad base of partnerships with other state, federal, regional, and local government agencies, and other stakeholders, including community and non-profit groups and academic institutions. This partnership supports and strengthens the Agency's programs by proposing new ideas and input, increasing understanding of water quality issues, and building commitment to implementing solutions.

Chapters 1 through 4 in the TBP describe water quality in the Basin, protection and restoration priorities, and efforts to protect and restore water quality for each sector. This information supports the targeted strategies listed in the implementation tables in Chapter 5 (Figure 2).

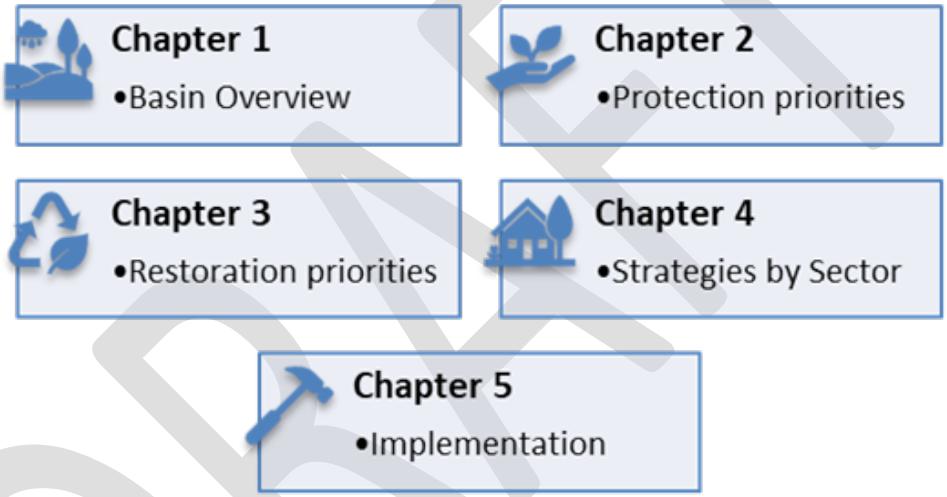


Figure 2. Key roles of the five chapters in the Tactical Basin Plans

Basin-specific water quality goals, objectives, strategies, and projects described in this Plan aim to protect public health and safety, ensure public use and enjoyment of Vermont waters and their ecological health as set forward in the Vermont Nonpoint Source Management Plan and the Vermont Water Quality Standards. These strategies inform individual projects that are identified and tracked in the Watershed Projects Database and the Watershed Projects Explorer. The Project Database and Explorer are found on ANR's Clean Water Portal and are regularly updated to capture project information throughout the TBP process.

Chapter 1 – Basin Description and Conditions

A. Basin Overview

Lake Champlain's Missisquoi Bay covers 30 square miles but only reaches a depth of 14 feet. The bay's watershed covers 1199 square miles with approximately 58% of the watershed located in Vermont and 42% in the Canadian Province of Quebec. In Vermont, the watershed extends over most of Franklin County, and parts of Orleans and Lamoille Counties.

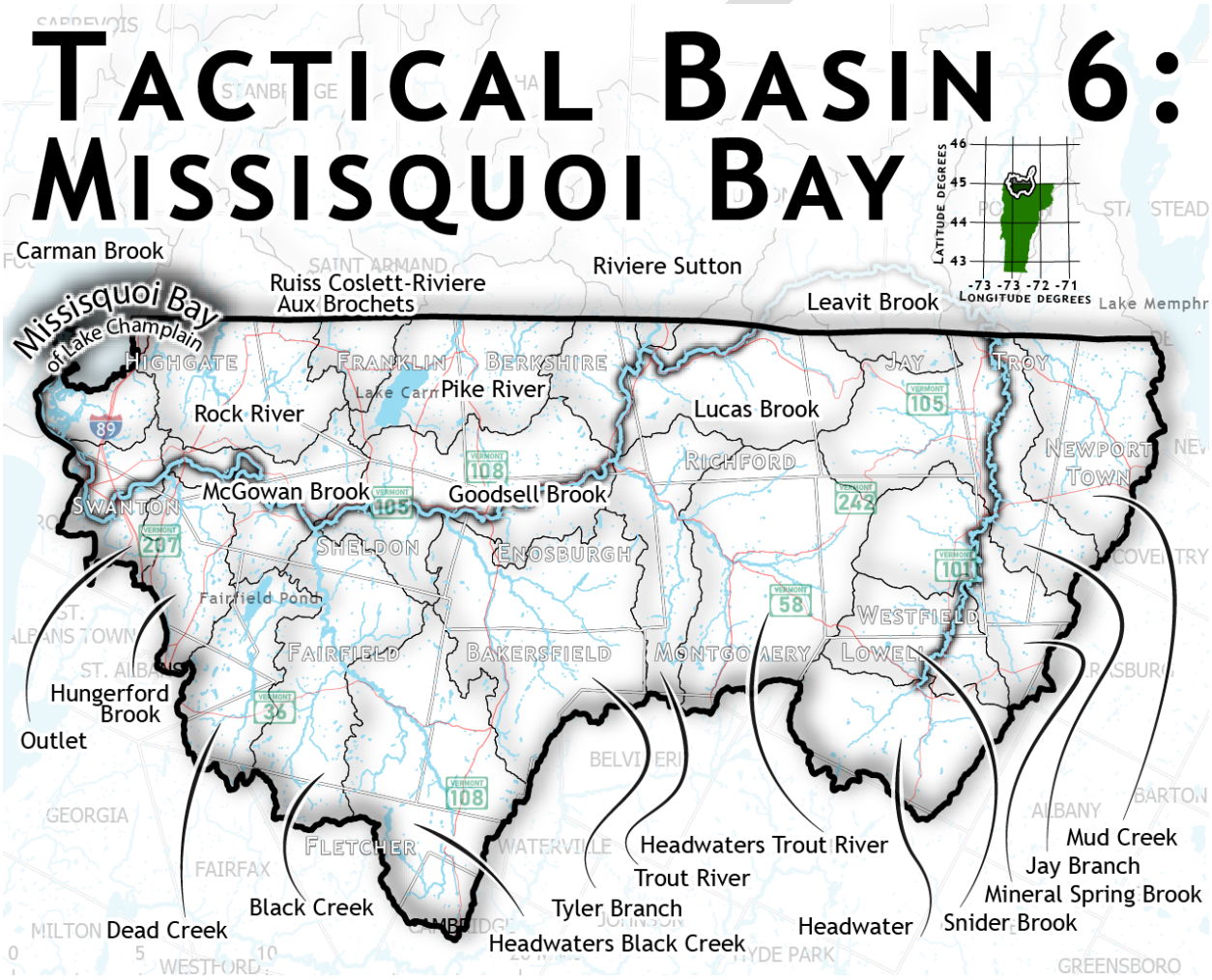


Figure 3. Major streams and watersheds in Basin 6.

The Missisquoi River is Missisquoi Bay's largest tributary, followed by the Rock and Pike Rivers. Missisquoi River tributaries include Black Creek, Tyler Branch, Trout River,

Hungerford and Mud Creek (Figure 3). Detailed information about waters within the Basin can be found in the Basin 6 Assessment Report.

Land Use and Land Cover

The land use on the American side of the Missisquoi Bay watershed is 66% forested, and 25% agricultural. Developed land, including transportation infrastructure, occupies approximately 6% of land in the Basin (Figure 4). The health of a waterbody is controlled, for the most part, by the land use or land cover in its watershed. A forested watershed provides the best protection as it absorbs or detains the precipitation, with the Upper Missisquoi and Trout River subbasin as an example. Whereas, in landscape dominated by developed or agricultural land use, like the Rock and the Pike, impervious surfaces or compacted soils are responsible for sending polluted stormwater runoff to waterbodies. When comparing the land-use map, Figure 4, with the maps of degraded waters in Chapter 3, the degraded waters are often adjacent to these developed and agricultural-managed landscapes. Dams, industrial waste sites and acidic precipitation are responsible for the other degraded waters, see Chapter 3.

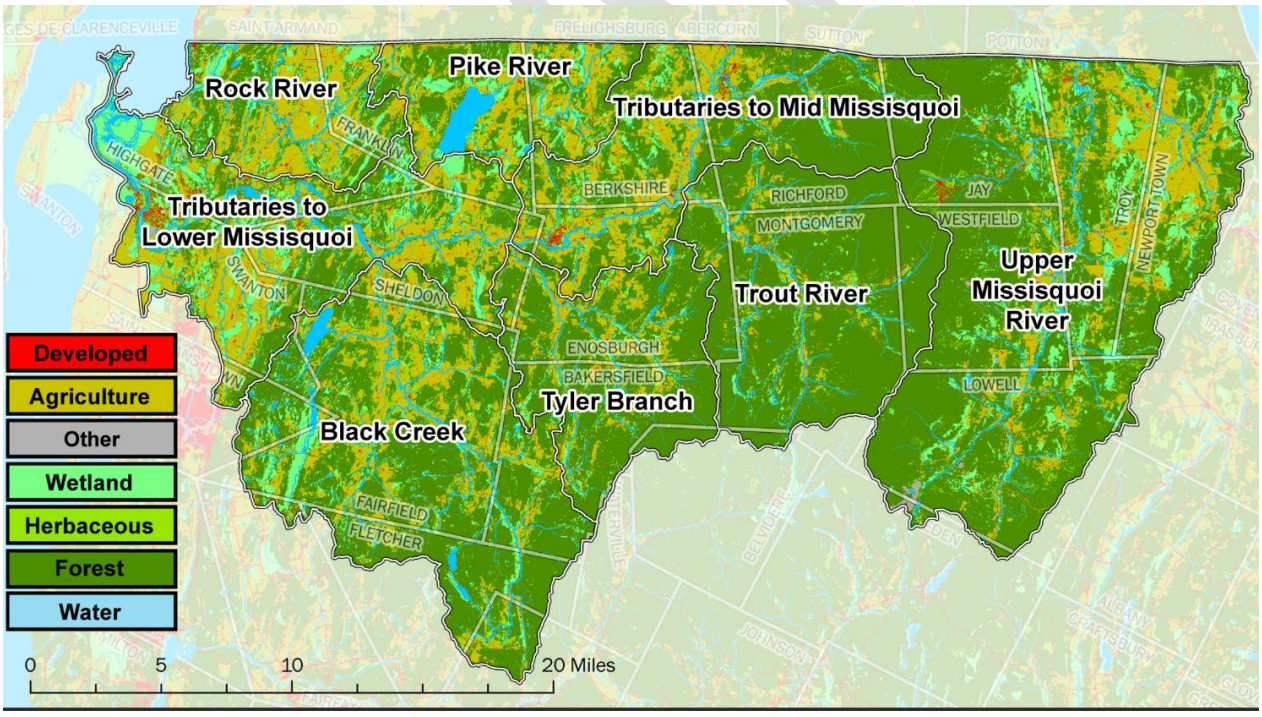


Figure 4. Landcover based on the land-cover dataset produced by the University of Vermont spatial analysis laboratory and the Lake Champlain Basin Program

Climate Change Implications for Water Resource Management

Vermont is experiencing climate-related events with increasing frequency, complexity, and severity. These trends are projected to intensify, making it imperative that Vermont and Vermonters adapt now and build resilience for the storms, floods, and droughts expected in coming decades. Among the natural hazards facing the state, flooding poses the greatest risk to Vermont's infrastructure and communities as outlined in the Vermont Climate Action Plan (ANR, 2021).

Adapting how we manage and use surface waters in the face of climate change is one of the primary challenges for basin planning. The Resilience Implementation Strategy charges basin planning to incorporate climate resilience into plans at the watershed or other regional scale. Numerous strategies are included in the implementation tables that address climate issues. The 2021 Vermont Climate Assessment established state-level climate data with direct implications for local surface waters. Since 1900, Vermont's average annual temperature has risen by nearly 2°F (1.11°C), with winter warming occurring twice as fast (Galford, 2021). This warming has led to earlier thaw dates for rivers, lakes, ponds, and mountain snowpack. Average annual stream flows are increasing and are expected to continue doing so, leading to more frequent high-flow events that cause inundation flooding and fluvial erosion—both of which are influenced by land-use decisions.

Increased runoff and streamflow can degrade aquatic habitats through greater sediment mobilization, nutrient loading, scouring, and higher water temperatures. In turn, local freshwater plant and animal species may shift their ranges, abundance, and seasonal behaviors (Stamp J, 2020).

The Vermont Climate Assessment suggests extreme weather events such as droughts and floods will become more common. Vermont now experiences an average of 2.4 more days of heavy precipitation per year than in the 1960s, particularly during summer. These changing precipitation patterns are driving further increases in streamflow and associated impacts on erosion, flooding, and aquatic ecosystems.

The Vermont Climate Assessment highlights five central messages related to water:

- Water Availability – Increased variability in precipitation, coupled with higher water use for snowmaking and agriculture, may exacerbate low water availability during prolonged dry spells and droughts.

- Streamflow Changes – Increases in overall and extreme precipitation, have raised average annual stream flows since 1960. While this trend will continue, it also disrupts normal seasonal flow cycles.
- Water Quality Risks – Heavier precipitation events increase runoff, erosion, and nutrient loading, which—combined with warmer temperatures—create ideal conditions for cyanobacteria blooms.
- Flooding and Infrastructure – More frequent high stream flows heighten flood risks, threatening roads, bridges, and other crossings. Reducing these risks requires updating and right-sizing outdated infrastructure.
- Nature-Based Solutions – Protecting and restoring river corridors, floodplains, and wetlands, along with investing in green infrastructure, provides effective, low-cost strategies for flood mitigation and water quality improvement.

Protective measures including strategic land acquisition and development limits in river corridors and floodplains may be the most cost-effective ways to safeguard surface waters and build resilience (Watson, Ricketts, Galford, Polasky, & O'Niel-Dunne, 2016); (Weiskel, 2007). Where historic or current land use contributes to pollution, this basin plan identifies complementary strategies such as river corridor and wetland easements, riparian plantings, floodplain and wetland restoration, dam removals, and agricultural, forestry, and stormwater best management practices (BMPs).

Ongoing efforts to strengthen ecological resilience and leverage natural infrastructure are detailed on the Climate Change in Vermont website that includes links to the Resilience Implementation Strategy and the Vermont Climate Toolkit. The Vermont Climate Toolkit provides municipalities with tools to assess climate emergency preparedness, evaluate infrastructure funding capacity, and prioritize resilience investments.

B. Water Quality Conditions

The Vermont Water Quality Standards (VWQS) form the foundation for how the Vermont Department of Environmental Conservation (DEC) evaluates the condition of surface waters (DEC, 2022). Each waterbody's assessment considers its classification, designated and existing uses, and the corresponding narrative and numeric criteria (see Chapter 2 for definitions). Based on this evaluation, Vermont's assessed surface waters are categorized as fully supporting, altered, impaired, or unassessed.

DEC uses a five-year rotational monitoring approach, in which basin sites are typically sampled once every five years. State monitoring data are supplemented by community-science programs, including the LaRosa Partnership Program (LPP), and the Lay Monitoring Program (LMP). Water quality monitoring and assessment work is described in detail in the Watershed Management Division (WSMD) 2024-2025 Water Quality Monitoring and Assessment Summary Report.

Most surface water monitoring is led by programs in the WSMD, including the Rivers Program, the Lakes and Ponds Management and Protection Program and the Wetlands Program. These programs generate site-specific assessments that inform the Basin's water quality status and management priorities.

The Biomonitoring and Aquatic Studies Section of the Rivers Program focuses on biological monitoring of aquatic macroinvertebrate and fish communities, as well as targeted water chemistry and temperature monitoring. Biomonitoring staff also support the LPP, which engages partners to collect stream samples and conduct pollutant tracking in the Basin. Basin partners supported by LPP include the Franklin Watershed Committee (FWC) in sampling the Lake Carmi tributaries, the Missisquoi River Basin Association (MRBA) and the Friends of Northern Lake Champlain in sampling sites throughout the basin.

The Rivers Program also supports stream geomorphic assessments, which evaluate river stability, sediment transport, and physical habitat conditions.

The Lakes and Ponds Management and Protection Program (LPMPP) supports the Inland Lake Assessment and LMP, which evaluate nutrient conditions, long-term trends, and shoreland conditions on Vermont's lakes. More detailed analyses are conducted through the Spring Phosphorus Program and Next Generation Lake Assessments. The LPMPP also conducts surveys to monitor the spread of aquatic invasive species in Vermont's public waters through the Aquatic Invasive Species Program.

Together, the Rivers Program and LPMPP maintain a statewide network of sentinel monitoring sites that include twelve stream sites and five lake sites that are sampled annually for biological, chemical, and physical parameters, including water temperature and hydrology (at select locations). These sites, located in minimally developed areas, provide valuable long-term data for detecting climate change-related trends in Vermont's surface waters.

The Wetlands Program conducts biological assessments focused on the functions and values of Vermont's wetlands.

In addition to the WSMD programs, several other state agencies and partners contribute critical data for assessing Vermont's surface water health:

- The Vermont Fish and Wildlife Department (FWD) conducts fishery assessments and targeted temperature monitoring to assess the health of recreational fish populations and identify opportunities for habitat restoration.
- A streamflow gage network is funded and operated collaboratively by the US Geological Service, DEC, the Vermont Agency of Transportation (VTrans), and the Vermont Department of Public Safety.
- The Vermont Agency of Agriculture, Food, and Markets (AAFM) monitors rivers and tributaries in agricultural areas through the Ambient Surface Water Study, which tracks pollutants such as neonicotinoids, glyphosate, corn herbicides and their degradates, and nitrate to establish baseline conditions and identify trends.
- The DEC Drinking Water and Groundwater Protection Division and the Watershed Management Division monitor for Per- and Polyfluoroalkyl Substances (PFAS) in surface and groundwater systems. The DEC is working with the Vermont Department of Health to identify sources and reduce the use and release of and public exposure to PFAS. The 2023 PFAS Road Map hosted on DEC's PFAS website, outline strategic priorities relating to PFAS and summarize the actions taken by DEC to monitor and address PFAS in Vermont.

Water quality monitoring results from these programs are incorporated into Tactical Basin Plans as they relate to the designated uses defined in the VWQS. Most DEC monitoring data are publicly available through the Vermont Integrated Watershed Information System (IWIS) online data portal.

The compilation of data from each five-year monitoring cycle provides insight into long-term trends and changes in water quality. These results are described by resource type, including rivers and streams, lakes and ponds, and wetlands. The full Basin 6 Assessment Report includes additional detail on water quality conditions and monitoring priorities.

In addition, to tables 21-23 in the Basin 6 Assessment Report, the Basin 6 Monitoring Priorities Table provides an additional list of water quality monitoring priorities to guide monitoring over the next five years. The Agency's Water Quality Monitoring Strategy

describes the monitoring programs (see also Chapter 2) supported by ANR and its partners. Common goals for monitoring efforts across programs include identifying water quality conditions, tracking water quality trends, identifying pollution sources and evaluating improvements over time. The table includes more sites than there is capacity to monitor and as such, will be further prioritized before monitoring occurs.

Rivers and Streams

Biological Assessment

Biological communities reflect overall ecological integrity (i.e., chemical, physical, and biological integrity). Therefore, biological survey results directly assess the status of a waterbody relative to the primary goal of the Clean Water Act. These communities integrate the effects of different stressors over time and thus provide a broad measure of fluctuating conditions and their aggregate impact. Where criteria for specific ambient impacts do not exist, biological communities may be the only practical means of evaluation.

Aquatic biomonitoring can be used for determining compliance with VWQS and detecting aquatic impairments. This monitoring can also identify streams at or near a reference level condition that may be suitable for higher levels of protection through reclassification (see Chapter 2).

DEC's Biomonitoring and Aquatic Studies Section surveys the aquatic macroinvertebrate and fish communities of wadable rivers and streams to evaluate the biological integrity of the resource. Biomonitoring is conducted following procedures outlined in the WSMD Field Methods Manual (DEC, 2022). Biocriteria is applied and assessments are determined for both communities as outlined in Appendix G of the VWQS (DEC, 2022). Each biotic community is rated from poor, representing the greatest deviation from reference conditions, to excellent, representing non-significant deviation from reference conditions. While there are currently no criteria for assessing Brook Trout Only streams (where Brook Trout are the only observed fish species), population density and age class distribution can be used to determine candidacy for reclassification - see Chapter 2). More information about the biological and chemical results of these sampling sites and events can be found online through the Vermont Integrated Watershed Information System (IWIS).

Macroinvertebrate and Fish Community Monitoring

Macroinvertebrate communities were assessed at 76 sites in the Basin between 2015 and 2025 (Figures 5-8). For the most recent samples at each site, the majority (50) scored *Good* or better (meeting VWQS criteria), with 28 exceeding the criteria (Very Good or better) and 26 that scored below *Good* (failing to fully meet VWQS criteria).

Fish communities were assessed at 21 of the 76 sites between 2015 and 2025. Four additional sites were found to have only native Brook Trout, with two of these meeting draft reclassification criteria for Brook Trout only streams. Four exhibited Very Good or better condition. Assessments for 15 sites scored below Good (failing to fully meet VWQS criteria). Of the 15 sites that failed to meet the VWQS based on the fish assessment, in the same year the corresponding macroinvertebrate sample met minimum criteria at six sites. For the other sites where monitoring for both macroinvertebrates and fish occurred, both communities supported similar conditions.

Streams requiring more monitoring to evaluate attainment of aquatic biota use are identified in Figure 9. These streams have limited biomonitoring data that indicates indeterminate or failing condition, but not enough data to fully evaluate the attainment of VWQS aquatic biota criteria.

For both communities, sites with scores that fully meet VWQS criteria are priorities for maintenance and protection. Some of the sites with failing scores have identified stressors that need to be addressed while others will need further assessment to determine the cause of the failing assessments.

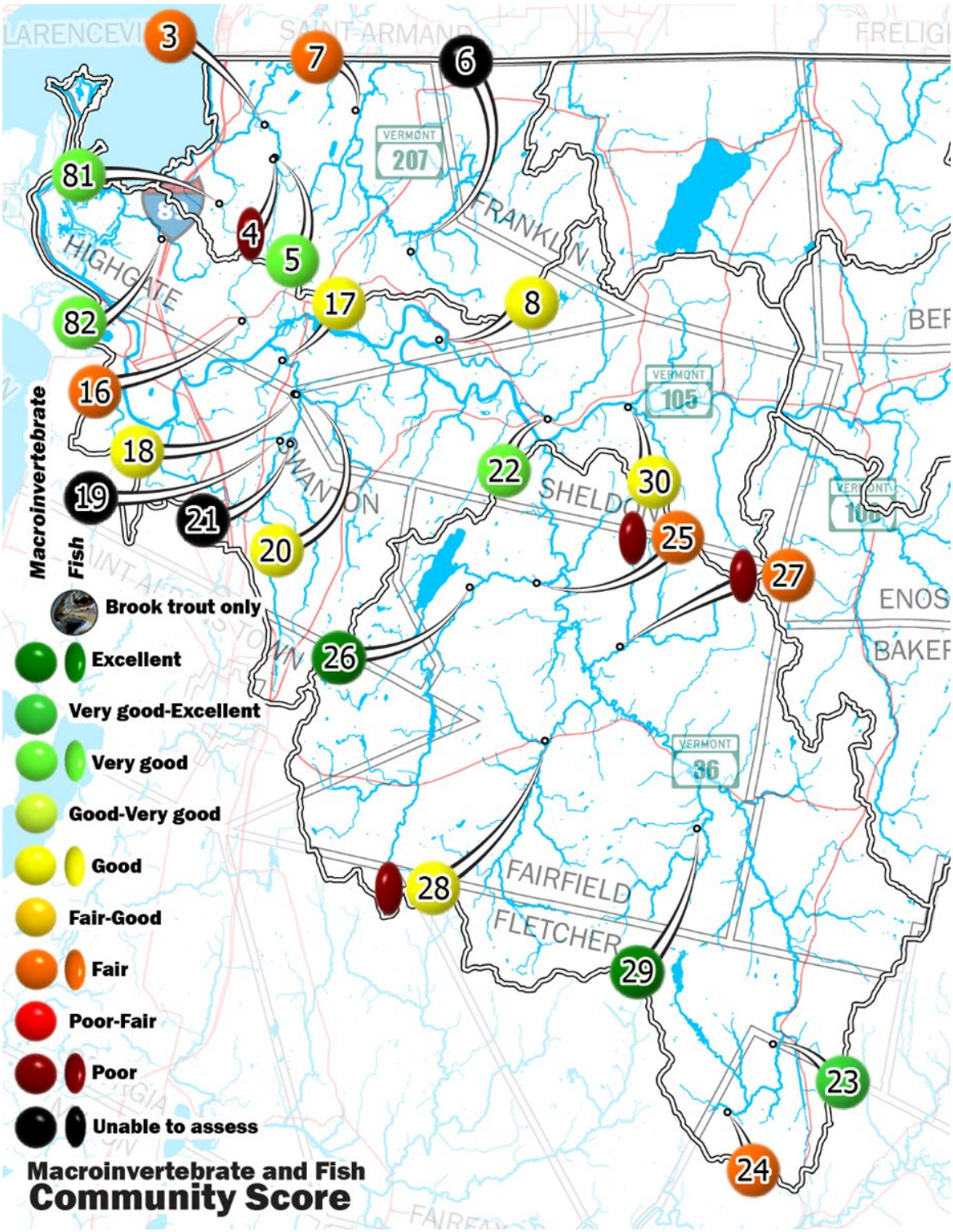


Figure 5. Biological Condition of the most recent Macroinvertebrate and Fish Community assessments from 2015-2025 sites in Basin 6, west section. Map IDs correspond to Table 14 in the Basin 6 Assessment Report.

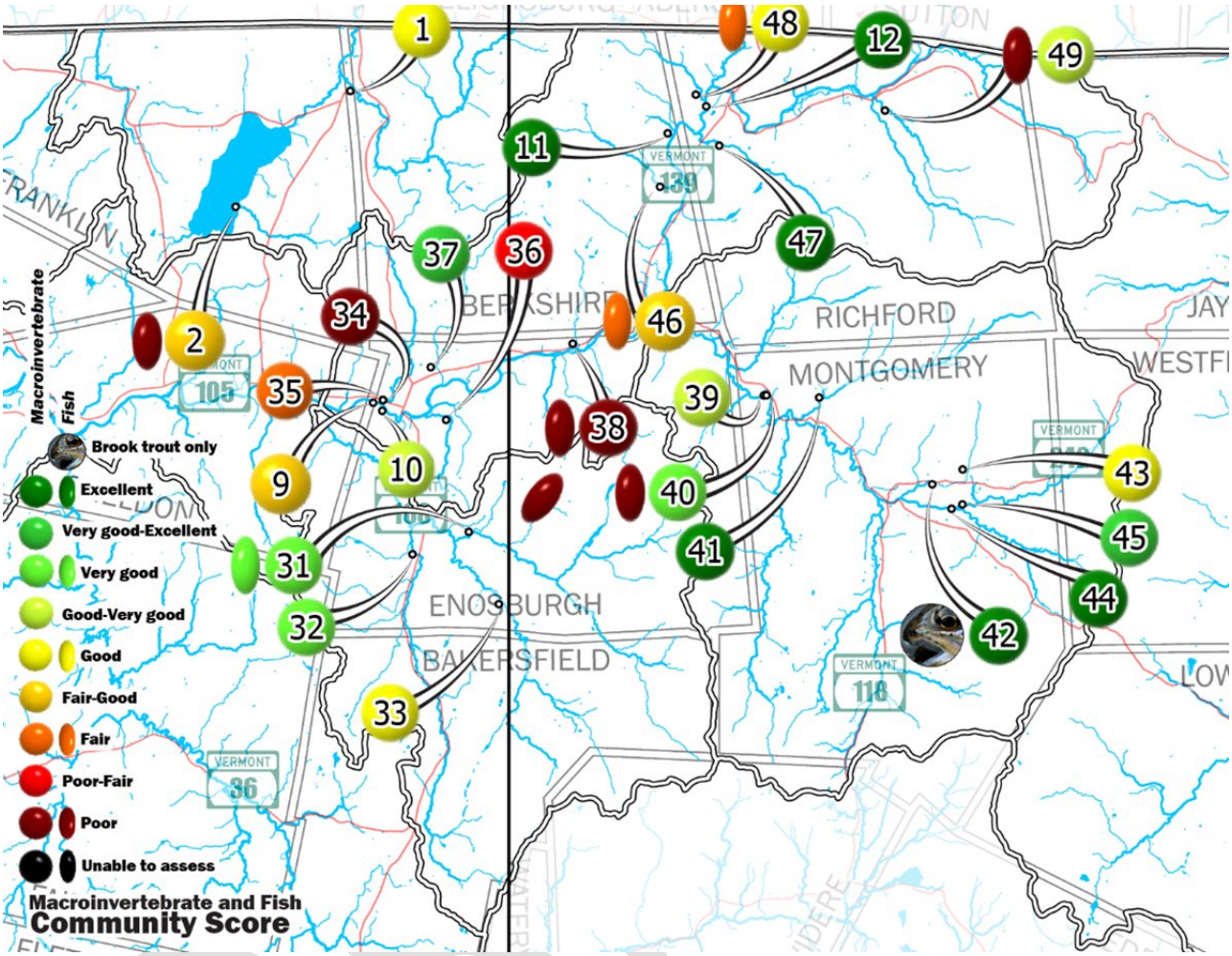


Figure 6. Biological Condition of the most recent Macroinvertebrate and Fish Community assessments from 2015-2025 sites in Basin 6, central section. Map IDs correspond to Table 15 in the Basin Assessment Report.

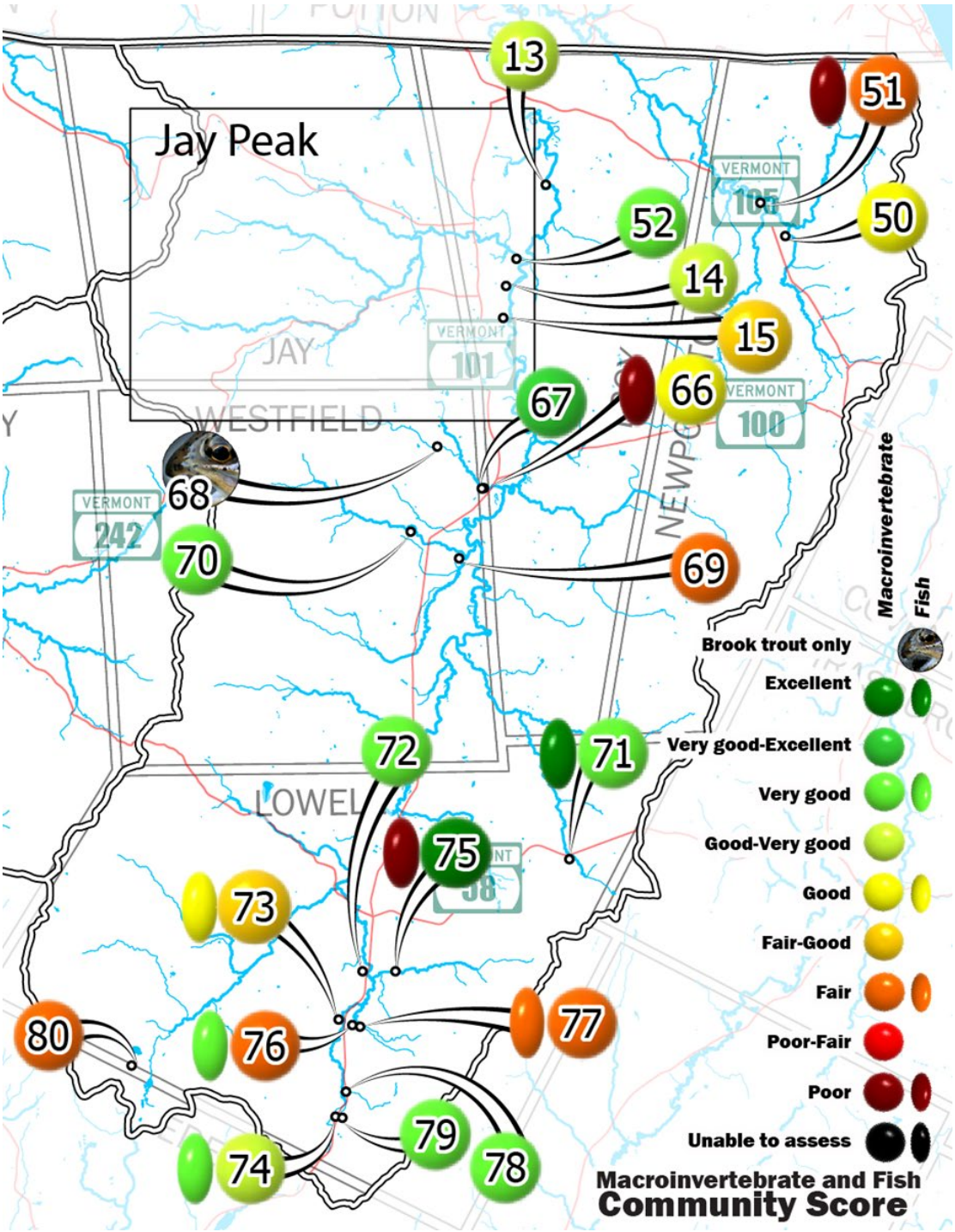


Figure 7. Biological Condition of the most recent Macroinvertebrate and Fish Community Assessments from 2015-2025 sites in Basin 6, eastern section. Map IDs correspond to Table 16 in the Basin 6 Assessment Report.

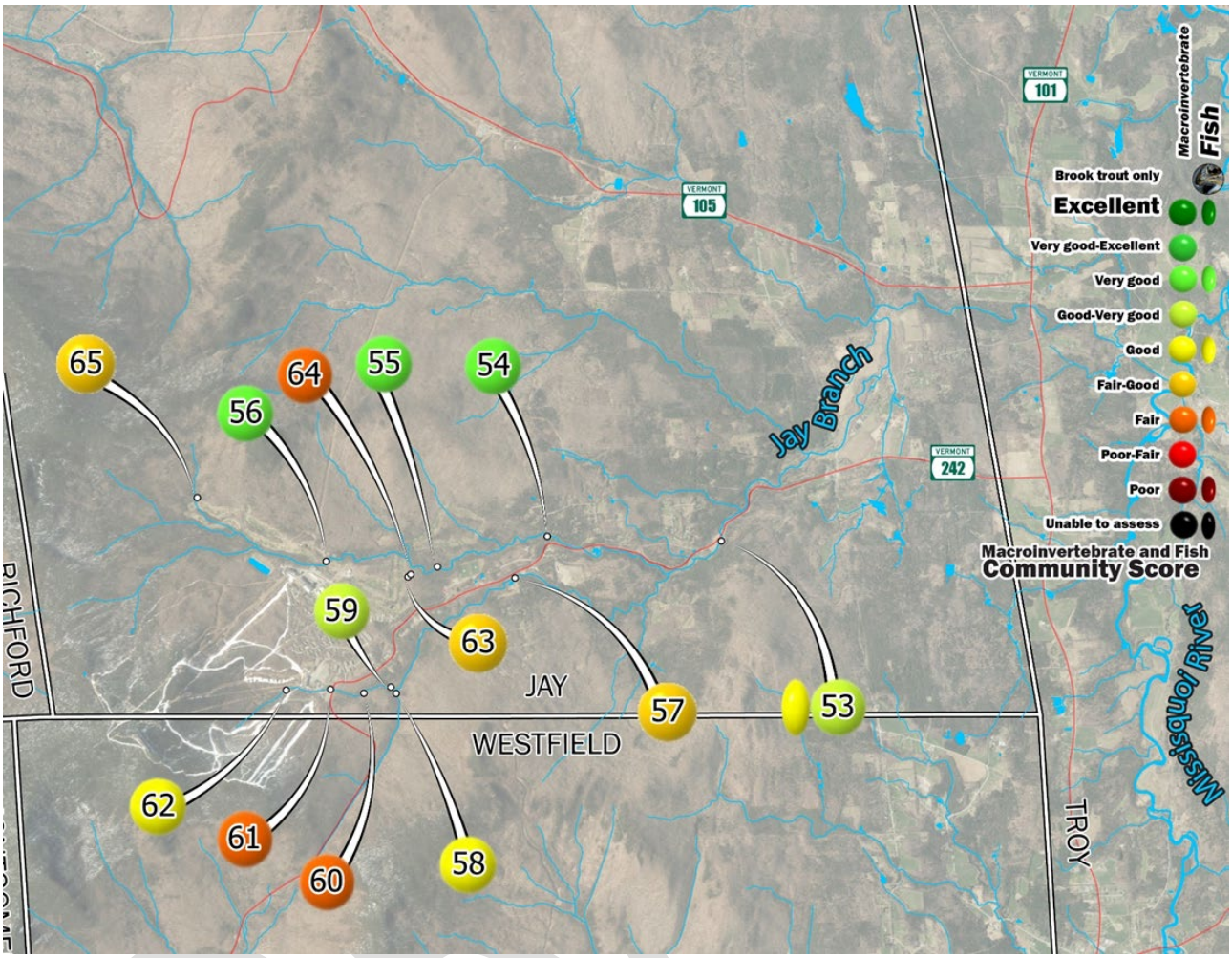


Figure 8. Biological Condition of the most recent Macroinvertebrate and Fish Community assessments from 2015-2025 sites in Basin 6, Jay Branch section. Map IDs correspond to Table 16 in the Basin 6 Assessment Report.

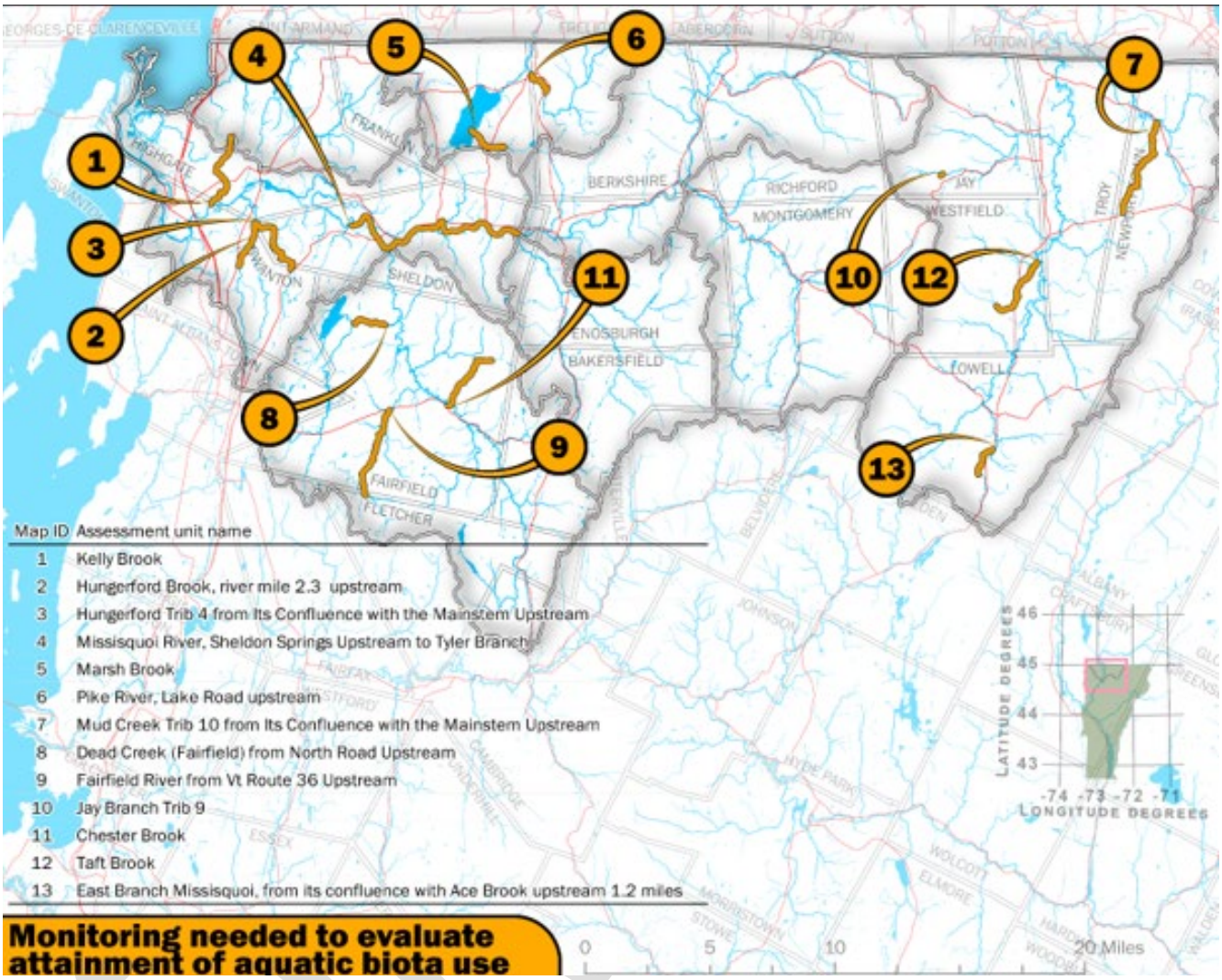


Figure 9. Streams with additional monitoring needed in Basin 6 to determine compliance with the VWQS. Map IDs correspond to Table 22 in the Basin 6 Assessment Report.

Stream Geomorphic Assessment

Fluvial geomorphology examines how flowing water shapes and modifies Earth's surface through erosional and depositional processes. Vermont has Stream Geomorphic Assessment protocols to document the physical condition of rivers. Physical condition can provide insight into how a river or stream may be responding to past and current channel management activities and land uses. The assessment documents physical channel adjustments, the stream's ability to access its floodplain, and the overall stability of the stream. Streams in reference and good condition experience natural levels of erosion and deposition and show greater stability during

high flow events, whereas streams in fair or poor condition experience accelerated erosion and may need time and space to recover and restore natural processes. Phase 1 is a watershed assessment and Phase 2 is a rapid field stream assessment. For more information see the River Program's Geomorphic Assessment webpage.

The majority of tributaries to Missisquoi River, as well as the Pike and Rock Rivers have Phase 1 and/or Phase 2 Stream Geomorphic Assessments (SGAs) completed, see Table 18 in Chapter 4. For Maps and additional information on geomorphic condition of Basin 6 stream reaches, see Figures 7 and 8 in the Basin 6 Assessment Report. The River Corridor Plans from these assessments provide numerous restoration and protection opportunities that are prioritized for implementation. Final SGAs and River Corridor Plans can be accessed at: Stream Geomorphic Assessment - Final Reports

Lakes and Ponds

The Missisquoi Basin drains to Lake Champlain's Missisquoi Bay and also encompasses 19 inland lakes and ponds, 10 acres or larger in size. The impounded lakes should be managed in accordance with the Vermont Hydrology Policy and meet the Hydrology Criteria (§29A-304) in the 2022 VT Water Quality Standards to ensure full support of designated uses. More information on dam location, status, purpose, and ownership can be found in Appendix A.

Lake Scorecard Assessment

The Vermont Lakes and Ponds Management and Protection Program (LPMPP) shares inland lake assessments using the Vermont Inland Lakes Score Card[1] (see Figure 10). The scorecard provides available data on overall lake health by providing a rating of a waterbody's nutrient trend, shoreland and lake habitat, atmospheric pollution, and aquatic invasive species. The Lake Scorecard's rating system is detailed here. Lake-specific, including Lake Champlain and up-to-date water quality and chemistry data can be accessed online at https://dec.vermont.gov/watershed/lakes-ponds/lakes-monitoring-and-data.

Of the four lakes with sufficient data to analyze water quality trends in 2022, three lakes trends rate as good: Metcalf, McAllister and Fairfield Ponds (Figure 10). Lake Carmi's

[1] The Lake Score Card and Figure 10 are from 2022 and is in the process of being updated to reflect new Lay Monitoring Program sampling protocols and results.

trends are rated as fair and the lake has a Phosphorus TMDL to address it, see Chapter 3. Ten lakes have ratings for shoreland condition: Five have good ratings, four have fair ratings, while only Lake Carmi is rated as poor.

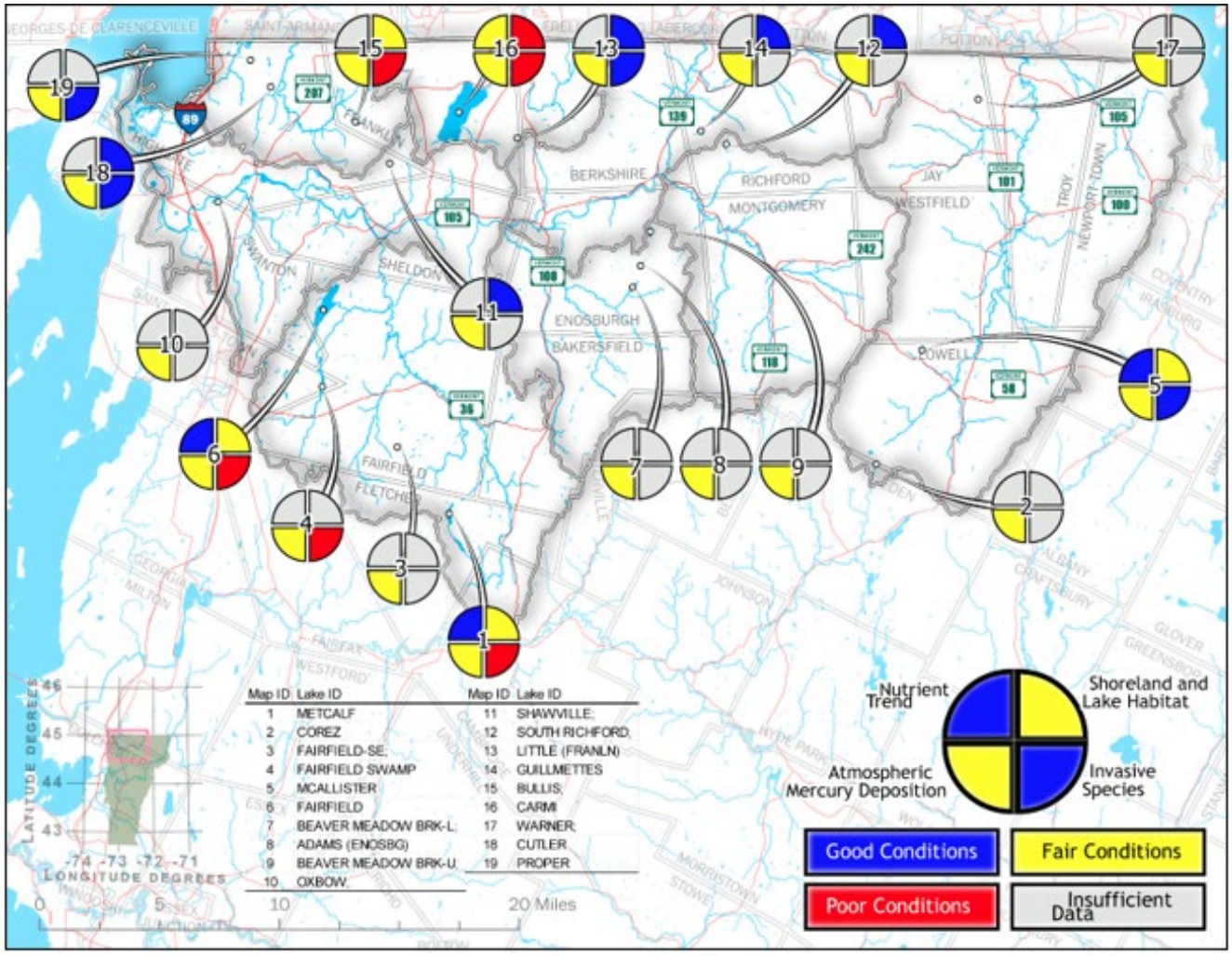


Figure 10. Condition of Lakes and Ponds in Basin 6. Map IDs correspond to Table 7 in the Basin Assessment Report. See also Vermont Lake Data for more information for each lake.

All the Basin's lakes are impacted by atmospheric deposition of mercury and one, Kings Hill Pond in Bakersfield, is impaired by atmospheric deposition of acid. These pollutants are attributable to the prevailing weather pattern that carries mid-west air pollution through the region, the proximity to those pollution sources and to the lack of buffering capacity of Vermont's bedrock geology. Two primary airborne pollution types affect the

acidity of lakes and ponds in Vermont are sulfur dioxide and nitrogen oxides. Due to implementation of the Clean Air Act the acidic conditions are slowly improving over time.

Mercury contamination has resulted in fish consumption advisories in nearly every lake in Vermont. Dramatic shifts in water level, due to the way reservoirs are managed for hydroelectrical production, cause the release of bio-available mercury that is otherwise sequestered in the sediments. This mercury is more easily transferred up the food chain to fish and loons and other larger birds and mammals. All lakes in the basin are considered fair for mercury The Vermont Department of Health posts safe-eating guidelines for fish consumption that recommends limits for all Vermont waters, as well as waterbody specific advisories.

Aquatic Invasive Species (AIS) alter habitat and degrade recreational opportunities in Bullis Pond, Lake Carmi, Metcalf Pond, Fairfield Pond and Fairfield Swamp, with Eurasian Water Milfoil, *Myriophyllum spicatum*, the predominant species of concern.

The Lake Score Card found on the Vermont Lake Data website provides a list of AIS present and for detailed information see Vermont Macrophyte Data.

Missisquoi Bay in Lake Champlain

The basin's Missisquoi, Rock and Pike Rivers along with smaller tributaries and shoreline empties into Lake Champlain's Missisquoi Bay. Phosphorus and Mercury levels in Missisquoi Bay are pollutants of concern (Table 4) and the bay is altered by aquatic invasive species (Table 8).

DEC surveys have shown increasing populations of water chestnut in the Missisquoi Bay since 2022 that increased substantially after the region's 2023 and 2024 flooding events in 2023 and 2024. In 2022, MNWR identified and reported a quarter acre mat of water chestnut in Gander Bay and in response, DEC has actively managed the operation that includes surveying and harvesting the plant with a total of 60,000 rosettes removed in 2024, just in Gander Bay. DEC's surveys show water chestnut in multiple areas in and outside of the refuge, extending north into the Rock River delta.

Managing internal Phosphorus loading in the Bay was the focus of a LCBP-funded alternatives study, completed in 2024, see the following StoryMap by Stone Environmental, Inc for a summary: Missisquoi Bay Phosphorus Management.

A summary of additional information about the Missisquoi Bay lake segment is provided by the State of the Lake Report (Lake Champlain Basin Progran, 2026). The report

includes a summary of certain assessment results as ecosystem indicators status and trends.

Wetlands

The Vermont Wetlands Program uses its Bioassessment Project to gather data about the health of Vermont wetlands. Plant species are used as the primary biological indicator to assess wetland health. Based on a 2017 analysis of bioassessment data, the principal factors that correlate with poor wetland condition are:

- presence of invasive species,
- disturbance to the wetland buffer or surrounding area,
- disturbance to wetland soils, and
- disturbance to wetland hydrology (how water moves through a wetland) through ditching (e.g., agricultural), filling (e.g., roads) and draining (e.g., culverts).

Wetlands in remote areas and at high elevations tend to be in good condition, with the most threatened wetlands occurring in areas of heavy agricultural use and high development pressure often exhibiting habitat loss.

Wetland Bioassessment and Vermont Rapid Assessment Method

In Basin 6, 82 wetlands have been assessed using the Vermont Rapid Assessment Method (VRAM), which assigns each wetland a score ranging from 15 to 100 with higher numbers representing more intact ecological condition and higher levels of wetland functions and values. A map of VRAM assessments and additional information about wetland conditions is available in the Basin Assessment Report. Note that the VRAM assessments in this watershed are not meant to be representative of the Basin's wetlands, wetlands are selected or recommended for assessment rather than chosen through random sampling. A more complete inventory of all the wetlands in the Basin is taking place overtime.

Wetlands representing significant natural communities include the Missisquoi Delta, Franklin Bog and Fairfield Swamp (see Figure 13). The Missisquoi Bay and Delta wetlands complex was recognized as Wetlands of International Importance under the Ramsar Convention on Wetlands in 2013.

Chapter 2 – Priority Areas for Surface Water Protection

The state protects lakes, wetlands, and rivers by establishing and supporting surface water management goals. Tactical Basin Plans identify surface waters that consistently attain a higher level of quality and value based on physical, chemical, and biological criteria. These waters are prioritized for reclassification or designation. This allows for the establishment of enhanced management objectives and supports implementation of strategies to protect these surface waters. Eleven streams in the Basin meet or exceed standards for very high-quality condition and are prioritized for reclassification (Figure 11).

Additional pathways to increase protection of priority waters include land stewardship programs, local protection efforts, conservation easements, and land acquisition. Specific Basin 6 strategies are described in Chapter 4 - Strategies to Reduce Pollution by Sector.

A. Surface Water Reclassification and Designation

Vermont's surface water classification system establishes management goals and supporting criteria for designated uses in four classes of water. Designated uses include aquatic biota and wildlife, aquatic habitat, aesthetics, fishing, boating, swimming, public water supply, and irrigation. The Vermont Water Quality Standards (VWQS) (DEC, 2022) begin classification with two broad groups based on elevation:

- All waters above 2,500 feet in elevation are designated Class A(1) for all uses, unless specifically designated Class A(2) for use as a public water source.
- All waters at or below 2,500 feet in elevation, are designated Class B(2) for all uses, unless specifically designated as Class A(1), A(2), or B(1) for one or more uses.

Current classifications of surface waters and their uses are published in the VWQS and are identified through the tactical basin planning process or on a case-by-case basis. The following are the possible classes for each designated use:

- Class A(1) are waters that have excellent conditions for one or more of the following uses: aquatic biota and wildlife, aquatic habitat, aesthetics, fishing, boating, or swimming.
- Class A(2) are waters that have been designated for use as public drinking water source.
- Class B(1) are waters that have very good conditions for one or more of the following uses: aquatic biota and wildlife, aquatic habitat, aesthetics, fishing, or boating.
- Class B(2) are waters that have good conditions for one or more of the following uses: aquatic biota and wildlife, aquatic habitat, aesthetics, fishing, boating, swimming, public water source or irrigation.

Surface waters are protected by the anti-degradation policy of the VWQS, including the Outstanding Resource Waters designation. Protection also occurs through the following pathways:

- Reclassification of surface waters.
- Class I Wetland designation.

Tactical basin planning identifies and documents surface waters that meet the criteria for a higher classification or designation (10 V.S.A. § 1253).

Public involvement is an essential component of protecting rivers, wetlands, and lakes in Vermont. The public, watershed partners, and stakeholders are encouraged to make recommendations for additional monitoring and research where very high-quality waters may exist. The public may petition DEC to reclassify streams and lakes, and to designate Outstanding Resource Waters. Further information on reclassification and petition forms can be found at: Stream Reclassification, Lakes and Ponds Reclassification, and Class I Wetlands.

A(2) Public Water Sources

Eight waters in the Basin are designated as A(2) public water sources and six are noted in the VWQS as abandoned and could be reclassified to reflect their current condition for each designated use (Table 1).

Table 1. Class A(2) Public Water Sources in Basin 6 managed to be suitable for use as a public water source with disinfection, and filtration when necessary (VWQS).

Water[2]	Location	Use
Mountain Brook and a tributary (Upper Missisquoi in Quebec)	North Troy, Jay	Abandoned - Village of North Troy water source
Hannah Clark Brook (Trout River)	Montgomery village	Abandoned – Village of Montgomery Center water source
Black Falls Brook (Trout River)	Richford, Montgomery	Abandoned - Village of Montgomery Center water source
Stanhope Brook (Missisquoi)	Richford	Village of Richford water source
Coburn Brook and reservoir and tributaries (Missisquoi)	Troy/Westfield	Abandoned - Village of Troy water source
Unnamed trib to Trout River (Missisquoi)	Enosburg	Abandoned- Village of East Berkshire water source[3]
Trout Brook(Missisquoi)	Berkshire	Abandoned - Village of Enosburg Falls water source
Loveland Brook (Missisquoi)	Richford	Emergency – Village of Richford water source

A(1) & B(1) Waters for Aquatic Biota Use

Biomonitoring assessments by the WSMD identifies Tyler Branch as a water that consistently and demonstrably attains a level of quality meeting aquatic biota criteria for Class B(1) (Figure 11). No waters in the basin are currently classified as A(1) waters or are candidates in the basin.

[2] Includes watershed upstream of intake pipe (if present). See VWQS for specifics.
[3] Based on DEC's Drinking Water and Groundwater Protection Program records, the Village of East Berkshire water source is not abandoned and the next revision of the VWQS will reflect updated information on the town's use of the water supply.)

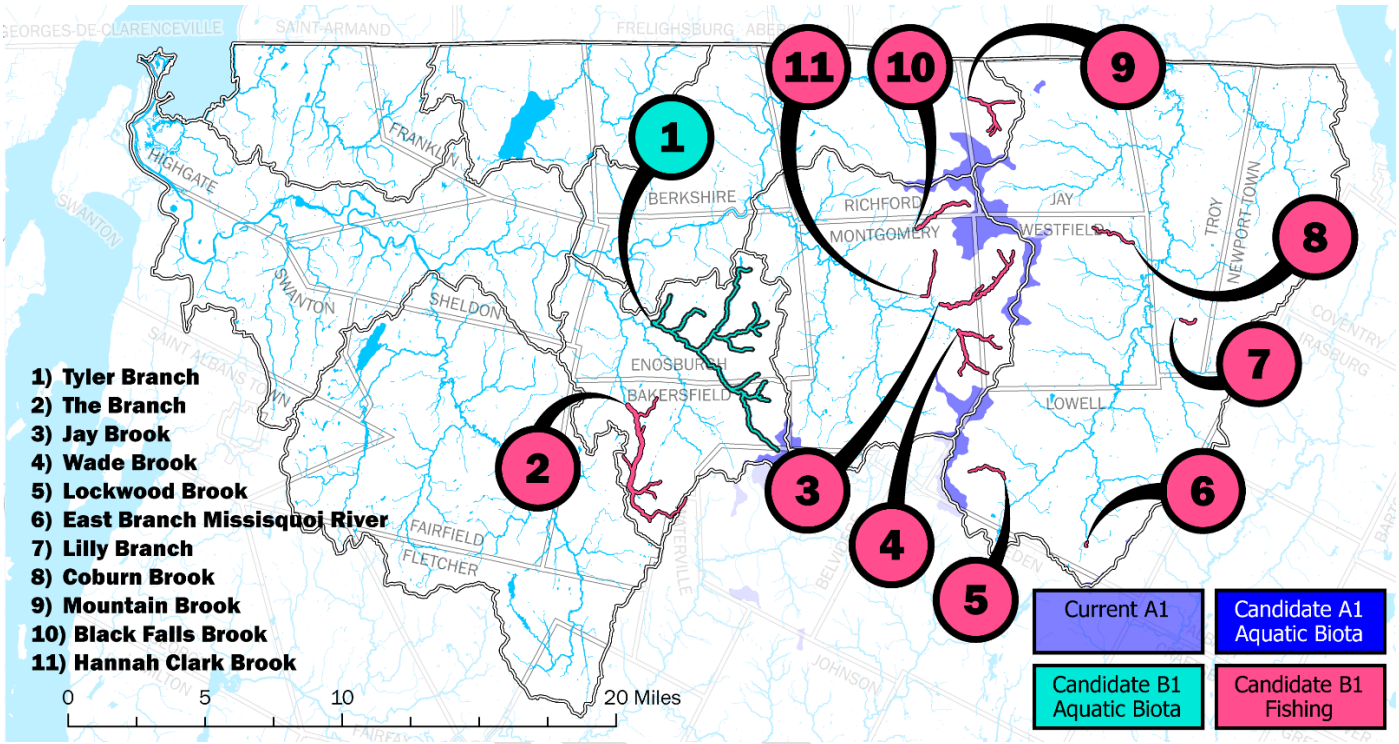


Figure 11. River Protection Priorities in Basin 6 based on data from 2015-2025 showing candidates for B(1) aquatic biota or fishing uses (listed in Table 2)

Eleven streams have historical data that suggest B(1) conditions and need additional monitoring to assess their condition for Aquatic Biota use reclassification (Figure 12). Additional surface waters in need of supplemental monitoring to determine their potential for reclassification are included in the Monitoring and Assessment Table on the Basin 6 webpage

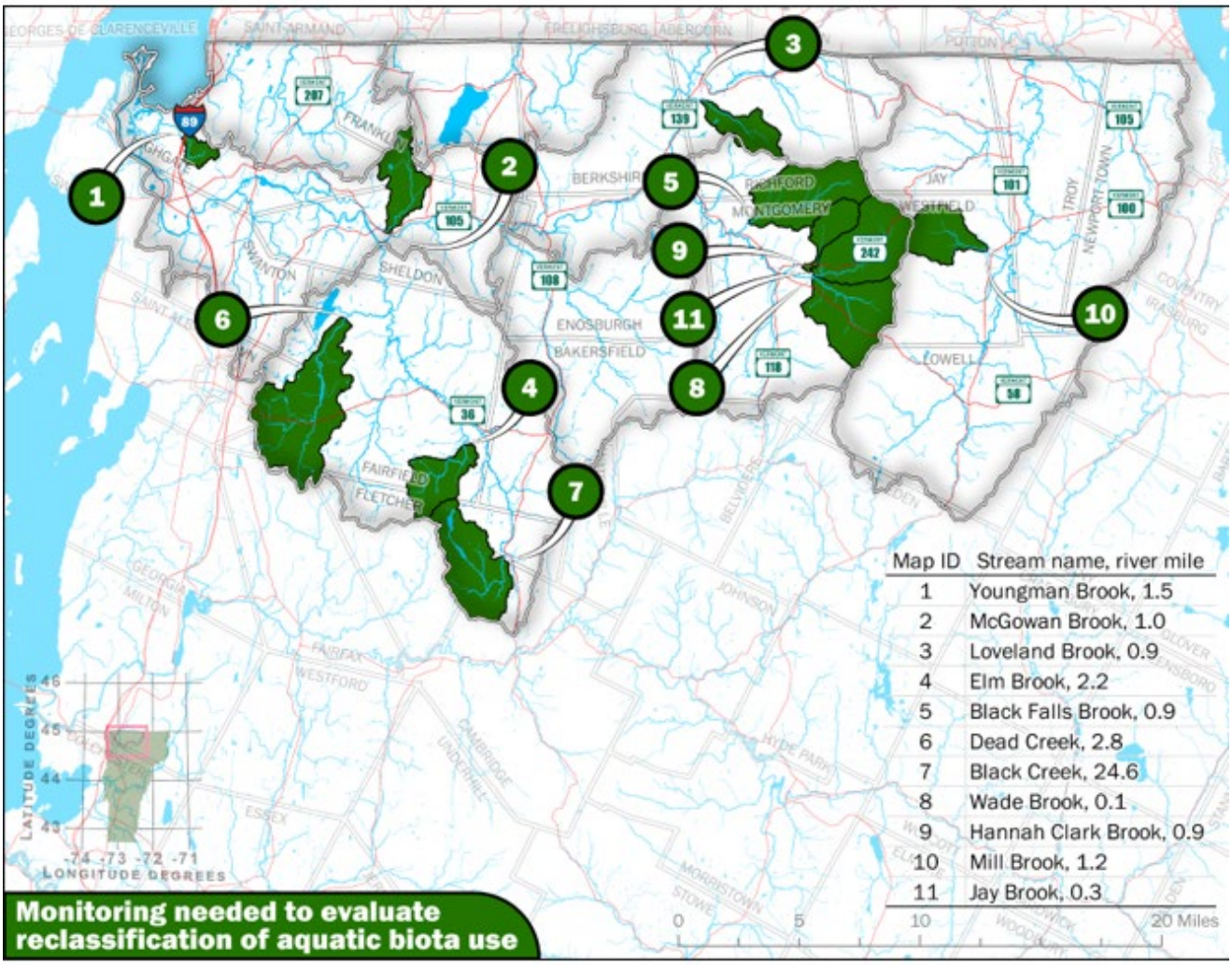


Figure 12. Map of rivers in Basin 6 that require more monitoring to assess condition relative to A(1) or B(1) criteria for Aquatic Biota use. The streams have biological monitoring data between 2015-2025 which suggests Very Good or Excellent condition. Additional data may be necessary to assess if it meets A(1) or B(1) criteria for Aquatic Biota use.

B(1) Waters for Recreational Fishing Use

Rivers and streams classified as B(1) recreational fishing waters by the DFW support wild, self-sustaining salmonid populations characterized by the presence of multiple age classes and a minimum abundance of 1,000 individuals per mile (all species/ages/sizes); and/or 200 large (> 6 inches total length) individuals per mile; and/or 20 pounds/acre (all species/ages/sizes).

Ten streams (Figure 11, Table 2) currently have sufficient data to demonstrate that they meet B(1) criteria for recreational fishing (§29A-306 of the VWQS). Waters identified to meet B(1) criteria shall be managed to achieve and maintain the documented quality of fishing. It is important to note that all waterbodies that would naturally support fish populations are protected and maintained for this use in perpetuity.

Table 2. Streams in Basin 6 that are candidates for B(1) Fishing classification, see Figure 11.

Stream	Location	Watershed	Latitude	Longitude
Coburn Brook	Westfield	Mineral Spring Brook-Missisquoi River	-72.42297	44.91095
East Branch Missisquoi River	Lowell	Headwater Missisquoi River	-72.58376	44.91862
Hannah Clark Brook	Montgomery	Headwaters Trout River	-72.42297	44.91095
Jay Brook	Montgomery	Outlet Trout River	-72.4571	44.75331
Lilly Branch	Troy		-72.58035	44.88297
Lockwood Brook	Lowell	Snider Brook-Missisquoi River	-72.56573	44.87878
Lucas Brook	Jay		-72.3876	44.87062
Mountain Brook	Jay	Lucas Brook-Missisquoi River	-72.5189	44.78691
The Branch	Bakersfield	Tyler Branch	-72.5447	44.98734
Wade Brook	Montgomery	Headwaters Trout River	-72.44328	45.00417

B. Class I Wetland Designation

The State of Vermont identifies and protects the functions and values of significant wetlands to achieve no net loss of wetlands. Based on an evaluation of the extent to which a wetland provides functions and values, it is classified as:

- **Class I**: Exceptional or irreplaceable in its contribution to Vermont's natural heritage and therefore, merits the highest level of protection.
- **Class II**: Merits protection, either taken alone or in conjunction with other wetlands.
- **Class III**: Neither a Class II nor a Class I wetland.

Impacts to Class I wetlands may only be permitted when the activity is necessary to meet a compelling public need for health or safety. The Wetlands Program Class I Wetlands website highlights the designated Class I wetlands statewide and lists those recommended for Class I designation. The Missisquoi Refuge delta complex is a candidate for Class I designation, and Franklin Bog and Fairfield Swamp are proposed for further study to evaluate if these wetlands are candidates for wetland reclassification. These wetlands are highlighted in Figure 13.

DEC supports the further study and designation of Class I wetlands, and the Wetlands Program welcomes recommendations for Class I candidates. Wetlands found to meet criteria for Class I designation may be proposed for reclassification through petition or departmental rulemaking authority, consistent with the Vermont Wetland Rules.

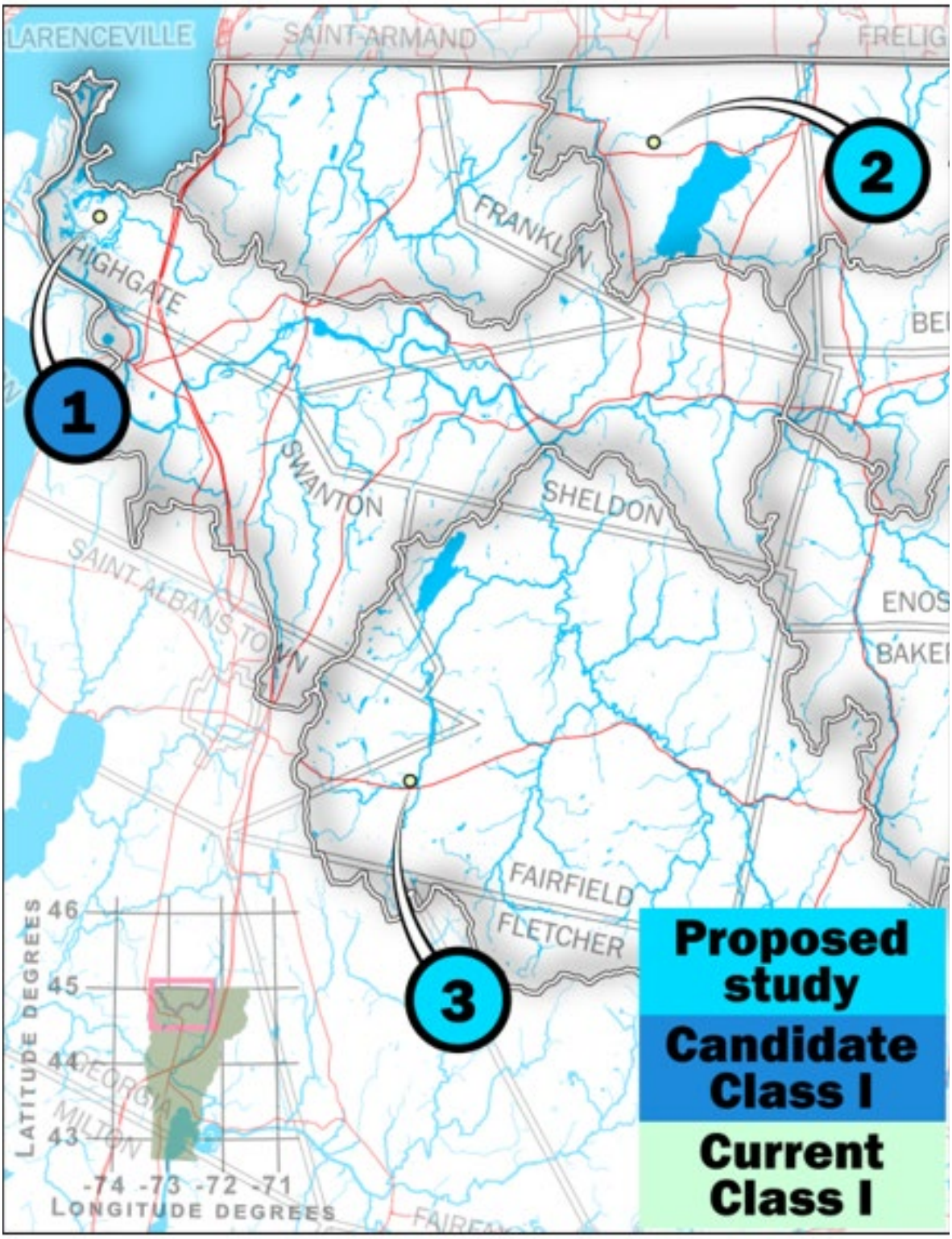


Figure 13. Wetland Protection Priorities in Basin 6, See Table 3..

Table 3. Wetlands that are Class I candidates or proposed for study (See Map ID on Figure 13)

Map ID	Wetland	Location	Latitude	Longitude
1	Missisquoi Delta	Highgate	42.9793	-72.5206
2	Franklin Bog	Franklin	44.9911	-72.8963
3	Fairfield Swamp	Fairfield, Saint Albans Town	43.1237	-72.6269

C. Outstanding Resource Waters Designation

Rivers, streams, lakes and ponds that have "exceptional natural, cultural, recreational, or scenic values" can be protected through designation as Outstanding Resource Waters (ORW; 10 V.S.A. § 1424a). The ORW designation protects exceptional waters through permit conditions for in-stream alterations, dams, wastewater discharges, aquatic nuisance controls, solid waste disposal, Act 250 projects, and other activities. ORWs can be designated by the Agency through a public petition process. Big Falls in Big Falls State Park on the Upper Missisquoi River in Troy is a candidate for further study as a potential ORW in the basin for its water quality and aesthetics associated with geology of the area. It is a popular swimming hole and is identified by the state as a Natural Resource Management Area (Vermont Conservation Design Plan).

D. Identification of Existing Uses

Existing uses of waters and the level of water quality necessary to protect those existing uses shall be maintained and protected regardless of the water's classification (DEC, 2022).

The Agency may identify existing uses of waters during the tactical basin planning process or on a case-by-case basis during application reviews for State or Federal permits. Consistent with the federal Clean Water Act, the VWQS stipulate that existing uses may be documented in any surface water location where that use has occurred on or after November 28, 1975.

The Agency stipulates that all lakes and ponds in the state have existing uses of swimming, boating, and fishing. The Agency recognizes that fishing activities in streams and rivers are widespread and too numerous to thoroughly document for the Basin. In the case of streams too small to support significant fishing activity, the Agency recognizes these as potential spawning and nursery areas, which contribute fish stocks downstream where fishing may occur. These small streams support the use of fishing and are protected at a level commensurate with downstream areas.

Existing uses listed in the basin should be viewed as a partial accounting of known existing uses based upon limited information. The list does not change protection under the Clean Water Act or VWQS for unlisted waters. The Existing uses list for the basin is located on the Missisquoi Bay Basin Tactical Basin Planning webpage and includes swimming, boating, fishing, and public water sources. The public is encouraged to recommend waters for the existing uses of swimming, boating, fishing, public water source, and ecological significance given that they provide evidence of such use.

E. Wild and Scenic Designation

In 2014, Congress designated 46.1 miles of the Upper Missisquoi (Westfield to Enosburgh) and Trout Rivers in northern Vermont as components of the National Wild and Scenic Rivers System - the first such designation in the state. This designation protects the rivers for their outstandingly remarkable values: scenic and recreational, historic and cultural, water quality, and natural resources. A local partnership, the UMATR Wild & Scenic Committee oversees the development and implementation of a Management Plan. The Plan presents a series of recommendations that can be voluntarily implemented by area residents, riverfront landowners, local municipalities in with partnership state and federal agencies to help protect these river-related resources and maintain the quality and way of life valued by so many people.

Chapter 3 – Priority Areas for Surface Water Restoration

A. Impaired and Altered Surface Waters

The DEC monitors and assesses the chemical, physical, and biological status of individual surface waters to determine if they meet the VWQS per the 2026 Vermont Surface Water Assessment and Listing Methodology (DEC, 2026). Surface waters are assessed as: full support, altered, or impaired.

The assessment results are the basis for the 2024 biennial statewide 303(d) List of Impaired Waters and List of Priority Surface Waters Outside the Scope of 303(d) (Figures 14-17) as well as the priority waters for protection for aquatic life support (Chapter 2). The list of impaired or altered waters includes preliminary information on responsible pollutant(s) and/or physical alterations to aquatic and riparian habitat and identifies the cause, if known. Altered and impaired waters become a priority for restoration. Additionally, the Vermont Lake Score Card identifies lakes and ponds that have increasing nutrient trends and therefore are a priority for nutrient reduction strategies, as shown in Figure 10 in Chapter 1. To address documented water quality concerns, the strategies proposed in the Chapter 5 Implementation Tables are prescribed based on the land use sector-specific practices outlined in the Vermont Surface Water Management Strategy.

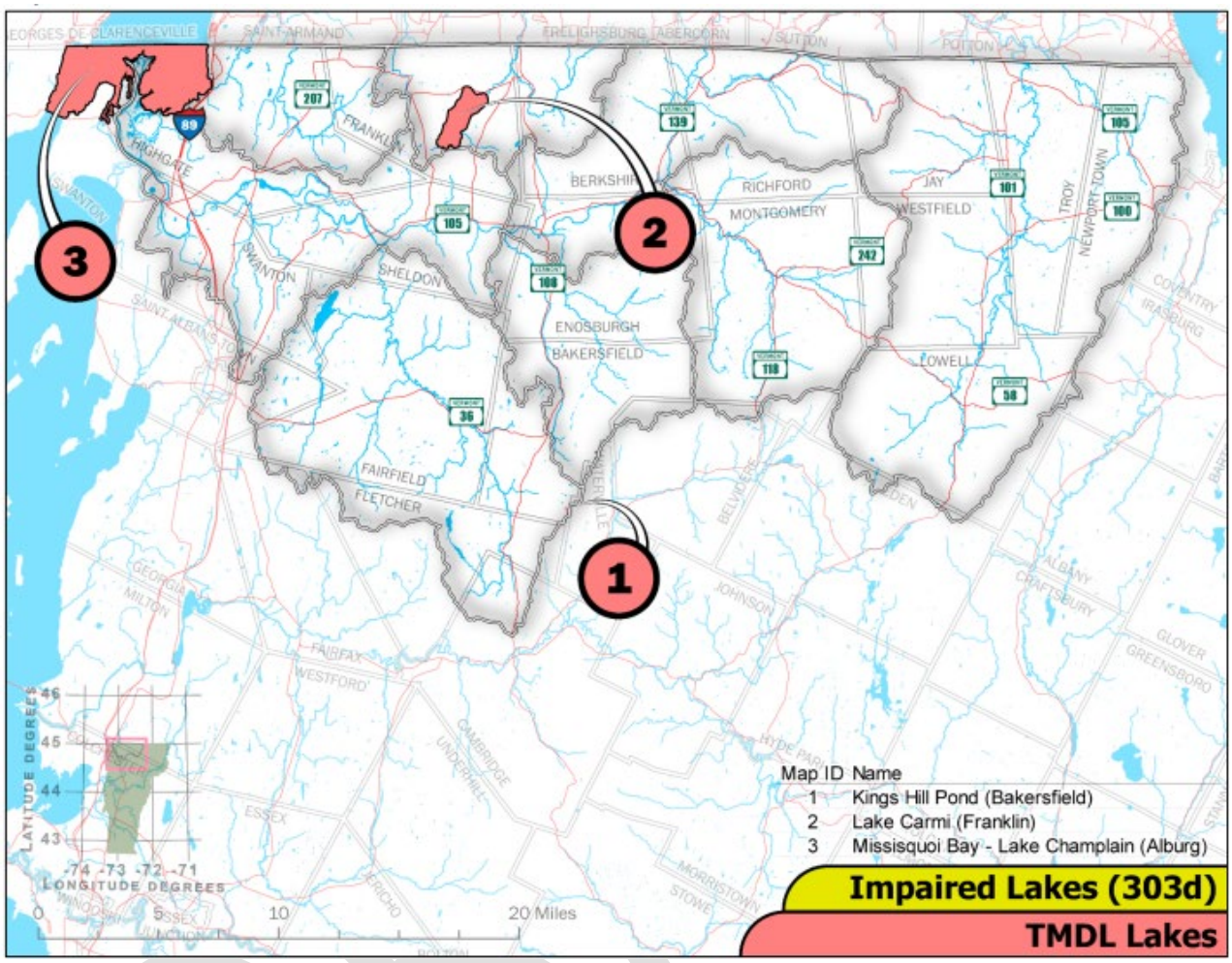


Figure 14. Impaired lakes in Basin 6. Yellow represents lakes that are on the 2024 303(d) list (Part A-Priority Waters List). Salmon represents lakes that have an approved TMDL but remain impaired (Part D-Priority Waters List).

Table 4. Priority lakes considered impaired with a TMDL (Map # shown on Figure 14)

PART D	IMPAIRED, COMPLETED TMDL		
Map ID	Name	Pollutant	Problem
1	Kings Hill Pond (Bakersfield)	pH	Atmospheric deposition: extremely sensitive to acidification
2	Lake Carmi (Franklin)	Phosphorus	Algal Blooms
3	Missisquoi Bay - Lake Champlain (Alburg)	Mercury In Fish, Phosphorus	Elevated levels of mercury in walleye, Phosphorus enrichment

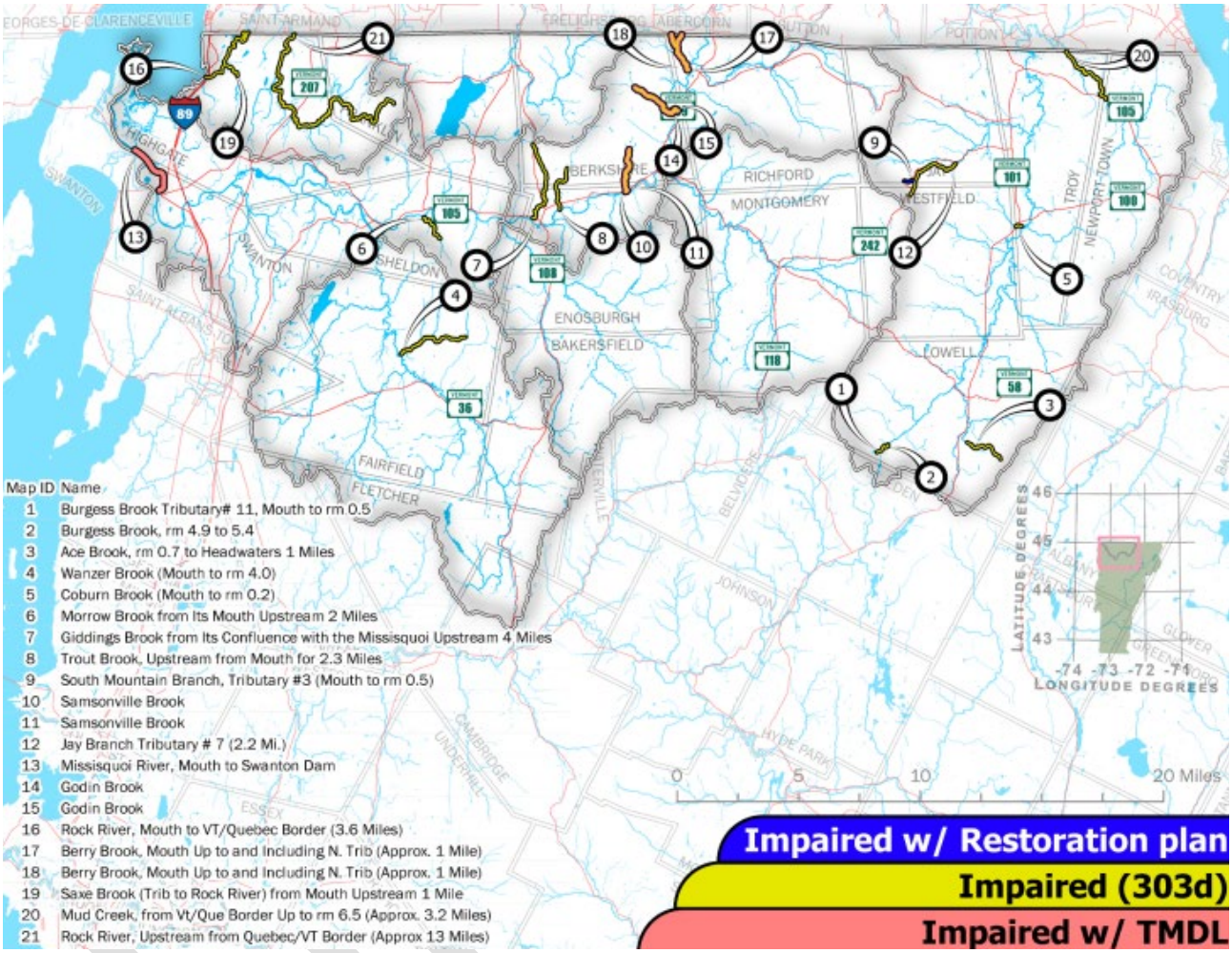


Figure 15. Impaired rivers in Basin 6. Yellow represents rivers on the 2024 303(d) list (Part A-Priority Waters List). Salmon represents rivers with an approved TMDL but remain impaired (Part D-Priority Waters List). See also Table 5.

Table 5. Priority Streams considered impaired. (Map ID shown on Figure 15).

PART A	IMPAIRED, TMDL REQUIRED		
Map ID	Name	Pollutant	Problem
1	Burgess Branch Tributary# 11, Mouth to rm 0.5	Sedimentation/ Siltation, Asbestos	Asbestos mine tailings erosion; asbestos fibers
2	Burgess Branch, rm 4.9 to 5.4	Sedimentation/ Siltation, Asbestos	Asbestos mine tailings erosion; asbestos fibers

PART A	IMPAIRED, TMDL REQUIRED		
Map ID	Name	Pollutant	Problem
3	Ace Brook, rm 0.7 to Headwaters 1 Miles	Sedimentation/ Siltation	Sediment discharges and hydrologic change from logging activity
4	Wanzer Brook (Mouth to rm 4.0)	Nutrients, Sedimentation/ Siltation	Agricultural runoff
5	Coburn Brook (Mouth to rm 0.2)	Nutrients	Agricultural activities and runoff
6	Morrow Brook from Its Mouth Upstream 2 Miles	Nutrients	Runoff from agricultural lands
7	Giddings Brook from Its Confluence with the Missisquoi Upstream 4 Miles	Pollutants In Urban Stormwater, Nutrients	Runoff from agricultural and developed lands
8	Trout Brook, Upstream from Mouth for 2.3 Miles	Nutrients	Runoff from agricultural lands
10	Samsonville Brook	Sedimentation/ Siltation, Nutrients	Agricultural runoff, aquatic habitat impacts
12	Jay Branch Tributary # 7 (2.2 Mi.)	Sedimentation/ Siltation	Erosion from parking areas and on-mountain activities
14	Godin Brook	Sedimentation/ Siltation, Nutrients	Agricultural runoff, aquatic habitat impacts
16	Rock River, Mouth to VT/Quebec Border (3.6 Miles)	Nutrients, Sedimentation/ Siltation	Algal growth; agricultural runoff
17	Berry Brook, Mouth Up to and Including N. Trib (Approx. 1 Mile)	Nutrients, Sedimentation/ Siltation	Agricultural runoff, aquatic habitat impacts
19	Saxe Brook (Trib to Rock River) from Mouth Upstream 1 Mile	Nutrients	Agricultural runoff
20	Mud Creek, from Vt/Que Border Up to rm 6.5 (Approx. 3.2 Miles)	Nutrients, Sedimentation/ Siltation	Agricultural runoff; nutrient enrichment impacts macroinvertebrates

PART A	IMPAIRED, TMDL REQUIRED		
Map ID	Name	Pollutant	Problem
21	Rock River, Upstream from Quebec/VT Border (Approx 13 Miles)	Nutrients, Sedimentation/ Siltation	Nutrient enrichment; agricultural runoff

Table 6. Priority Streams for Restoration. Considered Impaired, No TMDL required
(Map ID corresponds with Figure 15)

PART B	IMPAIRED, NO TMDL REQUIRED		
Map ID	Name	Pollutant	Problem
9	South Mountain Branch, Tributary #3 (Mouth to rm 0.5)	Sedimentation/ Siltation	Erosion from parking areas and on-mountain activities.

Table 7 Priority Streams for Restoration. Considered Impaired with completed TMDL
(Map ID corresponds with Figure 15)

PART D	IMPAIRED WITH COMPLETED TMDL		
Map ID	Name	Pollutant	Problem
11	Samsonville Brook	Escherichia coli (E. coli)	Elevated E. coli levels
13	Missisquoi River, Mouth to Swanton Dam	Mercury In Fish Tissue	Elevated levels of mercury in walleye
15	Godin Brook	Escherichia coli	Elevated E. coli levels
18	Berry Brook, Mouth Up to and Including N. Trib (Approx. 1 Mile)	Escherichia coli	Elevated E. coli levels

Part E and F (Tables 8 and 9) of the Vermont Priority Waters List are assessed as "altered" where aquatic habitat and/or other designated uses are not supported due to the presence of invasive aquatic species (Part E) or altered for flow (Part F). Alterations arise from flow fluctuation, obstructions, or other manipulations of water levels that originate from hydroelectric facilities, dam operations, water withdrawals for industrial or municipal water supply, snowmaking (Part F).

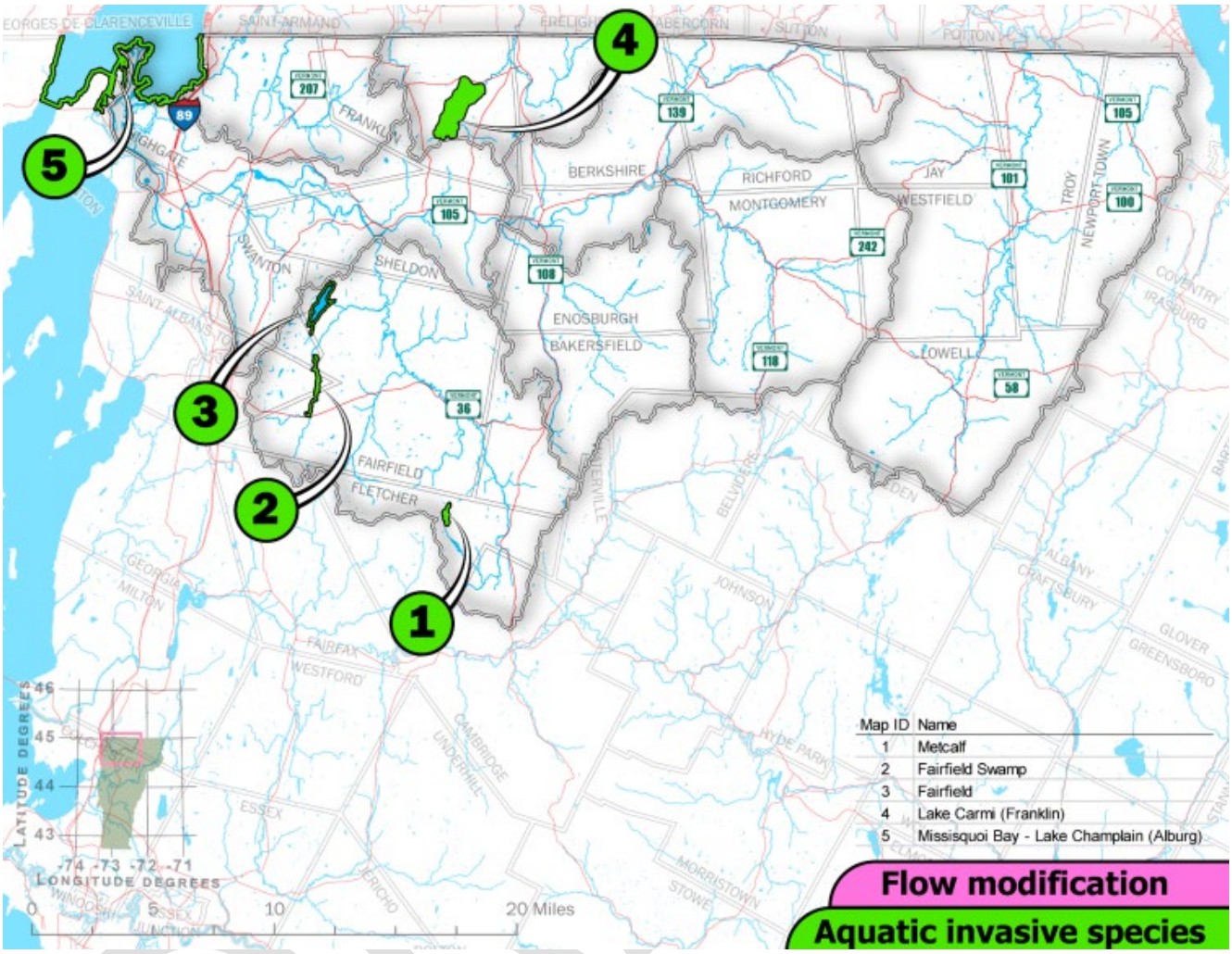


Figure 16. Lakes altered by aquatic invasive species, see Table 8.

Table 8. Lakes altered by aquatic invasive species. (Map ID corresponds with Figure 16)

PART E	LAKES ALTERED BY AQUATIC INVASIVE SPECIES		
Map ID	Name	Pollutant	Problem
1	Metcalf	Locally abundant Eurasian watermilfoil (EWM) growth.	No active management.
2	Fairfield Swamp	Locally abundant EWM growth.	No active management.
3	Fairfield	Locally abundant EWM growth.	Ongoing management plan includes diver-operated

PART E	LAKES ALTERED BY AQUATIC INVASIVE SPECIES		
Map ID	Name	Pollutant	Problem
			suction harvesting, benthic barriers, and hand-pulling.
4	Lake Carmi (Franklin)	Locally abundant EWM growth.	Ongoing management plan includes mechanical harvesting.
5	Missisquoi Bay - Lake Champlain (Alburg)	EWM, Variable-leaf milfoil, Zebra Mussels (ZM), and Water chestnut infestation.	Active hand-pulling efforts for water chestnut. ZM are ubiquitous.

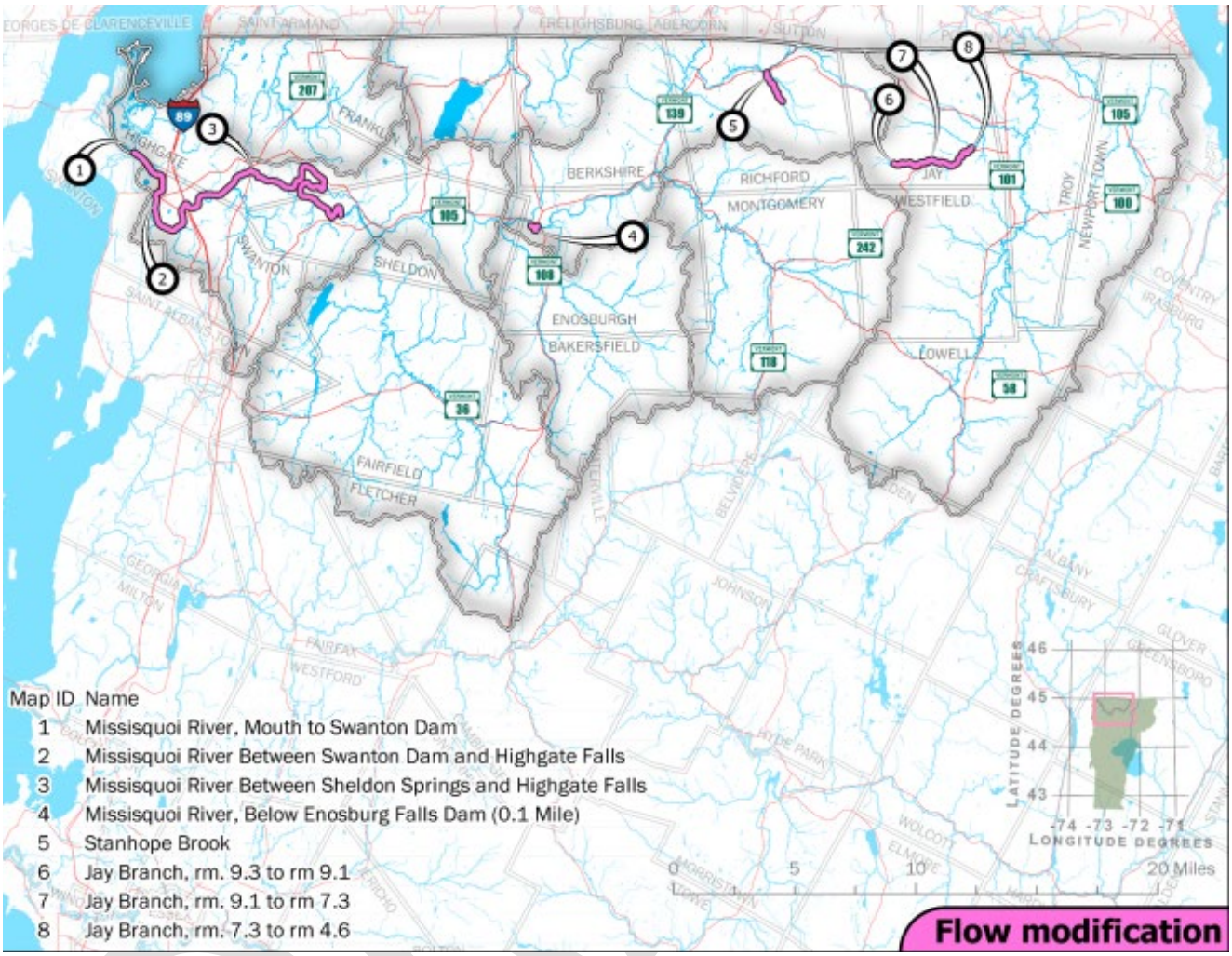


Figure 17. Map of flow altered rivers for Basin 6.

Table 9. Rivers altered by flow (Map ID corresponds with Figure 17).

PART F	STREAMS ALTERED BY FLOW	
Map ID	Name	Pollutant
1	Missisquoi River, Mouth to Swanton Dam	FERC license expires 2024; Artificial flow fluctuating and condition by hydropower production
2	Missisquoi River Between Swanton Dam and Highgate Falls	FERC license expires 2024; Artificial flow fluctuating and condition by hydropower production
3	Missisquoi River Between Sheldon Springs and Highgate Falls	FERC license expires 2024; Owner has proposed to operate in a run-of-river mode under a new license;

PART F	STREAMS ALTERED BY FLOW	
Map ID	Name	Pollutant
		Artificial flow fluctuating and condition by hydropower production
4	Missisquoi River, Below Enosburg Falls Dam (0.1 Mile)	FERC license expires 2023; Owner in in the process or going through the FERC relicensing process; Artificial flow fluctuating and condition by hydropower production
5	Stanhope Brook	Richford water supply; Possible lack of minimum flow below water supply withdrawal point
6	Jay Branch, rm. 9.3 to rm 9.1	Partial support 4.7 mi (8.7 mi total length); Jay Peak evaluating expansion/alternatives; Artificial & insufficient flow below Jay Peak snowmaking water withdrawal
7	Jay Branch, rm. 9.1 to rm 7.3	Artificial & insufficient flow below Jay Peak snowmaking water withdrawal
8	Jay Branch, rm. 7.3 to rm 4.6	Partial support 4.7 mi (8.7 mi total length); Jay Peak evaluating expansion/alternatives; Artificial & insufficient flow below Jay Peak snowmaking water withdrawal

B. Total Maximum Daily Loads (TMDLs)

For waters listed as impaired, the federal Clean Water Act requires a plan that identifies the pollutant reductions a waterbody needs to meet Vermont's Water Quality Standards, and it must identify ways to implement those reductions. A Total Maximum Daily Load (TMDL) is the calculated maximum amount of a pollutant that a waterbody can receive and still meet VWQS. A TMDL can be calculated for reducing water pollution from specific point and nonpoint source discharges or for an entire watershed to determine the location and amount of pollution reductions needed.

The TBPs are the implementation plans guiding the execution of actions necessary to meet TMDL requirements specific to each basin (see Chapter 4 and the implementation tables for associated strategies). Impaired surface waters with a TMDL are listed in Tables 4 and 7 and are covered by one of the TMDLs listed below. Impaired surface

waters that do not require a TMDL include South Mountain Branch, Tributary 3 because the water quality management plan listed below will resolve the impairment.

- 2003 TMDL for 30 Acid Impaired Lakes in Vermont
- Northeast Regional Mercury Total Maximum Daily Load
- 2011 Vermont Statewide Bacterial TMDL
- Jay Peak Water Quality Management Plan
- 2008 Lake Carmi Phosphorus TMDL
- 2016 Lake Champlain Phosphorus TMDL

The plans to meet the TMDL targets for acid-impaired (Kings Hill Pond) and Mercury-impaired waters (Missisquoi Bay and mouth of the Missisquoi River) are primarily focused on regional efforts to reduce atmospheric deposition and as a result are not described in greater detail beyond the links provided above.

The Jay Peak Water Quality Management Plan is an EPA-approved remediation plan. Progress towards meeting the remediation plan is described in the following factsheet: Ski Resort Improves Stormwater Management and Restores Two Streams in Jay Branch Watershed (EPA 841-F-19-001SS). However, the 2025 report: 2025 JPR WQRP Update.pdf, describes decreased scores for the two streams that may be due to conditions outside the control of the ski resort. Future updates can be found on the Assessment and Listing | Department of Environmental Conservation. It is expected that future monitoring scores will meet standards. The third stream, South Mountain Brook Tributary 3 is still impaired, see the update regarding remediation strategies.

Progress towards meeting the Bacterial TMDL, the Lake Carmi TMDL and the Lake Champlain Phosphorus TMDL Phase 4 is described in the next section. This Tactical Basin Plan takes the next step of ensuring pollutant targets are met with existing resources by identifying and directing funding towards the highest priority projects to achieve specific TMDL goals, see Chapter 5.

Statewide Bacterial TMDLs

Twenty-one of Vermont's waters are impaired at least in part due to bacterial contamination associated with human health risk. The bacteria, Escherichia coli, (E.

coli) is an indicator for the presence of fecal material from warm-blooded organisms and can be correlated with the presence of waterborne pathogens. Three E. coli-impaired waterbodies are in Basin 6 (see Figure 15 for map):

- A 2.6-mile reach of Berry Brook,
- a 4.4-mile reach of Godin Brook and
- a 4.5-mile reach of Samsonville Brook

A Vermont Statewide Bacteria TMDL Report supports bacteria reduction and watershed restoration throughout Vermont, including the river segments listed above. The TMDL, which established bacterial targets for each impaired waterbody, was completed in September 2011. The report's appendices include specific data monitoring and watershed information about each of the impaired waterbodies.

Agricultural land represents a significant portion of the watershed area of the three Basin 6 streams, with dairy production as the predominant activity that contributes to the bacteria load. The TMDL report supports the implementation of agricultural-related practices, including land treatments that reduce runoff of animal waste into streams and exclude livestock from riparian buffers.

As Berry and Godin Brooks are also nutrient-impaired predominately due to agricultural activity, the Lake Champlain Phosphorus TMDL Implementation Plan and subsequent Phase 4 (see following relevant section) directs efforts towards these streams. The associated TBP strategies that will reduce nutrients and sediment, specifically those associated with managing animal waste and organic debris, will also serve to reduce bacteria loading in all three streams. The bacteria concentrations of each listed stream will need monitoring to show improvements once implemented. The bacteria TMDLs will be addressed in part by regulations and actions that will be implemented in the Basin.

Lake Carmi TMDL

Lake Carmi is impaired for Phosphorus with levels exceeding the lake's 22 µg/L standard. To address the impairment, DEC developed The Lake Carmi TMDL, which was approved by US EPA in 2009. DEC also completed the Lake Carmi Phosphorus Reduction Action Plan to meet the TMDL. Since then, DEC and AAFM have worked together with the Franklin Watershed Committee (FWC) and other partners to implement the plan to reduce nonpoint sources of phosphorus in the watershed.

In 2018, Lake Carmi was designated the state's only Lake in Crisis due to the long-term presence of toxic algal blooms. The state's response included the release of the Lake Carmi Crisis Response Plan, a 2019 Lake Carmi Progress Report and a 2022 update with additional project. For more information, see the following factsheet: TechnicalFAQ_Carmi_FINAL.pdf. In the fall of 2025, the town of Franklin with DEC support conducted an Aluminum sulfate (Alum) in-lake treatment (see https://dec.vermont.gov/watershed/restoring/carmi).

Alum was applied to the lake to reduce phosphorus from the water column that would normally be available to phytoplankton and plants. Alum bonds to phosphates through precipitation, forming a particulate known as a floc. The floc settles on the lake bottom creating a barrier that slows phosphorus release from the sediment.
Alum treatments are typically effective for 10 to 15 years; however, continued elevated levels of phosphorus entering Lake Carmi could overwhelm the treatment dosage, reducing its effectiveness. The previous and ongoing work of adopting best management practices throughout the watershed by all community members and sectors has allowed the state to support an alum treatment at Lake Carmi as well as increase the length of time that it remains effective.

DEC will continue to support implementation of the Lake Carmi associated plans. These plans include projects that DEC and partners have identified to reduce phosphorus loading from the watershed. In 2024, the Franklin County Natural Resources Conservation District (FCNRCD) identified an additional list of 15 priority projects with Clean Water Funds. As of SFY 2025, the state and federal government has invested 5.5 million dollars to implement projects in the watershed, the majority towards agriculture and as well as the in-lake treatment. As of SFY 2024, these investments have reduced P loading by over 1600 kg/yr. Nearly all (roughly 99%) of the estimated phosphorus reductions currently quantifiable in the Lake Carmi watershed have been associated with adoption of agricultural BMPs, see the Lake Carmi Agricultural interactive report, https://tinyurl.com/us7kevbf.

While Lake Carmi has benefited from a significant reduction, the continued high P concentrations in tributaries (pers. communication, Mark Mitchell, LPMPP) and the need to extend the life span of the Alum treatment requires continued BMP implementation to mitigate P loading towards reduction of algal blooms. The DEC support for programs and strategies identified in the Lake Champlain Phosphorus TMDL Phase 4, will support continued implementation of BMPs in the Lake Carmi watershed, see Section C.

C. Lake Champlain Phosphorus TMDL Phase 4 Content

Lake Champlain covers 373 square miles with a watershed that extends across 8,234 square miles, draining nearly half the land area of Vermont, as well as portions of northeastern New York and southern Quebec. The large land to water ratio (20:1) has resulted in significant phosphorus loading from land-use activity in the watershed, a predominant source of the lake's phosphorus impairment (LCBP 2021). The excessive phosphorus in the lake has impaired aquatic life and reduced recreational use due to cyanobacteria blooms, unpleasant odors, and low dissolved oxygen concentrations.

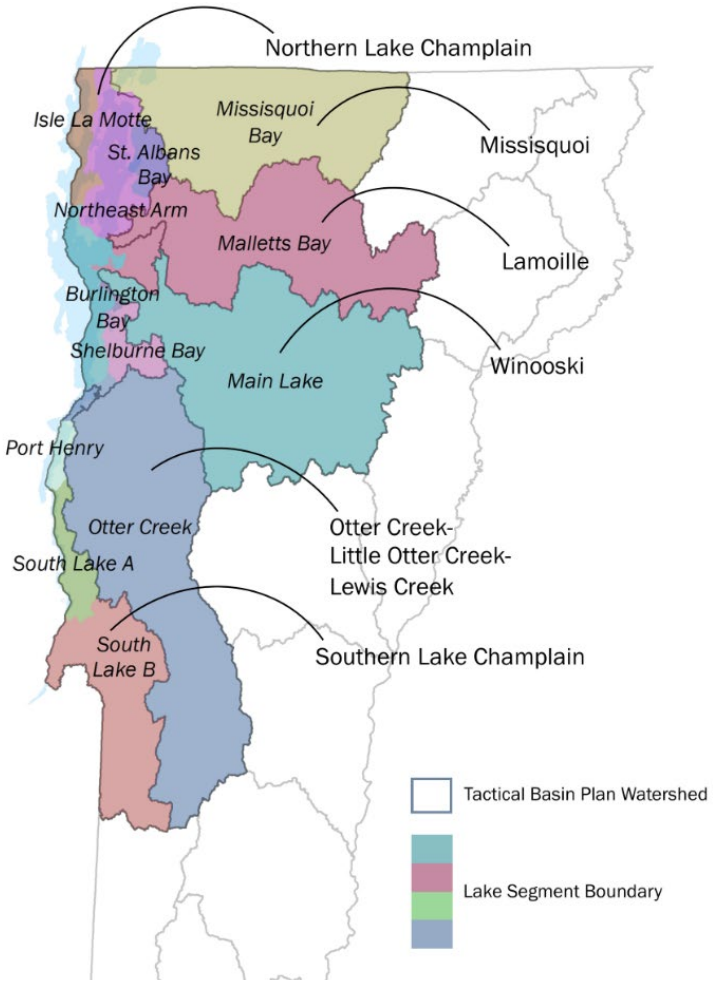


Figure 18. The 12 TMDL lake segments and their watersheds in Vermont.

The United States Environmental Protection Agency (EPA) established TMDLs for the 12 Vermont segments of Lake Champlain (Figure 18) to ensure that phosphorus reductions are achieved. To meet requirements of the 2016 Lake Champlain Phosphorus TMDL (LC TMDL), Vermont's implementation plan (Phase 1) takes a lake-wide approach in recognition of the interconnectedness of the segments. As required, the plan is a phased approach over a 20-year period and includes an accountability framework to ensure pollution reduction targets are achieved across contributing land-use sectors. This section, along with Chapters 4 and 5, gauges progress as part of the LC TMDL's Phase 4 (See Missisquoi 2021 plan for Phase 3).

Phases 1, 2, & 3 of the Lake Champlain TMDL

The 2016 VT Lake Champlain Phosphorus TMDL Phase 1 Implementation Plan addresses programmatic commitments and milestones to address the major Vermont sources of phosphorus to Lake Champlain across all sectors. Vermont's successful completion of the 28 milestones in Phase 1 Accountability Framework[4] in 2020 has resulted in enhanced state regulatory oversight for municipal road and stormwater management, silvicultural and agricultural practices, as well as incentives for landowners to implement water quality best management practices. In addition, the state established a long-term funding source, the Clean Water Fund, to support clean water projects and a tracking and accounting system to evaluate total phosphorus (TP) reduction progress.

The subsequent two phases of the LC TMDL are embedded in the TBPs associated with the Lake Champlain Basin. Along with providing updates on Vermont's progress towards addressing policy commitments, each phase provides the following information:

- Phase 2 in the 2016 Missisquoi Bay TBP downscales phosphorus allocations (reduction targets) to the tactical basin level from land-use sectors and prioritizes basin catchments for remediation (critical source areas) based on highest modeled phosphorus load reductions.
- Phase 3 in the 2021 Missisquoi Bay Lake TBP documents phosphorus reductions by sector achieved since the last basin plan and sets projected target reductions for the next five years.

[4]see Progress Report on Lake Champlain TMDL Implementation Plan (January 2021)

Using outcomes of Phase 2 and 3, the TBP strategies in the 2021 and the current 2026 plan direct technical and financial resources to critical source areas to facilitate regulatory compliance and voluntary adoption of Best Management Practices (BMPs) across all land-use sectors. Specific projects to address the strategies in the Implementation Table (see Chapter 5) are included in the ANR's Watershed Projects Database.

The following Phase 4 content for the 2026 Missisquoi Bay TBP describes Vermont's progress towards achieving maximum phosphorus reduction and, along with information in Chapters 4 and 5, updates the approach for reducing phosphorus loading from each land-use sector including, agriculture, forestry, developed lands and streams. In addition, five-year targets are assigned. As the wastewater targets identified in Phase 1 are achieved through each wastewater treatment facility permitting process, five-year targets are not set, and progress towards these targets are discussed in Chapter 4.

Commitment and Strategy to Meet Targets

To meet the TMDL targets, Vermont has enhanced regulatory program commitments (Act 64 of 2015) as well as established a clean water delivery framework (Act 76 of 2019). The passage of Act 76 has accelerated the implementation of natural resource restoration projects to meet non-regulatory target reductions. Vermont's Water Investment Division (WID) focuses on collaborative, data-driven efforts to reduce nutrient and sediment pollution through the engagement and support of stakeholders at basin-specific coordination meetings and public forums. WID utilizes the watershed planning process and targets clean water investments to support nonpoint source pollution mitigation, and natural infrastructure projects that improve water quality.

Key initiatives include:

- the ongoing deployment of the state's clean water engagement strategy , see Engagement Strategy section, to develop, maintain, and enhance the Agency's organizational partnerships;
- the implementation of Act 76 to support those partnerships and ensure project prioritization and funding;
- the annual tracking, accounting, and reporting of progress that is being made in each sector; and
- maintaining project reporting systems to obtain an accurate reflection of phosphorus reduction by project type within each basin.

These initiatives are described below and in detail in Chapter 4.

Measuring Progress Toward TMDL Targets

Vermont has made a long-term commitment to provide the mechanisms, staffing, and financing necessary to achieve and maintain compliance with the LC TMDL, along with the Vermont Water Quality Standards. To achieve this, the Vermont Department of Environmental Conservation's Clean Water Initiative Program and the Watershed Planning Program coordinate with committed state and federal agencies and local partners to fund, develop, implement, and track clean water projects that protect and restore water quality. The Clean Water Initiative Program's work includes the development and application of tracking and accounting methods as well as standard operating procedures (SOPs) for phosphorus reduction estimation and reporting (see Tracking and Accounting methodology here.)

The Clean Water Initiative Program tracks practices implemented by state-fiscal year (SFY) in the Clean Water Reporting Framework (CWRF) database and documents progress towards statewide pollution reduction goals in the Vermont Clean Water Initiative Annual Performance Report. The ANR Clean Water Portal's Clean Water Interactive Dashboard, an online tool, allows users to interact with Performance Report data on investments, project outputs, estimated pollutant load reductions and project cost effectiveness.

For the Phase 4 content, the Watershed Planning Program uses project reporting outputs that are generated from the CWRF database in development of the state fiscal year TP reduction estimates by general land-use sector for each basin, along with overall TMDL sector reduction targets. At the beginning of each subsequent five-year planning cycle, the Watershed Planning Program evaluates and documents progress against the five-year reduction target (described in this section) with a goal of meeting pollution reduction targets and in-lake water quality standards over the TMDL implementation period (2016-2036).

In addition, the Watershed Planning Program reports on the state's progress in each basin towards implementing and supporting regulatory and non-regulatory programs that address the TMDL commitments. While this Phase 4 content includes an overview of progress within each basin, DEC reports on completion of strategies in each TBP implementation table in interim (every 2.5 years) and final (every 5 years) progress reports with the final report coinciding with the completion of the TBP 5-year cycle (Chapter 5). The progress reports are published concurrently with Vermont Clean Water

Initiative's Annual Performance Reports (annual performance reports). The USEPA uses these progress reports to issue report cards on Vermont's TMDL implementation progress, pursuant to the LC TMDL accountability framework.

The ANR uses an adaptive management approach towards meeting targets. Any revisions to accounting and target setting will be documented in subsequent TBPs and annual performance reports.

DEC also works with the Lake Champlain Basin Program and the New York State Department of Environmental Conservation to implement the Lake Champlain Long-Term Water Quality and Biological Monitoring Project. Field data from the project, collected annually since 1992, are used to assess the attainment of the annual mean TP criteria for Lake Champlain and annual TP loading as well as trends for major tributaries, in addition to other monitoring goals.

State Programs to Meet Regulatory Targets

The regulatory programs that support the attainment of annual TMDL reduction targets in each sector are described in Phase 1 and Phase 2, as well as the annual performance reports. The state's progress towards program promulgation is described in Table 10. Chapters 4 and 5 describe how the Agency supports delivery of outreach and technical assistance to facilitate compliance.

Table 10. Regulatory programs supporting attainment of annual TMDL reduction targets

Source Sector*	Permit Program	Efficiency	Spatial Scale of TP Loading	Implementation Timeline
Agriculture	AAFM Required Agricultural Practices/Large Farm Operation & Medium Farm Operation Rules and Permits	Reduction efficiencies vary. Calculated using Standard Operating Procedures (SOP)	Implemented and tracked at HUC12 scale	AAFM - Estimates completed at HUC12 scale per farm size inspection cycle. Certified Small Farm Operations at least once every 7 years, Medium Farm Operations at least once every 3 years, and Large Farm Operations annually.
	DEC Concentrated Animal Feeding Operation permits	NA	NA	NA
Developed Lands: Stormwater	Operational 3-acre Permit	SOP	Can estimate once 3-acre GIS layer is finalized	DEC reissued General Permit 3-9050 in Dec. 2025 with a permit coverage due date of 10/1/2028 and implementation due 5 years after permit obtainment
	Municipal Separate Sewer System (MS4) General Permit	SOP	Determined by MS4	DEC reissued the MS4 permit in Summer 2023. All MS4 communities have updated phosphorus control plans and flow restoration plans and are in compliance. Phosphorus control plans must be fully implemented by 2036.

Source Sector*	Permit Program	Efficiency	Spatial Scale of TP Loading	Implementation Timeline
Developed Lands: Roads	Municipal Roads General Permit (MRGP)	SOP	Stormwater Program estimated regulatory MRGP P reductions expected over the lifespan of the TMDL	DEC reissued MRGP in January 2023. Towns must update road erosion inventories (REI) by Fall 2027. In addition, towns must upgrade 7.5% of their non-compliant road segments annually, including 20% of Very High-Priority segments annually beginning in 2026, and complete all work by 12/31/2036.
	Transportation Separate Storm Sewer System (TS4) Permit	TBD	TBD	Stormwater Program issued the TS4 permit to VTrans April 2023. Its phosphorus control plan must be fully implemented by 2036
Forest	Acceptable Management Practices (AMPs)	See Forestry SOPs	Completed at HUC12 scale	Assumed that lake segments with 5% forest reduction will be achieved via compliance with revised AMPs; however, Basin 6 will require additional reductions to achieve TMDL target by 2036

*The Vermont General Assembly passed Act 121 of 2024 (the Flood Safety Act) to strengthen state-level oversight to reduce flood risks by regulating development in river corridors. Key provisions include mandatory municipal adoption of new state flood hazard standards, updated maps, and state-level permitting for development in river corridors starting in 2028. These rules protect existing floodplains through avoidance of future encroachments through the establishment of statewide river corridors.

Act 76 Framework to Meet Non-Regulatory Targets

The state recognizes the valuable role of community partners in facilitating the adoption of non-regulatory practices. The implementation of these non-regulatory projects is required to meet the TMDL and therefore provide the reasonable assurances that those reductions would be achieved. The 2019 Vermont Clean Water Service Delivery Act (Act 76) provides a funding and project delivery framework to support, enhance and

facilitate partner implementation of non-regulatory projects to achieve Vermont's clean water and TMDL targets by:

- providing long-term funding through Clean Water Fund revenue;
- supporting non-regulatory projects such as wetland and floodplain restoration, and riparian tree and shrub plantings;
- establishing Basin Water Quality Councils led by regional Clean Water Service Providers (CWSPs) to identify, implement, operate, and maintain non-regulatory projects to meet TMDL reduction targets; and
- distributing funds for non-regulatory projects based on interim phosphorus reduction targets and a standard cost per unit phosphorus reduced.

Act 76 established four complementary grant programs that are described in the following sections. They are intended to support implementation of the Clean Water Initiative by addressing sources of pollution through both regulatory and non-regulatory mechanisms: Water Quality Restoration Formula Grants, Water Quality Enhancement Grants, Municipal Stormwater Implementation Grants, and Developed Lands Implementation Grants. In addition to the establishment of the four complementary grant programs, the Act's creation of Clean Water Service Providers (CWSPs) has begun supporting the implementation of developed lands projects, as well as other nonregulatory sectors since 2022. The program continues to expand, with increases in developed land phosphorus reductions expected. The CWSPs may also elect to adopt prior implemented clean water projects for P credit to ensure functionality of projects to achieve their expected lifespan.

During SFY 2023-2026, the agency has awarded Formula Grants to the Northwest Regional Planning Commission, the Basin 6 CWSP, with a target to work with project implementers to reduce 342 kg/yr of TP through non-regulatory projects. The contracted P target is expected to grow each year as the agency continues to invest in program and partner capacity to broaden the reach and impact of clean water project implementation.

Engagement Strategy

In addition to Act 76 funding framework, the Watershed Planning Program engages partners using strategies that strengthen the partners' sense of ownership and therefore participation in the planning process and implementation. The desired outcomes of the state's engagement strategy include:

- Multi-partner collaboration across sectors and localities to assist with developing, writing, and implementing TBPs;
- Strategic inclusion and engagement with different sectors and localities throughout the TMDL Phase 4 planning process to ensure that all concerns, needs, and targets are addressed;
- Strategic communication efforts to ensure understanding of and support for the plan among key stakeholders and the general public throughout the watershed; and the establishment of the Clean Water Workforce Capacity Development Grant to expand organizational capacity within our stakeholder networks to support voluntary, non-regulatory efforts. This grant is meant to build capacity in under-resourced entities to increase their ability to engage in more clean water projects, engage in more complex clean water projects, or propel others to do clean water projects.

The DEC's accomplishments to date include:

- Standing up the CWSPs as a function of Act 76 program delivery and the establishment of the clean water service network. A number of DEC's statutory partners are now serving as CWSPs as well as members of recently established Basin Water Quality Councils. These groups will enhance community outreach and engagement for clean water project delivery efforts
- Developing the Watershed Planning Program Communications Plan
- Creating web-based resources that support the work of partners and the Basin Water Quality Council, including engagement and training resources and Clean Water Fund applicant and recipient resources
- Completing a partners' needs assessment and addressing an identified need for financial support to build partner capacity through the Clean Water Workforce Capacity Development Initiative

These efforts will continue to promote widespread and improved understanding of the requirements for TMDL implementation efforts, support diverse and sustained collaboration, and help in building new partnerships. As a result, the TMDL implementation efforts will continue to enhance shared ownership and be well informed by those working on the ground, which will enhance reasonable assurance that Vermont will achieve improvements in local water quality and the Lake Champlain TMDL reduction targets.

Missisquoi Bay Basin TMDL Targets

Each of the 12 Lake Champlain segments has individual phosphorus load estimates and reduction targets under the Lake Champlain TMDL. Information on how phosphorus loading was projected in the Lake Champlain Basin can be found in Chapter 5 of the Phosphorus TMDLs for Vermont Segments of Lake Champlain (LC TMDL). Phosphorus reductions will be realized by reducing phosphorus loading from the associated Vermont basins draining into each of these lake segments. The Missisquoi Bay lake segment is the only lake segment wholly contained in the Missisquoi Bay basin (figure 18). The USEPA, DEC, and Tetra Tech used the best available modeling to develop load and target estimates at smaller watershed scales. Sub-tactical (HUC12) basin scale phosphorus loading and reduction estimates for HUC12 watersheds within the Missisquoi basin are summarized in an online Power BI dashboard (Estimated LC TMDL TP Loading and Target Reductions). The dashboard displays estimates for all land-use sectors and HUC12 watersheds in the Lake Champlain Basin. The first page of the dashboard summarizes estimated phosphorus loading by HUC12 watershed; the second page of the dashboard summarizes estimated TMDL reduction targets by HUC12 watershed. Although reductions are reported at the basin scale, for tracking and target setting purposes these reduction targets have been downscaled to a HUC12 watershed scale. These HUC12-scale targets can be compared to reported reductions to assess progress, identify new strategies, and prioritize future funding and management actions.
Information from this dashboard is summarized in the table below.

Table 11. Summary table of the Missisquoi Basin's total phosphorus annual loading, total annual reduction targets (allocation) and required reductions by sector. (Estimated TMDL TP Loading and Reduction online report).

Sector	Category	Allocation Category	Total Load (kg/yr)*	Total Reduction Target (kg/yr)	Reduction Required for Basin (%)
Agriculture	Fields/pastures	Load	59,316	49,114	82.80%
	Barnyard Production Areas	Wasteload	3,227	2,581	80.00%
Developed Land – Road & Stormwater	Summary		21,554	7,371	34.20%
	VTrans owned roads and developed lands	Wasteload			
	Roads MRGP	Wasteload			
	MS4	Wasteload			
	Three-Acre General Permit	Wasteload			
Wastewater	WWTF discharges**	Wasteload	1,500	779	51.90%
	CSO discharges	Wasteload	NA	NA	NA
River	All streams	Load	44,810	30,695	68.50%
Forest	All lands	Load	22,829	11,415	50.00%
		Total	151,327	100,429	

* Terrestrial load, as opposed to delivered load at lake segment
** This sector's values are delivered load estimate to Missisquoi Bay lake segment

Summary of Missisquoi P Reductions SFY 2016-2025 by Sector

Most of the reductions achieved in the Missisquoi tactical basin have come from the agriculture sector (Figure 19). This sector achieved approximately 45% of the overall agricultural TMDL target in SFY 2024 (Table 13). The forest and road sectors achieved 12.5% and 11%, respectively, in SFY 2025 (Table 13), although reductions in the road and stormwater sectors have been increasing steadily in the basin since 2016 (Table 12).

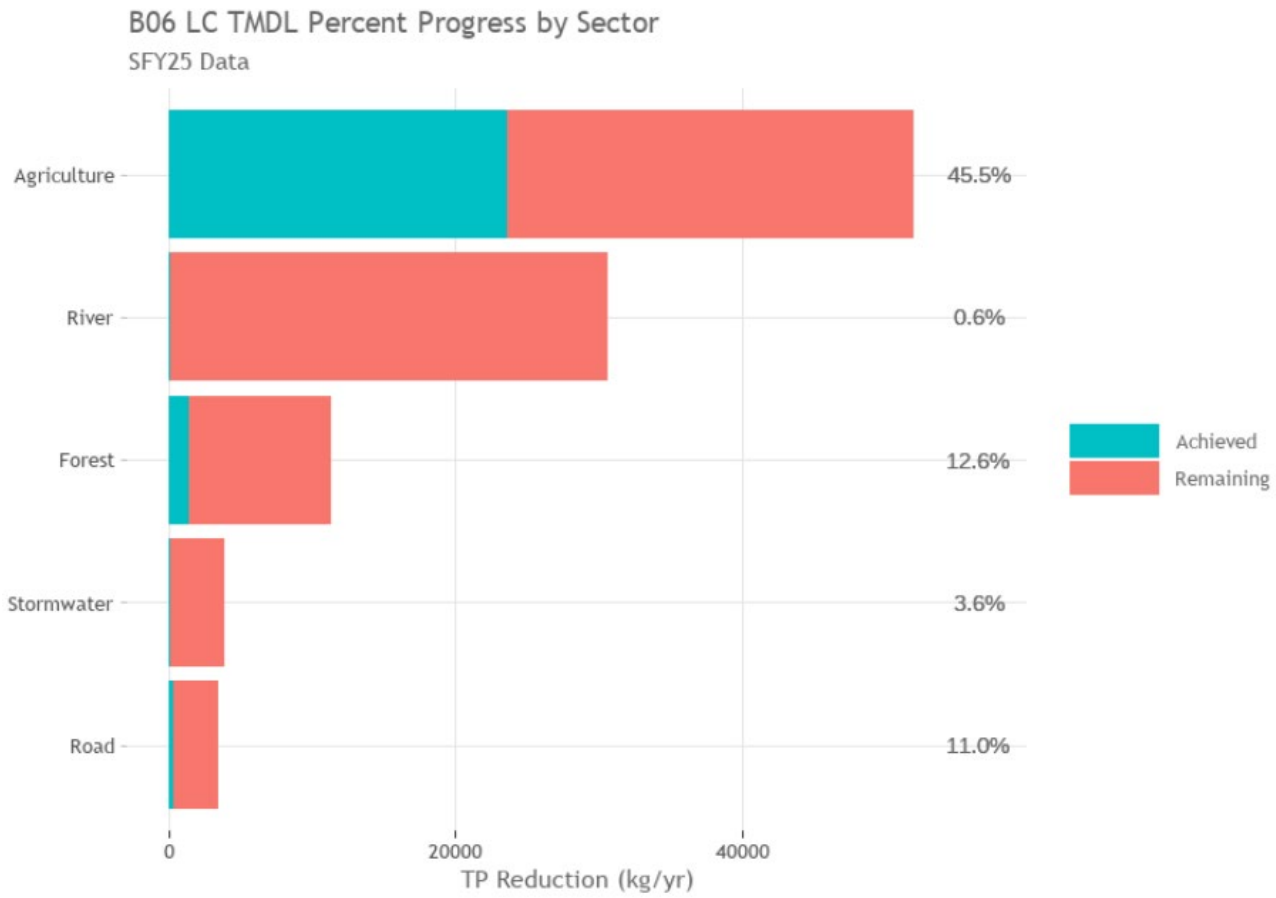


Figure 19. Estimated TP reduction (kg/yr) and remaining TMDL target by land-use sector.

In SFY 2025, the basin achieved approximately 25% of the total TMDL reduction target across all land-use sectors. Excluding the river-sector target, which is expected to be achieved by protecting river corridor areas and allowing channels to reach a stable equilibrium state over decades, the Missisquoi basin achieved approximately 36% of the total basin reduction target in 2025.

Table 12. Estimated TP reductions (kg/yr) in the Missisqoi Basin by sector and state-fiscal year achieved by state and parters. *SFY 2025 Agricultural reporting is currently incomplete.

Sector	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025*
Agricul -ture	3665	4082	6643	9177	11156	14664	19303	25379	23626	16595
Forest	1307	1556	1658	1610	1576	1542	1428	1355	1355	1434

River	0	0	61	77	101	127	159	169	181	193
Road	2	3	7	24	68	88	154	238	307	380
Storm water	8	14	16	18	18	70	86	106	120	143

Table 13. Percent of TP target reductions achieved in the Missisquoi Basin by sector and state fiscal year. *SFY 2025 Agricultural reporting is currently incomplete

Sector	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025*
Agricul-ture	7.05	7.8	12.8	17.66	21.7	28.22	37.2	48.8	45.47	31.94
Forest	11.5	13.6	14.5	14.11	13.1	13.51	12.5	11.8	11.8	12.56
River	0.00	0.00	0.20	0.25	0.33	0.41	0.52	0.55	0.59	0.63
Road	0.05	0.08	0.22	0.69	1.97	2.54	4.46	6.89	8.89	11.00
Storm water	0.22	0.35	0.41	0.45	0.46	1.79	2.20	2.70	3.05	3.65

Implementation of the TMDL is not a linear path. Changing rates of progress over the 20-year implementation timeframe are to be expected and are associated with swings in financial assistance levels, and the capacity of agencies and partners to administer funds, implement projects, and report outcomes. In addition, now that many of the low-hanging projects have largely been implemented, identification and implementation of projects that are in some cases more complex and involved, will need to be completed to reach Vermont's water quality goals in the basin. The variability of implementation rates across years also underscores the importance of investing in program and partner capacity to broaden the reach and impact of clean water project implementation. The narrative provides some context to explain TMDL implementation progress by sector.

TMDL Five-Year Sector Targets: Missisquoi Bay Basin 2026-2031

A goal of the Phase 4 content (and subsequent Phases beyond Phase 4) is to refine pollution reduction targets to achieve the load allocations (reduction targets) of the TMDL. This Phase 4 establishes the next set of five-year targets (Table 14) to 2031. Subsequent phases will report on TP reduction progress towards meeting targets in five-year increments. For the developed lands sector, the five-year targets identify the P reduction expected from implementation of non-regulatory projects, while the agricultural and forest sector targets are expected to be addressed by all activities tracked by the state.

Table 14. The Missisquoi basin five-year TP targets and final targets for each land-use sector (kg/yr).

Sector	SFY2025 Estimated TP Reductions	Remaining TMDL Sector Target	2026 Target	2031 Target	TMDL Sector Target
Agriculture	23626*	28,337	27097	39082	51963
Forest	1433	9,982	4832	6878	11415
River	N/A		N/A	N/A	30695
Developed Lands: Road**	380	3,073	1209	2056	3452
Developed Lands: Stormwater**	143	3776	1353	2203	3919

*SFY 2024 is used here for the agricultural sector
**2026 and 2031 targets include anticipated reductions from regulatory programs

The five-year target setting is obtained by subtracting current-year estimated TP reductions and any anticipated reductions from regulatory programs from the overall TMDL sector target and dividing into five-year segments:

$$[5\ year\ target = \frac{TMDL\ target - (current\ SFY\ reduction + regulatory\ reduction\ estimates)}{remaining\ TMDL\ years} * 5]$$

The five-year targets represent a linear estimate that describes how much additional TP should be reduced over the next five years to reach the 2036 TMDL target, given the amount of TP reduction achieved in SFY 2025. The estimate does not include SFY 2026 data but assumes an 11-year period stretching between 2025 and 2036.

The five-year target uses the most recent finalized CWRF reductions for that sector. The developed lands sector has anticipated regulatory reduction estimates from programs such as MRGP; these estimated regulatory reductions are considered when calculating the five-year goal (if regulatory programs are expected to reduce 20% of the total sector goal, then current CWRF reductions AND the regulatory estimate are subtracted from the sector goal). Other sectors, like agriculture and forest, have

regulatory programs (RAPs and AMPs), but no estimate as to how much TP these programs will achieve; so, only the finalized CWRF data are used.

The river sector does not have a five-year target assigned in this Phase 4 content. The rivers are expected to meet targets over a longer time frame than the other sectors, as the evolution of rivers towards a more stable condition can take many years to accomplish through passive restoration projects, and by avoiding future encroachments into the river corridor, see below for additional explanation.

The following sections further explain the 2031 targets established per sector. A measure of progress towards meeting phosphorus reduction goals is included as well as supporting information for developing the five-year targets for agricultural and developed land-use sectors. Data shown include up to SFY 2024 for agriculture and SFY 2025 for all others, so actual achievements as of the publication of this plan may be higher.

Agriculture

State and federal agencies and partner groups support programs and funding sources to assist the agricultural community's compliance with RAPs or adoption of non-regulatory BMPs (see Chapter 4).

The TMDL agricultural reduction targets for the Missisquoi basin are 44,023 kg/yr for crops, 5,091 kg/yr for pasture, and 2,849 kg/yr for barnyard production area sources. These individual sector targets sum to a combined agricultural reduction target of 51,963 kg/yr.

The Missisquoi Bay Basin Agriculture Tracking and Accounting Results

To date, the agricultural community has made substantial progress towards meeting targets. Overall, about 45.5% of the agricultural target was met in SFY 2024 (Figure 19, Tables 12 and 13). This includes 27.6% of the production area/barnyard management target. Please note that reporting lags mean that these data are provisional and should be considered incomplete until the subsequent year.

Agricultural Five-Year Target Update

As part of the LC TMDL's tracking and accounting framework, interim 5-year sector reduction targets were established in the Missisquoi tactical basin in SFY 2021. Based on finalized SFY 2024 agricultural data, the state and its partners have made good progress towards this target (Figure 20). However, progress assessment for this sector will need to wait until SFY25 and SFY26 data are finalized. Reporting on the results of state investments may lag based on the terms and duration of funding agreements, and results are likely incomplete for recent years covered in this report. The duration of project results reporting lag time varies by sector and funding source. Data for all years are updated each reporting cycle to more accurately reflect total results.

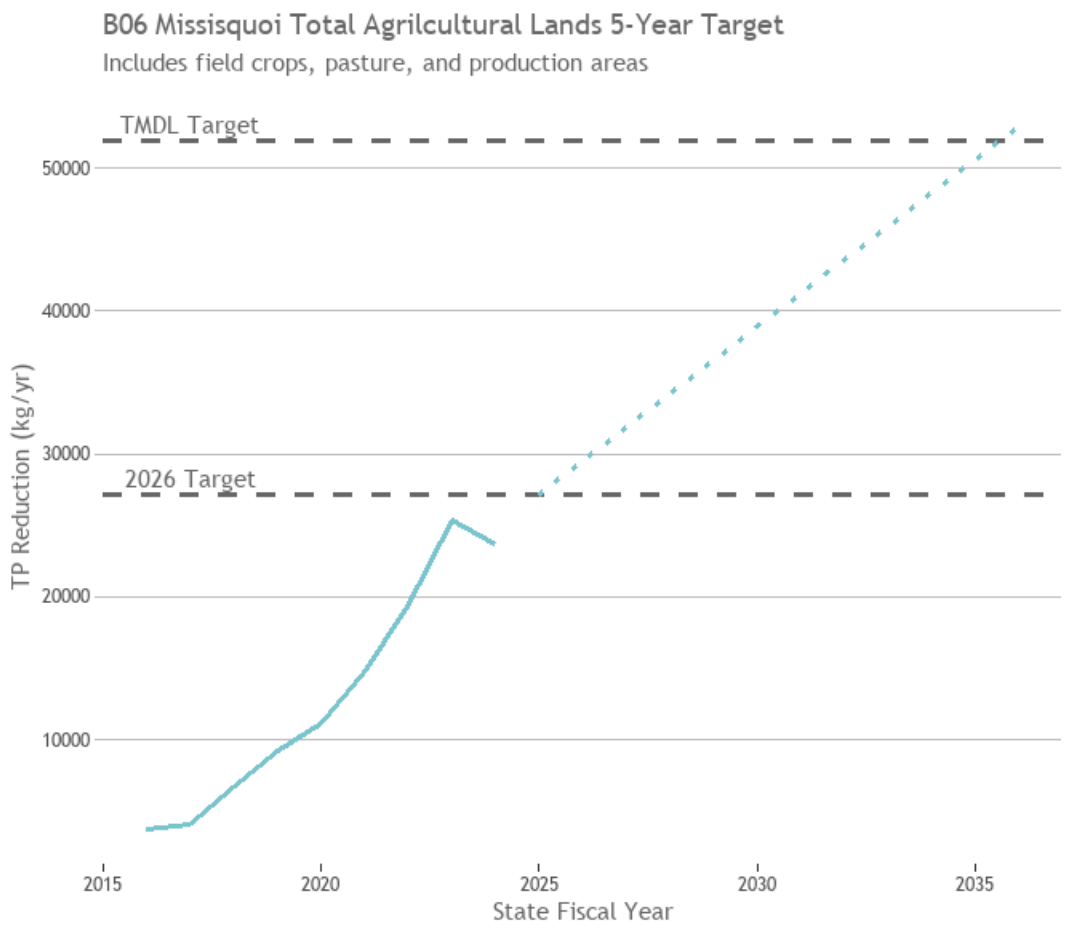


Figure 20. Estimated agricultural TP reductions by state fiscal year with SFY2026 5-year target noted. Solid line represents finalized CWRF reductions, dotted line represents linear trend required to meet the TMDL target by 2036.

Assuming that SFY2025-26 agricultural reduction estimates will be comparable to gains achieved prior to 2024, the next interim 5-year reduction target is calculated to be an additional 15,450 kg/yr (or a total 39,082 kg/yr) reduction to be achieved by SFY 2031.

Assessment of Progress

Since the 2021 tactical basin plan, two additional efforts have been adopted: 1) the AAFM's Pay for Performance program and 2) additional involvement of CWSP partners to address 10% of the agricultural phosphorus not met by existing agricultural programs.

To keep track of the work by multiple partners, the Vermont Agency of Agricultural, Food and Markets manages the Multi-Partner Agricultural Conservation Practice Tracking and Planning Geospatial Database (Partner Database) to support phosphorus reduction tracking and accounting efforts by the state and state funded partner projects.

Vermont will continue to support and improve on programs described in Chapter 4 to facilitate an increase in rates of BMP adoption and RAP compliance activity by the agricultural community. The state expects to meet the target by working with local and regional partners to prioritize and direct resources and funding towards cost effective phosphorus reduction efforts. Future efforts expected to work towards decreased P loading from the agricultural sector include:

- Discussions with partners have and will continue to identify how to improve delivery of services to support farmers' adoption or to support their continued implementation of BMPs.

- New research into whole farm nutrient management (Mass balance) to reduce phosphorus loading from farms by reducing the amount of imported phosphorus contained in purchased animal feed through improved feed storage and in-field crop management practices of home-grown forages.

- BMPs to reduce tile drain P, see Chapter 4 for additional information.

- Support for precision agriculture technology and innovation to improve nutrient management planning and implementation.

- Support for federal USDA program enrollment through Local Workgroup engagement and Locally Led Conservation funding pool development. Through

this new effort of NRCS, Conservation Districts can apply for funding specific to local issues in their area. For example, in 2025, Franklin County NRCD secured $1,500,000 for infrastructure improvements in Basin 6.

- Support and funding for the Vermont Pay for Performance Program.

- Advocacy for Federal Farm Bill Policy in collaboration with other states. Progress in this sector is partially dependent on continued financial assistance, which historically has been supported by federal, as well as state funding.

Another significant initiative is the reduction of the agricultural P loading within the Rock River and Hungerford Brook watershed as a NRCS National Water Quality Initiative (NWQI) that receives prioritized financial assistance. DEC meets annually with NRCS and assists in water quality projects in these NWQI areas. In previous years, DEC had also provided Regional Conservation Partnership Program (RCPP) resources for the Friends of Northern Lake Champlain (FNLC) to expand their water quality monitoring and farmer outreach and evaluation in the Rock River (a long-time, key NWQI region).

Developed Lands - Stormwater

Developed lands encompass multiple general land use classes, including urban, residential, and industrial areas, as well as paved and unpaved roads.

The Lake Champlain TMDL phosphorus reduction targets for the developed lands sector in Missisquoi Bay are 7371 kg for paved and unpaved roads as well as other developed areas. These reduction targets represent percent reductions over the modeled 2001-2010 baseline phosphorus loading estimates of 34% (Table 11 and The Lake Champlain TMDL interactive online report). Vermont calculates that regulatory compliance based on current regulatory programs will address 18% of the developed lands target (Figure 21). This would leave the remaining 82% to be addressed through the community's adoption of nonregulatory practices.

The Missisquoi Bay Basin Developed Lands Tracking and Accounting Results

As of SFY 2025, approximately 7% of the total developed lands target has been achieved (11% roads and 3.7% other developed lands). The majority of this has been met through regulatory actions. Achieved reductions have been accelerating in

recent years and additional reductions are expected over the life of the TMDL as regulatory programs in this sector get underway (Figure 2). Status and trends are illustrated in the online Power BI dashboard, Estimated LC TMDL Developed Lands TP Reductions.

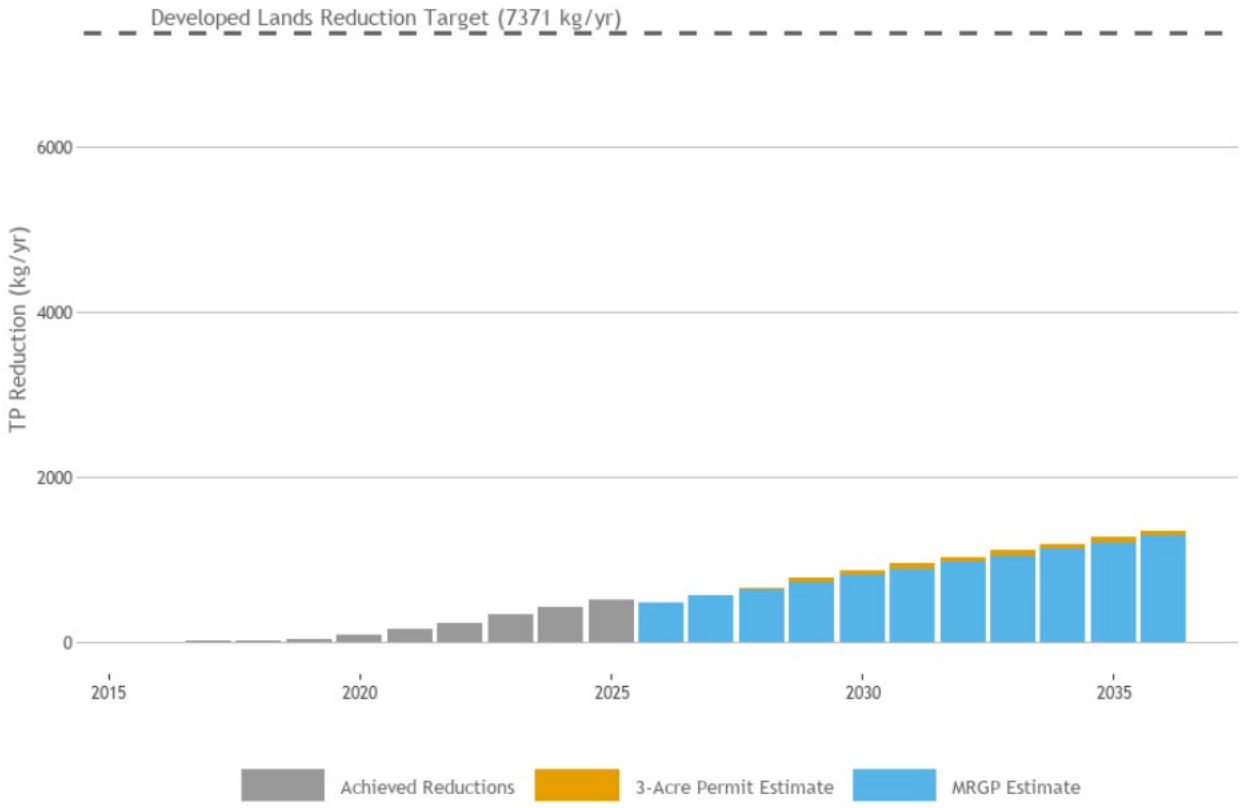


Figure 21 Achieved developed lands TP reductions through SFY 2025 and anticipated reductions from regulatory stormwater programs. Anticipated regulatory reductions are approximately 18% of the 7371 kg/yr developed lands target for the Missisquoi Bay basin.

Developed Lands Five-Year Target Update

As part of the LC TMDL's tracking and accounting framework, an interim 5-year developed land reduction target of 2,562 kg/yr was established for the Missisquoi Basin in SFY 2021. As of SFY 2025, road and other stormwater management projects addressed approximately 522 kg/yr (Figure 21) or 20% of the 5-year SFY 2026 target.

The next interim 5-year target is a total 4,257 kg/yr reduction from roads and stormwater to be achieved by SFY 2031 (Table 14).

Assessment of Progress

The reductions associated with regulatory program compliance are expected to achieve 18% of the developed lands target; however, achieving the remaining 82% of the developed lands target through non-regulatory BMP adoption will be a challenge. Measured phosphorus reductions did not meet the recent five-year target. While the agency believes that existing or new programs provide opportunities to increase P reduction trends, it does not expect to meet the next five-year target either. As the developed lands target only makes up 15% of the basin's overall reduction target, the agency is considering opportunities to realize greater reductions in other sectors that will address the shortfall in Basin 6's developed lands sector.

Resources directed towards nonregulatory actions include the Act 76 framework discussed earlier. Additional opportunities to support nonregulatory activity are described in Chapter 4, including stormwater management on private roads and residential BMPs on small lots. These and other activities will become available for phosphorus crediting once additional methodologies for calculating phosphorus reductions and assessment processes are completed. The agency expects to release resources for assessing and improving private roads by 2027.

Regulatory programs and resources are in place to facilitate permit compliance and meet projected phosphorus reductions for regulatory stormwater within the TMDL implementation period. The regulatory programs are described in Clean Water Initiative 2025 Performance Report, page 81. Regulatory stormwater financial assistance programs were updated through Act 76 of 2019 and include the Developed Lands and Municipal Stormwater Implementation Programs, see the Clean Water Initiative 2025 Performance Report, Appendix A.

Vermont's Act 37 of 2025 updated the state's approach to stormwater management, with a primary focus on the Three-Acre Permit. It directs the state to incentivize municipal adoption of three-acre sites, for which DEC is developing a pilot incentive program. Pursuant to Act 37, DEC is also working with a study committee to explore options to more efficiently meet stormwater regulatory requirements at a regional scale. The study committee's recommendation is due to the Vermont General Assembly in 2027. Outcomes of these efforts may inform future funding needs/changes. The Act also extended the deadline for Three-Acre Permit coverage in the Lake Champlain,

Lake Memphremagog, and stormwater-impaired watersheds from October 1, 2023, to October 1, 2028.

Act 37 also directed DEC to publish a Public Resource Guide to Stormwater Management that provides to persons subject to stormwater operation permits information and resources related to compliance with permit requirements. The additional support through Act 37 described here is expected to address the current barrier of landowners' inexperience and lack of funds (especially in the residential sector) to comply with the Three-Acre Permit.

Municipalities' implementation of the Municipal Roads General Permit (MRGP), with state financial assistance, is leading to phosphorus reductions from municipal road networks. The MRGP requires municipalities to bring hydrologically connected road segments up to standards to reduce erosion and sediment/phosphorus transport into waters of the state. Municipalities can access financial assistance through Vermont's Agency of Transportation (VTrans). Experience gained from recent extreme storm events and subsequent damages to Vermont's municipal roadway network has incentivized municipalities to prioritize culvert upgrades and ditching to enhance road resilience.

New tracking tools, such as the Stormwater Program's Drainage Infrastructure Resource Tool (D.I.R.T.), will help the state better direct resources to areas with higher actualized P loading. The map provides a visualization of towns' progress in terms of recorded drainage upgrades, as well as contributing drainage areas to larger culverts regulated under the MRGP. With priority areas outlined on the map identified through the Road Erosion Inventory (REI), towns are able to direct their attention to specific road segments to enhance flood resilience and reduce maintenance costs, with a focus on steep sections prone to erosion. ANR and VTrans continue to provide financial and technical assistance to encourage towns to address their steepest and most vulnerable roads first.

The annual implementation requirement from the MRGP has led to towns self-funding additional road segment upgrades beyond grant-funded work. While ANR tracks grant-funded road upgrades, it relies on municipalities to report on town-funded upgrades. While a positive turn of events, the ANR expects this could lead to its undercounting of P reductions.

Another area of undercounting may also be associated with the actual P reduced. The current P reduction calculation provides an average across a range of road slopes that

were expected to be addressed at issuance of the first MRGP permit. The second permit issuance requirement for reassessment includes a focus on a steeper set of roads and therefore road segment P reduction may be higher than the previously assumed average.

The state is also taking an adaptive management approach by assessing the need for changes to water quality management practices in order to be more responsive and resilient to the impacts of climate change. Work includes a VTrans-supported study by UVM to assess how well current road BMPs are holding up to current precipitation patterns, see NES1 - Doran.Wemple.VT AOT Symposium Presentation.pdf.

Additional P reductions from the developed lands in the Missisquoi Bay basin are also expected due to the previous influx in federal funding under the American Rescue Plan Act (ARPA), continued increase in Clean Water Fund revenue enacted under Act 76 of 2019, and ongoing investment in the capacity of clean water partners. These resources have driven project implementation across sectors, but especially the developed land sector. While much of this funding is beginning to be reflected in reported state investment figures, the results of these investments will not be fully reflected in estimated phosphorus reductions until projects are completed, which may take multiple years.

If the developed lands P target continues to look challenging during the upcoming five-year performance period, Vermont would consider redirecting P reduction to sectors with less expensive solutions and opportunities for additional project implementation.

RIvers

The TMDL target for rivers is associated with the river system's progress towards achieving an equilibrium condition and therefore a more stable condition because highly eroding, unstable stream reaches account for most of the particulate phosphorus inputs from river channels.

Excessive channel erosion as an outcome of river instability and lack of floodplain connectivity accounts for 29% of phosphorus loading to the Missisquoi basin. The TMDL reduction target is 30,695 kg/yr, requiring a 68.5% load reduction (see Table 11 and The Lake Champlain TMDL interactive online report).

Missisquoi Basin Rivers Tracking and Accounting Results

As of SFY 2025, 200 kg/yr of the target reduction for the streams sector had been achieved, though several river restoration projects are in the design/ development stage, and several landowners have enrolled in river corridor easements.

Vermont expects to achieve TMDL river sector TP reductions in part through active floodplain restoration activities; however, the primary focus continues to be the protection of river corridors to allow for ongoing channel evolution processes, stream equilibrium, and natural floodplain function through the natural channel forming processes that occur during floods. Much of this will happen through the promulgation of Act 121 (Vermont's Flood Safety Act of 2024) and regulatory compliance with the Stream Alteration Rules, although further research is needed to determine the level of phosphorus reductions that will be achieved through regulatory versus non-regulatory actions. For this reason and the assumption that the progress towards stream equilibrium will take decades, this Phase 4 content will not include a five-year reduction target for non-regulatory river restoration.

In contrast to the other sectors, ANR expects streambank source loads to decrease over time due to natural stream evolution processes. Therefore, the ANR is focused on actions designed to support and enhance these natural processes rather than on actions essential to achieving the reductions. In addition, the recent passage of Act 121 (of 2024) introduces statewide regulation of development in river corridors and gives the DEC Rivers Program authority over development in mapped river corridors starting in 2028, with new state rules for Special Flood Hazard Areas taking effect in 2026.

Passive restoration achieved through regulation is the primary mechanism to address phosphorous loading due to stream instability. The River Management Program has estimated that two-thirds of future stream reductions will be achieved through implementation of regulatory programs aimed at restoring stream equilibrium conditions over time, especially with the passage of Act 121. Specifically, regulatory programs that limit new encroachments and channelization practices facilitate larger scale passive restoration as rivers reconnect to floodplains and achieve a stable slope through the channel evolution process. In addition to Act 121, these programs include the stream alteration permit program and flood hazard area/river corridor regulations implemented at the state and local levels.

The potential for regulatory and non-regulatory phosphorus reduction targets and tracking will be refined with Functioning Floodplains Initiative tools, described below,

additional geospatial analysis, and considerations for strengthened regulations that further support the restoration of equilibrium conditions.

The DEC recently obtained the methodology for attributing phosphorus reduction credits to stream-sector projects as a result of the 2023 Functioning Floodplain Initiative (FFI). In addition, the WID's 2022 Natural Resource Standard Operation Practices and associated Interim Phosphorus Reduction Calculator provide the opportunity to calculate P credits for river and floodplain restoration and protection projects.

The FFI team, including DEC staff and hired consultants, has developed and continues to improve a web-based system for planning and tracking implementation, effectiveness, and value of river and floodplain/wetland restoration and conservation projects. This system allows users to readily access information and visualize maps developed in prior efforts and is designed to track implementation of projects to understand how progress is being made at different scales towards restoring stream equilibrium, floodplain functionality and flood resilience. The tracking interface will be used to update, and display implemented projects at the site, provide instruction, delineate HUC12 sub-watersheds and other basin scales, and provide updated calculations of benefits.

The FFI project establishes a relationship between the floodplain connectivity score and the prospective phosphorus reduction targets, whereby the higher the connectivity score, the more the phosphorus reduction target is achieved. This relationship demonstrates that repairing the most disconnected reaches may achieve a larger phosphorus reduction. In other words, the size of the connectivity credit awarded to a project is commensurate with the degree to which geomorphic equilibrium is restored (see Chapter 4 for additional information).

As a result, DEC is now able to attribute phosphorus credit to river projects associated with stream's progress towards geomorphic equilibrium. This ability to track and prioritize projects will also allow DEC and partners to target resources towards projects where there is the greatest opportunity to achieve improved stream equilibrium conditions and expected phosphorus reductions. More information is available on the Functioning Floodplain Initiative website.

The ANR views the achievement of river equilibrium as a long-term (multiple decades) process that will be achieved primarily through regulatory compliance and therefore has not projected incremental targets for non-regulatory actions. Although the FFI can now be used to attribute phosphorus reduction as well as progress towards equilibrium to

river restoration projects, only River Corridor Bylaw regulations are counted in the FFI toward regulatory reductions. No method exists to assign a load reduction to other regulations. As we implement Act 121 and develop some accounting for this and refine floodplain restoration crediting, we could articulate progress towards completing actions necessary for streams to restore equilibrium, but we don't yet have these tools to do so in a reasonable way.

ANR is still working to develop methods to assign load reductions to other regulations

Assessment of Progress

In addition to state regulations that support natural processes, the TBP river corridor protection strategies that enhance natural processes include supporting municipalities in adopting and implementing floodplain protection regulations such as the adoption of municipal river corridor bylaws. In addition, TBP strategies support river corridor easement and riparian buffer enhancement and protection opportunities, as well as over 250 restoration activities identified in 6 River Corridor Plans, 8 geomorphic assessment reports, and through the Functioning Floodplain Initiative tool and related scoping efforts.

Flooding that occurred in 2023 and 2024 galvanized community interest and partner collaboration and will continue to increase implementation of River sector projects to enhance floodplain access. Through continued education by ANR and partners about the benefits of floodplain access towards flood resilience, the community has embraced conservation and other nature-based solutions towards flood resilience. In addition, FEMA funding for buyout projects is being supplemented by the state's Flood Resilient Communities Fund. Partners may also leverage state CWF dollars with FEMA funds to implement river restoration projects.

Progress in other sectors will also contribute to natural stream evolution processes, such as the agricultural sector's riparian buffer protection and animal exclusion activities through compliance with the Required Agricultural Practices.

The FFI tool has provided the state and its partners with the ability to attribute P reductions to river restoration projects and therefore access to project funding. The FFI's ability to assign TP reductions for existing standard project types, expand phosphorus crediting capabilities for certain rivers projects that don't currently receive phosphorus credit (e.g., river corridor easements and strategic wood additions that

enhance floodplain connectivity), and may retroactively attribute TP reductions to projects already implemented but not yet credited.

From SFY2017-2025, partners in the Missisquoi basin reconnected one acre of floodplain, reforested 93 acres of riparian buffer and conserved 578 acres of riparian corridor through easements, However, only a portion of these projects were credited with P reductions to the extent that partners had access and were able to use the new FFI tool. The FFI tool will therefore provide both a re-accounting of past work and an incentivizing of TP efficient rivers projects for formula grant consideration. As part of the engagement strategy, the FFI project team and agency-trained partners on using the tool in spring 2023.

Forestland

Forestlands phosphorus loading is attributed to forest management activities, where loading can be minimized through forest management practices that maintain water quality and minimize erosion.

The TMDL reduction target for the Missisquoi basin forest sector is 11415 kg/yr, requiring a 50% load reduction. The loading reduction estimated to date is 1434 kg/yr, meeting 12.5% of the load reduction target (see Table 12). As the final target cannot be met solely through compliance with Acceptable Management Practices, the agency will continue to support additional forest BMPs (nonregulatory) implementation projects that may be advanced by Clean Water Service Providers and through opportunities to bring private and public forest roads into compliance with Clean Water standards.

Missisquoi Basin Forestland Tracking, and Accounting Results

According to the Lake Champlain TMDL, lake segments with at least 5% forest reduction will be achieved via compliance with the 2017 updated Acceptable Management Practices; however, given the percentage or amount of forested lands in the Missisquoi basin relative to other TMDL sectors, additional reductions were assigned to the forestland sector. For the Missisquoi Basin, 50% of the forestry reduction required by the TMDL is met by 5% reduction through AMPs and 45% through voluntary projects (10% vs 90%) which equates to 10% AMPs compliance vs 90% non-regulatory project implementation.

In calculating the forest sector reduction, regulatory compliance was associated with enrollment of a forest parcel in the Vermont's Use Value Appraisal (UVA) Program. The program enables eligible private landowners who practice long-term forestry to have their land appraised based on the property's value of production of wood rather than its residential or commercial development value. To qualify, parcels must contain at least 25 acres that will be enrolled and be managed according to a forest management plan approved by the Vermont Department of Forests, Parks and Recreation (FPR). Parcels enrolled in the UVA Program require application of the Acceptable Management Practices (AMPs) for Maintaining Water Quality on Logging Jobs in Vermont to the maximum practical extent possible. Forestland parcels enrolled in the UVA Program are eligible for phosphorus credit if the 10-year forest management plan and compliance work began after the TMDL modeling periods. For the Lake Champlain Basin, this refers to UVA enrollment only after 2010. Previous Phase 3 did not include UVA acreage as part of the P reduction calculation, resulting in minimal forest sector reduction estimates. The ANR is still evaluating the estimated phosphorus reductions assigned to UVA program compliance. This review may result in changes to the estimated forest sector phosphorus reductions related to future UVA program compliance.

The ANR has established phosphorus and sediment accounting methods (2022) to estimate load reductions associated with forestland BMP implementation. The development of these methods included the identification and mapping of critical source areas of forestland and establishing a method to estimate the potential for phosphorus and sediment reductions associated with forestland BMPs and Acceptable Management Practices. Additionally, field verification and ground truthing were conducted during the 2023 and 2024 field seasons.

The Natural Resources Tracking and Accounting Standard Operation Procedures (based on above methodology) was used to support tracking of Acceptable Management Practices compliance and accounting for forest sector reductions. The Standard Operating Procedures will also allow DEC to track and credit forest restoration projects associated with phosphorus reductions to support phosphorus reductions within the forestland sectors.

Assessment of Progress

The agency has undertaken the development of forestlands assessment and planning tools to address phosphorus reductions stemming from forest management activities. Currently, the agency is coordinating with natural resource consultants, professional foresters, and researchers with the University of Vermont's Spatial Analysis Lab to

deploy a basin-wide forest landscape assessment tool to identify critical source areas and erosional features to inform the prioritization framework that will be used to design and implement forestry BMPs. Phase II of this assessment and prioritization project will be used to:

- Finalize the framework to field verify and calibrate the Spatial Analysis Lab model's identification of erosion features in critical source areas on forested lands;
- Refine the framework for project prioritization in high-priority Lake Champlain basins (Missisquoi and South Lake) to achieve target load allocations (reduction targets) for lake segments that won't meet reduction targets through VT Acceptable Management Practices compliance alone; and
- Pilot the project prioritization framework in a representative geographic area.

While the Forestlands Critical Source Area mapping project is currently underway, the agency has been actively conducting Road Erosion Inventories on state forest roads, including piloting a private Road and Trail Erosion Inventory (RTEI). These assessment tools are applicable to private forest road assessments akin to the development of private roads Road Erosion Inventories discussed above and in Chapter 4. With these new tools, the agency is better able to support Acceptable Management Practices compliance as well as additional voluntary BMP implementation within the Missisquoi basin. Additional resources to support AMP compliance as well as nonregulatory activity are described in Chapter 4.

Chapter 4 – Strategies to Address Pollution by Sector

The Agency of Natural Resources' 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 22). Ongoing protection and restoration efforts and recommendations to meet water quality objectives are developed for each sector. These recommendations support the development of the strategies in the Chapter 5 Implementation Tables.

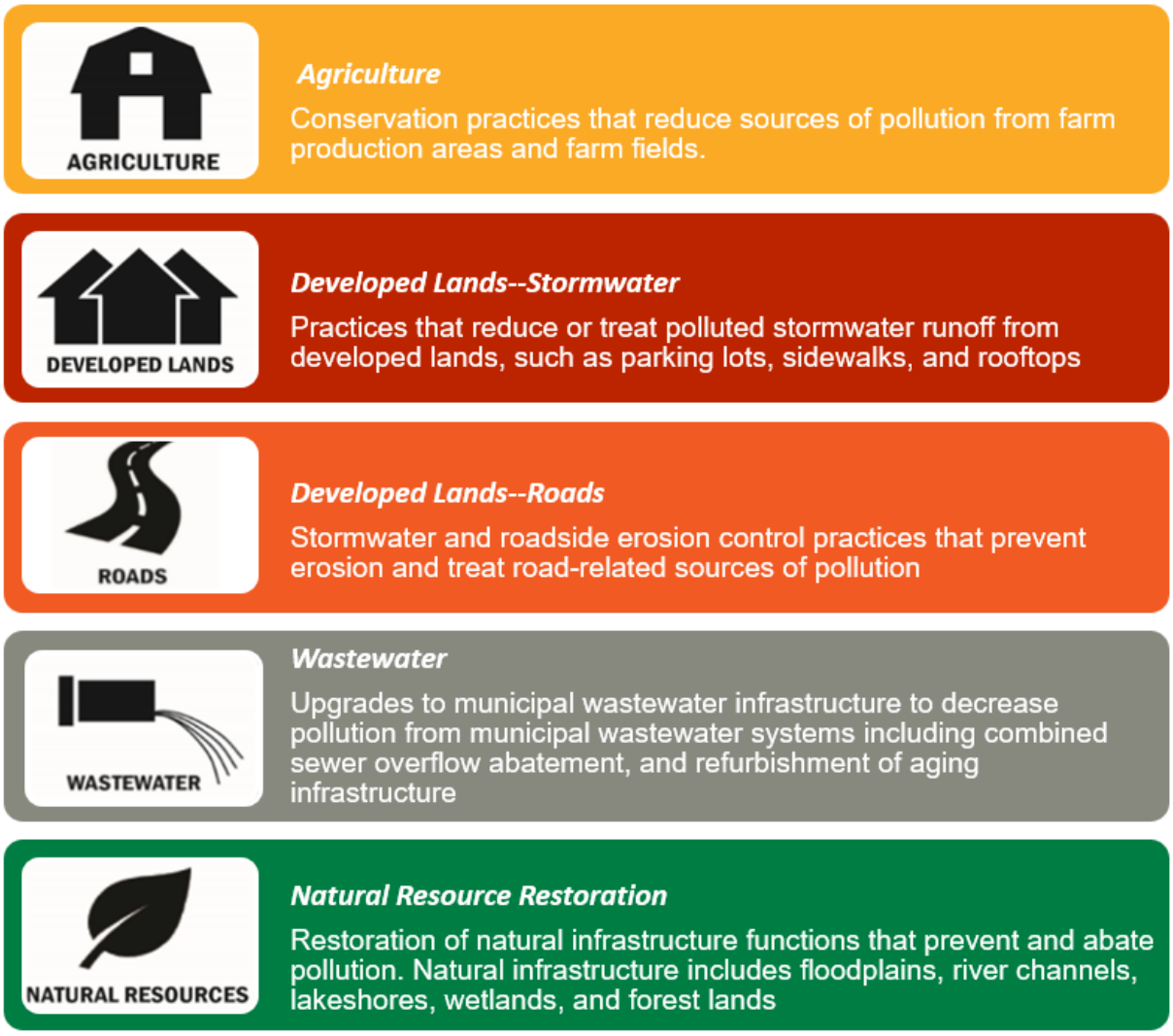


Figure 22. Land-use sector framework identifying water quality goals for each sector.

A. Agriculture

Agricultural land use makes up approximately 25% of the land cover in the Basin (Figure 4). The agricultural landscape in the Missisquoi Basin is managed predominantly by livestock and dairy operations to raise animals and grow corn and hay (Figure 23).

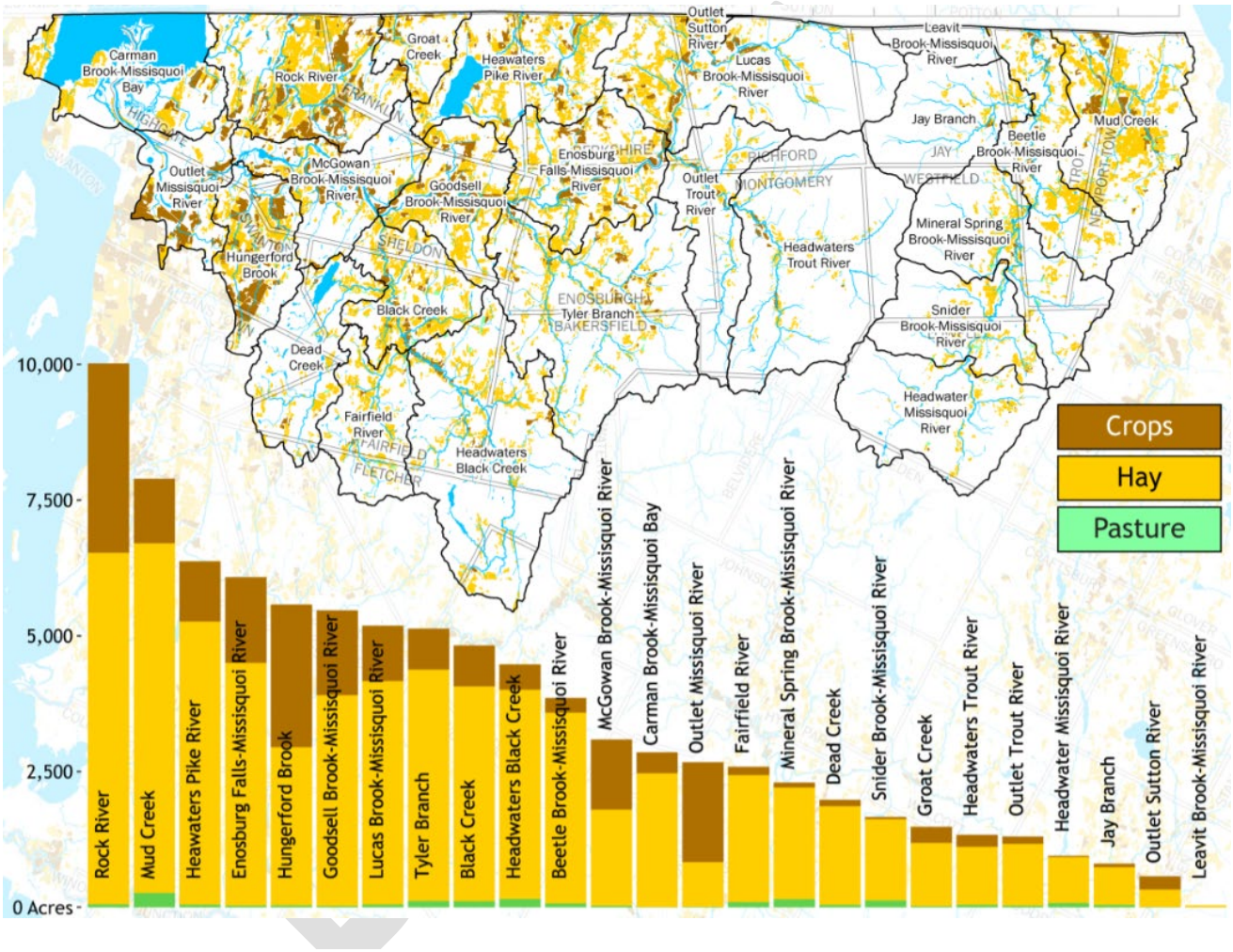


Figure 23. Map of agricultural land use aggregated by acreage of crops, hay, and pasture by HUC12 watershed in Basin 6.

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 can 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 ensure that nutrient laden runoff does not reach surface waters.

The ANR and AAFM address agricultural water resource impairments by collaborating with federal, local, and regional partners to direct agricultural BMP implementation in the watershed towards the 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 (WPP Agricultural P reduction interactive report). Through AAFM cost-share programs only, cover cropping and manure injection cover the most acres as shown in the VAAFM Water Quality Division Interactive Report.

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

Regulatory Programs

The 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 or annual cropland acreage (Table 15), 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 updates to agricultural regulations (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 307 agricultural operations ranging in size from SFOs to LFOs in the Basin that need to comply with the RAPs.

Table 15. Number of Farms by Size as of 2025 (Source: AAFM)

Farm size	Animal Units	Inspection Schedule	# Facilities / Operations
Large Farm Operation (LFO)	700 or a greater number of mature dairy cows or equivalent	Annually	29/9
Medium Farm Operation (MFO)	200-699 mature dairy cows or equivalent	Every 3 years	35/22
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	90/70
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	209/202

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

DEC is working collaboratively toward standing up a Clean Water Act-compliant concentrated animal feeding operation (CAFO) NPDES permit program in Vermont to meet EPA requirements. The DEC WSMD CAFO Program is responsible for overseeing CAFO agricultural water quality compliance, conducting onsite inspections, and issuing CAFO permits.

Federal (CAFO) rules apply to farmsteads that meet certain animal population thresholds with the same large or medium farm operation threshold as used by AAFM, and that have direct discharges to surface waters. The rules also apply to small farm operators where they are deemed significant contributors of pollutants to surface waters. The CAFO Program has expanded to five full-time staff who conduct 10-15 large and medium sized CAFO onsite inspections annually, ongoing enforcement follow-up, permit issuance, and program development.

DEC, in coordination with AAFM, will continue to hold pre-rulemaking discussions with a stakeholder group initially convened in 2025 which will continue in 2026 in accordance with Acts 67 (S.124) and 178 (S.323). The initiative represents collaboration among ANR-DEC-WSMD, AAFM-WQ Division, UVM Extension, NRCS, Conservation Districts, farmers, technical service providers, EPA, and representatives from agricultural and

environmental organizations. As part of the stakeholder recommendations, DEC will coordinate the CAFO Permit Program Working Group to support the development of regulatory clarity and technical resource availability, seeking agricultural water quality improvements while maintaining a profitable agricultural economy for Vermont farms and Vermonters.

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 Franklin and Grand Isle Farmers Watershed Alliance, all of whom promote the voluntary adoption of conservation practices. In addition, the Franklin and Grand Isle Farmers Watershed Alliance, and Franklin and Orleans County NRCDs and Friends of Northen Lake Champlain support farmer-led discussions and collaborations to address gaps in funding and technical assistance. Partners have found that one-on-one assistance is most effective. The USDA Natural Resources Conservation Service (NRCS) also provides technical assistance; however, staff cuts have created gaps, especially in engineering. 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. 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. The Partnership recently updated its strategic plan.

Outcomes of collaborations include the development of a web-based mapping application developed with LCBP funding and a training for partners to help identify agricultural BMPs and geographic areas with greatest P reduction. The Toolkit can be accessed at: https://www.stone-env.net/mass_balance/

Other products include the Franklin County Natural Resources Conservation District's Guide to Assistance for Agricultural Producers to support farms in accessing programs that promote BMP implementation. The FCNRCD also helped to coordinate a farmer soil-health peer-learning network led by UVM Extension in 2023-2025 with several farmers from Basin 6. Ongoing soil health learning opportunities and one on one technical assistance to farms are expected.

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 connecting with them for outreach on available programs. UVM Extension's New Farmer Project and the Women's Agricultural Network is an example of a capacity building project with 24 agricultural service providers to support diverse and new farming audiences.

In addition to providing or supporting technical assistance, the AAFM and NRCS provide financial assistance to farmers to implement BMPs. Additional funds come through the Vermont Housing and Conservation Board and NRCS' National Water Quality Initiative (NWQI) for Phosphorus reduction within the Rock River and Hungerford Brook watershed. Landowners in these subwatersheds are allocated separate funds from the NRCS Environmental Quality Incentives Program (EQIP) to directly target local needs.

The Act 76 formula grant provides additional funding to address agricultural BMPs on non-RAP farms or natural resource restoration and protection projects on any 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 four acres, or do not file a 1040(F), or make less than $2,000 annually from the sale of agricultural products.

As a result of the technical and financial support, the agricultural community has implemented field BMPs to achieve its interim phosphorus reduction target (see Lake Champlain P TMDL Phase 4 in Chapter 3 and the WID's agricultural interactive report). Most of the reduction is due to the implementation of cover crop, manure injection, NMP and crop rotation practices.

AAFM's Vermont Pay for Performance Program (VPFP) accounts for a majority of BMPs that are accounted for and contribute to phosphorus (p) reductions through State water quality programs. The VPFP program is a new and innovative program that provides performance-based payments to Vermont farmers for reducing P losses from the agricultural fields

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 Capital Equipment Assistance Program (CEAP) funds, including manure injection, and the technical assistance supported through Agricultural Clean Water Initiative Program (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 Conservation Reserve Enhancement Program (CREP) funding, although CREP is not a permanent protection program. CREP is funded by the USDA Farm Service Agency, with the AAFM providing outreach and technical assistance to design and develop CREP projects for Vermont farmers. Multiple partners in the basin are already involved in assisting farmers to identify and implement riparian buffer and natural resource projects.

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

- Technical assistance to farmers provided by NRCDs, UVM Extension and other agricultural partners, often in collaboration with other partners with AgCWIP funds
- Precision agriculture technology and innovation to improve nutrient management planning and implementation
- Whole farm assessments to direct resources to achieve best P reduction and overall outcome
- Continuation of existing state agricultural funding programs, including the Vermont Pay for Performance Program
- Continuation of the Conservation Reserve Enhancement Program

- Continued investment in farm viability programs to support sustainable management of the landscape.
- Technical assistance to enhance ditch management to control erosion
- Technical assistance to nutrient management practices on fields to reduce phosphorus loss through tile drains.

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 and substantial additional funding to these regions. Priorities in common included natural resource restoration, soil health, flood resilience,

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 and offer key line plow, rock picker for rotations, lime/wood ash 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 very expensive. The proposed solution is targeted investments towards farmstead infrastructure and field-based water quality improvements

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 Chapter 3, Table 5): 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 with a Phosphorus TMDL (see Chapter 3).
- NRCS National Water Quality Initiative (NWQI) supported rivers – Rock, Pike, Hungerford.

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 Swanton, Richford, and Enosburgh as well as Jay Peak Resort and the shoreline of Lake Carmi and Fairfield Pond.

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)

General Permit 3-9050 for Operational Stormwater Discharges

General Permit 3-9050 addresses stormwater run off 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, (Three-Acre Permit) (see: Operational Stormwater Discharge Permits | Department of Environmental Conservation.

The general permit covering three-acre sites became effective in 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 three-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 followed by 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 Grant Initiative and Developed Lands and Municipal Stormwater Implementation Programs, respectively. The DEC Stormwater Program facilitates Three-Acre General Permit obtainment and compliance by providing permittees design and implementation support.

As the designated CWSP for Basin 6, NRPC has established a framework for identifying, designing, and implementing priority non-regulatory projects, including specific stormwater retrofits. A retrofitted project originally completed to comply with regulations could be eligible for partial CWSP funding when the retrofit exceeds regulatory requirements and provides demonstrable phosphorous reduction benefits.

Green School Block Grant 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 General Permit 3-9050 (referred to as the Three-acre Permit). During Phase 1, the funding program administrator, Greenprint Partners, worked to support participating schools obtain permit coverage and complete stormwater designs. Of the roughly 63 schools in the state seeking Three-Acre Permit obtainment, all are successfully moving towards obtaining permits, with 62 issued and one under review as of March 2026. In Basin 6, these include the Swanton School, Missisquoi Valley Union Middle & High School, and Enosburg Elementary School

Phase 2 is currently underway and is focused on supporting construction. Funding for Phase 2 is comprised of American Rescue Plan Act (ARPA) and Lake Champlain Basin Program (LCBP) dollars, totaling to $30.21 million dollars. Greenprint Partners is supporting the majority of public schools, who have requested funding, implement permitted designs. Although the schools' authorized permits have a deadline of October 1, 2033, to construct the permitted stormwater treatment practices, it's the goal of the Green Schools Initiative to construct the stormwater management practices before the end of 2027. The three basin 6 schools began work in the summer of 2025 and by completion will have addressed 23.57 acres of impervious surface.

The Green Schools Initiative partners with Lake Champlain Sea Grant to provide schools with watershed and stormwater lesson plans as well as training for students

and teachers. Additionally, Lake Champlain Sea Grant will help schools identify ways to maximize the benefits of green stormwater projects, such as creating pollinator habitat and outdoor classrooms.

Stormwater Mapping and Master Planning

Stormwater infrastructure mapping projects are completed for municipalities (Table 16) 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).

Towns with plans are identified in Table 16. 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 areas of concentrated development in Bakersfield, Lowell, Montgomery, Jay, and Troy. Where appropriate, these plans could also identify sources of runoff from agricultural landscapes that intersect with developed land for agricultural BMPs. The need for additional stormwater master plans will be assessed by the agency upon request.

Table 16. Municipalities with completed stormwater mapping and SWMPs

Municipality	Streams of focus	Stormwater Mapping	Stormwater Master Plan
Bakersfield		2015	

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

Municipality	Streams of focus	Stormwater Mapping	Stormwater Master Plan
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. Of the 180 sites sampled, 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

Collaborative outreach efforts in the basin have focused on stream (Stream Wise) and lake shore (Lake Wise) 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: Stream Wise, Lake Wise and SSAP; Friends of Northern Lake Champlain: Lake Wise and SSAP; Missisquoi River Basin Association: Stream Wise and Franklin Watershed Committee: Lake Wise.

Local resources to support landowners and communities in addressing water quality concerns related to stormwater runoff include the Lake Champlain Basin Program's Lawn to Lake, a collaborative program with other basin partners to promote healthy lawn and landscape practices to protect water resources in the Lake Champlain Basin. To date, their campaigns have included efforts to reduce phosphorus runoff from lawns ("Don't 'P' on Your Lawn) and improve soil health and stormwater infiltration by increasing grass height on lawns ("Raise the Blade").

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.

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 (See Natural Resource – Rivers sector for more information). In addition, winter management practices can contribute excessive Chlorides in the form of winter deicing salts that degrade aquatic habitat.

Roads are included in the 6% of developed land coverage in the basin. 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[5] to surface waters.

[5] **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.

The agency primarily addresses public road-related discharges through regulation. Working with partners, including VTrans, the agency also provides guidance and financial assistance to facilitate compliance. Partners have provided technical assistance to help 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 (LCSG) provides most of the outreach on winter road management in the basin to the community. 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. The NRPC has and will continue to support a road salt-related webinars or other trainings targeted at municipal staff.

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 the road infrastructure and stabilize stormwater conveyance paths 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 adding ditches adjacent to undersized culvert to catch flows that would otherwise overtop road to 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 REI results by town can be viewed in the MRGP Implementation Table.

The MRGP, 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. Towns are currently working on the next round. 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 (see below) to towns or to RPCs and partners to assist towns in completing REIs and implementing projects. NRPC manages a Lake Champlain basin wide initiative to refine Road Erosion Inventory (REI) assessment methods specifically for private roads. The assessment protocols are expected to be complete by the end of 2026. Additionally, NRPC has entered into an agreement with VTrans to design and implement several culvert projects with Aquatic Organism Passage (AOP) benefits, funded through the redirected Missisquoi Bay causeway initiative. One to two projects are expected to be completed within the next 2 years. 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, the plan recommends support of towns in their development of capital budget plans to fully 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

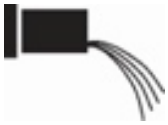
The Transportation Separate Storm Sewer System General Permit (TS4) covers stormwater discharges from all Vermont Agency of Transportation (VTrans) owned or controlled impervious surfaces. The TS4 general permit combines the stormwater requirements for VTrans associated with its designated regulated 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 VTrans phosphorus reduction target 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 by lake segment. As the Basin 6 makes up the majority of the watershed for the Missisquoi Bay lake segment, the lake segment's progress reflects Basin 6's 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 seven direct discharge facilities in the Missisquoi Bay basin (Table 17).

An overarching consideration for the agency's issuance of NPDES 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 (reduction targets) 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

Table 17. Wastewater Treatment Facilities in Basin 6

Facility (permit[6] ID)	Permit Effective Date	Permit Expiration Date[7]	Permit Flow MGD[8]	TMDL WLA[9] (MT P/yr)	Current % of Design Flow[10]	Treatment Type	# of CSO	Receiving Water
West Rock 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

[6] 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. Permits are found on the Report Viewer.

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

[8] MGD= million gallons per day

[9] The TMDL Waste Load Allocation (metric tons P/yr) is the same as the current permitted load.

[10] Percentage was calculated using the average monthly flows (Effluent Gross Value) for the period 1/1/2025-12/31/2025.

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%	Sequentia l batch reactor	0	Missis-quoi River

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 Company - 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 - 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 (reduction target) 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 with a collection system that includes CSOs (Table 17). 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, 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.

With many WWTF located in the floodplain, FEMA (see Rivers Sector) becomes a resource to address flood damage and mitigate against future damage

The DEC and partners are also available to assist municipalities with asset management planning, which includes needed upgrades and timeline as well as funding sources and deadlines

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. 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 municipality 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. In 2025, NRPC issued its **Guide to Owning & Maintaining a Septic System in Northwest Vermont.**

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[11] In addition to the

[11] 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.

CWSRF planning fund, the Tactical Basin Support grant is available to community partners to assist with this aspect of the planning process.

NRPC has facilitated critical planning for village wastewater and is continuing to assist community wastewater system development for the Town of Highgate. Municipalities that have considered community systems and progress to date are listed below:

Montgomery – A new centralized wastewater project will serve the village center. Small lot sizes and existing old malfunctioning septic systems are an economic limitation to Montgomery. The project supports retaining and development of jobs within the Town and new development of affordable housing. Construction is anticipated to start in 2026. Funding included a Northern Border Regional Commission (NBRC) grant in 2020.

Highgate - 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. The town received a NBRC grant of $1,000,000.00 towards the total project cost of $6,839,130.00

D. Natural Resources

Forests, lakes, ponds, rivers, floodplains, and wetlands are all examples of natural resources that provide continuing benefits both socially and ecologically. Natural resource restoration and protection projects help to prevent and reduce pollution, improve flood resilience 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.

While agency regulatory programs protect natural resources, the agency also supports landowner interest in natural resource protection and restoration and depends on partners to provide some of this assistance.

Conservation of forest and other natural resources within the watershed is an important pathway to protecting waters. The agency and VHCB are currently developing the Vermont Conservation Plan with input from a range of stakeholders. The plan prioritizes the protection of natural habitats and biodiversity through land conservation across the state. The Draft Framework for the Vermont Conservation Plan identifies Tactical Basin Planning as a complementary initiative to Objective 1, Pathway 4 focused on supporting aquatic system. This pathway recommends enhanced protection, stewardship, and restoration of riparian areas and aquatic systems as well as expansion of funding available for stewardship, management, and restoration of riparian areas and aquatics systems.

Specific Basin 6 strategies that support enhanced protection of priority waters through conservation and restoration of natural resources are described in this chapter.

Water Infrastructure Sponsorship Program (WISPr)

The Water Infrastructure Sponsorship Program (WISPr) provides an additional 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 that could be sponsored through this program. Regional Planning Commissions or NRCDs may able to assist in the management of WISPr-funded natural resource projects where local capacity is limited.

The State Clean Water Funds also support these projects and can be accessed through Clean Water Service Providers (NRPC for Basin 7) or Enhancement Design/Implementation Block Grant for non-regulatory water quality projects that don't meet the CWSP phosphorus reduction thresholds but yield many other valuable co-benefits.

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 and maintained by the processes associated with the inputs of water, sediment, and woody material from the watershed. A stream in equilibrium regularly flows out onto the floodplain every 1-2 years. When achieved at a watershed scale, equilibrium conditions are associated with minimal erosion, floodwater attenuation, 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 accelerated erosion processes and contributed to a loss of stream equilibrium and floodplain access state-wide.

Improving all forms of connectivity, upstream-to-downstream and river-to-floodplain, encourages streams to restore their equilibrium through natural processes. 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

The agency 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, and through the Vermont Flood Hazard Area and River Corridor 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 Table 23). 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 Table 9.

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 of 2024 (the Vermont Flood Safety Act). Act 121 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 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.

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.

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 (Table 23), 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. In Basin 6, the FCNRCD completed a hydrologic study of the upper Trout in town of Montgomery that identified nature-based solutions, among other mitigation practices, to their communities' flood challenges. A floodplain restoration project managed by FCNRCD is currently in design with Lamoille CWSP funding. Partners and DEC staff will 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. ERAF provides State matching funds for Federal Emergency Management Agency (FEMA) Public Assistance after federally declared disasters. The level of State funding depends on the number and type of mitigation activities a town has adopted as follows:

At the 12.5% assistance rate

- participate in the National Flood Insurance Program,
- adopt the latest version of VTrans Town Road and Bridge Standards,
- approve a Local Emergency Management Plan each year, and
- adopt a FEMA-approved Local Hazard Mitigation Plan.

At the 17.5% assistance rate

- the actions above, and
- protect river corridors from new encroachment; or protect their flood hazard areas from new encroachments through local bylaws and participating in the FEMA Community Rating System.

Currently three 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. While Act 121 will lead to statewide river corridor regulation in 2028, interested towns are still encouraged to establish and administer their own river corridor bylaws to help further reduce potential flood damages to new and existing encroachments in these areas, and to receive higher ERAF match.

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.

In Basin 6, 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.

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. 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.

In support of this task, 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. Planners at Northwest Regional Planning Commission are working with municipal officials, and VT DEC floodplain managers, to support bylaw updates. NRPC provides ongoing technical assistance to municipalities regarding the 2027 FEMA flood map update deadline, advising communities on strengthening flood bylaws

The Northeastern Vermont Development Association (NVDA) has developed a flood hazard regulation review checklist and reviewed municipal bylaws for their towns 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, by-laws 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 in the Clean Water Initiative 2025 Performance Report's Appendix A for a summary of projects implemented since the 2021 plan. In 2026, the VT Rivers Program received funding to develop a VT River Restoration Guide, similar to that of the Vermont Wetlands Restoration guide. The guide is expected to be available beginning in 2027. The guide will describe best practices for actively moving rivers toward equilibrium conditions.

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 completed for Basin 6 are listed in Table 18 and can be found at: Stream Geomorphic Assessment Final Reports. Where funding, local support, and interest exists, priority projects and objectives identified in RCPs and SGAs should be pursued. The 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. A list of streams identified by the Rivers Program as candidates for SGA are listed in Table A.2.

Table 18. Stream Geomorphic Assessments completed in Basin 6

Date	Stream Reach	Sub Watershed	Title	Priority Actions for TBP
2005	Wanzer Brook	Black Creek Head	Wanzer Brook Watershed Phase 2	Protect, riparian buffer planting
2009	Black Creek	Black Creek Mouth	Black Creek Corridor Plan	Riparian buffer planting, protect floodplain access, reduce sediment input from upland sources (cropland)
2008	Hungerford Brook	Hungerford Brook	Hungerford Brook Corridor Plan	Restore hydrology: restore floodplain and wetlands
2006	Hungerford Brook	Hungerford Brook	Hungerford Brook Phase 2 Report	See above
2008	Missisquoi	Missisquoi - Canada to Trout	Missisquoi River Mainstem Phase 2	Riparian buffer protection, control urban stormwater
2007	Rock River	Rock River	Rock River Phase 2 Report	Restore floodplain and wetland, reduce sediment input from upland sources (cropland)
2023	Rock River (Canada)	Rock River	Rock River Phase 2 Update and Phase 2 report for Canada	
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

Date	Stream Reach	Sub Watershed	Title	Priority Actions for TBP
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
2009	Tyler Branch	Tyler Branch	Tyler Branch Corridor Plan	See above
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.
2011	Upper Missisquoi	Upper Missisquoi	Upper Missisquoi River Corridor Plan	Allow channel to regain planform by protecting river corridors. Increase woody riparian buffer.
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	

The Functioning Floodplain Initiative Tool

In 2023 ANR released the Functioning Floodplain Initiative tool (FFI), a web-based planning tool that augments the River Program's River Corridor Planning process. It was developed to provide practitioners, program managers, and policymakers with the maps and data to identify potential wetlands, stream, and floodplain restoration opportunities to support the implementation of the Lake Champlain Phosphorus TMDL. The tool uses a stream connectivity-based framework to allocate phosphorus baseload among the stream network, to quantify gains made towards equilibrium via restoration and protection activities, and to credit and track the resulting improvements to water quality (i.e., phosphorus load reductions).

Generally, restoring the most vertically and laterally disconnected stream reaches will achieve the most phosphorus reduction. From a target-setting perspective, project implementers should target stream reaches that have the most opportunity to move toward an improved equilibrium condition, are necessary in the area they are located, are feasible with the resources available, provide additional habitat and flood resilience co-benefits, and have moderate to high pollution reductions.

The FFI tool is one step in prioritizing projects for implementation. Other resources, such as River Corridor Plans, stream geomorphic assessment data, field evaluations, and alternatives analyses are needed to determine the full needs, priorities, and options for pursuing a given project.

River Corridor and Wetland Easements

Through its River Corridor and Wetlands Easement Program, the Rivers Program promotes the conservation of river corridors as a 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 or donate their river channel management rights within the meander belt width corridor of sensitive and unstable streams along with associated wetlands. Agricultural lands also have access to NRCS river easement funds (NRCS WRE).

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 (RCWE) Program webpage. In 2026 the WID Funding Policy will include Rivers Program will release additional guidance and mapping for partners interested in scoping and developing easement projects. Partners funded to do scoping work need to work closely with the River Program to ensure coordination and tracking of projects being scoped for RCWE.

Riparian Buffers

Riparian buffers filter pollutants from upland runoff, provide shoreland and shallow-water habitat, and stabilize streambanks. Partners including the FCNRCD and MRBA identify potential planting sites and work with interested landowners to establish woody

riparian buffers. Barriers to success identified in the TBP 2021 plan have been addressed with help of MRBA's new tree nursery to increase stock as well as their work to better understand how to manage an invasive, Japanese Knotweed. The invasive overwhelms all other nearby plant species, making this species a cause for concern as it affects the integrity and function of streambanks and lakeshores throughout Vermont.

An ongoing project by the FCNRCD with LCBP funding through DEC will result in improved practices that enhance planting success. This includes supporting stewardship practices on project installation, learning from experience (adaptive management) to develop innovative practices and finally to provide trainings to partners. The resulting resources and others will be available to partners. The Lake Champlain Sea Grant Watershed Forestry Partnership manages a resource page on their website for partners to support riparian buffer plantings. A resource for landowners is the LCBP's Stream Wise Program, see more under the Developed Land Section.

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 and the Montgomery Flood Resilience and Hazard Mitigation study and resulting plan.

In Vermont, practitioners are also adopting low-tech process-based restoration (LTPB) 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 LTPB 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. DEC also recently developed a strategic wood addition geospatial layer to inform the initial phases of process-based restoration project scoping.

The Franklin County NRCD, MRBA and Vermont Land Trust have been actively working to apply LTPB techniques where smaller streams have been straightened or ditched. They and other partners are part of a newly formed LTPB network that will help with outreach and support for these types of projects. These projects have the potential to restore wetland and floodplain habitats that are critical to maintaining water quality and supporting fish and wildlife. Partners, including the VLT.

Stream Crossings

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. The US Fish and Wildlife Service has collaborated with partners in the Missisquoi River region, including DFW, Upper Missisquoi Wild and Scenic, MRBA, NRPC, FCNRCD, and OCNRCD to address aquatic organism passage (AOP). As part of this AOP workgroup, in 2022, OCNRCD and DFW identified and designed 8 culvert upgrades in Westfield, Lowell and Jay. The NRPC and DFW have 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 ANR documented dams. 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 A and the Vermont Dam Inventory.

For additional information, the Nature Conservancy hosts the Dam Screening Tool which provides information for dams in the Missisquoi Basin and additional details on each dam's ecological impact.

Recently completed or in progress dam removals include Trout Brook Reservoir Dam on a Missisquoi River tributary, and Johnson's Mills on the Brogue Branch, both by the FCNRCD. MRBA completed a dam removal on Mud Pond, aka Sleepers Pond in 2026. In addition to other funding sources, the CWF administered by the NRPC, the Clean Water Service Provider serving the Missisquoi Bay Basin has contributed over 1 million dollars towards these removals.

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 Resources 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. Appendix A is a source of information about DEC known dams in the basin. The Nature Conservancy also provides statewide support, including the 2023 publication of the Scaling Up Dam Removal Guide. Partners collaborate to prioritize dams 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 supports prioritizing dams on high gradient streams like the Bakersfield dam removal where a braided stream is reverted to a wetland forest.

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.

The 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]

Basin 6 longitudinal stream temperature studies by FWD in 2022 indicate that groundwater coming from wetlands and forested seeps is critical for maintaining cold water and base river flows protecting fisheries, especially during drought conditions. The longitudinal survey was successful at documenting how water temperatures within the Missisquoi River, especially along the East Branch (upstream from Burgess Branch confluence), vary in relation to tributary inputs, groundwater inputs, and other sources of warming.

Overall, water temperatures in the East Branch Missisquoi River are suitable for high-quality Brook Trout populations and should be the focus of future habitat protection and restoration. Restoration efforts should further investigate the area of warming near the start of the survey along RT 100 and Mink Farm Rd as well as Ace Brook which also appears to contribute to substantial warming. Similarly, certain areas where substantial cooling occurred should be further investigated as they are likely the source of groundwater inputs, especially in the stretch along RT 100 upstream of Ace Brook. Ensuring this groundwater input remains protected should be a high priority for conservation work along the Missisquoi River.

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 affect 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 Vermont Inland Lakes Scorecard depicting the condition of lakes and ponds, along with input from the Lakes and Ponds Management and Protection Program (LPMPP) 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 poor or fair shoreland score will benefit from implementing Lake Wise Program best management practices.

Five lakes in the Basin are rated as having fair or poor shoreland habitat conditions on the Vermont Lake Scorecard. Two of them, Fairfield Pond and Lake Carmi, have Lake Watershed Action Plans or similar and DEC and partners have supported Lake Wise assessments of lakeshore properties. Metcalf Pond would be a candidate for Lake Wise if there was community interest and the LWAP if monitoring indicates increasing nutrient trends. The Franklin County NRCD and Franklin Watershed Committee have supported work on Lake Carmi. The Friends of Northern Lake Champlain conducted the LWAP on Fairfield Pond and is continuing work to support Lake Wise outreach and implement projects.

Lake users interested in becoming involved in the health of their favorite lake or pond can find information on the DEC 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 nutrient trends. Planning and project implementation that is necessary to maintain the trend is described on the DEC website for Lake Carmi. Although a LWAP has not been completed, comparable assessments were completed, See Lake Carmi TMDL in Chapter 3 for additional information on progress.

The Fairfield Pond LWAP by the Friends of Northern Lake Champlain has led to the identification of projects 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-term 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 phosphorus 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. Missisquoi Bay and Bullis Pond have water chestnut infestations. 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 four 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. Lake Carmi and Fairfield ponds both have greeters. Vermont Invasive Patrollers Program trainings are offered on an annual basis. A map of active greeter and control efforts is available online

Management of AIS is ongoing in the basin and in the Bay. Local organizations are managing Eurasian watermilfoil populations in their lakes with DEC support. 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. DEC manages the water chestnut population that has exploded in recent years, using contractors to survey and harvest the plants. This historic expansion of the population requires ongoing commitment from the state and the community for the management of the species to keep it from expanding to other

locations in the bay and inland. While DEC anticipates adequate state and federal resources for ongoing management of the population, community involvement would always be a benefit and also be available to offset any potential reductions in government support.

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Wetlands

Wetlands cover at least 13 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 has modeled wetland functions 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.

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 from the site. 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 before harvesting begins. 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. When used properly, these 20-ft long, portable wooden 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 the online resource Temporary Wooden Skidder Bridges, and information on the bridge rental program is available in the online resource Temporary Bridge Rentals. Use of skidder bridges is recommended basin-wide, particularly on larger stream crossings where other temporary crossing structures, such as temporary culverts or poled fords, would be inadequate. The Franklin County NRCD supports a rental program for two skidder bridges they own.

Additionally, FPR directly rents skidder and truck bridges to loggers, foresters, and landowners through its Water Quality Assistance Program. Bridges available include: three 25-ft, heavy-duty steel skidder bridges, as well as 35-ft and 40-ft steel truck bridges. Rental of these bridges is coordinated by FPR's Watershed Forester. As of 2025, DFPR is supporting a Crane Mat Cost-Share Program, a new initiative funded by the US Forest Service that offers low-cost crane mats to logging contractors. The mats provide a stable surface for easier use of heavy logging equipment and protect soil and water quality when harvesting in wet or sensitive areas. Applications for the first round

of the Crane Mat Cost-Share Program closed in May 2026, but a second funding round may be offered later in the year, or in early 2027. Up-to-date information on all rental and cost-share opportunities available through the Water Quality Assistance Program can be found on the FPR Watershed Forestry webpage. Guidance is available from DFPR in the Vermont Voluntary Harvesting Guidelines to Protect Forest Health and Sustainability.

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.

In Basin approximately 215,000 acres are enrolled in UVA and of those forest and wetlands make up ~78% of the acreage, with ~19% in agriculture. The remaining area is spread among other land use at <1% (Figure 24).

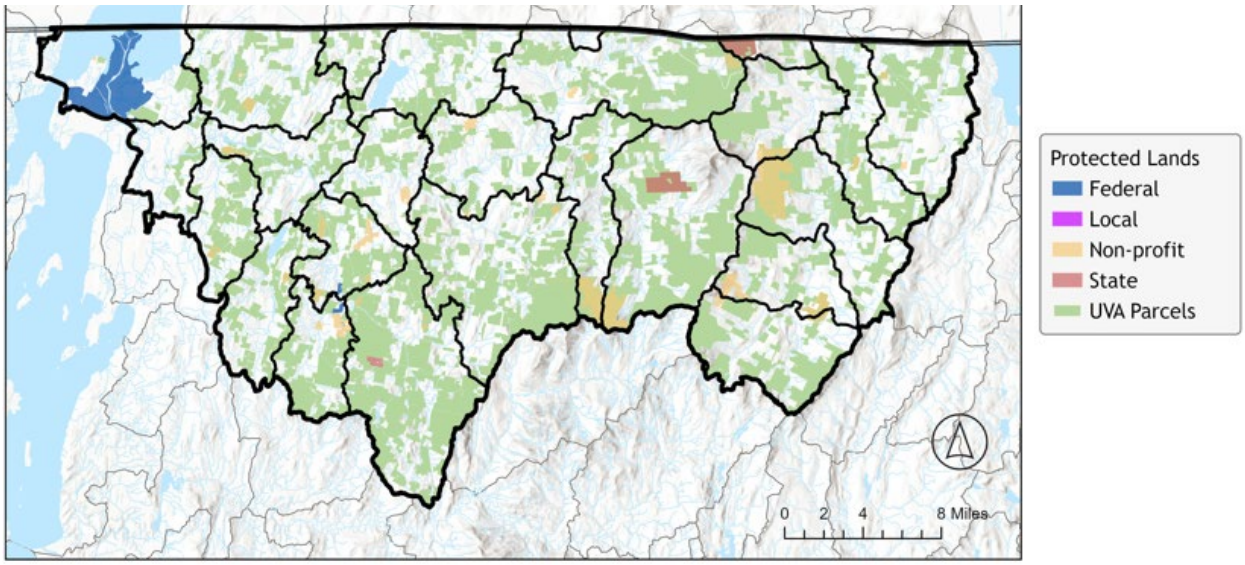

Figure 24. Protected Forest Lands in Basin 6.

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 continues to develop spatial analytical tools to assist with project identification in order to support restoration opportunities throughout the forested landscape. These mitigation efforts remain a high priority in the Missisquoi Basin as the Missisquoi Bay lake segment is 62% forested and contributes 170 metric tons of phosphorus to the lake annually

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 training 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 landowners 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.

The agency 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 drinking and recreational uses, ensuring fish caught in Vermont are safe to eat, 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, and
- Equitable implementation of clean water projects in all communities, for example through explicit consideration of environmental justice in grant funding decisions.

Continued engagement with the community will include work through partner organizations. For example, Abenaki community members are invited to a conversation in partnership with the Abenaki Nation of Missisquoi and facilitated by the Franklin County Natural Resources Conservation District (NRCD) in 2026 - 2027 at multiple sites. Participants will lead discussions on their priorities, needs, and concerns on the following topics: water quality, habitat, recreation, and access in their community**.** From these discussions, the FCNRCD hopes to create a list of future projects that create real benefits identified by and for members of the Abenaki community. The Abenaki of Missisquoi and the Franklin County NRCD will then collaborate with community

members, including the agency, to find funding, resources, and assistance to move these ideas forward into action.

Chapter 5 – Implementation Tables

A. Progress in the Basin

The 2021 Basin Plan identified 43 strategies to address protection and restoration of surface waters. X strategies (or x%) have been implemented. The 2026 Report Card, posted online, provides the status for each strategy identified in the 2021 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 19-26) 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 DFPR), 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.
The draft Basin 6 Tactical Basin Plan was discussed at several public meetings to gather community input. These meetings were hosted by the x, and by the X. Additionally, basin-specific questions were included in a WPP survey that was widely distributed across the basin.

Key concerns identified include,

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 Counties Natural Resources Conservation District (NRCD), USDA Natural Resources 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 (NRPC), the Northeastern Vermont Development Association (NVDA), 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; and
- monitoring water quality (e.g., lay monitoring program on lakes and rivers).

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 Tables (IT) (Tables 19 - 26) provides a list of 41 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.

Table 19. Agricultural Strategies. See Acronyms on page 146

Strategies	Priority Area	Partners	Funding
1. Hold at least 1 meeting annually of the Northwest and Northeast Regional Vt. Ag. water quality partnership.	Basin wide	FCNRCD, OCNRCD, AAFM, NRCS, VDEC, UVM Ext.	AGCWIP
2. Provide technical support to farmers requesting assistance to maintain and implement Nutrient Management Plans (NMPs) and increase acre of field BMPs implemented on farms.	See priority geographic areas in Agric section	FCNRCD, OCNRCD, AAFM, NRCS, VDEC, UVM Ext.	EQIP, CSP, AGCWIP
3. Provide technical and financial assistance to farmers to acquire equipment or utilize available rental equipment for effective implementation of BMPs such as Nutrient Management Plans, manure injection, cover cropping and no or minimal tillage.	See priority geographic areas in Agric section	FCNRCD, OCNRCD, AAFM, NRCS, VDEC, UVM Ext.	AGCWIP, CEAP, UVM Ext,
4. 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.	See priority geographic areas in Agric section	FCNRCD, OCNRCD, AAFM, NRCS, VDEC, UVM Ext.	AGCWIP, EQIP, CSP, RPP, AAFM cost-share programs (AAFM)
5. Identify farms with potential natural resource protection opportunities including floodplain restoration, riparian buffer plantings, river corridor protection, or wetland restoration and provide outreach and technical assistance to develop and implement potential projects.	Basin wide	FCNRCD, OCNRCD, AAFM, NRCS, VDEC, UVM Ext.	TBPSG, AGCWIP, Enhancement Grants, AAFM, CREP, CWF

Strategies	Priority Area	Partners	Funding
6. Provide technical and financial assistance to farmers to implement barnyard and production area BMPSs that improve water quality and compliance with water quality regulations	See priority areas in Agric section	FCNRCD, OCNRCD, AAFM, NRCS, VDEC, UVM Ext.	NRCS, AAFM, VHCB, EQIP, BMP, WQ Grants
7. Provide education about the best management practices to reduce nutrient loss through tile drains.	See priority areas in Agric section	UVM ext., AAFM	LCBP, AgCWIP

Table 20. Developed Lands - Stormwater Strategies. See Acronyms on page 146

Strategies	Priority Area	Partners	Funding
8. Complete stormwater Master Plans where supported by ANR.	Areas of concentrated development	NRCDs, FNLC, RPCs, MRBA	CWF
9. Design and implement stormwater treatment practices identified in stormwater mapping reports and Stormwater Master Plans.	See Table 16	NRCDs, FNLC, MRBA, RPC, VTrans, municipalities	CWF, LCBP
10. Promote campaigns to raise awareness of residential stormwater management solutions.	Basin Wide	NRCDs, FNLC, MRBA, RPCs, municipalities	LCBP, TBPSG

Table 21. Developed Lands - Roads Strategies. See Acronyms on page 146

Strategies	Priority Area	Partners	Funding
11. Assist municipalities in updating REI inventories and prioritizing and implementing roads projects to meet the Municipal Roads General Permit (MRGP).	Very high-priority projects in REI, as well as those located in subbasins with known impairments or lakes with	RPCs, NRCDs, NVDA, VTrans	TBPSG, BRP, VTrans Grant-in-Aid

Strategies	Priority Area	Partners	Funding
	increasing nutrient trends.		
12. 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.	Basin Wide	NRCDs, NRPC, NVDA, VTrans	TBPSG
13. Provide technical assistance to towns and private landowners to manage beaver road conflicts.	Basin Wide	NRCDs, VT Beaver Collective, VFW	VT Beaver Collective, TBPSG
14. Complete private road erosion inventories and address private road erosion issues that are identified	Subbasins with known impairments or lakes with increasing nutrient trends.	NRCDs, NRPC, NVDA, watershed groups, DEC, LPMPP	TBPSG, CWF
15. Support municipal investment in winter maintenance technology to reduce use of salt, including ability to adjust salt distribution, measure pavement temperature and plows with multiple sort segments.	Basin Wide	Lake Champlain Sea Grant, RPCs	LCBP

Table 22. Wastewater Strategies. See Acronyms on page 146

Strategies	Priority Area	Partners	Funding
16. Provide support and materials to lake communities to host Wastewater Workshops.	Fairfield Pond, Lake Carmi	FWC, FCNRCD, FNLC, DEC	LCBP, TBPSG

Strategies	Priority Area	Partners	Funding
17. Support communities in planning for and installing community onsite-wastewater systems	Basin wide	NRPC, NVDA	CWSRF, NBRC

Table 23. Natural Resources – Rivers Strategies. See Acronyms on page 146

Strategies	Priority Area	Partners	Funding
18. Develop a prioritized list of streams needing Phase 2 SGA and complete	See Table A.3	NRCDs, DEC	CWF
19. Complete river hydraulic models with DEC River Program consultation		NRPC	Northern Border Regional Commission
20. Identify and prioritize potential floodplain restoration locations in the basin, including other natural resource-based flood mitigation projects	River Corridor Plans, Community led Projects ID'd in Upper Trout River Hydraulic study	NRCDs, NRCS, VEM, DFW, USFWS	TBPSG, CWF, NRCS, VEM, FEMA, USFWS
21. Implement priority floodplain and wetland restoration projects, including river corridor easements.	River Corridor plans and hydraulic modeling-based plans; East Branch Missisquoi River, Missisquoi River mainstem tributaries downstream of Burgess Branch.	NRCDs, AAFM, NRCS, USFWS, DFW	CWF, USFWS, NRCS
22. Establish and enhance riparian buffers.	Upper watershed of river systems and extensions of functioning	NRCDs, AAFM, NRCS, LCSG, USFWS	AgCWIP, CWF, TFS, NRCS, USFWS, CREP, LCBP

Strategies	Priority Area	Partners	Funding
	floodplains and wetlands		
23. Enhance the effectiveness and efficiency of riparian plantings including addressing tree stock shortages and managing invasive species	Basin Wide	UVM Ext., NRCDs, ICN, AAFM, NRCS, watershed groups, DEC	CWF, LCBP
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	Small tributaries and other segments Streams that are identified with moderate to high suitability based on the SWA ranking	UVM Ext., NRCDs, AAFM, NRCS, VLT, Cold Hollow to Canada, USFWS, TNC	CWF, LCBP, NRCS
25. Remove obsolete dams in the watershed	Basin Wide	NRCDs, watershed groups, CWSP, VNRC	CWF, LCBP
26. Scope, design, and implement high-priority culvert replacements prioritized by AOP work group	Basin Wide	NRCDs, RPCs, NVDA. MRBA, Towns, VFW, USFWS	CWF, BRP, GIA, EBTJV, NFPP, VTrans Structures grants, LCBP
27. Provide technical support to towns in adopting new FEMA flood maps using state model inundation bylaw or similarly protective language and consider state model river corridor bylaws	Basin Wide	NRPC, NVDA, LCSG	TBPSG, River Program
28. Enhance community understanding of river and floodplain processes and role in protecting flood resilience	Basin-wide	LCSG, TNC, NRCDs, RPCs, VRC, DEC	TBPSG, River Program, LCBP

Strategies	Priority Area	Partners	Funding

Table 24. Natural Resources – Lakes Strategies. See Acronyms on page 146

Strategies	Priority Area	Partners	Funding
29. Complete Lake Watershed Action Plans (LWAP)	Lakes with increasing nutrient trends	NRCD, DEC	CWIP, LCBP
30. Conduct Lake Wise assessments	Fairfield Pond, Lake Carmi	FCNRCD, FNLC, FWC, DEC	CWF
31. Implement lakeshore restoration projects identified through LWAPs and Lake Wise or other assessments	Fairfield Pond, Lake Carmi,	FCNRCD, FNLC, FWC, DEC	CWF
32. Conduct surveys and harvesting of AIS to reduce its expansion and introduction of new populations	Water chestnut infestations	DEC, LCBP, NRCDs, watershed groups	LCBP, ANC grant-in-aid, TBPSG;

Table 25. Natural Resources – Wetlands Strategies. See Acronyms on page 146

Strategies	Priority Area	Partners	Funding
33. Support outreach to local communities around updated wetland maps	Basin Wide	NRCDs, AAFM, NVDA, NRPC	TBPSG, AgCWIP
34. Identify potential wetland restoration sites and support partner outreach to landowners to develop projects.	High-elevation wetland seeps, watershed of Brook Trout streams	NRCDs, DEC, AAFM, USFWS, NRCS, DFW	TBPSG, CWF, NFWF, NRCS

Strategies	Priority Area	Partners	Funding
35. Design and implement priority wetland restoration projects	See above	NRCDs, DEC, AAFM, NRCS, USFWS	TBPSG, ACEP-WRE , NFWF, CWF
36. Increase local capacity for designing and implementing low tech wetland restoration projects.	Basin Wide	NRCDs, DEC, AAFM, NVDA, LTPBR Network	TBPSG

Table 26. Natural Resources – Forest Strategies. See Acronyms on page 146

Strategies	Priority Area	Partners	Funding
37. Provide education and technical support to landowners, loggers, and foresters on AMPs to protect water quality.	Basin Wide	NRCDs, DFPR, NRCS	TBPSG, NRCS
38. Complete outreach to private landowners to identify properties with forest roads and trails that would benefit from restoration practices.	Basin Wide	NRCDs, DFPR, DEC, NRCS, watershed groups, conservation commissions	TBPSG, NRCS
39. Complete forest road and trail erosion inventories on priority properties.	Basin Wide	NRCDs, DFPR, DEC	CWF
40. Implement forest road and trail practices identified through inventories	Basin Wide	NRCDs, NRCS, watershed groups	CWF, NRCS

Strategies	Priority Area	Partners	Funding
41. Assist interested landowners with forest conservation and UVA enrollment.	Basin wide. Source Protection Areas, including A2 waters	DFPR, Vermont Land Trust, TNC	TBPSG

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
ACEP-WRE	Agricultural Conservation Easement Program Wetland Reserve Easement
AgCWIP	Agricultural Clean Water Initiative Grant Program managed by AAFM
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
BRP	Back Roads Program
BMP	Best Management Practice
CAFO	Concentrated-Animal Feeding Operation
CCNRCD	Caledonia County NRCD
CEAP	Capital Equipment Assistance Program
CREP	Conservation Reserve Enhancement Program
CSO	Combined Sewer Overflow
CSP	Conservation Stewardship Program
CWF	Clean Water Fund
CWIP	Clean Water Initiative Program
CWSP	Clean Water Service Provider
CWSRF	Clean Water State Revolving Fund
DEC	Department of Environmental Conservation VT ANR
DFW	Department of Fish and Wildlife VT ANR
DFPR	Vermont Department of Forests, Parks and Recreation VT ANR
EBTJV	Eastern Brook Trout Joint Venture
EQIP	Environmental Quality Incentive Program
ERAF	Emergency Relief and Assistance Fund
FCNRCD	Franklin County Natural Resources Conservation District
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FNLC	Friends of Northern Lake Champlain
FWC	Franklin Watershed Committee
GIA	VTrans Grant in Aid Program
GIS	Geographic Information System
HUC	Hydrologic-Unit Code

ICN	Intervale Conservation Nursery
IDDE	Illicit Discharge Detection and Elimination
IWIS	Vermont Integrated Watershed Information System
IUP	Intended Use Plan
LC TMDL	Lake Champlain Phosphorus TMDL
LCBP	Lake Champlain Basin Program
LCCD	Lamoille County Conservation District
LCSG	Lake Champlain Sea Grant
LFO	Large Farm Operation
LiDAR	Light Detection and Ranging
LPMPP	Lakes and Ponds Management and Protection Program
LMP	Lay-Monitoring Program
LPP	LaRosa Partnership Program
LTPBR	Low-Tech Process Based Restoration Network
MFO	Medium Farm Operation
MRBA	Missisquoi River Basin Association
MRGP	Municipal Roads General Permit
MS4	Municipal Separate Storm Sewer System
NFIP	National Flood Insurance Program
NFPP	National Fish Passage Program
NFWF	
NGLA	Next Generation Lake Assessments
NRPC	Northwest Regional Planning Commission
NMP	Nutrient Management Plan
NPDES	National Pollution Discharge Elimination System
NPS	Non-point source pollution
NRCD	Natural Resource Conservation District
NRCS	Natural Resources Conservation Service
NVDA	Northern Vermont Development Association
OCNRCD	Orleans County NRCD
ORW	Outstanding Resource Water
P	Phosphorus
PFP	Pay For Performance Program
PCP	Phosphorus Control Plan
PFAS	Per- and Polyfluoroalkyl Substances
RAP	Required Agricultural Practice
RCWE	River Corridor and Wetland Easement
RCP	River Corridor Plan
RCPP	Regional Conservation Partnership Program
REI	Road Erosion Inventory

RPC	Regional Planning Commission
SFO	Small Farm Operation
SFY	State Fiscal Year
SGA	Stream Geomorphic Assessment
SWMP	Stormwater Master Plan
SWA	Strategic Wood Addition
TBP	Tactical Basin Plan
TBPSG	Tactical Basin Planning Support Grant
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TP	Total Phosphorus
TS4	Transportation Separate Storm Sewer System Permit
TU	Trout Unlimited
VRAM	Vermont Rapid Assessment Method
VSWI	Vermont Significant Wetlands Inventory
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UVA	Use Value Appraisal program, or Current Use Program
UVM Ext.	University of Vermont Extension
VACD	Vermont Association of Conservation Districts
VEM	Vermont Emergency Management
VHCB	Vermont Housing and Conservation Board
VIP	Vermont Invasive Patrollers
VLT	Vermont Land Trust
VRC	Vermont River Conservancy
VSA	Vermont Statutes Annotated
VTrans	Vermont Agency of Transportation
VWQS	Vermont Water Quality Standards
WG	Watershed Grant
WID	Water Investment Division, VT DEC
WISPr	Water Infrastructure Sponsorship Program
WSMD	Watershed Management Div., VT DEC
WUV	Watersheds United Vermont
WWTF	Wastewater Treatment Facility

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Appendix A. Dams

Table A.1. List of Dams from DEC Dams list with the addition of an "interest in removal" field based on Basin 6 partner input

Name	Town	Stream	Dam Status	Purposes	OrigPurp	Hazard Potential Classification	Interest in removal
Browns Pond	Bakersfield	The Branch	Breached (Partial)	Other		Low	Active
Johnsons Mill	Bakersfield	Bogue Branch	Removed			Minimal	Removed 2021
Trout Brook Reservoir	Berkshire	Trout Brook	In Service			Minimal	Removal 2026
East Berkshire	Berkshire	Missisquoi River-TR	Removed				Removed 2025?
Corez Pond	Eden	Burgess Branch	In Service			Minimal	
Enosburg Falls	Enosburgh	Missisquoi River	In Service	Hydroelectric	Hydro Power	Low	None
Fairfield Pond	Fairfield	Dead Creek-TR	In Service	Water Supply	Water Supply	Low	None: DFW manages for waterfowl
Webster (Lower)	Fairfield	Black Creek	Breached (Partial)			Minimal	assess Identified
Webster (Upper)	Fairfield	Black Creek	Breached (Partial)			Minimal	assess Identified
Lake Carmi	Franklin	Pike River-TR	In Service	Recreation	Recreation	Low	None
Bullis Pond	Franklin	Rock River	In Service	Other	Mill Power	Low	
Highgate Falls	Highgate	Missisquoi River	In Service	Hydroelectric	Hydro Power	Low	None

Name	Town	Stream	Dam Status	Purposes	OrigPurp	Hazard Potential Classification	Interest in removal
Missisquoi National Wildlife Refuge	Highgate	Missisquoi River-OS	In Service			Low	None Waterfowl management
East Highgate	Highgate	Missisquoi River	Breached				
Jay Peak Snowmaking Diversion Structure	Jay	Jay Branch Brook	In Service	Recreation		Minimal	None
Jay Peak	Jay	Jay Branch Brook-OS	In Service	Recreation	Snowmaking	Significant	None
Vermont Asbestos Co.	Lowell	Burgess Branch	In Service			Minimal	None
Sleeper Pond	Newport Town	Mud Creek	Breached (Partial)		Low		Design complete
Guilmettes Pond	Richford	Missisquoi River-TR	Breached (Partial)	Recreation		Low	assess
Richford Reservoir	Richford	Missisquoi River-OS	In Service	Water Supply	Water Supply	Low	None
Sheldon Springs	Sheldon	Missisquoi River	In Service	Hydroelectric		Low	None
Fairfield Swamp Pond	Swanton	Dead Creek	In Service	Recreation; Fish and Wildlife Pond	Wildlife/Recreation	Low	None DFW manages for waterfowl
Swanton	Swanton	Missisquoi River	In Service	Hydroelectric	Hydro Power	Low	None
Lucille Farms WWTF	Swanton	Black Creek-OS	In Service	Other	WWTF - Storage Pond	Low	None
North Troy	Troy	Missisquoi River	In Service	Hydroelectric		Low	None

Name	Town	Stream	Dam Status	Purposes	OrigPurp	Hazard Potential Classification	Interest in removal
Bakers Falls	Troy	Missisquoi River	In Service	Hydroelectric		Low	None
Chaput Manure Storage Pond	Troy	Mud Creek-TR-OS	In Service	Other	Liquid Manure Stor.	Low	None
Bonneau	Troy	Mud Creek-TR	In Service		Recreation	Minimal	Assess
Coburn Brook Reservoir	Westfield	Coburn Brook	In Service			Minimal	Assess

Geomorphic Assessment Priorities for Missisquoi Bay Watershed

Identify projects through updated or new Phase 2 SGA on streams that are stressed or impaired by sediment or nutrients to determine if channel erosion processes involved:

- Blue – 1st tier
- Yellow – 2nd tier
- White - Update or develop SGA for purposes of identifying projects
- Green - Preliminary evaluation through stream walk to infer initial condition and if further assessment needed

Table A.2. Potential SGA assessments for streams in Basin 6

Stream	Town	Proposed assessment	Purpose
Loveland Brook		Update Phase 1 to Phase 2	ID high-quality stream, and Development stressor at lower reach

Stream	Town	Proposed assessment	Purpose
Mountain Brook	Richford	Update Phase 1 to Phase 2	ID stressors that led to poor biomonitoring results although not on stressed list
Morrow Brook		Initiate	ID stressors to assist with ID of remediation projects to address agric impairment
Tyler Branch and the Branch		Update Phase 2	ID stressors to assist with ID of remediation projects to address stressed reaches
Samsonville Brook		Update Phase 1 to 2	ID stressors to assist with ID of remediation projects to address agric impairment
Godin Brook	Berkshire	Update Phase I to Phase 2	ID stressors to assist with ID of remediation projects to address agric impairment
Berry Brook	Richford	Update Phase 1 to Phase 2	ID stressors to assist with ID of remediation projects to address agric impairment
Wanzer Brook		Update Phase 2	ID projects to address channel erosion to remediate agric impairment
Ace Brook, lowest reach		Update Phase?	ID projects to remediate impairment from sediment discharge
Mud Creek, MO4		Update Phase 2	ID projects to address channel erosion to remediate agric impairment
East Branch, Missisquoi, R47		Update Phase 2	ID projects to address stressed condition due to sedimentation, and most likely temperature
Giddings Brook	Enosburg	Update Phase 1 to Phase 2	ID projects to address channel erosion to remediate stormwater? impairment
Fairfield River, 2 headwater tribs	Fairfield	Update Phase 2	Update corridor plan project list
Black Falls Brook (add Hanna and Wade Brook)	Montgomery	Update Phase 1 and 2 to Phase 2	Project ID to address development
Beetle Brook	Troy	Update Phase 1 to 2	ID projects to address road impacts
Taft Brook	Westfield	Update Phase I and 2 to Phase 2	ID projects to address potential land use impacts

Stream	Town	Proposed assessment	Purpose
Lucus Brook		Visual assessment/Initial scoping/stream walk	Assist in ID as B1
Stanhope Brook	Richford	Initial scoping/stream walk	Determine if evidence of low flows at town water intake; determine source of channel adjustment higher up in forested headwaters
Trout Brook	Enosburg	Initial scoping/stream walk to update Phase I	Need for Phase 2? Identify projects to address agric impaired section
Snyder Brook		Initial scoping/stream walk	Need for Phase 2?
McGowan Brook	Sheldon	Initial scoping/stream walk	Need for Phase 2?
Tamarack (upper Missisquoi)		Initial scoping/stream walk	Need for Phase 2?
Mineral Brook	Troy	Initial scoping/stream walk	Need for Phase 2?
Jay Branch	Jay	Initial scoping/stream walk	Identify projects (Lucifer Road down is stressed and has Phase 2 from 2008)
Prouty Brook	Franklin	Phase 2	Identify project
Dewing Brook and other Lake Carmi tribs	Franklin	Initial scoping	Identify project

Appendix B. Responsiveness Summary

Vermont Department of Environmental Conservation

Agency of Natural Resources

Responsiveness Summary to Public Comment regarding:

Basin 6 Tactical Basin Plan

On **DATE**, the Vermont Department of Environmental Conservation (VDEC) of the Agency of Natural Resources (ANR) released a final draft of the Basin 6 Tactical Basin Plan for public comment. The public comment period commenced on October 1 and ended on **DATE**. Press releases were sent out to regional publications by VDEC, Regional Planning Commissions (RPCs), Natural Resource Conservation Districts (NRCDs) and partnering watershed groups. Additionally, two public meetings were noticed and held by DEC and these organizations. Both meetings were offered in-person and virtually.

Meetings for public comment:

DATE TIME PM

- In-Person Location:
- # participants

DATE TIME PM

- In-Person Location:
- # participants

The DEC prepared this Responsiveness Summary to address specific comments and questions and to indicate how the plan has been modified in response to public comment. Comments may have been summarized, paraphrased, or quoted in part. Additionally, numerous editorial comments were provided and appropriate edits were made.

Comment:

Response: