# Vermont Nonpoint Source Management Program Plan 2021-2025

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## Acknowledgements

Thank you to the many individuals and partner agencies and programs who provided input to this update of Vermont's Nonpoint Source Management Plan. This Plan was prepared by the Vermont Agency of Natural Resources Department of Environmental Conservation (DEC) Water Investment Division staff who coordinated closely with staff of the Vermont Agency of Agriculture, Food and Markets; Vermont Agency of Transportation; Vermont Department of Forests, Parks and Recreation; DEC's Drinking Water and Groundwater Protection Division; and DEC's Watershed Management Division.

The front cover photo was taken in Charleston Vermont, near Echo Lake by L. Miller.

The Vermont Nonpoint Source Management Program Plan ("the Plan") was prepared by the Vermont DEC in fulfillment of a federal requirement arising from Clean Water Act Section 319 program guidance promulgated by the U.S. Environmental Protection Agency (EPA).

# Executive Summary

The Vermont Nonpoint Source (NPS) Management Program Plan ("the Plan") summarizes the causes and sources of NPS pollution in Vermont and identifies strategies to protect and restore waters of Vermont impacted by NPS pollution. The Plan contains the key components EPA requires for states to remain eligible for continued Clean Water Act Section 319 grant funding to combat the various types or sources of NPS pollution.

Vermont's approach to NPS mitigation includes adaptive policy adoption and adjustment, developing Tactical Basin Plans, monitoring and assessing surface water, protecting against threats to groundwater resources, and tracking, reporting and accounting under various Total Maximum Daily Load (TMDL) pollution control plans on a cyclical basis. DEC considers this Plan to be consistent with applicable TMDL implementation plans in the State of Vermont.

## A. Key Updates to the Plan

The Plan updates the 2015 version of the Vermont NPS Management Program Plan in several ways. First, it more fully addresses NPS impacts to both surface water and ground water in Vermont. The specific approach taken by Vermont to address NPS pollution in surface impacts is outlined in the Department of Environmental Conservation's Surface Water Management Strategy (SWMS) further described in Chapter 4 of this document.[1] The three primary goals for managing the State's surface waters are to: protect, maintain, enhance, and restore the biological, chemical & physical integrity of all surface waters; support the public use and enjoyment of water resources; and protect the public health and safety.

The SWMS is complemented by the Vermont Groundwater Management Plan which makes actionable suggestions that work toward ensuring groundwater resources are sustainable in both quantity and quality and that groundwater use does not harm water quality or the ability of future Vermonters to have access to groundwater resources.[2]

In addition to better covering groundwater impacts, a wide variety of state and federal programs, rules, procedures, permits and practices exist and have been modified since their creation to help clean up, avoid or minimize the generation of NPS pollution and the contribution of NPS pollutants to Vermont's waters. Reflecting the iterative and adaptive nature of Vermont's approach, the following new initiatives have all been developed and are described in this version of the Plan, including:

1. Passage of Vermont Clean Water Act (Act 64 of 2015).

[1] DEC's Surface Water Management Strategy available: https://dec.vermont.gov/watershed/map/strategy
[2] Vermont's Groundwater Management Plan available: https://dec.vermont.gov/sites/dec/files/dwgwp/DW/2018%20Groundwater%20Management%20Plan.pdf

2. Promulgation of the EPA Total Maximum Daily Loads for Phosphorus in Lake Champlain and Lake Memphremagog.
3. Passage of the Clean Water Service Delivery Act (Act 76 of 2019).
4. Reorganization of DEC programs to better align with Act 76 requirements.
5. Expanded eligibility of the Clean Water State Revolving Fund, integrating it with nonpoint source initiatives.
6. Development of initiatives focused on climate change and other emerging issues (e.g. contaminants of emerging concern).
7. Issuance of the Clean Water Initiative Program's (CWIP) Annual Performance Reports documenting progress of the State's clean water investments, starting in SFY 2016.
8. Adoption of the Vermont Groundwater Management Plan and the Vermont Groundwater Protection Rule and Strategy, which implements Vermont's 2008 designation of groundwater as a Public Trust resource.

## B. Summary of Progress

Ongoing assessments of Vermont surface waters and groundwaters indicate that NPS-related impacts occur in each of Vermont's fifteen river drainage basins. The types and extent of water quality problems and threats associated with these NPS pollution sources, however, show a considerable degree of variation within and between basins. Two of Vermont's largest lakes, Lake Champlain and Lake Memphremagog, have water quality problems predominantly caused by NPS. Both waters are shared with other jurisdictions (New York State, the Province of Quebec) where NPS issues within contributing watersheds in those jurisdictions are also documented as major concerns.

As shown in Figure 1 below, between state fiscal year (SFY) 2016 through SFY 2019, Vermont has invested $84.4M into pollution control within the Lake Champlain Basin, of which 73% is for NPS control. For the other major basins of the state, the figures for funding and the percentage for NPS control are: Connecticut River, $37.7M (57%); Memphremagog Basin, $4.7M, (100%); and Hudson, $11.3M (15%). The achievements documentable for the Lake Champlain Watershed are substantial. An estimated 16.9 metric tons of phosphorus pollution have been reduced during this time period, reflecting greater than 7% of the total TMDL reduction required in just 4 years. Importantly, there have been put in the ground many projects for which complete pollution accounting methodologies are still in development. Thus, the actual achievements to date are likely to be substantially greater.

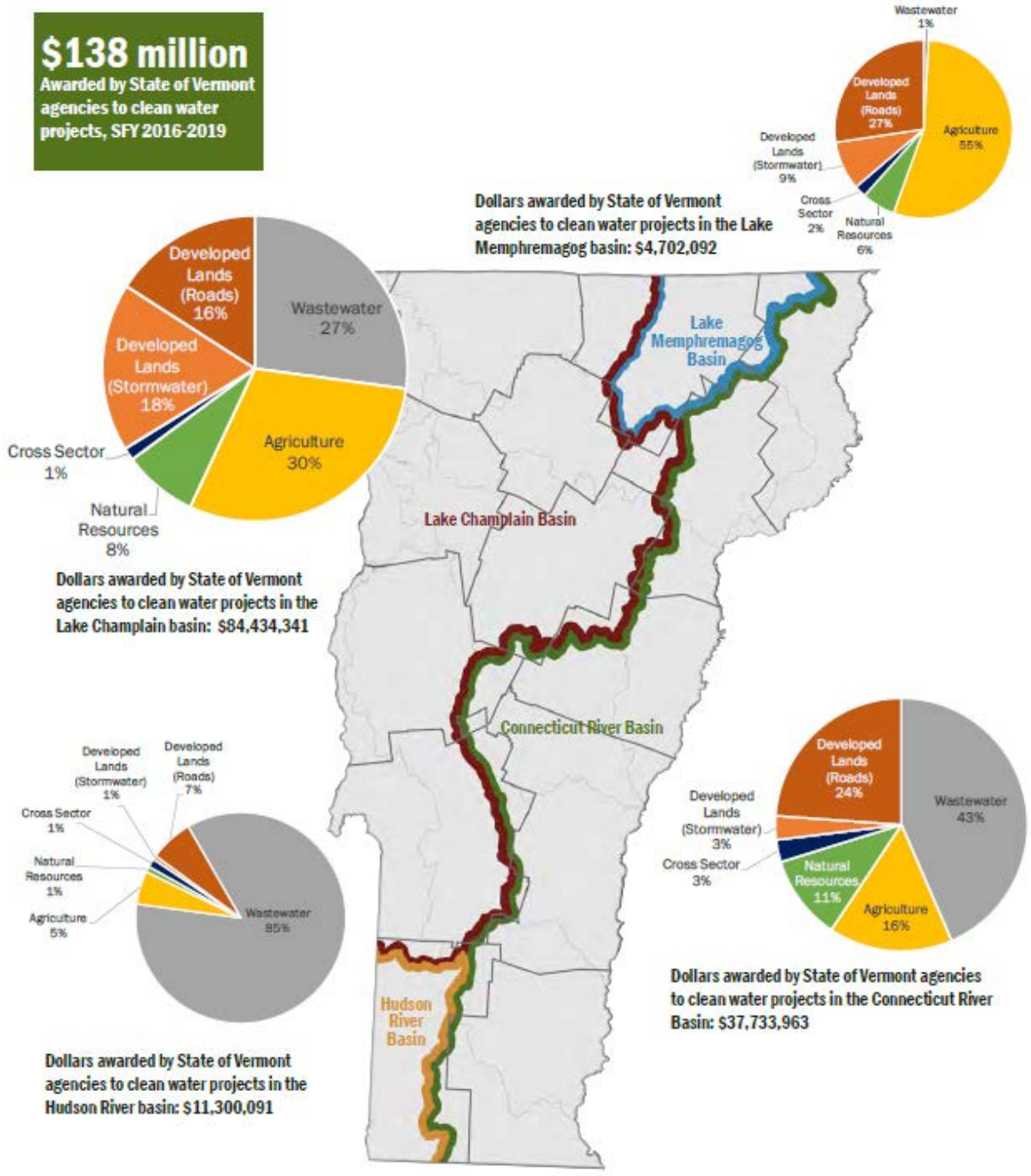


Figure 1. Investments awarded by State of Vermont Agencies to clean water projects by large basin, SFY 2016-2019.[3]

[3] Figure from Vermont Clean Water Initiative 2019 Performance Report, available here: https://dec.vermont.gov/sites/dec/files/wsm/erp/2020-01-14_CleanWaterPerformanceReport_SFY2019-FINAL.pdf

Table 1. Outlines a summary of the chapters contained in this document.

| Chapter | Summary |
|---|---|
| 1 | Summarizes the **purpose** and **scope** of this Plan, the major **causes of NPS pollution** in Vermont waters, information indicating where the Section 319 key components are addressed, and acknowledgement of contributing and lead programs working on NPS pollution. |
| 2 | Includes the **mission, goals, and guiding principles** behind the State's NPS management program. An effective nonpoint source management program will continue to rely on a combination of efficient and effective policy, the application of effective controls and techniques that involve structural and non-structural measures in regulatory and non-regulatory contexts, the ability to monitor or measure program outcomes, and an educated citizenry. |
| 3 | Provides the framework behind Vermont's overall NPS management program, summarizing **key State and Federal laws** and the **statewide and watershed-based approaches** which guide Vermont's overall approach to controlling NPS pollution. A key **new component** of this Chapter, and indeed this overall Plan, is the establishment of clear linkages that clarify the eligible uses of Clean Water State Revolving Loan Fund to address NPS pollution. Based on recent statutory changes in Vermont, the CWSRF is now available as a powerful tool to support municipal and private organizations with funding to mitigate NPS pollution. |
| 4 | Describes the **nature of NPS pollution** that is affecting or threatening Vermont's surface and ground water resources. Defining causes, stressors and sources is supported in large measure by water quality monitoring data. For surface waters, DEC recognizes eight subject areas of NPS concern and five major categories of NPS pollution. |
| 5 | Identifies waters **impaired and threatened by NPS pollution**. Identification and prioritization of waters affected or threatened by NPS pollution is a fundamental element of Vermont's approach to NPS management dating back to 1988. Priority nonpoint source impaired waters are defined. A current list nonpoint source threatened waters in need of protection is included in Appendix C). |
| 6 | Describes how water quality management and implementation are being conducted in order to target limited resources to **address NPS pollution priorities**. Tactical Basin Planning and the generation of Tactical Basin Plans, two hallmark measures of Vermont's commitment to restore and protect its water resources, have helped to define water quality problems, needs and solutions and launch implementation efforts whether intended for protection or restoration purposes. |
| 7 | Describes the **many regulatory and non-regulatory programs and partnerships** critical to ongoing and effective NPS pollution management within Vermont. Vermont's NPS pollution management program is built upon and continues to rely on a collection of programs at state, federal and regional levels. The Vermont NPS Management Program has evolved due to collaboration amongst an extensive network of functional partners including town government, non-profit groups, research and academic institutions. |
| 8 | Describes **measuring environmental progress** and **evaluating this multi-faceted NPS management program**. This chapter provides a glimpse into monitoring efforts to show improvements to water resources and other approaches to evaluate the success of managing NPS pollution being carried out by the State of Vermont. |
| 9 | Vermont's **adaptive management approach** is a process of continual improvement to address NPS pollution, highlighting innovation approaches for policy, projects, financing, and risk mitigation through incremental investment. New initiatives adopted since Vermont's last NPS Management Plan in 2015 are highlighted. |

# Chapter 1: Introduction

Nonpoint source (NPS) pollution is the leading cause of water use impairment to Vermont's surface water and groundwater resources.[4] Addressing NPS pollution is complicated by the diffuse nature of the pollution, the complex regulatory landscape governing it, and the expense involved in addressing it. Since the adoption of the Federal Clean Water Act in 1972, Vermont has invested in the control, prevention, reduction, and overall management of nonpoint source pollution throughout the State.

> NPS pollution is"…caused by diffuse sources that are not regulated as point sources and normally is associated with agricultural, silvicultural and urban runoff, runoff from construction activities, etc. Such pollution results in the human-made or human-induced alteration of the chemical, physical, biological and radiological integrity of water. In practical terms, NPS pollution does not result from a discharge at a specific, single location but generally results from land runoff, precipitation, atmospheric deposition or percolation…."

In Vermont, there are five major categorical sources of NPS pollution that have been addressed in Chapter 2 of this document:

1. Agricultural sources;
2. Stormwater runoff from developed areas;
3. Stormwater runoff from the transportation network;
4. Hydromodification, which includes rivers, lakes, and wetland modifications; and
5. Forest management.

Overall, major causes of use impairment to Vermont surface waters from NPS pollution are siltation and turbidity, nutrients (especially phosphorus), flow alteration and noxious aquatic plants. Other causes affecting Vermont surface waters include pathogens, elevated temperature and toxic substances, and contaminants of emerging concern.

Activities identified as having the greatest impacts on surface waters include streambank erosion/de-stabilization; removal of riparian vegetation; agricultural land uses and activities; developed land and roadway runoff; flow alteration from different facilities; and channel instability[5]. Additional significant impacts on Vermont's waters include atmospheric deposition, road salt, legacy man-made chemicals of emerging concern (e.g. Per and

[4] Definition of Nonpoint source from EPA, Section 319 Program Guidance, 1987. More information can be found at: US EPA, Nonpoint Source Pollution: https://www.epa.gov/nps/types-nonpoint-source-pollution

[5] Based on the percent of surface waters impaired or stressed as assessed in DEC's 2018 305(b) report. https://dec.vermont.gov/sites/dec/files/documents/WaterQualityAssessmentReport_305b_2018.pdf

Polyfluoroalkyl Substances (PFAS), personal care products and medical chemicals), flood impacts resulting from poorly sited or designed human structures or activities, land development (active development as opposed to runoff from existing roads and development), and upstream impoundments.

The major causes of groundwater contamination were from pollutants originating from unlined landfills, petroleum product storage or transport and human waste disposal systems. Other less than major causes affecting Vermont groundwaters include road salt and PFAS and related chemicals. This document includes brief descriptions of the ten stressors which affect Vermont's water resources.

The control, prevention, reduction and overall management of NPS pollution has been underway within Vermont since the establishment of the federal Water Pollution Control Law (aka Clean Water Act) in the early 1970s and since enactment of Vermont's water pollution control statute (Title 10, Chapter 47). A wide variety of state and federal programs, rules, procedures, permits and practices exist and have been modified since their creation to minimize the generation of NPS runoff and the contribution of NPS pollutants to Vermont's waters.

The Plan draws from several other existing State water quality management documents, each of which play a role in defining the status, objectives and direction to be taken by the State when managing NPS and protecting or improving water quality in the near term future. Other existing State water quality management documents that play a role in NPS management include but are not limited to:

- Vermont Water Quality Standards
- Vermont Clean Water Act
- Section 305b Reports
- Vermont NPS Priority Waters List
- Vermont Surface Water Management Strategy
- Vermont Surface Water Monitoring Strategy
- Vermont Groundwater Protection Rule & Strategy
- Vermont Groundwater Management Plan
- Vermont Underground Injection Control Rule
- Vermont Indirect Discharge Rules
- Vermont Water Supply Rule
- Vermont Lake Champlain Phosphorus TMDL Phase One Implementation Plan
- and various ANR-approved river basin water quality management plans.

## A. Purpose and Scope

The purpose of this Plan is to establish the overall strategy the State of Vermont will use when carrying out and implementing various NPS pollution control and management programs

during the next five-year period (Federal Fiscal Year (FFY) 2021 – 2025). The Plan supersedes and replaces the 2015 Nonpoint Source Management Program Plan.

The Plan sets state agency priorities and strategically targets the use of certain federal Clean Water Act funds (Section 319) and certain state funds to address Vermont's most pressing NPS problems and threats. This document describes how multiple government agencies will operate, coordinate with each other and with watershed groups and contribute human and/or financial resources to meet various NPS management goals or objectives whether concerning the protection of unimpaired or threatened waters or the restoration of impaired or otherwise degraded waters. The Plan will help direct how state and certain federal funds can be used to control or reduce NPS pollution. The Clean Water Act requires Vermont (and all other states) produce this strategic management plan in order to continue to qualify for annual Section 319 grant awards.

The scope of this Plan is as follows:

1. Summarizes the causes and sources of NPS pollution;
2. Sets priorities for Vermont state agencies to prevent and reduce on a statewide basis Vermont's most pressing NPS pollution sources;
3. Identifies strategies, funding resources and partnerships that will be used to restore surface and groundwater impaired by NPS pollution and to protect waters that are threatened by NPS pollution; and
4. Describes five-year objectives, actions, and milestones towards making incremental progress when achieving longer term goals of Vermont's NPS Management Program.

## B. About the Plan

The document, which updates earlier versions of the Vermont NPS Management Program, contains the key components EPA requires for states to remain eligible for continued 319 grant funding to combat eligible types or sources of NPS pollution. DEC has written this document to be consistent with the Phase I Implementation plan associated with the phosphorus-based TMDLs approved in 2016 by the EPA for the Vermont portion of Lake Champlain and its drainage.

The United States Environmental Protection Agency (EPA) requires states to have an updated NPS Management Program plan in place to qualify for federal Section 319 grant awards under the Clean Water Act. Once awarded by EPA, DEC uses 319 dollars consistent with an EPA-approved work plan in a variety of ways for eligible activities. This Plan meets EPA's Section 319 Program guidance on key components of an effective state NPS plan[6] (Table 1).

[6] https://www.epa.gov/sites/production/files/2015-09/documents/key_components_2012.pdf

Table 2. Summary of how EPA's Key Elements of an effective state NPS management Program have been incorporated into Vermont's plan.

| Element Number | Key Elements of an Effective State NPS Management Program as per EPA guidance | Vermont NPS Program Plan Chapter |
|---|---|---|
| 1 | The state program contains explicit short- and long-term goals, objectives and strategies to restore and protect surface water and ground water, as appropriate. | 2 |
| 2 | The state strengthens its working partnerships and linkages to appropriate state, interstate, tribal, regional, and local entities (including conservation districts), private sector groups, citizens groups, and federal agencies. | 7 |
| 3 | The state uses a combination of statewide programs and on-the-ground projects to achieve water quality benefits; efforts are well-integrated with other relevant state and federal programs. | 6 & 7 |
| 4 | The state program describes how resources will be allocated between abating water quality impairments from NPS pollution and protecting high quality waters from significant threats caused by present and future NPS impacts. | 5 &7 |
| 5 | The state program identifies priority waters impaired by NPS pollution for restoration as well as priority unimpaired waters for protection. The state establishes a process to assign priority and to progressively address identified watersheds by conducting more detailed watershed assessments, developing watershed-based plans and implementing the plans. | 5 & 6 |
| 6 | The state implements all program components required by Section 319b of the Clean Water Act and establishes strategic and adaptive management approaches to achieve and maintain Water quality standards (WQS) as expeditiously as practicable. The state reviews and upgrades program components as appropriate. State program includes a mix of regulatory, non-regulatory, financial and technical assistance, as needed. | 2, 3,7 8,9 |
| 7 | The state manages and implements its NPS management program efficiently and effectively, including necessary financial management. | 7 & 8 |
| 8 | The state reviews and evaluates its NPS management program using environmental and functional measures of success and revises its NPS management program at least every five years. | 8 |

# Chapter 2: Vermont NPS Management Program Mission, Goals & Objectives

The Vermont Nonpoint Source (NPS) Management Program, in existence since the inception of the Clean Water Act in 1972, is guided by the following overarching mission, long term goals, and guiding principles. This chapter of the NPS Management Program Plan includes objectives, actions, and milestones to achieve program goals over the next five years.

## A. Vermont NPS Management Program Mission, Long Term Goals and Guiding Principals

Vermont's NPS Management Program mission is to prevent, control, or abate ground and surface water pollution caused by the myriad of nonpoint pollution sources, such that beneficial uses of water resources are maintained or restored. This is accomplished by promoting the implementation, use, and maintenance of effective best management practices (BMPs) through funding and regulatory programs across state NPS agencies. State NPS agencies include the Vermont Agency of Natural Resources' Department of Environmental Conservation, Department of Forests, Parks and Recreation, and Department of Fish and Wildlife; Vermont Agency of Agriculture, Food and Markets, Vermont Agency of Transportation, and various other partners.

The following are the long-term overarching goals of the NPS Management Program, carried over from previous plans.

Long Term Goals

1. **Restoration of Waters –** To restore waters that are impaired by nonpoint sources of pollution to meet water quality standards.
2. **Protection of Waters –** To prevent, avoid, or minimize NPS-related impairments of unimpaired waters.
3. **Targeting of Resources –** To effectively target human and financial resources in order to protect, maintain, enhance, and restore waters in the most efficient and timely manner possible.

Vermont NPS agencies apply the following guiding principles to meet Vermont's NPS Program mission and long-term goals:

1. Promote the use, inspection, and maintenance of BMPs funded, required, or recommended by state NPS agencies statewide to effectively control or prevent NPS pollution;

2. Promote voluntary, locally led, incentive-based strategies to address NPS issues;
3. Ensure ongoing compliance with regulatory requirements;
4. Establish, expand, and strengthen partnerships among local, state, academic, and federal stakeholders in managing NPS pollution sources;
5. Encourage proper management of wetlands, wetland buffers, river corridors, riparian areas, lake shorelands, floodplains, natural areas, and other so-called "green infrastructure" to protect, maintain, enhance and restore water quality;
6. Avoid potential groundwater quality impacts when mitigating NPS pollution (e.g. infiltration of surface runoff pollutants within a groundwater recharge or source water zone);
7. Use watershed-based planning and management approaches to identify, prioritize, and implement NPS programs; and,
8. Integrate surface and groundwater monitoring into implementation activities to better track and evaluate NPS management program effectiveness.

## B. NPS Control Strategies with Five Year Objectives, Actions, Milestones & Timeline

This section is organized by the major NPS pollution categories: agriculture, stormwater (includes developed lands and roads), hydromodification (includes rivers, lakes, and wetlands) and forestry. It identifies the objectives, actions, and associated milestones to be implemented from 2021 to 2025 by each pollution category. In addition to the four pollution categories, objectives, actions and milestones are provided related to NPS programs and adaptive management strategies, as well as the required NPS program administration objectives. Vermont will use these objectives, actions, and scheduled milestones to guide NPS management efforts, as well as identify and address any gaps or deficiencies in NPS management. EPA will use these milestones to make progress determinations on Vermont's NPS program.

The purpose of the objective tables below is not only to identify NPS control strategies for the next five years, but also track progress in meeting those objectives by attaching specific milestones and timelines. All objectives and milestones, below, are also reflected in Appendix A and will be reported on annually. Many of the objectives align with requirements of Act 76 of 2019, Act 64 of 2015, the Lake Champlain and Lake Memphremagog phosphorus TMDLs, Phase 3 tactical basin plans, and Vermont's Surface Water Management Strategy. The following summarizes sector-specific objectives, actions, and milestones for the next five years.

### i. Agricultural NPS Pollution

The Vermont Agency of Agriculture, Food and Markets (AAFM) Water Quality Division is responsible for administering the Vermont Agricultural Nonpoint Source Pollution Program. This includes administering the Required Agricultural Practices (RAPs) and farm water quality inspections and enforcement, as well as education, outreach, technical and financial assistance to farms and the agricultural community to achieve state water quality goals. As AAFM

continues to lead and support efforts that result in regulatory compliance, conservation practice adoption, and NPS pollution reduction, it is important to acknowledge the current challenges facing the agricultural community. These challenges include changing climate, low milk and commodity prices, and unanticipated financial loss due to COVID-19. Between 2016 and 2019, the average number of dairy farms in Vermont fell nearly 20% and in the first half of the 2020 calendar year alone, the State saw 25 dairy farm operations go out of business. During this time of challenges and uncertainty for many agricultural operators, AAFM will facilitate a collaborative process with ANR, federal, and agricultural partners through the Vermont Agricultural Water Quality Partnership to effectively target agricultural BMP implementation and support the agricultural community in meeting state water quality goals. However, the flux in farm numbers and farm types under the current constraints is why setting numeric targets as milestones can be difficult for some agricultural objectives and therefore alternative targets have been established such as percent-based milestones of active operations.

The following subcategories describe AAFMs NPS strategies for the next five years including objectives, actions, and milestones. Many objectives, actions, and milestones are currently and will continue to be tracked through annual reporting frameworks for the period of this NPS plan. During the annual review and reporting process, AAFM will be improving and refining agricultural conservation work tracking, data management, and data analysis, to better define baselines and milestones.

**Required Agricultural Practices and Regulatory Programs**

The Required Agricultural Practices (RAPs) are standards to which all types of farms must be managed to reduce the impact of agricultural activities to water quality. These standards are intended to improve the quality of Vermont's waters by reducing and eliminating cropland erosion, sediment losses, and nutrient losses through improved farm management techniques, technical and compliance assistance, and where appropriate, enforcement. The Vermont Legislature directed the Agency to revise the RAPs in the next five years, as described in objective 1.1 below.

RAP compliance will continue to be assessed through AAFM's inspection and regulatory program. While the RAPs apply to all types and sizes of farms that meet the thresholds described in the RAPs, additional requirements have been promogulated for Certified Small Farm Operations (CSFOs), Medium Farm Operations (MFO), and Large Farm Operations (LFOs). See Chapter 7 Section C for additional information about agricultural NPS regulatory programs.

The table below identifies objectives, actions, and milestones for agricultural regulatory programs lead by AAFM.

| Objectives Table 1. Required Agricultural Practices and Regulatory Programs<br>Lead Entity: AAFM unless otherwise noted in the Actions column | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 |
| 1.1 | Revise the Required Agricultural Practices (RAP) rule | • Update definition and requirements for Custom Manure Applicators<br>• Develop Technical Service Provider (TSP) certification program<br>• Develop and provide guidance for managing agricultural activities related to wetlands | • Rulemaking complete for revised Custom Manure Applicator statute update and TSP certification<br>• Complete Wetlands rulemaking | X | | | | |
| | | | | | | | | X |
| 1.2 | Conduct inspections on all Large Farm Operations (LFOs) annually | • Minimize Large Farm Operation (LFO) NPS pollution<br>• Ensure LFO permit terms and provisions, and RAP requirements are attained | • 100% LFOs reporting and inspected annually (36 LFOs in 2019) | X | X | X | X | X |
| 1.3 | Conduct inspections of Medium Farm Operations (MFOs) on a 3-year inspection cycle | • Minimize Medium Farm Operation (MFO) NPS pollution<br>• Ensure MFO General Permit terms and RAP requirements are attained | • All permitted MFOs inspected at least once every three years. Tto meet rotation schedule, AAFM will inspect approximately 33% of MFOs each year. (114 MFOs in 2019) | X | X | X | X | X |
| 1.4 | Revise MFO General Permit every 5 years | • Revise MFO General Permit to ensure consistency with current water quality regulations and conservation practices | • Initiate MFO General Permit revisions | | X | | | |
| | | | • Complete revisions, release new MFO General Permit | | | X | | |
| 1.5 | Conduct inspections of Certified Small Farm Operations (CSFOs) on a 7-year inspection cycle | • Reduce Certified Small Farm Operation (CSFO) and Small Farm Operation (SFO) NPS pollution<br>• Assess CSFO compliance with RAP requirements | • All CSFOs inspected at least once every 7 years (to meet inspection schedule, AAFM will inspect approximately 14% of CSFOs each year) (312 CSFOs total in 2019) | X | X | X | X | X |

| Objectives Table 1. Required Agricultural Practices and Regulatory Programs<br>Lead Entity: AAFM unless otherwise noted in the Actions column | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 |
| 1.6 | Conduct Vermont Housing Conservation Board (VHCB) water quality assessments per AAFM/VHCB agreement | • Annually meet the terms of the AAFM/VHCB grant agreement, ensuring water quality assessments for farmland conservation applicants are completed to assess compliance with the RAPs | • 100% of VHCB-funded farmland conservation projects will have a current AAFM water quality assessment (Average of15 VHCB water quality assessments per year) | X | X | X | X | X |
| 1.7 | Ensure implementation and compliance of the AAFM/ANR Memorandum of Understanding (MOU) | • Conduct routine meetings between ANR DEC Watershed Management Division (WSMD) and Environmental Compliance Division (ECD), VT Attorney Generals' Office, and AAFM to share current activities and review cases<br>• Institute measures or protocols to ensure consistency between DEC and AAFM during farm inspection process<br>• Coordinate with DEC-WSMD to review new or amended LFO permits<br><br>Note: actions above are a collaboration between AAFM and DEC | • Report annually on successful implementation of MOU, accepted by the Vermont Legislature | X | X | X | X | X |

**Outreach, Education, Technical Assistance and Financial Assistance**

AAFM works directly and collaboratively with agricultural partners to provide and support a variety of outreach, education, technical, and financial assistance programs. While regulation of agricultural operations, as described above, provides a legal mechanism for farm oversight , AAFM's outreach, education, and assistance programs are intended for farmers to increase compliance with regulations and improve and protect water quality. AAFM's Water Quality Division administers multiple technical and financial assistance opportunities for farmers in

Vermont, while supporting partners to provide educational programs and technical assistance to Vermont farmers, as well as to engage in innovative NPS reduction activities.

There are a variety of objectives identified below to address existing gaps or areas of work that will be expanded and/or strengthened over the next five years to enhance agricultural NPS efforts in Vermont.

| Objective Table 2. Agricultural Outreach, Education, Technical Assistance and Financial Assistance<br>Lead Entity: AAFM unless otherwise noted | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 |
| 2.1 | Support partner technical assistance and educational events promoting Nutrient Management Planning (NMP) development and implementation | • Provide financial support to partners to host NMP development, implementation, and update workshops and provide NMP technical assistance | • Annual report summarizing partner education and technical assistance efforts related to NMP development and implementation | X | X | X | X | X |
| 2.2 | Expand NMP educational and training opportunities | • Develop and deliver NMP training program(s) for Custom Manure Applicators and Technical Service Providers, requiring educational credits | • 80% certified technical service providers and certified custom manure applicators in compliance with educational credit requirements | | | | | X |
| 2.3 | Provide technical and financial assistance for field and manure management practice implementation | • Deliver AAFM cost share and technical assistance programs that promote agronomic and manure management practices | • Annual report of funding, technical assistance visits, and acreage of conservation practices implemented through AAFM cost share programs<br>• Achieve cumulative increase in phosphorus reductions over the course of 5 years as a result of field practice implementation | X<br>X | X<br>X | X<br>X | X<br>X | X<br>X |
| 2.4 | Promote improved grazing, pasture management, and livestock exclusion | Support agricultural partners and existing pasture based technical assistance programs, to provide technical and financial assistance for grazing pasture management and exclusion fencing practices | • Annual report of funding, technical assistance visits, and acreage of pasture conservation practices implemented through AAFM cost share programs | X | X | X | X | X |

| Objective Table 2. Agricultural Outreach, Education, Technical Assistance and Financial Assistance<br>Lead Entity: AAFM unless otherwise noted | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 |
| 2.5 | Continue research and development of best management practices for tile drain systems | • Continue tile drain sampling and research data analysis<br>• Continue development of best management practices (BMPs) for tile drain management based on research and data analysis, and provide outreach and education on developed BMPs | • Deliver annual update to partners and the agricultural community on tile drain research, sampling, and BMP updates | X | X | X | X | X |
| 2.6 | Conduct conservation practice surveys and conservation adoption social science efforts and surveys | • Support partner efforts to understand, track, and report farmer-funded conservation adoption outside of state and federal programs<br>• Ensure funding available for education, outreach, and organizational development to support social science approach to conservation efforts | • Track and report farmer-funded conservation practice installation in the Partner Database | | X | X | | |
| | | | • Analyze and develop report summarizing social research results to inform effective and realistic water quality policy and program development | | | | | X |

**Agricultural Partnerships and Initiatives**

AAFM NPS programs regulate and support farms to prevent and resolve NPS pollution and risks. Partner collaboration, coordination, and initiatives leverage and enhance NPS programs to achieve state clean water goals. These include partnerships across state and federal agencies, non-profit organizations, and businesses. Many partners participating in the objectives below are part of the Vermont Agricultural Water Quality Partnership (VAWQP), a formalized partnership dedicated to improving water quality on farmland. In addition to partnerships, prioritization efforts such as identifying specific watersheds for increased funding or technical assistance in collaboration with Tactical Basin Planning efforts, is an additional tool in

effectively supporting farms in improving water quality. The following collaborative objectives have been identified and initiated in Vermont to reduce NPS pollution from agriculture.

| Objective Table 3. Agricultural Partnerships and Initiatives<br>Lead Entity: AAFM unless otherwise noted in Actions column | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 |
| 3.1 | Increase water quality improvement by adapting innovative and flexible practices under Regional Conservation Partnership Program (RCPP) funding in Vermont | • Receive and allocate additional $10 million funding to extend RCPP through 2025<br>• Apply for and implement additional RCPP funds, as possible<br><br>Note: DEC will lead the above actions with support from AAFM | • Annual quantification of phosphorus reduction based on RCPP contract implementation | X | X | X | X | X |
| 3.2 | Improve understanding of land treatment and water quality response in conjunction with National Water Quality Initiative (NWQI) (Rock River, East Creek, and Hungerford Brook) | • Review current NWQI projects with partners and identify more site-specific monitoring and localized opportunities for water quality improvement<br>• Carry out water quality monitoring efforts and interpret monitoring data<br>• Acquire non-sensitive information from NRCS regarding land treatment implementation<br><br>Note: DEC will lead the above actions with support from AAFM | • NWQI progress reports submitted to EPA on annual or biannual basis | X | X | X | X | X |
| 3.3 | Support agricultural water quality partners to increase and strengthen partnerships, assistance, and resources to farms, and efforts to | • Host, maintain, and enhance the Multi-Partner Agricultural Conservation Practice Tracking and Planning Geospatial Database (Partner Database) | • Provide Partner Database trainings and support<br><br>• Include farmer-led watershed groups in stakeholder meetings, as applicable | X<br><br>X | X<br><br>X | X<br><br>X | X<br><br>X | X<br><br>X |

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| | improve water quality | • Provide support to new and existing farmer-led watershed groups<br>• Provide support to agricultural partners through the Agricultural Clean Water Initiative Program grants (Ag-CWIP)<br>• Support local conservation practice research and monitoring | • Research and monitoring results developed and disseminated as available | | | X | | X |
| 3.4 | Collaborate and Coordinate with the Vermont Agricultural Water Quality Partnership (VAWQP) | • Implement the VAWQP strategic plan developed in 2019 to build a stronger coalition and share research and learning across the partnership<br>• Create and sustain a formal VAWQP structure<br>• Utilize Tactical Basin Planning to Prioritize watersheds within each basin<br>• Support Vermont-specific research and monitoring, including Conservation Effects Assessment Program in Addison County, Discovery Acres in Franklin County, and the MAPHEX (phosphorus removal system) demonstrations in collaboration with Penn State<br>Note: VAWQP will lead the above actions with support from AAFM and DEC | • Host biennial research summit where researchers share their findings, results, and on-going work with partners, including Vermont, regional, and national experts<br>• Hold Annual VAWQP Meeting, Steering Committee meetings, and VAWQP Leadership meetings | X | | X | | X |
| | | | | X | X | X | X | X |
| 3.5 | Administer Vermont Phosphorus Innovation Challenge (VPIC) to harness creative solutions to address phosphorus pollution | • Continue VPIC program implementation, supporting the development of innovative protypes to address phosphorus pollution in Vermont<br>Note: AAFM will lead with DEC support | • Report on the potential of VPIC projects for future phosphorus reduction | X | X | X | X | X |

### ii. Stormwater Runoff from Developed Lands and Transportation Sources

A portion of stormwater runoff from developed land is considered point source pollution and is currently regulated through permit programs under the National Pollutant Discharge Elimination System (NPDES), including the operational stormwater permit, Municipal Separate Storm Sewer System (MS4) permit, Municipal Roads General Permit (MRGP) and the multi-sector general permit (MSGP).. Sites regulated by NPDES permits are considered point sources of pollution and are beyond the scope of the NPS Management Program.

**Non-Regulatory Stormwater Management**

Non-regulatory stormwater pollution originates from unpermitted developed lands and roads and is addressed under Vermont's NPS Management Program. ANR-DEC promotes non-regulatory stormwater treatment using green stormwater infrastructure (GSI) and low impact design (LID). Opportunities for stormwater treatment are identified and prioritized through grant-funded stormwater master plans. Prioritized stormwater treatment projects are integrated in Tactical Basin Plans and the Watershed Projects Database. The state supports outreach and technical and financial assistance to municipalities and other landowners to promote installation of non-regulatory stormwater treatment practices.

ANR-DEC also supports a Green Infrastructure Cooperative to increase adoption of GSI through an advisory "Roundtable" of stakeholders from the public and private sector. The Roundtable established a GSI strategic plan, targeting four key audiences and objectives:

- Design Professionals: Design professionals (e.g., engineers, landscape architects, architects, design/build contractors) statewide are trained in promoting and utilizing LID principles, GSI practices, and "maintenance-friendly design practices" of GSI BMPs.
- Municipalities: Help municipalities recognize the impacts from stormwater runoff and work to mitigate the effects. Municipal staff are also trained on long-term maintenance practices of green infrastructure.
- Property Owners: Property owners voluntarily implement GSI practices on their property(s).
- State Agencies: State Agencies secure and commit funding to develop policies and programs to support GSI.

The state will continue to promote the non-regulatory stormwater treatment as an objective for managing NPS pollution through targeting planning, prioritization, and technical and financial assistance programs. In the next five years, a new strategic objective is to promote long term operation and maintenance of GSI, in addition to promoting GSI implementation.

| Objectives Table 4. Nonregulatory Stormwater Management<br>Lead entity: DEC Clean Water Initiative Program unless otherwise noted | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 |
| 4.1 | Increase education and awareness of long term operation and maintenance (O&M) of installed BMPs | • Establish O&M standards based on project type<br>• Conduct training and technical assistance targeting municipalities and private owners of BMPs CWSPs or CWSP O&M contractors on O&M standards<br>• Organize a regional O&M summit or outreach event each year for partners, municipalities and consultants<br>Note: DEC will lead this effort in conjunction with Lake Champlain Sea Grant. | • Training materials/curriculum developed on O&M inspection and maintence standards and techniques | X | | | | |
| | | | • Conduct annual O&M training and technical assistance each year. | X | X | X | X | X |
| 4.2 | Identify priority non-regulatory road segments contributing to NPS pollution and mitigate erosion and polluted runoff | • Develop methods and tools to inventory non-regulatory roads<br>• Pilot inventory of non-regulatory roads in high priority watersheds (as defined in Basin Plans, SWMPs etc.) to identify projects<br>• Identify funding sources to implement priority non-regulatory road projects<br>• Implement high priority non-regulatory road improvement projects (O&M responsible party must be in place) | • Complete pilot inventory for non-regulatory roads to identify and prioritize road segments for remediation | | X | | | |
| | | | • 10% of non-regulatory roads brought up to applicable non-regulatory standards and O&M responsible party in place | | | | | X |
| 4.3 | Utilize the Basin Planning process to identify priority municipalities for developing Stormwater Master Plans (SWMPs) and maintain a list of | • Identify priority towns or watersheds that have not completed SWMPs<br>• Implement SWMP's as described in specific Basin Planning objectives | • 15 new SWMPs funded and completed over 5 years | | | | | X |

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| | priority proposed stormwater projects to be addressed | | | | | | | |
| 4.4 | Make progress toward meeting Lake Champlain and Lake Memphremagog developed lands targets through implementation of non-regulatory projects | • Fund and implement non-regulatory developed lands treatment projects | • Progress on non-regulatory developed lands reductions in Lake Champlain and Memphremagog basins consistent with achieving 5-year targets in Phase 3 Tactical Basin Plans | | | | | X |

**Regulatory Stormwater Management: Conversion of Nonpoint Sources to Point Sources**
Stormwater runoff from roads and existing developed lands are being addressed in a staged and prioritized manner through a system of watershed-based stormwater permitting based on existing regulatory authorities and new programs established by the Vermont Clean Water Act of 2015 (10 V.S.A. §1264). The permits in place and associated actions below mean that all impervious surfaces controlled by state or federal permits are no longer considered nonpoint sources. Because of this, no specific objectives tables are listed here.

**Transportation Separate Storm Sewer System (TS4) for State Roads**
The State highway system is now regulated under the TS4 Stormwater General Permit. The TS4 General Permit regulates all stormwater discharges from the state-owned transportation network and associated transportation facilities by consolidating permit requirements from the existing Municipal Separate Storm Sewer System (MS4), Multi-Sector General Permit (MSGP) and state-law based post-construction stormwater permits. Implementation of a comprehensive TS4 General Permit approach allows for the prioritization of maintenance, upgrade of stormwater infrastructure, and implementation of remediation activities based on environmental benefit. Stormwater management practices will be consistent with the Vermont Stormwater Management Manual, with an emphasis on surface infiltration (where/when feasible) to maximize nutrient reduction (particularly phosphorus). Additionally, VTrans is developing phosphorus control plans pursuant to the TS4 General Permit that achieve pollutant reductions consistent with the Lake Champlain TMDLs.

**General Stormwater Permit for Municipal Roads**
Vermont municipalities maintain approximately 13,000 miles of road. Roughly 50% of road miles are hydrologically-connected to surface waters. Initial road erosion inventory results indicate that approximately half of connected road segments require additional best management practices to prevent excess erosion. These roads are a significant source of sediment and nutrient pollution and affect the volume of runoff being generated, which in turn, can alter the hydrology and ecological health of receiving waters.

As a result, DEC issued the Municipal Roads General Permit (MRGP) in 2018. The MRGP requires development of management plans based on local road conditions including road slope, connectivity to receiving waters and other factors, that identify the type and scope of BMPs necessary for the municipality. To date, all affected municipalities have obtained permit coverage, and the first assessments (road erosion inventories) are due at the end of 2020. Each municipality shall, within the first five-year permit term (by January 2023), upgrade at least 15% of the non-compliant road segments identified in the road erosion inventory to meet MRGP standards. Municipal Separate Storm Sewer System (MS4) General Permit

On July 27, 2018, Vermont's MS4 Permit was issued. This MS4 permit is the third MS4 General Permit issued by the State of Vermont. The first MS4 permit was issued in 2003 and amended in 2004 and the next was issued in 2012. Under the Municipal Separate Storm Sewer System (MS4) municipalities are required to develop Flow Restoration Plans for stormwater-impaired, as well as phosphorus control plans in the Lake Champlain watershed (this affects all Vermont MS4s). The extensive deployment of stormwater-management infrastructure associated with these requirements will contribute substantially to the improvement of water quality and meeting TMDL wasteload allocation requirements.

**Permits for Existing Developed Lands**

Stormwater runoff from existing developed land, exclusive of surfaces regulated under the TS4, MS4, or MRGP programs, will be addressed in a staged and prioritized manner using a combination of state law and NPDES-based regulatory authority.

State law, 10 V.S.A. §1264, requires stormwater permit coverage and stormwater treatment for sites with three acres or more of impervious surfaces that are currently unpermitted or permitted under standards prior to the 2002 Stormwater Management Manual. DEC has adopted technical standards for these projects in the form the Stormwater Permitting Rule, which went into effect in 2019. The Department has developed and issued the final General Permit (GP) 3-9050 in 2020 to cover these projects. Sites in the Lake Champlain and Lake Memphremagog basins must obtain GP 3-9050 coverage by the statutory deadline of 2023. Sites in other parts of the state must obtain GP 3-9050 coverage by 2033.

As a result of funding from the Lake Champlain Basin Program the state has initiated a project that incentivizes collaborative efforts between the regulated three-acre property owners and municipal governments. One goal of this project is to create public-private partnerships that will result in greater water pollution and nutrient reductions than would occur from providing treatment for the three-acre property. In the first phase, 10 public-private partnerships will be developed within the Lake Champlain Basin.

**Operational Permits for New Development**

DEC's Stormwater Program administers a post-construction operational stormwater permit program pursuant to state statute. Regulated projects are required to implement BMPs in accordance with the Vermont Stormwater Management Manual (VSMM). The VSMM was

revised in 2017 to increase the use of green stormwater infrastructure practices and increase the required levels of phosphorus removal in approved practices. Precipitation volumes used for the stormwater treatment criteria were revised based on best-available data (NOAA Atlas 14) to account for changes in precipitation volumes, and regional variability. The new VSMM employs state-of-the-art stormwater treatment practices designed to maximize phosphorus removal. These practices, combined with Vermont's regulatory program requiring permits for all new and redevelopment projects with over one acre of impervious surface, as well as expansions greater than 5,000 square feet, will prevent substantial pollutant loading and reflect climate readiness standards or specifications.

### iii. Hydromodification (Resource Protection and Restoration)

This category of NPS pollution includes modifications to river channels, wetlands, lakes, and ponds. The Vermont Agency of Natural Resources (ANR) and the three departments therein (DEC, Fish and Wildlife, and Forests, Parks and Recreation) own and manage about 350,000 acres of land across Vermont. ANR also has easements on an additional 150,000 acres of land. Many easements occur along riparian areas that reflect different categories or types of water resources (i.e., ephemeral streams, intermittent and small perennial streams, wetlands, vernal pools, lakes and ponds, perennial streams/rivers with narrow or broad floodplains). The conservation and management of riparian zones assists in reducing or avoiding NPS pollution and provides resilience to a changing climate. In addition, protection, restoration, and management of these resources serves to showcase sound land use management by the State.

**Minimizing River Corridor and Floodplain Encroachments and Restoring Riparian Buffers**

Managing rivers and floodplains to attain and maintain dynamic equilibrium conditions (i.e., vertically stable banks and least erosive conditions achieved when there is a balance between erosion and deposition processes) accomplishes three surface water resource objectives:

1. Provides greater flood resilience and public safety;
2. Reduces NPS sediment and nutrient pollution;
3. Protects aquatic and riparian habitat.

Removing old dams that no longer serve any useful purpose along with avoiding new buildings, utilities, or public infrastructure in river corridors and floodplains and maintaining vegetated buffers (native plants) are essential to attaining and maintaining equilibrium conditions. Avoiding new encroachments decreases adverse river channel modifications and increases the capacity of valley landforms to store floodwaters and NPS pollutants such as sediment and nutrients. Floodplains, wetlands, and meanders with vegetated buffers:

1. Dampen flood energy and soil erosion by moderating stream flow velocities when floodwaters spill onto them;
2. Allow for sediment deposition on floodplains during floods, which account for the greatest volumes of sediment over time; and

3. Moderate streambank failures due to the root strength, root depth, and root density of the vegetated buffer.

Minimizing river corridor and floodplain encroachments will not only serve to limit future increases in NPS pollutant loadings but is the most effective form of stream and riparian restoration to reduce present day NPS pollutant loadings. River dynamics ensures that, given the proper space, rivers and streams will eventually evolve under their own power to the least erosive form and arrive at equilibrium conditions. Minimizing river corridor and floodplain encroachments also represents an effective short and long-term strategy for managing or avoiding impacts that arise from more frequent extreme weather events brought about by climate change.

DEC will continue to use existing statutory authority to avoid or minimize river corridor and floodplain encroachments using, the Flood Hazard Area and River Corridor Rule and Protection Procedures and General Permits. DEC will continue to support the "Flood Ready" website and the Emergency Relief & Assistance Fund (ERAF) and provide technical assistance to promote disaster recovery incentives for municipalities that adopt regulations for floodplains, river corridors, and riparian buffers. DEC's interest is to have as many towns as possible take steps to protect river corridors from encroachment in order to receive the highest 17.5% ERAF reimbursement rate[7].

**Functioning Floodplains Initiative (FFI): Restoring Rivers, Floodplains and Wetlands**
Growing public interest in improved water quality, ecological integrity, and flood resiliency is creating a need for better tools to aid the restoration and protection of rivers, wetlands, and floodplains. With a combination of State and EPA funding, the Functioning Floodplains Initiative (FFI) was initiated in 2019 to identify nature-based projects through scoring, tracking, and mapping of floodplain and wetland functions and quantification of their social values.[8] FFI will help to prioritize rivers and floodplains as well as wetland restoration projects which will assist with flood resiliency related to climate change.

An FFI contract with an outside consultant is being managed in two phases. Phase 1 deliverables include stream and floodplain connectivity mapping. Phase 2 will produce a set of products that explain and track existing and potential river form and process, as well as the effectiveness of interventions to improve river and floodplain connectivity and function, integrate stakeholder programs involved in restoring stream and floodplain connectivity, and engage the public to support these interventions. One important piece will be developing a method to account for phosphorus reductions from these natural resource restoration projects. Previously, DEC did not have a way to capture reductions from these important projects. Once

[7] As of July 15, 2015 and based on a working list of 295 communities (towns, villages, cities, gores) 43 communities have highest 17.5% ERAF reimbursement rate, 92 communities have 12.5% ERAF rate and 169 communities
[8] More information on Functioning Floodplains Initiative available here: https://dec.vermont.gov/rivers/ffi.

the method is final, the reductions gained from these projects can be used to show progress toward meeting the Lake Champlain and Lake Memphremagog TMDLs.

| Objectives Table 5. Functioning Floodplains Initiative (FFI): Restoring Rivers, Floodplains and Wetlands<br>Lead Entity: DEC Rivers Program unless otherwise noted | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 |
| 5.1 | Phase 1 Functioning Floodplains Initiative (FFI): identify nature-based projects through scoring, tracking, and mapping of floodplain and wetland functions. | • Develop methods and mapping to identify high priority projects to restore and protect stream, wetland, and floodplain functions.<br><br>Note DEC's Rivers Program will lead this effort with assistance from a technical advisory committee comprised of several DEC staff and outside contractors | Phase 1. deliverables completed<br>1. Attainment scoring<br>2. Connectivity Maps<br>3. Reconnect VT Rivers Maps<br>4. Conceptual Hydrology/Hydraulics mapping | X | | | | |
| 5.2 | Phase 2 Functioning Floodplains Initiative (FFI): track existing and potential river form and process, as well as the effectiveness of interventions to improve river and floodplain connectivity and function | • Work with contractor as part of a technical advisory committee to advise and assist in completion of required deliverables<br><br>Note DEC's Rivers Program will lead this effort with assistance from a technical advisory committee comprised of several DEC staff and outside contractors | Phase 2 deliverables completed<br>1. Weighted prioritizations of floodplain and river reconnection projects<br>2. Function and values assessment and mapping methodologies<br>3. Web-based mapping and tracking program with training modules<br>4. Outreach materials reconnect Vermont rivers<br>5. Final Report/Closeout | | X | | | |

**Preventing Adverse River Channel Modifications**

Widespread and historic stream channelization (incision from dredging, berming, straightening and armoring practices) in many Vermont rivers and streams has led to increased erosion and increased sediment and nutrient loading. Land drainage activities and structural controls such as rip-rap may prevent flooding and erosion at one site, but increase erosion downstream and contribute to destabilizing the stream system. These activities increase the power of floods thereby increasing NPS stream bed and bank erosion, property damages, and risks to public safety.

Valley streams and rivers in Vermont are, by nature, evolving to a least erosive, equilibrium condition where sediment erosion and deposition (storage) are in balance. Due to past channelization, these same streams and rivers function primarily as transport (or non-storage) streams. The floodplain deposition of fine sediment, so critical to NPS nutrient retention, has been drastically reduced (>50%) throughout the Lake Champlain basin. It is estimated that comparable reductions in floodplain deposition are true for Vermont's three other regional watersheds. Stream alteration activities that result in conditions which depart from or impede the attainment of an equilibrium condition need to be limited or better managed.

DEC will continue to use existing statutory authority to manage the channel modification program, including implementation of Stream Alteration Rules and General Permits, River Management training programs and MOUs regarding inter-agency coordination during flood response periods. Because these efforts are ongoing, no specific objectives are identified in this plan.

In support of Act 76, DEC's Rivers Program staff will provide technical assistance to support the restoration and protection of high priority critical source areas identified in Tactical Basin Plans or river corridor plans, recognizing that restoration measures will vary from avoidance-based to active interventions to restore stream equilibrium conditions, including riparian buffers, depending on site characteristics, plan recommendations, and willing landowners.

**Wetland Protection and Restoration**

Wetlands receive protection from NPS pollution and are considered a nature-based solution for water quality protection from their natural ability to filter sediments, attenuate nutrients, and store flood water and stormwater. Beyond NPS goals, wetlands provide many other co-benefits to the ecosystem and public including critical wildlife habitat and recreational value. Wetlands with a water column are surface waters and are protected from discharges through the water quality standards and regulatory stormwater management. Wetlands which are not saturated with nutrients serve as a natural filter between land use and waters. Therefore, the simple act of keeping activities outside of wetlands and leaving intact buffers can protect water quality. Wetlands and their buffer zones are protected by the state through the **Vermont Wetland Rules**. DEC started an initiative in 2013 to designate Vermont's most exceptional and irreplaceable wetlands with Class I status which prevents nearly all adverse activities within these wetlands and establishes a larger protected buffer zone. Providing the public, landowners, and developers with the locations of protected wetlands through mapping allows for improved project planning to maximize resource avoidance. Wetland map improvements may also be incorporated into existing and future restoration models.

Given that approximately 35% of Vermont's wetlands were drained or filled prior to 1980, there is a large opportunity to increase wetland natural NPS pollution attenuation through restoring those wetlands historically lost. Reconnecting wetland hydrology, restoring topography, and planting native vegetation provides for more spaces for water to settle and nutrients to be

absorbed by diverse vegetation. Protecting and restoring those wetlands adjacent to developed land aids in NPS pollution control.

| Objectives Table 7. Wetland Protection and Restoration<br>Lead entity: DEC Wetlands Program | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 |
| 7.1 | Provide regulatory assistance in wetland avoidance and minimization. restoration | • Revise VWR to include greater clarity on avoidance and minimization steps<br>• Administer Vermont Wetland Rules (VWR) | • Rule revision adoption | X | | | | |
| | | | • Yearly reports of wetland losses and gains from permitting. | X | X | X | X | X |
| | | | • 5-year report of wetland losses and gains demonstrating the achievement no net loss. | X | | | | |
| 7.2 | Increase protections for our most irreplaceable wetlands that provide water storage and water quality protection functions. | • Complete Class I Designations | • 2,000 acres of wetland designated as Class I | | | | | X |
| 7.3 | Improve knowledge of wetland locations to enhance wetland avoidance in project design. | • Update wetland advisory layer and Vermont Significant Wetlands Inventory | • 20 square miles added to map layers | | | | | X |
| 7.4 | Increase wetland acreage and function through restoration of previously drained and degraded wetlands | • Provide technical assistance to the Department of Fish and Wildlife's wetland restoration program to ensure projects maximize water quality improvements.<br>• Provide incentive funding to the NRCS WRE program to increase number of farmers enrolled.<br>• Provide grant funding for wetland restoration projects. | • 1,000 acres of wetlands restored | | | | | X |

**Lakes and Ponds**

Nonpoint source pollution is a principal source of external nutrient loading and eutrophication in Vermont's lakes and ponds. For example, the Lake Carmi and Lake Champlain TMDL analyses identified various nonpoint sources as the contributors of over 90% of phosphorus

loading to the lakes[9]. Nonpoint source pollution is a threat to the health of lake ecosystems in Vermont as increased external nutrient loading can trigger harmful cyanobacteria blooms, promote the growth of aquatic invasive species, decrease water clarity, and limit economic and recreational benefits provided by lakes. In Vermont, the majority of oligotrophic lakes are showing increasing total phosphorus trends, principally due to increased nonpoint source pollution driven by land use and climate change.

The Lakes and Ponds Program within the Vermont DEC is addressing nonpoint source pollution in lakes and their watersheds through a variety of programs and initiatives detailed in the table below. While most nonpoint source mitigation efforts are focused on reduction of external and internal phosphorus loading and their impacts on lakes, the Lakes and Ponds Program is also monitoring increasing chloride trends in a number of lakes and working with state and federal agencies to reduce chloride applications.

| Objective Table 8. Lakes and Ponds NPS pollution<br>Lead entity: DEC Lakes and Ponds Program | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 |
| 8.1 | Reduce runoff from impervious surfaces on shorelands into lakes | • Work with shoreland residents through the Lake Wise Program to implement land management practices that reduce this runoff, including planting and maintaining vegetated areas, ensuring clean runoff, and stabilizing banks.<br>• Training Lake Wise Evaluators, individuals qualified to help residents identify sources of runoff and address those through the implementation of best management practices, is another important ongoing effort. | • Ten Lake Wise BMP project sites identified during each summer field season | X | X | X | X | X |
| | | | • Complete at least five lake wise implementation projects each summer field season | X | X | X | X | X |
| | | | • Two Shoreland Erosion Control Trainings completed each year | X | X | X | X | X |
| 8.2 | Identify and address sources of nonpoint source pollution in a lake's watershed and develop projects to | • Develop water quality restoration plans known as Lake Watershed Action Plans (LWAPs) that identify sources of nutrient and | • Identify five lakes to develop LWAPs | X | | | | |
| | | | • Complete five LWAPS pending funding and willing partners | | X | | | |

[9] https://ofmpub.epa.gov/waters10/attains_impaired_waters.show_tmdl_document?p_tmdl_doc_blobs_id=79000; https://dec.vermont.gov/sites/dec/files/documents/WSMD_mapp_2009_Carmi%20P%20tmdl.pdf

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| | reduce loading | sediment loading to lakes, prioritize sources based on various environmental, economic, and social criteria, and design projects to mitigate those sources. | • Begin to implement LWAP projects | | | X | X | X |
| 8.3 | Detect and Eradicate Aquatic Invasive Species (AIS) | • Implement a series of projects to reduce the spread of AIS enabled by increasing phosphorus concentrations, such as EWM.<br>• Award annual grants to support projects that will contain further AIS spread, including the Vermont Public Access Greeter Program which educates boaters and provides courtesy watercraft inspections to prevent invasive plants and animals from spreading from one waterbody to another. | • Implement the Greeter Program at 30+ boat access areas across the state on an annual basis to prevent the spread of AIS to lakes where none are currently present | X | X | X | X | X |
| 8.4 | Reducing nonpoint phosphorus pollution from roads near lake shores | • To help reduce road runoff and protect surfaces waters, Act 64 mandates all hydrologically connected roads (class one through four) be maintained according to new road drainage standards. One such standard is an exemption that protects trees and shrubs along roads within 250 feet from cutting or moving and prevents roads from being widened toward the lake side. The Lakes and Ponds Program is training road maintenance officials and road building contractors and providing materials to successfully implement this aspect of Act 64. | • Completion of Bioengineering Manual showcasing five years of shoreland road restoration projects and methodologies for the installation of these practices | | X | | | |
| | | | • New shoreland BMP guidance to address specific road / shoreland interface challenges | | X | | | |
| | | | • Implement new BMPs and evaluate effectiveness of BMPs | | | X | X | X |

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| 8.6 | Reverse pattern of increasing chloride trends in Lake Champlain and other relevant inland lakes | • Support the development of a program in VT similar to New Hampshire's Green Snow Pro program which reduces liability for certified salt applicators and thereby is a guard against over-salting, integrate lakes priorities into VTrans Snow and Ice Transportation Plan, and begin an effort to monitor lakes where chloride concentrations are increasing | • Development of legislation for a reduced salt application program | X | X | | | |
| | | | • Work with VTrans to add low-salt zones around chloride-sensitive lakes into Snow & Ice Plan | | X | X | X | |

### iv. Forest Management

**Forest Lands Analysis, Tracking, Accounting and Pollutant Reduction Initiatives**

Over 70% of the landscape in the Lake Champlain Basin is occupied by forest which contribute significantly to clean water and healthy environment of the Lake Champlain basin. The phosphorus runoff rates per acre from undisturbed forest land are typically very low; however, runoff/erosion associated with forest roads, trails, and stream crossings can increase phosphorous run-loading from forests. Vermont protects water quality in forestlands in several ways as described in the sections below.

**Acceptable Management Practices**

The Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont (AMP) have been in effect by rule in Vermont since 1987 and were most recently updated in 2019[10]. The AMPs are practices employed on logging operations and are intended to prevent discharges of sediment, petroleum products, logging slash, and other materials associated with logging from entering streams and other bodies of water, to control soil erosion and to maintain natural water temperature and quality.

**Assistance to Forest-Based Businesses**

The 2013 Vermont Timber Harvesting Assessment indicated that stream crossings are the principal source of sediment associated with logging operations evaluated in this study. Findings also revealed that most stream crossing structures were undersized to handle flood events. As stated in Vermont's Forest Action Plan, "stream crossings used during harvesting have been a particular area of concern in eliminating discharges of sediment." Below is a list of recent projects initiated by FPR to improve stream crossing practices on logging operations in Vermont.

[10] The 2019 AMP manual can be found here: https://fpr.vermont.gov/forest/managing-your-woodlands/acceptable-management-practices

1. Presented three portable skidder bridge workshops to train loggers how to build and install bridges.
2. Developed the Portable Skidder Bridge Installation Guide for loggers available in print and web version.
3. Created a heavy-duty temporary steel bridge rental program for crossing large streams.
4. Provided training to foresters and loggers on the updated AMPs, as well as the new regulatory standards for sizing permanent stream crossing structures on forestry operations to enhance flood resilience. Developed the second edition of Vermont's AMP manual in print and web version with enhanced instructive guidance, new tools and technology that will ensure a higher level of protection for water resources.
5. Provided $150,000 of funding appropriated by the Vermont Legislature to provide a cost-share program for loggers and foresters to purchase temporary bridges.

**Private Lands**

FPR has an active and effective AMP monitoring and compliance program that is responsible for responding to water quality complaints associated with logging, as well as providing technical assistance to loggers, foresters, and landowners. FPR also provides education and outreach to foresters and loggers through work with the Logger Education to Advance Professionalism (LEAP) program.

FPR county foresters are employees of the State of Vermont that provide technical assistance to private landowners. County foresters equip landowners with the tools they need to understand their forest and manage it well. Among other forestry related services, county foresters provide direct technical assistance to landowners and communities to apply the AMPs, prevent and address water quality concerns.

FPR staff are critical partners in communication of water quality related programs for landowners including RCPP, EQIP and other programs.

Vermont's Use Value Appraisal (UVA) program includes more than 16,000 enrolled parcels and 2,000,000 forestland acres in Vermont. To maintain eligibility, landowners must employ the AMPs to the maximum practicable extent in addition to other forest-sustaining standards. On-the-ground inspections and technical assistance by the county foresters and the work of private consultants, loggers and informed landowners help to ensure these forested parcels continue to provide clean water.

**ANR Lands**

The Agency of Natural Resources (ANR) owns 8% of Vermont's land base (majority forested) representing approximately 360,000 acres total. ANR owned land includes approximately 600 miles of forest and park roads and approximately 1,500 miles of trails. DEC's Municipal Roads

General Permit (MRGP) program includes a streamlined process for inventorying water quality concerns related to municipal road runoff and prioritizing the construction of necessary improvements. ANR is adapting the MRGP framework to guide and prioritize implementation of best management practices for State Forest and State Parks roads and recreational access points. This includes developing a field survey and companion database to gather and store data on project identification and prioritization, and then guide construction of BMPs to reduce nutrient and sediment pollution. Several objectives related to these strategies are identified below.

| Objective Table 9: Forest Lands Analysis, Tracking, Accounting and Pollutant Reduction<br>Lead Entity: Department of Forest Parks and Recreation (FPR) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 |
| 9.1 | Encourage compliance with AMP rules and decrease enforcement cases. | • Continue annual AMP enforcement and compliance reporting under revised AMPs using the AMP database. | • Decrease average number of complaints from a baseline of 32 cases per year and increase the average number of technical assists from a baseline of 13 per year. | X | X | X | X | X |
| 9.2 | Provide technical assistance and outreach to loggers, foresters and landowners | • Provide trainings through partnerships with LEAP, Vermont Woodlands Association (VWA), Vermont Forests Products Association (VFPA).<br>• Develop digital AMP manual consisting of the new AMP manual as a smartphone application with enhanced tools to help implement the AMPs | • Offer 2-3 workshops per year<br>• Disseminate the new digital AMP manual. | X<br>X | X | X | X | X |
| 9.3 | Reduce erosion and sedimentation at stream crossings during harvesting | • Provide technical support and bridge rentals to loggers, foresters and landowners<br>• Continue to administer the cost-share program for temporary skidder brides<br>• Continue to support stream crossing improvement projects with RCPP funds | • 2-3 rentals of the heavy-duty bridges per year<br>• Support cost share 5-7 bridges per year | X<br>X | X<br>X | X<br>X | X<br>X | X<br>X |

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| 9.4 | Develop methods to track and account for phosphorus and sediment reduction of forestland projects | • Hire contractors to define methodology to identify and map critical sources areas of forestland phosphorus and sediment reduction potential<br>• Create list of prioritized sites to target project development<br>• Hire contractors to develop forestland BMP phosphorus accounting methodology design life and data requirements | • Critical source area maps categorized by forestland BMP type, and prioritized locations to target field assessments and project development<br>• Finalize forestland phosphorus accounting methods<br>• Promote BMP implementation through private lands staff, Technical Service Providers (TSPs), private foresters and other strategies. | X | | | | |
| | | | | X | | | | |
| | | | | | X | X | X | X |
| 9.5 | Refine the tracking and accounting of UVA AMP compliance, especially in priority basins to meet TMDL targets | • Inspect parcels and document AMP compliance and identify opportunities for improvements | • Develop, test and refine data collection system<br>• Fully deploy system | X | | | | |
| | | | | | X | X | X | X |
| 9.6 | Implementation of forestry BMPs on high priority state lands | • Develop method to inventory ANR roads and trails<br>• Prioritized list of projects for remediation-completed in 3 phases<br>• Implement BMPs based on priority and funding | • Conduct inventory assessment of ANR lands over 3 years. Phase one starting in 2020.<br>• Complete final prioritization list<br>• Inventory results and project prioritization incorporated into long range management planning and FPR Annual Stewardship plans. | X | X | X | | |
| | | | | | | X | | |
| | | | | | | X | X | X |
| 9.7 | Enhance inter-Departmental (within ANR) coordinated approach in managing current state lands | • Identify high priority acquisition projects that meet mutual (multiple) objectives<br>• Work with District Stewardship Teams to revise/update criteria and apply to new acquisition priorities forwarded to the Agency Lands Acquisition Committee (ALAC) | • Update ANR Lands Conservation Plan | X | | | | |

### Healthy Forest Cover – Enhancing Urban Forest Canopy

Healthy natural forests have been documented to produce the cleanest water of any land cover or use. Research indicates that on a watershed scale and for riparian forest buffers, negative water quality impacts can be seen when forest cover extent becomes less than 65% and 70%, respectively. Vermont's land cover is presently about 75% forested with variations between watersheds and from site to site. A forest cover strategy of **no net forest cover loss** supports the creation of a system to promote forest cover goals in priority zones, including riparian and developed areas, coupled with mechanisms to ensure the health, maintenance, and conservation of existing cover.

Healthy forests, one form of green infrastructure, translate into functional ecosystems that prevent additional NPS runoff. Given that 86% of Vermont forests are privately owned and managed, successfully achieving a no net forest cover loss relies on landowners reaping some financial benefits from their forestlands. Economic incentives for forest products, therefore, become an integral part of keeping and maintaining healthy forestland and healthy forest cover.

Climate change poses significant uncertainty with respect to understanding forest response to disturbance and effectiveness in meeting forest management goals. Temperature, heavy precipitation events, mild winters, and extreme wind and ice storms are predicted to increase. The best risk management associated with minimizing forestland or logging related NPS pollution in light of anticipated climate change is to manage forests to be more resilient to a variety of weather conditions and to build forest harvest plans that account for anticipated extreme weather influences.

As noted previously, NPS pollution resulting from stormwater runoff associated with developed lands is one of the leading causes of water quality impairment in Vermont. FPR is leading an effort to promote green approaches, including urban forest enhancement and other green stormwater infrastructure (GSI) practices that intercept and infiltrate rainwater across the landscape. Healthy trees and forests translate into functional ecosystems that bind phosphorus and water, preventing additional runoff while providing many other significant and important benefits. Opportunities exist to absorb stormwater by improving current infrastructure within the public road rights-of-way and make the integration of trees and other GSI practices standard components of the roadway system.

| Objectives Table 10: Healthy Forest Cover<br>Lead Entity: FPR Division of Forests | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 |
| 10.1 | Protect and enhance urban forest | • Provide high-priority communities with targeted technical & financial assistance to protect urban forest | | X | X | X | X | X |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | canopy cover through outreach and technical assistance | canopies. Assistance includes conducting tree inventories and canopy assessments, reviewing policies and plans, and supporting tree wardens and tree management objectives<br>• Deliver urban forestry outreach presentations to varying audiences. Provide educational opportunities to municipalities to develop sustainable urban forestry programs and advance urban forestry management. | • Provide assistance to 10 communities per year.<br>• Provide 5 outreach events per year. | X | X | X | X | X |
| 10.2 | Maintain and increase UVA enrolled forestland among eligible parcels. | • Provide outreach and technical assistance to private landowners and foresters to equip them with tools to apply, enroll and manage their land in accordance with program standards, including implementation of AMPs. Current forestland enrolled is just under 2,000,000 acres | • Provide 5 outreach events per year with the goal of increasing UVA enrollment | X | X | X | X | X |
| | | | • Visit 800 parcels per year | X | X | X | X | X |

### v. NPS Program Planning, Reporting, Funding, and Adaptive Management Strategies

**Planning and Reporting on TMDL Progress**

The Lake Champlain TMDL outlines an accountability framework that requires reporting on the status of implementation tables within each Tactical Basin Plan every 2.5 years. EPA will review these reports and determine if progress is adequate. Under DEC's Water Investment Division, the Watershed Planning Program (WPP) is charged with developing and implementing watershed management plans, or Tactical Basin Plans, that summarize existing water quality conditions and associated attainment with surface water uses, with identified priorities for surface water protection and restoration of degraded waters. The five-year cyclical Tactical Basin Planning process is further described in Chapter 6. In addition, under Act 76, WPP is taking the lead on setting TMDL Targets by sector and split into regulatory and non-regulatory targets.

The Clean Water Initiative Program (CWIP) within DEC funds, tracks, and reports on priority projects to restore Vermont's waters, and communicates progress toward meeting water quality restoration targets outlined in the states large TMDLs. CWIP also coordinates funding, tracking, and reporting of clean water efforts for federal and state partners, including Clean Water Initiative partner state agencies in the Clean Water Initiative Annual Performance Report. This report summarizes state funding programs including: (a) state investments made in clean water projects through grants, contracts, and loans; (b) state clean water education efforts; and (c) results of state-funded clean water projects. Starting in State Fiscal Year (SFY) 2019, this report

also included the Lake Champlain TMDL Progress Report and was submitted to EPA for review. The objectives outlined below largely relate to planning, tracking and reporting on Lake Champlain and Lake Memphremagog TMDL's.

| Objective Table 11. Planning and reporting on TMDL Progress<br>Lead Entity: DEC's Watershed Planning Program (WPP) unless otherwise noted | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 |
| 11.1 | Identify and develop high priority clean water projects to implement TMDLs | • Coordinate with inter-agency programs and statutory partners to develop draft TBPs for review | • Publish 15 Basin Plans | | | | | X |
| 11.2 | Meet TMDL target load allocations to comply with VT Water Quality Standards | • Publish Tactical Basin Plans with phase 3 and/or geographically explicit implementation priorities | • Lake Champlain Phase 3 content completed and subsequent iterations of other TBPs (Memphremagog, Connecticut River Basins) | Basin 6&7 | Basin 2/4 | Basin 8 | Basin 3&5 | |
| | | | • Implementation targets for Lake Memphremagog | | X | | | |
| 11.3 | Develop TMDL targets by basin and sector | • Target-setting to meet allocations by sector, by basin split into regulatory and non-regulatory | • Phase 3 accounting and target setting completed (Champlain) | Basin 6&7 | Basin 2/4 | Basin 8 | Basin 3&5 | |
| | | | • Implementation targets established (Memphremagog) | | X | | | |
| 11.4 | Report on progress made towards clean water restoration and protection goals | • Develop Tactical Basin Plan Implementation Table interim and final report cards<br>• CWIP and WPP develop and submit Annual Clean Water Initiative Performance Report including TMDL progress report | • Interim/ Final Report Cards developed for basins according to Lake Champlain TMDL Accountability Framework | Basin 8 | Basin 2/4 & 3 | Basin 8 & 5 | Basin 3 | Basin 5 |
| | | | • Basins 6 and 7 submit final reports in 2021 | | X | | | |

**Clean Water Service Delivery Act Tasks and Programs Addressing Nonpoint Source Pollution**

The Clean Water Service Delivery Act (Act 76 of 2019) restructures the administration of clean water funds in the State of Vermont to enhance nonpoint source and non-regulatory clean water project implementation efforts. These changes will roll out incrementally throughout the duration of this five-year management plan. While other funding mechanisms such as NRCS and LCBP currently support clean water project implementation, non-regulatory clean water projects, necessary to meet TMDL pollutant reductions, will be eligible through Water Quality Restoration Formula Grants to decentralized entities known as "Clean Water Service Providers" (CWSPs). To address non-regulatory phosphorus reductions necessary to meet the Lake Champlain and Lake Memphremagog TMDLs, CWSPs will be established through rulemaking by November 1, 2020 and will receive Water Quality Restoration Formula Grants effective November 1, 2021. The state will establish a schedule for addressing other priority nonpoint source pollutants statewide by November 1, 2023. These dates are subject to change based on impacts of COVID-19.

CWSPs will be responsible for identifying, prioritizing, developing, and implementing projects to meet a five-year phosphorus reduction target for non-regulatory activities, identified through Tactical Basin Planning. CWSPs are responsible for partnering with Basin Water Quality Councils (BWQCs) to identify, implement, operate, and maintain non-regulatory projects to meet non-regulatory interim phosphorus reduction targets. This provides additional assurances that voluntary measures (i.e., not driven by clean water regulations) will be met and TMDL targets will be achieved. Funds will be distributed to CWSPs through a formula based on its phosphorus reduction target and a standard cost per unit of phosphorus reduced. Additionally, a CWSP will be responsible for and receive funding for the long-term operation and maintenance of all non-regulatory clean water projects in its region.

Act 76 of 2019 also establishes the Water Quality Enhancement Grant Program to provide statewide funding for (1) protection and enhancement of high quality waters, (2) maintenance or improvement of water quality in all waters, (3) restoration of degraded or stressed waters, and (4) creation of resilient watersheds and communities. Depending on the geographic region of the state and the priority water quality concern, this grant program may support implementation of both restoration projects in impaired waters, as well as protection projects in unimpaired waters.

Act 76 also establishes grant programs targeting point source stormwater regulatory requirements. Those are not discussed here due to this Management Plan's focus on nonpoint source pollution.

The objectives below represent the development of funding programs, accounting methodologies, Clean Water Service Providers, BMP Verification and adaptive management strategies related to Act 76.

| Objective Table 12. Clean Water Service Delivery Tasks and Programs Addressing Nonpoint Source Pollution<br>Lead Entity: Clean Water Initiative Program and Watershed Planning Program | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 |
| 12.1 | Provide reasonable assurances that non-regulatory TMDL targets will be achieved and maintained | • Establish Clean Water Service Providers (CWSPs) and Water Quality Restoration Formula Grant Program | • Complete rulemaking process to establish CWSPs in Lake Champlain and Lake Memphremagog Basins and finalize Water Quality Restoration Formula Grant Guidance Document | X | | | | |
| | | | • Implement Water Quality Formula Grant Program | | X | | | |
| | | | • Determine timeline for expanding CWSP model to address other priority pollutants statewide | | | X | | |
| 12.2 | Ensure protection and enhancement of unimpaired waters through enhanced NPS management and protection projects | • Establish Water Quality Enhancement Grant Program | • Implement Water Quality Enhancement Grant Program statewide | | X | | | |
| 12.3 | Develop and deploy clean water accounting methodology to track reductions from clean water projects | • CWIP coordinate the development of phosphorus accounting methodologies for all project types without methods in place (e.g. rivers, floodplains and | • Document phosphorus accounting methodology by sector and project types | X | | | | |
| | | | • Develop Quality Assurance Project Plan (QAPP) on phosphorus accounting methodology and submit to EPA | | X | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | previously unaccounted for | wetland restoration and forestry BMPs)<br>• CWIP confirm existing accounting methodology for non-regulatory projects<br>• CWIP coordinate development of standard design life for all project types | • Reductions attained from all completed clean water projects, not previously reported on, captured in Clean Water Initiative Annual Performance Report | | | X | X | X |
| 12.4 | Establish Clean Water Service Providers for each Champlain (tactical) Basin/ region and Memphremagog Basin | • Rulemaking process to adopt the CWSP for 6 Champlain Basins and 1 Memphremagog Basin | • CWSPs for Champlain and Memphremagog Basins selected and adopted by rule | X | | | | |
| | | | • Basin Water Quality Councils (BWQCs) established and operational for Champlain and Memphremagog Basins | | X | | | |
| 12.5 | Provide assurance that BMPs implemented on the ground are properly functioning throughout their useful design life | • Establish BMP Verification Procedures<br>• Train CWSPs, and other entities on BMP Verification (see Objective table 4 for training milestones) | • BMP Verification procedures documented | X | | | | |
| | | | • Operation and Maintence (O&M) standards manual developed, and standards incorporated in cost share programs and verification programs | | X | | | |
| | | | • Field verify O&M of 35 state funded GSI projects per year | X | X | X | X | X |
| 12.6 | Adaptive management strategy developed and deployed | • Applying accounting methods, determine progress made in meeting target allocations (WID) | • Analyze and report on Clean Water BMP implementation progress annually by sector and basin | X | X | X | X | X |
| | | | • BMP implementation progress informs updated targets for next planning cycle | | X | | X | |

### vi. Section 319 NPS Program Administration and Oversight

DEC is committed to the continuation of this management plan and the associated reporting requirements. In addition, Vermont DEC expects to submit at least two more success stories detailing the restoration and delisting of our impaired waters to EPA over the next reporting period. The Clean Water Initiative Program within DEC, specifically the Nonpoint Source Coordinator, will continue to coordinate the required tracking and reporting annually on all the listed objectives below in a timely fashion.

| Objective Table 13. NPS Program Administration and Oversight<br>Lead Entity: Clean Water Initiative Program | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 |
| 13.1 | EPA approved NPS Success Stories that document partial or full restoration of NPS impaired waters | • Through reliable water quality monitoring efforts, document NPS impaired situations where water quality is fully or partially restored. | • At least two type 1 Vermont NPS success stories submitted and made part of EPA's NPS Success Stories web page with each biannual listing cycle. | | X | | X | |
| 13.2 | Continue to manage & implement NPS program to meet goals while working towards addressing Vermont's NPS water quality problems effectively & expeditiously | • Employ appropriate programmatic & financial systems that ensure 319 dollars are used efficiently & consistent with fiscal and legal obligations. In keeping with Section<br>• 319(h)8 & 11, provide EPA with sufficient information/reports/data about VT 319 program to allow EPA to determine progress & whether meeting or exceeding all elements in EPA's Satisfactory Progress Determination (SPD) checklist. | • Vermont NPS Program continues to receive SPDs on an annual basis in a timely fashion. | X | X | X | X | X |
| 13.3 | Preparation & submittal of annual NPS program reports consistent with EPA guidance | • Assemble pertinent material reporting on Vermont's progress meeting program milestones noted in NPS Management Program plan.<br>• When information is available, report estimated reductions in NPS pollutant loading & other improvements in water quality arising from program implementation. Provide | • Report annually on progress made in implementing the state's NPS Management Program | X | X | X | X | X |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | draft annual program report to EPA for review.<br>• Submit annual report. | | | | | | |
| 13.4 | Revised NPS Management Program plan | • Track the status of actions, milestones & accomplishments found in current 2021-2025 NPS Management Program plan.<br>• Prepare revised & updated NPS Management Program | • EPA-approved Vermont NPS Management Program plan (2026-2030) in place by 10/1/2025 | | | | | X |

# Chapter 3. Framework of Vermont's NPS Pollution Management Program

A wide variety of state and federal programs, rules, procedures, permits, and practices exist to minimize the generation of NPS pollution and the contribution of NPS pollutants to Vermont's waters. The history of Vermont's NPS program means there have also been lessons learned and research findings applied when revising programs, rules, permits, and practices, as further described in Chapter 9. Due to the variability, persistence, and severity of NPS pollution, there are significant challenges that remain regarding NPS pollution and the protection and improvement of Vermont's water resources.

## A. Key Federal and State Laws

As Vermont's designated lead water quality agency, DEC is responsible for developing and implementing water quality protection and improvement programs required under various state and federal laws. DEC manages regulatory, non-regulatory and voluntary programs and collaborates with a wide variety of local, and other state and federal agencies to plan and carry out programs, strategies, and practices to protect the State's water quality and water resources. The following sections summarize key state and federal laws that provide the essential foundations of Vermont's NPS management program and the statewide and watershed-based approaches that guide Vermont's overall approach to controlling NPS pollution.

### i. Clean Water Act Section 319 and Section 603 – Surface Water

Congress enacted Section 319 in 1987 with amendments to the Clean Water Act, which established a national program to control NPS pollution. NPS pollution has been defined to mean any source of water pollution that does not meet the legal definition of "point source" in section 502(14) of the Clean Water Act.

> The term "point source" means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture.

Funding appropriated under Section §319 can be used to implement state NPS programs including, as appropriate, non-regulatory or regulatory programs for enforcement, technical assistance, financial assistance, education, training, technology transfer, and demonstration projects to achieve implementation of best management practices and to meet water quality goals. EPA provides grants to states, tribes, and territories (since 1990) to implement programs that control and prevent nonpoint source pollution to waters. To be eligible for §319 funding, states must implement updated NPS Management Programs and follow other related program guidelines.

Reference to Section 319 of the Clean Water Act in this Plan would be incomplete without reference to the Vermont Clean Water State Revolving Loan Fund (CWSRF). Established in §603 of the Clean Water Act, the CWSRF is a self-perpetuating loan assistance authority for water quality improvement projects in the United States. Within this 2020 Vermont Plan, Vermont is providing a detailed description of the non-point source, or "319-eligible" projects that could be supported with CWSRF loans or CWSRF additional subsidy.

For the goals of the Clean Water Act to be met, pollution control programs are to be established and, when necessary, modified through the interactions of various assessment, planning, management and implementation documents and ensuing activities. For Vermont, notable documents that affect pollution control programs include, but are not limited to,

- The State's biennial Water Quality Section 305b Report,
- The State's biennial listing of impaired and other waters,
- River basin tactical water quality management plans,
- The Vermont Water Quality Standards,
- Total Maximum Daily Load (TMDL) determinations and associated TMDL implementation plans.

### ii. The Vermont Clean Water Act (Act 64)

The Vermont Legislature passed Act 64 in 2015[11], to address water quality issues, with provisions related to agricultural water quality, Tactical Basin Planning, stormwater, and logging. The Act also raised revenue to fund water quality improvements and programs.

1. The "accepted agricultural practices" were renamed the "required agricultural practices (RAPs)." The revised RAPs include requirements for: small farm certification, nutrient storage, soil health, buffer zones, livestock exclusion, nutrient management, and tile drainage.
2. The act provided that if a farm meets the RAPs, they shall be presumed to not have a discharge of agricultural pollutants to waters of the State. The Act further clarified that after an on-site inspection of a farm that where person engaged in farming is complying with the RAPs but there still exists the potential for agricultural pollutants to enter the waters of the State, the Secretary shall require the person to implement additional, site-specific on-farm conservation practices designed to prevent agricultural pollutants from entering the waters of the State.
3. It reorganized and enhanced AAFM's water quality enforcement authority to include: issue emergency orders to protect water quality; issue mandatory corrective actions; or

[11] The Vermont Clean Water Act (Act 64) available here: https://legislature.vermont.gov/Documents/2020/Docs/ACTS/ACT064/ACT064%20As%20Enacted.pdf

require a farmer to sell or remove livestock from a farm when the volume of animal waste exceeds farm capacity.

4. The act clarified the activities that require an operational stormwater permit, including: construction of one acre or more of impervious surface; discharge from industrial facilities; municipal separate storm sewer systems; earth disturbance of one or more acres; expansion of existing impervious surface by more than 5,000 square feet if the resulting impervious area is more than one acre; runoff from municipal roads; and retrofitting of old impervious surface.
5. The Act required ANR to issue a general permit for stormwater runoff from municipal roads. The permit includes a schedule and requirements for the inventory of roads, prioritization of projects, and project implementation. All cities, towns, and villages shall apply for the Municipal Roads General Permit by July 1, 2021.
6. The Act required ANR to issue a general permit for discharges of stormwater from impervious surface of three or more acres in size that previously were never permitted or were permitted under a pre-2002 permit standard. Issued in September of 2020, the general permit requires retrofitting or redevelopment of old impervious surface. Initial permit applications will be due on a staggered schedule, starting 12 months from the effective date of the general permit and will extend through early 2023, however previously permitted "three-acre sites" will apply for permit coverage prior to expiration of their existing permits, starting with the effective date of the general permit.
7. The act established a Vermont Clean Water Fund to provide funding for: State compliance with water quality requirements and implementation of water quality projects or programs; water quality staff positions when needed to maintain compliance with water quality requirements and existing revenue sources are inadequate; and organizations, associations, and other entities for community-based water quality programs. The Fund shall consist of revenue dedicated to it including a 0.2 percent property transfer tax surcharge. A Clean Water Fund Board shall administer the Fund.

### iii. Vermont Clean Water Service Delivery Act (Act 76)

Act 76 of 2019[12] established a water quality project delivery framework to support Vermont's clean water goals. In addition to securing a new long-term funding source for the Clean Water Fund, three of the most fundamental aspects of this law are to provide assurances to meet non-regulatory targets, to establish interim phosphorus reduction targets, and to establish Clean Water Service Providers, further described below.

1. Providing assurances to meet non-regulatory targets: Act 76 prioritizes program

[12]Clean Water Service Delivery Act (Act 76 of 2019) available here: https://legislature.vermont.gov/Documents/2020/Docs/ACTS/ACT076/ACT076%20As%20Enacted.pdf

delivery and funds for non-regulatory projects. Non-regulatory projects include sub-jurisdictional stormwater management practices and natural resource restoration projects such as floodplain reconnections, wetlands restoration, forestland best management practices, and forested riparian buffer restoration. While not required through existing regulatory programs, these projects are essential to achieve the water quality goals spelled out in the Lake Champlain and Lake Memphremagog TMDLs.

2. Establishing interim phosphorus reduction targets: Act 76 requires formula dispersal of funds for non-regulatory projects in the Lake Champlain and Lake Memphremagog basins. Formula is based on interim phosphorus reduction targets and a standard cost per unit phosphorus reduced, consistent with "pay for performance" models.
3. Establishing Clean Water Service Providers: Act 76 establishes new regional organizations called clean water service providers (CWSP). CWSPs will be established for each Tactical Basin Planning watershed in the Lake Champlain and Lake Memphremagog basins. CWSPs are responsible for partnering with Basin Water Quality Councils to identify, implement, operate, and maintain non-regulatory projects to meet non-regulatory interim phosphorus reduction targets.

### iv. Vermont Clean Water State Revolving Loan Fund (CWSRF) -Title 24, Chapter 120

Established in §603 of the Clean Water Act, the CWSRF is a self-perpetuating loan assistance authority for water quality improvement projects in the United States. The fund is administered by the EPA jointly with state agencies and is the largest water quality financing source in the nation. Through the CWSRF program, each state and Puerto Rico maintain revolving loan funds to provide independent and permanent sources of low-cost financing for a wide range of water quality infrastructure projects. Funds to establish or capitalize the CWSRF programs are provided through federal government grants and state matching funds (equal to 20 percent of federal government grants). Vermont offers a variety of assistance options, including loans, refinancing, additional subsidy, and other instruments. Vermont tailors loan terms, including interest rates from zero percent to market rate, and repayment periods up to 30 years or the useful life of the project, whichever is less. through the process in developing annual Intended Use Plans, Vermont exercises flexibility to target resources to their particular environmental needs, including polluted runoff from urban and agricultural areas, wetlands restoration, groundwater protection, brownfields remediation, estuary management, and wastewater treatment.

In Vermont, the CWSRF provides subsidized loans for the construction of municipal water pollution control facilities, privately-owned wastewater systems, and implementation of nonpoint source pollution control projects of many types. As described in more detail below, and also in Chapter 7, projects that implement a state's 319 nonpoint source management plan are eligible expenses under a state CWSRF program[13]. Within this 2020 Vermont Plan,

[13] More information on Vermont's CWSRF program available here: https://dec.vermont.gov/water-investment/water-financing/cwsrf

Vermont is providing a detailed description of the nonpoint source, or "319-eligible" projects that could be supported with CWSRF loans or CWSRF additional subsidy.

Chapter 120 of Title 24 directs how the State of Vermont implements the CWSRF Program for the State and establishes eligibilities for projects supported by the CWSRF[14]. Traditionally reserved for wastewater and "grey" stormwater infrastructure, as amended by Act 185 of 2018, 24 V.S.A. Chapter 120 now provides for expanded eligibilities for usage of the CWSRF that mirror Federal allowable uses. There are eleven specific Federal CWSRF eligibilities, all now authorized by Vermont statute, the most impactful for the purposes of this NPS Plan being:

- Section 319 Nonpoint Source Projects §603(c)(2)
- Stormwater
- Agricultural Best Management Practices
- Decentralized Wastewater Treatment
- Contaminated Sites and Landfills
- Habitat Protection and Restoration
- Surface Water Protection and Restoration

With passage of Act 185 of 2018, Vermont can now use the CWSRF to provide subsidized loans and to municipal applicants, additional subsidy, pursuant to provisions of annual intended use plans, for a broad suite of the project types defined in State statute as natural resource projects. "Natural resources project" means a project to protect, conserve, or restore natural resources, including the acquisition of easements and land, for the purpose of providing water quality benefits.

Eligible CWSRF natural resources projects are defined as a project to protect, conserve, or restore natural resources, including the acquisition of easements and land for the purposes of providing water quality benefits (24 VSA Chapter 120 §4752). The following project types are categorically considered eligible for CWSRF funding:

- Wetland restoration projects
- Floodplain/stream restoration
- River corridor easements
- Woody buffer plantings
- Dam Removal (where there is a water quality benefit)
- Lake shoreland retrofit using LakeWise principles
- Water Resource Protection through land acquisition or easements for the purposes of
- providing water quality benefits
- Gully Stabilization (where there is a downstream water quality benefit)
- Forestland Conservation

[14] More information on Chapter 120 of Title 24 statute available here: https://legislature.vermont.gov/statutes/chapter/24/120

Not all 319=eligible clean water projects are natural resource projects. For example, a decentralized wastewater system is 319-eligible but not considered a natural resource project. Federal regulations necessitate that CWSRF eligibility be documented on a project by project basis and in some cases ownership can limit the eligibility. The inclusion of the CWSRF program in this Plan is intended to document that:

- Eligibility for any project that implements this Plan, as intended by CWA §603(C)(2), is considered eligible for CWSRF support by loan or additional subsidy, unless that project is specifically ineligible pursuant to Federal or State statue.

- The manner in which any given Natural Resource Project is determined to implement this plan is described further in Chapter 6. Projects which meet the eligibilities defined above, and which do not fall in the category of "treatment works {see CWA §603(c)(1)}" are further exempted from certain Federal cross-cutting requirements pertaining to the construction of treatment works. These requirements include adherence to Davis Bacon Act prevailing wage rates, engagement of Disadvantaged Business Enterprises, American Iron and Steel, and environmental review pursuant to National Environmental Policy Act (NEPA). Importantly, while environmental review is not required for §603(c)(2)-eligible (NPS) projects, all projects supported under this eligibility, and necessitating environmental permits, are required to obtain those permits prior to construction. Certain projects may require additional environmental review that does not rise to the level of NEPA review.

Several types of loans are available:

- Planning Loans: Term of 5 to 15 years with 0% interest.
- Final Design Loans: Terms of 5 to 15 years with 0% interest.
- Construction Loans: Terms of 20 to 30 years with 2% administrative fee, compounded annually. Terms need to be less than or equal to the cost weighted asset life of the project. Planning and Final Design Loans are consolidated with the Construction Loans.

Additionally, Vermont is in the process of developing a new method of financing using the CWSRF for privately-owned stormwater management systems in conjunction with the 3-Acre General Permit. This new approach may utilize what are known as "linked deposits." In a linked deposit program, funds from the SRF are provided to individual banks for the purpose of providing low-cost loans to private entities such as individual property owners and home owners associations to comply with the general permit. Provided that they are not gray stormwater infrastructure, these loans would also not require adherence to Federal cross-

cutting requirements.[15]

### v. Vermont Water Pollution Control Statute (Title 10, Chapter 47)

Chapter 47 of Title 10 establishes the policy of the State of Vermont to[16]:

1) protect and enhance the quality, character and usefulness of its surface waters and to assure the public health;
2) maintain the purity of drinking water;
3) control the discharge of wastes to the waters of the state, prevent degradation of high-quality waters and prevent, abate or control all activities harmful to water quality;
4) assure the maintenance of water quality necessary to sustain existing aquatic communities;
5) provide clear, consistent and enforceable standards for the permitting and management of discharges;
6) delegate to the Secretary of Agriculture, Food & Markets the State agricultural nonpoint source pollution control program and its planning, implementation, and regulation;[17]
7) protect from risk and preserve in their natural state certain high-quality waters, including fragile high-altitude waters, and the ecosystems they sustain;
8) manage the waters of the state to promote a healthy and prosperous agricultural community, to increase the opportunities for use of the state's forest, park and recreational facilities, and to allow beneficial and environmentally sound development;
9) seek over the long term to upgrade the quality of waters and to reduce existing risks to water quality.

Notable provisions connected to NPS pollution and NPS management include classification of surface waters, the need for permits to discharge to waters of the state including surface waters and groundwaters, management of stormwater and wetlands, discharges of phosphorus and the application of phosphorus fertilizer, detergents and household cleaning products and Lake Champlain water quality.

### vi. Vermont Alteration of Streams Statute (Title 10, Chapter 41)

The purpose of this statute is to regulate activities that change, alter, or modify the course, current, or cross section of a watercourse within Vermont[18]. Stream alteration permits regulate activities that take place in or along streams. The permit program ensures that stream alterations will not adversely affect public safety by increasing flood and fluvial erosion hazards; will not significantly damage fish or wildlife; will not significantly damage the rights of riparian owners; and will adversely affect outstanding resource waters designated by the Secretary of the Agency of Natural Resources. The types of activities that are regulated include

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[15] For more information on green vs gray stormwater, see the Vermont Green Stormwater Infrastructure Definition. Gray stormwater practices that meet the Treatment Works definitions are not CWSRF eligible except to municipal borrowers.
[16] More information on the Water Pollution Control Statute available here:
https://legislature.vermont.gov/statutes/section/10/047/01250
[17] 10 V.S.A. § 1259(i)
[18] Vermont Alteration of Streams Statute (Title 10, Chapter 41)
https://legislature.vermont.gov/statutes/section/10/041/01021

streambank stabilization, road improvements that encroach on streams, bridge and culvert construction or repair, and utility crossings under streambeds.

### vii. Vermont Flood Hazard Area Statute (Title 10, Chapter 32)

The purpose of this statute is to minimize and prevent the loss of life and property, the disruption of commerce, the impairment of the tax base, and the extraordinary public expenditures and demands on public service that result from flooding[19]. The chapter seeks to ensure that the development of the flood hazard areas within Vermont is accomplished in a manner consistent with the health, safety and welfare of the public; federal, State, and local management activities for flood hazard areas are done in a coordinated fashion; to encourage local government to manage flood hazard areas and other flood-prone lands; to provide State assistance to local government in management of flood-prone lands. Further, this chapter's purpose is also to comply with FEMA's National Flood Insurance Program (NFIP) requirements for the regulation of development; to authorize adoption of state rules for management of uses exempt from municipal regulation in flood hazard areas and river corridors; to maintain the agricultural use of flood-prone lands consistent with the NFIP; to carry out a comprehensive statewide flood hazard area management program in order to ensure eligibility for flood insurance under the requirements of the NFIP.

### viii. Vermont Lake Shoreland Protection Statute (Title 10, Chapter 49A)

The Vermont Legislature passed the Shoreland Protection Act which regulates certain activities within 250 feet of the mean water level of lakes having a surface area greater than ten acres[20]. The intent of the Shoreland Protection Act (effective 7/1/2014) is to allow reasonable development along the shoreland areas of lakes and ponds while protecting near-shore lake aquatic habitat and lake water quality and maintaining the natural stability of shorelines.

### ix. Vermont Agricultural Pollution Control Statute (Title 6, Chapter 215)

The purpose of this state law is to ensure that agricultural animal wastes do not enter waters of the State[21]. To meet that purpose, it is State policy that all farms must meet certain standards in the handling and disposal of animal wastes and the cost of meeting these standards shall not be borne solely by farmers, but rather by all members of society who stand to benefit. Accordingly, State and federal funds shall be made available to farms, regardless of size, to help defray the major cost of complying with the law's requirements. State and federal conservation programs to assist farmers should be directed to those farms that need to improve their infrastructure to prohibit direct discharges or bring existing water pollution control structures into compliance with standards issued by the US Department of Agriculture Natural Resources Conservation Service. Additional resources should be directed to education and technical assistance for farmers to improve the management of agricultural wastes and protect water quality. Subchapters include provisions for the required agricultural practices, regulations for large,

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[19] Vermont Flood Hazard Area Statute (Title 10, Chapter 32) http://legislature.vermont.gov/statutes/chapter/10/032
[20] Vermont Lake Shoreland Protection Statute (Title 10, Chapter 49A) http://legislature.vermont.gov/statutes/chapter/10/049A
[21] Vermont Agricultural Pollution Control Statute (Title 6, Chapter 215) http://legislature.vermont.gov/statutes/chapter/06/215

medium and small farms, programs related to technical and financial assistance, and the authority for the enforcement of agricultural water quality requirements.

### x. Vermont Groundwater Protection Statute (Title 10, Chapter 48)

Groundwater of Vermont is recognized as a precious, finite, and invaluable resource upon which there is an ever-increasing demand for present, new, and competing uses and that an adequate supply of groundwater for domestic, farming, dairy processing, and industrial uses is essential to the health, safety, and welfare of the people of Vermont. The law establishes the four classes of groundwater and that the withdrawal of groundwater should be regulated in a manner that benefits all Vermonters and is done to be compatible with long-range water resource planning, proper management, and use of the water resources of Vermont[22].

The law establishes it is the policy that the State shall protect its groundwater resources to maintain high-quality drinking water; groundwater resources are to be managed to minimize the risks of groundwater quality deterioration by regulating human activities that present risks to the use of groundwater in the vicinities of such activities while balancing the state's groundwater policy with the need to maintain and promote a healthy and prosperous agricultural community; and, that the groundwater resources of the state are held in trust for the public.

The recent revisions to the Groundwater Protection Rule and Strategy (adopted 2019) requires 11 DEC programs that permit activities that may discharge to or impact groundwater to incorporate protection of groundwater trust resources into each rule. This requirement, once initially addressed, is to be reviewed and revised every seven years thereafter to institutionalize awareness of groundwater protection. The four goals for groundwater management declared within 10 VSA §1390 are briefly summarized as follows:

1. Withdrawal of groundwater should be regulated in a manner that benefits the people of the state;
2. The state shall protect its groundwater resources to maintain high-quality drinking water;
3. Groundwater resources shall be managed to minimize risks to groundwater quality deterioration; and
4. Groundwater resources are held in a trust for the public.

The Groundwater Protection Rule was revised (and adopted) in 2019 to incorporate public trust doctrine into 11 DEC regulatory programs, update and revise the reclassification of groundwater process, incorporate changes to Groundwater Enforcement Standards and add Per and Polyfluoroalkyl Substances (PFAS) compounds to the list of chemicals.

This "umbrella" rule establishes processes that must be incorporated into regulatory programs to ensure that activities that present a potential threat to groundwater are designed, managed,

[22] Vermont Groundwater Protection Statute (Title 10, Chapter 48)
http://legislature.vermont.gov/statutes/chapter/10/048

and permitted to protect groundwater resources; and a system to protect the groundwater resources that are held in trust for the public. Following an initial period of five years for program review and revision to incorporate public trust doctrine, these rules will be reviewed every seven years thereafter.

This Rule applies to all activities that are subject to the following Agency rules:

(1) Solid Waste Management Rules;
(2) Hazardous Waste Management Regulations;
(3) Underground Storage Tank Rules;
(4) Aboveground Storage Tank Rules;
(5) Salvage Yard Rule;
(6) Underground Injection Control Regulations;
(7) Indirect Discharge Rule;
(8) Stormwater Management Rule;
(9) Stormwater Management Rule for Stormwater-Impaired Waters;
(10) Wastewater System and Potable Water Supply Rules (for wastewater systems only);
(11) Investigation and Remediation of Contaminated Properties Rule.

### xi. Vermont Groundwater Management Plan (2018)

In 2008, the legislature revised 10 V.S.A Chapter 48 to make groundwater a public trust resource. The Groundwater Withdrawal Reporting and Reporting Rules was created and adopted in 2009 based on this change. The DEC Groundwater Coordinating Committee developed a VT Groundwater Management Plan approved in 2018 to incorporate various strategies for groundwater evaluation and protection and an implementation plan.

The primary goal of the plan is to make actionable suggestions that work toward ensuring groundwater resources are sustainable in both quantity and quality and that groundwater use does not harm water quality or the ability of future Vermonters to have access to groundwater resources. The three primary objectives of the Drinking Water and Groundwater Protection Division for managing the State's Groundwaters are to:

1. Improve information available for groundwater management decisions,
2. Protect public health and the environment and,
3. Expand communication.

These objectives are supported by seven tasks:

1. Continue studies of groundwater resources
2. Interagency collection and compilation of data
3. Identification and mapping of groundwater resources
4. Adoption of technical criteria and standards
5. Integration of groundwater protection considerations into regulatory programs

6. Technical assistance and planning for municipalities
7. Compilation of information and educational materials for the public and cooperate with federal agencies

The Groundwater Management Plan includes several management considerations:

1. Surface water and groundwater need to be effectively managed as integrated resources.
    a. Groundwater originates from and contributes as base flow to and storage for surface water.
    b. Changes in surface water flow can affect groundwater levels or quality.
    c. The legal system and our ANR regulatory programs generally consider surface water and groundwater management separately.
2. Groundwater quality and quantity are interdependent and need to be considered in an integrated manner.
    a. Groundwater may not be usable because of contamination either from natural or human sources.
    b. Monitoring and evaluating groundwater quality provides managers with necessary data for sound decisions.
    c. Numerous state programs monitor different aspects of groundwater quality.
3. Land use decisions can affect quality and quantity of groundwater.
    a. Little may be known about the location of regional or local recharge areas and discharge areas.
    b. Protection and preservation of recharge areas needs to be incorporated into land use decisions.
4. Groundwater science is more challenging given that the resource is not directly observable.
    a. Known points of data are essential to enabling interpolation and extrapolation.
    b. The completion of groundwater investigations independent of regulatory activities is vital to making effective long-term management decisions regarding the sustainability of groundwater use within the state.
5. Funding to assist in state and local groundwater management and expand groundwater investigations is currently limited.
    a. Funding should be increased for additional studies, hiring staff and use of contractors for specific projects.

The last section of the Groundwater Management Plan is a task specific implementation plan with a rolling 5-year cycle to track and modify as necessary the progress toward completion of each task and sub-tasks. Some task/subtask are in planning stages, some nearing completion and some will be on-going such as geologic mapping or data acquisition. Additional opportunities are available to fill gaps or collaborate with the Tactical Basin Planning process for tasks that overlap to better address the inter-relation of surface and groundwater and impacts from natural and man-made activities.

### xii. Vermont Public Water Supply Statute (Title 10, Chapter 56)

This statute gives authority to the Agency of Natural Resources to regulate drinking water, which includes drinking water standards; the adequacy, construction, and operation of public water systems; oversight of public drinking water sources (surface and groundwater); and public water source protection areas.[23]

### xiii. Vermont Municipal & Regional Planning & Development Statute (Title 24, Chapter 117)

Also known as the Vermont Planning and Development Act[24], the intent and purpose of this law includes, but is not limited to, encourage the appropriate development of all lands in Vermont by the action of its municipalities and regions, with the aid and assistance of the State, in a manner which will promote the public health, safety against fire, floods, explosions, and other dangers; to facilitate the growth of villages, towns, and cities and of their communities and neighborhoods so as to create an optimum environment; and to provide means and methods for the municipalities and regions of this State to plan for the prevention, minimization, and future elimination of such land development problems as may presently exist or which may be foreseen and to implement those plans when and where appropriate.

### xiv. Vermont Land Use and Development Control Statute (Title 10, Chapter 151)

The Land Use and Development Control Statute is designed to mitigate the effects of development through an application process that addresses environmental and community impacts of certain projects exceeding a particular threshold in size.[25] The law has created nine District Environmental Commissions that are to review large-scale development projects using ten criteria intended to safeguard the environment, community life, and aesthetic character of Vermont.

## B. Statewide and Watershed-Specific Approaches

### i. Statewide Approach

Vermont's statewide approach targets five major categories of NPS pollution:

1. agricultural runoff,
2. hydrologic modification (river channel/corridor impacts),
3. stormwater from developed areas,
4. stormwater from transportation, and
5. forestry runoff.

Other noteworthy NPS pollution categories of concern include on-site wastewater disposal; lake shorelands development; waste management and non-native nuisance aquatic species; and emerging chemicals of concern. The State's lead NPS agencies and other cooperating agencies

[23] Vermont Public Water Supply Statute (Title 10, Chapter 56)
http://legislature.vermont.gov/statutes/chapter/10/056
[24]Vermont Planning and Development Act http://legislature.vermont.gov/statutes/chapter/24/117
[25] Vermont Land Use and Development Control Statute (Title 10, Chapter 151)
http://legislature.vermont.gov/statutes/chapter/10/151

and partners collectively implement an array of regulatory and non-regulatory programs to control pollution from these other NPS categories.

Regulatory programs that include permitting, compliance assistance and enforcement are administered under several core environmental laws such as those noted above, as well as rules or other requirements related but not limited to stormwater management, construction erosion control, management of lakeshore lands, pesticide application, water supply source permitting and source protection, and on-site wastewater disposal and forestry operations that involve harvesting 40 or more acres. These various laws and rules limit or control specific activities and require use of BMPs or other specified control measures to manage NPS pollution and pollutant delivery.

The broad nature and geographic scope of NPS pollution requires that Vermont has robust regulatory oversight of NPS management through laws, rules or other program requirements in conjunction with increasing investments in technical assistance, grants and loans. These regulations and laws accompany an equally vital component of Vermont's NPS Management Program that involves efforts to encourage more widespread voluntary use of proven effective BMPs. Non-regulatory programs typically involve providing technical assistance; education and outreach to municipalities, landowners, businesses, schools and non-governmental organizations; social marketing to change behaviors and BMP trainings and demonstrations. Monitoring is invaluable when describing water quality effectiveness of certain practices or approaches. Recognition programs (such as the LakeWise Program and Septic-Smart) play an essential role in Vermont's NPS Management Program when highlighting efforts directed at preventing or reducing NPS pollution. In addition, the Vermont Groundwater Management Plan, Source Protection Area and Plan program, USGS Water Research and Use grant project, among other initiatives, all provide a strategic and tactical approach to evaluating, managing, and protecting groundwater resources in coordination with other state agencies and federal partners.

### ii. River Basins and Watersheds Approach

To complement its statewide approach for NPS management, Vermont uses its tactical river basin and watershed approach to restore and protect waters from NPS pollution. Through its long standing and legislatively mandated Tactical Basin Plan planning process, DEC is able to assess surface waters and characterize NPS problems and threats, then develop and prioritize strategies for restoration and protection followed by basin project related funding decisions to linkage(s) to an identified or prioritized strategy. Restoration needs for surface waters are identified and driven by biennial listing efforts that become integrated into Tactical Basin Plans. DEC's rotational assessment/monitoring efforts also assist during the evaluation of success or effectiveness.

Under the Vermont Water Supply Rule, DEC's requirement for source protection plans are aimed at protecting public community and non-community drinking water sources from contamination, administered by individual water systems, and includes outreach to the public

within the Source Protection Area. The Source Protection Area, for a public community water system, includes the hydro geologically delineated primary and secondary recharge areas for the drinking water source(s).

Success of the river basin and watershed approach aspect of the Vermont NPS Management Program depends on a broad base of partnerships with other state agencies and interstate, regional and local entities, private sector as well as citizens and non-profit groups, academic institutions and federal agencies. These partners and their affiliated programs have interests, goals and needs that align or overlap with the goals of Vermont NPS Program. It is without question that effective, yet flexible partnerships strengthen the NPS Program by attracting new ideas and input, increasing understanding of NPS problems and building commitment to implementing solutions. Vermont's lead NPS agencies use a variety of formal and informal means to develop, maintain and enhance these partnerships. Chapter 7 of the Plan provides further descriptions concerning many of these partnerships.

### iii. Restoring Impaired Surface Waters and Protecting Waters Threatened by NPS Pollution

This plan outlines methods and approaches to restore the relatively small number of surface waters impaired by NPS pollution and protect the many other waters currently threatened by NPS pollution. Vermont's 2018 State of the State's Water Quality Report indicates aquatic life is supported on approximately 92% of assessed river/stream miles and on 59% of assessed inland lake/pond acres. Swimming uses are supported on 97% of assessed river/stream miles and on 76% of assessed inland lake/pond acres. For Lake Champlain, although levels of phosphorus impair swimming uses in the majority of the lake's acres, aquatic life use is in fact supported on 88% of the waterbody. That said, many of Vermont's good condition waters that are presently attaining standards are considered threatened due to NPS pollution.

Given the relatively high proportion of un-impaired surface waters and relatively low number of impaired surface waters found in Vermont, DEC needs to balance the use of available NPS resources intended to restore impaired waters and protect threatened waters. Since DEC believes pollution prevention or protection of threatened waters is often more feasible and less expensive than restoration of an already impaired or degraded water, DEC along with other state NPS agencies (and many partners) devotes some program resources for projects and activities that protect waters considered threatened or at risk. The NPS Priority Waters list (see Chapter 5) identifies particular priority surface waters impaired and waters threatened[~~26~~2] by NPS pollution.

### iv. Addressing Diffuse NPS Ground and Surface Water Pollution by Incentivizing Decentralized Wastewater Systems: Vermont's Village Wastewater Initiative

Many villages in rural communities lack community sewer systems instead depending solely on individual septic systems. Small village lots or properties in close proximity to nearby wells and

[26] The term 'threatened' in this context refers to unimpaired waters that are subject to potential and likely to occur impacts from NPS pollution. Importantly, the term in this context is not connected nor to be confused with 'threatened' under Clean Water Act Section 303d listing purposes where waters are anticipated to become non-attainment waters within a two year period (i.e., by the next 303d listing cycle/submittal).

water bodies often limit the ability to install new or replacement septic systems and leach fields. This can hamper or halt village revitalization efforts due to required setbacks from wells, property lines, and surface waters. These private systems, aging out of their design life or failing altogether, can lead to bacterial contamination and excess nutrients entering surface and groundwater. These communities often historically developed along rivers, lakes, and streams may be important areas to consider for alternative wastewater treatment solutions. VDEC supports communities with technical assistance and funding in planning and installation of wastewater solutions.

In general, new village wastewater solutions are decentralized and often involve in-ground disposal systems (leach fields) though numerous options are available. Projects can range in size from serving just one property to connecting the entire village. A variety of funding sources can assist with feasibility planning, design, and construction to reduce costs to municipalities. These may include:

- State and federal infrastructure grants and loans;
- Local bonds;
- Coordinating with construction projects (housing, public buildings, business expansion etc.) to address the new wastewater needs along with the existing village needs;
- Funds to replace individual systems can be applied to a community system instead.

The Village Wastewater Initiative Committee (VWIC) led by DEC meets biweekly to discuss progress of the villages, development of tools and resources, and coordination between funders and service providers. VWIC offers a workbook to help in organizing a village wastewater committee first step in initiating solutions.

# Chapter 4. Nature of NPS Problem Affecting Vermont's Surface & Ground Waters

## A. Overview of Vermont's Water Resources

Understanding the hydrologic cycle provides an opportunity to recognize that "surface water" and "groundwater" are just simple expressions of water movement through different media. Programmatically, we tend to treat them separately, but groundwater is the base flow for streams and lakes which then fill bank storage and aquifers through flooding and seasonal losing and gaining streams. Managing land use activities through regulation (permits), prevention, mitigation or remediation of groundwater will reduce the impacts to surface water.

### i. Surface Waters

Within its borders, Vermont has approximately 7,100 miles of rivers and streams, 300,000 acres of freshwater wetlands and 812 lake and pond waterbodies (those at least 5 acres in size or those named on US Geological Survey maps) that total about 230,900 acres. Surface waters (not including wetlands) are classified as Class A or Class B. Class A waters are managed for enjoyment of water in its natural condition, as public drinking water supplies (with disinfection when necessary) or as high quality waters which have significant ecological values. Class B waters are managed for aquatic biota and wildlife sustained by high quality habitat; good to excellent aesthetic value; suitable swimming, fishing and boating among other uses. There are 172 wastewater treatment facilities found within Vermont and each facility is operated in accordance with a National Pollutant Discharge Elimination System (NPDES) permit issued by the State of Vermont.

As shown in Figure 2 below, Vermont's border waters include the Connecticut River on the east (border with New Hampshire), Lake Memphremagog and Lake Champlain on the north (partial border with the Province of Quebec) and the Poultney River and Lake Champlain on the west (partial border with New York). The 15 major river basins of Vermont drain to one of four large regional drainages: Lake Champlain, Connecticut River, Lake Memphremagog, or the Hudson River.

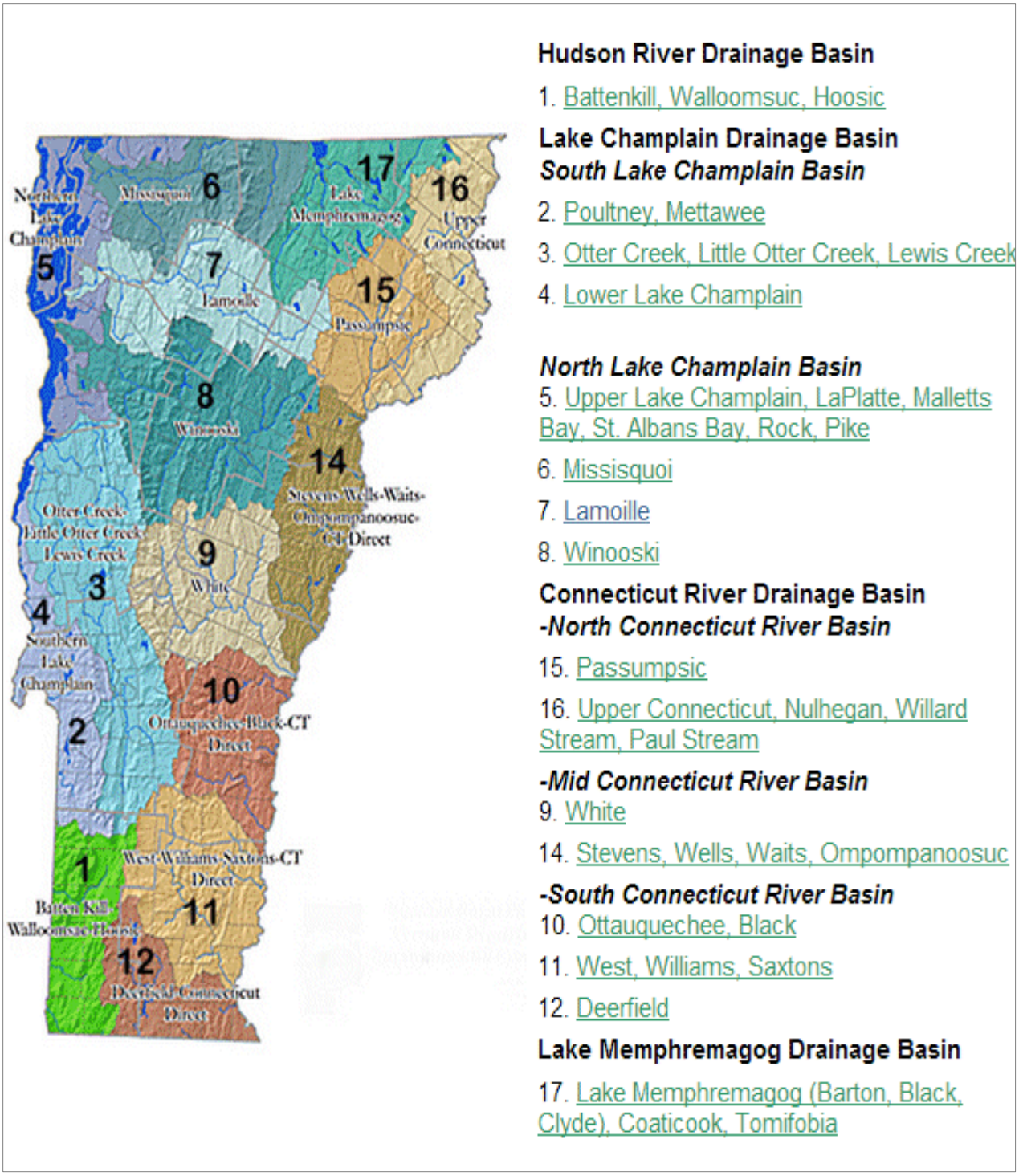


Figure 2. Vermont's major river basins and regional drainages.

Additional surface water resource information is contained in Table 3. The map appearing on the previous page shows the various river basins and the larger regional drainages.

Table 3. Surface Waters Atlas

| | |
|---|---|
| State population (July 1, 2019 estimate) | 623,989 |
| State population change (2000-2010) | 2.8% increase |
| State surface area | 9,609 square miles |
| State population density | 65 persons/square miles |
| Miles of perennial rivers & streams | 7,099 (includes CT River) |
| Border miles of shared rivers/streams (subset) | 262 (CT R. 238, Poultney 24) |
| Longest river in the state (not including Conn R.) | 100 miles (Otter Creek) |
| Largest river watershed in the state (not including Conn R.) | 1,080 square miles (Winooski River watershed) |
| Number of lakes, reservoirs & ponds over 20 acres | 280 |
| Number of lakes, reservoirs & ponds from 10 to 20 acres | 190 |
| Number of lakes, reservoirs & ponds (at least 5 acres but less than 10 acres) | 148 |
| Number of significant lakes, reservoirs & ponds less than 5 acres (or size unmeasured) | 206 |
| Deepest in-land lake (Willoughby) | 308 feet |
| Greatest depth of Lake Champlain (off Thompsons Point) | 394 feet |
| Acres of lakes, reservoirs & ponds[1] | 230,927 |
| Acres of freshwater wetlands[2] | 300,000 |

Table Notes:

1 Number includes the Vermont portion of Lake Champlain, some private waters and some waters less than 5 acres in size. This figure also accounts for two CT River impoundments, Moore and Comerford Reservoirs, which are 1,255 and 777 acres in size respectively. The figure also accounts for newly inventoried ponds that were not previously tracked in Vermont's Lake Inventory Database and for some minor lake size changes that were identified via GIS analyses.

2 Number does not include wetlands found on agricultural lands that are actively used for agricultural purposes.

Wetlands within Vermont are classified as Class I, Class II or Class III. Class I wetlands are those wetlands that are exceptional or irreplaceable in their contribution to Vermont's natural heritage and that merit the highest level of protection. Class II wetlands are those wetlands, other than Class I wetlands that, are so significant, either taken alone or in conjunction with other wetlands, that they merit protection. Class III wetlands are those wetlands that have not been determined to be so significant that they merit protection either because they have not been evaluated or because when last evaluated were determined not to be sufficiently significant to merit protection. The majority of wetlands within Vermont are Class II.

### ii. Groundwater

Groundwater is currently used for drinking water by approximately 60% of Vermont's population. About 46% of the population is self-supplied while about 24% is served by public water systems. All of the public community water systems in the State have a corresponding source protection areas or aquifer recharge areas mapped on a hydro-geologic basis. There have been several projects that evaluated naturally occurring contaminants – arsenic,

manganese, nitrates, radiological chemicals that show various regions or formations in the state with elevated levels. The Vermont Department of Health has aggregated maps for specific chemicals by town based on private well data.

Groundwater in Vermont is divided into four classes.

1. Class I. Suitable for public water system, character uniformly excellent with no exposure to activities which pose a risk to its current or potential use as a public water system.
2. Class II. Suitable for public water system, character uniformly excellent but exposed to activities which may pose a risk to its current or potential use as a public water system.
3. Class III. Suitable as a source of water for a potable water supply, irrigation, agricultural use, and general industrial and commercial use.
4. Class IV. Not suitable as a source of water for a potable water supply but suitable for some agricultural, industrial, and commercial use, provided the Secretary may authorize, subject to conditions, use as a source of potable water supply or other use under a reclassification order issued for the aquifer.

All groundwater in the state is considered Class III and is acceptable for most uses. There are areas of the state that may be set aside for protection due to its "uniformly excellent" character, mainly where the risk of contamination is very low. Isolated or remote areas such as undeveloped mountain tops, confined aquifers, areas with restricted land use or existing or proposed public water sources. These areas may be reclassified to Class II using a petition and public notice process specified in the Groundwater Protection Rule and Strategy to identify them as protected areas and limit development that might degrade the water quality. The Brandon water system source protection area has also been reclassified to Class II for additional protection.

Similar to "impaired waters" for surface water bodies, areas of groundwater are often contaminated by man-made chemicals from historic usage or spills or releases of hazardous material or landfills. When contamination is identified, such as fuel oil spills or release from fuel storage tanks, the Waste Management and Protection Program work with the property owner to clean up the site and sites are tracked from discovery to closure (remediated). The Groundwater Enforcement Standards in the Groundwater Protection Rule and Strategy are used to evaluate contaminated sites and determine necessary actions to be taken. These standards are derived from either EPA or Vermont Department of Health and set levels based on health affects for several chemicals.

In some cases, based on the chemical(s) involved, remediation may not be feasible or may take five or more years. One option for difficult or long-lasting chemicals is to petition to reclassify an area as Class IV. Once an area has been reclassified due to contamination, this restricts or prohibits use of that area for other purposes that might impact public health – using or installing public or potable water supplies (wells or springs). There are currently 14 of these areas in Vermont and they can be found on the public facing online ANR Atlas[27]. For example,

[27] ANR Atlas can be accessed here: http://anrmaps.vermont.gov/websites/anra5/

the Pine Street Barge Canal site in Burlington was reclassified and the PFAS contaminated area in Bennington is nearing the end of the reclassification process with connection of many contaminated homes wells to be disconnected and a new connection made to the municipal water system.

## B. Surface Water Assessment

The primary vehicle by which the overall surface water quality assessment in Vermont is developed and delivered is through the Water Quality Assessment Integrated Report, also known as the 305(b) Report. Section 305(b) of the federal Clean Water Act requires each state to submit a report on the quality of the state's surface and ground waters to the Environmental Protection Agency (EPA) on a biennial basis. As of this writing, the most recent update of Vermont's 305(b) Report[28] is from 2018.

The 305(b) Report is a required report for communicating to EPA and Congress about the progress being made in maintaining and restoring the State's water quality and describing the extent of remaining problems. The extent of remaining water quality problems in the State of Vermont is accounted for in the following lists: impaired, impaired with TMDL, impaired with TMDL alternative, altered by flow regulation, and altered by aquatic invasive species.

The methods used to assess the condition of surface waters in Vermont are detailed in the Vermont Surface Water Assessment and Listing Methodology[29]. The 2018 305(b) Water Quality Integrated Assessment Report delineates the use support status of waters in Vermont. The three use support categories used by the Vermont DEC are full support, altered, or impaired.

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

**Altered** - These are surface waters where a lack of flow, water level or flow fluctuations, modified hydrology, physical channel alterations, documented channel degradation or stream type change is occurring and arises from some human activity, OR where the occurrence of exotic species has had negative impacts on designated uses.

**Impaired** - These are surface waters where there are chemical, physical and/or biological data collected from quality assured and reliable monitoring efforts that reveal 1) an ongoing violation of one or more of the criteria in the Water Quality Standards and 2) a pollutant of human or human-induced origin is the most probable cause of the violation.

[28] Vermont 2018 305(b) report can be accessed here: https://dec.vermont.gov/sites/dec/files/documents/WaterQualityAssessmentReport_305b_2018.pdf
[29] Vermont Surface Water Assessment and Listing Methodology can be accessed here: https://dec.vermont.gov/sites/dec/files/wsm/mapp/docs/WSMD_AssessmentAndListingMethodology.pdf

### i. Causes and Sources of Impacts to Rivers and Streams

A cause, or cause parameter, is a pollutant or condition that results in a water quality or aquatic habitat impairment or alteration. A source is the origin of the cause and can be a facility, a land use, or an activity. Tables 4 and 5below, taken from Vermont's 2018 305(b) Report, summarize miles of rivers and streams affected by various causes and sources, respectively.

The top five causes of impairment or alteration in Vermont, as measured in stream miles, are **flow modification, E. coli, sediment, mercury in fish tissue and nutrients**.

Table 4. Summary of cause parameters for Vermont rivers and streams (miles).

| Cause Parameter | Length impaired or altered by cause | Cause Parameter | Length impaired or altered by cause |
|---|---|---|---|
| Arsenic | 0.4 | Nutrients | 54.8 |
| Asbestos | 2.3 | Organic enrichment | 1.2 |
| Cause unknown | 2 | PCBs in fish tissue | 7 |
| Chloride | 2.1 | pH, Low | 31.6 |
| Dissolved oxygen | 6 | Stormwater | 33.0 |
| E. coli | 165.6 | Sedimentation/Siltation | 63.1 |
| Eurasian Water Milfoil | 22.5 | Temperature | 13.1 |
| Flow regime modification | 255.4 | Toxicity | 1.9 |
| Iron | 6.2 | Water Chestnut | 10.6 |
| Manganese | 0.4 | Zinc | 0.2 |
| Mercury in fish tissue | 58.2 | | |
| Metals | 9.1 | | |

The top five sources of impacts to water quality as measured in miles are **agricultural runoff, streambank modification, acid deposition, removal of riparian vegetation and runoff from developed lands**.

Table 5. Summary of sources for Vermont rivers and streams (miles).

| Source | Miles impaired or altered by source |
|---|---|
| Agriculture | 139.3 |
| Atmospheric deposition - acidity | 81.0 |
| Channel instability | 18.0 |
| Channelization | 20.3 |
| Developed land runoff (urban/suburban) | 61.9 |
| Floods (and infrastructure failures etc) | 21.0 |
| Hazardous waste site | 8.0 |
| Impoundment | 41.7 |
| Land development | 33.0 |
| Municipal point sources | 26.8 |
| Recreational activities | 5.3 |
| Removal of riparian vegetation | 72.5 |
| Resource extraction | 15 |
| Streambank modification/destabilization | 97.6 |

### ii. Causes and Sources of Impacts to Lakes and Ponds

Taken from Vermont's 2018 305b Report, causes of impact Vermont's inland lakes are shown in Table 6, and the related sources of impact to these waters are provided in Table 7. With regards to pollutants, **mercury contamination of fish** and **phosphorus impact** the greatest acreage of inland lakes. For all nutrient-impaired lakes, the sources of phosphorus are largely of NPS origin, including **agriculture, road maintenance, and sediment losses related to development**. Flow modification and Eurasian watermilfoil also impact large amount of lake acreage but are not driven by NPS pollution.

Table 6. Summary of cause parameters for impaired and altered lakes and ponds (# of Lakes, including Lake Champlain Units with identified cause parameters) (Acreage, not including Lake Champlain (LC) Acreage).

| Cause Parameter | # of Lakes | Acreage |
|---|---|---|
| Brittle naiad, *Najas minor* | 3 | 681 |
| Curly-leaf pondweed, *Potamogeton crispus* | 16 | 3,456 |
| Eurasian water milfoil, *Myriophyllum spicatum* | 47 | 4,922 |
| Flow regime modification | 23 | 13,535 |
| Mercury in fish tissue | 22 | 8,115 |
| Other non-native aquatic plants | 4 | 1,094 |
| PCBS in fish tissue | 10 | LC only |
| PH | 37 | 2,360 |
| Phosphorus | 16 | 7,874 |
| Sedimentation/siltation | 1 | 100 |
| Turbidity | 1 | 100 |
| Variable-leaved watermilfoil, *Myriophyllum heterophyllum* | 1 | LC only |
| Water chestnut *Trapa natans* | 10 | 1,001 |
| Organic compounds | 1 | LC only |
| Zebra mussel, *Dreissena polymorph* | 12 | 472 |

Table 7. Summary of sources of pollution for lakes and ponds (number of Lakes, including Lake Champlain with identified sources of pollution. Acreage, not including Lake Champlain (LC))

| Source | Number of Lakes | Acreage |
|---|---|---|
| Agriculture | 12 | 1,520 |
| Animal feeding operations (nps) | 1 | 140 |
| Atmospheric deposition - acidity | 13 | 1,825 |
| Atmospheric deposition - toxics | 19 | 4,613 |
| Contaminated sediments | 1 | LC only |
| Crop production (non-irrigated) | 2 | 1,024 |
| Highway/road/bridge runoff (non-construction related) | 2 | LC only |
| Illegal dumps or other inappropriate waste disposal | 10 | LC only |
| Industrial point source discharge | 1 | LC only |
| Internal nutrient recycling | 1 | 54 |
| Managed pasture grazing | 2 | 1,844 |
| Natural sources | 27 | 535 |
| Nonpoint source | 12 | 6,030 |
| AIS Spread | 43 | 3,018 |
| Post-development erosion and sedimentation | 3 | 452 |
| Streambank modifications/destabilization | 1 | 100 |

### iii. Causes and Sources of Impacts to Lake Champlain

For Lake Champlain, the three most widespread causes of impairment are mercury and PCB contamination in fish tissue, with atmospheric deposition of toxics and improper waste disposal being the respective sources. The third most widespread cause of impairment for Lake Champlain is phosphorus pollution. The sources of phosphorus vary by lake segment but predominantly arise from various categories of NPS pollution (along with some contribution from treated effluent associated with municipal wastewater treatment plants). Eurasian watermilfoil, water chestnut and zebra mussel infestations are the causes of alterations to Lake Champlain which result from transport of plant fragments and larval zebra mussels (veligers) through, in part, recreational boating and fishing activities.

Table 8. Summary of cause parameters (acreage of Lake Champlain with identified sources of pollution)

| Cause Parameter | Altered or Impaired Acres |
|---|---|
| Eurasian water milfoil, *Myriophyllum spicatum* | 17,019 |
| **Mercury in fish tissue** | **174,175** |
| PCBS in fish tissue | 165,715 |
| **Phosphorus** | **174,175** |
| Variable-leaved watermilfoil, *Myriophyllum heterophyllum* | 1,600 |
| Water chestnut *Trapa natans* | 2,525 |
| Organic compounds | 6 |
| Zebra mussel, *Dreissena polymorph* | 16,746 |

Table 9. Summary of sources (acreage of Lake Champlain with identified sources of pollution)

| Source | Acres Impaired or Altered Acres |
|---|---|
| Agriculture | 31,859 |
| **Atmospheric deposition - toxics** | **174,175** |
| Contaminated sediments | 6 |
| Highway/road/bridge runoff (non-construction related) | 13,725 |
| Illegal dumps or other inappropriate waste disposal | 165,715 |
| Industrial point source discharge | 4,423 |
| Natural sources | 63,572 |
| Nonpoint source | 132,053 |
| AIS Spread | 16.736 |
| Post-development erosion and sedimentation | 13,725 |

## C. Protecting and Improving Surface Waters by Managing Stressors

### i. Overview of Surface Water Management Strategy

The Watershed Management Division developed the Vermont Surface Water Management Strategy (SWMS)[30] (revised 2017) to describe the management of pollutants and stressors that affect the uses and values of Vermont's surface waters. The strategy presents DEC's goals, objectives and approaches for the protection and management of Vermont's surface waters and

[30] The Statewide Surface Water Management Strategy can be accessed here: https://dec.vermont.gov/watershed/map/strategy

will help to guide the DEC's future decision-making to ensure efficient, predictable, consistent and coordinated management actions. Surface waters are defined as all rivers and streams, lakes, ponds and reservoirs, and wetlands. This SWMS fulfills provisions of 10 V.S.A. §1253d regarding preparation of a comprehensive statewide surface water management strategy, and effectively updates the "Continuous Planning Process" document of 2001, and the Clean Water Act §208 Areawide Plan of 1981, both required by the Environmental Protection Agency (EPA).


Specifically, the SWMS:

***1.*** Sets forth goals and objectives for managing Vermont's surface waters in light of the goals of the federal Clean Water Act, and Vermont's Clean Water Act and state surface water quality policy;

***2.*** Describes pollutants and stressors that affect the uses and values of Vermont's surface waters, approaches to address stressors, and appendices describing regulations, funding and technical assistance programs;

***3.*** Describes the DEC's approach to protecting and improving surface waters by managing stressors rather than individual pollutants;

***4.*** Presents the DEC's Business Plan for implementing this strategy.

***5.*** Describes the DEC's updated Ambient Surface Water Monitoring and Assessment Strategy that will work hand in hand with watershed management planning at the statewide and basin-specific level to identify and prioritize waters in need of protection, restoration and management; and

**6.** Implements a focused approach to tactical basin-level watershed management planning that provides the geographic specificity necessary to effectively implement this strategy.

### ii. Ensuring Stressors Relate Back to our Objectives

In developing the 2017 SWMS, DEC undertook an intensive evaluation process aimed at identifying areas of program duplication and program "gaps," to ensure program efficiency in meeting SWMS goals and objectives. A key element of this approach is the recognition that individual pollutants (often more than one) can be simultaneously mitigated by managing surface water stressors. These stressors are of critical interest to DEC and many other state, federal and local agencies and organizations in Vermont having an interest in surface water quality management.

DEC has identified **ten major stressors** with unique causes and sources, and sometimes overlapping effects, which result in documented surface water impacts. By identifying stressors and approaches to their management, the SWMS sets the stage for DEC's approach to multi- agency planning and implementation affecting Vermont's surface water resources.

The ten major stressors affecting Vermont's surface waters are introduced below according to stressor ranking: high, moderate, or low. The importance of each stressor has been previously evaluated by DEC in light of its extensiveness, intensity, duration and urgency and also in regard to programs available to address the stressor.[31] There are NPS management and control implications for each stressor described below. Refer to Table 10 below to gain a better understanding of how management of each stressor meets one or more objectives of the SWMS.

### iii. Stressors with High Ranking

**Channel erosion** – The effects of channel erosion are pervasive and consequential throughout the state making this a highly ranked stressor. Excessive channel erosion occurs on rivers and streams throughout Vermont, brought about by human activities that alter runoff patterns and channel morphology and that lead to stream disequilibrium. Channels and floodplains that once had the capacity to accommodate stream flows and store sediment and associated nutrients are now scouring and or transporting these materials. Excessive channel erosion adversely affects stream habitat and higher loads of nutrients and sediments have become pollutants in downstream receiving waters such as inland lakes, wetlands and Lake Champlain. Successful management of channel erosion achieves Objectives A, B, and C of the SWMS.

**Encroachment** – A highly ranked stressor, the placement of public or private infrastructure upon lakeshores, wetlands and river corridors results in the loss of riparian zone buffers, increasing sunlight penetration of shallows and reducing aquatic habitat quantity and quality. Encroachments along river corridors can also create or perpetuate stream disequilibrium, both immediately adjacent to the structure, and in areas far upstream or downstream. Encroachments are pervasive along Vermont lakes and streams. In wetlands, fill, alteration of vegetation, and changes to hydrology result in a loss of the functions and values. Lakes with poor lakeshore habitat from overdevelopment can be three times more likely to have poor ecological integrity. Management of encroachments meets Objectives A, B, and C of the SWMS.

**Invasive species** – A highly ranked stressor, invasive aquatic species such as Eurasian watermilfoil, purple loosestrife, and water chestnut cause severe impacts to aquatic habitat. Japanese knotweed, an invasive terrestrial plant species is also of concern. Collectively, these invasive species readily out-compete native plants, algae and animals, ruin or seriously degrade recreational opportunities, and alter entire ecosystem functions. Invasive species are spreading rapidly throughout Vermont surface waters, especially lakes, and are transported from one waterbody to the next by natural spread (avian transfer), human dispersion (such as aquaria or ballast release, boat/trailer transfer, fish tournaments) or by following drainage or road ditches. Successful control of invasive species meets Objective B of the SWMS.

[31] Extensiveness concerns how widespread and frequent the problem is. Intensity concerns the consequence of the problem related to water resource goals (ranging from: none/positive to substantial and quantifiable). Duration relates to the length of time that the stressor persists, as well as the period of time for the resource to repair itself. Urgency relates to the potential threat of the stressor to persist unchecked without intervention, and if by not addressing would result in the problem becoming significantly worse over time.

**Land erosion** – A highly ranked stressor, erosion of sediments off land surfaces delivers sediment and adsorbed nutrients to surface waters. These sediments can readily alter the dynamic equilibrium of naturally functioning stream channels, resulting in stream instability and delivery of sediments and nutrients to downstream waters, resulting in eutrophication. Land erosion occurs in all landscape types such as urban areas, construction sites, unpaved gravel roads, and improperly managed forests and farms. Successful control of land erosion meets Objectives A, B, and C of the SWMS.

**Nutrient loading** – A highly ranked stressor, direct discharge or runoff of nutrients also occurs independently of channel or land-based erosion. Nonpoint sources such as septic systems, over-fertilizer usage in residential areas and agricultural settings and animal or milkhouse wastes can deliver nutrients directly to surface or ground waters. Nutrients, like phosphorus and nitrogen, are beneficial in naturally occurring low levels. Excessive contributions of nutrients, however, results in eutrophication of lakes and streams and increases the likelihood of toxic algae growth. Elevated levels of nitrogen in groundwater is a public health concern. Successful control of excessive nutrient contributions meets Objectives A, B, and D of the SWMS.

### iv. Stressors with Moderate Ranking

**Acidity** – A moderately ranked stressor, acidification of Vermont's lakes and streams is a major problem caused primarily by the atmospheric deposition of acidic nitrogen and sulfur compounds (aka acid rain). Acidification can also result from runoff of active or abandoned mines. Acidification is widespread in the higher elevations of Vermont, resulting in considerable impacts to lake and stream biology. Acidification from abandoned mines in Vermont is limited to a handful of sites. Successful management of acidity meets Objectives A, B, and D of the SWMS.

**Flow alteration** – A moderately ranked stressor, altering the natural flow regime of rivers and streams through impoundment or dewatering or the fluctuation of lake levels affects the extent and quality of aquatic, riparian and wetland habitats, water temperature, dissolved oxygen and other aspects of water chemistry, including concentrations of toxins in aquatic organisms. Since flow alteration is a consequence of water withdrawals and hydroelectric power generation, these NPS activities must be properly managed to avoid impacting aquatic biota and recreational uses. Successful management of flows and water levels meets Objectives A, B, C, and D of the SWMS.

**Toxic substances** – A moderately ranked stressor, several categories of toxic contaminants may be present in Vermont's surface waters. Mercury contamination of lake fishes is widespread, reflecting that mercury is an atmospheric contaminant. Hazardous waste sites can result in localized contamination of PCB's, heavy metals and other toxic compounds. Toxic cyanobacteria (linked to excessive nutrient levels) are becoming more frequently observed in certain lakes and ponds. Pesticide application and storage can contribute toxic substances to ground and surface waters. Of particular concern are "new generation" compounds such as endocrine-mimicking compounds, pharmaceutical degradants and personal care products.

These compounds come from an array of products society uses as part of daily living. They occur at very low concentrations, have poorly understood but consequential impacts to aquatic life, and are a direct manifestation of people living, working and moving about as an integral part in each of Vermont's many watersheds. Successful management of toxic substances meets Objectives A, B, and D of the SWMS.

**Thermal stress** – A moderately ranked stressor, excess warming of surface waters occurs as a result of riparian buffer removal, the impoundment of water or cooling water discharge. It is anticipated that climate change will also contribute to this stressor. Excessive warming of surface waters impacts aquatic species that are intolerant of warm temperature. Further, excess warming can turn an otherwise cool babbling brook into bathwater; an undesirable effect for humans and certain aquatic biota on a hot day. Successful management of thermal stress meets Objectives A, B, and C of the SWMS.

### v. Stressor with Low Ranking

**Pathogens –** A lower ranked stressor, pathogenic organisms of human and non-human origin can be present in Vermont's surface waters. When swimmers are exposed to certain pathogens in excessive levels, they may become ill, typically with gastrointestinal distress. Pathogenic organisms are the result of fecal contamination from several sources: poorly functioning septic systems, episodic events at wastewater treatment facilities, unmanaged agricultural runoff, pet waste, and natural sources such as wildlife. Vermont employs a readily measured indicator organism called *E. coli* to assess the potential presence of pathogens from warm-blooded animals Monitoring and controlling pathogens meets Objective A of the SWMS.

The manner in which each of the ten stressors described above relates to the SWMS **goals** and **objectives** is shown in Table 10. Each stressor is linked to one or more sources of NPS pollution and therefore to Vermont's ongoing and adaptive approach for NPS management.

Table 10. Vermont Surface Water Management Strategy Stressors, Goals & Objectives

| *Strategy Goals* | Biological, Chemical, Physical Integrity Public Use & Enjoyment Public Health & Safety | Biological, Chemical, Physical Integrity Public Use & Enjoyment | Public Use & Enjoyment Public Health & Safety | Biological, Chemical, Physical Integrity Public Use & Enjoyment Public Health & Safety |
|---|---|---|---|---|
| *Objectives→* *Stressors* ↓ | A. Minimize anthropogenic nutrient & organic pollution | B. Protect & restore aquatic & riparian habitat | C. Minimize flood & alluvial erosion hazards | D. Minimize toxic, pathogenic pollution & chemicals of emerging concern |
| Acidity | X | X | | X |
| Channel erosion | X | X | X | |
| Flow alteration | X | X | X | X |

| | | | | |
|---|---|---|---|---|
| Encroachment | X | X | X | X |
| Invasive species | X | X | | |
| Land erosion | X | X | | X |
| Nutrient loading | X | X | | X |
| Pathogens | | | | X |
| Thermal stress | X | X | X | |
| Toxic substances | X | X | X | |

## D. Special Areas of NPS Concern

DEC's Surface Water Management Strategy, highlights ten major stressors and ongoing statewide assessment of water quality conditions, there are eight areas of NPS concern that deserve recognition. These eight areas of NPS concern will be further expanded upon in Chapter 7 and Chapter 9 of this Plan.

### i. Agricultural NPS Runoff

Controlling agricultural NPS pollution is a key element in reducing sediment and nutrient loading and pathogenic contributions to Vermont's surface waters and meeting water quality standards. Controlling agricultural nutrients and pathogens is also an important consideration for Vermont's groundwater, drinking water, and related water resources. The control of agricultural NPS pollution presents a major challenge due to the diffuse nature of pollutant contributions which can originate from production areas, farm fields, pasture lands and field drainage networks. Some of these sources, especially from field or cropping activities, are difficult to identify, quantify and control from season to season and from year to year. In recent years, there has been confusion about whether tile drainage is contributing to NPS pollution or whether it is reducing NPS pollution by allowing additional conservation measures to be implemented. Continued research on tile drainage is ongoing and is currently in the second year of sample monitoring.

In working to control the variety of agricultural NPS runoff, Vermont has invested heavily in programs to **provide technical and financial assistance to farmers** to help reduce and improve farmstead runoff and provide incentives for soil-based conservation practices such as cover cropping, reduced tillage and improved nutrient and manure management. While there is a regulatory component to managing agricultural NPS runoff, a strong agricultural conservation partnership exists between state and federal agencies, as well as with non-profit and academic sectors, that provides non-regulatory outreach and education about these programs and practices.

While there are still concerns about agricultural contributions to NPS pollution, the agricultural community has embraced education and outreach at an accelerated pace and the inspection, enforcement and technical assistance data all demonstrate increased compliance and implementation of conservation practices. The Agency of Agriculture, Food & Markets (AAFM)

has seen significant increases in staffing, which has allowed for an expansion of regulatory oversight and expanded capacity to extend resources to partners working with farms in the field to provide further technical assistance.

### ii. Stormwater NPS Runoff from Developed Areas

Controlling stormwater NPS runoff – its volume and its quality - is another key element needed when reducing sediment and nutrient contributions to Vermont's surface waters and to achieve water quality standards. The control of stormwater NPS pollution, even in a largely rural state, presents a major challenge due to the significant extent of impervious surfaces and the diffuse nature of land use activities occurring on or adjacent to those impervious surfaces. Some of these sources, especially from older developments or from more densely developed areas, are challenging and expensive to remedy - or even partially remedy. Despite this, Vermont DEC implements a robust stormwater regulatory program with permits targeting new development, roads, larger towns, and now existing sites with large amount of impervious. For more information on stormwater regulations, refer to Chapter 2 section B.ii or Chapter 7 section C.vii.

### iii. Dams & Dam Removal (Hydrologic Modification)

There are over 1,200 inventoried dams on Vermont's rivers, streams and lakes. Recent stream assessments indicate there are many more structures that are not included in the state dam inventory. While many of the inventoried dams continue to serve one or more useful purposes – such as recreation, flood control, water supply, hydroelectric power generation – many more do not serve any purpose and are considered to be sources of NPS pollution. Most of the dams no longer serving a useful purpose were built many years ago, often to provide power for a mill that has long since ceased to operate and may no longer exist. These old (sometimes historic) dams remain and continue to have significant ecological impacts. Fundamentally, these dams change free-flowing streams to unnatural impoundments, impacting species that depend on riverine habitat for their survival and altering ecosystem processes.

The degree to which dams and associated impoundments disrupt river ecology make them one of the most significant NPS alterations humans have wrought on surface water systems. The recent string of dams that have been removed and dams being considered for removal within Vermont demonstrate the multiple water quality and aquatic habitat benefits that can be captured through restoration of free-flowing conditions. As pressure to dam rivers persists in light of interest for local renewable energy development, it is becoming increasingly important to communicate the benefits of free flowing rivers and streams to the public and to ensure that resources are available to resolve the conflict presented by dams that have outlived their utility but which continue to exert a NPS and ecological impact on riverine systems.

### iv. Invasive Exotic Plants & Animals in Vermont Surface Waters

Invasive exotic aquatic plants and animals are established in Vermont - at least 49 non-native aquatic plant and animal species are known – and many of the state's waters, especially lakes, have a history of impacts related to these invasions. Although the number of new introductions of species already known from Vermont increases annually, many of these

populations are found early in the invasion, when control efforts can be more successful. Invasive exotic species have been a form of NPS pollution since the 1989 NPS Management Program Plan. There are close to 140 lakes (20 acres or larger) deemed as threatened by Eurasian Watermilfoil given their 10-mile distance from lakes with a confirmed infestation.

For more information on the extent and types of aquatic invasive species (AIS) in Vermont including a map of AIS and what is being done to combat their spread can be found on the Aquatic Invasive Species Program website[32].

While not an exotic aquatic plant species, Japanese knotweed (*Fallopia japonica*) tends to invade riparian habitat and overwhelm 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. Recent storm events that modified many riparian areas resulted in significant re-location of the species into what had been previously un-infested riparian areas. Japanese knotweed is found in scattered areas of high abundance in each Vermont's fifteen river basins.

### v. Atmospheric Deposition of Pollutants

The long-distance transport and deposition of air-borne pollutants (mercury, sulfate, and nitrous oxides) to Vermont's landscape has been principally responsible for the impairment of fish consumption uses on 8,165 inland lake acres, all of Lake Champlain's acres, and 56 river and stream miles. Acidity due to atmospheric deposition impairs aquatic life uses on 4,468 inland lake acres and has resulted in 38 lakes listed as impaired because of acidity.

Over the past 32 years, various regional US and Canadian emission control programs have resulted in substantial reductions in the deposition of sulfate, nitrate and acidity as measured in Bennington, Vermont at the National Atmospheric Deposition Program site. Reductions in deposition have translated into significant reductions of in-lake concentrations of acidifying pollutants. Acid lakes in Vermont have responded to these changes in deposition with many waters showing reduced in-lake sulfate concentrations and increasing pH levels. However, in-lake calcium concentrations remain too low to support sensitive aquatic organisms, such as fingernail clams. Future reductions in acid deposition and increases in calcium and other base cation concentrations are necessary for healthy waterbodies. Recent federal regulations such as the 2014 EPA Tier 3 Motor Vehicle Emission and Fuel Standards are expected to further reduce the acidifying pollutants in the atmosphere and in Vermont lakes. It is anticipated that these reductions will improve water quality of Vermont's acid lakes. However, changes in precipitation volume and intensity due to climate change will have unpredictable effects on Vermont's acid sensitive lakes.

### vi. River Corridors & Water Quality

Vermont ANR is pursuing river corridor protection as the primary tool to restore and protect dynamic equilibrium in rivers. River corridors consist of lands adjacent to, and including, the

[32] Aquatic Invasive Species Program website: https://dec.vermont.gov/watershed/lakes-ponds/aquatic-invasives.

present channel of the river. Delineations are based primarily on floodplain function, the lateral extent of stable meanders (i.e., the meander belt width) and a wooded riparian buffer to provide streambank stability. The meander belt width is governed by valley landforms, surficial and bedrock geology, and the length and slope requirements of the river in its most probable stable form.

A River Corridor Easement Program, established in 2007, focuses on conserving river reaches identified as high priority sediment and nutrient storage areas. The opportunity to purchase and sell river corridor easements was created to augment river corridor zoning which, if adopted, avoids future encroachment and flood damage, but does not restrict channelization.

DEC's Rivers Program works closely with state and federal farm service agencies, the Vermont Housing and Conservation Board (VHCB) and land trust organizations to combine corridor easements with other land conservation programs. The easement ensures that watercourses and wetlands are not manipulated to alter natural water level or flow or intervene in the natural physical adjustment of the water bodies. To date, the program and its various partners have completed 97 river corridor easements across Vermont which encompass a total of about 54 river miles and 2,083 acres of adjacent land.

### vii. Lakeshore Development, Alteration of Littoral Habitat & Need for Vegetated Lakeshore Buffers

The National Lakes Assessment found that the most widespread stressor to lakes in Vermont is lakeshore disturbance caused by excessive clearing and impervious areas close to the water's edge. The assessment found that 82% of Vermont's lakes greater than 25 acres in size are in fair or poor condition for lakeshore disturbance, a figure that was greater than both the NAP ecoregion and the nation. These findings were presented in DEC's 2013 Gauging the Health of Vermont Lakes report[33].

Vermont's 2005-2009 Littoral Habitat Assessment study found that the way Vermont was developing its lakeshores was degrading aquatic habitat and biota in conflict with Vermont Water Quality Standards (Merrell, Howe and Warren, 2009) [34]. In 2011, DEC and the Maine Department of Environmental Protection collaborated on a joint study to determine if lakeshore developed in compliance with Maine's mandatory shoreland zoning act standards would protect aquatic habitat and biota in compliance with Vermont's water quality standards. The study found that it is possible to develop a lakeshore and protect aquatic habitat and biota in compliance with Vermont's narrative standards; development that meet Maine's mandatory shoreland zoning act standards protected aquatic habitat. These findings were presented in DEC's 2013 "Determining if Maine's Mandatory Shoreland Zoning Act Standards are Effective at Protecting Aquatic Habitat" report.

[33] Gauging the Health of Vermont Lakes Report (2013) can be accessed here: https://dec.vermont.gov/sites/dec/files/wsm/lakes/docs/lp_GaugingtheHealthofVermontLakes.pdf
[34] Littoral Habitat Assessment Study and other related reports can be accessed here: https://dec.vermont.gov/watershed/lakes-ponds/monitor/assessment#Special Studies

In response to recommendations in a legislatively mandated report on how to better protect Vermont's waters, a shoreland commission, consisting of members from the Vermont House, Vermont Senate and ANR was formed to take public input at a series of public meetings held over the course of a summer. Effective July 1, 2014, the Vermont Legislature passed the Shoreland Protection Act[35] (Chapter 49A of Title 10, §1441 et seq.), which regulates shoreland development within 250 feet of a lake's mean water level for all lakes greater than 10 acres in size.

### viii. Climate Change

Climate trend data for Vermont and the larger Northeast region serve as helpful guides in understanding NPS-related risks associated with climate change impacts being faced today and when structuring and executing actions needed to minimize those risks in the future. Scientists have documented changes in Vermont's climate over the past 50 years and trends indicate warmer surface temperatures are probable to likely. Warmer surface temperatures are, in turn, changing precipitation patterns and snowpack. On an annual basis, more precipitation is falling as rain during the winter months which reduces snowpack.

Trends towards more frequent high intensity precipitation events are of particular concern for Vermont and the northeast region. More frequent high intensity precipitation events are also of concern for the future of NPS management. Studies show precipitation in Vermont has increased by 15 to 20 percent over the past 50 years and increases in more frequent and intensive severe weather are projected to continue[36] (Betts 2011, ). The ANR 2011 report entitled, Resilience: A Report on the Health of Vermont's Environment[37], released in the aftermath of Tropical Storm Irene, reported that storms now "release 67 percent more rain than they did 50 years ago."

The Vermont Climate Assessment Report [38] indicates the state's average temperature has increased by 1.3 degrees (F) since 1960 with about 45% of this increase occurring since 1990. The Report notes that precipitation has increased across Vermont with the largest increases found in the higher elevations and mountainous areas. Average annual precipitation across Vermont has increased by 5.9 inches since 1960 where 48% of this increase has occurred since 1990. Annual average stream flows are increasing as precipitation increases. Records show that heavy rainfall events are becoming more common in Vermont which poses growing threats to more runoff, more erosion and further flooding, whether localized or more widespread.

Climate change impacts on precipitation appear to magnify the effects of land use on water quality, placing a greater burden on already stressed ecological systems. The greater frequency

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[35] Vermont's Shoreland Protection Act can be accessed here: https://dec.vermont.gov/sites/dec/files/wsm/lakes/docs/Shoreland/lp_ACT172_Shoreland%20Protection%20Law.pdf

[36] Betts, A.K. (2011): Vermont Climate Change Indicators. Weather, Climate and Society, 3, 106-115, doi: 10.1175/2011WCAS1096.1

[37] Resilience : A Report on the Health of Vermont 's Environment can be accessed here: https://anr.vermont.gov/sites/anr/files/aboutus/documents/Resilience%202011.pdf

[38] The Vermont Climate Assessment Report can be accessed here: http://dev.vtclimate.org/wp-content/uploads/2014/04/VCA2014_FullReport.pdf

of climate change induced severe precipitation events, coupled with increases in impervious surfaces from existing and new development are likely to generate additional runoff and erosion and further water quality degradation. The degree and extent of impact associated with climate change is believed to be a function of localized factors – the current condition of Vermont's landscape that either heightens or minimizes its vulnerability to storm runoff and erosion.

Climate change is projected to increase the intensity as well as the frequency of so called 'extreme precipitation events,' thereby exacerbating delivery of nutrients, sediment, bacteria and other pollutants to receiving waters from existing sources or stressors. The three major NPS stressors that comprise most of the sediment and nutrient loading to Vermont's surface waters include (a) runoff and erosion from developed lands, agricultural lands, construction, and logging operations; (b) non-erosion-related nutrient loading from sources such as over-fertilization of cropland or poor manure management practices; and (c) stream channel erosion. The magnitude and extent of each of these stressors are closely linked to present and future climate conditions.

While considerable uncertainty remains about the magnitude and extent of climate change impacts on temperature, precipitation, soil moisture (especially important for vegetation in general as well as for agricultural production and forest management) as well as other factors, uncertainty is not an excuse for inaction. Uncertainty requires commitment to a process of re-evaluation of progress, applying lessons learned, incorporation of weather and water quality-based monitoring and assessment data, and adjustment of NPS and land management actions. This process is otherwise collectively known as an adaptive management approach.
This approach, which accommodates new information as a result of research and implementation progress, provides a means to identify and carry out necessary adaptations whereby the negative consequences of climate change are avoided or minimized.

## E. Lake Champlain, Lake Memphremagog, and Long Island Sound TMDLs

There are three significant TMDLs that apply to approximately 94% of Vermont's landmass—Lake Champlain Phosphorus TMDL, Long Island Sound Nitrogen TMDL, and Lake Memphremagog Phosphorus TMDL as shown in the figure below. Implementation of these TMDLs is a critical part of DEC's work and implicates numerous sectors, including urban and road runoff, agriculture, forestry, and wastewater treatment facilities. Additional TMDLs implemented by the Department include, among others, Lake Carmi Phosphorus TMDL, statewide bacteria TMDL, stormwater-impaired water TMDLs, and acid rain TMDLs. The DEC works with federal, state, and local partners to ensure implementation of TMDLs, as well as with Quebec, New York, and other jurisdictions as needed.

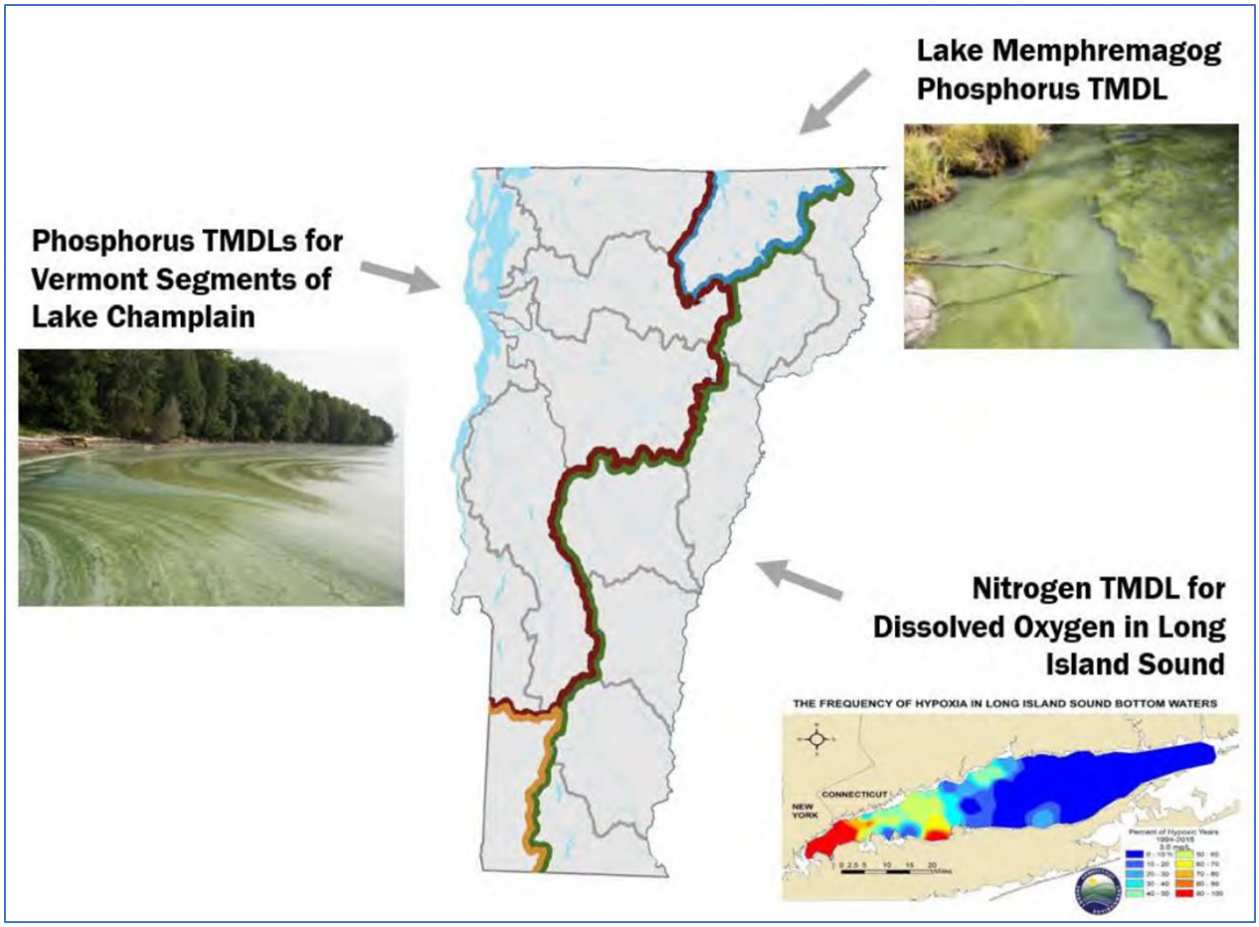

Figure 3. Vermont's large TMDL's that require nutrient pollutant reductions.

### i. Lake Champlain TMDL and Implementation Planning

The Lake Champlain TMDL will be foundational to DEC's management of surface waters over the next two decades. The Lake Champlain Phase 1 Implementation Plan[39] outlines the policy commitments requested by EPA to ensure success. These policy commitments address all major sources of phosphorus to the lake, and include:

- Wastewater treatment facility discharges
- Untreated/unmanaged runoff from existing developed lands
- Discharges from farmsteads and agricultural production areas, poorly managed cropland, and unmanaged or poorly managed pastures
- River and stream channel modifications
- Floodplain, river corridor, and lakeshore encroachments
- Stormwater runoff from developed lands and construction sites
- Road construction and maintenance
- Forests and forestry management practices
- Wetland alteration and loss

[39] Lake Champlain Phase 1 Implementation Plan can be accessed here: https://dec.vermont.gov/sites/dec/files/wsm/erp/docs/160915_Phase_1_Implementation_Plan_Final.pdf

- Legacy effects of historic phosphorus loading
- Additional phosphorus contributions anticipated due to climate change

The commitments presented in the Phase 1 Plan include new and enhanced regulation, funding and financial incentives, and technical assistance. It builds on work already done by the State over the past 10 years to reduce phosphorus contributions to the lake. They will require new and increased efforts from nearly every sector of society, including state government, municipalities, farmers, developers, businesses, and homeowners. The Department is employing a twenty-year implementation schedule to allow for communities to plan and stage necessary improvements to roads, stormwater, and wastewater infrastructure into long-term capital funding plans as a means of keeping costs and funding burdens down.

### ii. Long Island Sound TMDL

The Long Island Sound Nitrogen TMDL was completed by the Connecticut Department of Energy and Environmental Protection and New York State Department of Environmental Conservation and approved by EPA in 2001 to address oxygen deficiency in the western regions of the Sound. Since that time, Connecticut and New York have made significant reductions in point source nitrogen loading—enough to detect improvements in the oxygen concentration over the long-term. Vermont, along with other 'upper basin' states, including New Hampshire and Massachusetts, have also been working toward nitrogen reductions from point sources. For example, wastewater treatment facilities in Vermont capped their current nitrogen loading to the Connecticut River and continue to work toward optimizing their facility processes to better remove nitrogen. Through Tactical Basin Planning, the Department targets and funds nitrogen reduction projects to improve both local water quality and water quality in the Sound. The Department continues to work with the other states and EPA to further refine the TMDL and to look for ways to efficiently reduce nitrogen flowing to Long Island Sound.

### iii. Lake Memphremagog TMDL

Phosphorus levels in the Vermont portion of Lake Memphremagog are over 20% higher than that lake's Water Quality Standard. The 2017 phosphorus TMDL for Lake Memphremagog includes a 29% reduction in phosphorus loading across agricultural, developed, and forested lands along with reductions in stream channel erosion to meet water quality standards for the lake[40]. A Tactical Basin Plan for the Lake Memphremagog, Tomifobia, and Coaticook watersheds was developed with strategies to provide technical and financial resources for this effort as well as a list of specific projects for meeting phosphorus reduction targets and will be updated in 2022.

[40] The 2017 Lake Memphremagog Phosphorus TMDL can be accessed here: https://dec.vermont.gov/sites/dec/files/wsm/mapp/docs/Memph%20TMDL%20Final%20EPA%20approved.pdf

## F. Overview of NPS Impacts on Groundwater

In 2008, the legislature revised 10 V.S.A Chapter 48 to make groundwater a public trust resource. The Groundwater Withdrawal Reporting and Reporting Rules was created and adopted in 2009 based on this change. The DEC Groundwater Coordinating Committee developed a VT Groundwater Management Plan approved in 2018 to incorporate various strategies for groundwater evaluation and protection and an implementation plan. The primary goal of the plan is to make actionable suggestions that work toward ensuring groundwater resources are sustainable in both quantity and quality and that groundwater use does not harm water quality or the ability of future Vermonters to have access to groundwater resources. The three primary objectives of the Drinking Water and Groundwater Protection Department for managing the State's Groundwaters are to:

1. Improve information available for groundwater management decisions,
2. Protect public health and the environment and,
3. Expand communication.

These objectives are supported by 7 tasks:

1. Continue studies of groundwater resources
2. Interagency collection and compilation of data
3. Identification and mapping of groundwater resources
4. Adoption of technical criteria and standards
5. Integration of groundwater protection considerations into regulatory programs
6. Technical assistance and planning for municipalities
7. Compilation of information and educational materials for the public and cooperate with federal agencies

The Groundwater Protection Rule and Strategy was revised (and adopted) in 2019 to incorporate public trust doctrine into 11 DEC regulatory programs. This rule incorporates a comprehensive update to groundwater remediation standards, including the codification of standards for polyufluorinated alkyl substances (PFAS). PFAS are a class of "forever" chemicals that have emerged in Vermont and regionwide as a leading environmental contamination issue in the past five years.

**Contaminants of Emerging Concern**

In Hoosic Falls, NY and Bennington, VT, PFAS compounds have been found in groundwater and surface waters, originating from a manufacturing facility where discharges and aerial release and deposition has occurred across a large area of the region. PFAS compounds have been identified in other areas of the state as well and are of similar or other forms (fire-fighting foam) of the chemical compound. These chemicals are long-lasting and have been found in a number of public water systems, the extent of which is still in progress.

PFAS compounds are a prime example of a new category "Chemicals of Emerging Concern". Several workgroups and Task Forces have been formed to evaluate a host of chemicals that do not currently have health effects or standards (Maximum Contaminant Levels or Health Advisory Levels) established by EPA or Vermont Department of Health. This list also includes personal care products, pharmaceutical products and degradants, some of which have been shown to be endocrine disruptors or have developmental toxicity. As new chemicals are developed or existing ones are evaluated, concern arises regarding potential short and long term impacts as these chemicals are used, applied, ingested and then passed into waste disposal systems, groundwater and surface water sources. The legislature along with DEC and Department of Health among others are evaluating how best to address the millions of chemicals created and used in this country.

### i. Potable Water Supply Systems

During the permitting process, VT DEC requires testing for water quality parameters of Primary and Secondary Groundwater Protection Standards. These same standards are required during the permitting of Transient Non-Community water sources. Public Community and Non-Transient Non-Community water sources have a more comprehensive list of volatile organic, synthetic organic, inorganic and radiological chemicals. Upon connection of a new water source to a public system, frequent, routine monitoring of these various chemicals is required for each system as part of a compliance schedule. These results are managed and tracked in the divisions SDWIS database and provided to EPA, the VT Department of Health and other agencies upon request.

### ii. Underground Injection Control (UIC) Rule

In 2014, DEC completed the rulemaking process for amending the UIC Rules which are rules regulating the discharge of wastes into any subsurface disposal system. Vermont administers the UIC Program by authorization from the federal government which created the program nationally under the Safe Drinking Water Act.

The amended rules replace the original UIC Rules which were adopted more than 30 years ago. Historically, the definition for a "injection well" and "wastes" (including stormwater) were very vague and the earlier version of Vermont's UIC Rule attempted to be inclusive of any activity that fell under these broad definitions. The result was a program which was inundated by low risk discharges to groundwater which bottle-necked the permitting process and resulted in a serious permitting backlog with no clear operational focus. The amended rules provide a much narrower definition of what constitutes an injection well and more clearly define UIC jurisdiction.

According to EPA's definition, there are six classes of injection wells. Classes I, II, III are generally very deep, high-technology type wells used for the disposal of hazardous and radioactive wastes or enhancement of oil and gas and mineral recovery through a process known as 'hydrofracking.' These types of wells do not exist in Vermont and are banned under

the 2014 Vermont amended UIC Rule. Class IV injection wells, which involve the shallow injection of hazardous wastes, are only allowed in Vermont in conjunction with a groundwater remediation effort under State supervision. Class VI wells involve the injection of carbon dioxide into deep geologic formations for the purpose of carbon sequestration. Class VI injection wells do not currently exist in Vermont and are not expected to be proposed for the foreseeable future.

Class V injection wells are defined by EPA as any well which does not fall into the category of Class I, II, III, IV, or VI. These are typically shallow disposal systems which may pose a risk of groundwater contamination. Class V injection wells which pose a high risk to the quality of groundwater are now banned in Vermont under the 2014 Vermont amended UIC Rule. Examples include, but are not limited to, discharges to groundwater from vehicle maintenance activities, from gas stations and other fuel distribution locations, from locations where hazardous materials are stored, from salt storage locations, and from photo finishing operations. The UIC Program will be collaborating with other State programs and property owners to ensure proper closure of each prohibited injection well and eliminate ongoing potential sources of groundwater contamination.

The 2014 Vermont UIC Rule clearly identifies those Class V underground injection activities that pose a moderate risk to groundwater quality and that require a UIC permit. Examples include, but are not limited to, specific listed industrial processes, boiler blowdown waste and mineral processing wastes. Some activities may be conditionally exempt from permitting (e.g. certain water treatment system backwash systems, geothermal extraction wells, and some mining wastes). In addition to clarifying permitting requirements, the new UIC Rule provides technical standards that are applied to permitted activities. A better understanding of risks and requirements will improve management of the State's groundwater resource.

Finally, the new 2014 Vermont UIC Rule eliminates permit redundancy by not requiring UIC Permits for injection wells or injection-type activities that are subject to management and regulation under other ANR or DEC permitting programs. This includes, but is not limited to solid waste facilities, indirect discharge systems, stormwater systems and wastewater systems."

### iii. Other Monitored NPS Impacts to Groundwater

Runoff and infiltration from road salt application on Vermont roads contaminate wells and springs and other groundwater uses before impacting surface water. Many communities implement road salt reduction or no salt use policies on certain roadways, particularly in the areas where the roadway(s) intercepts a source protection area.

Reduced snowpack coupled with fluctuations in precipitation levels as a result of climate change has resulted in more frequent and intense drought situations which lead to more drinking water systems sources (wells and springs) having water shortages or outages. There has been a rise in well deepening, hydrofracturing or well replacement over the past decades.

Geologic influence and occurrence from natural contaminants such as: arsenic (south west), manganese (statewide), radiological (plutons, Mount Holly, Clarendon Springs formations) are monitored by the Drinking Water and Groundwater Division. Microscopic Particulate Analysis is used to identify surface water intrusion from overland flow into drinking water supplies, usually with poor construction or lack of sealed or grouted casing. Giardia and Cryptosporidium are two of the many indicators used in the analysis.

# Chapter 5. Protection and Restoration of Priority Waters

Identification and prioritization of surface and ground waters and watersheds on a statewide basis is a basic element of Vermont's NPS Management Program. Vermont's original listings of NPS priority waters (targeted-impaired and targeted-threatened) were first developed back in 1988 as part of Vermont's initial NPS Management Program plan document that received EPA approval. Vermont's NPS impaired waters listings have been substantially revised on an on-going and biennial basis since 1992. Vermont NPS impaired waters listings are done in conjunction with reporting requirements under Clean Water Act Section 303d.

The listings that have been prepared for this document were developed to help DEC define and prioritize surface water quality management and water pollution control efforts as well as to guide program partners when undertaking activities to reduce or avoid NPS pollution whether to restore impaired waters or protect threatened waters; with the added benefit to groundwater. DEC has prepared a statewide listing of NPS impaired waters and a statewide listing of NPS threatened waters. DEC reviews and updates the overall and priority NPS listings on a regular basis as monitoring, assessment and implementation findings dictate.

To complement its listing of waters process, DEC also conducts regular reviews of NPS priority watersheds though its Tactical Basin Planning process with an eye towards identifying a smaller subset of highest priority waters to receive focused water quality monitoring, TMDL development or grant funding to carry out discrete NPS projects. These reviews help DEC direct its limited NPS program resources towards critical needs and opportunities when restoring or protecting waters.

Whether expressed by the Surface Water Management Strategy as described in Chapter 4, the delivery of various NPS control efforts or EPA's Section 319 program guidelines, Vermont applies a balanced approach when restoring impaired waters and protecting unimpaired yet threatened waters. Tactical Basin Plans and other surface water quality management plans define waters and approaches for restoration and protection. Restoring waters impaired by NPS to meet water quality standards (WQS) has been and remains a high priority focus of Vermont's surface water quality management efforts.

Protecting waters that currently meet Vermont WQS but are threatened by NPS pollution is viewed as a priority since such an approach avoids the need for restoration and can be a remarkably cost effective means to maintaining high quality of waters. [41].

## A. Priority NPS Impaired Surface Waters in Need of Restoration

### i. NPS Impaired Waters Listing

Waters appearing as NPS impaired waters fall within one of two categories. In one category are surface waters where reliable monitoring efforts reveal an ongoing violation of one or more of

[41] DEC's 2017 Water Quality Standards can be accessed here: https://dec.vermont.gov/watershed/map/assessment/waterqualitystandards

the criteria in the WQS, and a human-induced pollutant is the most probable cause of the violation A Total Maximum Daily Load (TMDL) may have been prepared for some of these waters.

In the second category are surface waters where one of the following exist: a lack of flow, water level or flow fluctuations, modified hydrology, physical channel alterations, human-induced channel degradation or stream type change , or where exotic species have had negative impacts on designated uses. The aquatic communities are altered from the expected ecological state. This second category, referred to as **altered waters**, includes those waters where there is documentation of WQS violations for flow and aquatic habitat but EPA does not consider the problem(s) caused by a pollutant or where a pollutant results in WQS not being met due to historic or previous human-caused channel alterations that are presently no longer occurring. The two categories noted above, when combined, represent the entire extent of Vermont's NPS impaired waters.

### ii. Priority NPS Impaired Waters

A smaller subset of NPS impaired waters, an indication of priority NPS impaired waters, is helpful to promote and elevate the need (urgency) for NPS abatement work in drainages and watersheds degraded by NPS pollution. The list of **priority NPS impaired waters** is used to help prioritize DEC's NPS water pollution control and management efforts as well as draw the attention of local communities and partner groups to take action to restore waters impaired by NPS pollution.

The waters appearing on the priority NPS impaired waters list were evaluated using certain guiding factors. One factor was that any listed water needed to have NPS pollution as the primary or predominant source of impairment. Examples include situations where pollutants either runoff from the watershed, such as sediment or nutrients or where riparian buffer conditions are less than ideal. Factors not considered applicable to NPS prioritization include waters impaired by atmospheric depositional sources (Hg, acid), channelized or flood damaged river channels, point sources, or where sources are unknown. A second factor was that water quality conditions were likely to improve if NPS funding and support were devoted to implementing NPS control measures to fix the problem.

The list of priority NPS impaired waters for Vermont is a subset of the 303(d) impaired waters list and is shown in Appendix B. Additionally, nonpoint source priority waters from the Part D List (impaired waters with completed TMDLs) were also included in Appendix B since they remain impaired and could benefit from watershed pollution reduction efforts. The waters are identified here are from the 2020 EPA approved 303(d) List but is subject to change as future biennial lists are developed.

## B. Priority NPS Threatened Surface Waters in Need of Protection

### i. Threatened and stressed waters

NPS threatened waters are referred by DEC as "stressed" waters. Stressed waters are waters that support the uses for the classification but:

1. the water quality and/or aquatic biota/habitat have been disturbed by NPS pollution. The water may require some attention and resources, to maintain or restore its high quality;

2. the water quality and/or aquatic habitat may be at risk of not supporting uses in the future; or

3. the structure or integrity of the aquatic community has been changed. Available data or other information confirms water quality or habitat disturbance but not to the degree that any designated or existing uses have become altered or impaired (i.e. not supported).

Certain lakes showing the potential for water quality decline, whether determined through water quality monitoring, by levels of lakeshore disturbance or by proximity to other lakes infested with Eurasian watermilfoil are not referenced specifically but are identified by the DEC Lake scorecard.[42]

As with the impaired NPS priority waters, stressed waters were considered an NPS priority when the predominant source of the stressor is from the watershed. Examples include situations where pollutants either runoff from the watershed, such as sediment or nutrients or where riparian buffer conditions are less than ideal. Factors not considered applicable to NPS prioritization include waters impaired by atmospheric depositional sources (mercury, acid), channelized or flood damaged river channels, point sources, or where sources are unknown. The list of priority NPS impaired waters for Vermont is a subset of the Stressed Waters List and is given in Appendix C. The waters are identified in the appendix are from the 2020 Stressed Rivers and Streams List but is subject to change as future biennial lists are developed.

Protection of NPS threatened waters is a priority for Vermont NPS management. Often DEC can broaden its reach concerning protection efforts by working closely with partner groups and organizations. Many of these partners understand the nature and extent of NPS threats because of their proximity to the water and landowners affected, are able to effectively carry out the broad range of protection activities such as monitoring and assessment, education and implementation. DEC views protection of healthy but NPS threatened waters of comparable importance to restoration of NPS impaired waters. Rather than a specific annual allocation of resources set aside for protection purposes, DEC makes protection an integral component of its

[42] DEC Lake Score Cards available at: https://dec.vermont.gov/watershed/lakes-ponds/data-maps/scorecard

ongoing water resources management efforts.

### ii. Initiatives to Protect Lakes with Increasing Phosphorus

Lakes and ponds across Vermont are experiencing increases in phosphorus concentrations. A 2018 analysis of spring and summer phosphorus concentrations in almost 200 lakes and ponds found significant increases in phosphorus concentrations in oligotrophic and mesotrophic lakes between the early 1980s and the present[43]. These increases in phosphorus concentrations typically come from NPS pollution in a lake's watershed, and can lead to water quality challenges in lakes including harmful cyanobacteria blooms, spread of invasive species such as Eurasian Water Milfoil (EWM), loss of habitat, and decreased water clarity. Additionally, while many eutrophic lakes have stable total phosphorus concentrations, such as Lake Carmi or Shelburne Pond, they suffer from these same challenges and require intervention to restore the lake to its previous unimpaired state. The Vermont DEC Lakes and Ponds Program is working with local stakeholders like lake associations, other state agencies like AAFM, and federal agencies like the US Army Corps of Engineers to address these challenges, protect our highest quality lakes and ponds, and restore those that are suffering from water quality challenges. Specific examples include:

- **Shoreland Restoration**: Runoff from impervious surfaces immediately adjacent to Lakes and Ponds is an important source of phosphorus pollution. The Lakes and Ponds Program is working with shoreland residents through the Lake Wise Program to implement land management practices that reduce this runoff, including planting and maintaining vegetated areas, ensuring clean runoff, and stabilizing banks. Training Lake Wise Evaluators, individuals qualified to help residents identify sources of runoff and address those through the implementation of best management practices, is another important ongoing effort.

- **Development of Lake Watershed Action Plans**: DEC is supporting lake associations, such as those at Lake Eden and Lake Elmore, to develop water quality restoration plans that identify sources of nutrient and sediment loading to lakes, prioritize sources based on various environmental, economic, and social criteria, and design projects to mitigate those sources.

- **Aquatic Invasive Species Detection, Response, and Eradication Efforts**: The Lakes and Ponds Program is implementing a series of projects to reduce the spread of aquatic invasive species enabled by increasing phosphorus concentrations, such as EWM. Annual grants support projects designed at containing further AIS spread and the Vermont Public Access Greeter Program helps to educate boaters and provide courtesy watercraft inspections to prevent invasive plants and animals from spreading from one waterbody to another.

[43] Article by Mathews, Merrell and Thomas, "Is Vermont losing its Oligotrophic Lakes" published in 2018, available here: https://www.vpr.org/sites/vpr/files/lakelinematthews_et_al_2018__1_.pdf

- **Reducing Phosphorus Pollution from Roads**: Vermont roadways are responsible for about 10% of sediment and phosphorus sources to surface waters, and municipal roads make up 70% of 118,777 total miles of roads in Vermont. To help reduce road runoff and protect surfaces waters, Act 64 mandates all hydrologically connected roads (class one through four) be maintained according to new road drainage standards. One such standard is an exemption that protects trees and shrubs along roads within 250 feet from cutting or moving and prevents roads from being widened toward the lake side.

- **Support to Implementation of Agricultural Best Management Practices**: In lake watersheds across the state, the Lakes and Ponds Program is working with farmers to implement best management practices that reduce phosphorus loading to lakes and their tributaries. For example, the Lakes and Ponds Program provided funding, along with AAFM, to purchase and provide training for a manure injection system that injects liquid manure into the soil and reduces the risk of phosphorus runoff.

## C. Process to Identify and Protect High-Quality Waters

The surface waters in the State of Vermont are held in the Public Trust, which includes 7,100 miles of rivers and streams and 378.5 square miles of surface water. In 2018, 2019, and 2020, three wetlands totaling 642 acres were designated through rulemaking as Class I, earning them the highest level of protection in the State. As of 2020, DEC has identified **17 candidate Class I wetlands**. DEC has identified several reclassification opportunities for streams and lakes. DEC has identified **78 wadeable streams** that have achieved and maintained conditions necessary to support aquatic biota consistent with waters in their natural condition. Vermont Fish and Wildlife has identified **148 streams** that support very high-quality cold-water salmonid fisheries, whereby providing high quality fishing opportunities. In addition, DEC has identified **21 very high-quality lakes** that provide very high-quality aesthetics based on phosphorus, secchi, and chlorophyll-a criteria consistent with waters in their natural condition. Protecting the watersheds of these wetlands, streams, lakes is priority for the State of Vermont.

DEC's Biomonitoring and Aquatic Studies staff identify streams that meet A1 criteria for aquatic biota through biomonitoring assessments of macroinvertebrate and fish communities. Each community type must be sampled at least twice in the last ten years and be insignificantly different than waters in their natural condition, meaning they must have a minimum of three out of four very good or better assessments.

Identification of very high-quality fishing use are based upon fishery assessments conducted by Vermont Fish and Wildlife. Priorities are defined as fishing waters that support wild, self-sustaining salmonid populations characterized by the presence of multiple age classes and a minimum abundance of 1000 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). These priorities are not based on a statewide assessment.

Identification of very high-quality aesthetics use in lakes is based upon total phosphorus, secchi depth, and chlorophyll-a criteria from the summer months with at least two years of data representative of the entire season. For specifics see Table 3 on page 30 of the 2017 Vermont WQS.

The Vermont Wetland Rules uses a class system for wetland protections (Class I, Class II, Class III). Reclassifications may be initiated by the Secretary of ANR or through a third-party petition process. Class I wetlands are exceptional or irreplaceable in its contribution to Vermont's natural heritage and therefore, merits the highest level of protection. Impacts to Class I wetlands may only be permitted when the activity is necessary to meet a compelling public need for health or safety. There are only nine wetlands which have been designated as Class I and many which likely meet the standard as exceptional or irreplaceable. The Tactical Basin Plans have been updated to identify those wetlands which should be considered for reclassification. There are approximately 50 wetlands which have been identified as potential Class I wetlands in the Tactical Basin Plans.

Wetland Reclassification of Class I wetlands have been determined to be, based on their functions and values, exceptional or irreplaceable in its contribution to Vermont's natural heritage and, therefore, merits the highest level of protection. All Class I wetlands are mapped on the Vermont Significant Wetland Inventory (VSWI) maps and listed in the Vermont Wetland Rules.

# Chapter 6. Vermont Water Quality Planning & Implementation

As described in Chapter 3, a wide variety of programs are in place within Vermont to prevent, avoid or otherwise reduce impacts to Vermont's surface and ground waters. Since the development of the 2015 NPS Plan, Vermont has deployed a comprehensive approach in how required Clean Water projects are identified, prioritized, funded and implemented to achieve necessary water pollution control strategies. To promote and deliver the most efficient and cost-effective system to address NPS management and the implementation of BMP controls, DEC has developed a coordinated watershed assessment, planning, project identification and funding effort. This includes the development of "Tactical Basin Plans" which support targeted funding efforts provided by the Clean Water Initiative Program (CWIP), the Clean Water State Revolving Loan Fund and many others. CWIP, in many cases, connects clean water or other Federal funds to identified priority NPS projects whether used for protection or restoration of surface waters. In other cases, Tactical Basin Plans (TBPs) will be augmented to meet planning requirements under the Section 319 grant program (Section C below). Additionally, the development of source water protection plans supported by funding efforts provided by state funds provides a mechanism to link NPS prevention work with source water protection[44]. Source Protection Plans (SPP), developed for surface water and groundwater public drinking water systems, provide a mechanism to link NPS prevention measures with source protection risk management implementation strategies. The DEC State Drinking Water Revolving Fund (DWSRF) is available to provide funding support for plan development and source area acquisition.

## A. Vermont Tactical Basin Planning for NPS

Tactical Basin Planning (on the major river basin scale) has been and remains an organic ingredient to Vermont's approach when managing NPS pollution. Dating back to the late 1970s and Section 208 of the Clean Water Act, Vermont has devoted significant resources when defining the nature and extent of NPS problems and when prioritizing treatment programs and geographic areas needing attention. The portion of Vermont's land area that drains into Lake Champlain has been and continues to be a high priority area for NPS management, especially for waterbodies with TMDLs that have been approved to reduce NPS pollutants – i.e., sediment and nutrient (phosphorus) contributions. More recently, additional priority areas for NPS management include lands in Vermont that drain to the Connecticut River and Lake Memphremagog (see Figure 3 illustrating these priority regional drainages). Vermont's Tactical Basin Planning efforts are conducted in such a manner so as to be consistent with Section 303(e) of the Clean Water Act and 40 CFR 130.6 and a number of state requirements (state statutes 10 VSA 1253(d), etc.).

[44] More information on Source Protections Plans can be found here: https://dec.vermont.gov/water/drinking-water/public-drinking-water-systems/source-water-protection

Federal regulations (40 CFR 130) direct state agencies to prepare basin plans, to focus on priority issues and geographic areas, to identify priority point and nonpoint water quality problems, consider alternatives and recommend control solutions and funding sources. At the state law level, basin and watershed planning requirements are found in a number of statutory and regulatory provisions, including but not limited to, Title 10 V.S.A. §§ 1251, 1253 and 1258, and the Vermont Water Quality Standards (WQS). Title 10 V.S.A. §1253(d) provides that basin plans must be developed on a five-year rotational basis. Section 103(e) of the WQS requires that basin plans:

1. Include an inventory of the existing and potential causes and sources of pollution that may impair surface waters.
2. Establish a strategy to improve or restore surface waters and to ensure full support of uses.
3. Seek public participation to identify and inventory problems, solutions, high quality waters, existing uses and the quality of such uses, and significant resources of high public interest.
4. Identify strategies, where necessary, by which to allocate levels of pollution between various sources as well as between individual discharges.

To the extent appropriate, basin plans shall contain specific recommendations by the Vermont ANR Secretary that include but are not limited to:

1. The identification of all known existing uses, salmonid spawning or nursery areas important to the establishment or maintenance of such fisheries;
2. Reference conditions appropriate for specific surface waters;
3. Recommended changes in classification and designation of surface waters; and
4. Schedules and funding for remediation, stormwater management, riparian zone management, and other measures or strategies pertaining to the enhancement and maintenance of the quality of waters within a basin.

DEC currently carries out Tactical Basin Planning to identify the highest priority opportunities for protection and restoration actions affecting NPS and surface waters. At present, Tactical Basin Planning relies on monitoring and assessment data as well as outcomes of sector-specific assessment analyses, combined with remote sensing and modeling to identify and prioritize opportunities for NPS implementation projects and activities. TBPs, to be developed on a five year recurring cycle (see Table 11), help ensure that state and federal funds are directed to the highest merit NPS implementation opportunities based on identification, targeting, and treatment of specific sites determined to be at greatest risk of delivering NPS pollutant loads to surface waters. These critical sources are identified within land use categories including agricultural land, urban and developed land, road networks, and river corridors. Tactical Basin Planning is carried out by a group of five DEC basin planners, each of which is assigned a district comprised of three major Tactical Basin Planning units.

Table 11. Tactical Basin Plan development schedule, including monitoring and assessment rotational cycle by major watershed 2020-2025

| Basin Number and Name | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | Major Watershed | Planner |
|---|---|---|---|---|---|---|---|---|
| Basin 1 – Hoosic, Battenkill | Start | Finish | | Mon | Assess | Start | Hudson | Angie Allen |
| Basin 2 and 4 – Poultney, Mettawee, South Lake | Assess | Start | Finish | | Mon | Assess | Lake Champlain | |
| Basin 3 – Otter, Lewis, Little Otter | | Mon | Assess | Start | Finish | | | |
| Basin 5 – Northern Lake Champlain Dir. | Finish | Mon | Assess | | Start | Finish | Lake Champlain | Karen Bates |
| Basin 6 – Missisquoi, Rock, Pike | Start | Finish | | Mon | Assess | Start | | |
| Basin 8 – Winooski | Mon | Assess | Start | Finish | | Mon | | |
| Basin 7 – Lamoille | Start | Finish | | Mon | Assess | Start | Lake Champlain | Danielle Owczarski |
| Basin 9 – White | Mon | Assess | Start | Finish | | Mon | Connecticut River | |
| Basin 14 (16) – Stevens, Wells, Waits, Ompompanoosuc, CT Direct | Finish | | Mon | Assess | Start | Finish | | |
| Basin 10 (13) – Black, Ottauquechee | Assess | Start | Finish | | Mon | Assess | Connecticut River | Marie Caduto |
| Basin 11 (13) – West, Williams, Saxtons | Start | Finish | Mon | Assess | Start | Finish | | |
| Basin 12 (13) – Deerfield, Broad Brook | | Mon | Assess | Start | Finish | | | |
| Basin 15 – Passumpsic | Mon | Assess | | Start | Finish | Mon | Connecticut River | Ben Copans |
| Basin 16 – Northern Connecticut | Finish | | Mon | Assess | Start | Finish | | |
| Basin 17 - Memphremagog | Assess | Start | Finish | | Mon | Assess | Memphremagog | |

| Planning Stage | Description |
|---|---|
| Monitoring | Targeted monitoring for the basin based on priorities identified in previous TBP and monitoring summit |
| Assessment | Follow-up monitoring and compilation of monitoring results and assessments into basin assessment report |
| Start of Basin Planning process | Identification of water quality protection and restoration priorities and draft strategies with partners |
| Completion of Basin Plan | Development and review of final basin plan with graphics and tables with targeted strategies and actions |
| Implementation Phase (ongoing for all stages) | Ongoing implementation of priority projects and strategies to protect and restore basin surface waters |

Tactical Basin Planning is DEC's current planning and management approach to integrate and focus NPS implementation. TBPs facilitate implementation of remediation efforts by translating results of integrated basin water quality assessments into specific geographical areas for project-level intervention. These science-based assessments also serve to identify where additional regulatory program requirements may be brought to bear by relevant programs.

One core component of each TBP is the plan's implementation table. The implementation table outlines the priorities of DEC and partner organizations for protection or restoration of particular surface water segments affected by specific NPS pollution sources, which are to be addressed by application of interventions, strategies or BMPs outlined in DEC's Surface Water Management Strategy. The implementation table serves to notify partner organizations about the types and locations of NPS projects that DEC will support with grant or loan programs or to other funding sources where DEC has leverage. Implementation tables in each TBP connected to specific implementation practices which are listed in the Watershed Project Database (WPD) and are updated frequently as new information becomes available result of regulatory program requirements. Further, such implementation tables may identify the appropriate restoration strategies based on monitoring and assessment data and identify regulatory programs or financial incentives best suited to implement one or more particular restoration strategies.

Stakeholders can review a comprehensive database of clean water projects that have been identified through the online Watershed Projects Database (WPD) and Clean Water Project Explorer. Both tools, in addition to several others can be accessed through the Clean Water Portal. [45] The WPD tracks funding, status, and outcomes of clean water projects by sector (e.g., stormwater from developed lands and roads, agriculture, river and wetland restoration opportunities, etc.) for all of the major river basins in the state and is constantly updated as sector-based assessments (e.g., stormwater master plans and river corridor plans) are used to identify and upload additional projects that are referenced. While the Clean Water Project Explorer displays information both from internal DEC programs as well as projects funded and tracked by other agencies.

In addition to the tools displayed on the portal, stakeholders having interest with identified implementation needs can inspect Tactical Basin Plan specific implementation tables by visiting the Tactical Basin Planning web site and then accessing particular TBPs[46]

[45] Watershed Projects Database and the Clean Water Project Explorer Can be accessed through the Clean Water Portal, here: https://anrweb.vt.gov/DEC/cleanWaterDashboard/
[46] Watershed Planning Program information available here: https://dec.vermont.gov/water-investment/watershed-planning

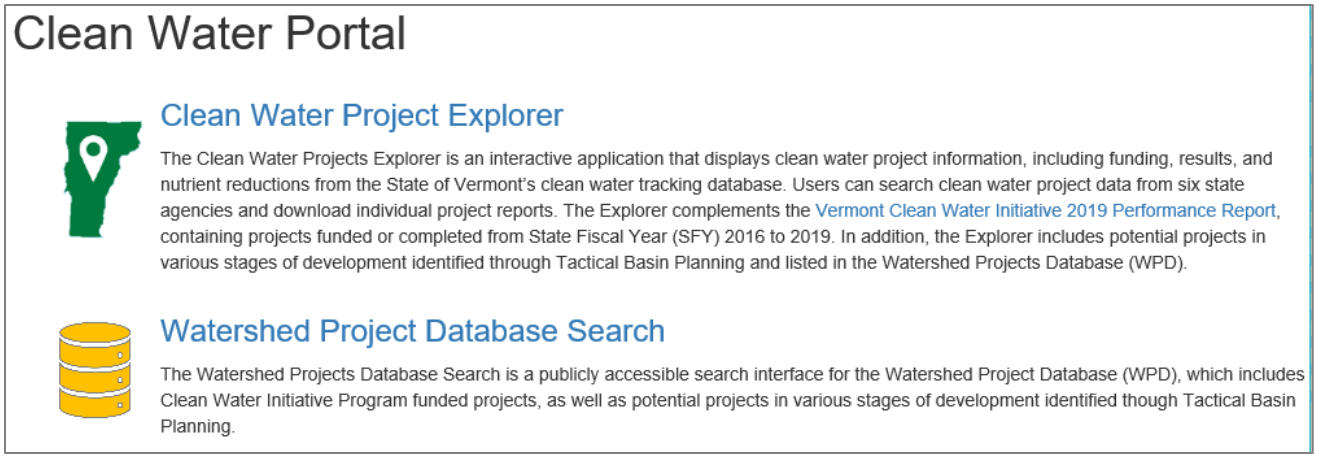


Figure 4. A view of the Clean Water Portal and a description of two of its tools.

## B. Tactical Basin Planning Implementation

Implementation of strategies and projects found in TBPs are typically a cooperative effort involving state DEC staff, staff from agencies such as NRCS, Vermont AAFM, VTrans and local entities such as conservation districts, municipalities and watershed groups. Implementation activities vary depending on the nature of the water quality impairment or threat and watershed characteristics, but often include agricultural NPS practices such as cover cropping, changes in tillage, nutrient management and buffers; stormwater retro-fit projects, roadside erosion control and streambank restoration when supported by appropriate stream geomorphic assessments. The implementation of many of these projects and practices is increasingly being coordinated through one or more programs within DEC.

Act 76 created a long-term funding source for the Vermont Clean Water Fund, which will continue to support NPS implementation efforts, especially for non-regulatory projects. The Clean Water Fund is administered by a Clean Water Fund Board which consists of the Secretaries from Vermont agencies of Administration, Agriculture, Commerce and Community Development, Natural Resources and Transportation, and four at-large members appointed by the Governor.

Funding for implementation comes from a variety of sources including the Clean Water Fund, the Clean Water State Revolving Loan Fund, USDA and Vermont AAFM cost share programs, Section 319 funding, and municipal or privately funded sources, and other grant programs. Projects to control runoff from roads are often supported by Municipal Roads Grants-in-Aid funding, municipal funds or direct VTrans investments. Chapter 7 of this Plan provides a more in-depth description of sources of NPS implementation funding available.

Most agricultural projects are supported on a cost share basis with funds from USDA and/or AAFM. Significant additional USDA implementation funds have been obtained for work in

both the Lake Champlain and Connecticut River drainages through the Regional Conservation Partnership Program (RCPP). Coordination among DEC and the agricultural agencies has increased in recent years. For example, NRCS in coordination with DEC and AAFM, has identified four small priority watersheds to focus implementation efforts over the coming five-year period (Rock River, Pike River, St Albans Bay watershed and small drainages in western Addison County known collectively as McKenzie Brook). In addition, Vermont NRCS worked in collaboration with DEC and other drinking water partners and the members of the USDA State Technical Committee to identify two priority areas for source water protection under the 2018 Farm Bill. The 2018 Farm Bill amended the Food Security Act of 1985 to add a provision providing for the protection of source water through targeted conservation practices in identified watersheds. The two watersheds eligible for specialized conservation assistance through the Environmental Quality Incentives Program (EQIP) are the Headwaters Passumpsic River watershed in the northeastern part of the state and the Vernon Dam watershed in the southern part of the state, both in the Connecticut River Watershed. This new initiative related to water quality and quantity and the protection of drinking water sources provides eligible producers with a 90% payment assistance rate for implementing key conservation practices such as: Conservation Crop Rotation, Cover Crops, Ground Water Testing, Riparian Forest Buffer, Filter Strip, Heavy Use Area Protection, Nutrient Management, Integrated Pest Management, Agrichemical Handling Facility, and Well Decommissioning. USDA also provides funding to support erosion control on certain abandoned logging roads.

## C. Tactical Basin Plans as EPA Watershed-Based Plans

Starting in 2003 and expressed by EPA in *Nonpoint Source Program and Grants Guidelines for State and Territories*, EPA requires watershed-based plans to guide Section 319-funded work in impaired watersheds. The EPA-required watershed-based plans (WBP) must address nine key elements. The nine elements for a watershed-based plan and Vermont's conformance with these nine elements are noted below.

Vermont's Tactical Basin Plans (TBP) are consistent with the U.S EPA's framework for developing "nine-element" watershed-based plans. EPA's nine key elements ensure that the contributing causes and sources of nonpoint source pollution are identified that key stakeholders are involved in the planning process, and that protection and restoration strategies addressing water quality concerns are identified. The following describes how Vermont's TBPs comply with EPA's nine elements of watershed-based plans.

1. ***An identification of the causes and sources or groups of similar sources that will need to be controlled to achieve the load reductions estimated in this watershed-based plan.***

The Lake Champlain Phosphorus TMDL Implementation Plan addresses phosphorus sources by land use sector. It is clearly documented that the pollutant phosphorus is the major cause of

impairment to the Lake Champlain segments as well as Lake Memphremagog and further addressed in DEC TBPs within these watersheds. These geographically explicit TBP TMDLs comprise the "Phase II" and forthcoming "Phase III" blueprints by which the TMDL is to be accomplished.

2. ***An estimate of the load reductions expected for the management measures described under paragraph (c) below.***

The Lake Champlain Phosphorus "Phase II" TMDL content in TBPs provide tables estimating phosphorus load reduction based on the implementation of management measures which are presented by regulatory program area. In addition, catchments with top phosphorus loading are presented for each sector, using SWAT modeling outputs.

3. ***A description of the NPS management measures that will need to be implemented to achieve the load reductions estimated under paragraph (b) above and an identification (using a map or a description) of the critical areas in which those measures will be needed to implement this plan.***

TBPs present a summary Implementation Table. This table includes strategies for protecting and restoring surface waters in the basin. The specific actions are catalogued in the Watershed Projects Database (WPD), can be viewed using ANR's new mapping interface called the "Clean Water Project Explorer," (Figure 4) and progress towards implementation will be tracked using the BMP Accounting and Tracking Tool.

4. ***An estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon, to implement this plan.***

TBPs provide the regulatory programmatic requirements that are specific to each phosphorus source-sector, segregated among load and wasteload allocation components of the TMDL. These Plans also describe the Vermont Clean Water Act and provide details both regulatory and non-regulatory efforts needed to implement these Plans. Each Plan provides a generalized cost assessment related to large-scale planning undertaken by Vermont as part of the Champlain TMDL Phase I Implementation Plan, and from the draft Vermont Clean Water Act-required Treasurer's Report. Comprehensive, sector-specific cost estimates result from the development of each assessment listed in Champlain Tactical Basin Plan(s) Implementation Tables and will evolve over the life of the first implementation phase for each Plan.

5. ***An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the NPS management measures that will be implemented.***

The Tactical Basin Planning Process includes information and education efforts such as regional coordination meetings with Regional Planning Commissions, Natural Resource Conservation

Districts, as well as with watershed organizations, and participation in workshops and trainings to support NPS pollution reduction project identification and implementation. Each Plan documents the continuing planning processes (and per the DEC's "Continuing Planning Process") with these statutory partners.

6. ***A schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious.***

Tactical Basin Plans present a timeline for the implementation of regulatory programs and associated assessments. The plan also presents commitments for incremental implementation and anticipated phosphorus reductions. The plan identifies (by sector) the WLA + LA load reductions and timeframe and projects future reductions to the extent that this is possible and as a function of adaptive management.

7. ***A description of interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented.***

The Accountability Framework of the Lake Champlain TMDL presents specific milestones that are required for the entire Basin and referenced in each of the Champlain Tactical Basin Plans. VDEC will track and account for the actions taken to implement the Lake Champlain and Memphremagog TMDLs, primarily through state and federal funding programs and regulatory programs and estimate P load reductions achieved relative to targets. Progress will be evaluated for the implementation of the Champlain TBPs every 2.5 years through interim and final Lake Champlain TMDL report cards. This evaluation process will identify where additional technical, financial, and/or regulatory assistance may be needed to meet TBP milestones.

8. ***A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards and, if not, the criteria for determining whether this watershed-based plan needs to be revised or, if a NPS TMDL has been established, whether the NPS TMDL needs to be revised.***

The 2017 Vermont Water Quality Standards (WQS) establish policies and specific criteria for the management and protection of Vermont's surface waters. Section § 29A-305 of the Vermont Water Quality Standards state that the Secretary may establish and apply numeric biological indices to determine support of the aquatic biota use for each class of water, and procedures for the collection and analysis of biologically relevant data used to determine compliance with the class-specific narrative and numeric criteria included in § 29A-306(a) of these rules. Additionally, Vermont's Surface Water Assessment and Listing Methodology (revised 2019) requires an examination of the water's chemical, physical, and biological condition, and the causality of the conditions observed. Data is used to determine a waterbody's "attainment status." If a waterbody is determined not to attain one or more criteria of the Vermont Water

Quality Standards, appropriate water quality management strategies for each waterbody are developed and incorporated into Vermont's Tactical Basin Plans, Water Quality Remediation Plans, and or TMDL implementation plans.

9. ***A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (h) immediately above.***

In accordance with the federal Clean Water Act (sections 130.3 and 130.4), Vermont has established appropriate monitoring methods and procedures (including biological monitoring and assessment) necessary to compile and analyze data on the quality of surface waters throughout the state. Specifically, Vermont has developed and continues to revise the methodology on the application of biocriteria for fish and macroinvertebrate communities in Vermont wadeable streams and rivers through the WQS. Bioassessment techniques are best used for detecting aquatic life use impairments and assessing their relative severity. Once an impairment is detected, additional ecological data, such as chemical and biological (toxicity) testing, is helpful to identify the causative agent, its source, and appropriate mitigation measures. Integrating information from these data types as well as from habitat assessments, hydrological investigations, and land use analysis is helpful to provide a comprehensive diagnostic assessment of impacts from the five principal factors affecting biological health in aquatic systems – water quality, habitat structure, energy source, flow regime, and biotic interaction factors.

Following the implementation of BMPs and other mitigation measures, bioassessment are important for evaluating the effectiveness of such control measures. bioassessment may be used within a planning and management framework to prioritize water quality problems for more stringent assessments and to document "environmental recovery" following implementation measures and restoration activities.

## D. Clean Water State Revolving Fund Eligibility - Tactical Basin Plans and the Watershed Projects Database

As described in Chapter 3, projects that implement this Plan are considered eligible for funding by the CWSRF, under the eligibility established in §603(c)(2) of the Clean Water Act. These projects may be public or privately owned and must support the implementation of a current EPA approved state NPS management program plan (e.g., this Plan) or nine-element watershed-based plan (e.g., a Tactical Basin Plan). In order for the eligibility test to be met, the project must 1) have a water quality benefit and, 2) address a nonpoint source of pollution or nonpoint source impact upon a designated use protected under the Vermont Water Quality Standards. Further, for Federal crosscutting requirements to be waived, the project must not have appurtenant treatment systems that rise to the level of Treatment Works as defined in Section 212 of the Clean Water Act.

The vast majority of project types outlined in TBPs and listed in the Watershed Projects Database are likely eligible for financing support by CWSRF, and many of these do not require adherence to the Federal cross-cutters. To streamline eligibility determinations and make maximum use of the CWSRF to meet Vermont's water quality goals, any project meeting the criteria established above must be listed in the Watershed Projects Database, and must not meet the definition of Treatment Works, in order to be considered supportive of this Plan, and eligible for CWSRF support without application of cross cutters. Additional CWSRF subsidy may be awarded only to municipal projects that are: 1) eligible; 2) are ranked for priority under Environmental Protection Rule Chapter 2; and 3) subject to due adoption of the relevant CWSRF Intended Use Plan and terms and conditions of the federal capitalization grant.

At the project specific level, it is the responsibility of the Watershed Planning Program within the DEC Water Investment Division to make these final eligibility determinations for Natural Resource Projects. When an NPS project is proposed for financial support with the CWSRF, the WPP shall as needed furnish a written statement that the project in consideration meets the eligibilities outlined above.

## E. Source Water Protection Plans & Planning

Source water protection plans and planning is separate and distinct from Tactical Basin Planning but plays an important role regarding the avoidance or minimization of contamination affecting water used for drinking water purposes. Beginning in 1992, all Public Community Water Systems (PCWS) and all Non-transient Non-community Water Systems (NTNC) within Vermont must have in place a DEC-approved Source Protection Area (SPA) and associated Source Protection Plan (SPP). An approved SPP addresses actions the water system provider will perform or undertake to minimize or control the contaminant risks to their drinking water supply source(s), whether the supply source is surface water or ground water. An approved SPP is also necessary in order to receive an operating permit and a Phase II/V monitoring waiver from DEC. The water system provider is required to submit to DEC an updated SPP every three years for review and re-approval.

An approvable SPP must contain a particular set of required information as outlined in the Vermont Water supply Rule, Subchapter 21-16. Plan components must include

1. a brief description of the water system (nature of the source, construction details,
2. extent of storage,
3. population served,
4. number of connections,
5. permitted yield, land use setting),
6. how the source protection area was delineated,

7. the identification of actual and potential sources of contamination (PSOC) along with a risk assessment of each PSOC,
8. a risk management plan, and a contingency plan in the event of an emergency and, if groundwater is the source, the well log, and
9. maps of the delineated Source Protection Area (SPA) in relation to the landowners, topography, and PSOC.

The SPA is the area of land that likely recharges or passes groundwater through to the source. This area is the basis of the activities that the water system will perform to minimize source water contamination. Public drinking water systems must control, through ownership or easement, the isolation zone around the water source(s). This is the area immediately around the drinking water withdrawal site, and the area where impacts from contamination are likely to be immediate and certain. For public community water systems, this area is generally a 200-foot radius around the source well/intake.

A major component of each SPP is the inventory and assessment of PSOC found within the SPA. Sources of contamination include many examples of nonpoint sources such as large or small septic systems, gas stations, farm operations, traffic corridors, or parking lots. Each potential or actual contamination source needs to be given a risk rating (high, medium, or low) based on several factors such as proximity to the water source, level of control, toxicity, amount of contamination, well construction, and soil and aquifer characteristics.

Importantly, each SPP needs to have a risk management plan; a strategic plan for dealing with the potential and actual sources of contamination and future needs of the water system. This part of the SPP needs to include a list of all landowners in the SPA, and local, regional and state officials, with contact information, who will receive notice of the SPA. The strategic plan section should also outline the specific steps the water system will take to mitigate the threat from identified contamination sources and include future plans the water system may have in the realm of advancing source protection. Examples include purchasing land or development rights to control the SPA, promoting forestry stewardship, stormwater management planning, and encouraging road salt reduction policies and agreements.

As of May 2020, there are about 660 active public water systems with a source protection plan (411 Public Community and 249 Non-Transient Non-Community public water systems). Transient Non-Community public water systems are not required to have a source protection plan. Each water system has made progress when addressing potential and actual sources of contamination which tend to be of an NPS nature.

# Chapter 7. NPS Funding Programs, Regulatory Programs and Partnerships in Vermont

Managing and controlling NPS pollution throughout Vermont is one of the key elements in preventing and reducing pollutant loads to surface waters and groundwaters and when meeting applicable water quality standards. The control of NPS pollution presents a major challenge due to the diffuse nature of NPS contributions which, as a result of precipitation or snow melt, may arise from runoff from buildings and parking lots and other impervious surfaces, farm fields and barnyards, lawns and other sorts of turf, stream channel erosion, forest management, trails and roads. NPS pollution spans across sectors making them difficult to regulate and fund efficiently and effectively.

Vermont's NPS Management Plan addresses this challenge by relying on a myriad of varied funding and regulatory programs supported by funding sources at state, federal and regional levels and on an extensive network of partnerships. This chapter will touch on many of the funding and regulatory programs and partnerships deemed essential to an ongoing, effective overall NPS management program within Vermont.

## A. State NPS Funding Programs and Associated Funding Sources

The following tables describe NPS-related **funding programs** that are managed at the state level listed alphabetically by the state agency that manages them. The **funding source** of the program may be state funding or federal funding or a combination of both. Programs described below are in place as of SFY 2021, but subject to change over the next five years due to changes in funding levels and adaptive management approaches.

**Funding allocated to Protection vs Restoration**

State funding programs support a variety of activities across sectors that support both restoring impaired waters and protecting unimpaired waters. Funding programs that target **restoration** of impaired waters include Lake Champlain Basin Program TMDL Implementation funds (which were about $7 million in FFY2019 and 2020), ANR's Lake in Crisis Program and Ecosystem Restoration Program. Some programs that are committed to conservation and **protection** of waters include AAFM's Conservation Reserve Enhancement Program, ANR's River Corridor Easement program, and VHCB's Conservation Grants. At the same time, there are many programs that seek to cover all geographic regions of the state whether they are in an impaired watershed or not.

Vermont's allocation and prioritization of funding resources across sectors, and among protection and restoration activities, is subject to annual recommendations by Vermont's Clean Water Board to the Vermont Governor, as described in state law at Title 10 VSA 1389(a). During the five-year period subject to this Plan, Vermont DEC will transition from current water

quality funding programs supported by the Clean Water Fund to four new programs specified by the Clean Water Service Delivery Act of 2019 (see 10 V.S.A. Sections 925-928). One of those programs, the **Water Quality Enhancement Grant Program**, focuses mainly on **protection** of water resources. The Act specifies that up to 25% of the Clean Water Fund, not to exceed $5 million per year, shall be allocated to this program. Vermont's is expected to allocate approximately $20 million to the Clean Water Fund, and an additional $10 to $12 million in capital funding support to clean water. Capital funding may be used to secure water quality restoration, while the $5 million in Clean Water Funds will specifically be targeted to protection activities. Thus, at least 17% of State funds targeted to Clean Water are associated with protection-related activities. Additional Federal funds the State receives from the Lake Champlain Basin Program under Chapter 120 may further increase funding to protection activities, where those activities secure significant phosphorus reductions.

### i. Agency of Administration Funding Program

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| Stormwater Utility Payments | The Legislature has encouraged the Clean Water Fund to award monies to support the establishment and maintenance of stormwater utilities. The Clean Water Fund supports an annual appropriation of $25,000 to municipal stormwater utilities. By SFY 2020, five municipalities established stormwater utilities: Williston, Colchester, South Burlington, St. Albans City and Burlington. |

### ii. Agency of Agriculture Food and Markets Funding Programs

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| Agricultural Environmental Management (AEM) Program | The AEM Program is established to provide farms of Vermont with State financial assistance to alternatively manage their farmstead, cropland, and pasture in a manner that will address identified water quality concerns that, traditionally, would have been wholly or partially addressed through federal, State, and landowner investments in BMP infrastructure, in agronomic practices, or both. Funded by the Clean Water Fund and Capital Fund. |
| Agricultural Clean Water Initiative Program (Ag-CWIP) | AAFM's grant funding program made possible by the Clean Water Fund, created by Act 64 of 2015 or the Vermont Clean Water Act. Funding is awarded to a wide variety of partner organizations through various grant opportunities such as Education and Outreach, Organizational Development, Farm Conservation Practice Surveys, Innovative Nutrient Reduction activities and more. This funding develops and supports the continual improvement of water quality across the state of Vermont by supporting organizations to provide farmers with education and outreach, technical assistance, identifying and implementing best management practices, planning, and more. Funded by the Clean Water Fund. |
| Agronomy Conservation Assistance Program (ACAP) | Support for ACAP to continue delivering agronomic (field-based) technical support to farmers statewide, in coordination with federal and state agencies. Funded by the Clean Water Fund. |

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| Best Management Practice (BMP) Program | AAFM provides grants and contracts for capital expenditures on farms in Vermont. The BMP program provides technical and financial assistance for the design, development, and implementation of BMPs. BMPs are site-specific on-farm conservation practices implemented to address the potential for agricultural pollutants to enter the waters of the state. Eligible practices may include manure and agricultural waste storage facilities, composting stack pads, silage leachate collection, laneway development and stream crossings, and clean water diversions. Funded by the Capital Fund, Clean Water Fund, NRCS and Lake Champlain Basin Program. |
| Capital Equipment Assistance Program (CEAP) | Financial assistance is available for new or innovative equipment that will aid in the reduction of surface runoff of agricultural wastes to state waters, improve water quality of state waters, reduce odors from manure application, separate phosphorus from manure, decrease greenhouse gas emissions, and reduce costs to farmers when they apply manure. Funded by the Capital Fund. |
| Conservation Reserve Enhancement Program (CREP) | This program provides technical and financial assistance in developing and installing vegetative buffers. This program funds 15 to 30-year term water quality agreements to remove land from agricultural production and install vegetative buffers to reduce sediment runoff and improve water quality. Funded by the Capital Fund, NRCS, and Lake Champlain Basin Program. |
| Farm Agronomic Practice (FAP) Program | The FAP Program utilizes state funding to help Vermont farms implement soil-based agronomic practices that improve soil quality, soil health, increase crop production, and reduce erosion and agricultural waste discharges. The FAP program also provides education and instructional activity grants to support outreach regarding the impacts of agricultural practices on water quality and current state agricultural water quality regulations. Eligible practices include cover cropping, conservation crop rotation, conservation crop rotation with nurse crop, conservation tillage, no-till pasture and hay land renovation, rotational grazing, manure injection, aeration, educational or instructional activities. Funded by AAFM and Lake Champlain Basin Program. |
| Grassed Waterway and Filter Strip (GWFS) Program | The program provides technical and financial assistance to Vermont farmers for in-field agronomic best practices to address critical source areas, erosion, and surface runoff. Eligible practices include establishment of grassed waterways, filter strips, and critical source field area seedings that will remain established for 10 years. Funded by the Capital Fund and Clean Water Fund. |
| Pasture Surface Water Fencing (PSWF) Program | The PSWF Program provides pasture management technical assistance and financial assistance to Vermont farmers to improve water quality and on-farm livestock exclusion from surface waters statewide. Eligible practices include fence, pipeline, water source development, water tanks, improved permanent water areas, stream crossings, and fence chargers. Funded by the Capital Fund and Clean Water Fund. |
| Vermont Phosphorus Innovation Challenge (VPIC) | Innovative water quality improvement methods for manure management, phosphorus reduction and new techniques that |

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| | directly assist partners and farmers in water quality implementation activities. Funded by the Clean Water Fund. |

### iii. Agency of Commerce and Community Development Funding Programs

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| Better Connections Planning Grant | Better Connections is an award-winning interagency grant program (VTrans, ACCD, ANR, VDH) that supports the implementation of local projects to increase local transportation options, build resilience, and revitalize communities. Funding will help municipalities incorporate stormwater management strategies into downtown and village center transportation and community revitalization plans. |
| Downtown Transportation Fund | In partnership with VTrans, this program helps municipalities incorporate stormwater BMPs into infrastructure improvement projects that make Vermont's downtown areas more pedestrian, bike, and transit friendly. |

### iv. Agency of Natural Resources Funding Programs

In addition to the established funding programs listed below, the Clean Water Service Delivery Act of 2019 (Act 76) changes the administration and implementation of clean water funds in the State of Vermont. Act 76 requires the establishment of four new grant programs going into effect November 1, 2021 (aligning with SFY 2022), listed below. The Clean Water Board will determine funding levels of each program through its annual public budget process, beginning with the SFY 2022 budget.

1. **10 V.S.A. Chapter 37 § 925. Clean Water Service Provider, Water Quality Restoration Formula Grant Program:** Grants to clean water service providers to meet non-regulatory pollutant reduction requirements. The grant amount shall be based on the annual pollutant reduction goal established for the clean water service provider multiplied by the standard cost for pollutant reduction including the costs of administration and reporting. Not more than 15 percent of the total grant amount awarded to a clean water service provider shall be used for administrative costs.
2. **10 V.S.A. Chapter 37 § 926. Water Quality Enhancement Grant Program:** Competitive grant program to fund projects that protect high quality waters, maintain or improve water quality in all waters, restore degraded or stressed waters, create resilient watersheds and communities, and support the public's use and enjoyment of the state's waters. Not more than 15 percent of the total grant amount awarded shall be used for administrative costs.
3. **10 V.S.A. Chapter 37 § 927. Developed Lands Implementation Grant Program:** Grant program to provide grants or financing to persons who are required to obtain a permit to implement regulatory requirements that are necessary to achieve water quality standards, including financing for projects related to the permitting of impervious surface of three acres or more. Not more than 15 percent of the total grant amount awarded shall be used for administrative costs.

4. **10 V.S.A. Chapter 37 § 928. Municipal Stormwater Implementation Grant Program:** Grant program to provide grants to any municipality required to obtain or seek coverage under the Municipal Roads General Permit (MRGP), the Municipal Separate Storm Sewer Systems Permit (MS4), a permit for impervious surface of three acres or more, or a permit required by the Secretary to reduce the adverse impacts to water quality of a discharge or stormwater runoff. Not more than 15 percent of the total grant amount awarded shall be used for administrative costs.

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| Clean Water Service Delivery Act of 2019 (Act 76) development funds | Support development of nutrient pollutant reduction target setting and project tracking and accounting, as well as other requirements associated with developing programs in Act 76 of 2019. This funding supports ANR grant programs including; partner capacity and development related to Tactical Basin Planning, project development, technical capacity (train-the-trainer), landowner outreach, watershed work crews, Lake Champlain Sea Grant green stormwater infrastructure technical support, targeted water-quality monitoring and laboratory testing of water samples. |
| Clean Water State Revolving Fund (CWSRF) Loans | The Clean Water State Revolving Fund (CWSRF) provides low-interest loans for municipal and private entity stormwater, wastewater and natural resources projects. Vermont provides a 20% match to draw down an 80% federal match. The interest rates on loans to private entities will be slightly higher than interest rates to municipalities, and these revenues will be used to offset reduced interest rates on loans to municipalities that promote natural resource projects. By statute, municipal projects always have priority over loans to private entities. The CWSRF provides a powerful tool for the implementation of Section 319-eligible projects, provided that those projects are determined to be eligible for CWSRF support, as described in Chapters 3 and 6 of this Plan. See particularly page 51. |
| Clean Water Initiative Program Grants and Contracts | DEC provides grants and contracts to municipalities, watershed organizations, lake associations, conservation districts, and regional planning commissions for natural resources restoration. Through the Tactical Basin Planning process, DEC can identify and prioritize the award of grants for natural resources projects. |
| | Design & Implementation Block Grant supports partners in managing clean water projects involving preliminary design, final design, and/or implementation. Individual projects are identified in Tactical Basin Plans and listed in DEC Watershed Projects Database. |
| | Ecosystem Restoration Grant Program's goal is to support voluntary projects initiated by our partners that reduce sediment and nutrient pollution, including phosphorus, from runoff and soil erosion that discharge into the state's rivers, streams, lakes, ponds, and wetlands. |
| | River Corridor Conservation Easement grants target critical river corridor and floodplain property to allow for the restoration of channel stability over time to reduce flood hazards, improve water quality, and enhance riparian habitats. River corridor easements ensure no new structures or development within the river corridor, |

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| | support passive restoration by restricting intervention of the river adjustment processes, and provide for the development of a riparian buffer of native woody vegetation. |
| | Project Development & Technical Capacity (Train the Trainer) Block Grant helps prepare for Act 76 by supporting project development to move projects towards design and implementation; support partnerships via technical outreach and capacity building. |
| | Woody Buffer Block Grant supports the implementation of high-priority, cost-effective, native riparian woody buffer plantings. |
| | Watershed Work Crew grant supports local organizations with youth work crews implementing on-the-ground, high priority projects that have been identified in Tactical Basin Plans and sector-based assessments, such as stormwater master plans, road erosion inventories, or lake assessments. |
| Drinking Water State Revolving Fund (DWSRF) Loans | The DWSRF provides low cost loan financing to municipal and privately owned public water systems for capital improvements that improve public health protection and facilitate compliance with the Safe Drinking Water Act. The DWSRF has three separate but related, funding opportunities. The Construction Loan Program provides funding for a variety of water system improvements, for public community water systems and non-profit non-community water systems (i.e. both non- transient-non-community and transient non-community types). The Planning Loan Program provides 0% interest, 5-year term loans to public water systems seeking to conduct preliminary and final design engineering. Source Protection Loans can be used to purchase land or conservation easements to help protect public water sources and ensure compliance with state and federal drinking water standards. |
| Onsite Loan Fund | In 2012, the Vermont Legislature established the Vermont Wastewater and Potable Water Revolving Loan Fund (aka the On-site Loan Program). This loan program was created to provide Vermont residents or homeowners a source of low- cost financing for the repair or replacement of failed septic and/or water supply systems if they cannot obtain traditional financing. |
| Fish and Wildlife Department Watershed Grants | The Vermont Watershed Grants Program, co-administered by DEC and the Department of Fish and Wildlife, distributes grant dollars for noteworthy local and regional water-related projects within Vermont. The funding source for this program is derived from the sale of the Vermont Conservation License Plate. |
| Lake Champlain Basin Program TMDL Implementation | EPA awarded the State of Vermont and the Lake Champlain Basin Program funds to implement the Lake Champlain Phosphorus Total Maximum Daily Loads (TMDL), which sets phosphorus pollution targets for Vermont segments of Lake Champlain. For the State of Vermont, the Agency of Natural Resources, including Departments of Environmental Conservation, Forest, Parks and Recreation, and Fish & Wildlife, and AAFM, are administering these funds. These funds support projects that will result in reduced phosphorus and sediment loads from developed lands, agricultural lands, and wastewater treatment facilities, and restore wetlands in the Lake Champlain Basin of Vermont. |

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| Lake in Crisis Fund | Act 168 of the 2018 Session created a Lake in Crisis Fund and requires the ANR to recommend a budget for the fund. Currently only one lake, Lake Carmi, has been designated as a Lake in Crisis. ANR and AAFM use other grant programs to support phosphorus mitigation in the Lake Carmi watershed. |
| Municipal Pollution Control Grants | In addition to low-interest loans through the Clean Water State Revolving Loan Funds, some municipal clean water projects are eligible for municipal pollution control grants in FY20 up to 35% of the project cost. The source of funding for municipal pollution control grants is the Capital Bill. These grants are for municipalities only. The Legislature has adopted a priority system for municipal pollution control grants,10 V.S.A. 1626b(c) & 1628. |
| Skidder Bridge Program | The Department of Forests, Parks and Recreation (FPR) provides direct grants to loggers to reimburse a portion of the cost of skidder bridges (per 2017 Act 75, 10 V.S.A. § 2622a). Portable skidder bridges prevent erosion and runoff at stream crossings on logging jobs. |
| State Forests and Recreational Access Points Best Management Practices (BMPs) | This is a new program in 2021 that supports adapting Municipal Roads General Permit (MRGP) inventory/prioritization methodology for ANR owned forest roads, VAST trails and State Park access roads, developing a field application and companion database to gather and store data, and constructing projects based on the prioritized list of road BMPs to reduce nutrient and sediment pollution. |
| Water Infrastructure Sponsorship Program (WISPr) | New in 2019, this program allows up to 10% of a municipality's Clean Water State Revolving Fund loan to be used to implement natural resources projects. A reduced administrative fee over the life of the loan will cover the total value of the sponsored restoration project. |

### v. Agency of Transportation (VTrans)

VTrans supports several programs under its Highway Division. The mission of the Highway Division is to timely and cost-effectively deliver quality programs and projects in support of the Agency's mission.

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| Better Roads Program | Construction projects funded by grants to municipalities in the Better Roads Program are meant to be quick, low cost projects that are easy to advance without all the requirements of federal funding. Example construction projects include ditching, check dams, gravel wetlands, stream bank or slope stabilization, and structure/culvert upgrades. Municipalities have 12 months, or one state fiscal year, to complete the construction projects. In addition to the construction projects which are funded in part by the Clean Water Fund, VTrans also funds road erosion inventories through the program, as required by the Municipal Roads General Permit. Funding source is Clean Water Fund. |
| Municipal Highway Stormwater Mitigation Program | Environmental mitigation activities, including pollution prevention and pollution abatement activities and mitigation, to address stormwater management, control, and water pollution prevention |

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| | or abatement related to highway construction or due to highway runoff. |
| Municipal Roads Grants-in-Aid | Provides financial assistance to municipalities to bring hydrologically connected municipal road sections into full compliance with the MRGP. Funds are dispersed by formula to all participating municipalities based on hydrologically connected road miles. In SFY 2018-2020, municipalities enrolled through regional planning commissions and complete construction and regional planning commissions provide project verification and reporting. Practices eligible for funding under this project include drainage ditch installation and upgrades, turnouts, removal of high road shoulders, and stabilization of drainage culverts and catch basin outlets, and on Class 4 roads, stabilization of gully erosion. Funding source is the Clean Water Fund. |
| Transportation Alternatives Program (TAP) | Environmental mitigation activities, including pollution prevention and pollution abatement activities and mitigation, to address stormwater management, control, and water pollution prevention or abatement related to highway construction or due to highway runoff |

### vi. Vermont Housing and Conservation Board (VHCB)

The Vermont Housing and Conservation Board has dual goals of creating affordable housing for Vermonters, and conserving and protecting Vermont's agricultural land, forestland, historic properties, important natural areas, and recreational lands are of primary importance to the economic vitality and quality of life of the State.

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| Conservation Grants | Part of VHCB's core funding, this allocation is used for grants to eligible applicants (land trusts and other conservation non-profits, towns, certain state agencies) for conservation and water-quality related investments in fee lands and conservation easements. All grants will require perpetual conservation restrictions. Those with surface waters will include specific water quality-related easement provisions such as riparian buffers and wetland protection zones. |
| Farmland Retirement Grants | VHCB works closely with other partners – particularly AAFM and ANR – to identify agricultural land that is difficult to farm without adversely impacting water quality. These funds allow VHCB to help fund the purchase and/or conservation of such properties with a goal of taking them all or mostly out of production. All grants require perpetual conservation restrictions. |
| Water Quality Grants | VHCB uses this funding to award grants to farmers for water quality-related capital improvements. Eligible projects include production area improvements, manure management projects, farm equipment and pasture management. Grants typically help farmers pay for project components that state and federal grant programs cannot cover. In cases of significant hardship, the grants may assist farmers who are otherwise unable to fully meet the cost share requirements for priority AAFM BMP or Natural Resources Conservation Service projects. |

## B. Funding Sources

State agencies' clean water investments are supported by a variety of funding sources including state, federal and loan funds. Figure 5 below provides an overview of the proportion of total dollars awarded by state agencies to clean water projects by funding source from SFY 2016 to 2019. These proportions may not reflect how they will be allocated moving forward. For example, the clean water fund is expected to become a bigger percent of the total funding in the next five years. The variety of funding sources are necessary to support all aspects of clean water projects, from outreach and project development to construction.

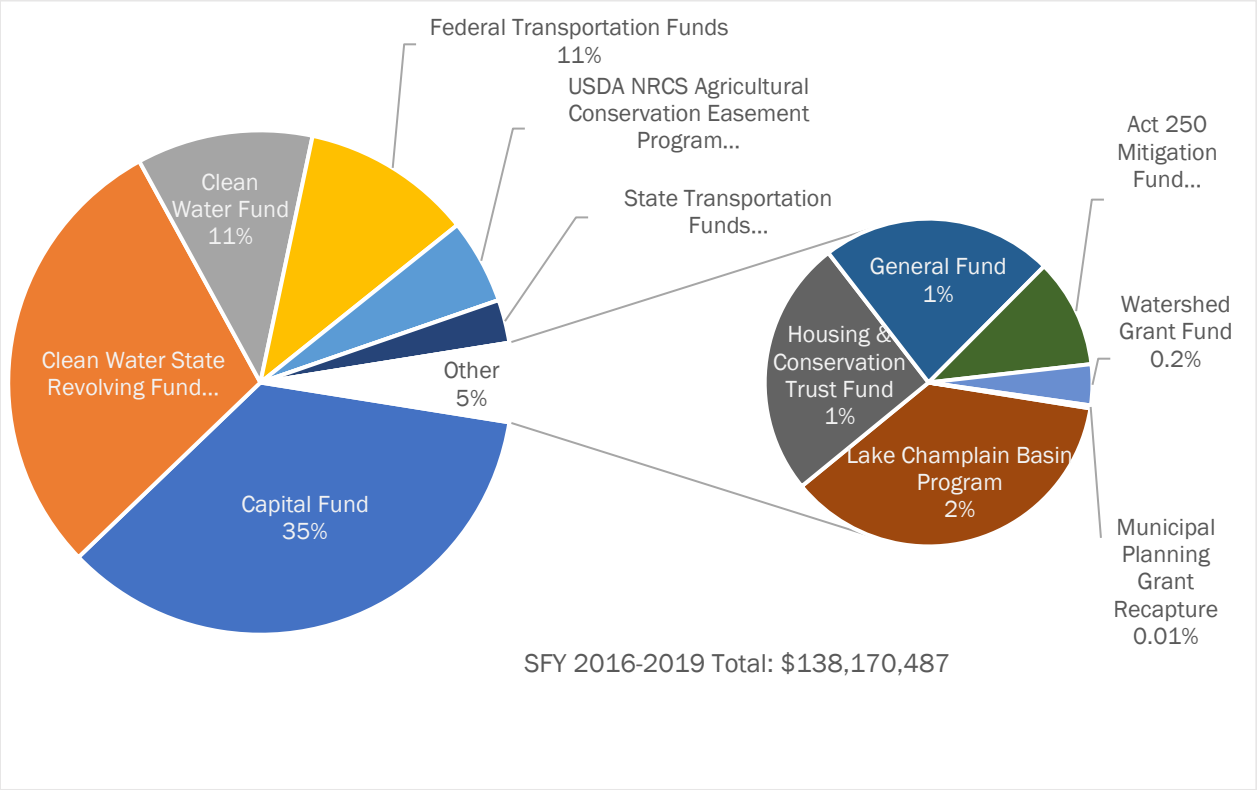
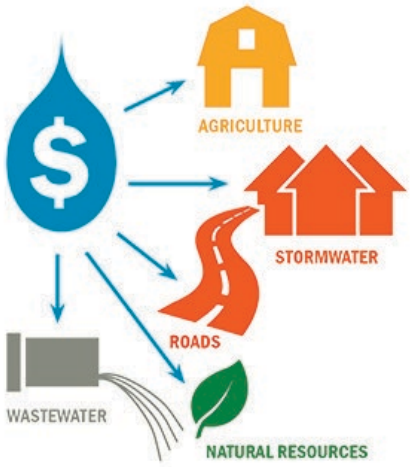



Figure 5. Proportion of dollars awarded to clean water projects through State of Vermont agencies, SFY 2016-2019 by funding or financing source[47]

[47] Investments reported include state and federal dollars awarded to projects by state agencies, but exclude federal funds awarded to projects directly by federal agencies. Federal funding sources included in this report: Clean Water State Revolving Fund, Federal Transportation Funds, USDA NRCS Agricultural Conservation Easement Program, and Lake Champlain Basin Program.

### i. Clean Water Board Budget

Vermont's clean water funding helps municipalities, farmers, and others implement projects that will **reduce nutrient and sediment pollution** from all sectors: agriculture; developed lands, including stormwater and roads; unstable streambanks and lakeshores; and wastewater. Clean water projects also protect public health and safety, support Clean Water Act compliance, increase flood resilience, enhance recreation, improve fish and wildlife habitat, save money over the long-term and leverage federal funds.




Vermont's clean water funding comprises **Capital Funds** and the **Clean Water Fund** with revenue from the Meals and Rooms Tax Allocation, Property Transfer Tax Surcharge and unclaimed bottle deposits.

Recommendations for how state Clean Water Funding is allocated are made by the **Clean Water Board**, with representation from five state agency secretaries: Administration; Agriculture, Food and Markets; Commerce and Community Development; Natural Resources; and Transportation. In addition, four members of the public are appointed by the Governor.

### ii. Federal Funding Sources and Programs

Vermont DEC partners with a variety of federal partners to implement funding programs or assist with federal regulations. The following section includes brief descriptions of important and the most prominent federal NPS-related programs that play a vital role in managing and controlling NPS pollution within Vermont.

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| Clean Water Act Section 106: Pollution Control, Water Quality Monitoring | The federal Clean Water Act Section 106 funds support staffing and related expenses to support statewide water quality monitoring and assessments to ensure that the state's surface waters – rivers, streams, lakes, ponds, and wetlands – are safe for public uses, and that municipally-operated wastewater control facilities and other dischargers into surface waters operate in a manner that maintains good water quality. |
| Clean Water Act Section 319 Nonpoint Source Funding | The federal Clean Water Act Section 319 grant supports approximately 10 Full Time Equivilents of DEC staff efforts to implement state clean water improvement projects. The grant focuses on addressing nonpoint source pollution, the leading cause of water use impairment to Vermont's surface water and ground water resources. Funding supports the implementation of the major nutrient TMDLs statewide, including the Lake Champlain TMDLs for phosphorus, the Lake Memphremagog TMDL for phosphorus, and the Long Island Sound/Connecticut River TMDL for nitrogen.See more about the mangement of this grant in Section D below. |

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| Clean Water Act Section 604b | Section 604b funds, awarded by EPA to Vermont since 1989, are used for Tactical Basin Planning purposes that may include a host of planning related activities for NPS management. Annual funding is typically $100,000 of which 40% is passed through to the eleven Regional Planning Commissions (RPC) in Vermont. A wide variety of NPS-planning related activities are undertaken by the RPCs using these funds. The remaining 60% is used by DEC in conjunction with its ongoing water quality and NPS pollution assessment and Section 305(b) reporting efforts. |
| Lake Champlain Basin Program (LCBP) | The Lake Champlain Basin Program (LCBP), a program partner of NEIWPCC, is a Congressionally-designated initiative to restore and protect Lake Champlain and its surrounding watershed. LCBP works with partners in New York, Vermont, and Québec to coordinate and fund efforts to address challenges in the areas of phosphorus pollution, toxic substances, biodiversity, aquatic invasive species, and climate change, as guided by LCBP's Opportunities for Action Management Plan. LCBP has provided millions of dollars over the years for nonpoint source implementation projects as well as education and outreach in several grant opportunities available to partners throughout the Champlain Basin. LCBP's Local Implementation Grants are awarded in one of several categories: pollution prevention and habitat conservation, aquatic invasive species spread prevention, education and outreach, and organizational support. In addition, LCBP's annual budget process solicits and prioritizes specific technical and education and outreach initiatives for funding, to achieve the goals of Opportunities for Action and provide critical information to other research and management partners who are working to improve the health of the lake. |
| Department of the Interior – Fish and Wildlife Service (FWS) | USFWS's Partners for Fish and Wildlife (PFW) Habitat Restoration Program was established in 1987 for on-the-ground wetland restoration projects on private lands. The Program can assist with projects in all habitat types which conserve or restore native vegetation, hydrology, and soils associated with imperiled ecosystems such as longleaf pine, bottomland hardwoods, tropical forests, native prairies, marshes, rivers and streams, or otherwise provide an important habitat requisite for a rare, declining or protected species. Locally-based field biologists work one-on-one with private landowners and other partners to plan, implement, and monitor their projects. PFW Program field staff help landowners find other sources of funding and help them through the permitting process, as necessary. |
| US Army Corps of Engineers (USACE) | The US Army Corps of Engineers (COE or Corps) is a worldwide organization that provides engineering services and construction support for a wide variety of military and civil projects. The Corps primary civilian mission is to develop, manage and protect water resources throughout the country. Corps projects reduce flood damage, improve harbors and navigation channels, protect streambanks and shorelines, generate hydroelectric power, and preserve and |

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| | safeguard the environment. Through its regulatory program, the Corps administers laws to regulate various activities in waters and wetlands. Vermonters benefit from Federal Corps funding under Sections 542 (Lake Champlain Ecosystem Restoration) and 1177 (Dam Modification and Reconstruction) of the Water Resources Development Act |
| Natural Resources Conservation Service (NRCS) - Farm Bill | The Agriculture Improvement Act of 2018 (2018 Farm Bill) provides support for agricultural conservation efforts with technical and financial assistance through conservation practices, activities and enhancements on agricultural and forest land. The 2018 Farm Bill added the provision and funding for source water protection. The various Farm Bill programs are described below. |
| Environmental Quality Incentive Program (EQIP) | The Environmental Quality Incentives Program (EQIP) provides financial and technical assistance to agricultural producers to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, increased soil health and reduced soil erosion and sedimentation, improved or created wildlife habitat, and mitigation against increasing weather volatility. |
| Agricultural Conservation Easement Program (ACEP) | The Agricultural Conservation Easement Program helps landowners, land trusts, and other entities protect, restore, and enhance wetlands, grasslands, and working farms and ranches through conservation easements. |
| Regional Conservation Partners Program (RCPP) | The Regional Conservation Partnership Program (RCPP) promotes coordination between NRCS and its partners to deliver conservation assistance to producers and landowners. NRCS provides assistance to producers through partnership agreements and RCPP conservation program contracts. |
| Federal Highway Administration (FHWA) | These funds are used for a variety of purposes, such as paving roads, rehabilitating or repairing bridges and improving infrastructure in downtowns. Awards result in reimbursement grants that require 20 percent in matching funds from the grantee. |

## C. NPS Regulatory Programs

### i. Agricultural Nonpoint Source Pollution Control Program

The Vermont Agency of Agriculture, Food & Markets (AAFM) facilitates, supports, and encourages the growth and viability of agriculture in Vermont while protecting the working landscape, human health, animal health, plant health, consumers, and the environment. The AAFM Water Quality Division is responsible for administering the Vermont Agricultural Nonpoint Source Pollution Control Program.

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| Required Agricultural Practices (RAPs) | The Required Agricultural Practices (RAPs) are standards to which all types of farms must be managed to reduce the impact of agricultural activities to water quality. The RAPs include required practices and management strategies, some of which |

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| | apply to all farms and some of which are specific to certain sizes of operation or to certain environmental factors. |
| Large Farm Operation (LFO) permit program | The Large Farm Operation (LFO) Program is designed to ensure that Vermont LFOs have land management practices implemented and structures in place in production areas in order to prevent a direct discharge. The LFO program requires large sized farms to operate under an individual LFO permit. The program's requirements aim to reduce the amount of phosphorus and other nutrients that would find their way into Vermont waterways. The LFO Individual Permit establishes regulatory requirements for Large Farm Operations in the state of Vermont pertaining to the management of agricultural wastes and prohibits the direct discharge of waste into state waters. Unless otherwise given notice by AAFM, all LFOs in the state of Vermont are required to operate under the coverage of an Individual Permit. LFOs are inspected annually. |
| Medium Farm Operation (MFO) permit program | Created in 2006 in response to changes in federal regulations for Concentrated Animal Feeding Operations (CAFO), the Medium Farm Operation (MFO) program provides a Vermont-specific program that allows medium sized farms to seek coverage under a single General Permit issued by AAFM. The program's requirements aim to reduce the amount of phosphorus and other nutrients entering Vermont waterways. The MFO Program Rules establish AAFM authority to develop regulatory requirements for Medium Farm Operations in Vermont through the MFO General Permit pertaining to the management of agricultural wastes and prohibits the direct discharge of waste into state waters. Unless otherwise given notice by AAFM, all MFOs in the state of Vermont are required to operate under the coverage of a General Permit. The Medium Farm Operation General Permit is valid for a five-year period at which time it is renewed by the AAFM. MFOs are inspected at least once every three years. |
| Certified Small Farm Operation (CSFO) certification program | As of Act 64 in 2015, small farm operations above a particular farm size are required to annually self-certify their operation. All CSFOs are inspected at least once every seven years for compliance with the RAPs. The goal of this program is to support famers to ensure their clear understanding of the RAPs and NPS regulations, while providing assistance to assess, plan and implement any necessary conservation and management practice that might be necessary to meet water quality goals. |

### ii. Drinking Water and Groundwater Protection

The mission of DEC's Drinking Water and Groundwater Protection Division is to protect human health and the environment for this and future generations by managing Vermont's drinking water supplies; protecting the quality and quantity of Vermont's groundwater resources; and regulating wastewater disposal activities that could adversely affect groundwater. The Division accomplishes this mission through its outreach, education,

assistance and regulatory activities. The following table displays NPS related regulations or permit programs.

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| Public Water Source Permits | The Program reviews and issues permits for new or changes to existing drinking water sources (wells, springs, surface water intakes) to serve public water systems (more than 24 people). Staff review proposed locations for contaminant threats, meeting construction standards and isolation distances as well as quantity and quality, interference and source protection areas and plans. |
| Wastewater System Permits | The Program issues water/wastewater permits (WW Permits) for soil-based wastewater systems with flows of less than 6,500 gallons per day, for potable water supplies (water supplies that are not public water supplies), and for municipal water and sewer connections. Staff also administers the licensed designer program and reviews innovative and alternative systems for potential use in the state. |
| Indirect Discharge Permits | The Indirect Discharge Rules (IDR), Chapter 14 of the Environmental Protection Rules[48], have been minimally updated with an effective date of April 12, 2019. The revisions were in association with the newly revised Wastewater System and Potable Water Supply Rules effective April 12, 2019. It clarifies that the revised Wastewater System and Potable Water Supply Rules will regulate non-sewage wastewater systems that are less than 6,500 gallons per day (GPD). In addition, many indirect discharging systems are authorized under the General Permit. The Indirect Discharge Rules (IDR) contain requirements for permitting land-based, sewage disposal facilities with design flows greater than 6,499 gallons per day. This includes both soil-based (leach field) and ground surface spray disposal systems. The IDRs require a certified operator for all wastewater treatment facilities other than septic tank/leach field systems. The IDRs also regulate the land-application of certain non-sewage food processing wastes. |
| Underground Injection Control | According to EPA's definition, there are six classes of injection wells. Classes I, II, III do not exist in Vermont and are banned under the 2014 Vermont UIC Rule. Class IV injection wells are shallow hazardous waste disposal wells and are permitted in Vermont only when consistent with a corrective action plan approved by the Secretary. Class VI wells, involve the injection of carbon dioxide into deep geologic formations for the purpose of carbon sequestration. Class VI injection wells do not currently exist in Vermont and are not expected to be proposed for the foreseeable future. Class V injection wells, which are typically shallow disposal systems, pose a potential risk to the quality of groundwater, with many high-risk categories now banned in Vermont under the 2014 UIC Rule. The 2014 UIC Rule clearly identifies those Class V underground injection activities that |

[48] Chapter 14 of the Environmental Protection Rules can be accessed here: https://dec.vermont.gov/sites/dec/files/dwgwp/indirect/pdfs/Indirect-Rules-April-12-2019.pdf

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| | pose a moderate risk to groundwater quality and that require a permit. Examples include, but are not limited to, specific ~~the~~ listed industrial processes, boiler blowdown waste and mineral processing wastes. Some activities may be conditionally exempt from permitting (e.g. certain water treatment system backwash systems, geothermal extraction wells, and some mining wastes). In addition to clarifying permitting requirements, the UIC Rule provides technical standards that are applied to permitted activities. |
| PFAS (Per- and Polyfluoroalkyl Substances) | In response to PFAS contamination in Vermont's environment, Act 21[49], an act relating to the regulation of polyfluoroalkyl substances in drinking and surface waters, was passed by the Legislature and signed by Governor Scott in May, 2019. This law established an interim standard of 20 parts per trillion of detected PFAS compounds in Public Community and Non-Transient Non-Community Water Systems. If PFAS compounds are found above the interim standard, then water systems will be required to protect public health through public notice, over a short-term plan and a long-term plan. The purpose of the short-term plan is to protect public health quickly so that a system can have the required "Do Not Drink" public notice lifted, while a long-term plan is developed. The public notice will direct Public Water Systems to obtain alternative water. |

### iii. Environmental Assistance

The Environmental Assistance Office (EAO) of DEC helps Vermonters follow environmental regulations, reduce impacts to human health and the environment, and increase sustainability. We offer environmental compliance assistance to Vermont businesses and municipalities, provide recognition programs for green businesses in Vermont, and promote practices that reduce, eliminate, or prevent pollution at its source. EAO assists individuals, businesses, communities, state agencies, and others to identify effective and economical ways to reduce waste and pollution at the source.

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| Pollution Prevention Planning | The purpose of pollution prevention planning is to identify opportunities to reduce or eliminate the generation of hazardous waste and the use of toxic chemicals at the source rather than treating or controlling these materials after they have been created or used. Vermont's Pollution Prevention Planning law requires businesses that exceed certain thresholds to complete pollution prevention plans, submit annual progress reports that describe progress made toward reduction goals established in the plan, and to submit annual fees. |

[49] Act 21 relating to the regulation of polyfluoroalkyl substances (PFAs) in drinking and surface waters, available here: https://legislature.vermont.gov/Documents/2020/Docs/ACTS/ACT021/ACT021%20As%20Enacted.pdf

### iv. Department of Forest Parks and Recreation

The Department of Forests, Parks and Recreation (FPR) is responsible for the conservation and management of Vermont's forest resources, the operation and maintenance of the State Park system, and the promotion and support of outdoor recreation for Vermonters and our visitors. In addition, FPR is responsible for the acquisition, planning coordination and administration of all Agency of Natural Resources lands. Department employees are stationed throughout Vermont, including offices in Montpelier and at five regional locations.

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| Accepted Management Practices (AMPs) for Logging | The 1986 Vermont Legislature passed amendments to Vermont's water quality statutes, which stated that "it is the policy of the state to seek over the long term to upgrade the quality of waters and to reduce existing risks to water quality." The revised state law requires permits for discharges of "any waste, substance or material into the waters of the state." However, individual permits are not required for any discharges that inadvertently result from logging operations, if responsible management practices have been followed to protect water quality. Acceptable Management Practices (AMPs) for Maintaining Water Quality on Logging Jobs in Vermont were developed and adopted as rules for Vermont's water quality statutes and became effective in 1987 and were subsequently revised effective August 11, 2018. AMPs are intended and designed to prevent sediment, petroleum products, and woody debris (logging slash) from entering Vermont's waters. In 2019 a new AMP manual was produced by FPR that includes the new changes to the AMPs, as well as pertinent information on job planning and protecting wetlands. FPR is currently working on the creation of an AMP smart-phone App that will allow easy access to the manual, as well as include other tools that will assist in compliance with the AMPs.<br>In addition, FPR provides technical assistance to the Skidder Bridge Rental Program that is run by the Natural Resource Conservation Districts. In 2018, FPR also began renting heavy duty truck bridges to loggers and foresters to assist in meeting the AMP requirements when crossing larger streams. |

### v. Waste Management and Prevention

The Waste Management and Prevention Division oversees the use, treatment and handling of hazardous and solid wastes. The Division performs emergency response for hazardous materials spills, issues permits for federal and state programs regulating hazardous wastes, solid wastes, and underground storage tanks, and manages cleanup at hazardous sites under state and federal authorities.

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| Hazardous materials spills emergency response | The DEC Spill Program[50] assesses the environmental impact of hazardous materials spills, oversees the cleanup of spills, and enforces environmental laws and regulations triggered by spills. A program member is available 24-hours a day, year-round. The |

[50] DEC Spill Management website: https://dec.vermont.gov/waste-management/spills

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| | DEC Spill Program works with first response organizations and responsible parties to determine if a spill impacts or threatens sensitive receptors such as surface waters or drinking water wells. Program members oversee the cleanup of a spills, and work with Environmental Enforcement to enforce environmental regulations triggered by spills. The DEC Spill Program has the authority to hire cleanup contractors when the responsible party cannot be identified in a timely manner or is unwilling/unable to conduct the cleanup. It is also obligated to pursue cost recovery from potentially responsible parties when State funds have been expended. |
| Contaminated Sites | The Sites Management Section provides State oversight for the investigation and cleanup of properties where a release of a hazardous material has contaminated the environment, including soils, groundwater, surface water, and indoor air. This section includes brownfield restoration under state and federal authorities, including the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response Compensation and Liability Act (CERCLA, also known as Superfund), |
| Hazardous Waste Management | The Vermont Hazardous Waste Management Program regulates the generation, transportation, storage, treatment, recycling and disposal of hazardous waste, used oil, and universal hazardous waste. The program, which is authorized by the EPA to be implemented in lieu of the federal hazardous waste program, maintains the Vermont Hazardous Waste Management Regulations (VHWMR)[51]. The program conducts inspections to evaluate compliance and responds to citizens' complaints regarding the mishandling of hazardous waste; tracks hazardous waste manifests (shipping records) to ensure all hazardous wastes are delivered to appropriate facilities; issues permits to facilities that engage in long-term or commercial storage and facilities that treat or dispose of hazardous waste; and provides regulatory assistance; and tracks hazardous waste data. |
| Underground storage tank permitting | The regulation of Underground Storage Tank (UST) was created in 1985 to regulate the installation and operation of underground petroleum/chemical storage tanks. The goal of the Program is to protect human health and the environment by preventing releases of liquid petroleum and hazardous substances from storage tank systems. The release of these regulated products into the environment threatens groundwater resources and can cause explosive vapors to seep into confined spaces and occupied dwellings. Vermont's underground and aboveground storage tank rules prohibit the installation of a new underground liquid fuel tank (heating oil, gasoline, kerosene, etc.) within the source protection area of a public water supply. An update to the current UST rule is expected in 2020. |

[51] Vermont Hazardous Waste Management Regulations: https://dec.vermont.gov/waste-management/hazardous/regulations

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| Residuals Management and Emerging Contaminants | This program oversees the management of residual materials, industrial and municipal wastes with the potential for beneficial use on soil. Examples of residual materials include wastewater treatment sludges, septage, short paper fiber, wood ashes and water treatment residuals. The primary options for final management of residual materials in Vermont include land application, landfill disposal, or septage haulers |

### vi. Lake and Shoreland Management and Protection

The Lakes and Ponds Management and Protection Program works to protect, maintain, enhance, and restore the health of Vermont lakes and the public uses that healthy lake ecosystems provide through outreach and education, monitoring and assessment, and regulatory programs.

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| Aquatic Nuisance Control | A permit is required for activities used to control nuisance aquatic plants, insects, or other aquatic life (including lamprey) in Vermont's waterbodies. Examples include use of pesticides, pond dyes, copper-based algaecides, bottom barriers, powered mechanical devices, and structural and biological controls. Aquatic Nuisance Control Permits are issued under 10 V.S.A. Chapter 50, Subsection 1455. |
| Lake Encroachment | Projects encroaching on public waters (from mean water level towards the lake) such as docks, walls, boathouses, bridges, water intakes, cables, dredging, or fill requires a permit. Lake Encroachment Permits are issued under 29 V.S.A. Chapter 11. |
| Lake Shoreland | As of July 1, 2014, changes to land use within 250 feet of a lake's mean water level (also known as the Protected Shoreland Area), such as any new development, redevelopment, or vegetation removal, may require a permit. Shoreland Permits are issued under 10 V.S.A Chapter 49A, Subsections 1441–1449. |
| Pesticide General Permit | The Pesticide General Permit was issued pursuant to Vermont's federally delegated National Pollutant Discharge Elimination System (NPDES) program. Discharges from the application of pesticides to waters of the state for the following pesticide use patterns require coverage under Vermont's Pesticide General Permit: (1) mosquito and other flying insect pest control; (2) weed and algae control; (3) animal pest control; and (4) forest canopy pest control. |

### vii. Rivers Program

The Vermont Rivers Program is responsible for protecting and restoring natural river and floodplain processes to enhance water quality, ecological health, and flood resilience. River resource protection is achieved through a combination of permitting, regulatory/non-regulatory technical assistance, assessment, planning, education, and outreach.

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| River Management and Stream Alteration General Permit | The River Management Program provides regulatory review and technical assistance to landowners, municipalities, non-governmental organizations and other agencies to help |

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| | determine the appropriate river/stream channel management practices necessary to resolve and avoid conflicts with river systems. Stream Alteration Rules and a General Permit establish first-in-the- nation equilibrium and connectivity standards and which regulate next-flood and emergency protective measures. To meet the equilibrium and connectivity standards, a proposed project shall not: (a) result in conditions that cause or perpetuate the un-natural raising or lowering of the channel's bed elevation or (b) create a significant disconnect in the stream bed, banks or floodplain that will cause damage related to erosion or deposition in the stream or create a barrier to the movement of aquatic biota. |
| Streamflow Protection | The goal of the Streamflow Protection Program is to maintain river or stream flows necessary to protect aquatic habitat and stream ecology. The program addresses the timing, frequency, duration and magnitude of both high and low flow events and their influence on the physical and biological attributes of a stream or river. From a regulatory standpoint, this program issues Section 401 water quality certifications to moderate or cease streamflow and reservoir level fluctuations, including those associated with hydroelectric projects and other dams. |
| River Corridor and Floodplain Protection and Flood Hazard Area & River Corridor Permit | Under an annual cooperative agreement with the Federal Emergency Management Agency (FEMA), DEC provides technical support to 249 Vermont communities enrolled in the National Flood Insurance Program (NFIP). The River Corridor and Floodplain Protection Program provides technical assistance, education and outreach on floodplain management, flood hazard mapping and flood insurance. This Program has established state floodplain rules that set a high standards of "no adverse impact"[52] in floodplains and river corridors and address all developments exempt from municipal regulation, including state buildings and transportation facilities, utility projects and agricultural structures. Flood Hazard Area and River Corridor Protection Procedures have also been adopted by DEC to guide the regulation of developments under Act 250 and Section 248; establish map amendment and revision procedures; and river corridor BMPs (e.g. establishment and maintenance of riparian buffers).<br>A General Permit [53]was issued pursuant to 10 V.S.A. §754 to regulate activities exempt from municipal regulation in flood hazard areas and river corridors. These activities include state-owned and operated institutions and facilities, accepted agricultural and silvicultural practices, and power generating and transmission facilities seeking a Certificate of Public Good from the Public Service Board. |

52 To meet "no adverse impact" standard, a proposed project shall not: (a) be located within a river corridor, (b) decrease storage capacity within FEMA designated flood hazard area without providing compensatory storage to offset impacts or increase flood elevations or velocities for adjacent landowners.

53 Flood Hazard Area & River Corridor General Permit can be accessed here: https://dec.vermont.gov/sites/dec/files/wsm/rivers/docs/rv_FHARC_GP_2016-08-10.pdf

### viii. Stormwater Management

The Stormwater Management Program provides regulatory oversight and technical assistance to 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.

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| Operational Permit | The Operational Stormwater Permit Program regulates runoff from impervious surfaces (rooftops, paved/gravel roads, parking areas, etc.). The Program has specific jurisdictional thresholds based on the amount of impervious surface as per the Stormwater Management Rules - either Chapter 18 (Stormwater Management Rule for Non-Stormwater Impaired Waters) or Chapter 22 (Stormwater Management Rule for Stormwater Impaired Waters). In general, projects creating more than one acre of new impervious surface, or projects that expand existing impervious surfaces where the total resulting impervious surface is greater than one acre require permit coverage. Projects requiring permit coverage must design a management system in compliance with standards contained in the 2017 Vermont Stormwater Management Manual (VSMM). |
| Construction Permit | The Construction Stormwater Permit (CSP), originally issued in 1997, addresses stormwater runoff from earth disturbance activity involving one or more acres of land and is a requirement of the federal Clean Water Act. DEC is delegated to issue these permits. In general, compliance with the CSP requires the development of an erosion prevention and sediment control plan. The goals of each CSP-based plan is to minimize the erosion of disturbed land and soils and to minimize or eliminate the discharge of sediment through the implementation of appropriate erosion prevention and sediment control measures. |
| Municipal Separate Storm Sewer System (MS4) Permit Program | Under the MS4 permitting program, permittees are required to develop a stormwater management program that includes six Minimum Control Measures (MCM) designed to reduce the potential for pollutants to enter the MS4 system and discharge to surface waters. The six MCMs include public education and outreach, public participation/involvement, illicit discharge detection and elimination, construction site runoff control, post-construction runoff control, and pollution prevention/good housekeeping. The regulated MS4s submit annual reports detailing their progress on MCM implementation.<br>Regulated MS4s that discharge to waters impaired by stormwater and are also required to develop Flow Restoration Plans to implement the hydrology-based stormwater TMDLs and Phosphorus Control Plans designed to achieve a level of phosphorus reduction equivalent to the percent reduction target for developed land in the associated TMDL lake segment(s) as applied to municipally-owned, developed lands. The extensive deployment of stormwater management |

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| | infrastructure associated with this requirement will contribute substantially to phosphorus reduction in Lake Champlain. |
| Municipal Roads General Permit (MRGP) | The Municipal Roads General Permit is intended to achieve significant reductions in stormwater-related erosion from municipal roads, both paved and unpaved. Municipalities will implement a customized, multi-year plan to stabilize their road drainage system. The plan will include bringing road drainage systems up to basic maintenance standards, and additional corrective measure to reduce erosion as necessary to meet a TMDL or other water quality restoration effort. The permit is required by Act 64, the Vermont Clean Water Act, and the Lake Champlain Phase I TMDL. |
| Multi-Sector General Permit (MSGP) | The MSGP is a federally mandated National Pollutant Discharge Elimination System (NPDES) permit that covers new and existing discharges of stormwater from industrial facilities. Industrial facilities conduct activities and use materials that have the potential to impact the quality of Vermont's waters. The permit requires facilities to examine potential sources of pollution, implement measures to reduce the risk of stormwater contamination, and test stormwater discharges for sources of pollution. In Vermont, DEC is the permitting authority and administers the MSGP. Permit coverage is required by private and municipal industries identified on the MSGP Standard Industrial Classification (SIC) code list. |
| Developed Lands Permit | The final Developed Lands General Permit (3-9050) was issued in 2020 and replaces previous versions of the operational permits. It is an important component of the Vermont Clean Water Act of 2015 (Act 64) and is designed to assist in the implementation of clean-up efforts in Lake Champlain, Lake Memphremagog, and stormwater-impaired waters, while also protecting high quality surface waters statewide. This general permit covers all operational stormwater permitting, including new development, redevelopment, and permit renewal. Additionally, this general permit serves as the "Three-Acre General Permit" as required under the Vermont Clean Water Act. |

### ix. Wetland Program

The Vermont Wetlands Program is responsible for identifying and protecting wetlands and the functions and values they provide by the implementation of the Vermont Wetland Rules.[54] Activities to achieve these goals include education, project review, permitting, and enforcement.

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| Wetland Permits | The State of Vermont protects wetlands which provide significant functions and values and also protects a buffer zone directly adjacent to significant wetlands. Wetlands in Vermont are classified as Class I, II, or III based on the significance of the functions and values they provide. Class I and Class II wetlands provide significant functions and values and are protected by |

[54] Vermont Wetland Rules can be accessed here: https://dec.vermont.gov/watershed/wetlands/jurisdictional/rules

| | |
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| | the Vermont Wetland Rules. Any activity within a Class I or II wetland or buffer zone which is not exempt or considered an "allowed use" under the Vermont Wetland Rules requires a permit. |

## D. NPS Program Administration and Oversight

EPA's Section 319 guidance outlines how states can use Federal Section 319 funding for program activities and watershed projects.[55] The guidance includes the requirement to submit an annual workplan to EPA describing how the Section 319 award will be spent in the state. In addition, an annual report is submitted to EPA demonstrating progress with the goals and objectives of this Management Plan, including:

- A summary of major accomplishments and updates of completed or ongoing milestones;
- A description of Section 319-funded statewide programs and completed Section 319-funded or leveraged watershed projects;
- A list of active Section 319-funded or leveraged projects with expected completion dates;
- A summary of water quality improvements (e.g., restoration of impaired waters or other notable environmental results); and
- Estimated NPS pollutant load reductions (i.e., total phosphorus and sediment) accomplished by NPS watershed projects and reported in EPA's Grants Reporting and Tracking System (GRTS).

The table in Appendix A serves as a basis for demonstrating progress on this plan. DEC's Nonpoint Source Coordinator fulfills these requirements each year.

Typically, 50 percent of Section 319 federal funding is used to support program activities, and 50 percent is used to support NPS-related and watershed-related implementation projects. The Section 319 guidance includes a provision that gives flexibility in the use of Section 319 funds to states able to appropriate (or "leverage") a large amount of state funds (equal to or more than the full federal Section 319 allocation) for eligible NPS watershed projects. A state that meets specific criteria to qualify for this "leveraging option" may direct the watershed funds to a much broader range of uses and apply the entire Section 319 allocation to support program activities. The DEC received EPA approval to use the leveraging option over the past few years and most recently in FFY 2020.

The leveraging option requires DEC to demonstrate its capacity to leverage the annual award amount in state funding that support NPS project implementation. All leveraged projects will be entered into and reported on in GRTS. For a summary of Leveraged projects from the previous plan, refer to Appendix D of this plan.

[55] Nonpoint Source Program and Grants Guidelines for State and Territories: https://www.epa.gov/sites/production/files/2015-10/documents/319-guidelines-fy14.pdf.

# Chapter 8. Measuring Environmental Conditions, Progress & Evaluating Vermont's NPS Management Program

## A. Measuring Environmental Conditions, Progress & Success

This section provides an overview of Vermont's water quality indicators to put NPS related monitoring and program evaluation efforts into context. The Vermont Water Quality Standards (WQS) are the foundation for Vermont's surface water pollution control and surface water quality management efforts. The WQS, promulgated by DEC, provide the specific criteria and policies for the management and protection of Vermont's surface waters. The classification of rivers, streams, lakes and ponds establishes the management goals to be attained, maintained and therein codified as "designated uses" for each class of water. The WQS are used in determining the condition of surface waters including whether the water meets (attains) or does not meet (exceeds or violates) certain criteria. The assessment of a water's condition within the context of the VWQS requires consideration of the water's classification, a variety of designated or existing uses, and a series of criteria which can be numerical or narrative. The outcome of an assessment conducted by the Department of Environmental Conservation (DEC) is to categorize Vermont's surface waters as either "full support," "stressed," "altered," or "impaired." Over time, the Department is gradually reducing the number of waters characterized as "unassessed."

The most recent Vermont WQS became effective January, 2017. A triennial review of State water quality standards is required by the Clean Water Act. The next triennial review is planned for 2020. The most recent version of the WQS can be found on the Water Quality Standards website[56].

Vermont's Surface Water Assessment and Listing Methodology,[57] was updated in 2019 and will be updated again during the timeframe of this plan. The document contains an overview of the Water Quality Standards; a description of water quality monitoring approaches that are utilized and their linkage to assessment efforts; the four assessment categories and the factors and decision principles applied when evaluating data and other information to determine if a water meets the Standards; and, the rationale when deciding where and how to list a particular water. Figure 6 below illustrates the major components of DEC's assessment and listing process. The most recent 303(d) list, as of this writing, of impaired waters in Vermont can be found in Appendix B.

[56] DEC's Water Quality Standards https://dec.vermont.gov/watershed/map/assessment/waterqualitystandards
[57] Surface Water Assessment and Listing Methodology can be accessed here: https://dec.vermont.gov/sites/dec/files/wsm/mapp/docs/WSMD_AssessmentAndListingMethodology.pdf

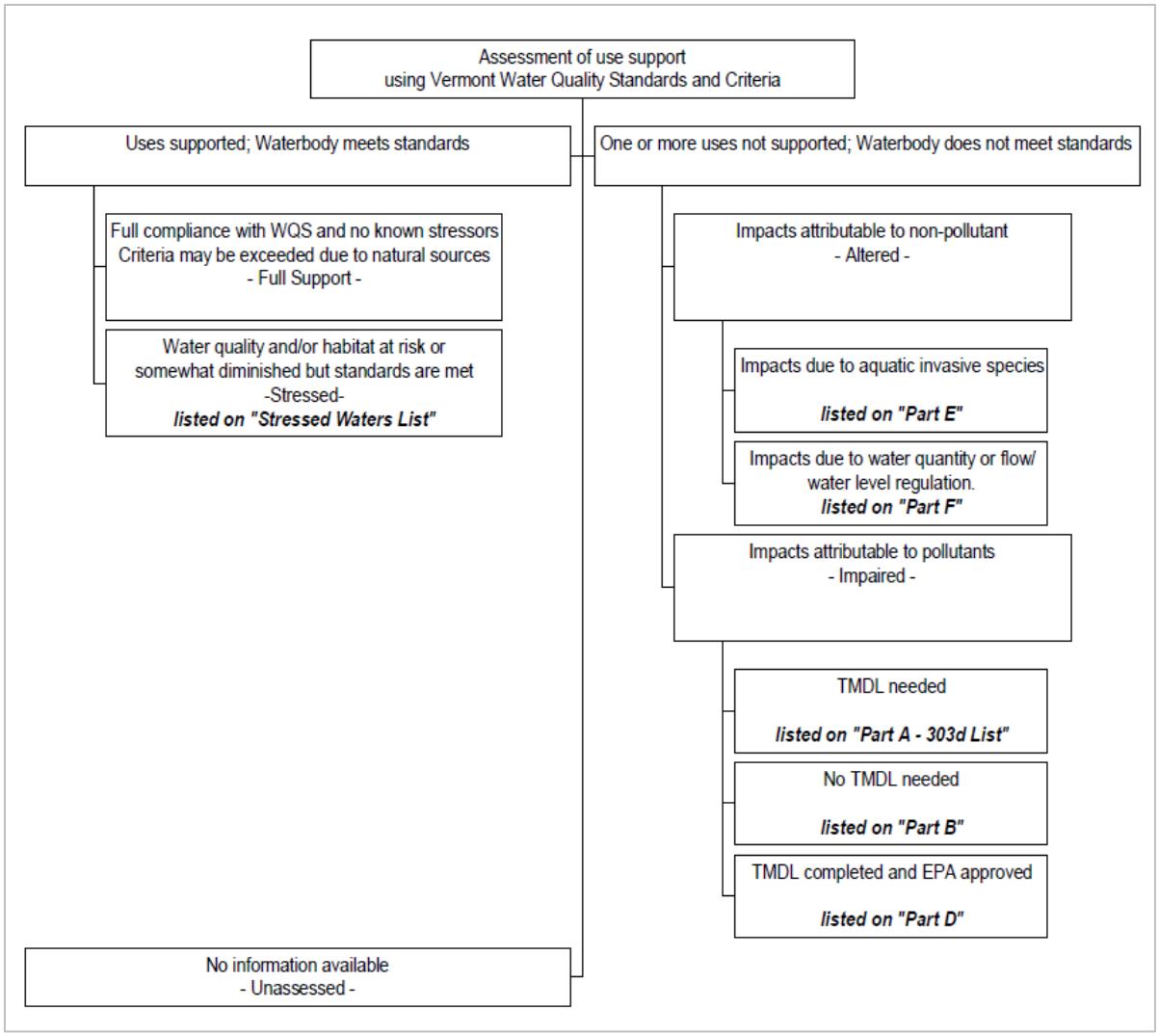


Figure 6. Organization of Vermont's Water Quality Assessment and Listing Methodology

### i. Role of Climate Change in Measuring Progress

Due to the nature of NPS pollution, many variables can affect the amount of load delivered to surface and groundwaters. For example, while the state can make significant progress installing clean water projects, a significant climate event like Tropical Storm Irene can deliver a year's worth of sediment and nutrients to the lake. Climate change has the potential to alter not only the temperatures but also the frequency and intensity of storms as described in Figure 8.1 below.

Climate data indicate statistically significant increases in frequency of intense storms and annual total precipitation. The trend has been building for decades, including since the TMDL baseline period (2001-2010).

Change in precipitation patterns may result in:

1. Increased erosion of unstable road networks and unnatural stream banks and lakeshores transporting phosphorus to Lake Champlain; and
2. Increased volume of stormwater runoff from impervious/hard surfaces, such as roads, parking lots, and rooftops, transporting phosphorus to Lake Champlain.

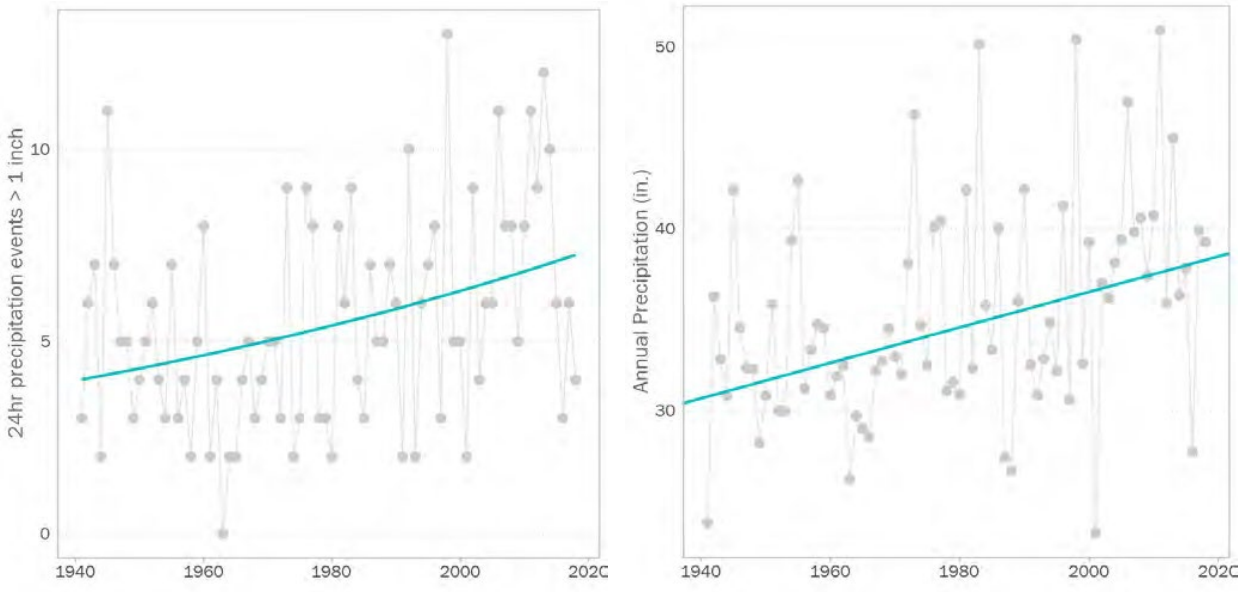


Figure 7. Change in number of days with precipitation greater than one inch (left), change in annual total precipitation (right) using Burlington to represent the Champlain Basin, 1940-2018. Blue line represents the trend. [58]

Change in precipitation patterns highlight the importance of climate adaptation, for example:

1. Protection and restoration of natural resources (e.g., wetlands, floodplains, lakeshores) to naturally mitigate extreme weather events;
2. Implementation of revised road, bridge, and culvert standards for resilience against higher flow and more intense storms; and
3. Implementation of Stormwater Management Manual standards that emphasize the importance of infiltrating stormwater runoff into soils.

### ii. Tracking and Accounting for Phosphorus in the Lake Champlain and Lake Memphremagog Basins

DEC tracks and accounts for clean water projects across sectors and agencies within their Clean

[58] Source: National Oceanic and Atmospheric Administration, Burlington International Airport climate station. Frequency Updated: Continuous

Water Reporting Framework (CWRF). On an annual basis, project data are collected from six different state agencies and reviewed for entry into CWRF. Project data including cost of awarded projects, project outputs and estimated nutrient pollutant reductions are compiled and reported on in the Clean Water Initiative Annual Performance Report. Data for this report go back to state fiscal year 2016.

DEC does not require pollutant monitoring of all individual BMPs constructed, rather they estimate pollutant reductions for particular BMP types based on the size of the practice, the area it is treating and other factors. While DEC has developed and can account for estimated phosphorus reductions for a variety of practices, there are some phosphorus accounting methodologies that cannot yet be accounted for and are under development. Further information on the tracking and accounting methods in place for various clean water project types can be found on the Clean Water Initiative Tracking and Accounting website[59]. These methods are used to track and account for progress made toward TMDLs such as the Lake Champlain and Lake Memphremagog Phosphorus TMDLs. Act 76 requires addressing gaps in tracking and accounting and publishing methods to estimate phosphorus reductions for clean water projects implemented in these basins by November 2021.

## B. Surface Water Quality Monitoring

There are numerous reasons to monitor the quality of Vermont's water resources as noted in the Vermont Water Quality Monitoring Program Strategy (2015) and the Vermont Groundwater Management Plan (2018). The Clean Water Act, Groundwater Protection Rule and Strategy, and the Safe Drinking Water Act require states to characterize water quality status and trends and determine the contributing factors, stressors, or pollution sources, which are critical to effectively manage Vermont's water resources. We do this through monitoring and assessment. The term "monitoring" is intended to address measurement or estimation of ambient physical, chemical, and biological water quality status and conditions. This includes physical stream or river geomorphic assessments. The term "assessment" refers to the determination of physical, chemical, or biological condition from monitoring data and information. It also refers to the determination of whether various surface water uses are supported by the condition.

Because NPS pollution is a significant driver of Vermont's water quality problems, monitoring and assessment of NPS impacts are particularly integral to effective water resource management. Overall, monitoring and assessment enable DEC to:

- Determine status and trends of individual surface waters, as well as waters statewide, and compare our waters regionally and nationally.
- Determine if surface waters are meeting Vermont Water Quality Standards (VWQS).
- Determine if groundwater as a public trust resource is in compliance with Groundwater Enforcement Standards, drinking water quality standards and permitting

[59] Clean Water Initiative Tracking and Accounting website: https://dec.vermont.gov/water-investment/cwi/projects/tracking-accounting

regulations.

- Inform and ensure compliance with permit conditions.
- Identify and track known and emerging stressors that threaten the integrity and uses of Vermont surface waters.
- Inform and evaluate effectiveness of management actions in achieving protection and restoration goals.
- Respond to public concerns and local emergencies regarding Vermont's surface waters and groundwater.

Determining whether waters comply with the applicable VWQS carries significant regulatory repercussions, therefore a thorough, transparent, and scientifically defensible framework that describes the various steps of monitoring, assessment, remediation, and protection processes is needed.

### i. Surface Water Monitoring Assessment Program

The term "monitoring" is intended to address measurement or estimation of ambient physical, chemical and biological water quality status and conditions for surface waters. This includes physical stream or river geomorphic assessments. The term "assessment" refers to the determination of physical, chemical or biological condition from monitoring data and information. It also refers to the determination of whether various surface water uses are supported by the condition. The Vermont Surface Water Assessment and Listing Methodology[60] (2019) describes this process in detail.

The process of assessment begins with the three components noted above: status, trend, and causality. Estimating the status and trends of waters, with known and quantifiable precision, is the first step in assessing standards attainment. In cases where a waterbody is determined to not attain standards, then determining the extent of the water quality impact caused by any number of stressors is the first step toward understanding and remediating a problem. Scientists and managers must consider monitoring in the framework of use support, listings and de-listings of waters and TMDL preparation, as well as in the context of the evaluation of management actions. These two objectives support both protection and restoration goals for surface waters. In addition, citizen science water quality monitoring programs allow citizens to contribute meaningfully to the assessment of surface water conditions and to their protection and or restoration, as informed by that assessment.

### ii. Vermont Water Quality Monitoring Program Strategy

DEC's Water Quality Monitoring Program Strategy[61], written in 2011 and updated in 2015, with an update anticipated in 2021, contains two broad goals and twelve associated objectives that

[60] Vermont Surface Water Assessment and Listing Methodology
https://dec.vermont.gov/sites/dec/files/wsm/mapp/docs/WSMD_AssessmentAndListingMethodology.pdf
[61] Water Quality Monitoring Program Strategy (2011-2020)
https://dec.vermont.gov/sites/dec/files/documents/WSMD_MonitoringStrategy2015.pdf

are provided below. These goals and objectives create the framework and approach that informs Vermont's surface water monitoring design.

**Goal 1** – To monitor and assess the physical, chemical, and biological condition of Vermont's surface waters to maintain, protect, enhance, and restore their integrity and uses.

Objectives:

A. Determine the status and trends in the condition of Vermont's waterbodies.
B. Determine if surface waters are meeting the Vermont Water Quality Standards.
C. Use probability assessments to provide an understanding of statewide surface water conditions.
D. Learn what stressors threaten the integrity and uses of Vermont waters.
E. Adapt monitoring efforts to identify and track pollutants in addition to emerging stressors.
F. Respond to public complaints and emergency situations regarding Vermont surface waters.
G. Evaluate the effectiveness of management actions and mitigation activities in achieving water quality goals.
H. Integrate monitoring and assessment with management actions.
I. Integrate volunteer monitoring efforts with current departmental needs.
J. Work with other divisions, agencies, state and federal partners to understand, evaluate and integrate into programs the inter-relationship of groundwater and surface water interactions.

**Goal 2** – To interpret, analyze and communicate monitoring and assessment results to the Agency of Natural Resources and outside groups to support the development of appropriate management decisions for Vermont surface waters.

Objectives:

A. Expand accessibility and use of surface water quality assessments within the ANR, by other state and federal entities, and by the public.
B. Provide information to support and evaluate Agency and Department planning, management, and regulatory programs, including the development of environmental indicators.
C. Communicate, collaborate, and coordinate on a regular basis with organizations, agencies, municipalities, and the public to assure complementary monitoring programs.

### iii. Monitoring Design

The monitoring design describes what, why and how monitoring projects are designed to meet DEC's water quality monitoring objectives. In addition, how DEC monitors Vermont surface waters and groundwaters should answer or address certain objectives from the Clean Water Act or Safe Drinking Water Act:

1. What is the overall quality of waters in Vermont?
2. To what extent is water quality changing over time?
3. What are the problem areas and areas needing protection? What level of protection is needed?
4. How effective are clean water projects and programs?

Vermont uses three distinct monitoring design approaches to meet the monitoring strategy goals and objectives for surface water. The three design approaches are: (1) targeted fixed stations; (2) randomly selected probability-based stations; and (3) river/stream geomorphology assessments.

Integrating the information gained from these design approaches is a major aim of the monitoring strategy and provides information about point source and NPS pollution, watershed processes, and the overall condition of Vermont surface waters.

Targeted sites with fixed stations are chosen for a specific reason, such as a stream section with problematic erosion or discharge, or on a pond with increasing nutrients or a known nuisance or invasive species problem. Other targeted sites serve as reference sites for a class of stream, wetland, or pond to assess longer term changes or trends. Probability-based sites are randomly selected by EPA to give an unbiased assessment of water quality conditions statewide. This approach is useful in determining the overall status of waterbodies and identifying overall threats to those resources. Probability-based assessment can help water quality management agencies direct resources based on intensity and distribution of threats in a quantifiable manner. River/stream geomorphic assessments identify physically unstable or 'out-of-equilibrium' areas and river corridors in need of protection from a watershed perspective.

Through these three design approaches, Goal 1 and all its objectives are met.

### iv. Targeted Fixed Station Sites

The design approach for targeted fixed station monitoring sites consists of three distinct types, each of which is intended to better understand and manage NPS pollution. The types of targeted fixed station monitoring efforts are outlined below.

**1A. Rotational Tactical Basin Assessment**

For the purposes of assessing and reporting water quality information, Vermont is divided into fifteen major drainage basins. Each basin contains four to twenty-two river sub-basins or main stem segments. The major river basins drain into one of four larger regional drainages: Lake Champlain, Connecticut River, Lake Memphremagog, or the Hudson River.

To assess the State's waters comprehensively and regularly, DEC designed a rotational watershed assessment process such that lakes and rivers within each of the 15 major basins are evaluated once every five years. To the extent feasible, wetland assessments also follow this rotation schedule, as do geomorphology assessments. By focusing evaluations on selected watersheds each year, DEC believes more systematic and intensive efforts can be made to evaluate not only status and trends, but also characterize and understand NPS impacts. A focus

on a limited number of watersheds also provides the opportunity to determine the best characteristics of the river system to use as indicators of improving water quality and aquatic habitat; potentially reveal water quality trends; involve the public; and, provide interagency coordination. The current planned schedule for each basin assessment is shown in Figure 8 below.

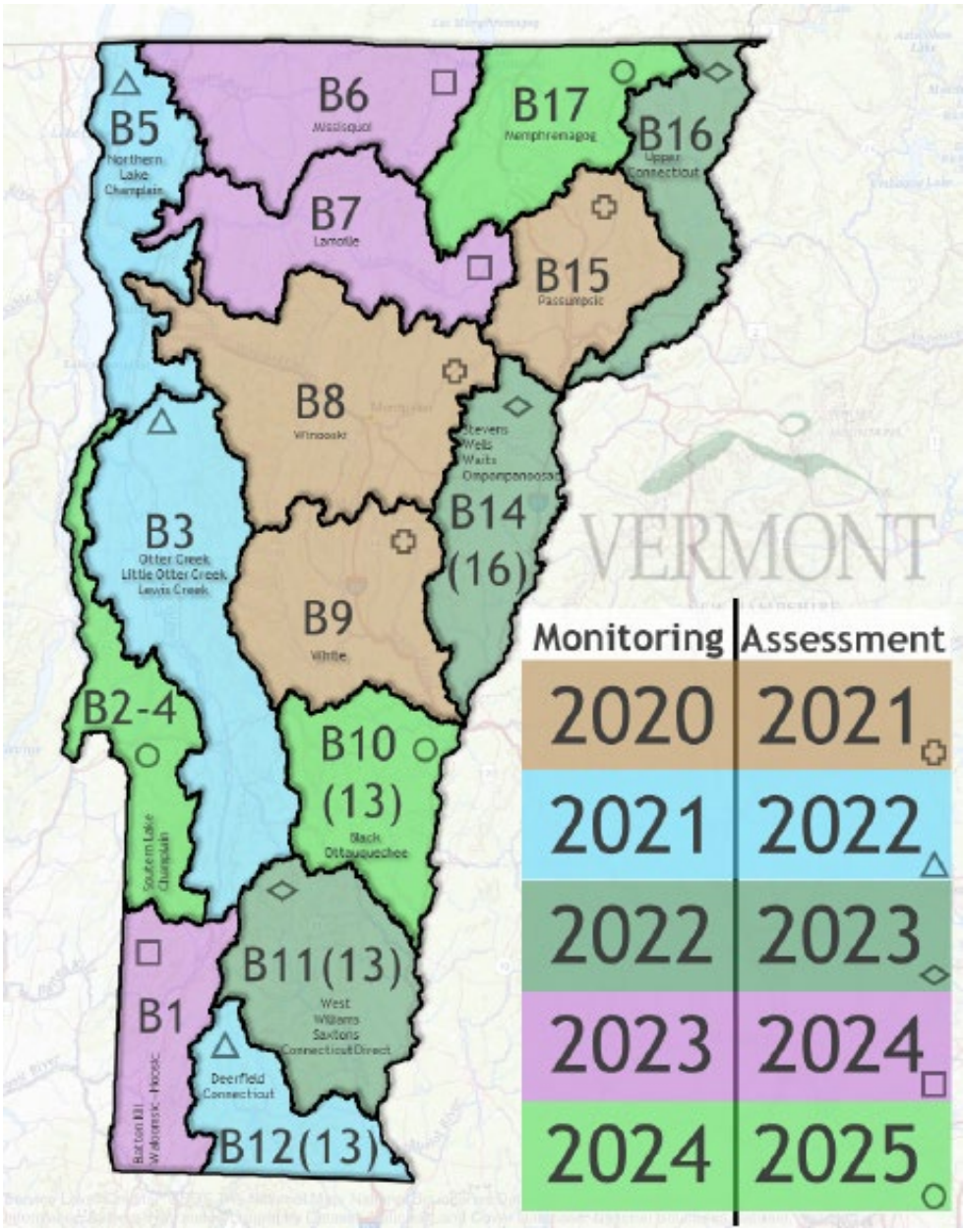


Figure 8. Monitoring and Assessment Schedule by River Basin, 2020 – 2025

The rotational assessment approach, which meets the objectives under Monitoring Goal 1 and Goal 2 above, results in the periodic production of tactical basin-specific assessment reports.

Each assessment report characterizes the causes and sources affecting use support and is a valuable tool when focusing NPS pollution management efforts – whether for protection or restoration purposes. Individual Tactical Basin Plan assessment reports are updated on a recurring five-year basis.

**1B. Long term projects**

DEC coordinates a large number of fixed-station monitoring projects, incorporating river, stream and lake water quality projects. Fixed station, long-term, recurring projects are those that DEC has operated (or intends to operate) for several years. Some of these projects, such as the Ambient Biomonitoring Network and Lake Assessment Programs (both of which incorporate several individual monitoring projects and studies) achieve dense statewide spatial coverage.

The total number of stream and lake stations established under these two programs alone exceeds 1,700 and 700, respectively. These monitoring networks are designed to assess status and detect trends, and therefore meet Objectives 1A, 1B, 1D, and 1G of the Strategy.

One of Vermont's major lake monitoring programs is a fixed-station, volunteer-based initiative that meets Objective 1I. Stations are added as needed to achieve more comprehensive and complete coverage. In addition, the existing fixed stations can serve as pre-established monitoring locations for random, probability-based projects allowing for hybridization of fixed and probability surveys, while maintaining consistency in monitoring location coverage.

DEC also conducts or assists with monitoring in conjunction with edge-of-field type projects intended to understand and quantify BMP effectiveness. The paired watershed type monitoring design was been utilized in several agricultural settings as part of Vermont's NPS management efforts dating back to the 1980s.

Monitoring data and other information from the long term stations are of considerable use when documenting the nature and extent of NPS impacts, detecting possible changes in water quality resulting from NPS management or control actions and when determining the water quality effectiveness of particular NPS control actions, measures, or BMPs.

**1C. Special and TMDL-Related Studies**

DEC undertakes special and TMDL-related monitoring studies as needed, in response to compelling data and information supplied under fixed-station and probability-based projects. Special and TMDL-related monitoring studies meet Objectives 1E and 1F. The number and nature of special studies is dictated by the nature of issues and problems that are predominantly of NPS origin. Certain special monitoring studies may be linked to waters being reported in Vermont's biennial Priority Waters Listings or those waters on the Stressed Waters list. Such waters typically require additional information to make an informed impairment decision. These types of fixed station studies include detailed sampling to assess use support or standards violations, diagnostic-feasibility studies, watershed-based surveys and evaluations, and enhanced monitoring of stormwater-impaired watersheds. Special monitoring studies

would also include water quality effectiveness evaluations for specific BMPs or particular NPS controls.

Under Section 303(d) of the Clean Water Act, certain waters found to not meet VWQS (i.e. impaired waters) are to have a Total Maximum Daily Load (TMDL) determination prepared. TMDL-related monitoring studies are scheduled as needed consistent with the timeline established in Vermont's impaired waters/303(d) listings and depending on available resources. DEC has prepared and received EPA approval on a significant number of TMDLs dating back to 2001[62].

### v. Probability-Based Monitoring

Probability monitoring surveys are useful for determining the extent and intensity of statewide water quality conditions by waterbody type. Additionally, these surveys can provide information on the extent and severity of new environmental or public health concerns. These surveys provide statistically defensible estimates on stressors and use attainment statewide or basin-wide and meet Objectives 1A, 1C and 1D of the Monitoring Strategy. EPA works with DEC to conduct the probability surveys through the National Aquatic Resource Survey (NARS).

Results from NARS aid in the allocation of resources and can guide overall water quality management activities on a larger basis. DEC strives to maximize the benefits of probability-based surveys by actively supporting or designing projects in which a predictive system can be part of the outcome. DEC has undertaken probability-based projects in collaboration with EPA-Region 1 for rivers, lakes, and wetlands. A schedule of surveys completed or underway is presented in Table 12 with an indication of additional benefits to DEC and the Vermont NPS Program.

Table 12. National Aquatic Resource Survey (NARS) Monitoring Schedule

| Waterbody Type | Monitoring Year | Benefits to DEC & NPS Program |
|---|---|---|
| National Wetland Condition Assessment | 2021 | Wetland bio-criteria developed |
| National Lakes Assessment | 2022 | Lake bio-criteria implemented |
| National Rivers Assessment | 2023 | Methods for determining biological condition on large rivers provided |
| Wadeable Streams Assessment | 2024 | Identify and prioritize statewide stressors |

NARS probabilistic surveys also help to identify and prioritize the importance of statewide stressors due to an 'overdraw' of probability sites in Vermont. To achieve this, DEC monitoring staff have routinely worked with EPA-ORD personnel to build sample draws that provide such coverage. Sample 'overdraws' leverage the Environmental Monitoring and Assessment Program (EMAP) algorithms for site selection, are statistically robust and provide estimates of

[62] Approved TMDLs in Vermont are posted at: https://dec.vermont.gov/watershed/map/tmdl.

the target attainment condition with a 90%+ confidence level. Overdraws provide Vermont with enough sites to determine a statewide assessment in addition to the regional assessment determined by EPA. Probabilistic surveys allow DEC to determine status and trends in statewide waterbody health, examine the principle stressors, and compare Vermont waterbody conditions to regional and national scales.

Beginning in early 2022, Vermont will report annually on the statewide stream condition based on a rolling 3-year average. A 2019 DEC report summarized the wadeable stream results from 2013-2017. The recent redesign of the survey will allow for both annual reporting of statewide biological condition, and more rapid trend detection A complete description of Vermont's probability-based projects is in the monitoring strategy.[63]

### vi. River/Stream Geomorphic Assessments

Unlike targeted sites or probabilistic-based monitoring efforts describe above, geomorphic assessments measure and assess the physical dynamics of an entire watershed or collection of river reaches. These assessments meet Monitoring Strategy Objectives 1D and 1H. While these assessments are not strictly monitoring in the sense that stream sites are re-measured on a regular ongoing basis, geomorphological assessments result in the collection of data and other information essential to identifying and remediating watershed stressors and protecting Vermont's flowing waters. Physical aspects of river/stream dynamics are assessed according to one of three sequentially-based phases: using maps, existing data, and windshield surveys (Phase 1); using field observation and simple measurements (Phase 2); and using surveying techniques and quantitative analysis (Phase 3). Geomorphic assessments have been completed in each of the 15 river basins in Vermont and often provide a strong foundation for NPS restoration and protection efforts affecting stream channels, streambanks, riparian and floodplain areas in riverine systems. Appropriate river/stream channel and corridor related management activity guidance is provided through DEC's River Corridor and Floodplain Protection Section[64].

### vii. National Water Quality Initiative (NWQI) Monitoring

DEC staff continue to engage with NRCS under the NWQI program in Vermont. The NWQI focuses conservation funding on priority HUC-12 watersheds, as recommended by state water quality agencies, for addressing agricultural sources of NPS pollution. DEC coordinates with the Vermont Office of NRCS on NWQI watershed identification and selection and, when applicable, coordinates funding of NWQI activities. For designated NWQI watersheds, DEC ensures water quality monitoring data is made available to NRCS to help partner agencies assess water quality improvements in NWQI watersheds. Rock River, East Creek and

[63] https://dec.vermont.gov/sites/dec/files/documents/WSMD_MonitoringStrategy2015.pdf
[64] https://dec.vermont.gov/watershed/rivers/river-corridor-and-floodplain-protection

Hungerford Brook were the three NWQI watersheds targeted for conservation practice implementation and were allocated $811,795 in cost share dollars in FFY 2019.

## C. Groundwater and Drinking Water Monitoring

The Vermont Groundwater Management Plan (2018) contains three tasks that incorporate the strategic plan for the Vermont Geological Survey:

- Continue Studies of Groundwater Resources
- Interagency Collection and Compilation of Data
- Identification and Mapping of Groundwater Resources.

Each task has multiple sub-tasks and a running 5-year implementation plan.

The Vermont Department of Health gathers data from water quality samples taken from single family home wells across the state and is used in town-level water quality assessments and mapping. The Drinking Water and Groundwater Protection Division (DWGPD) has decades of water quality results for groundwater and surface water sources that serve public water systems as part of EPA required routine and special sampling.

**Public and potable water systems**, including single family homes, are required to obtain permits prior to serving water to the public. As part of the permitting process, surrounding site conditions are evaluated for possible impact to the proposed source (well, spring, intake) from potential sources of contamination and impact to other water resources. A similar process is conducted for groundwater withdrawals proposed for commercial and industrial uses.

The Vermont Geological Survey (VGS) conducts detailed geologic (bedrock, surficial, groundwater favorability) mapping along with specific studies gathering or using existing water quality data to identify and evaluate areas where chemicals of concern exist. Some studies include, arsenic, fluoride, radioactivity, and most recently PFAS contamination.

Historically, DEC had a groundwater monitoring network of 13 wells across the state, where water levels were measured on an annual or more frequent basis. The **water level data** was generally used to evaluate seasonal and drought related conditions. This network was later incorporated into the USGS monitoring program. In 2017 VGS and DWGPD was issued a USGS Water Research and Use grant to update withdrawal data, including quantifying various withdrawals from public systems, snow making and improve well location accuracy.

The DWGPD has compiled over 40 years of aquifer data from public water groundwater wells based on discharge testing into a Groundwater Interference database. When a public well is tested to determine adequate yield to serve the system, interference analysis is done through monitoring wells and springs within a specified radius. Interference impact may occur with the production well is hydraulically connected to one or more water sources. If the impact is adverse the nearby source may not be able to meet its own demand. The systems and areas

where this occurred has been incorporated into a searchable database. This online well interference is a critical aspect in permitting Public Community Water Systems and particularly regarding Groundwater Public Trust and resource allocation issues now and for the future land use development in Vermont. The searchable database allows stakeholder (consulting and public) use along with the ability for the consulting community to enter required data directly. The location of these impacts is available as a layer on the ANR Atlas.

## D. Vermont NPS Program Evaluation

In addition to documenting the status and trends of water quality conditions, the nature of NPS pollution and being able to track or quantify progress with restoration and protection goals, DEC conducts NPS program evaluations on an ongoing basis as required by current or relevant EPA Section 319 guidance. The following ten evaluation approaches should be of help to Vermont and to EPA in assessing the effectiveness of the Vermont NPS Program as well as in measuring Vermont's progress in meeting or addressing various objectives, actions and milestones.

1. **Priorities and Commitments (P&C)** - DEC will continue to work with EPA when defining and accounting for NPS-related P&Cs established under Performance Partnership Grant and Performance Partnership Agreement negotiations. Updates on P&C progress will continue to be submitted to EPA on a semi-annual basis.

2. **Annual NPS Report** – DEC will develop and submit an annual NPS Program Report to describe significant Vermont NPS program activities, completed grant projects and documented water quality improvements. The report will also make reference to completed goals, objectives and milestones described in Chapter 2 and Appendix A of this Plan.

3. **NPS Success Stories** –Vermont's NPS success stories as described above, meet EPA's critical national water quality measure (WQ-10). DEC will continue its close collaboration with the regional office of EPA when documenting and describing particular NPS impacted surface waters.

4. **Grant Reporting and Tracking System (GRTS) database** – On an annual basis and before the February data entry deadline, DEC will continue to enter into GRTS the mandated elements concerning 319 program and project information. Pollutant loading reduction estimates resulting from certain completed projects will be entered as appropriate.

5. **Satisfactory Progress Determination** – Upon request, DEC will provide to EPA other 319 or NPS information not reported in 1-4 above. EPA is responsible for conducting an annual progress and performance review of the State's program as specified under Section 319(h)(8).

6. **Updates to Vermont NPS Management Program Plan** – Vermont's NPS Management Program Plan will be updated on a recurring five-year interval. The next EPA-approved Vermont NPS Management Program Plan will be updated in 2024 and will include milestones for the 2026 – 2030 period.

7. **Quality Assurance Project Plan** – DEC will revise and submit for approval its Section 319 Program Quality Assurance Project Plan. DEC's current 319 Program QAPP was last approved by EPA in October 2011.

8. **Federal Financial and Performance Reports** – Annual financial and performance reports will be completed by the DEC business office as required by 40 CFR 31.40(b)(1) and 40 CFR 31.41(b).

9. **Clean Water Initiative Annual Performance Report**[65]- The purpose of the Vermont Clean Water Initiative Performance Report is to summarize the State of Vermont's clean water efforts and demonstrate how clean water investments are making a difference through the following accountability measures: Investment, Education, Project Output and Pollutant reduction measures. This report also includes the "**Lake Champlain Progress Report**" which summarizes progress under the *Phosphorus Total Maximum Daily Loads (TMDLs) for Vermont Segments of Lake Champlain*, including: (a) estimated phosphorus reductions achieved through state funding, federal funding, and regulatory programs; (b) external variables affecting phosphorus loading to Lake Champlain; and (c) monitored phosphorus loading to Lake Champlain. The **Clean Water Projects Explorer** complements this report by allowing interested parties to search for and learn more about the details of individual state-funded clean water projects. The Explorer also contains potential projects identified through Tactical Basin Planning.

### i. Success Stories

As of September 2020, Vermont has documented 15 NPS success stories describing the restoration of 17 waterbodies, the most of any New England state[66]. The latest success story involved the remediation of two streams in the vicinity of the Jay Peak Ski Resort in northern Vermont.

In the early 2000s, sediment in stormwater runoff from parking lots, driveways and construction projects at Jay Peak Resort (JPR) in Jay, Vermont, degraded biological communities in Jay Branch and a contributing stream identified as Tributary 9. As a result, the Vermont Department of Environmental Conservation (DEC) placed the two streams on its Clean Water Act (CWA) section 303(d) list of impaired waters in 2006. In response, JPR designed and installed numerous stormwater runoff treatment, control and prevention projects, which

[65] Clean Water Initiative Program Reports website: https://dec.vermont.gov/water-investment/cwi/reports

[66] NPS Success Stories about restoring impaired water bodies https://www.epa.gov/nps/success-stories-about-restoring-water-bodies-impaired-nonpoint-source-pollution#vt

ultimately reduced sediment levels in both streams. Biological monitoring in 2016 and 2017 demonstrated both streams achieved full compliance with Vermont's water quality standards (WQS) for aquatic life. As a result, DEC removed both streams from the CWA section 303(d) list in 2018.

DEC will continue its close collaboration with the regional office of EPA when documenting and describing particular NPS impacted waters that may fall into one of three categories regarding water quality improvement.

### ii. CWSRF Annual Report

In accordance with Section 606(d) of the CWA, Vermont DEC submits an annual report on financial and project activity of the CWSRF to the EPA R1 Municipal Assistance Section. These reports describe how the State has met the goals and objectives for the previous fiscal year as identified in its annual Intended Use Plan. This includes identification of loan recipients, loan amounts, and loan terms and similar details on other forms of financial assistance provided from the CWSRF. If the State has funded any 319 projects, information about those projects is included in the report.

### iii. Tactical Basin Planning Annual Report

The overall goal for each TBP water quality management plan is to establish and carry out strategies that will protect, maintain, enhance or restore the surface waters of the basin by directing regulatory, technical assistance, and funding to highest-priority sub-watershed areas. At the end of each calendar year, DEC develops and publishes a progress report on Tactical Basin Planning that is prepared in fulfillment of 10 VSA §1253(d)(1), which states:

> "The Secretary shall prepare and maintain an overall surface water management plan to assure that the State water quality standards are met in all State waters. The surface water management plan shall include a schedule for updating the basin plans. (…) On or before January 15 of each year, the Secretary shall report to the House Committees on Agriculture and Forest Products, on Natural Resources and Energy, and on Fish, Wildlife and Water Resources, and to the Senate Committees on Agriculture and on Natural Resources and Energy regarding the progress made and difficulties encountered in revising basin plans. The report shall include a summary of basin planning activities in the previous calendar year, a schedule for the production of basin plans in the subsequent calendar year, and a summary of actions to be taken over the subsequent three years."

During 2019 and with the passage of Act 76, the Division has been working with watershed organizations, Regional Planning Commissions (RPCs), Natural Resources Conservation Districts (NRCD), and municipalities to identify and construct water quality projects to achieve

reduction targets. Per revisions to 10 VSA § 1253(d), the Division will engage with Watersheds United Vermont (WUV), the Regional Planning Commissions (VAPDA, or RPCs), and the Natural Resource Conservation Districts (NRCDs) to serve on Basin Water Quality Councils (BWQC) for each major river basin through the basin planning process in order to:

- Participate in the basin planning process, and assist in developing and reviewing Tactical Basin Plans;
- Provide technical assistance and data collection activities to inform municipal officials and the State in making water quality investment decisions;
- Coordinate municipal planning and adoption or implementation of municipal development regulations to meet State water quality policies and investment priorities; and
- Assist the Secretary in implementing a project evaluation process to prioritize water quality improvement projects within the region to ensure cost effective use of State and federal funds.

DEC will continue to contract with RPCs, NRCD, and watershed organizations to fulfill the specific roles and responsibilities around the development of Tactical Basin Plans as articulated in Sections 26 and 27 of Act 64 as well as Act 76. Through this cooperative process, VAPDA, the NRCC, and WUV have set forth a series of activities that each Regional Planning Commission, Natural Resource Conservation District, as well as watershed organizations shall undertake in support of tactical planning for all watersheds in the State. This relatively new organizational alignment recognizes that significant (and ongoing) municipal and landowner outreach is needed to develop understanding of emerging Act 76 authorities, develop Tactical Basin Plans, assist landowners and municipalities, and ultimately track the implementation of projects and BMP installations that are carried out by municipalities, landowners, RPCs, NRCDs, and other stakeholders. The roles and responsibilities articulated in the State Fiscal Year 2020 (SFY20) performance contract with RPCs and NRCDs specifically acknowledges their strengths in supporting landowner, municipal, as well as other stakeholder activities aimed at water quality protection and restoration. The contracted activities under the SFY2020 contracts, and those anticipated for SFY21 include:

1) Assistance in the drafting and development of Tactical Basin Plans, including the vetting and review with other stakeholders including the RPC Clean Water Advisory Committees and regional coordination workgroups with NRCDs and WUV;
2) Coordination of landowner, municipal, and regional input to assist in Tactical Basin Plan development, including project prioritization;
3) Increased outreach for landowner, municipal, and stakeholder awareness and readiness to implement Act 64 by conducting landowner and municipal outreach and education, and cross-program integration and coordination;

4) Promotion of stormwater master planning and other assessments for municipalities identified by the relevant Tactical Basin Plans as in need of such assessment;
5) Promotion of flood resilience and water quality protection and improvement by providing natural resource and municipal planning assistance;
6) Enhanced outreach and delivery of information for municipalities by providing coordination of water quality monitoring, and oversight of independently funded assessments;
7) Assistance in the coordination of regional partner meetings to address high priority water quality issues such as through Clean Water Advisory Committees and agricultural partner and other sector workgroup meetings;
8) Assistance in the protection of high-quality resources and documentation of restoration efforts by participating in Tactical Basin Plan implementation.

For each RPC, NRCD, and partnering watershed organization, the specific scope of work has been tailored to the development process associated with the timeframe of each Tactical Basin Plan, and to the constituencies of each partner. There are performance tasks that are required statewide, certain tasks that are required for specific watersheds, and still other tasks that a RPC and/or NRCD may elect to engage in, which are optional but valuable activities.

The RPCs, NRCDs, and Watershed United Vermont (WUV), are providing tactical planning services that substantially enhance DEC's ability to reach landowners, municipalities, and other relevant stakeholders. Further, the contracted activities are developing augmented capacity in RPCs and NRCDs to support water quality protection and restoration. The outreach process undertaken in late 2019 by RPCs and NRCDs in support of the draft tactical plan release and public comment has benefitted the Department by bringing municipalities into the planning process in a more forthright manner. In coming years, RPCs, NRCDs, and WUV anticipate the opportunity to continue to assist municipalities and landowners with implementation of requirements of Act 76, including clean water project delivery services. The WPP will continue to seek the means to strengthen and expand these partnerships in order to maintain the momentum and capacity that has been cemented with these entities and which have enhanced coordination.

Importantly, DEC will continue to monitor subrecipients receiving Section 319 or other federal funds using established standard business operating practices or procedures including office visits and site visits to certain selected construction/implementation projects. DEC continues to issue performance-based grant agreements to every subrecipient, regardless of grant funding source.

# Chapter 9. Adaptive Management

The management of NPS pollution sources may seem simple when viewed from a project-specific lens. Treating a certain number of impervious acres with a suitable sized practice will yield a given modeled pollutant reduction based on the site-specific factors. However, the management of collections of these types of projects, across multiple pollution source sectors, is a much more complex matter. As is well described by the Vermont EPSCoR program[67] Vermont's large basin TMDL efforts are influenced in a dynamic manner by environmental, social, and economic factors. These factors include variability in BMP performance, variation in climatic conditions, fluctuations in the economy, and variation in individual and community willingness or ability to proceed to act, particularly for non-regulatory clean water practices. These broad factors influence the pace of achieving the goals on the large basin TMDL's and impart uncertainty into the target timeframes for ultimate water quality attainment. Thus, it is important to view this iteration of Vermont's NPS Management Plan as being the next adaptation in a series of long-term programmatic adjustments, reflecting Vermont's adaptive management framework. As described below, adaptive management in Vermont is implemented through cyclical planning, innovation in projects, innovation in financing, innovation in policy, and a forthright recognition that adaptive management requires investment that carries risk and operates in a dynamic, uncertain landscape, where each dollar invested will not always bear identical results.

## A. Adaptive Management Through Tactical Basin Planning and Accounting of Accomplishments

The accountability framework for the Lake Champlain[68] and Memphremagog[69] TMDLs identify the Tactical Basin Planning process described in Chapter 6 of this Plan as the vehicle by which these major pollution control plans will be adaptively implemented across five-year planning cycles. Vermont has within this process adopted a phased approach, which was initiated with the enactment of the Vermont Clean Water Act (Act 64) of 2015. Phase I can be described as the implementation of the 28 milestones of the accountability framework of the Lake Champlain TMDL. Vermont's progress towards achieving these milestones is largely complete, as documented by the Clean Water Initiative Annual Performance Report[70], and related documentation[71] of achievement of the milestones.

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[67] Koliba et al., 2016. Vermont J. Env. Law. 17:4. EPSCoR stands for Established Program to Stimulate Competitive Research.
[68] Lake Champlain Phosphorus TMDL can be accessed here: https://www.epa.gov/tmdl/lake-champlain-phosphorus-tmdl-commitment-clean-water
[69] Lake Memphremagog TMDL can be accessed here: https://dec.vermont.gov/sites/dec/files/wsm/mapp/docs/MemphTMDL Final EPA approved.pdf
[70] Clean Water Initiative Program reports can be accessed here: https://dec.vermont.gov/water-investment/cwi/reports
[71] For more information on restoring Vermont's waters: https://dec.vermont.gov/watershed/restoring

Phase-II is implemented through the iterative Tactical Basin Planning process, and for all Lake Champlain basins and the Memphremagog basin, phase-II five-year basin plans have been adopted by the Secretary of ANR. These basin plans establish geographically downscaled estimates of pollution reduction necessary to achieve the TMDLs, and identify, through their implementation tables, steps necessary to make incremental progress for the duration of that five-year planning cycle[72]. Vermont is now referring to future iterations of the basin plans that implement the Champlain or Memphremagog TMDL's as "phase-III" Tactical Basin Plans. As described in Chapter 6, forthcoming phase-III plans present five-year accountings of progress, and identification of the next five-year planned pollution reductions.

As noted in Chapter 6, Tactical Basin Plans are not limited in geographic scope to TMDL basins, nor limited to pollution reduction activities. In addition to small watershed TMDLs, all Tactical Basin Plans also identify opportunities for water quality protection and habitat restoration, which are accounted for, and projected forward, following a similar Phase-III approach described above.

## B. Adaptive Management Through Innovation in Projects

In addition to planning, Vermont is continually reviewing opportunities to incorporate innovation in project types into the portfolio of activities necessary to meet water quality goals and support attainment of water quality standards, while accounting for the economic and social considerations and co-benefits. Such project types include alternative BMPs, "above and beyond" non-regulatory projects, and pollution recapture and marketization efforts.

With respect to alternative BMP's, Vermont is presently pursuing the development of an adoption framework that accounts for essential design considerations, limitations in usage, presumed effectiveness, and cost and societal acceptance of alternative practice adoption. This adaptive strategy ensures appropriate consideration of the usage of an alternative BMP and recognizes that today's 'alternative' BMP becomes tomorrow's standard practice. For example, the protection or restoration of natural infrastructure, once relegated strictly to the realm of conservation, is now being recognized by some jurisdictions as a standard practice to achieve MS4 pollution reduction goals (for example, Pennsylvania's PENNVEST[73] program).

Vermont is continuing to pursue development of innovative non-regulatory projects that can cost-effectively supplement pollution reductions in areas of specific challenge. Three such projects are in process. The first, being funded by the Lake Champlain Basin Program, is a regulatory and design feasibility study to construct a pollution control "treatment train" for the Jewett Brook watershed of St. Albans Bay. Similar to a novel installation in Grand Lake St., Mary's, Ohio, this system would divert and treat up to 40% of the annual flow of this highly

[72] Kamman, N.C. and E. Swift. Vermont J. Env Law 17:4.
[73] Pennsylvania's PENNVEST program: https://www.pennvest.pa.gov/Pages/default.aspx

polluted agricultural stream. This project is not intended to replace agricultural NPS efforts, but rather to complement these efforts by accelerating the pace at which St. Albans Bay approaches attainment of standards. The second project- an assessment of opportunities to interrupt internal nutrient recycling to St. Albans Bay- is being funded by the State of Vermont and the US Army Corps of Engineers. This project may further accelerate the pace of attainment in St. Albans Bay by designing an innovative treatment system to interrupt nutrient recycling in the bay and its upstream wetland complex. The third project is a similar initial feasibility assessment of opportunities to document sediment nutrient-release "hotspots" in the Missisquoi Bay. This project is also being funded by the Lake Champlain Basin Program, with similar goals as those articulated for St. Albans Bay.

Regarding pollution recapture and marketization, in February 2018, The Vermont Phosphorus Innovation Challenge[74] (VPIC) was launched as a competition to harness creative solutions. VPIC complements ongoing, essential work to install conservation measures and best management practices to reduce phosphorus losses from farms and in stormwater runoff from developed lands. These new technologies aim to make existing protections even more effective. Beginning in September 2018, awardees engaged in technology prototyping and business case development, honing their technologies for phosphorus recovery and researching the market potential for the extracted nutrients. Stage Two for VPIC was the submission of a final business report in 2019. These reports included: detailed business plans describing the method, process and costs for full implementation of a given technology; the proven ability of the technologies to recover phosphorus; the potential revenue streams associated with recovered phosphorus; and an explanation of the suitability of the technology or practice to address Vermont's existing phosphorus challenge. The business plans also described additional available funding and investments outside of state resources to help fully scale implementation of each proposal. Submission of this report qualified participants to move on to Stage Three of the VPIC. The VPIC projects will continue through 2020 and 2021.

## C. Adaptive Management through Innovation in Compensation and Financing Models

Vermont continues to push innovation in the areas of pay-for-performance, payment for ecosystem services, decentralized service provision, and innovative clean water financing models. Pay-for-performance models, which are being supported in the agricultural sector via the Regional Conservation Partnership Program (RCPP) referenced in Chapter 7, pivot compensation models from payment per practice, based on standard curves or actual costs, to payment for outcomes. Under this model, agricultural producers are compensated based on the total pollutant reduction achieved by practices installed, without regard for the actual practices.

[74] Vermont Phosphorus Innovation Challenge: https://agriculture.vermont.gov/Vermont_Phosphorus_Innovation_Challenge

Using standardized models such as Farm-Prep[75], a farmer can plug in various scenarios, and develop cost optimized sets of practices that produce the highest pollutant reductions. Such approaches rely on the ingenuity and hyper-local knowledge of the farmer to achieve the greatest phosphorus reductions, at the lowest cost. Under a payment for ecosystem services model, these same producers are compensated not only for the crops produced and pollution reductions achieved, but also for a suite of societally relevant services provided by the lands in their management. Examples include flood attenuation, wildlife support, and carbon sequestration. While a fully developed ecosystem service payment model is still relatively far off, the approach represents one avenue to achieve a vibrant and economically viable farm economy wherein environmental goals are fully achieved.

In conjunction with the Clean Water Service Delivery Act (Act 76) of 2019, Vermont is extending the pay-for-performance model across non-regulatory clean water sectors, by allocating pollutant reductions assignments to decentralized service providers, whom will receive compensation in the form of dollars per kilogram of pollutant reduced. The creation of Clean Water Service Providers (CWSPs) for all the major basins of Lakes Champlain and Memphremagog will create regional entities comprised of project implementation funding and accounting centers, each supporting a network of implementation organizations. The performance of Vermont's CWSPs will be tracked through annual determinations of progress, annual clean water performance reports, and through Tactical Basin Plans.

Vermont continues to adapt to changing needs for clean water funding by innovating in the area of clean water financing, as described in Chapter 7. Over the past three years, Vermont has continued to adapt the annual intended use plans for the State Revolving Fund loans to support 319-eligible nonpoint source projects in the most creative ways available given Federal eligibilities for the fund. As reported in the 2019 Annual 319 Report, these include water infrastructure sponsorship program, conservation bridge loans, additionally subsidized natural resource projects and planning, and additionally subsidized financing for targeted surface waters (e.g., lakes in crisis). Vermont's adaptive management framework for financing includes continued tracking of evolving needs for 319-eligible financing, identification of these needs in the Watershed Projects Database and/or respective Tactical Basin Plans, and proposals for creative additional subsidy use to meet pollution reductions for all Vermont watersheds.

## D. Adaptive Management Through Innovation in Policy

The history of clean water policy in Vermont over the past decade reflects a posture of adaptive management in clean water policy that transcends administration cycles. Key legislative changes in recent years, as further described in Chapter 3, were borne from new science and a recognition by the states highest-ranking policymakers of the need to evolve and improve our

[75] Farm-PREP model can be accessed here: https://www.stone-env.com/assets/resources/6d35ca97df/E_17054-FarmPREP.pdf

nonpoint pollution efforts. The following is an incomplete list of legislative policy change which substantiates Vermont's forthright commitment to and investment in adaptive management and continuous improvement and investment:

- Establishment of the Vermont river corridor management program (Act 110 of 2010)
- Establishment of river equilibrium as State policy (Act 138 of 2012)
- Vermont Shoreland Protection Act (2014)
- Vermont Clean Water Act (Act 64 of 2015)
- Establishment of new higher tiers of water quality classification (Act 79 of 2016)
- Establishment of eligibility for natural resources projects under the CWSRF Program (Act 185 of 2018)
- Clean Water Service Delivery Act (Act 76 of 2019)

## E. Adaptive Management Through Incremental Investment

The premise of adaptive management is that prior experience informs authentic learning, resulting in corrective changes to a system when things do not go as planned, and further refinement of a system when things are going well. The incremental innovation approach holds that advancement cannot occur without investment, yet not all of that investment will yield advancement. Vermont has heretofore approached its adaptive innovation in policy very much in this light, with incremental state-level investments in new policy instruments (good examples are Acts 64 and Act 76), followed by adaptive learning. Based on the new authorities in Act 64, and sustained public investments, the 2019 Clean Water Initiative Annual Performance Report is showing over 7% reductions in phosphorus relative to Lake Champlain TMDL goals in just the first four years of effort. Vermont is just at the beginning of incremental investment into the establishment of the Act 76 network of service providers, with significant learning and prospective adaptation in the coming years.

The same premise of incremental innovation investment also applies at the project level. Clean water projects are typically implemented following a design lifecycle, with some or all of the following phases: feasibility; 30% and 60% design; final design and permitting; construction; operation and maintenance. Each phase carries an incrementally higher level of investment, thus proceeding from one phase to the next should be evaluated in terms of the risk of failure and reward of continued investment. In its present efforts to establish the decentralized provider network, Vermont is building tools for state and external water quality professionals to apply these criteria in order to limit incremental investment to projects that meet gating criteria to pass to the next phase. By implementing such a staged system, Vermont can ensure that the public investment in clean water is made in a manner that encourages innovation, but quickly ceases further investment when risk is too high.

## F. Conclusion

The various chapters comprising the Vermont NPS Management Program Plan represent an acknowledgement of the need for continuing application of past successful approaches plus the integration of new initiatives to address NPS pollution. This combination of past successes, ability to adapt to changing needs and new efforts provide a high degree of optimism that meaningful and measurable reductions in NPS pollution control can and will continue to be achieved.

# Appendices

A. Appendix A: Annual Reporting on Nonpoint Source Management Plan Objectives

B. Appendix B: List of Priority NPS Impaired Surface Waters

C. Appendix C: List of Priority NPS Threatened or Stressed Surface Waters

D. Appendix D: List of Important Documents

# Appendix A: Annual Reporting on Nonpoint Source Management Plan Objectives 2021-2025

| Objectives Table 1. Required Agricultural Practices and Regulatory Program<br>Lead Entity: AAFM unless otherwise noted | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| 1.1 | Revise the Required Agricultural Practices (RAP) rule | • Update definition and requirements for Custom Manure Applicators<br>• Develop Technical Service Provider (TSP) certification program<br>• Develop and provide guidance for managing agricultural activities related to wetlands | • Rulemaking complete for revised Custom Manure Applicator statute update and TSP certification | X | | | | | |
| | | | • Complete Wetlands rulemaking | | | | | X | |
| 1.2 | Conduct inspections on all Large Farm Operations (LFOs) annually | • Minimize Large Farm Operation (LFO) NPS pollution<br>• Ensure LFO permit terms and provisions, and RAP requirements are attained | • 100% LFOs reporting and inspected annually (36 LFOs in 2019) | X | X | X | X | X | |
| 1.3 | Conduct inspections of Medium Farm Operations (MFOs) on a 3-year inspection cycle | • Minimize Medium Farm Operation (MFO) NPS pollution.<br>• Ensure MFO General Permit terms and RAP requirements are attained | • All permitted MFOs inspected at least once every three years. To meet the inspection schedule, AAFM will inspect approximately 33% of MFOs each year. (114 MFOs in 2019) | X | X | X | X | X | |
| 1.4 | Revise MFO General Permit every 5 years | • Revise MFO General Permit to ensure consistency with current water quality regulations and conservation practices | • Initiate MFO General Permit revisions | | X | | | | |
| | | | • Complete revisions, release new MFO General Permit | | | X | | | |
| 1.5 | Conduct inspections of Certified Small Farm Operations | • Reduce Certified Small Farm Operation (CSFO) and Small | • All CSFOs inspected at least once every 7 years. To meet the | X | X | X | X | X | |

| Objectives Table 1. Required Agricultural Practices and Regulatory Program<br>Lead Entity: AAFM unless otherwise noted | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| | (CSFOs) on a 7-year inspection cycle | Farm Operation (SFO) NPS pollution<br>• Assess CSFO compliance with RAP requirements | inspection schedule, AAFM will inspect approximately 14% of CSFOs each year (312 CSFOs in 2019) | | | | | | |
| 1.6 | Conduct Vermont Housing Conservation Board (VHCB) water quality assessments per AAFM/VHCB agreement | • Annually meet the terms of the AAFM/VHCB agreement, ensuring water quality assessments for farmland conservation applicants are completed to assess compliance with the RAPs | • 100% of VHCB-funded farmland conservation projects will have a current AAFM water quality assessment<br>• (Average 15 VHCB water quality assessments per year) | X | X | X | X | X | |
| 1.7 | Ensure implementation and compliance of the AAFM/ANR Memorandum of Understanding (MOU) | • Conduct routine meetings between DEC-Watershed Management Division (WSMD) and Environmental Compliance Division (ECD), VT Attorney Generals' Office, and AAFM to share current activities and review cases<br>• Institute measures or protocols to ensure consistency between DEC and AAFM during farm inspection process<br>• Coordinate with DEC-WSMD to review new or amended LFO permits<br><br>Note: actions above are a collaboration between AAFM and DEC | • Report annually on the successful implementation of MOU accepted by the Vermont Legislature | X | X | X | X | X | |

| Objective Table 2. Agricultural Outreach, Education, Technical Assistance and Financial Assistance<br>Lead Entity: AAFM unless otherwise noted | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress |
| 2.1 | Support partner technical assistance and educational events promoting Nutrient Management Planning (NMP) development and implementation | • Provide financial support to partners to host NMP development, implementation, and update workshops and provide NMP technical assistance | • Annual report summarizing partner education and technical assistance efforts related to NMP development and implementation | X | X | X | X | X | |
| 2.2 | Expand NMP educational and training opportunities | • Develop and deliver NMP training program(s) for Custom Manure Applicators and Technical Service Providers, requiring educational credits | • 80% certified technical service providers and certified custom manure applicators in compliance with educational credit requirements | | | | | X | |
| 2.3 | Provide technical and financial assistance for field and manure management practice implementation | • Deliver AAFM cost share and technical assistance programs that promote agronomic and manure management practices | • Annual report of funding and acreage of conservation practices implemented through AAFM cost share programs | X | X | X | X | X | |
| | | | • Achieve cumulative increase in phosphorus reductions over the course of 5 years as a result of field practice implementation | X | X | X | X | X | |
| 2.4 | Promote improved grazing, pasture management, and livestock exclusion | • Support agricultural partners and existing pasture based technical assistance programs, to provide technical and financial assistance for grazing pasture management and exclusion fencing practices. | • Annual report of funding, technical assistance visits, and acreage of conservation practices implemented through AAFM cost share programs | X | X | X | X | X | |

| Objective Table 2. Agricultural Outreach, Education, Technical Assistance and Financial Assistance<br>Lead Entity: AAFM unless otherwise noted | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress |
| 2.5 | Continue research and development of best management practices for tile drain systems | • Continue tile drain sampling and research data analysis<br>• Continue development of best management practices (BMPs) for tile drain management based on research and data analysis, and provide outreach and education on developed BMPs | • Deliver annual update to partners and the agricultural community on tile drain research, sampling, and BMP updates | X | X | X | X | X | |
| 2.6 | Conduct conservation practice surveys and conservation adoption social science efforts and surveys | • Support partner efforts to understand, track, and report farmer funded conservation adoption outside of state and federal programs<br>• Ensure funding available for education, outreach, and organizational development to support social science approach to conservation efforts | • Track and report farmer-funded conservation practice installation in the Partner Database | | X | X | | | |
| | | | • Analyze and develop report summarizing social research results to inform effective and realistic water quality policy and program development | | | | | X | |

| Objective Table 3. Agricultural Partnerships and Initiatives<br>Lead Entity: AAFM unless otherwise noted | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions by AAFM and partners | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Update |
| 3.1 | Increase water quality improvement by adapting innovative and flexible practices under Regional Conservation Partnership Program (RCPP) funding in Vermont | • Receive and allocate additional $10 million funding to extend RCPP through 2025<br>• Apply for and implement additional RCPP funds as possible<br><br>Note: DEC will lead the above actions with support from AAFM | • Annual quantification of phosphorus reduction based on RCPP contract implementation | X | X | X | X | X | |
| 3.2 | Improve understanding of land treatment and water quality response in conjunction with National Water Quality Initiative (NWQI) (Rock River, East Creek and Hungerford Brook) | • Review current NWQI projects with partners and identify more site-specific monitoring and localized opportunities for water quality improvement<br>• Carry out water quality monitoring efforts and interpret monitoring data<br>• Acquire non-sensitive information from NRCS regarding land treatment implementation<br><br>Note: DEC will lead the above actions with support from AAFM | • NWQI progress reports submitted to EPA on annual or biannual basis. | X | X | X | X | X | |
| 3.3 | Support agricultural water quality partners to increase and strengthen partnerships, | • Host, maintain, and enhance the Multi-Partner Agricultural Conservation Practice Tracking and Planning Geospatial | • Provide Partner Database trainings and support | X | X | X | X | X | |

| Objective Table 3. Agricultural Partnerships and Initiatives<br>Lead Entity: AAFM unless otherwise noted | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions by AAFM and partners | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Update |
| | assistance and resources to farms, and efforts to improve water quality | Database (Partner Database)<br>• Provide support to new and existing farmer-led watershed groups<br>• Provide support to agricultural partners through the Agricultural Clean Water Initiative Program grants (Ag-CWIP)<br>• Support local conservation practice research and monitoring | • Include farmer-led watershed groups in stakeholder meeting, as applicable | X | X | X | X | X | |
| | | | • Research and monitoring results developed and disseminated as available | | | X | | X | |
| 3.4 | Collaborate and Coordinate with the Vermont Agricultural Water Quality Partnership (VAWQP) | • Implement the VAWQP strategic plan developed in 2019 to build a stronger coalition and share research and learning across the partnership<br>• Create and sustain a formal VAWQP structure<br>• Utilize Tactical Basin Planning to Prioritize watersheds within each basin<br>• Support Vermont-specific research and monitoring including Conservation Effects Assessment Program in Addison County, Discovery Acres in Franklin County and the MAPHEX (phosphorus removal system) demonstrations in collaboration with Penn State. | • Host biennial research summit where researchers share their findings, results, and on-going work with partners, including Vermont, regional and national experts | X | | X | | X | |
| | | | • Hold Annual VAWQP Meeting, Steering Committee meetings and VAWQP Leadership meetings. | X | X | X | X | X | |

| Objective Table 3. Agricultural Partnerships and Initiatives<br>Lead Entity: AAFM unless otherwise noted | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions by AAFM and partners | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Update |
| | | Note: VAWQP will lead the above actions with support from AAFM and DEC | | | | | | | |
| 3.5 | Administer Vermont Phosphorus Innovation Challenge (VPIC) to harness creative solutions to address phosphorus pollution | • Continue VPIC program implementation, supporting the development of innovative protypes to address phosphorus pollution in Vermont | • Report on the potential of VPIC projects for future phosphorus reduction | X | X | X | X | X | |

| Objectives Table 4. Nonregulatory Stormwater Management<br>Lead entity: DEC Clean Water Initiative Program unless otherwise noted | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| 4.1 | Increase education and awareness of operation and maintenance (O&M) of installed BMPs | • Establish O&M standards based on project type<br>• Conduct training and technical assistance targeting municipalities, private owners of BMPs, CWSPs or CWSP O&M contractors on O&M standards<br>• Organize a regional O&M summit or outreach event each year for partners, municipalities and consultants<br>Note: DEC will lead this effort in conjunction with Lake Champlain Sea Grant. | • Training materials/curriculum developed on O&M inspection and maintence standards and techniques | | X | | | | |
| | | | • Conduct annual O&M training and technical assistance each year. | X | X | X | X | X | |

| Objectives Table 4. Nonregulatory Stormwater Management<br>Lead entity: DEC Clean Water Initiative Program unless otherwise noted | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| 4.2 | Identify priority non-regulatory road segments contributing to NPS pollution and mitigate erosion and polluted runoff | • Develop methods and tools to inventory non-regulatory roads<br>• Pilot inventory of non-regulatory roads in high priority watersheds (as defined in basin plans, SWMP's etc.)<br>• Implement high priority non-regulatory road improvement projects (O&M responsible party must be in place) | • Complete pilot inventory for non-regulatory roads to identify and prioritize road segments for remediation | | X | | | | |
| | | | • 10% of non-regulatory roads brought up to applicable non- regulatory standards and O&M responsible party in place | | | | | X | |
| 4.3 | Utilize the basin planning process to identify priority municipalities for developing Stormwater Master Plans (SWMPs) and maintain a list of priority proposed stormwater projects to be addressed | • Identify priority towns or watersheds that have not completed SWMPs<br>• Implement SWMP's as described in specific basin planning objectives | • 15 new SWMPs completed over 5 years | | | | | X | |
| 4.4 | Make progress toward meeting Lake Champlain and Lake Memphremagog developed lands targets through implementation of non-regulatory projects | • Fund and implement non-regulatory developed lands treatment projects. | • Progress on non-regulatory developed lands reductions in Lake Champlain and Memphremagog basins consistent with achieving 5-year targets in Phase 3 Tactical Basin Plans | | | | | X | |

| Objectives Table 5. Functioning Floodplains Initiative (FFI): Restoring Rivers, Floodplains and Wetlands<br>Lead Entity: DEC Rivers Program unless otherwise noted | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| 5.1 | Phase 1 Functioning Floodplains Initiative (FFI):<br>identify nature-based projects through scoring, tracking, and mapping of floodplain and wetland functions. | • Develop methods and mapping to identify high priority projects to restore and protect stream, wetland, and floodplain functions.<br><br>Note DEC's Rivers Program will lead this effort with assistance from a technical advisory committee comprised of several DEC staff and outside contractors | Phase 1 deliverables completed<br>1. Attainment scoring<br>2. Connectivity Maps<br>3. Reconnect VT Rivers Maps<br>4. Conceptual Hydrology/Hydraulics mapping | X | | | | | |
| 5.2 | Phase 2 Functioning Floodplains Initiative (FFI):<br>track existing and potential river form and process, as well as the effectiveness of interventions to improve river and floodplain connectivity and function | • Work with contractor as part of a technical advisory committee to advise and assist in completion of required deliverables<br><br>Note DEC's Rivers Program will lead this effort with assistance from a technical advisory committee comprised of several DEC staff and outside contractors | Phase 2 deliverables completed<br>1. Weighted prioritizations of floodplain and river reconnection projects<br>2. Function and values assessment and mapping methodologies<br>3. Web-based mapping and tracking program with training modules<br>4. Outreach materials reconnect Vermont rivers<br>5. Final Report/Closeout | | X | | | | |

| Objectives Table 7. Wetland Protection and Restoration<br>Lead entity: DEC Wetlands Program | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| 7.1 | Provide regulatory assistance in wetland avoidance and minimization. restoration | • Administer Vermont Wetland Rules (VWR).<br>• Revise VWR to include greater clarity on avoidance and minimization steps. | • Rule revision adoption | X | | | | | |
| | | | • Yearly reports of wetland losses and gains from permitting. | X | X | X | X | X | |
| | | | • 5-year report of wetland losses and gains demonstrating the achievement no net loss. | X | | | | | |
| 7.2 | Increase protections for our most irreplaceable wetlands that provide water storage and water quality protection functions. | • Complete Class I Designations | • 2,000 acres of wetland designated as Class I | | | | | X | |
| 7.3 | Improve knowledge of wetland locations to enhance wetland avoidance in project design. | • Update wetland advisory layer and Vermont Significant Wetlands Inventory | • 20 square miles added to map layers | | | | | X | |
| 7.4 | Increase wetland acreage and function through restoration of previously drained and degraded wetlands | • Provide technical assistance to the Department of Fish and Wildlife's wetland restoration program to ensure projects maximize water quality improvements.<br>• Provide incentive funding to the NRCS WRE program to increase number of farmers enrolled.<br>• Provide grant funding for wetland restoration projects. | • 1,000 acres restored | | | | | X | |

| Objective Table 8. Lakes and Ponds NPS pollution<br>Lead entity: DEC Lakes and Ponds Program | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| 8.1 | Reduce runoff from impervious surfaces on shorelands into lakes | • Work with shoreland residents through the Lake Wise Program to implement land management practices that reduce this runoff, including planting and maintaining vegetated areas, ensuring clean runoff, and stabilizing banks.<br>• Training Lake Wise Evaluators, individuals qualified to help residents identify sources of runoff and address those through the implementation of best management practices, is another important ongoing effort. | • Ten Lake Wise BMP project sites identified during each summer field season | X | X | X | X | X | |
| | | | • Complete at least five lake wise implementation projects each summer field season | X | X | X | X | X | |
| | | | • Two Shoreland Erosion Control Trainings completed each year | X | X | X | X | X | |
| 8.2 | Identify and address sources of non-point source pollution in a lake's watershed and develop projects to reduce loading | • Develop water quality restoration plans known as Lake Watershed Action Plans (LWAPs) that identify sources of nutrient and sediment loading to lakes, prioritize sources based on various environmental, economic, and social criteria, and design projects to mitigate those sources. | • Identify five lakes to develop LWAPs | X | | | | | |
| | | | • Complete five LWAPS pending funding and willing partners | | X | | | | |
| | | | • Begin to implement LWAP projects | | | X | X | X | |

| Objective Table 8. Lakes and Ponds NPS pollution<br>Lead entity: DEC Lakes and Ponds Program | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| 8.3 | Detect and Eradicate Aquatic Invasive Species (AIS) | • Implement a series of projects to reduce the spread of AIS enabled by increasing phosphorus concentrations, such as EWM.<br>• Award annual grants to support projects that will contain further AIS spread, including the Vermont Public Access Greeter Program which educates boaters and provides courtesy watercraft inspections to prevent invasive plants and animals from spreading from one waterbody to another. | • Implement the Greeter Program at 30+ boat access areas across the state on an annual basis to prevent the spread of AIS to lakes where none are currently present | X | X | X | X | X | |
| 8.4 | Reducing non-point phosphorus pollution from roads near lake shores | • To help reduce road runoff and protect surfaces waters, Act 64 mandates all hydrologically connected roads (class one through four) be maintained according to new road drainage standards. One such standard is an exemption that protects trees and shrubs along roads within 250 feet from cutting or moving and prevents roads from being widened toward the lake side. The Lakes and Ponds Program is training road maintenance officials and road building contractors and providing materials to successfully implement this aspect of Act 64. | • Completion of Bioengineering Manual showcasing five years of shoreland road restoration projects and methodologies for the installation of these practices | | X | | | | |
| | | | • New shoreland BMP guidance to address specific road / shoreland interface challenges | | X | | | | |
| | | | • Implement new BMPs and evaluate effectiveness of BMPs | | | X | X | X | |

| Objective Table 8. Lakes and Ponds NPS pollution<br>Lead entity: DEC Lakes and Ponds Program | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| 8.6 | Reverse pattern of increasing chloride trends in Lake Champlain and other relevant inland lakes | • Support the development of a program in VT similar to New Hampshire's Green Snow Pro program which reduces liability for certified salt applicators and thereby is a guard against over-salting, integrate lakes priorities into VTrans Snow and Ice Transportation Plan, and begin an effort to monitor lakes where chloride concentrations are increasing | • Development of legislation for a reduced salt application program | X | X | | | | |
| | | | • Work with VTrans to add low-salt zones around chloride-sensitive lakes into Snow & Ice Plan | | X | X | X | | |

| Objective Table 9: Forest Lands Analysis, Tracking, Accounting and Pollutant Reduction<br>Lead Entity: Department of Forest Parks and Recreation (FPR) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| 9.1 | Encourage compliance with AMP rules and decrease enforcement cases. | • Continue annual AMP enforcement and compliance reporting under revised AMPs using the AMP database. | • Decrease average number of complaints from a baseline of 32 cases per year and increase the average number of technical assists from a baseline of 13 per year. | X | X | X | X | X | |
| 9.2 | Provide technical assistance and | • Provide trainings through partnerships with LEAP, | • Offer 2-3 workshops per year | X | X | X | X | X | |

| Objective Table 9: Forest Lands Analysis, Tracking, Accounting and Pollutant Reduction<br>Lead Entity: Department of Forest Parks and Recreation (FPR) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| | outreach to loggers, foresters and landowners | Vermont Woodlands Association (VWA), Vermont Forests Products Association (VFPA).<br>• Develop digital AMP manual consisting of the new AMP manual as a smartphone application with enhanced tools to help implement the AMPs | • Disseminate the new digital AMP manual. | X | | | | | |
| 9.3 | Reduce erosion and sedimentation at stream crossings during harvesting | • Provide technical support and bridge rentals to loggers, foresters and landowners<br>• Continue to administer the cost-share program for temporary skidder brides<br>• Continue to support stream crossing improvement projects with RCPP funds | • 2-3 rentals of the heavy-duty bridges per year | X | X | X | X | X | |
| | | | • Support cost share 5-7 bridges per year | X | X | X | X | X | |
| 9.4 | Develop methods to track and account for phosphorus and sediment reduction of forestland projects | • Hire contractors to define methodology to identify and map critical sources areas of forestland phosphorus and sediment reduction potential<br>• Create list of prioritized sites to target project development<br>• Hire contractors to develop | • Critical source area maps categorized by forestland BMP type, and prioritized locations to target field assessments and project development | X | | | | | |
| | | | • Finalize forestland phosphorus accounting methods | X | | | | | |

| Objective Table 9: Forest Lands Analysis, Tracking, Accounting and Pollutant Reduction<br>Lead Entity: Department of Forest Parks and Recreation (FPR) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| | | forestland BMP phosphorus accounting methodology design life and data requirements | • Promote BMP implementation through private lands staff, Technical Service Providers (TSPs), private foresters and other strategies | | X | X | X | X | |
| 9.5 | Refine the tracking and accounting of UVA AMP compliance, especially in priority basins to meet TMDL targets | • Inspect parcels and document AMP compliance and identify opportunities for improvements | • Develop, test and refine data collection system. | X | | | | | |
| | | | • Fully deploy system | | X | X | X | X | |
| 9.6 | Implementation of forestry BMPs on high priority state lands | • Develop method to inventory ANR roads and trails and map of ANR roads and trails | • Conduct inventory assessment of ANR lands over 3 years. Phase one starting in 2020. | X | X | X | | | |
| | | • Prioritized list of projects for remediation-completed in 3 phases. | • Complete final prioritization list | | | X | | | |
| | | • Implement BMPs based on priority and funding. | • Inventory results and project prioritization incorporated into long range management planning and FPR Annual Stewardship plans. | | | X | X | X | |

| Objective Table 9: Forest Lands Analysis, Tracking, Accounting and Pollutant Reduction<br>Lead Entity: Department of Forest Parks and Recreation (FPR) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| 9.7 | Enhance inter-Departmental (within ANR) coordinated approach in managing current state lands | • Identify high priority acquisition projects that meet mutual (multiple) objectives<br>• Work with District Stewardship Teams to revise/update criteria and apply to new acquisition priorities forwarded to the Agency Lands Acquisition Committee (ALAC) | • Update ANR Lands Conservation Plan | X | | | | | |

| Objectives Table 10: Healthy Forest Cover<br>Lead Entity: FPR Division of Forests | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| 10.1 | Protect and enhance urban forest canopy cover | • Provide high-priority communities with targeted technical & financial assistance to protect urban forest canopies. Assistance includes conducting tree inventories and canopy assessments, reviewing policies and plans, and supporting tree wardens and tree management objectives<br>• Deliver urban forestry outreach presentations to varying audiences. Provide educational opportunities to municipalities to develop sustainable urban forestry programs and advance urban forestry management. | • Provide assistance to 10 communities per year. | X | X | X | X | X | |
| | | | • Provide 5 outreach events per year. | X | X | X | X | X | |

| Objectives Table 10: Healthy Forest Cover<br>Lead Entity: FPR Division of Forests | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| 10.2 | Maintain and increase UVA enrolled forestland among eligible parcels. | • Provide outreach and technical assistance to private landowners and foresters to equip them with tools to apply, enroll and manage their land in accordance with program standards, including implementation of AMPs. Current forestland enrolled is just under 2,000,000 acres | • Provide 5 outreach events per year | X | X | X | X | X | |
| | | | • Visit 800 parcels per year | X | X | X | X | X | |

| Objective Table 11. Planning and reporting on TMDL Progress<br>Lead Entity: Water Investment Division Watershed Planning Program (WPP) unless otherwise noted | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| 11.1 | Identify and develop high priority clean water projects to implement TMDLs | • Coordinate with inter-agency programs and statutory partners to develop draft TBPs for review | Publish 15 Basin Plans | | | | | X | |
| 11.2 | Meet TMDL target load allocations to comply with VT Water Quality Standards | • Publish Tactical Basin Plans with phase 3 and/or geographically explicit implementation priorities | • Lake Champlain Phase 3 content completed and subsequent iterations of other TBPs (Memphremagog, Connecticut River Basins) | Basin 6&7 | Basin 2/4 | Basin 8 | Basin 3&5 | | |
| | | | • Implementation targets for Lake Memphremagog | | X | | | | |

| Objective Table 11. Planning and reporting on TMDL Progress<br>Lead Entity: Water Investment Division Watershed Planning Program (WPP) unless otherwise noted | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| 11.3 | Develop TMDL targets by basin and sector | • Target-setting to meet allocations by sector, by basin split into regulatory and non-regulatory | • Phase 3 accounting and target setting completed (Champlain) | Basin 6&7 | Basin 2/4 | Basin 8 | Basin 3&5 | | |
| | | | • Implementation targets established (Memphremagog) | | X | | | | |
| 11.4 | Report on progress made towards clean water restoration and protection goals | • Develop Tactical Basin Plan Implementation Table interim and final report cards<br>• CWIP and WPP develop and submit Annual Clean Water Initiative Performance Report including TMDL progress report | • Interim/ Final Report Cards developed for basins according to Lake Champlain TMDL Accountability Framework | Basin 8 | Basin 2/4 & 3 | Basin 8 & | Basin 3 | Basin 5 | |
| | | | • Basins 6 and 7 submit final reports in 2021 | | X | 5 | | | |

| Objective Table 12. Clean Water Service Delivery Tasks and Programs Addressing Nonpoint Source Pollution<br>Lead Entity: Clean Water Initiative Program and Watershed Planning Program | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| 12.1 | Provide reasonable assurances that non-regulatory TMDL targets will be achieved and maintained | • Establish Clean Water Service Providers (CWSPs) and Water Quality Restoration Formula Grant Program | • Complete rulemaking process to establish CWSPs in Lake Champlain and Lake Memphremagog Basins and finalize Water Quality Restoration Formula Grant Guidance Document | X | | | | | |
| | | | • Implement Water Quality Formula Grant Program | | X | | | | |
| | | | • Determine timeline for expanding CWSP model to address other priority pollutants statewide | | | X | | | |
| 12.2 | Ensure protection and enhancement of unimpaired waters through enhanced NPS management and protection projects | • Establish Water Quality Enhancement Grant Program | • Implement Water Quality Enhancement Grant Program statewide | | X | | | | |
| 12.3 | Develop and deploy clean water accounting methodology to track reductions from clean water projects previously unaccounted for | • CWIP coordinate the development of phosphorus accounting methodologies for all project types without methods in place (e.g. rivers, floodplains and wetland restoration and forestry BMPs)<br>• CWIP confirm existing accounting | • Document phosphorus accounting methodology by sector and project types | X | | | | | |
| | | | • Develop Quality Assurance Project Plan (QAPP) on phosphorus accounting methodology and submit to EPA | | X | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | methodology for non-regulatory projects<br>• CWIP coordinate development of standard design life for all project types | • Reductions attained from all completed clean water projects, not previously reported on, captured in Clean Water Initiative Annual Performance Report | | | X | X | X | |
| 12.4 | Establish Clean Water Service Providers for each Champlain (tactical) Basin/ region and Memphremagog Basin | • Rulemaking process to adopt the CWSP for 6 Champlain Basins and 1 Memphremagog Basin | • CWSPs for Champlain and Memphremagog Basins selected and adopted by rule | X | | | | | |
| | | | • Basin Water Quality Councils (BWQCs) established and operational for Champlain and Memphremagog Basins | | X | | | | |
| 12.5 | Provide assurance that BMPs implemented on the ground are properly functioning throughout their useful design life | • Establish BMP Verification Procedures<br>• Train CWSPs, and other entities on BMP Verification (see Objective table 4 for training milestones) | • BMP Verification procedures documented<br>• Operation and maintence (O&M) standards manual developed, and standards incorporated in cost share programs and verification programs | X | | | | | |
| | | | | | X | | | | |
| | | | • Field verify O&M of 35 state funded GSI projects per year | X | X | X | X | X | |
| 12.6 | Adaptive management strategy developed and deployed | • Applying accounting methods, determine progress made in meeting target allocations (WID) | • Analyze and report on clean water BMP implementation progress annually by sector and basin | X | X | X | X | X | |

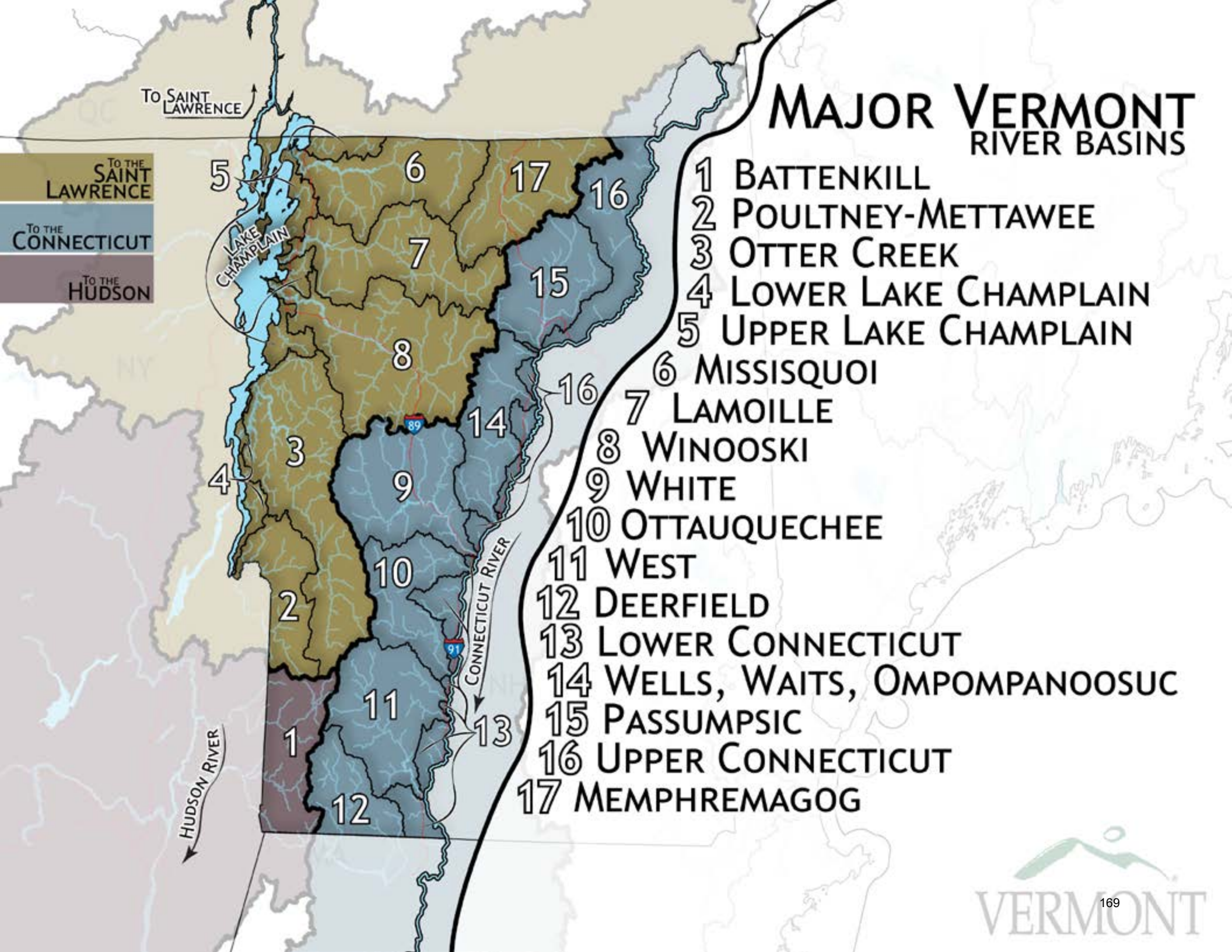
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | • BMP implementation progress informs updated targets for next planning cycle | | X | | X | | |

| Objective Table 13. NPS Program Administration and Oversight<br>Lead Entity: Clean Water Initiative Program: Nonpoint Source Coordinator | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| 13.1 | EPA approved NPS Success Stories that document partial or full restoration of NPS impaired waters | • Through reliable water quality monitoring efforts, document NPS impaired situations where water quality is fully or partially restored. | • At least two type 1 Vermont NPS success stories submitted and made part of EPA's NPS Success Stories web page with each biannual listing cycle. | | X | | X | | |
| 13.2 | Continue to manage & implement NPS program to meet goals while working towards addressing Vermont's NPS water quality problems effectively & expeditiously | • Employ appropriate programmatic & financial systems that ensure 319 dollars are used efficiently & consistent with fiscal and legal obligations. In keeping with Section<br>• 319(h)8 & 11, provide EPA with sufficient information/reports/data about VT 319 program to allow EPA to determine progress & whether meeting or exceeding all elements in EPA's Satisfactory Progress Determination (SPD) checklist. | • Vermont NPS Program continues to receive SPDs on an annual basis in a timely fashion. | X | X | X | X | X | |
| 13.3 | Preparation & submittal of annual NPS program reports consistent with EPA guidance | • Assemble pertinent material reporting on Vermont's progress meeting program milestones noted in NPS Management Program plan. | • Report annually on progress made in implementing the state's NPS Management Program | X | X | X | X | X | |

| Objective Table 13. NPS Program Administration and Oversight<br>Lead Entity: Clean Water Initiative Program: Nonpoint Source Coordinator | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Objectives | Actions | Milestones | 2021 | 2022 | 2023 | 2024 | 2025 | Progress Updates |
| | | • When information is available, report estimated reductions in NPS pollutant loading & other improvements in water quality arising from program implementation. Provide draft annual program report to EPA for review.<br>• Submit annual report. | | | | | | | |
| 13.4 | Revised NPS Management Program plan | • Track the status of actions, milestones & accomplishments found in current 2021-2025 NPS Management Program plan.<br>• Prepare revised & updated NPS Management Program | • EPA-approved Vermont NPS Management Program plan (2026-2030) in place by 10/1/2025 | | | | | X | |

# APPENDIX B: LIST OF PRIORITY NPS IMPAIRED SURFACE WATERS

This list of priority NPS impaired waters for Vermont is a subset of Part A (impaired waters without a TMDL) and Part D (impaired waters with completed TMDLs) of the 2020 303(d) impaired waters list.


To Saint Lawrence
To the Saint Lawrence
To the Connecticut
To the Hudson
Lake Champlain
Connecticut River
Hudson River
Major Vermont River Basins
1 Battenkill
2 Poultney-Mettawee
3 Otter Creek
4 Lower Lake Champlain
5 Upper Lake Champlain
6 Missisquoi
7 Lamoille
8 Winooski
9 White
10 Ottauquechee
11 West
12 Deerfield
13 Lower Connecticut
14 Wells, Waits, Ompompanoosuc
15 Passumpsic
16 Upper Connecticut
17 Memphremagog
VERMONT

## LIST OF PRIORITY NPS IMPAIRED SURFACE WATERS

Heading descriptions:

**Waterbody ID** - The two digits following VT identifies the Major Vermont River Basin illustrated in the attached map and the two digits following identifies the sub-basin or mainstem within the major basin.

**Code-** If the code contains an L the listing is a Lake within the sub basin and if the code is two digits the listing is a river reach within the sub basin or mainstem.

**Altered Use(s)** - (ALS) Aquatic biota and wildlife that may utilize or are present in the waters; (AH) Aquatic habitat to support aquatic biota, wildlife, or plant life; (CR) The use of waters for swimming and other primary contact recreation; (CRF) The use of waters for fishing and related recreational uses; (CRB) The use of waters for boating and related recreational uses; (AES) The use of waters for the enjoyment of aesthetic conditions

**TMDL Priority** - An indication of priority as to when TMDLs will be completed (High = 1-3 years, Medium= 4-8 years, Low = 8+ years)

**Status**- Waterbodies on Part D have a TMDL in place. This colum indicates the status of the TMDL.

----------The following is a subset of Part A of Vermonts 303(d) list (Impaired Surface Waters without a TMDL) ----------

| Waterbody ID | Code | Waterbody Name | Impaired Use(s) | Pollutant | Problem | TMDL Priority |
|---|---|---|---|---|---|---|
| VT01-02 | 02 | Ladd Brook, Mouth to rm 0.4 | ALS | SEDIMENTATION/SILTATION | Indication of sediment stress; potential impacts from eroding gravel roads | Medium |
| VT01-05 | 03 | Munson Brook | ALS | SEDIMENTATION/SILTATION | Runoff from developed lands, chloride stress biological community | Low |
| VT02-02 | 01 | Hubbardton River, Trib #7, Below WWTF Discharge | ALS | NUTRIENTS | Benson WWTF, agricultural runoff, elevated chloride possible sources | Medium |
| VT02-05 | 04 | Mettawee River, Flower Brook Confluence Downstream 4.3 Mi. | CR | ESCHERICHIA COLI (E. COLI) | Consistently elevated E. coli | Low |
| VT03-04 | 02 | Pleasant Brook from Leicester-Whiting Rd Upstream to VT Route 73e (2.2 Miles) | ALS | NUTRIENTS | Runoff from agricultural lands | Medium |
| VT03-06 | 01 | Moon Brook, Mouth to 1.8 | CR | ESCHERICHIA COLI (E. COLI) | Consistently elevated E. coli | Low |
| | 02 | Mussey Brook, Mouth to rm 0.1 | CR | ESCHERICHIA COLI (E. COLI) | Consistently elevated E. coli | Low |
| | 06 | Mussey Brook, rm 0.1 to rm 0.5 | CR | ESCHERICHIA COLI (E. COLI) | Consistently elevated E. coli | Low |
| VT05-01 | 01 | Rock River, Mouth to VT/Quebec Border (3.6 Miles) | AES, AH | NUTRIENTS, SEDIMENTATION/SILTATION | Algal growth; agricultural runoff | Medium |
| | 02 | Rock River, Upstream from Quebec/VT Border (Approx 13 Miles) | ALS | SEDIMENTATION/SILTATION, NUTRIENTS | Nutrient enrichment; agricultural runoff | High |
| | 03 | Saxe Brook (Trib to Rock River) from Mouth Upstream 1 Mile | ALS | NUTRIENTS | Agricultural runoff | Medium |

## LIST OF PRIORITY NPS IMPAIRED SURFACE WATERS

| Waterbody ID | Code | Waterbody Name | Impaired Use(s) | Pollutant | Problem | TMDL Priority |
|---|---|---|---|---|---|---|
| VT05-07 | 01 | Rugg Brook, from Mouth to Approx 3.1 Miles Upstream | AES, ALS, CR | SEDIMENTATION/SILTATION, NUTRIENTS, ESCHERICHIA COLI (E. COLI) | Agricultural runoff | High |
| | 03 | Jewett Brook (3.5 Miles) | ALS | SEDIMENTATION/SILTATION, NUTRIENTS | Agricultural runoff | High |
| | 04 | Mill River, from St. Albans Bay to 1.8 Miles Upstream | ALS | NUTRIENTS, SEDIMENTATION/SILTATION | Agricultural runoff, streambank erosion | High |
| | 05 | Stevens Brook, Mouth Upstream 6.5 Miles | ALS, CR | NUTRIENTS, SEDIMENTATION/SILTATION, ESCHERICHIA COLI (E. COLI) | Agricultural runoff; morphological instability; St Albans CSO | High |
| VT05-11 | 06 | Mccabes Brook, Mouth to rm 1.4 | ALS | NUTRIENTS | Includes above and below WWTF; possible toxic impact below WWTF; unstable channel above | Medium |
| VT06-03 | 01 | Morrow Brook from Its Mouth Upstream 2 Miles | ALS | NUTRIENTS | Runoff from agricultural lands | High |
| VT06-04 | 01 | Berry Brook, Mouth Up to and Including N. Trib (Approx. 1 Mile) | AES, ALS | SEDIMENTATION/SILTATION, NUTRIENTS | Agricultural runoff, aquatic habitat impacts | High |
| | 02 | Godin Brook | AES, ALS | SEDIMENTATION/SILTATION, NUTRIENTS | Agricultural runoff, aquatic habitat impacts | High |
| | 03 | Samsonville Brook | AES, ALS | SEDIMENTATION/SILTATION, NUTRIENTS | Agricultural runoff, aquatic habitat impacts | Medium |
| | 04 | Trout Brook, Upstream from Mouth for 2.3 Miles | ALS | NUTRIENTS | Runoff from agricultural lands | High |

## LIST OF PRIORITY NPS IMPAIRED SURFACE WATERS

| Waterbody ID | Code | Waterbody Name | Impaired Use(s) | Pollutant | Problem | TMDL Priority |
|---|---|---|---|---|---|---|
| | 06 | Giddings Brook from Its Confluence with the Missisquoi Upstream 4 Miles | ALS | NUTRIENTS, POLLUTANTS IN URBAN STORMWATER | Runoff from agricultural and developed lands | High, Low |
| VT06-05 | 02 | Wanzer Brook (Mouth to rm 4.0) | ALS | NUTRIENTS, SEDIMENTATION/SILTATION | Agricultural runoff | High |
| VT06-08 | 03 | Mud Creek, from Vt/Que Border Up to rm 6.5 (Approx. 3.2 Miles) | AES, ALS | SEDIMENTATION/SILTATION, NUTRIENTS | Agricultural runoff; nutrient enrichment impacts macroinvertebrates | High |
| | 04 | Coburn Brook (Mouth to rm 0.2) | ALS | NUTRIENTS | Agricultural activities and runoff | High |
| | 09 | Jay Branch Tributary # 7 (2.2 Mi.) | ALS | SEDIMENTATION/SILTATION | Erosion from parking areas and on-mountain activities | Medium |
| | 10 | Ace Brook, rm 0.7 to Headwaters 1 Miles | ALS | SEDIMENTATION/SILTATION | Sediment discharges and hydrologic change from logging activity | Low |
| VT07-03 | 02 | Stones Brook from 150 Feet Below Fairfax Road Upstream to the Confluence with Halfmoon Brook (1 Mile) | ALS | NUTRIENTS | Agricultural runoff, loss of riparian buffer | High |
| | L01 | Halfmoon | AES | PHOSPHORUS, TOTAL | Extremely elevated TP; agricultural influences | Low |
| VT08-02 | L01 | Shelburne | ALS, CR, CRF | PHOSPHORUS | Excessive algae and native plant growth causes periodic low dissolved Oxygen and fish kills | Low |
| VT08-07 | 01 | Winooski River, Plainfield rm 70.7 to rm 71.4 | CR | ESCHERICHIA COLI (E. COLI) | Consistently elevated E. coli | Low |
| | 02 | Winooski River, Marshfield, rm 72.8 Up to Confluence with Mollys Brook | CR | ESCHERICHIA COLI (E. COLI) | Consistently elevated E. coli, impairment continues upstream into VT08-09 | Low |
| VT08-08 | 02 | Blanchard Brook, Mouth to rm 0.4 | ALS | TEMPERATURE, CAUSE UNKNOWN | Failed biocriteria; stressors include temperature, chloride, sediment, nutrients and developed land runoff | Medium, |
| VT08-09 | 03 | Winooski River, Cabot, Mollys Falls Brook Up to rm 83.8 | CR | ESCHERICHIA COLI (E. COLI) | Consistently elevated E. coli; continuation of downstream impairment from VT08-07 | Low |
| VT08-16 | 04 | Stevens Branch, from Barre City Limits to Mouth, 5.8 Miles | CR | ESCHERICHIA COLI (E. COLI) | Consistently elevated e. coli, urban runoff | Low |

## LIST OF PRIORITY NPS IMPAIRED SURFACE WATERS

| Waterbody ID | Code | Waterbody Name | Impaired Use(s) | Pollutant | Problem | TMDL Priority |
|---|---|---|---|---|---|---|
| VT08-17 | 01 | Dog River, Riverton Canoe Access Downstream 0.5 Miles | CR | ESCHERICHIA COLI (E. COLI) | Consistently elevated E. coli | Low |
| VT08-20 | 01 | Clay Brook, rm 1.8 to rm 2.3 | AES, ALS | IRON, POLLUTANTS IN URBAN STORMWATER | Stormwater runoff, erosion from construction activities & gravel parking lot; increased peak stormwater flows | Low |
| VT09-04 | 01 | First Branch White River, Mouth to rm 15.2 | CR | ESCHERICHIA COLI (E. COLI) | Consistently elevated E. coli | Low |
| VT09-05 | 01 | Second Branch White River, Mouth to rm 9.8 | CR | ESCHERICHIA COLI (E. COLI) | Consistently elevated E. coli | Low |
| VT09-06 | 02 | Third Branch White River, Mouth to rm 4.3 | CR | ESCHERICHIA COLI (E. COLI) | Consistently elevated E. coli | Low |
| VT10-06 | 01 | Roaring Brook, rm 3.5 to rm 4.2 | AES, ALS | POLLUTANTS IN URBAN STORMWATER | Stormwater runoff, land development, erosion | Low |
|  | 02 | E. Branch Roaring Brook, rm 0.1 to rm 0.6 | AES, ALS | IRON, POLLUTANTS IN URBAN STORMWATER | Stormwater runoff, land development, erosion | Low |
| VT12-05 | 06 | Ellis Brook, Mouth to rm 0.5 | ALS | TEMPERATURE, NUTRIENTS | Possible impacts from NBFD WWTF, agricultural runoff and channel alterations, lack of riparian buffer; high algal cover | Medium |
| VT13-13 | 01 | Crosby Brook, Mouth to rm 0.7 | ALS | SEDIMENTATION/SILTATION | Habitat alterations due to sedimentation, channelization, and buffer loss | Medium |
| VT13-16 | 01 | Newton Brook, Mouth to rm 2.0 | ALS | SEDIMENTATION/SILTATION | Agricultural activity | Medium |
| VT17-02 | 01 | Stearns Brook Tributary (Holland) | ALS | NUTRIENTS | Agricultural runoff | High |
| VT17-08 | 01 | Roaring Brook, rm 2.4 to Lake Parker | ALS | NUTRIENTS | Agricultural runoff impacts macroinvertebrates | Low |
| VT17-09 | L01 | Walker (Covnty) | AES | PHOSPHORUS, TOTAL | Extremely elevated TP concentrations; agricultural influences | Low |
| VT17-10 | L02 | Mud (Crafby) | AES | PHOSPHORUS, TOTAL | Extremely elevated TP concentrations; agricultural influences | Low |

----------The following is a subset of Part D of Vermonts 303(d) list (Impaired Surface Waters with a TMDL) ----------

| Waterbody ID | Code | Waterbody Name | Impaired Use(s) | Pollutant | Problem | Status |
|---|---|---|---|---|---|---|
| VT02-05 | 03 | Flower Brook, Mouth to rm 0.5 | CR | ESCHERICHIA COLI (E. COLI) | Elevated E. coli monitoring results | EPA approved TMDL September 30, 2011 |
| VT03-01 | 01 | Otter Creek, Mouth of Middlebury River to Pulp Mill Bridge (4.0 Mi) | CR | ESCHERICHIA COLI (E. COLI) | Agricultural runoff, possible failed septic systems, Middlebury CSOs | EPA approved TMDL September 30, 2011 |
| VT03-06 | 01 | Moon Brook, Mouth to 1.8 | ALS | POLLUTANTS IN URBAN STORMWATER, TEMPERATURE | Elevated instream temperatures; impoundments and lack of shading | thermal TMDL completed by VTDEC and approved by EPA region 1, May 2018 |
| | 02 | Mussey Brook, Mouth to rm 0.1 | ALS | POLLUTANTS IN URBAN STORMWATER | Elevated instream temperatures; trout avoidance of stream reaches | thermal TMDL completed by VTDEC and approved by EPA region 1, May 2018 |
| | 04 | Moon Brook, rm 1.8 to rm 2.9 | ALS | TEMPERATURE, POLLUTANTS IN URBAN STORMWATER | Elevated instream temperatures; impoundments and lack of shading | thermal TMDL completed by VTDEC and approved by EPA region 1, May 2018 |
| | 05 | Mussey Brook, rm 0.5 to rm 1.2 | ALS | POLLUTANTS IN URBAN STORMWATER, TEMPERATURE | Elevated instream temperatures; trout avoidance of stream reaches | thermal TMDL completed by VTDEC and approved by EPA region 1, May 2018 |
| | 06 | Mussey Brook, rm 0.1 to rm 0.5 | ALS | TEMPERATURE, POLLUTANTS IN URBAN STORMWATER | Elevated instream temperatures; trout avoidance of stream reaches | thermal TMDL completed by VTDEC and approved by EPA region 1, May 2018 |
| VT03-07 | 01 | Little Otter Creek, Mouth to rm 1.0 | CR, FC | ESCHERICHIA COLI (E. COLI), MERCURY IN FISH TISSUE | Elevated E. coli monitoring results; Elevated levels of Hg in walleye; fish present only seasonally; extremely low numbers | EPA approved TMDL September 30, 2011; EPA approved regional mercury TMDL on December 20, 2007 |

## LIST OF PRIORITY NPS IMPAIRED SURFACE WATERS

| Waterbody ID | Code | Waterbody Name | Impaired Use(s) | Pollutant | Problem | Status |
|---|---|---|---|---|---|---|
| | 02 | Little Otter Creek, rm 15.4 to rm 16.4 | CR | ESCHERICHIA COLI (E. COLI) | Agricultural runoff | EPA approved TMDL September 30, 2011 |
| | 03 | Little Otter Creek, rm 1.0 to rm 4.1 | CR | ESCHERICHIA COLI (E. COLI) | Elevated E. coli monitoring results | EPA approved TMDL September 30, 2011 |
| VT03-08 | 01 | Lewis Creek, Parsonage Bridge Rd (Lcr19.5) to Covered Bridge (Lcr7.3) | CR | ESCHERICHIA COLI (E. COLI) | Agricultural runoff | EPA approved TMDL September 30, 2011 |
| | 02 | Pond Brook, from Lewis Creek Confluence Upstream (1.5 Miles) | CR | ESCHERICHIA COLI (E. COLI) | Agricultural runoff | EPA approved TMDL September 30, 2011 |
| VT03-12 | 01 | Middlebury River, from Mouth Upstream 2 Miles | CR | ESCHERICHIA COLI (E. COLI) | Agricultural runoff, livestock, possible failed septic systems | EPA approved TMDL September 30, 2011 |
| VT04-01 | L01 | Otter Creek Section - Lake Champlain (Ferrisburg) | AES, CR, FC | PHOSPHORUS, MERCURY IN FISH TISSUE | Phosphorus enrichment | EPA approved Lake Champlain phosphorus TMDL June 2016 |
| | L02 | Port Henry Section - Lake Champlain (Ferrisburg) | AES, CR, FC | PHOSPHORUS, MERCURY IN FISH TISSUE | Elevated levels of mercury in walleye | EPA approved regional mercury TMDL on December 20, 2007 |
| VT04-04 | L05 | Southern Section (B) - Lake Champlain (Bridport) | AES, CR, FC | PHOSPHORUS, MERCURY IN FISH TISSUE | Phosphorus enrichment | EPA approved Lake Champlain phosphorus TMDL June 2016 |
| VT05-01 | L01 | Missisquoi Bay - Lake Champlain (Alburg) | AES, CR, FC | PHOSPHORUS, MERCURY IN FISH TISSUE | Elevated levels of mercury in walleye | EPA approved regional mercury TMDL on December 20, 2007 |
| VT05-02 | L01 | Lake Carmi (Franklin) | ALL USES | PHOSPHORUS | Algae blooms | EPA approved TMDL April 13, 2009 |
| VT05-04 | L01 | Northeast Arm - Lake Champlain (Swanton) | AES, CR, FC | PHOSPHORUS, MERCURY IN FISH TISSUE | Elevated levels of mercury in walleye | EPA approved regional mercury TMDL on December 20, 2007 |
| | L02 | Isle Lamotte - Lake Champlain (Alburg) | AES, CR, FC | PHOSPHORUS, MERCURY IN FISH TISSUE | Phosphorus enrichment | EPA approved Lake Champlain phosphorus TMDL June 2016 |
| VT05-07 | 02 | Rugg Brook, rm 3.1 to rm 5.3 | AES, ALS | POLLUTANTS IN URBAN STORMWATER | Stormwater runoff | EPA approved TMDL February 19, 2009 |

## LIST OF PRIORITY NPS IMPAIRED SURFACE WATERS

| Waterbody ID | Code | Waterbody Name | Impaired Use(s) | Pollutant | Problem | Status |
|---|---|---|---|---|---|---|
| | 07 | Stevens Brook, rm 6.5 (Pearl St) to rm 9.3 | ALS | POLLUTANTS IN URBAN STORMWATER | Stormwater runoff, erosion/sedimentation, morphological instability | EPA approved TMDL February 19, 2009 |
| | L01 | St. Albans Bay - Lake Champlain (St. Albans) | AES, CR, FC | PHOSPHORUS, MERCURY IN FISH TISSUE | Phosphorus enrichment | EPA approved Lake Champlain phosphorus TMDL June 2016 |
| VT05-09 | 01 | Indian Brook, rm 5.8 (Suzie Wilson Rd) to rm 9.8 | AES, ALS | POLLUTANTS IN URBAN STORMWATER | Stormwater runoff, land development, erosion | EPA approved TMDL August 21, 2008 |
| | 02 | Direct Smaller Drainages to Inner Malletts Bay | CR | ESCHERICHIA COLI (E. COLI) | Urban runoff, potential failed/failing septic systems; includes Smith Hollow Brook & Crooked Creek | EPA approved TMDL September 30, 2011 |
| | L01 | Malletts Bay - Lake Champlain (Colchester) | AES, CR, FC | PHOSPHORUS, MERCURY IN FISH TISSUE | Elevated levels of mercury in walleye | EPA approved regional mercury TMDL on December 20, 2007 |
| VT05-10 | 01 | Englesby Brook, Mouth to rm 1.3 | AES, ALS, CR, CRB | POLLUTANTS IN URBAN STORMWATER, ESCHERICHIA COLI (E. COLI) | Stormwater runoff, blanchard beach closure | EPA approved TMDL September 30, 2007, PROBLEM: Elevated E. coli levels |
| VT05-11 | 01 | Munroe Brook, Mouth to rm 2.8 (Including North Trib.) | ALS | POLLUTANTS IN URBAN STORMWATER | Stormwater runoff, erosion, land development | EPA approved TMDL August 21, 2008 |
| | 02 | Bartlett Brook, Mouth to rm 0.7 | ALS | POLLUTANTS IN URBAN STORMWATER | Stormwater runoff, land development, erosion | EPA approved TMDL September 30, 2007 |
| | 03 | Potash Brook, Mouth Upstream 1 Mile | ALS, CR | ESCHERICHIA COLI (E. COLI), POLLUTANTS IN URBAN STORMWATER | Stormwater runoff, land development, erosion | EPA approved TMDL December 19, 2006 |

## LIST OF PRIORITY NPS IMPAIRED SURFACE WATERS

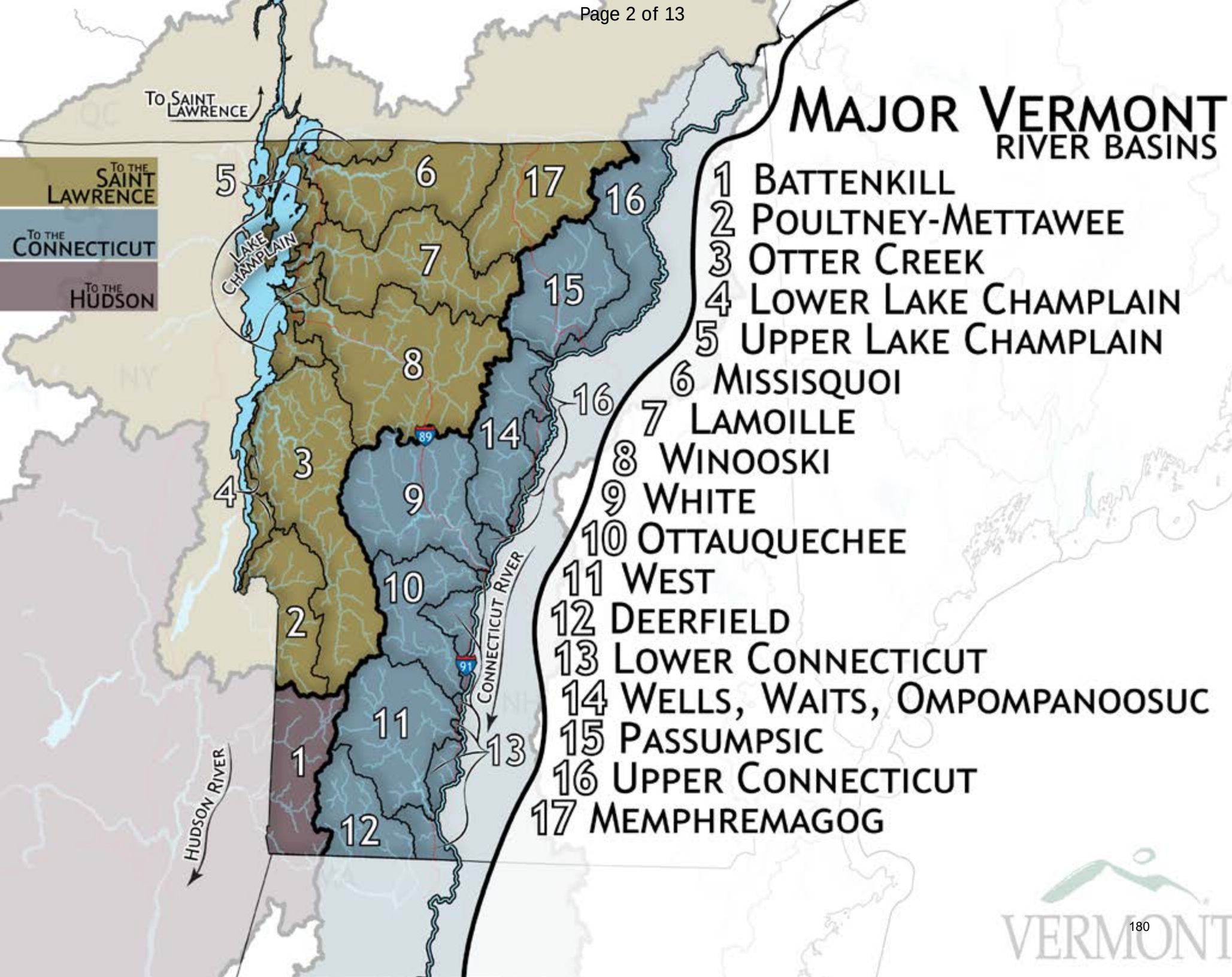
| Waterbody ID | Code | Waterbody Name | Impaired Use(s) | Pollutant | Problem | Status |
|---|---|---|---|---|---|---|
| | 04 | Laplatte River, at Mouth | CR, FC | ESCHERICHIA COLI (E. COLI), MERCURY IN FISH TISSUE | Agricultural runoff | EPA approved TMDL September 30, 2011 |
| | 05 | Mud Hollow Brook, from Mouth to 3 Miles Upstream | CR | ESCHERICHIA COLI (E. COLI) | Agricultural runoff, streambank erosion | EPA approved TMDL September 30, 2011 |
| | 07 | Potash Brook, I189 River Upstream 4.2 Miles | ALS | POLLUTANTS IN URBAN STORMWATER | Stormwater runoff, land development, erosion | EPA approved TMDL December 19, 2006 |
| | 08 | Laplatte River from Hinesburg to rm 0.2 | CR | ESCHERICHIA COLI (E. COLI) | Agricultural runoff | EPA approved TMDL September 30, 2011 |
| | L01 | Shelburne Bay - Lake Champlain (Shelburne) | AES, CR, FC | PHOSPHORUS, MERCURY IN FISH TISSUE | Elevated levels of mercury in walleye | EPA approved regional mercury TMDL on December 20, 2007 |
| VT06-04 | 01 | Berry Brook, Mouth Up to and Including N. Trib (Approx. 1 Mile) | CR | ESCHERICHIA COLI (E. COLI) | Elevated E. coli levels | EPA approved TMDL September 30, 2011 |
| | 02 | Godin Brook | CR | ESCHERICHIA COLI (E. COLI) | Elevated E. coli levels | EPA approved TMDL September 30, 2011 |
| | 03 | Samsonville Brook | CR | ESCHERICHIA COLI (E. COLI) | Elevated E. coli levels | EPA approved TMDL September 30, 2011 |
| VT08-02 | 01 | Allen Brook, rm 2.4 to rm 5.0 (Talcott Rd) | ALS, CR | ESCHERICHIA COLI (E. COLI), POLLUTANTS IN URBAN STORMWATER | Stormwater runoff, land development; erosion | EPA approved TMDL August 21, 2008 |
| | 04 | Sunderland Brook, rm 3.5 (Rt. 7) to rm 5.3 | AES, ALS | POLLUTANTS IN URBAN STORMWATER | Stormwater runoff, land development; erosion | EPA approved TMDL August 21, 2008 |
| | 05 | Centennial Brook, Mouth to rm 1.2 | ALS | POLLUTANTS IN URBAN STORMWATER | Stormwater runoff, land development; erosion | EPA approved TMDL September 30, 2007 |

## LIST OF PRIORITY NPS IMPAIRED SURFACE WATERS

| Waterbody ID | Code | Waterbody Name | Impaired Use(s) | Pollutant | Problem | Status |
|---|---|---|---|---|---|---|
| | 06 | Morehouse Brook, Mouth to rm 0.6 | ALS | POLLUTANTS IN URBAN STORMWATER | Stormwater runoff, erosion | EPA approved TMDL September 30, 2007 |
| VT08-10 | 01 | Huntington River, Vicinity of Bridge Street in Huntington | CR | ESCHERICHIA COLI (E. COLI) | Elevated E. coli levels detected at several sampling stations | EPA approved TMDL September 30, 2011 |
| VT08-18 | 01 | Mad River, Mouth to Moretown (6.2 Miles) | CR | ESCHERICHIA COLI (E. COLI) | Possible failing septic systems and other unknown sources; elevated E. coli levels | EPA approved TMDL September 30, 2011 |
| VT11-15 | 02 | Styles Brook (2 Miles) | AES, ALS | SEDIMENT | Land development, hydrologic modification | EPA approved TMDL June21, 2002 |
| VT11-17 | 01 | West River, Approx 1 Mile Below to 0.5 Mile Above South Londonderry | CR | ESCHERICHIA COLI (E. COLI) | Possible septic system discharges | EPA approved TMDL September 30, 2011 |
| VT12-05 | 02 | No. Branch, Deerfield River, Vicinity of West Dover | CR | ESCHERICHIA COLI (E. COLI) | High E. coli levels; cause(s) & source(s) unknown; needs assessment | EPA approved TMDL September 30, 2011 |
| VT13-14 | 01 | Whetstone Brook, Bend Northwest of Living Memorial Park Downstream | CR | ESCHERICHIA COLI (E. COLI) | Sources unknown, potentially faulty sewer line/septic system | EPA approved TMDL September 30, 2011 |
| VT14-03 | 01 | Ompompanoosuc River, Usacoe Beach Area to Brimstone Corner (9.8 Mi) | CR | ESCHERICHIA COLI (E. COLI) | Elevated E. coli levels | EPA approved TMDL September 30, 2011 |
| VT17-01 | L01 | Lake Memphremagog | AES, CR | PHOSPHORUS | Excessive algae growth, nutrient enrichment | EPA approved TMDL September 28, 2017 |

# APPENDIX C: LIST OF PRIORITY NPS THREATENED OR STRESSED SURFACE WATERS

This list of priority NPS threatened or stressed waters includes a subset of Vermont's 2020 Stressed Rivers and Streams list. These waters are assessed as stressed where stressors are present that prohibit the waters from attaining a higher water quality.


To Saint Lawrence
To the Saint Lawrence
To the Connecticut
To the Hudson
Lake Champlain
Connecticut River
Hudson River
Major Vermont River Basins
1 Battenkill
2 Poultney-Mettawee
3 Otter Creek
4 Lower Lake Champlain
5 Upper Lake Champlain
6 Missisquoi
7 Lamoille
8 Winooski
9 White
10 Ottauquechee
11 West
12 Deerfield
13 Lower Connecticut
14 Wells, Waits, Ompompanoosuc
15 Passumpsic
16 Upper Connecticut
17 Memphremagog
VERMONT

Heading descriptions:

**Waterbody ID** - The two digits following VT identifies the Major Vermont River Basin illustrated in the attached map and the two digits following identifies the sub-basin or mainstem within the major basin.
**Code-** If the code contains an L the listing is a Lake within the sub basin and if the code is two digits the listing is a river reach within the sub basin or mainstem.

**Altered Use(s)** - (ALS) Aquatic biota and wildlife that may utilize or are present in the waters; (AH) Aquatic habitat to support aquatic biota, wildlife, or plant life; (CR) The use of waters for swimming and other primary contact recreation; (CRF) The use of waters for fishing and related recreational uses; (CRB) The use of waters for boating and related recreational uses; (AES) The use of waters for the enjoyment of aesthetic conditions.

| Waterbody ID | Code | Waterbody Name | Stressed Use(s) | Pollutant | Problem |
|---|---|---|---|---|---|
| VT01-03 | 07 | Jewitt Brook | ALS | TEMPERATURE | Fair biological data 2008 |
| VT01-04 | 02 | Batten Kill | AH, CRF | HABITAT ALTERATIONS, SEDIMENT, TEMPERATURE | Loss of riparian vegetation, streambank erosion, runoff, lack of habitat features |
| VT02-01 | 02 | Poultney River, from rm 21.8 Up 3 Miles | ALS | ORGANIC ENRICHMENT, TEMPERATURE | poultney village and farm land are adjacent land uses |
| VT02-05 | 04 | Mettawee River, Flower Brook Confluence Downstream 4.3 Mi. | ALS | SEDIMENTATION/SILTATION, NUTRIENTS, TEMPERATURE | Loss of riparian vegetation, streambank erosion, agriculture |
| | 05 | Mettawee River, Upstream from NY Border to Flower Brook | ALS, CR, CRF | TEMPERATURE, NUTRIENTS, SEDIMENTATION/SILTATION | Loss of riparian vegetation, streambank erosion, agriculture |
| VT03-01 | 01 | Otter Creek, Mouth of Middlebury River to Pulp Mill Bridge (4.0 Mi) | AES, AH | NUTRIENTS, TURBIDITY, SEDIMENTATION/SILTATION | Agriculture and stream bank erosion |
| | 02 | Lower Otter Creek, Mouth Upstream to Vergennes Dam (Approx 7.6 Miles) | AES, AH | TURBIDITY, NUTRIENTS | |
| | 03 | Otter Creek, Pulp Mill Bridge Down to Vergennes | AES, ALS | NUTRIENTS, TURBIDITY, SEDIMENTATION/SILTATION | |
| VT03-04 | 03 | Neshobe River, East of Forest Dale Down to Brandon WWTF | AES, AH | HABITAT ALTERATIONS, SEDIMENT | Channelization, stream bank erosion |
| VT03-07 | 03 | Little Otter Creek, rm 1.0 to rm 4.1 | ALS | NUTRIENTS, SEDIMENTATION/SILTATION | Runoff from agricultural lands |
| | 07 | Little Otter Creek from rm 4.1 (Route 7) to rm 7.8 (Echo Rd) | ALS | SEDIMENTATION/SILTATION, TEMPERATURE | Runoff from agricultural lands |
| | 08 | Little Otter Creek Trib #15 | ALS | SEDIMENTATION/SILTATION, NUTRIENTS | Runoff from agricultural lands |
| | 09 | Mud Creek, Mouth Upstream 4 Miles | CR | ESCHERICHIA COLI (E. COLI) | Runoff from agricultural lands |
| VT03-09 | 01 | Lower Dead Creek, from Mouth Upstream (Approx 3 Miles) | AES, CR | SEDIMENT, ESCHERICHIA COLI (E. COLI), TEMPERATURE, TURBIDITY, NUTRIENTS | Agriculture, impoundments, and stream bank erosion |
| | 02 | Dead Creek | AES, CR | TURBIDITY, NUTRIENTS, SEDIMENT, TEMPERATURE, ESCHERICHIA COLI (E. COLI) | Agriculture, impoundments, and stream bank erosion |

| Waterbody ID | Code | Waterbody Name | Stressed Use(s) | Pollutant | Problem |
|---|---|---|---|---|---|
| | 03 | Dead Creek, East & West Branches | AES, AH, CR | TOTAL SUSPENDED SOLIDS (TSS), NUTRIENTS, TURBIDITY, TEMPERATURE | Agriculture, impoundments, streambank erosion |
| VT03-10 | 01 | Lemon Fair River, Mouth to rm 18 | CR | ESCHERICHIA COLI (E. COLI) | Elevated E. coli, sources unknown; potential large wildlife contribution |
| | 02 | Lemon Fair River, Richville Pond to Johnson Pond | CR | ESCHERICHIA COLI (E. COLI) | Elevated E. colii; sources unknown; potential large wildlife contribution |
| VT03-11 | 01 | New Haven River | AH, CR, CRF | SEDIMENTATION/SILTATION, ESCHERICHIA COLI (E. COLI) | E. coli source unkown, streambank erosion |
| VT03-15 | 01 | Clarendon River | CR | ESCHERICHIA COLI (E. COLI) | Agricultural, industrial, and urban runoff |
| VT04-01 | 01 | Hospital Creek, Mouth to rm 3.5 | AES, ALS | PHOSPHORUS, TURBIDITY | Runoff from agricultural lands |
| VT04-02 | 02 | Whitney Creek, from rm 1.0 to 2.5 | AES, ALS, CR | NUTRIENTS | Runoff from agricultural lands |
| VT04-03 | 03 | East Creek-North Fork | ALS | NUTRIENTS | Agricultural activites |
| VT05-07 | 03 | Jewett Brook (3.5 Miles) | CR | ESCHERICHIA COLI (E. COLI) | |
| | 08 | Mill River, 3.5 Miles in Upper Reaches | AES, ALS, CR | NUTRIENTS, ESCHERICHIA COLI (E. COLI), SEDIMENT, ORGANIC ENRICHMENT | Agricultural & urban runoff, streambank erosion |
| | 09 | Rugg Brook, Upstream from Route 7 | AES, AH | HABITAT ALTERATIONS, FLOW REGIME MODIFICATION | Land development, suburban runoff |
| VT05-11 | 04 | Laplatte River, at Mouth | AES, AH, CRF | SEDIMENTATION/SILTATION, TURBIDITY, TEMPERATURE | Land development |
| | 08 | Laplatte River from Hinesburg to rm 0.2 | AES, AH, CRF | TURBIDITY, TEMPERATURE, SEDIMENTATION/SILTATION | Land development |
| | 10 | Patrick Brook, from Laplatte River Up to Lower Pond | AES, AH | HABITAT ALTERATIONS, SEDIMENT | Land development, channelization |
| VT05-12 | 01 | Kimball Brook, from Town Farm Bay Up 1.1 Miles | AES, ALS | TURBIDITY, NUTRIENTS | Pasture, barnyard, lack of riparian vegetation |
| VT06-01 | | Missisquoi River, Sheldon Springs Upstream to Tyler Branch | AES, ALS | NUTRIENTS, TEMPERATURE, SEDIMENTATION/SILTATION, TURBIDITY | Agriculture, lack of riparian vegetation, and stream bank erosion |
| | 01 | Missisquoi River, Mouth Upstrm to Swanton Dam (Approx 8 Miles) | AES, ALS | NUTRIENTS, TEMPERATURE, TOXICITY, SEDIMENTATION/SILTATION, TURBIDITY | Agriculture, lack of riparian vegetation, pesticides, and stream bank erosion |
| VT06-02 | 02 | Missisquoi River, from Samsonville Bk to rm 45.3 | AES, ALS | SEDIMENTATION/SILTATION, TURBIDITY, NUTRIENTS, TEMPERATURE | Agriculture and stream bank erosion |

| Waterbody ID | Code | Waterbody Name | Stressed Use(s) | Pollutant | Problem |
|---|---|---|---|---|---|
| VT06-03 | 02 | Hungerford Trib 4 from Its Confluence with the Mainstem Upstream | ALS | SEDIMENTATION/SILTATION, NUTRIENTS | Runoff from agricultural lands |
| | 03 | Youngman Brook (1.8 Mi Above Mouth to Headwaters) | ALS | NUTRIENTS, SEDIMENTATION/SILTATION | Agricultural runoff |
| | 04 | Hungerford Brook | ALS | SEDIMENTATION/SILTATION, NUTRIENTS | Agricultural activites |
| VT06-04 | 07 | Dead Creek (Fairfield) from North Rd Upstream | ALS | NUTRIENTS | Runoff from agricultural lands |
| VT06-05 | 03 | Fairfield River from Vt Route 36 Upstream | ALS | SEDIMENTATION/SILTATION, NUTRIENTS | Runoff from agricultural lands, lack of woody riparian vegetation |
| | 04 | Black Creek, Mouth to East Fairfield (12 Miles) | AES, AH, CR | SEDIMENT, NUTRIENTS, ESCHERICHIA COLI (E. COLI) | Agricultural runoff |
| VT06-06 | 01 | Tyler Branch | AES, ALS, CR | ESCHERICHIA COLI (E. COLI), NUTRIENTS, SEDIMENT | Agricultural runoff, morphological instability (west enosburg to cold hollow brook) |
| | 02 | The Branch, Beaver Meadow Brk Up to Bridge E Bakersfield Rd | AES, AH | HABITAT ALTERATIONS, SEDIMENT | Streambank erosion, channelization |
| VT06-08 | 11 | Mud Creek Trib 10 from Its Confluence with the Mainstem Upstream | ALS | NUTRIENTS, TEMPERATURE | Runoff from agricultural lands, lack of woody riparian vegetation |
| | 12 | East Branch Missisquoi River, Gravel Pit Access Downs to Cheney Rd | AES, AH | SEDIMENTATION/SILTATION, TEMPERATURE | Eroding streambanks, pasture with no buffers, road to gravel pit |
| VT07-01 | 04 | Streeter Brook | ALS | POLLUTANTS IN URBAN STORMWATER, PHOSPHORUS, CHLORIDE | Needs more monitoring and further investigation |
| VT07-12 | 01 | Seymour River (Lowest 3.5 Miles) | AES, AH | NUTRIENTS, SEDIMENT | Bank erosion, agricultural encroachment, channel instability |
| VT07-13 | 05 | Brewster River from Ski Area to Mouth | AES, ALS | SEDIMENT | Construction erosion, increased peak stormwater discharge, road & parking lot runoff |
| VT07-15 | 04 | Dark Branch, rm 3.3 | ALS | SEDIMENT, ASBESTOS | Biological community barely passing VT water quality standards in 2007, possible impacts from asbestos mine |
| VT07-17 | 01 | Ryder Brook | AES, ALS, CRF | SEDIMENT, HABITAT ALTERATIONS | Agricultural activities, airport and residential development |
| VT08-01 | 01 | Winooski River, Mouth to Winooski Dam | AES, ALS, CRF | TOXICITY, SEDIMENTATION/SILTATION, TEMPERATURE, NUTRIENTS, POLLUTANTS IN URBAN STORMWATER | Stormwater, industry, agriculture |
| | 02 | Winooski River at Essex No. 19 | CR, CRF | NUTRIENTS, POLLUTANTS IN URBAN STORMWATER, SEDIMENTATION/SILTATION, TOXICITY, TEMPERATURE | Stormwater, industry, agriculture, Artificial & inadequate flow in bypass reach |

| Waterbody ID | Code | Waterbody Name | Stressed Use(s) | Pollutant | Problem |
|---|---|---|---|---|---|
| | 03 | Winooski River, Alder Brook to No 19 Dam | AES, ALS, CR, CRF | NUTRIENTS, POLLUTANTS IN URBAN STORMWATER, SEDIMENTATION/SILTATION, TEMPERATURE, TOXICITY | Stormwater from industry and runoff from agriculture |
| | 04 | Winooski River, No 19 Dam to Winooski Dam | AES, ALS, CR, CRF | SEDIMENTATION/SILTATION, POLLUTANTS IN URBAN STORMWATER, TOXICITY, NUTRIENTS, TEMPERATURE | Stormwater, industry, agriculture |
| VT08-05 | 02 | Winooski River Impoundment Above Middlesex #2 dam (2 miles) | CR, CRF | NUTRIENTS, SEDIMENTATION/SILTATION, POLLUTANTS IN URBAN STORMWATER | Urban runoff, channelization, transportation infrastructure confining stream |
| | 03 | Winooski River, Montpelier Wwtf Down 3 Miles | ALL USES | NUTRIENTS, SEDIMENTATION/SILTATION, POLLUTANTS IN URBAN STORMWATER | Urban runoff, channelization, transportation infrastructure confining stream |
| | 04 | Bypass below Middlesex #2 dam on the Winooski River | ALS, CR, CRF | POLLUTANTS IN URBAN STORMWATER, SEDIMENTATION/SILTATION, NUTRIENTS | Urban runoff, channelization, transportation infrastructure confining stream |
| VT08-06 | 02 | Graves Brook (Mouth Upstream to rm 0.3) | ALS | SEDIMENT | Residential watershed, some agriculture, riparian encroachments |
| VT08-07 | 01 | Winooski River, Plainfield rm 70.7 to rm 71.4 | AES, ALS, CRF | NUTRIENTS, HABITAT ALTERATIONS, TURBIDITY, SEDIMENTATION/SILTATION | Streambank erosion, channel instability, road runoff, E. coli source not known |
| | 03 | Winooski River, Martins Bridge Down to Plainfield Dam | ALL USES | NUTRIENTS, HABITAT ALTERATIONS, SEDIMENTATION/SILTATION, ESCHERICHIA COLI (E. COLI), TURBIDITY | Streambank erosion, channel instability, road runoff, E. coli source not known |
| | 04 | Winooski River, River Mile 70.7 Down to Kingsbury Branch | ALL USES | SEDIMENTATION/SILTATION, NUTRIENTS, ESCHERICHIA COLI (E. COLI), HABITAT ALTERATIONS, TURBIDITY | Streambank erosion, channel instability, road runoff, E. coli source not known |
| VT08-09 | 01 | Mollys Brook and Sucker Brook | AES, ALS | SEDIMENTATION/SILTATION | Streambank erosion, lack of riparian vegetation, physical alterations |
| | 02 | Winooski River - Cabot Village | AES, ALS | SEDIMENTATION/SILTATION | Streambank erosion, lack of riparian vegetation, physical alterations |
| | 04 | Winooski River, Cabot Cremery Down to Durrant Cemetary | AES, ALS | SEDIMENTATION/SILTATION | Streambank erosion, lack of riparian vegetation, physical alterations |
| | 05 | Winooski River, Cabot, RM 83.8 to 85.7 | AES, ALS | SEDIMENTATION/SILTATION | Streambank erosion, lack of riparian vegetation, physical alterations |

| Waterbody ID | Code | Waterbody Name | Stressed Use(s) | Pollutant | Problem |
|---|---|---|---|---|---|
| VT08-11 | 02 | Little River, From West Branch Down to Reservoir | AES, ALS, CRF | SEDIMENT, POLLUTANTS IN URBAN STORMWATER | Channel instability, channel manipulation, urban/suburban development |
| VT08-12 | 02 | Lower West Branch Little River | ALS, CRF | HABITAT ALTERATIONS | |
| | 06 | West Branch Little River (Rm 7.0 to rm 7.5) | ALS | SEDIMENT | Impacts may be related to past construction erosion |
| | 07 | Little River, Upstream of the West Branch Confluence | AES, ALS, CR | NUTRIENTS, ESCHERICHIA COLI (E. COLI), SEDIMENT | Land development, agricultural runoff, morphological instability (west br upstream to sterling brook) |
| | 10 | Little Spruce Brook | AES, ALS | SEDIMENT, HABITAT ALTERATIONS | Development |
| VT08-15 | 01 | Jail Branch, Washngton/Orange Area | CR | ESCHERICHIA COLI (E. COLI) | Elevated E. coli levels, source(s) unknown |
| VT08-16 | 04 | Stevens Branch, from Barre City Limits to Mouth, 5.8 Miles | AES, ALS | SEDIMENT, NUTRIENTS | Urban runoff including suspected floor drains from commercial buildings on river |
| VT09-02 | 01 | White River, from West Branch Down to Third Branch | AES, AH, CRF | TEMPERATURE, HABITAT ALTERATIONS, SEDIMENT | Loss of riparian vegetation, road runoff, floodplain encroachments, post-Irene dredging and windrowing |
| VT09-04 | 01 | First Branch White River, Mouth to rm 15.2 | ALS, CRF | TEMPERATURE, SEDIMENTATION/SILTATION | Soil & streambank erosion, loss of riparian vegetation |
| VT09-05 | 02 | Kingsbury Brook | ALS | TEMPERATURE, NUTRIENTS | Lack of riparian vegetation, agricultural runoff |
| VT09-06 | 02 | Third Branch White River, Mouth to rm 4.3 | AES, ALS | SEDIMENTATION/SILTATION, NUTRIENTS | Stormwater & agricultural runoff, livestock access, loss riparian vegetation, bank erosion |
| | 04 | Third Branch White River, River Mile 4.3 to Ayers Brook | AES, ALS | SEDIMENTATION/SILTATION, NUTRIENTS | Stormwater & agricultural runoff, livestock access, loss riparian vegetation, bank erosion |
| VT10-01 | 03 | Ottauquechee River, Kedron Brook Down to North Hartland Reservoir | AES, ALS, CR, CRF | SEDIMENT, ORGANIC ENRICHMENT, TEMPERATURE, NUTRIENTS, ESCHERICHIA COLI (E. COLI) | Golf course, road, developed land runoff, septic systems, fertilized turf, macroinvertebrate community barely passing VT water quality standards |
| VT10-06 | 03 | West Trib Roaring Brook | AES, ALS | SEDIMENTATION/SILTATION | |
| | 04 | Falls Brook Tributary #4 (0.4 Miles) | ALS | SEDIMENT | Land development, erosion, streambank destabilization |
| | 05 | Upper Roaring Brook and West Branch (Approx 1.2 Miles) | AES, ALS | SEDIMENT | Land development, erosion, road runoff |
| VT10-07 | 01 | Kedron Brook - Woodstock | AES, ALS, CR | ESCHERICHIA COLI (E. COLI), SEDIMENT, NUTRIENTS | Horse recreation activity, pasture, road runoff, loss of riparian vegetation, golf course |
| VT10-10 | 01 | Gulf Stream Brook | CRF | SEDIMENT | Gravel road maintenance |
| VT10-14 | 03 | Coleman Brook | AES, ALS | POLLUTANTS IN URBAN STORMWATER, FLOW REGIME MODIFICATION | Ski area development |
| VT11-01 | 01 | Lower Williams River (Mouth Upstream to Middle Branch Confluence) | CR | ESCHERICHIA COLI (E. COLI) | |
| VT11-04 | 01 | Williams River, Above Chester Village Up to Route 103/Smokeshire Junction | ALS, CRF | SEDIMENT, TEMPERATURE | Loss of riparian vegetation, road encroachment |
| VT11-05 | 01 | Saxtons River, Mouth To rm 5.0 Below Saxtons River WWTF | ALS | PHOSPHORUS | Phosphorus enrichment, incomplete stream canopy |

| Waterbody ID | Code | Waterbody Name | Stressed Use(s) | Pollutant | Problem |
|---|---|---|---|---|---|
| VT11-14 | 01 | Wardsboro Brook, from West Wardsboro to Mouth (7 Miles) | ALS | SEDIMENTATION/SILTATION, TEMPERATURE | Streambank erosion, land development, road runoff, channel widening, loss riparian vegetation |
| VT11-16 | 04 | Winhall River (I.p. Co. Bridge to Mouth) | AH, CRF | SEDIMENT, TEMPERATURE | Channelization, road runoff, loss of riparian vegetation, erosion/sedimentation |
| VT12-05 | 08 | Baselodge Tributary, from Mouth Up 0.2 Miles | AH | SEDIMENTATION/SILTATION | Ski area development |
| | 09 | Beaver Brook | AH | HABITAT ALTERATIONS, SEDIMENT | Channel relocation, straightening |
| VT13-08 | 01 | Mill Brook, From Mill Pond Dam to Connecticut River | AES, ALS | SEDIMENTATION/SILTATION, POLLUTANTS IN URBAN STORMWATER | Impoundment, developed land runoff |
| VT13-14 | 01 | Whetstone Brook, Bend Northwest of Living Memorial Park Downstream | AES, ALS | SEDIMENTATION/SILTATION, FLOW REGIME MODIFICATION | Streambank erosion, developed land runoff, channelization, altered hydrology |
| VT15-05 | 01 | Roberts Brook, Mouth Upstream 0.3 Miles | ALS | SEDIMENTATION/SILTATION, POLLUTANTS IN URBAN STORMWATER | Runoff from developed lands |
| VT15-06 | 01 | Miller Run | AES, AH, CRF | SEDIMENTATION/SILTATION, HABITAT ALTERATIONS | Agricultural lands with lack of riparian vegetation, streambank erosion |
| VT15-08 | 01 | Dish Mill Brook Tributary #2 | ALS | SEDIMENT | High embeddedness, erosion from parking areas |
| VT15-09 | 01 | Chesterfield Valley/Moose River | CR | ESCHERICHIA COLI (E. COLI) | Elevated E. coli, agriculture BMP installed in 2008 with improvement noted |
| VT16-16 | 01 | Scales Brook | ALS | SEDIMENT | Land development, agricultural runoff |
| VT17-01 | 02 | Johns River | AES, AH | SPECIFIC CONDUCTIVITY, NITROGEN, TURBIDITY | Farms, granite processing, lagoons and wetlands are potential stressors |
| VT17-02 | 02 | Stearns Brook, Canada Border Up to Holland Road | AES, AH, CRF | SEDIMENT | Eroding streambanks, poor logging, poor road maintenance |

## Appendix D: Links to Important Documents

This appendix is meant to be a short cut to the documents listed in the NPS Management Plan: 2021-2025. Links are listed below in the order in which they appear in the Plan.

- Vermont Surface Water Management Strategy (Revised 2017)
  - https://dec.vermont.gov/watershed/map/strategy
- Vermont Groundwater Management Plan (2018)
  - https://dec.vermont.gov/water/groundwater
  - https://dec.vermont.gov/sites/dec/files/dwgwp/DW/2018%20Groundwater%20Management%20Plan.pdf
- Vermont Nonpoint Source Management Program (2015)
  - https://dec.vermont.gov/sites/dec/files/wsm/erp/docs/VCWIP-Vermont-Nonpoint-Source-Management-Program.pdf
- Vermont Clean Water Act (Act 64 of 2015)
  - https://legislature.vermont.gov/Documents/2016/Docs/ACTS/ACT064/ACT064%20Act%20Summary.pdf
  - https://legislature.vermont.gov/Documents/2016/Docs/ACTS/ACT064/ACT064%20As%20Enacted.pdf
- Total Maximum Daily Loads for Phosphorus in Lake Champlain (2016)
  - https://dec.vermont.gov/watershed/restoring/champlain
  - https://www.epa.gov/sites/production/files/2016-06/documents/phosphorus-tmdls-vermont-segments-lake-champlain-jun-17-2016.pdf
- Total Maximum Daily Loads for Phosphorus in Lake Memphremagog (2017)
  - https://dec.vermont.gov/sites/dec/files/wsm/mapp/docs/Memph%20TMDL%20Final%20EPA%20approved.pdf
- Clean Water Service Delivery Act (Act 76 of 2019)
  - https://dec.vermont.gov/water-investment/statues-rules-policies/act-76#overview
  - https://legislature.vermont.gov/Documents/2020/Docs/ACTS/ACT076/ACT076%20As%20Enacted.pdf
- Vermont Clean Water Initiative Program's (CWIP) Annual Performance Reports
  - https://dec.vermont.gov/water-investment/cwi/reports
- Vermont Groundwater Protection Rule and Strategy (2018)
  - https://dec.vermont.gov/sites/dec/files/dwgwp/DW/Groundwater%20Protection%20Rule%20and%20Strategy.pdf

- Vermont (305(b) Water Quality Integrated Assessment Report (2018)
  - https://dec.vermont.gov/content/2018-305b-water-quality-assessment-report
  - https://dec.vermont.gov/sites/dec/files/documents/WaterQualityAssessmentReport_305b_2018.pdf
- Vermont's water pollution control statute (Title 10, Chapter 47)
  - https://legislature.vermont.gov/statutes/chapter/10/047
- Vermont Water Quality Standards (2017)
  - https://dec.vermont.gov/watershed/laws#2016%20WQS
  - https://dec.vermont.gov/sites/dec/files/documents/wsmd_water_quality_standards_2016.pdf
- Vermont Surface Water Monitoring Strategy (2015)
  - https://dec.vermont.gov/sites/dec/files/documents/WSMD_MonitoringStrategy2015.pdf
- Vermont Underground Injection Control Rule (2014)
  - https://dec.vermont.gov/content/underground-injection-control-rules
  - https://dec.vermont.gov/sites/dec/files/documents/dec-underground-injection-control-rules-effective-2014-10-29.pdf
- Vermont Indirect Discharge Rules (2019)
  - https://dec.vermont.gov/water/indirect-discharge
  - https://dec.vermont.gov/sites/dec/files/dwgwp/indirect/pdfs/Indirect-Rules-April-12-2019.pdf
- Vermont Water Supply Rule (2020)
  - https://dec.vermont.gov/content/vermont-water-supply-rule
  - https://dec.vermont.gov/sites/dec/files/documents/Water-Supply-Rule-March-17-2020.pdf
- Vermont Lake Champlain Phosphorus TMDL Phase One Implementation Plan (2016)
  - https://dec.vermont.gov/watershed/restoring/champlain
  - https://dec.vermont.gov/sites/dec/files/wsm/erp/docs/160915_Phase_1_Implementation_Plan_Final.pdf
- ANR-approved tactical basin plans (i.e., water quality management plans)
  - https://dec.vermont.gov/water-investment/watershed-planning
- Vermont Agency of Agriculture, Food and Markets (AAFM) Water Quality Division
  - https://agriculture.vermont.gov/water-quality
- VAAFM Required Agricultural Practices (RAPs) (2018)

    - https://agriculture.vermont.gov/rap
    - https://agriculture.vermont.gov/sites/agriculture/files/documents/RAPFINALRULE12-21-2018_WEB.pdf
- Vermont Agricultural Water Quality Partnership
    - https://vtagcleanwater.org/
- Vermont Phosphorus Innovation Challenge (VPIC)
    - https://agriculture.vermont.gov/Vermont_Phosphorus_Innovation_Challenge
- Vermont Municipal Roads General Permit (MRGP)
    - https://dec.vermont.gov/watershed/stormwater/permit-information-applications-fees/municipal-roads-program
- Transportation Separate Storm Sewer System (TS4) for State Roads
    - https://dec.vermont.gov/watershed/stormwater/transportation-general-permit
- Municipal Separate Storm Sewer System (MS4)
    - https://dec.vermont.gov/watershed/stormwater/permit-information-applications-fees/ms4-permit
- Multi- sector General Permit (MSGP)
    - https://dec.vermont.gov/watershed/stormwater/permit-information-applications-fees/multi-sector-general-permit
- 2002 Stormwater Management Manual (2002)
    - https://dec.vermont.gov/sites/dec/files/wsm/stormwater/docs/Resources/sw_manual-vol1.pdf
    - https://dec.vermont.gov/sites/dec/files/wsm/stormwater/docs/Resources/sw_manual-vol2.pdf
- Vermont Stormwater Management Manual (VSMM) (2017)
    - https://dec.vermont.gov/sites/dec/files/wsm/stormwater/docs/Permitinformation/2017%20VSMM_Rule_and_Design_Guidance_04172017.pdf
- Vermont River Management Program - Flood Hazard Area and River Corridor Rule and Protection Procedures and General Permits (2017)
    - https://dec.vermont.gov/sites/dec/files/documents/DEC_FHARCP_Procedure.pdf
    - https://dec.vermont.gov/sites/dec/files/documents/wsmd-fha-and-rc-rule-adopted-2014-10-24.pdf
- Vermont Emergency Relief & Assistance Fund (ERAF)
    - https://floodready.vermont.gov/find_funding/emergency_relief_assistance
- Vermont Functioning Floodplains Initiative (FFI)

    - https://dec.vermont.gov/rivers/ffi
- Vermont River Management Program - Stream Alteration Rules and General Permits
    - https://dec.vermont.gov/watershed/rivers/river-management#rules
- Vermont Wetland Rules (2020)
    - https://dec.vermont.gov/watershed/wetlands/jurisdictional/rules
    - https://dec.vermont.gov/sites/dec/files/documents/wsmd_VermontWetlandRules.pdf