VERMONT CLEAN WATER INITIATIVE
2020 PERFORMANCE REPORT

VERMONT CLEAN WATER INITIATIVE

VERMONT

AGENCY OF ADMINISTRATION
AGENCY OF AGRICULTURE, FOOD & MARKETS
AGENCY OF COMMERCE & COMMUNITY DEVELOPMENT
AGENCY OF NATURAL RESOURCES
AGENCY OF TRANSPORTATION

VERMONT CLEAN WATER INITIATIVE 2020 PERFORMANCE REPORT

Submitted by the Vermont Agency of Administration
January 15, 2021

Reporting Period: State Fiscal Year (SFY) 2016-2020
Part 1: Vermont Clean Water Investment Report
Part 2: Lake Champlain TMDL Progress Report

Relevant Reporting Requirements:	Fulfilled by:
10 V.S.A. § 1389a (a) The Report shall summarize all investments, including their cost-effectiveness, made by the Clean Water Board and other State agencies for clean water restoration over the prior fiscal year	Part 1. Vermont Clean Water Investment Report
10 V.S.A. § 1389a (b)(1) Documentation of progress or shortcomings in meeting established indicators for clean water restoration	Part 1. Vermont Clean Water Investment Report
10 V.S.A. § 1389a (b)(2) A summary of additional funding sources pursued by the Board, including whether those funding sources were attained; if it was not attained, why it was not attained; and where the money was allocated from the Fund	Report of the Working Group on Water Quality funding under 2017 Act 73[1]
10 V.S.A. § 1389a (b)(3) A summary of water quality problems or concerns in each watershed basin of the State, a list of water quality projects identified as necessary in each basin of the State, and how identified projects have been prioritized for implementation	Appendix A
10 V.S.A. § 1389a (b)(4-5) A summary of any changes to applicable federal law or policy related to the State's water quality improvement efforts, including any changes to requirements to implement total maximum daily load plans in the State; a summary of available federal funding related to or for water quality improvement efforts in the State	2020 Report on Federal Funding Related to Water Quality Improvement Efforts in Vermont[2]
10 V.S.A. § 1264 (k)(1-3) Report on installation of stormwater treatment practices through operational stormwater permits, including: (1) permitted new development is achieving at least a 70 percent average phosphorus load reduction; (2) estimated total phosphorus load reduction from new development, redevelopment, and retrofit of impervious surface permitted; and (3) number and percentage of projects that implemented Tier 1, 2, or 3 stormwater treatment practices	Appendix D
10 V.S.A. § 1386(e) Activities and Progress of Water Quality Ecosystem Restoration Programs	Appendix F
Lake Champlain TMDL Progress Report Part 2: (1) estimated phosphorus reductions from clean water projects in the Lake Champlain basin; (2) external variables affecting phosphorus loading to Lake Champlain; and (3) monitored phosphorus loading to Lake Champlain. Appendix B: interim status of priority actions from Tactical Basin Plan "Implementation Table" for Southern Lake Champlain basin. Appendix C: estimated total phosphorous load reductions by lake segment watershed.	Part 2. Lake Champlain TMDL Progress Report and Appendix B and C

[1] Report of the Working Group on Water Quality funding under 2017 Act 73, available at: https://anr.vermont.gov/sites/anr/files/specialtopics/Act73WorkingGroup/2017-11-15-FINAL-act-73-water-quality-funding-report.pdf.

[2] 2020 Report on Federal Funding Related to Water Quality Improvement Efforts in Vermont, available at: https://dec.vermont.gov/sites/dec/files/wsm/erp/docs/2020%20Vermont%20Federal%20Clean%20Water%20Funding%20Report Final.pdf.

ACKNOWLEDGEMENTS

This report was prepared by the Vermont Agency of Natural Resources Department of Environmental Conservation (DEC) Clean Water Initiative Program on behalf of the Vermont Secretary of Administration with assistance from partner agencies. The Clean Water Initiative Program coordinated with staff of the Vermont Agency of Administration; Vermont Agency of Agriculture, Food and Markets; Vermont Agency of Commerce and Community Development; Vermont Agency of Transportation; Vermont Fish and Wildlife Department; Vermont Department of Forests, Parks and Recreation; DEC's Water Investment Division; DEC's Watershed Management Division; Vermont Housing and Conservation Board; U.S. Department of Agriculture Natural Resources Conservation Service; and Lake Champlain Basin Program to complete this report. Vermont Agency of Digital Services supported data management and database development.

Report available electronically at: https://dec.vermont.gov/water-investment/cwi/reports

VERMONT CLEAN WATER INITIATIVE - cleanwater.vermont.gov

VERMONT CLEAN WATER INITIATIVE AGENCIES

Agency of Administration - aoa.vermont.gov
Agency of Agriculture, Food and Markets - agriculture.vermont.gov
Agency of Commerce and Community Development - accd.vermont.gov
Agency of Natural Resources - anr.vermont.gov
Agency of Transportation - vtrans.vermont.gov

COVER PHOTOS

Hazen Union School stormwater gravel wetland funded by DEC's Clean Water Initiative Program

Filter strip installed adjacent to a corn field in the Memphremagog Watershed funded by Agency of Agriculture, Food and Markets

Forester training on temporary skidder bridges at Mount Mansfield State Forest

West Windsor drainage ditch improvement funded by Agency of Transportation Better Roads Program

Cold Spring Brook Dam Removal funded by DEC's Clean Water Initiative Program

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Vermont Clean Water Initiative 2020 Performance Report Executive Summary

Clean water supports fishing, swimming, boating, and other recreational uses, bolsters tourism, helps to maintain property values and provides access to safe drinking water. Vermont's residents, visitors, and businesses care about clean water and benefit from continued investments in restoring and protecting our waters. The State of Vermont coordinates across agencies and with local and federal partners to develop and implement projects that improve water quality from all land use sectors, as follows.

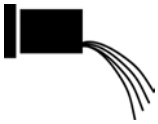
Clean Water Land Use Sectors

AGRICULTURE
Addresses runoff and soil erosion from farm production areas and farm fields.

NATURAL RESOURCES
Restores functions of "natural infrastructure"—river channels, floodplains, lakeshores, and wetlands

STORMWATER
Addresses stormwater runoff from developed lands, such as parking lots, sidewalks, and rooftops

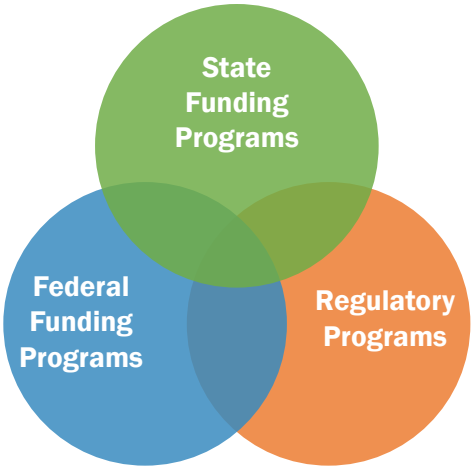
ROADS
Addresses stormwater runoff and erosion from roads



WASTEWATER
Decreases nutrients (phosphorus and nitrogen) through enhanced wastewater treatment and addresses aging infrastructure

Collectively, state and federal funding programs and regulatory programs drive clean water efforts. The State of Vermont coordinates across agencies to track these efforts and monitor progress. The overlapping program categories captured in clean water tracking are depicted at top-right of page.

Scope of Vermont Clean Water Tracking



This *Vermont Clean Water Initiative 2020 Performance Report* summarizes the State of Vermont's clean water efforts and demonstrates how investments are making a difference through the following accountability measures.

Accountability Measure Types

Investment measures of how State of Vermont invests in clean water projects from planning to design and implementation

Education measures on outreach and technical assistance to support, identify, and develop clean water projects

Project output measures that quantify the results of state-funded clean water projects

Environmental outcome measures that quantify water pollution reductions achieved through state-funded clean water projects.

Vermont Clean Water Initiative 2020 Performance Report
Executive Summary

This Executive Summary mirrors the SFY 2020 Performance Report, summarizing clean water efforts from State Fiscal Year (SFY) 2016 through 2020 (July 1, 2015 through June 30, 2020) in two parts, defined as follows, along with highlights from each accountability measure.

Part 1: Vermont Clean Water Investment Report
Summarizes state agencies' investments in clean water projects, results of completed state-funded projects, as well as education provided through outreach and technical assistance efforts. Part 1 includes State of Vermont investments and results only, statewide.

Part 1 SFY 2016-2020 State-Funded Highlights

Over $194 million invested through grants and contracts ($135 million) and financed through loans ($61 million), leveraging over $70 million in local and federal sources, in addition to loan repayment. See Report Part 1.A. for more information.

Over 2,000 outreach events held reaching over 57,000 attendees providing 5,970 hours of education to further capacity and support for Vermont's clean water efforts. See Report Part 1.B. for more information.

More than 90,000 acres of agricultural conservation practices implemented; 200 municipal road miles improved through best practices; 332 acres of impervious/hard (e.g., paved) surface treated by stormwater practices; over 290 riparian acres (adjacent to rivers, lakes, and wetlands) actively restored and over 1,200 riparian acres passively restored through conservation. See Report Part 1.C. for more information.

Estimated 12.4 metric tons of total phosphorus load reduced, as of SFY 2020, in Lake Champlain and Lake Memphremagog. Phosphorus pollution contributes to cyanobacteria and other water quality issues. Phosphorus reductions may also benefit smaller/local waterbodies in those basins. See Report Part 1.C. for more information.

Part 2: Lake Champlain TMDL Progress Report
Summarizes the state's progress implementing the *Phosphorus Total Maximum Daily Loads (TMDLs) for Vermont Segments of Lake Champlain*, which identifies phosphorus pollution reductions necessary for Lake Champlain to meet water quality standards.

Part 2 includes results projects/activities completed through state funding programs, federal funding programs, and regulatory programs in the Lake Champlain basin.

Part 2 Lake Champlain TMDL Progress Highlights

Estimated 28.2 metric ton total phosphorus load reduction achieved as of SFY 2020, representing 13 percent of the phosphorus reduction required for Lake Champlain to meet State of Vermont water quality standards by 2038.

Regulatory and funding programs are ramping up in the next 1-3 years expected to result in significant phosphorus reductions.

Wastewater treatment facilities in the Lake Champlain basin contributed 12 metric tons of total phosphorus load to Lake Champlain in 2019 — 20 metric tons below the maximum permittable limit of 32 metric tons.

See Report Part 2.A. for more information.

Explore Clean Water Project Data Online

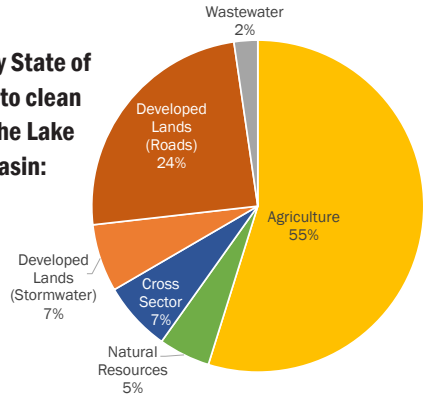
Clean water project data summarized in this report are available to the public through the "Clean Water Portal" available at: https://anrweb.vt.gov/DEC/cleanWaterDashboard/. The Portal contains the new Clean Water Interactive Dashboard – an online tool allowing users to interact with and filter Performance Report data.

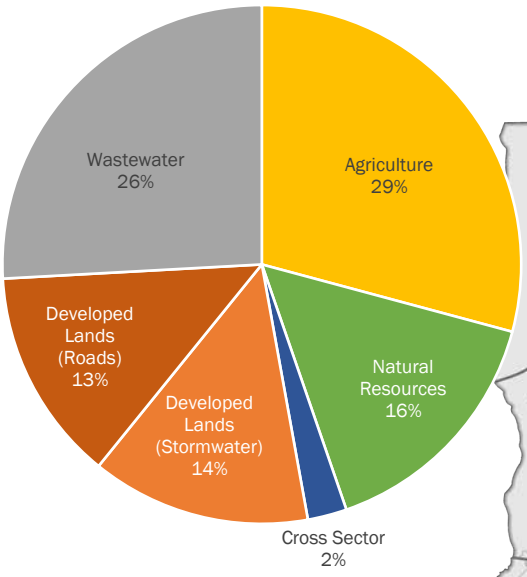
Part 1 Executive Summary: Vermont's Clean Water Investments

Dollars awarded by State of Vermont agencies to clean water projects, SFY 2016-2020. See report Part 1.A. "Vermont's Clean Water Investments" for more information.

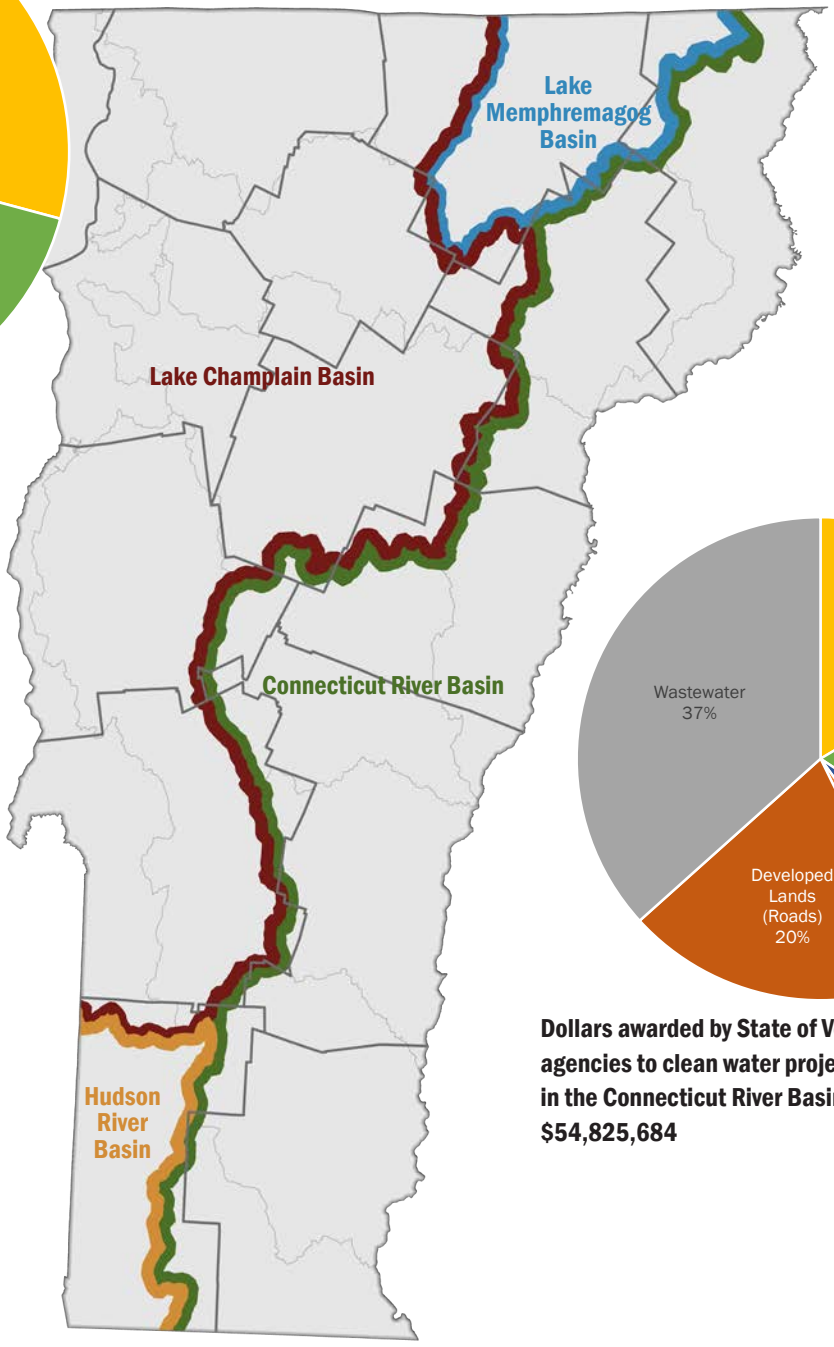
$194 million
Awarded by State of Vermont agencies to clean water projects, SFY 2016-2020

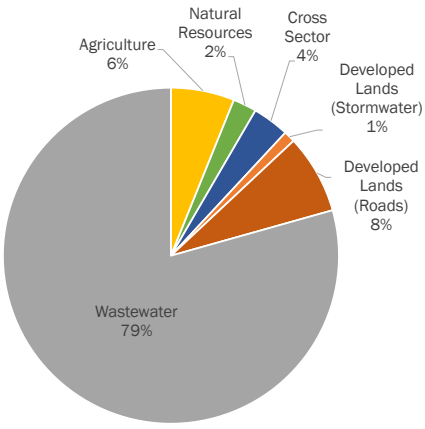
Dollars awarded by State of Vermont agencies to clean water projects in the Lake Memphremagog basin: $6,908,364





Dollars awarded by State of Vermont agencies to clean water projects in the Lake Champlain basin: $120,155,247





Dollars awarded by State of Vermont agencies to clean water projects in the Hudson River basin: $12,476,929

Dollars awarded by State of Vermont agencies to clean water projects in the Connecticut River Basin: $54,825,684

Part 1 Executive Summary: Results of Vermont's Clean Water Investments

Results of clean water projects funded by State of Vermont agencies, completed SFY 2016–2020, by sector. See report Part 1.C. "Results of Vermont's Clean Water Investments" for more information.

AGRICULTURE

STATE-FUNDED AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural conservation practices implemented	5,466	3,261	7,908	14,566	19,619	50,820
Acres of agricultural land treated through innovative equipment	–	2,043	5,415	14,022	14,521	36,001
Acres of agricultural land treated by forest and grass buffers	258	200	228	–	–	686
Acres of pasture with livestock excluded from surface waters	258	117	97	47	15	534
Acres of water quality protections within newly conserved agricultural lands	–	116	200	513	250	1,079
Acres of agricultural conservation practices reported through technical assistance	–	–	17	1,556	1,689	3,262
Number of barnyard and production area practices installed	59	86	96	77	119	437

STATE-FUNDED AGRICULTURE POLLUTANT REDUCTIONS	2016	2017	2018	2019	2020
Estimated total phosphorus load reduction (kilograms per year)	946	1,390	1,912	5,131	11,291

NATURAL RESOURCES

STATE-FUNDED NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored through buffer planting	85	32	60	58	13	248
Acres of riparian corridor conserved and restored through easements	141	208	236	5	90	680
Acres of floodplain restored	1	2	4	1	25	33
Acres of lakeshore restored	<1	–	9	1	<1	10
Stream miles reconnected for stream equilibrium/fish passage	32	100	124	157	33	446
Acres of wetland conserved and restored through easements	–	131	44	229	167	571
Acres of forestland conserved with water quality protections	58	172	598	63	63	954
Miles of forest road drainage and erosion control improvements	–	1	–	8	3	12
Number of stream crossings improved	–	–	1	19	10	30
Square feet of gully erosion remediated	–	–	50,660	135	305	51,100

STATE-FUNDED NATURAL RESOURCES POLLUTANT REDUCTIONS	2016	2017	2018	2019	2020
Estimated total phosphorus load reduction (kilograms per year)	52	109	218	265	293

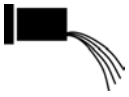
DEVELOPED LANDS

STORMWATER

ROADS

STATE-FUNDED DEVELOPED LANDS PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	<1	87	35	133	77	332
Miles of municipal road drainage and erosion control improvements	1	12	68	88	31	200
Number of municipal road drainage and stream culverts replaced	–	104	134	245	119	602
Cubic yards of Class IV road gully erosion remediated	–	–	260	33	–	293
Cubic yards of catch basin outlet erosion remediated	–	–	1	784	–	785
Acres stabilized through use of hydroseeder/mulcher equipment per year	–	–	19	98	248	365

STATE-FUNDED DEVELOPED LANDS POLLUTANT REDUCTIONS	2016	2017	2018	2019	2020
Estimated total phosphorus load reduction (kilograms per year)	4	38	193	392	784

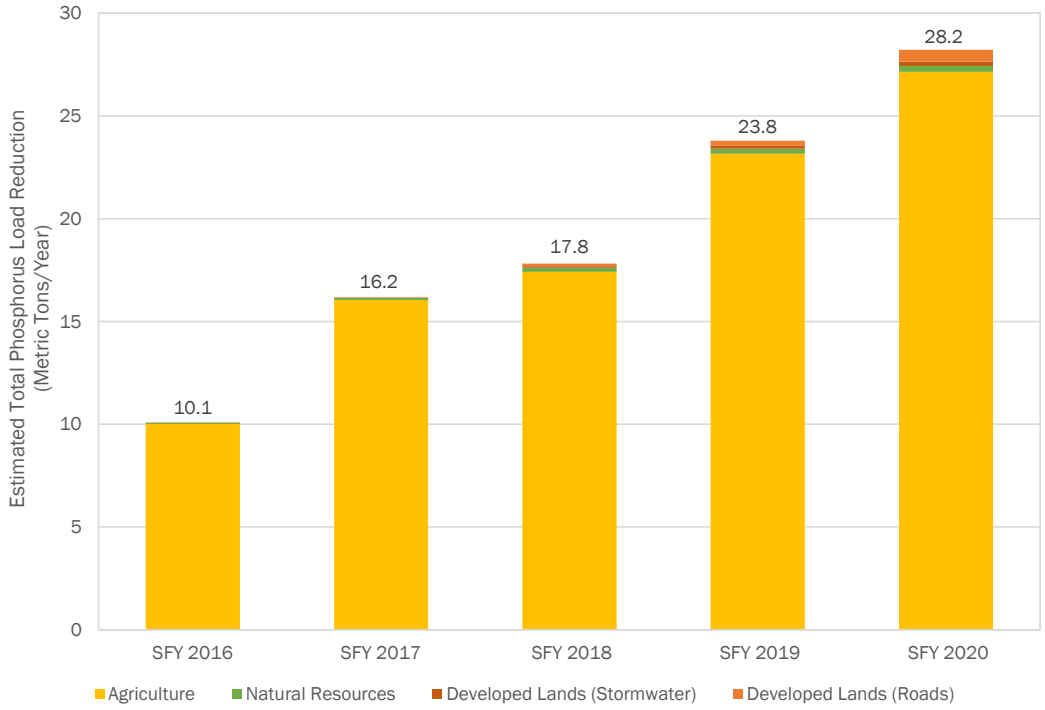


WASTEWATER

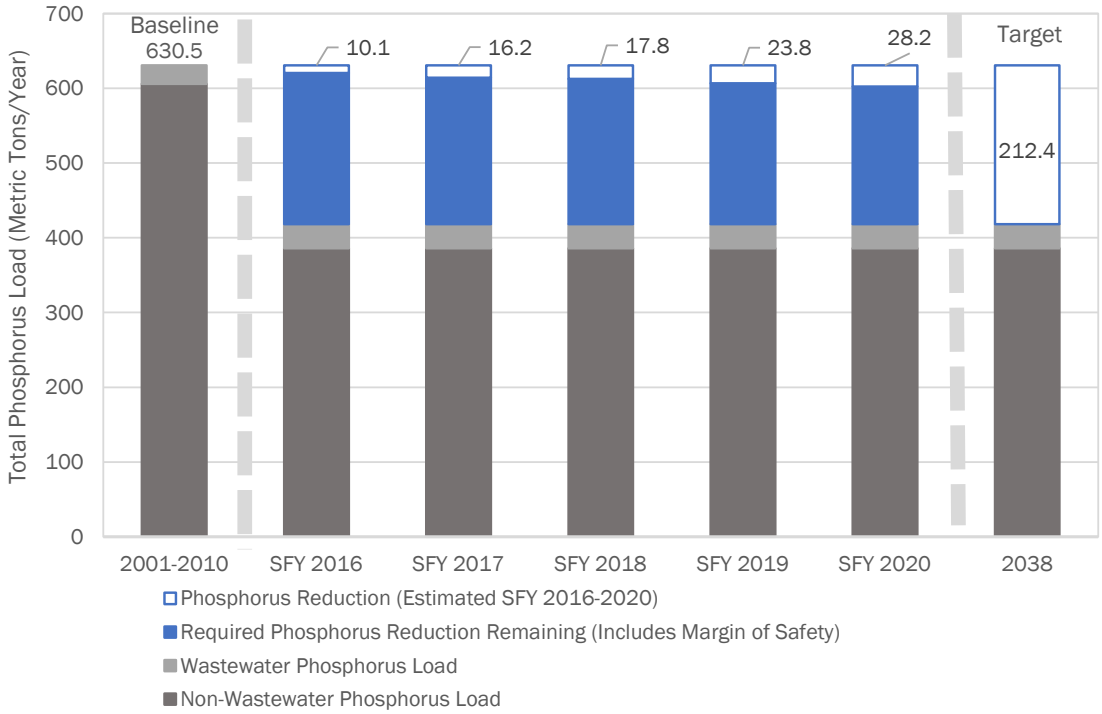
STATE-FUNDED WASTEWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Number of combined sewer overflow abatements completed	4	1	–	1	3	9
Number of sewer extensions completed	–	1	–	–	–	1
Number of wastewater collection systems refurbished	–	1	1	2	2	6
Number of wastewater treatment facilities refurbished	–	–	1	2	2	5
Number of wastewater treatment facility upgrades completed	1	4	1	–	–	6

Part 2 Executive Summary:
Lake Champlain TMDL Progress Report

Estimated total phosphorus load reduction (metric tons per year) achieved by clean water projects/activities that support implementation of the Lake Champlain Total Maximum Daily Load (TMDL), by land use sector, completed/in effect SFY 2016-2020. Includes activities implemented through state and federal funding programs and regulatory programs. See report Part 2.A. "Lake Champlain TMDL Performance Meausres" for more information.



<u>Estimated</u> total phosphorus load reductions achieved/in effect for the SFY 2016-2020 reporting period in the context of the Lake Champlain TMDL total phosphorus load baseline (2001-2010, at left) and target phosphorus load (year 2038, at right) in metric tons per year. SFY 2020 estimated reductions represent 13 percent of the required total phosphorus load reduction. See report Part 2.A. "Lake Champlain TMDL Performance Meausres" for more information.



Introduction

Vermont waterways provide access to safe drinking water, strengthen tourism, help to maintain property values, and support fishing, swimming, boating, and other recreational uses. Vermont's residents, visitors, and businesses care about clean water and benefit from continued investments in restoring and protecting our waters. The State of Vermont coordinates across state agencies and with federal and local partners, representing all land use sectors, to develop, implement, and track projects that improve water quality. The state and its federal and local partners are committed to restoring these impacted waters, as well as protecting high-quality waters.

Clean Water Restoration Plans (i.e., Total Maximum Daily Loads, or "TMDLs")

Vermont's waters are generally high quality. However, some suffer from excess pollution, which can lead to unhealthy conditions. Due to Vermont's rural characteristic, most water quality problems are caused by excess nutrient and sediment pollution, primarily transported from the landscape to waterways by rain-runoff and snowmelt, commonly referred to as "nonpoint source pollution." Nonpoint sources are harder to identify compared to point sources, which come from a single point, such as the end of a pipe.

Clean water restoration plans known as "Total Maximum Daily Loads" (TMDLs) identify pollutant reductions required for an impaired waterbody to meet the State of Vermont's water quality standards. TMDLs target both nonpoint source and point source (e.g., end-of-pipe) pollutant reductions. Then, the State of Vermont's Tactical Basin Planning process identifies and prioritizes specific actions necessary to achieve pollutant reduction targets identified in TMDLs.

Most of the State of Vermont is covered by three large-scale TMDLs that require nutrient pollutant reductions (i.e., phosphorus and nitrogen) shown in Figure 1. Lake Champlain and Lake Memphremagog TMDLs target phosphorus pollution to address cyanobacteria blooms (i.e., blue-green algae), as well as excess algae and aquatic plant growth, as seen in Figure 2 above. The five-state Long Island Sound TMDL targets nitrogen pollution, which causes low dissolved oxygen and dead zones in the Sound.

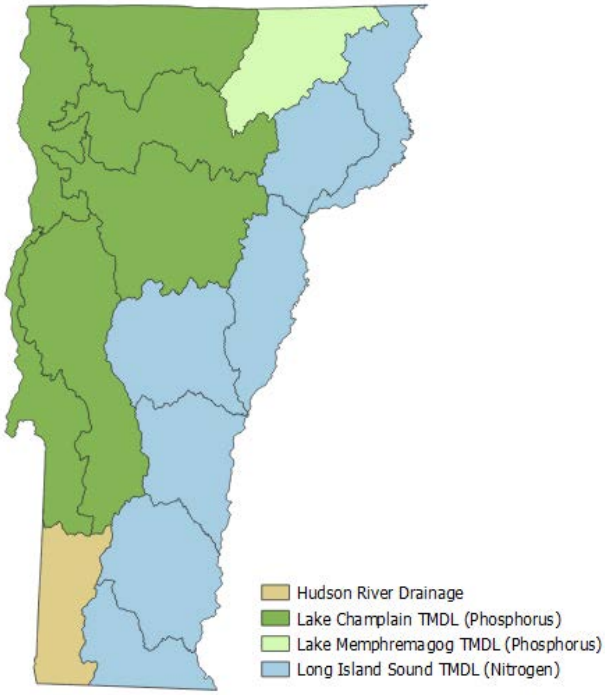


Figure 1. Vermont's large-scale TMDLs that require nutrient pollutant reductions (nutrients noted in legend)

Figure 2. Cyanobacteria bloom in Lake Champlain

Implementation of large-scale nutrient TMDLs also supports local water quality priorities. For example, Lake Carmi, located in the Lake Champlain basin, also suffers from cyanobacteria blooms. Actions to reduce phosphorus pollution in Lake Carmi support implementation of the Lake Champlain TMDL. Refer to Part 2, Appendix B, and Appendix C of this report for more information on Lake Champlain TMDL progress.

Clean Water Projects

Clean water projects, described in the figure below and throughout this report, target nutrient and sediment pollution across various land use sectors. Nutrient and sediment pollution reductions are required by TMDLs (described above) and may also be driven by the Vermont Clean Water Act (Act 64 of 2015) and the Combined Sewer Overflow (CSO) Rule.

Land Use	Clean Water Project Objectives and Example Project Images	Additional Benefits
AGRICULTURE	Addresses runoff and soil erosion from farm production areas and farm fields. 	• Cost-effective • Leverages federal funds • Supports agricultural economy • Supports regulatory compliance
NATURAL RESOURCES	Restores functions of "natural infrastructure"—river channels, floodplains, lakeshores, and wetlands 	• Cost-effective • Leverages federal funds • Increases flood resilience • Improves habitat • Enhances recreation
STORMWATER	Addresses stormwater runoff from developed lands, such as parking lots, sidewalks, and rooftops 	• Increases flood resilience • May enhance aesthetic appeal • Supports regulatory compliance
ROADS	Addresses stormwater runoff and erosion from roads 	• Cost-effective • Leverages federal funds • Increases flood resilience • Reduces future road maintenance costs • Supports regulatory compliance
WASTEWATER	Decreases nutrients (phosphorus and nitrogen) through enhanced wastewater treatment and addresses aging infrastructure 	• Protects public health and safety • Leverages federal funds • Supports regulatory compliance

Figure 3. Clean water project land use sectors, objectives, and additional benefits

Report Purpose and Scope

The purpose of the *Vermont Clean Water Initiative 2020 Performance Report* is to summarize the State of Vermont's clean water efforts and demonstrate how clean water investments, educational programs, and regulatory programs are making a difference through the following accountability measures.

Investment measures of how State of Vermont invests in clean water projects from planning to design and implementation

Project output measures that quantify the results of state-funded clean water projects

Education measures on outreach and technical assistance to support, identify, and develop clean water projects

Pollutant reduction measures of estimated nutrient load reductions achieved by clean water projects

This report covers State Fiscal Year (SFY) 2016 through 2020 (July 1, 2015 – June 30, 2020). Data have been collected from a variety of sources including state funding programs, regulatory programs, and federal funding programs. Collectively, state and federal funding programs and regulatory programs drive clean water efforts. For example, state funds leverage federal funds, and funding programs support the cost of regulatory compliance. The State of Vermont coordinates across agencies to track these efforts and monitor progress.

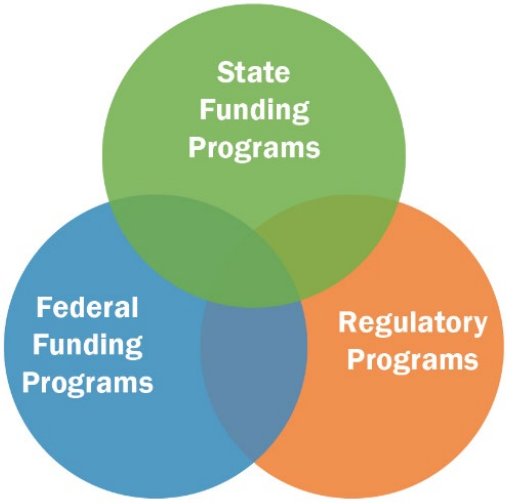


Figure 4. Program categories included in the scope of Vermont's clean water tracking and reporting

This report contains two parts which fulfill both state statutory reporting requirements (Part 1) and federal reporting requirements (Part 2). Part 1, *Vermont Clean Water Investment Report*, summarizes state funding program investments and results statewide. Part 2, *Lake Champlain TMDL Progress Report*, summarizes progress made across state and federal funding programs and regulatory programs implementing the *Phosphorus Total Maximum Daily Loads (TMDLs) for Vermont Segments of Lake Champlain*. The scope of parts 1 and 2 are summarized below.

Scope of Part 1: Vermont Clean Water Investment Report

- State agencies' investments in clean water projects through grants, contracts, and loans statewide, awarded SFY 2016-2020.
- Education provided through outreach and technical assistance by state agency staff, and/or external partners under a state grant or contract, SFY 2016-2020.
- Results of clean water projects funded by state agencies, completed SFY 2016-2020, including project output measures and nutrient pollutant load reductions.
- Cost effectiveness of state investments in clean water projects based on estimated total phosphorus load reductions.

Geographic Focus:
Statewide

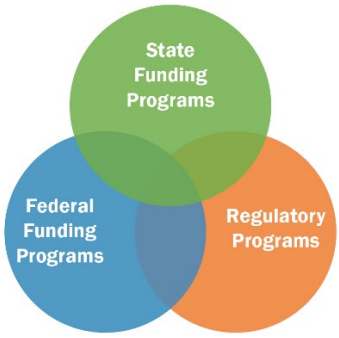
Program Focus:
State funding only

Scope of Part 2: Lake Champlain TMDLs Progress Report

- Estimated total phosphorus load reductions within the Lake Champlain basin associated with clean water projects/activities completed or in effect SFY 2016-2020 through federal funding programs, state funding programs, and regulatory programs.
- External variables affecting phosphorus loading to Lake Champlain, such as climate and land use change.
- Monitored total phosphorus load from Vermont tributaries of Lake Champlain relative to total phosphorus load target.

Geographic Focus:
Lake Champlain Basin

Program Focus:
State and federal funding, and regulatory programs



Data Beyond the Report Scope

- State investments in projects with agreements executed outside the reporting period.
- Results of projects completed outside the reporting period.
- Outreach and technical assistance from external partners outside state grants/contracts.
- Municipal and private investments in clean water projects necessary to comply with water regulations, unless reported as local match on a state grant or contract. Regulatory programs do not track costs associated with compliance.
- VTrans' investments in clean water projects to comply with water quality regulations on state highways and VTrans non-road developed lands. Results of VTrans' projects to comply with water quality regulations will be included in future reporting periods once data are available through VTrans' regulatory reporting requirements.

Learn More with the Clean Water Portal

The State of Vermont coordinates across agencies to track clean water efforts in a centralized database, known as the "Clean Water Reporting Framework." The Framework is used to compile and summarize project data to produce this report. These data are made available to the public through the "Clean Water Portal."[3] The Portal's "Clean Water Projects Explorer" allows interested parties to search for and learn more details about individual state-funded clean water projects. The Explorer also contains potential projects identified through Tactical Basin Planning – Vermont's science-based framework to identify and prioritize clean water projects. New to the Portal in 2021 is the "Clean Water Interactive Dashboard" (CWID). CWID is an online tool that allows interested parties to interact with Performance Report data on investments, project outputs, estimated pollutant load reductions and project cost effectiveness.

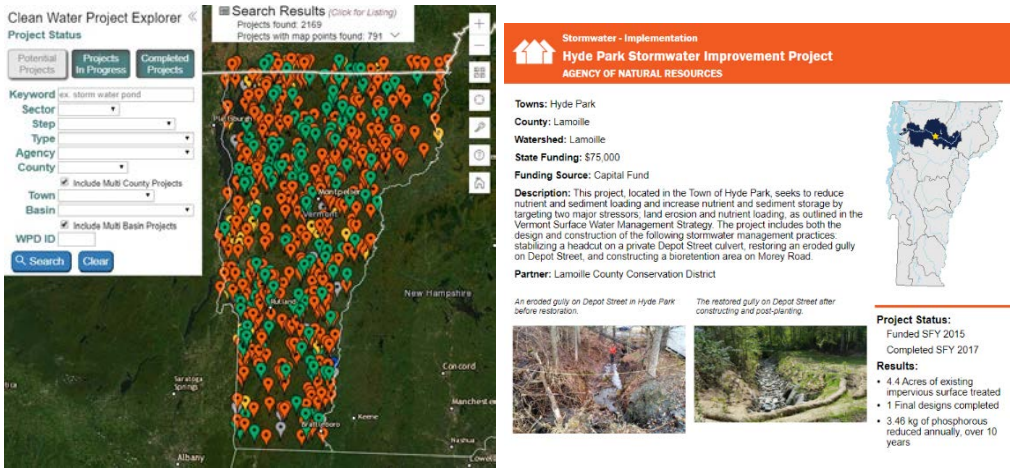


Figure 5. Sample Clean Water Projects Explorer search results (left) and individual project report (right)

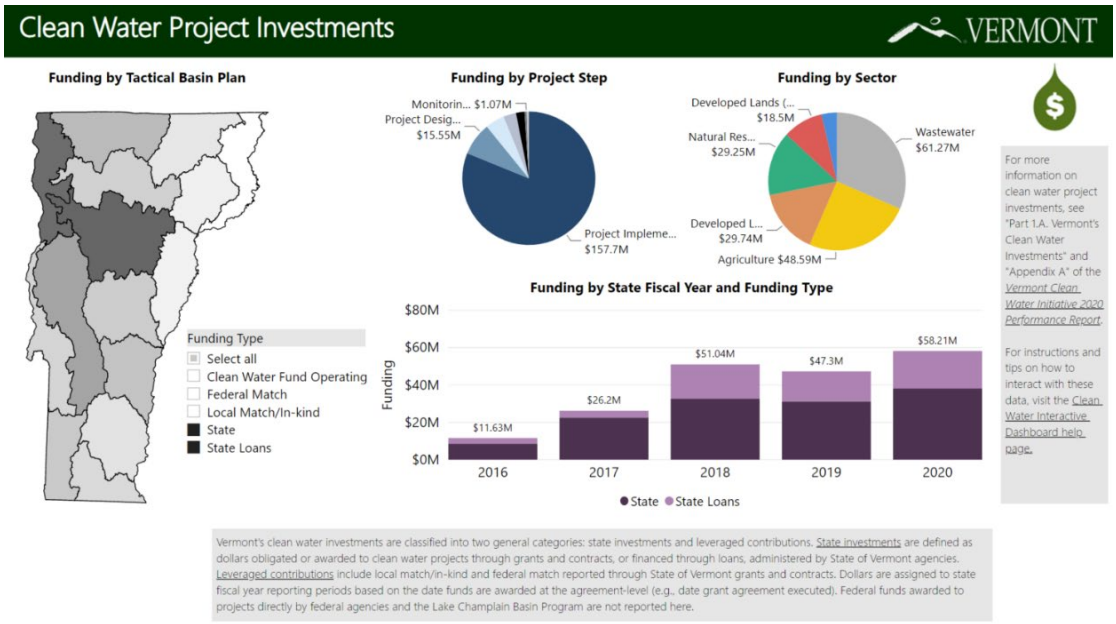


Figure 6. Sample of data available on the Clean Water Interactive Dashboard

[3] Clean Water Portal can be accessed here: https://anrweb.vt.gov/DEC/cleanWaterDashboard/.

Part 1: Vermont Clean Water Investment Report

1.A. Vermont's Clean Water Investments

How is the State of Vermont investing in clean water?

Restoring Vermont's clean water requires investments at the state, federal, municipal, and private level. The State of Vermont's clean water investments are channeled through grant, loan, and assistance programs to strategically restore and safeguard the state's rivers, streams, lakes, ponds, and wetlands. These funds are used to help identify and prioritize projects, as well as to design and implement projects. This work helps municipalities, farmers, and other landowners comply with regulations and encourages voluntary actions necessary to address polluted runoff from unregulated sources. Figure 7 through Figure 13 of this chapter summarize state clean water investments made through state funding programs shown in Table 1. **State investments** are defined as dollars obligated or awarded to clean water projects through grants and contracts, or financed through loans, administered by the State of Vermont agencies. Investments reported include state and federal dollars awarded to projects by state agencies, but exclude federal funds awarded to projects directly by federal agencies.

Table 1. State of Vermont funding programs reported by agency

Agency	Clean Water Funding Programs
Agency of Administration (AoA)	Stormwater Utility Incentive Payments
Agency of Agriculture, Food and Markets (AAFM)	Best Management Practice (BMP) Program Capital Equipment Assistance Program (CEAP) Clean Water Fund Grants and Contracts Clean Water Fund Operational Funds Conservation Reserve Enhancement Program (CREP) Farm Agronomic Practice (FAP) Program Grassed Waterway and Filter Strip Program Pasture Surface Water Fencing Program Water Quality (WQ) Grants Vermont Phosphorus Innovation Challenge (VPIC)
Agency of Commerce and Community Development (ACCD)	Better Connections Planning Grant Downtown Transportation Fund Vermont Center for Geographic Information (VCGI)
Agency of Natural Resources (ANR)	Clean Water Initiative Program Grants and Contracts Clean Water State Revolving Fund (CWSRF) Loans CWSRF Natural Infrastructure Interim Financing Program (new) Fish and Wildlife Department Watershed Grants Municipal Pollution Control Grants Municipal Roads Grants-in-Aid Program (transferring to VTrans in SFY 2021)
Agency of Transportation (VTrans)	Better Roads Program Municipal Highway Stormwater Mitigation Program Transportation Alternatives Program (TAP)
Vermont Housing and Conservation Board (VHCB)	Conservation Grants Farmland Protection Grants Water Quality Grants

Investments by State Agency and Fiscal Year

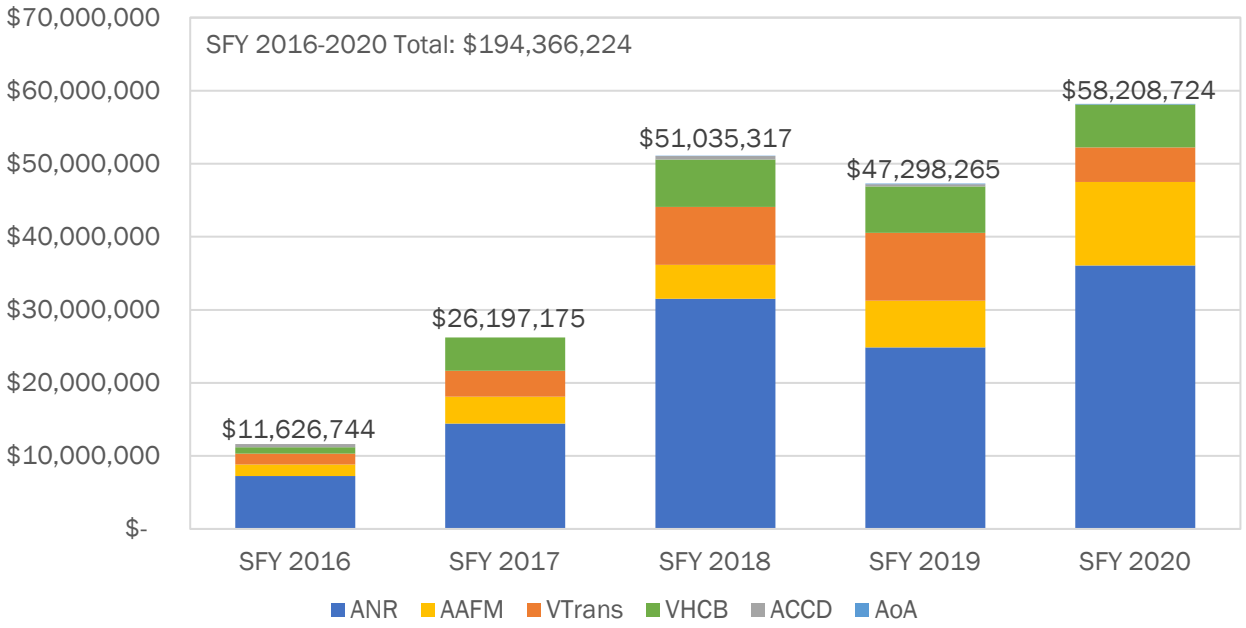


Figure 7. Total dollars awarded to clean water projects through State of Vermont agencies, SFY 2016-2020 by agency[4]

EXPLANATION OF FIGURE

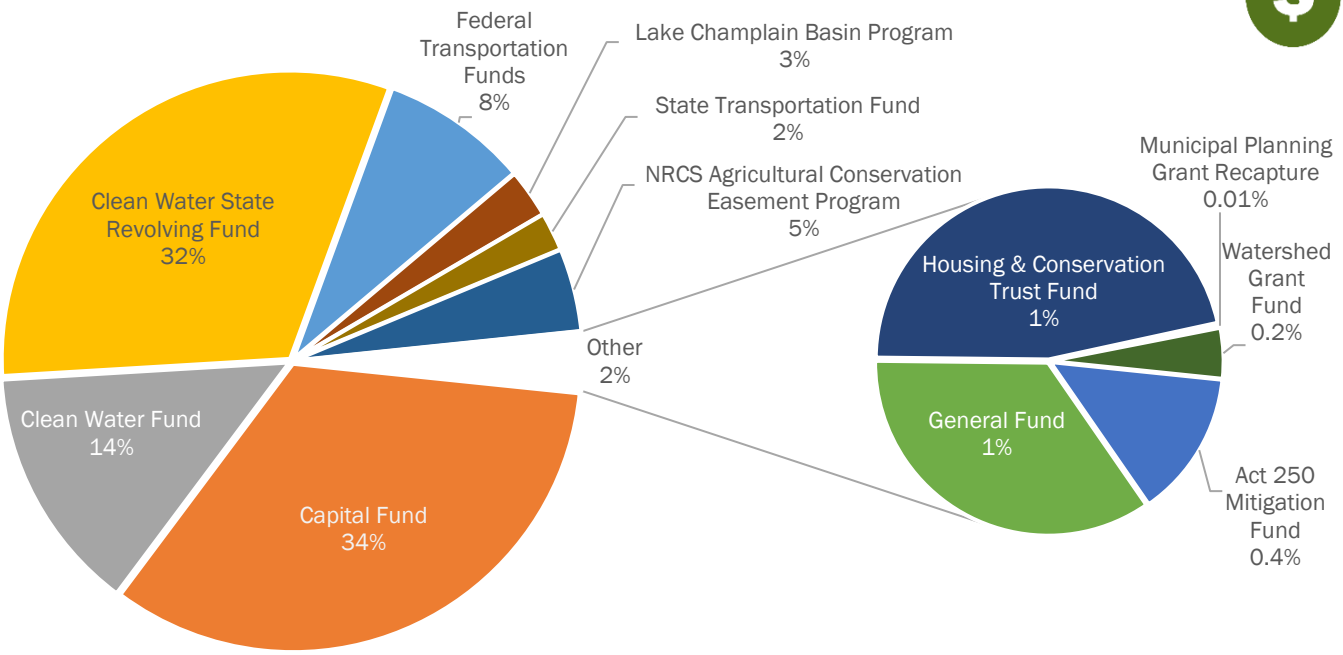
State agencies coordinate to track clean water investments and their results. Total dollars awarded to clean water projects through State of Vermont agencies show an increasing trend since SFY 2016. However, the COVID-19 pandemic's impact on the economy began affecting Clean Water Fund revenue sources in the fourth quarter of SFY 2020. This led to a slight reduction in appropriation and a temporary slowdown of funding programs. These impacts may be more apparent in SFY 2021 data reported next year. It should be noted that clean water projects support local jobs and economic stimulus.

There was an increase in dollars awarded in SFY 2020 by both Agency of Natural Resources (ANR) and Agency of Agriculture, Farm, and Markets (AAFM). ANR investments include both grant/contract and loan programs whereas other agencies only manage grant/contract funding programs. A new Natural Infrastructure Interim Financing program was established in SFY 2020 through the Clean Water State Revolving Fund (CWSRF) that provided $11 million in zero-interest loans to municipalities and nonprofits. ANR's funding appears variable from year to year due in part to CWSRF loans and Municipal Pollution Control Grants, as these programs fund large infrastructure projects and are contingent on demand from municipalities and dollars are awarded upon the completion of project construction.

AAFM increased dollars awarded through its Best Management Practice (BMP) Program in SFY 2020 by over $2 million which helps farmers improve barnyard/production areas to comply with Farm Operational Permits, such as through the construction of manure storage and waste management facilities.

[4] Dollars are assigned to SFY reporting periods based on the date funds are awarded at the agreement-level (e.g., date grant agreement executed). Dollars reported as awarded by SFY in this report are not the same as dollars appropriated by SFY.

Investments by Funding Source



SFY 2016-2020 Total: $194,366,224

Figure 8. Proportion of dollars awarded to clean water projects through State of Vermont agencies, SFY 2016-2020 by funding or financing source[5]

EXPLANATION OF FIGURE

State agencies' clean water investments are supported by a variety of funding sources. This figure shows the percent of total dollars awarded by state agencies by funding source from SFY 2016 to 2020. The Clean Water Fund's sole revenue source from SFY 2016 to SFY 2019 was the Property Transfer Tax Clean Water Surcharge, generating about $4 million to $5 million in revenue annually. Two new revenue sources were directed to the Clean Water Fund, beginning in SFY 2020, to establish adequate long-term revenue for Vermont's clean water efforts:

- 6 percent of the Meals and Rooms Tax, capped at $7.5 million in SFY 2020, and
- Unclaimed bottle deposits (i.e., "escheats") effective beginning in the second half of SFY 2020.

It should be noted that the COVID-19 pandemic's impact on the economy affected Clean Water Fund revenue in the fourth quarter of SFY 2020 and continues in SFY 2021. The State of Vermont and the Clean Water Board are monitoring Clean Water Fund revenue and adjusting appropriations based on revenue as needed in a manner that minimizes impact to clean water efforts on-the-ground.

Several federal funding sources *administered by state agencies* are considered state investments including: Clean Water State Revolving Fund (CWSRF), Federal Transportation Funds, U.S. Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) Agricultural Conservation Easement Program funds, and Lake Champlain Basin Program funds.

[5] Investments reported include state and federal dollars awarded to projects by state agencies, but exclude federal funds awarded to projects directly by federal agencies and the Lake Champlain Basin Program.

Investments by Project Step

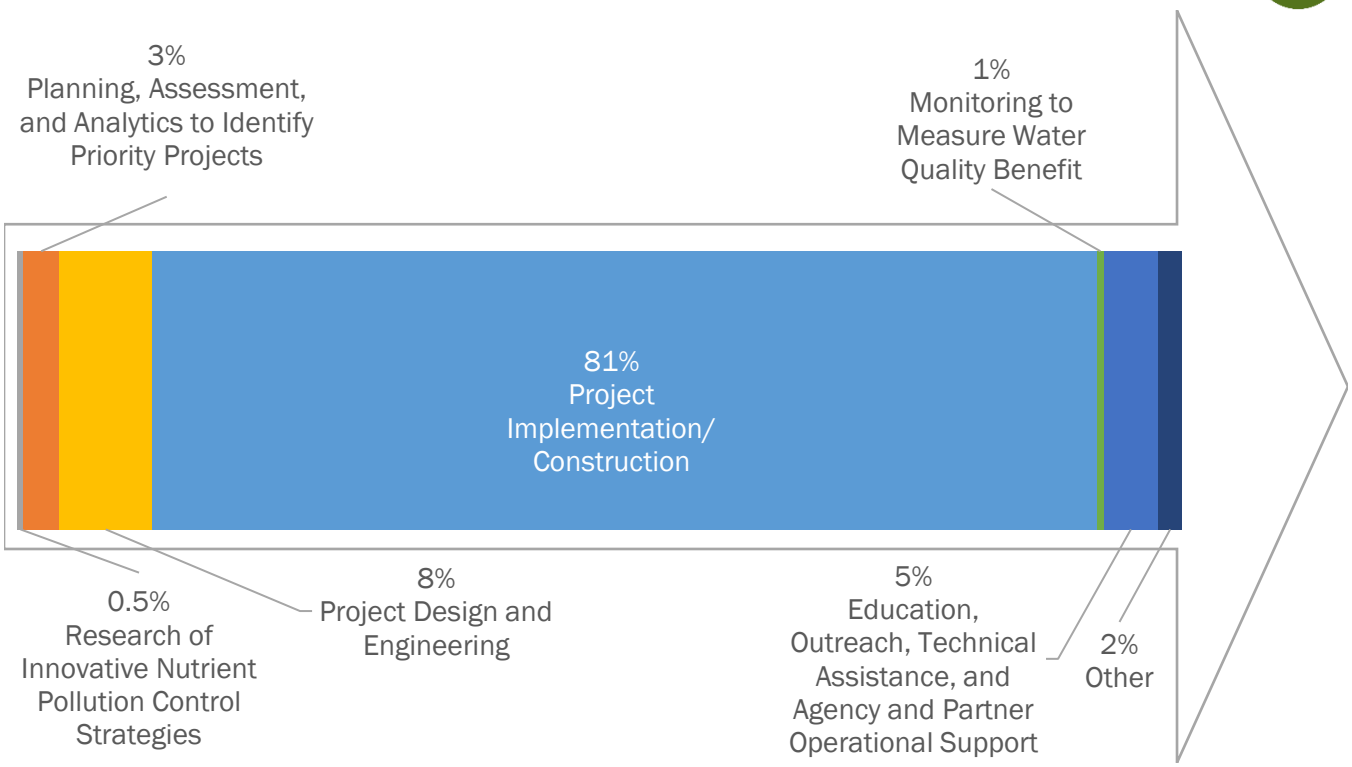


Figure 9. Proportion of dollars awarded to clean water projects through State of Vermont agencies, SFY 2016-2020 by project step in the clean water project development process

EXPLANATION OF FIGURE

Making wise investments in cost-effective clean water projects requires thorough project planning, analysis, design, and implementation. Investing in the project development process is key to ensuring state investments will yield the greatest water quality improvement per dollar, which includes dismissing lower-value or non-viable projects early in development. While the state invests in all project steps, most clean water investments are used to construct or implement clean water projects that reduce nutrient and sediment pollution.

The “other” category includes agreements that do not fit squarely into one project step, including multiple block grants issued to partners who will use the money to develop, design, and implement several projects. Once those projects are completed, those dollars will be reallocated to the appropriate step.

Investments by State Fiscal Year and Land Use Sector

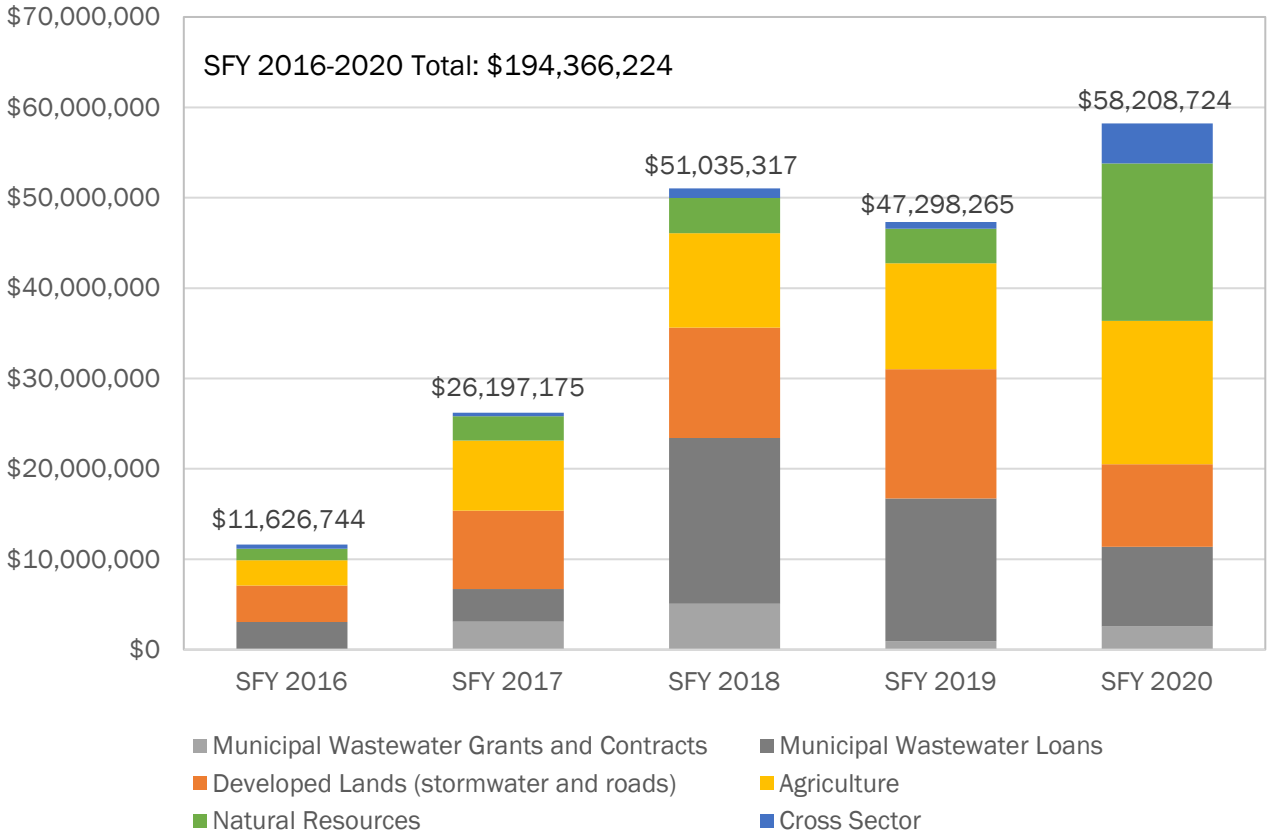


Figure 10. Total dollars awarded to clean water projects through State of Vermont agencies, SFY 2016-2020 by land use sector

EXPLANATION OF FIGURE

Reaching Vermont's clean water goals requires investments across all land use sectors shown in the figure above. The large increase in the natural resources sector funding in SFY 2020 reflects the addition of a new Natural Infrastructure Interim Financing program that provided $11 million in zero-interest loans to municipalities and nonprofits. Interim financing provides upfront access to capital to act on time-sensitive conservation opportunities and affords partners time to repay the loan over the course of five years. In addition, an increase in the agriculture sector in 2020 is due to a significant increase in awards through the AAFM Best Management Practice (BMP) program, as well as smaller increases in all other AAFM funding programs. A large portion of the investment in the municipal wastewater sector is in the form of loans with repayment to the state.

The "cross sector" category includes agreements that do not fit squarely into one sector, including certain outreach programs, and multiple block grants issued to partners who use the money to develop, design, and implement several projects across sectors. Once the block grants are completed, those dollars will be reallocated to the appropriate sector based on actual projects funded under the block grant.

Leveraged Contributions by Land Use Sector

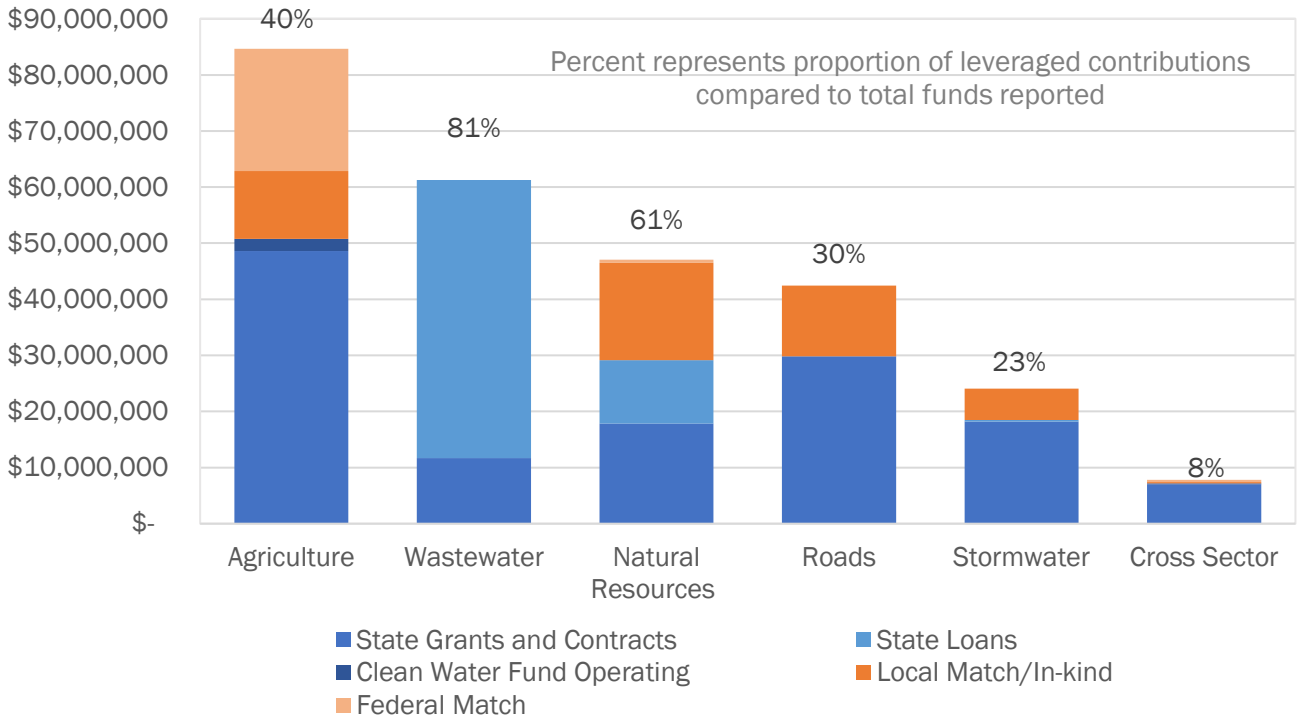


Figure 11. Leveraged contributions (i.e., local match/in-kind, federal match, and loans) reported through State of Vermont agencies in addition to state grants and contracts, SFY 2016-2020 by land use sector[6]

EXPLANATION OF FIGURE

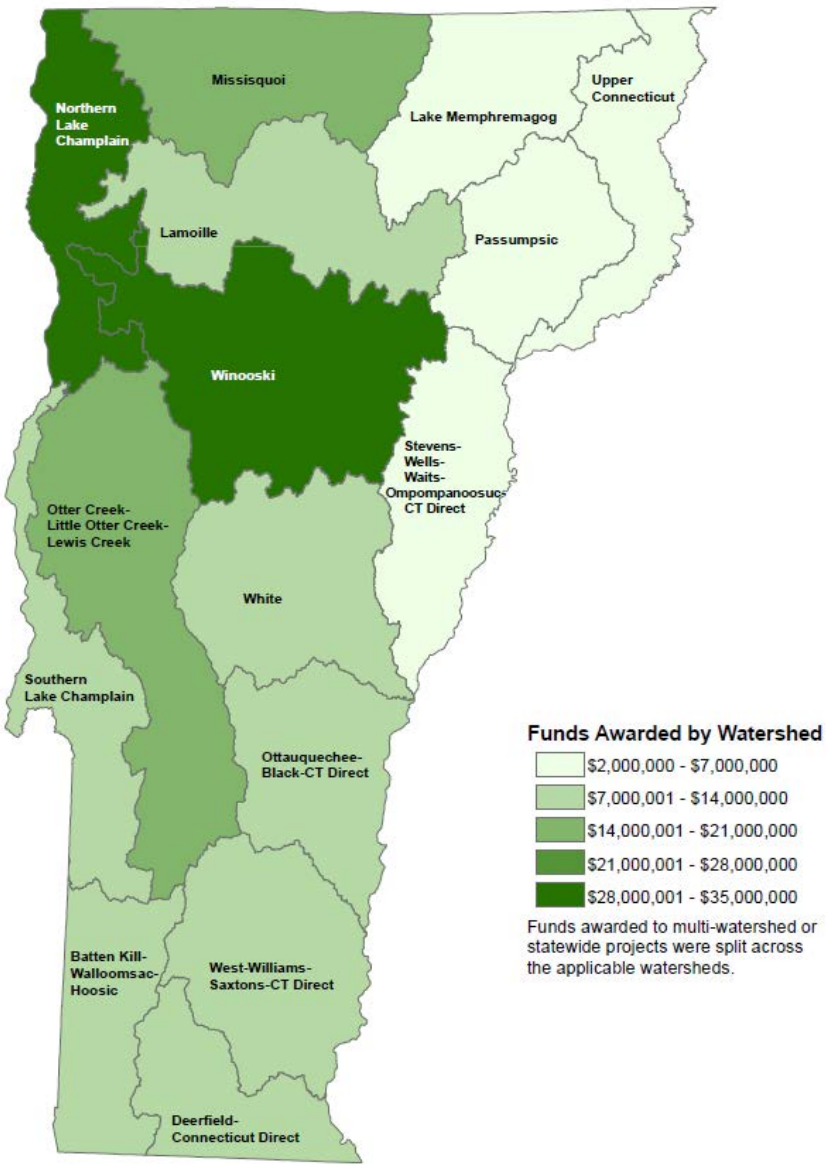
State-funded clean water projects leverage local and federal contributions to help cover project costs and to further clean water efforts in Vermont. Overall, leveraged contributions, including local match/in-kind, federal match, and loans represent 49 percent of total funds reported SFY 2016 through SFY 2020. Majority of wastewater funds reported are low-interest loans made to municipalities through the Clean Water State Revolving Fund that will ultimately be paid back to the state. Leveraged contributions reported here only include local match/in-kind and federal match reported through State of Vermont grants and contracts. "Clean Water Fund Operating" refers to limited AAFM and ANR personnel funded through the Clean Water Fund to support implementation efforts. This represents only a fraction of the substantial staffing costs associated with clean water work.

State-funded clean water projects have leveraged substantial investments since SFY 2016:

Total State Grants and Contracts:	$135,415,458	(50 percent of total)
Total State Loans:	$61,182,412	(23 percent of total)
Total Clean Water Fund Operating:	$2,400,000	(1 percent of total)
Total Local Match/In-Kind:	$47,967,105	(18 percent of total)
Total Federal Match:	$22,924,900	(8 percent of total)

[6] The "Cross Sector" category contains projects that span multiple sectors.

Investments by Watershed



Tactical Basin Plan Watershed	Total Awarded
Northern Connecticut	$2,138,416
Stevens, Wells, Waits, Ompompanoosuc-Connecticut Direct	$4,692,981
Passumpsic	$5,104,210
Lake Memphremagog	$6,908,364
West, Williams, Saxtons-Connecticut Direct	$7,713,621
Deerfield-Connecticut Direct	$9,428,096
South Lake Champlain	$10,461,296
Lamoille	$11,172,910
White	$11,919,237
Batten Kill-Walloomsac-Hoosic	$12,476,929
Ottauquechee-Black-Connecticut Direct	$13,829,123
Missisquoi	$15,519,097
Otter Creek-Little Otter Creek-Lewis Creek	$19,938,771
Northern Lake Champlain	$30,811,284
Winooski	$32,251,889
Total	$194,366,224

Figure 12. Map of total dollars awarded to clean water projects through State of Vermont agencies, SFY 2016-2020 by Tactical Basin Plan watershed

EXPLANATION OF FIGURE

Each of Vermont's 15 Tactical Basin Plan watersheds benefit from state investments in clean water projects. The Northern Lake Champlain and Winooski River watersheds received the largest investments since SFY 2016, totaling over $30 million and $32 million, respectively. Investments in the Lake Champlain Basin watersheds may be higher due to the relatively high levels of phosphorus reduction required under the Lake Champlain TMDL. Significant investments in these basins are largely driven by municipal wastewater treatment and CSO abatement requirements, as well as municipal stormwater treatment requirements for Vermont's most populous municipalities (i.e., Municipal Separate Storm Sewer System, or "MS4" communities). See Appendix A for detail on funding and results by watershed.

Investments Associated with Ongoing versus Completed Projects

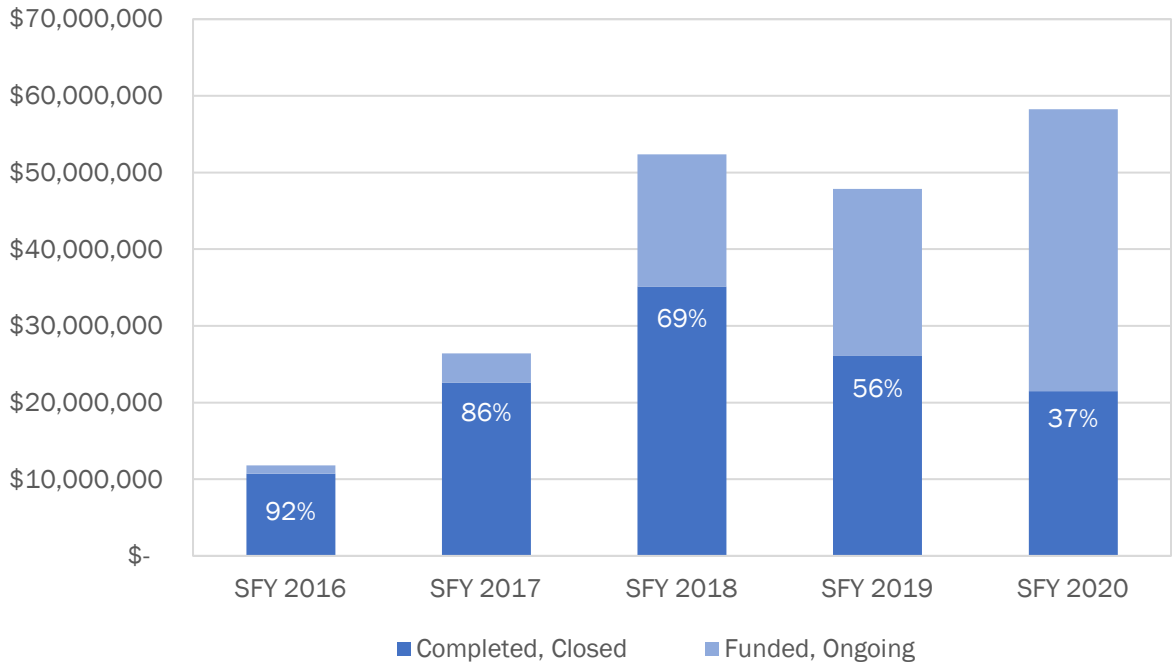


Figure 13. Total dollars awarded to clean water projects through State of Vermont agencies, SFY 2016-2020 by project status of "funded, ongoing" and "completed, closed;" percent represents proportion of dollars awarded associated with completed projects

EXPLANATION OF FIGURE

The figure above shows the proportion of dollars awarded to clean water projects by project status. Most projects funded early in the reporting period (e.g., SFY 2016-2017) are completed and/or closed-out as of SFY 2020. While many projects funded in recent years (e.g., SFY 2019-2020) are underway/ongoing as of SFY 2020. The amount of time it takes to complete a clean water project is variable. Some simpler projects may be feasible to implement in the same year they were awarded. While other projects are more technical in nature or encounter unforeseen challenges. Maintaining financial support to the state's partners and seeing these multi-year projects through to completion is important to ensure the state's investment yields water quality results. Once a project is completed, data on its funded amount is updated to reflect the final expended amount. Therefore, prior-reported investment data may change as projects closeout.

The State of Vermont does not report project results until a project is completed/constructed. Results reported in the Part 1.C. "Results of Vermont's Clean Water Investments" are based only on completed projects.

1.B. Vermont's Clean Water Education

How are state agencies educating Vermonters about clean water efforts?

Reducing nutrient and sediment pollution sources requires changing or adjusting our land uses, employing sound land use management practices. As a result, education and outreach to all Vermonters is critical to achieve our water quality goals, including municipalities, farmers, regional planning commissions, natural resources conservation districts, watershed groups, landowners and business owners, and others. The State of Vermont delivers clean water education through outreach (i.e., workshops, trainings, and public/stakeholder meetings) and technical assistance (i.e., targeted, one-on-one interactions). Clean water education aims to:

- Increase public awareness and engagement in establishing and implementing clean water priorities;
- Increase landowner acceptance of new and changing policies and willingness to adopt best management practices;
- Support regulated entities in preparing to meet new regulatory requirements in the most cost-effective manner;
- Support clean water project proponents, including regulated entities, in planning and securing resources to implement clean water projects; and
- Increase adoption and effectiveness of best management practices to improve water quality.

Educational efforts support all land use sectors in planning and securing resources to implement clean water projects. Clean water education measures, summarized in this report, show the extent of outreach and technical assistance conducted by state agencies and partners with state financial support.

The following section summarizes education and outreach efforts according to the following land use sectors with differing primary target audiences.

Outreach by Agency/Organization

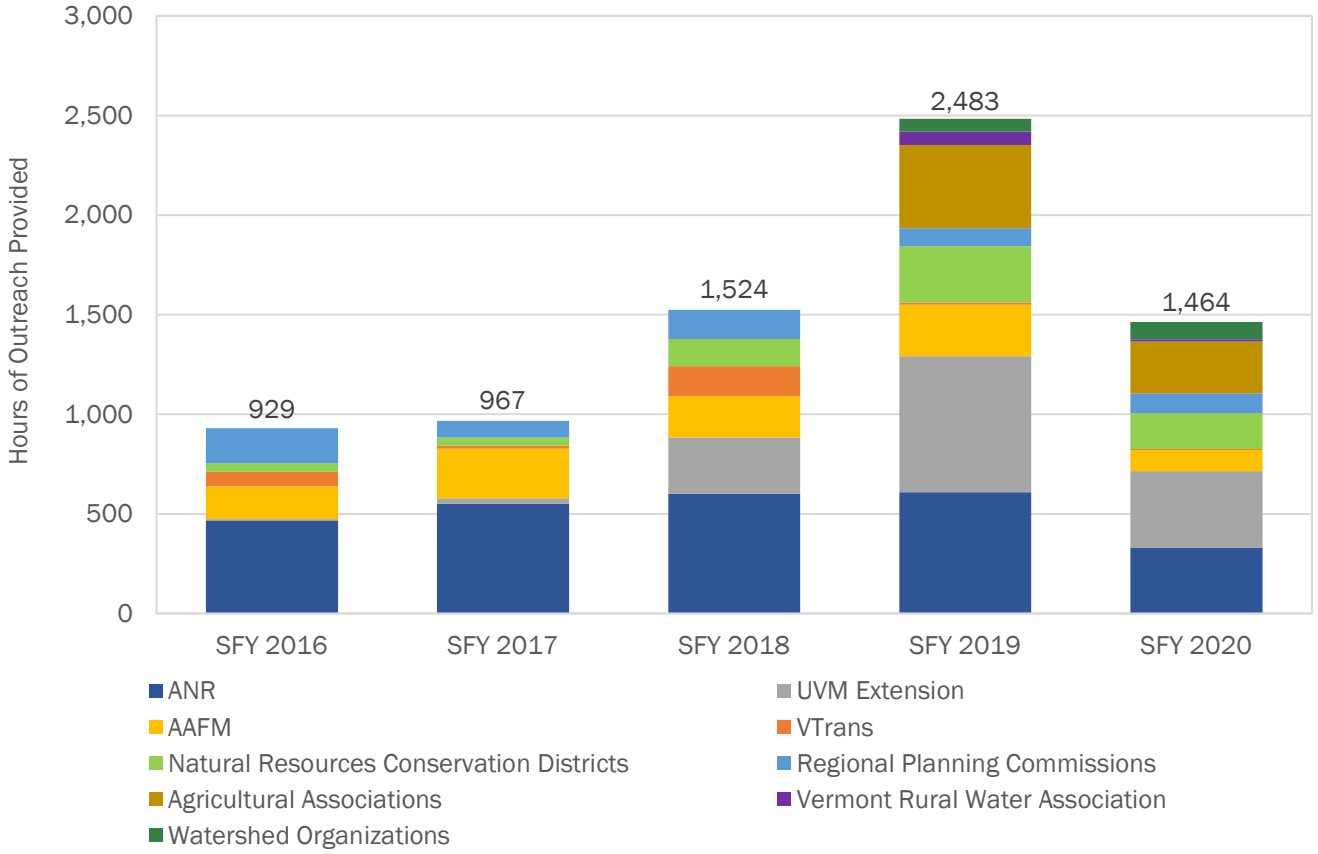


Figure 14. Total hours of education provided to participants of State of Vermont clean water outreach events (i.e., workshops, trainings, and public/stakeholder meetings), SFY 2016-2020 by outreaching organization/organization category[7,8]

EXPLANATION OF FIGURE

State clean water outreach efforts increased each year from SFY 2016 (when outreach data collection began) to SFY 2019. In SFY 2020, there was a decrease in the overall number of outreach events reported compared to previous years. Earlier outreach efforts were critical in the development of foundational programs to drive Vermont's clean water efforts, including the initial phases of implementing the Lake Champlain TMDL and the Vermont Clean Water Act (Act 64 of 2015). The decrease in SFY 2020 may be, in part, due to Vermont's clean water efforts shifting toward project development, targeted technical assistance, and implementation. In addition, the COVID-19 pandemic greatly limited outreach efforts in the fourth quarter of SFY 2020. In total, 2,099 outreach events have been reported, reaching 57,014 attendees, with 5,970 hours of education provided since SFY 2016.

[7] Agricultural associations include both regional and statewide organizations connecting and supporting the agricultural sector.
[8] For presentation purpose, Figure 14 excludes organizations with less than 50 hours of education provided in SFY 2020.

Outreach by Target Audience

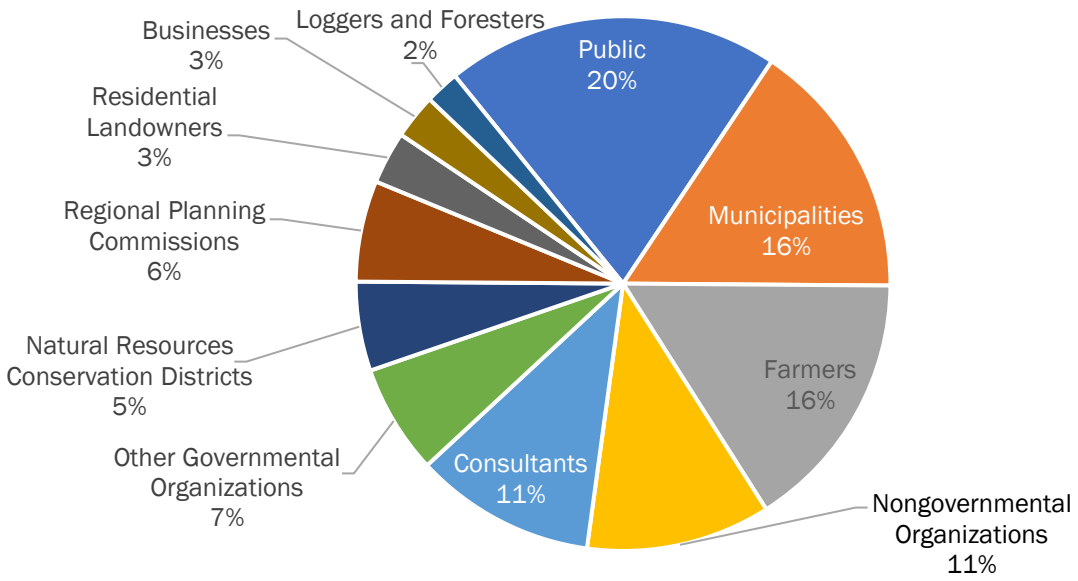


Figure 15. Target audiences reached through State of Vermont clean water outreach efforts (i.e., workshops, trainings, and public/stakeholder meetings), SFY 2016-2020

EXPLANATION OF FIGURE

This figure demonstrates how the state's outreach efforts target different sector and organization-based audiences. One of the state's water quality priorities is to support municipalities and farmers in addressing stormwater, wastewater, and agricultural sources of nutrient pollution, which is why these audiences represent a large proportion of the target audiences above. In addition, non-governmental organizations, such as watershed groups, regional planning commissions, and natural resources conservation districts, play a very important role working with municipalities, farmers, and other landowners to secure funds to implement priority clean water projects. It is also important to keep the public engaged for broader support of the state's clean water efforts.

Figure 16. Demonstration of soil improvements associated with no-till drill equipment use at an Addison County Fair and Field Day (Source: UVM Extension)

Figure 17. Logger Education to Advance Professionalism (LEAP) workshop (Source: Department of Forests, Parks and Recreation)

Technical Assistance Targeting Agricultural Audiences

The State of Vermont aims to support farmers in addressing agricultural sources of nutrient pollution. AAFM conducts regulatory farm visits to ensure compliance with Required Agricultural Practices (RAPs), Medium Farm Operation (MFO), and Large Farm Operation (LFO) Rules, as well as non-regulatory farm visits to support the implementation of conservation practices on farms. AAFM also provides financial assistance to enhance local partner capacity (e.g., natural resources conservation districts) to help farmers install and maintain conservation practices.

Land Use Sector	Primary or Target Audiences
AGRICULTURE	Businesses, farmers, natural resources conservation districts, nongovernmental organizations (e.g., watershed groups), public

Table 2. State of Vermont regulatory oversight, technical assistance, and capacity building to support clean water improvements on agricultural lands, SFY 2016-2020

Technical Assistance Measures	2016	2017	2018	2019	2020	Total
Number of water quality compliance farm visits conducted by AAFM to ensure compliance with RAP, MFO, and LFO Rules	186	352	675	614	571	2,398
Number of technical assistance visits conducted by AAFM and partners to support implementation of conservation practices	594	348	592	550	720	2,804
Acres of production area inspected by AAFM for RAP compliance[9]	--	1,410	1,034	2,063	2,719	7,227
Number of new or expanded partner-provided agricultural services	--	--	21	58	3	82

EXPLANATION OF TABLE

AAFM and partnering organizations have conducted over 2,800 technical assistance visits from SFY 2016 to SFY 2020 to support the implementation of agricultural conservation practices. On-site farm visits are an essential component of enabling the farming community with the information and resources available to plan, implement, and evaluate effective conservation practices for improved water quality. The acres of agricultural conservation practices implemented with technical assistance and the associated estimated total phosphorus load reductions are summarized in Part 1.C. of this report.

AAFM has conducted nearly 2,400 water quality compliance farm visits to ensure compliance with RAP, MFO, and LFO Rules, which are standards intended to reduce the impact of agricultural activities on water quality. AAFM's Agricultural Nonpoint Source Pollution Prevention Program has also inspected over 7,000 acres of agricultural production areas for RAP compliance. Compliant production areas identified through these inspections are associated with water quality benefits. The estimated total phosphorus load reductions associated with production area compliance in the Lake Champlain basin are presented in Part 2 of this report under regulatory programs.

[9] SFY 2016-2018 datasets are incomplete and do not fully account for all acres of production area inspected by AAFM for RAP compliance due to the initiation of this tracking mechanism.

Figure 18. Vermont Association of Conservation Districts (VACD) technical assistance staff review a conservation plan with a farm in the Missisquoi River watershed while planning projects under the AAFM Pasture and Surface Water Fencing Program. (Source: AAFM)

Figure 19. AAFM technical assistance staff assess a farm pasture and the contained surface water for water quality and pasture management improvements. (Source: AAFM)

Figure 20. UVM Extension assists a farm in developing their Nutrient Management Plan at Vermont Technical College. (Source: Willard, Vermont Technical College)

Figure 21. Poultney-Mettowee Natural Resources Conservation District assists farmers at an Agricultural Grant Writing Clinic. (Source: AAFM)

Technical Assistance Targeting Developed Lands and Wastewater Audiences

The State of Vermont aims to support municipalities, businesses, and other landowners in addressing stormwater and wastewater sources of nutrient pollution. Much of this work is driven by wastewater discharge permits, stormwater permits, and the Municipal Roads General Permit. The state's educational programs help municipalities prepare to meet new regulatory requirements in the most cost-effective manner and secure resources to increase adoption and implementation of clean water projects.

Land Use Sector	Primary or Target Audiences
STORMWATER	Businesses, municipalities, natural resources conservation districts, nongovernmental organizations (e.g., watershed groups), public, regional planning commissions, residential landowners
ROADS	Municipalities, other governmental organizations, public, regional planning commissions, residential landowners
WASTEWATER	Businesses, municipalities, public, residential landowners

Table 3. State of Vermont technical assistance targeting stormwater, roads, and wastewater treatment improvements, SFY 2016-2020

Technical Assistance Measures	2016	2017	2018	2019	2020	Total
Approximate hours of technical assistance provided by DEC's Water Investment Division engineers on municipal stormwater and wastewater projects	--	5,300	6,400	5,200	3,620	20,520
Hours of water quality municipal technical assistance provided by VTrans staff	--	1,483	1,489	2,063	569	5,604

EXPLANATION OF TABLE

ANR and VTrans staff provide technical assistance to prepare municipalities and other regulated entities to comply with water quality-related regulations. DEC's Water Investment Division engineers' decreased hours of technical assistance are associated with an improved tracking method, and not necessarily reflective of a decreased level of assistance. DEC programs also provide technical assistance in the form of developed lands, roads, and wastewater project review – ranging from 900 to 1,100 projects reviewed annually. These data are not included in the table, as data were not available at the time of publishing this report but may be included in future years.

Figure 22. VTrans and DEC staff collaborate to provide Road Erosion Inventory (REI) training to municipal road crews (Source: VTrans)

Technical Assistance Targeting Natural Resources Restoration Audiences

Natural resources restoration efforts are voluntary and not driven by regulation. Successful natural resource restoration and protection projects require landowner commitment. Education targeting the public and landowners increases likelihood of natural resource restoration projects moving forward. Non-governmental organizations (e.g., watershed groups) and natural resources conservation districts conduct outreach to landowners and help secure funds to complete projects. Educational activities help: (a) identify and prioritize opportunities for natural resource restoration, (b) gain landowner commitment to projects, and (c) inform the public on the value and co-benefits of natural resource restoration to increase adoption of projects.

Land Use Sector	Primary or Target Audiences
NATURAL RESOURCES	Loggers and foresters, nongovernmental organizations (e.g., watershed groups), natural resources conservation districts, other governmental organizations, public, regional planning commissions, residential landowners

Table 4. State of Vermont technical assistance to support natural resource restoration, SFY 2016-2020

Technical Assistance Measures	2016	2017	2018	2019	2020	Total
Number of logging operation site visits to provide Acceptable Management Practices (AMP) technical assistance[10]	11	12	17	19	--	59
Square miles of forest lands covered by Use Value Appraisal (UVA) site inspections[11]	296	330	305	350	--	1,281
Number of communities receiving Urban and Community Forestry Program technical assistance	94	78	78	102	117	469

EXPLANATION OF TABLE

Technical assistance within the natural resources sector is provided primarily by ANR staff. The Department of Forests, Parks and Recreation (FPR) offers technical assistance within the forestry sector and shows a steadily increasing trend in technical assistance efforts across programs. DEC programs also provide technical assistance in the form of project review to mitigate impacts to natural resources – ranging from 3,000 to 6,000 projects reviewed annually. These data are not included in the table above, as data were not available at the time of publishing this report but may be included in future years.

Figure 23. (Left) A forester, Basin Planner, and River Management Engineer assessing a potential clean water project site in Springfield; (Right) Forester training on temporary skidder bridges at Mount Mansfield State Forest (Source: FPR)

[10] Data are reported by calendar year rather than state fiscal year. Given the timeline of this report, calendar year 2020 data are not yet available. Data for calendar year 2020 will be available next year. FPR annual statewide summary reports are available at: https://fpr.vermont.gov/forest/managing-your-woodlands/acceptable-management-practices.

1.C. Results of Vermont's Clean Water Investments

How are the State of Vermont's investments improving rivers, lakes, ponds, and wetlands?

The following section summarizes the results of state-funded clean water projects, including both project output measures and estimated nutrient pollutant load reductions, completed SFY 2016 to 2020 by land use sector. At this time, nutrient pollutant load reductions can only be estimated for total phosphorus loading in the Lake Champlain and Lake Memphremagog basins. See Appendix E for a summary of methods used to estimate pollutant load reductions. State clean water investments and results are also summarized by watershed in Appendix A.

The results of state-funded clean water projects are classified according to the following land use sectors.

1.C.1. Results of Agricultural Pollution Prevention Projects

Agricultural pollution prevention projects involve the installation or application of conservation practices that reduce sources of nutrient and sediment pollution from farm production areas and agricultural fields.

Agricultural pollution prevention projects contribute to and count toward progress for a combination of the following requirements and co-benefits.

- Implements TMDL requirements
- Implements Vermont Clean Water Act (Act 64 of 2015) requirements
- Supports compliance with Required Agricultural Practices (RAPs), as well as Certified Small Farm Operation (CSFO), Medium Farm Operation (MFO) and Large Farm Operation (LFO) Rules
- Improves flood resiliency and flood hazard mitigation by supporting healthy soils
- Supports agricultural economy and working lands
- Improves habitat function

The following section summarizes project outputs (e.g., acres of agricultural lands treated) and estimated pollutant load reductions (e.g., kilograms of total phosphorus load reduced annually) associated with state-funded agricultural pollution prevention projects.

Agricultural Project Outputs

Table 5. Outputs of state-funded agricultural pollution prevention projects implemented statewide, SFY 2016-2020

Project Output Measures[11]	2016	2017	2018	2019	2020	Total
Acres of agricultural conservation practices implemented (excluding other practices listed below)	5,466	3,261	7,908	14,566	19,619	50,820
Acres of agricultural land treated through innovative equipment	–	2,043	5,415	14,022	14,521	36,001
Acres of agricultural land treated by forest and grass buffers adjacent to surface waters (i.e., riparian areas)	258	200	228	0	0	686
Acres of pasture with livestock excluded from surface waters	258	117	97	47	15	534
Acres of water quality protections within newly conserved agricultural lands	–	116	200	513	250	1,079
Acres of agricultural conservation practices reported through technical assistance[12]	–	–	17	1,556	1,689	3,262
Number of barnyard and production area practices installed	59	86	96	77	119	437

EXPLANATION OF TABLE

The number of agricultural pollution prevention projects implemented statewide has increased significantly from SFY 2016 to 2020. AAFM's Farm Agronomic Practice (FAP) Program has funded over 48,000 acres of agricultural conservation practices (e.g., cover crops, conservation tillage, and manure injection) since SFY 2016. AAFM Capital Equipment Assistance Program (CEAP)-funded equipment has resulted in the application of approximately 28,000 acres of agricultural conservation practices since SFY 2017. The Department of Environmental Conservation and Vermont Housing and Conservation Board also provided support for nearly 7,000 acres of agricultural land treated by innovative equipment from SFY 2016 to 2020.

AAFM's Best Management Practice (BMP) Program has funded 365 barnyard and production area practices since SFY 2016 to reduce runoff from agricultural production areas. This program provides engineering services on a priority basis for the design of BMPs at no cost to the farmer and can cost share on the construction of eligible practices. These practices can include waste storage facilities, roof runoff management, and heavy use area protection.

(Continued on following page)

[11] Agricultural project output measures can overlap with other project output measures if multiple practices were applied on the same field. For example, 10 acres of manure injection and 10 acres of cover crop applied on the same field will result in 20 acres of agricultural conservation practices implemented. Similarly, practices implemented on the same field over multiple years will be counted for each year implemented. For example, 10 acres of cover crop implemented on the same field in 2016, 2017, and 2018 will result in 30 acres of agricultural conservation practices implemented. Total agricultural project outputs column represents the total level of effort of state funding programs, rather than the number of distinct agricultural acres addressed.

[12] Acres of agricultural conservation practices reported through technical assistance represent agricultural conservation practices implemented without financial assistance from state programs reported through technical assistance funded by state programs.

EXPLANATION OF TABLE CONTINUED

While state funds are primarily used to provide direct financial assistance for the implementation of conservation practices, they are also used to provide technical assistance to farmers wishing to implement conservation practices. Technical assistance efforts funded through AAFM's Agricultural Clean Water Initiative Program have recently increased agricultural practice tracking mechanisms, allowing over 3,000 acres of agricultural conservation practices installed with technical assistance to be reported to the state from SFY 2018 to SFY 2020.

The reduction in acres of state-funded forest and grass buffers and the associated livestock exclusion from these projects was due to a change in land eligibility criteria for the federal Conservation Reserve Program (CRP) in January 2018. AAFM is working to address these land eligibility issues with partners and has successfully initiated new buffer projects in SFY 2021.

Agricultural Project Pollutant Load Reductions

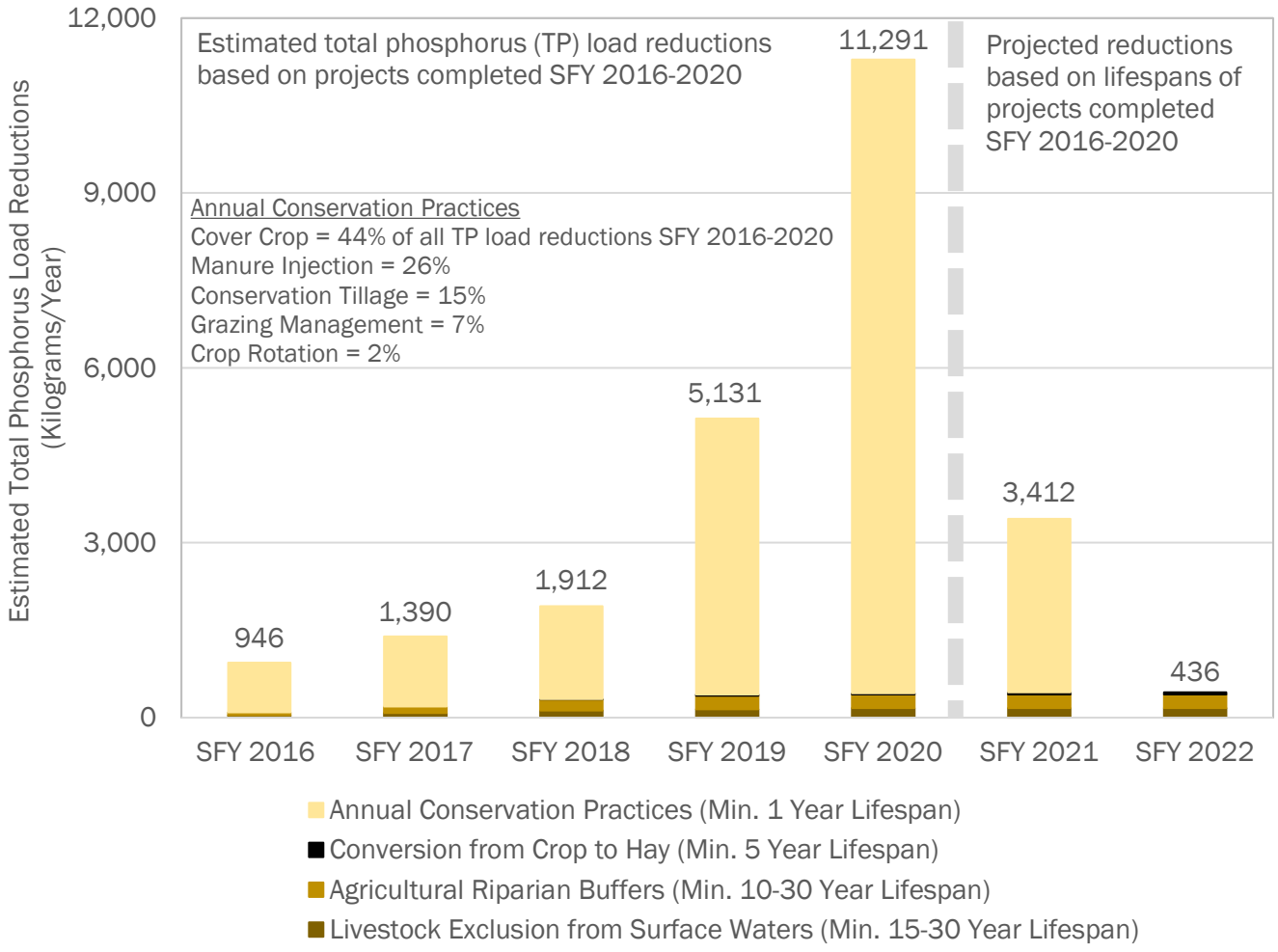


Figure 23. Annual estimated total phosphorus load reductions (kilograms per year) associated with state-funded agricultural pollution prevention projects in the Lake Champlain and Lake Memphremagog basins, SFY 2016-2020 and projected phosphorus load reductions SFY 2021-2022 based on lifespan of existing projects[13]

[13] In the *Vermont Clean Water Initiative 2019 Performance Report*, data label values for total phosphorus load reductions per SFY did not represent the total, rather a subset of the total. Additionally, total phosphorus load reductions associated with forage and biomass plantings were incorrectly displayed as the total of all agricultural phosphorus load reductions. The error has been corrected in the figure above.

EXPLANATION OF FIGURE

Estimated total phosphorus load reductions associated with state-funded agricultural projects in the Lake Champlain and Lake Memphremagog basins have increased 11-fold since SFY 2016. Most estimated total phosphorus load reductions result from annual conservation practices, such as cover crop, manure injection, and conservation tillage. In SFY 2020, over 5,000 kilograms of estimated total phosphorus load reductions were associated with the AAFM Farm Agronomic Practice (FAP) Program. AAFM's Agricultural Clean Water Initiative Program technical assistance efforts resulted in the reporting of conservation practices associated with over 2,000 kilograms of estimated phosphorus load reductions in SFY 2020.

Projected total phosphorus load reductions, shown to the right of the dashed line, are based on anticipated lifespans (noted in legend) of projects completed SFY 2016-2020. Agricultural conservation practices must be maintained in order for agricultural pollutant reductions to continue in future years. As annual conservation practices (e.g., cover crop, manure injection) represent 96 percent of estimated agricultural total phosphorus load reductions in SFY 2020, the continuation of annual conservation practices is paramount.

Prior year estimated total phosphorus load reductions changed compared to the *Vermont Clean Water Initiative 2019 Performance Report* due to improved agricultural conservation practice tracking and accounting. Additionally, new methods were established in SFY 2020 to estimate total phosphorus load reductions associated with manure injection and grazing management. These new methods have been applied to all years with data for these practices. See Appendix E for summary of methods used to estimate pollutant reductions.

The AAFM Best Management Practice (BMP) Program provides technical and financial assistance to help farmers achieve and maintain production area compliance. Due to the complexity of agricultural production areas, the results of individual state-funded production area improvement projects funded by the AAFM BMP Program cannot be directly connected to estimated total phosphorus load reductions. As a result, the state estimates total phosphorus load reductions based on production area compliance status assessed through AAFM inspections. The AAFM Agricultural Nonpoint Source Pollution Control Program, which inspects agricultural production areas for compliance with the Required Agricultural Practices (RAPs), has identified over 6,000 kilograms of estimated total phosphorus load reductions associated with farms' achievement of compliant production areas in the Lake Champlain and Lake Memphremagog basins from SFY 2016 to 2020. Estimated total phosphorus load reductions associated with production area compliance in the Lake Champlain basin are presented in Part 2 of this report under regulatory programs.

See Part 2 of this report for estimated total phosphorus load reductions associated with USDA-NRCS-funded agricultural projects implemented in the Lake Champlain basin. See Appendix A of this report for project outputs and estimated total phosphorus load reductions resulting from state and federal funding and regulatory programs by Tactical Basin Planning watershed.

Table 6. Extent of agricultural pollution prevention project outputs with total phosphorus load reduction estimates in the Lake Champlain and Lake Memphremagog basins, SFY 2016-2020

Project Output Measures	Lake Champlain and Lake Memphremagog Basins		
	Outputs with Phosphorus Load Reduction Estimates	Total Project Outputs	Percent Outputs with Phosphorus Load Reduction Estimates
Acres of agricultural conservation practices implemented (excluding other practices listed below)	41,318	47,015	88%
Acres of agricultural land treated through innovative equipment	13,094	33,156	40%
Acres of agricultural land treated by forest and grass buffers adjacent to surface waters (i.e., riparian areas)	516	516	100%
Acres of pasture with livestock excluded from surface waters	409	409	100%
Acres of water quality protections within newly conserved agricultural lands	0	942	0%
Acres of agricultural conservation practices reported through technical assistance	3,164	3,196	99%
Number of barnyard and production area practices installed	Phosphorus load reductions estimated based on production area compliance status assessed through AAFM inspections		

EXPLANATION OF TABLE

Agricultural pollutant load reductions can currently only be estimated for total phosphorus in the Lake Champlain and Lake Memphremagog basins for the following practice types: livestock exclusion, crop to hay rotation, riparian buffers, and some annual conservation practices. The State cannot yet estimate pollutant load reductions for other practice types, drainage basins (e.g., Connecticut River basin), and pollutants (e.g., total nitrogen) due to lack of project data and/or methods to estimate pollutant load reductions. As a result, not all the statewide project outputs displayed in Table 5 are associated with estimated pollutant load reductions. For example, approximately 47,000 acres of conservation practices have been implemented in the Lake Champlain and Lake Memphremagog basins, of which 41,000 acres (88 percent) are associated with practice types that have established methods to estimate total phosphorus load reductions. See Appendix E for more information on the methods used to estimate pollutant load reductions.

The Clean Water Service Delivery Act (Act 76 of 2019) requires the state to address gaps and publish methods to estimate total phosphorus load reductions for all clean water project types implemented in the Lake Champlain and Lake Memphremagog basins by November 1, 2021. Act 76 of 2019 also requires setting a schedule to publish methods for estimating other water quality impairments (i.e., non-phosphorus impairments) by November 1, 2023.

Agricultural Pollution Prevention Project Examples

Figure 24. Agricultural field planted with a winter rye cover crop in the Town of Middletown Springs with assistance through the AAFM Farm Agronomic Practice Program. (Source: Poultney Mettowee Natural Resource Conservation District)

Figure 25. Filter strip installed adjacent to corn field in the Lake Memphremagog watershed implemented with assistance through the AAFM Grassed Waterways and Filter Strip Program. (Source: AAFM)

Figure 26. Before (left) and after (right) construction of a heavy use area project in the Southern Lake Champlain watershed. Project included the construction of a covered area for the overwintering of animals, as well as the collection and diversion of roof runoff away from heavy use areas. Project funded through the AAFM Best Management Practice Program. (Source: AAFM)

1.C.2. Results of Developed Lands Projects

Developed lands projects decrease nutrient (e.g., phosphorus and nitrogen) and sediment pollution through the installation of practices that treat polluted stormwater runoff from developed lands, such as roads, parking lots, sidewalks, and rooftops. Stormwater and road projects are classified under the developed lands sector.

- Stormwater: Installation of stormwater treatment practices that treat polluted stormwater runoff and control flow from developed lands, such as parking lots, sidewalks, and rooftops.

- Roads: Installation of roadside erosion control practices that prevent erosion and mitigate road-related sources of nutrient and sediment pollution.

Developed lands projects (Stormwater and Roads) contribute to and count toward progress for a combination of the following requirements and co-benefits:

- Implements TMDL requirements
- Implements Vermont Clean Water Act (Act 64 of 2015) requirements
- Supports compliance with municipal stormwater permits (i.e., MS4 permit and operational stormwater permit)
- Supports compliance with the Municipal Roads General Permit (MRGP)
- Mitigates streambank erosion and flood hazards associated with unnatural storm runoff/flow from developed lands
- Enhances road networks' resilience to severe storm events and flood hazards and reduces maintenance costs
- Improves flood resiliency and flood hazard mitigation for public health and safety

The following section summarizes the project outputs (e.g., acres of impervious surface treated) and estimated pollutant reductions (e.g., kilograms of total phosphorus load reduced annually) associated with state-funded developed lands projects.

Developed Lands Outputs

Table 7. Outputs of state-funded stormwater treatment and road erosion remediation project development (i.e., planning and design) efforts completed statewide, SFY 2016-2020

Project Development Measures	2016	2017	2018	2019	2020	Total
Number of projects identified through Stormwater Master Plans	52	120	141	128	197	638
Number of illicit/unauthorized discharges confirmed (to be addressed by the responsible municipality or landowner)	40	9	1	52	11	113
Number of preliminary (30%) designs completed	19	13	58	30	62	182
Number of final (100%) designs completed	9	20	13	20	10	72
Hydrologically connected municipal road miles inventoried through Road Erosion Inventories	–	239	495	414	828	1,976
Hydrologically connected municipal road miles identified as requiring water quality improvements through Road Erosion Inventories	–	114	187	123	406	830

Table 8. Outputs of state-funded stormwater treatment and road erosion remediation projects implemented/constructed statewide, SFY 2016-2020

Project Output Measures	2016	2017	2018	2019	2020	Total
Acres of existing impervious surface treated by stormwater treatment practices	<1	87	35	133	77	332
Miles of municipal road drainage and erosion control improvements	1	12	68	88	31	200
Number of municipal road drainage and stream culverts replaced	–	104	134	245	119	602
Cubic yards of Class IV road gully erosion remediated	–	–	260	33	–	293
Cubic yards of catch basin outlet erosion remediated	–	–	1	784	–	785
Acres stabilized through use of hydroseeder/mulcher equipment per year	–	–	19	98	248	365

EXPLANATION OF TABLES

Stormwater Master Plans and Road Erosion Inventories identify and prioritize stormwater and road erosion remediation projects, respectively. Investment in project identification and prioritization efforts is critical to ensure the state strategically targets investments in project design and implementation. The number of stormwater projects identified through Stormwater Master Plans has increased significantly since SFY 2016 with nearly 200 projects identified in SFY 2020. Identified projects will be incorporated into the state's Tactical Basin Plans and prioritized for design and construction.

The number of hydrologically connected (i.e., road segments adjacent to or intersecting surface waters) municipal road miles inventoried has increased since SFY 2017, as municipalities are required to submit Road Erosion Inventories by the end of 2020 to comply with the Municipal Roads General Permit. Road Erosion Inventories have surveyed over 1,900 hydrologically connected municipal road miles, of which approximately 42 percent require water quality improvements. Vermont has approximately 13,000 municipal road miles, of which about half are hydrologically connected (6,500 miles) and fall under MRGP jurisdiction. Based on these estimates, Road Erosion Inventories completed and submitted at the close of SFY 2020 represent about 30 percent of road mileage with inventories due December 31, 2020.

State-funded stormwater treatment practices have treated over 300 acres of existing impervious surfaces since SFY 2016. From SFY 2018 to 2020, the Municipal Roads Grants-in-Aid Program has resulted in 106 miles of municipal road drainage and erosion control improvements to comply with the Municipal Roads General Permit. VTrans Better Roads Program funding has resulted in replacement of 600 municipal road drainage and stream culverts and 80 miles of municipal road drainage and erosion control improvements since SFY 2016.

These data only include state-funded improvements and may underrepresent municipal efforts to comply with the stormwater regulations and the Municipal Roads General Permit. The decrease in outputs reported in SFY 2020 is largely attributed to the COVID-19 pandemic resulting in limited municipal capacity, a shortened field season, and decreased ability to complete projects in spring 2020. The State of Vermont has issued grant extensions, as appropriate, to allow successful completion of projects.

Developed Lands Pollutant Load Reductions

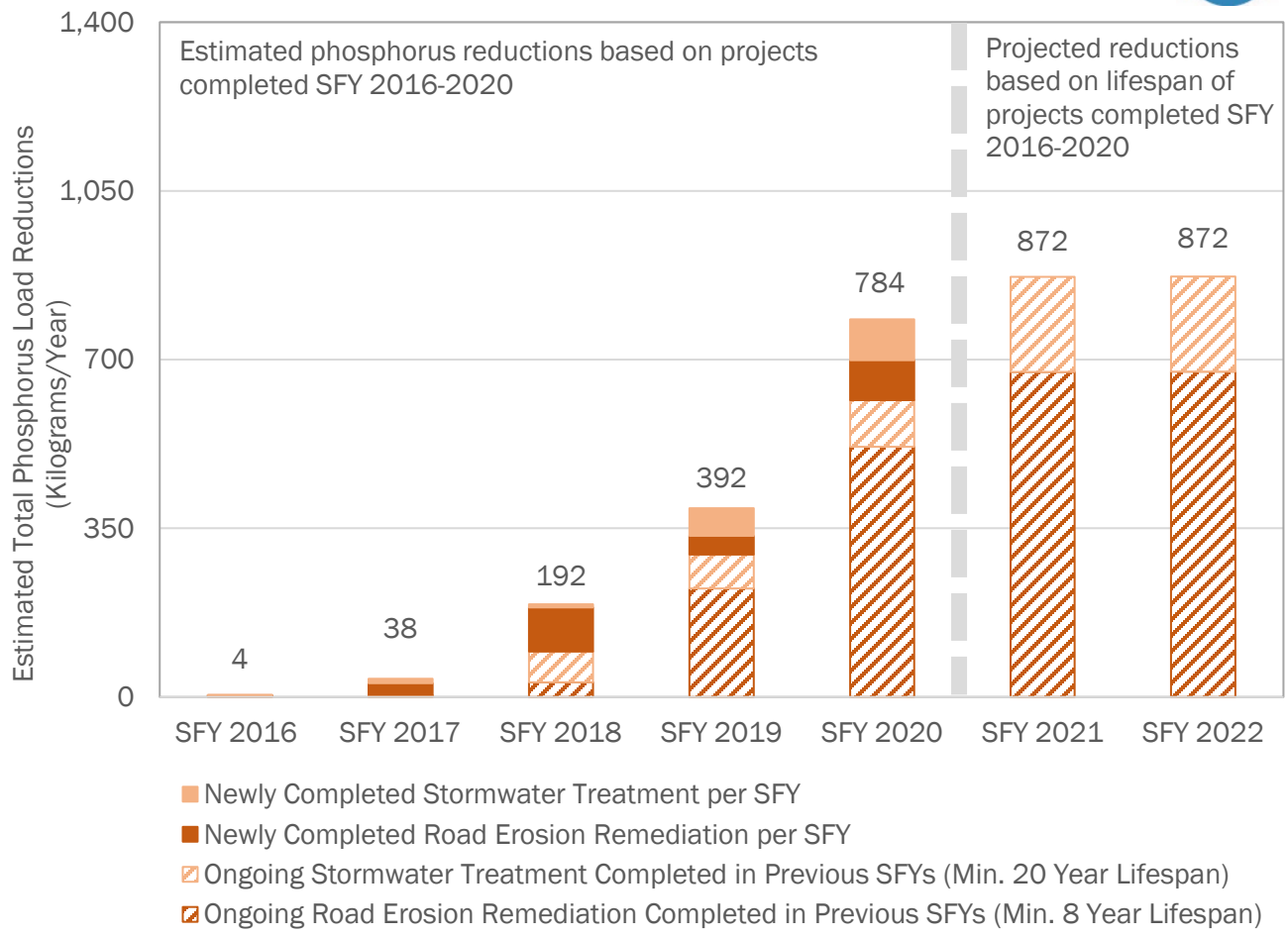


Figure 27. Annual estimated total phosphorus load reductions (kilograms per year) associated with state-funded stormwater treatment and state-funded and regulatory road erosion remediation projects[14] implemented/constructed in the Lake Champlain and Memphremagog basins, SFY 2016-2020[15]

[14] Note that some estimated total phosphorus load reductions associated with road remediation projects result from local funding by municipalities. Results of road erosion remediation projects completed with local funding and state funding are combined for this report.

[15] Note that estimated total phosphorus load reductions from newly implemented practices are prorated based on the practice installation date and do not necessarily represent the full average annual load reduction of the practice. For example, if a practice were installed March 1, 2020, the total phosphorus load reduction reported in SFY 2020 would only represent 4 out of 12 months of the annual average performance, but the full annual average performance would be in effect for SFY 2021.

EXPLANATION OF FIGURE

Estimated total phosphorus load reductions from the developed lands sector (stormwater and roads) have increased nearly exponentially since SFY 2016. Stormwater and road projects are generally structural and/or engineered solutions and require time and municipal capacity to implement. Therefore, annual gains in estimated total phosphorus load reductions (i.e., newly implemented practices per SFY) may be smaller under the developed lands sector compared to other sectors. However, these structural practices have relatively longer lifespans, especially if properly maintained, meaning practices will continue to perform in future years and estimated total phosphorus load reductions will continue.

The Municipal Grants-in-Aid Program that directly supports implementation of the Municipal Roads General Permit has resulted in a dramatic increase in the estimated total phosphorus load reductions from road projects since SFY 2018. Estimated total phosphorus load reductions from road erosion remediation practices increased over 400 percent from SFY 2018 to 2020, as municipalities are improving road segments to comply with the Municipal Roads General Permit. Estimated total phosphorus load reductions associated with stormwater treatment practices have also increased steadily since SFY 2016. Pollutant load reductions from stormwater projects are expected to increase substantially in the coming years as landowners participate in state funding/financing programs to implement stormwater treatment practices to comply with the operational stormwater General Permit 3-9050, also known as the "three-acre permit."

Projected total phosphorus load reductions, shown to the right of the dashed line, are based on anticipated lifespan (noted in legend) of projects completed SFY 2016-2020. Practices must be maintained for total phosphorus load reductions to continue in future years. Prior year estimated total phosphorus load reductions changed compared to the *Vermont Clean Water Initiative 2019 Performance Report* due to improved clean water project tracking and accounting. See Appendix E for summary of methods used to estimate pollutant reductions.

Note the figure above presents estimated total phosphorus load reductions for both state-funded and regulatory road erosion remediation projects. Refer to Part 2 of the report for additional phosphorus load reduction estimates associated with stormwater regulatory programs in the Lake Champlain basin, as well as Appendix D for results of operational stormwater permits.

Table 9. Extent of developed lands (stormwater treatment and road erosion remediation) project outputs with phosphorus load reduction estimates in the Lake Champlain and Lake Memphremagog basins, SFY 2016-2020

Project Output Measures	Lake Champlain and Lake Memphremagog Basins		
	Outputs with Phosphorus Load Reduction Estimates	Total Project Outputs	Percent Outputs with Phosphorus Load Reduction Estimates
Acres of existing impervious surface treated by stormwater treatment practices	284	284	100%
Miles of municipal road drainage and erosion control improvements[16]	98	116	84%
Number of municipal road drainage and stream culverts replaced	16	370	4%
Cubic yards of Class IV road gully erosion remediated	0	112	0%
Cubic yards of catch basin outlet erosion remediated	691	692	99%
Acres stabilized through use of hydroseeder/mulcher equipment per year	0	120	0%

EXPLANATION OF TABLE

Developed lands pollutant load reductions can currently only be estimated for total phosphorus loading in the Lake Champlain and Lake Memphremagog basins for some stormwater treatment and road erosion remediation practices. Estimated pollutant load reductions for other practice types, drainage basins (e.g., Connecticut River basin), and pollutants (e.g., total nitrogen) are currently unavailable due to lack of project data and/or methods to estimate pollutant load reductions. As a result, not all statewide project outputs displayed in Table 8 are associated with estimated pollutant reductions. For example, 116 miles of municipal road drainage and erosion control improvements have been implemented in the Lake Champlain and Lake Memphremagog basins, of which 98 miles (84 percent) have sufficient data and are associated with practices types that have established methods to estimate total phosphorus load reductions. See Appendix E for more information on the methods used to estimate pollutant load reductions.

The Clean Water Service Delivery Act (Act 76 of 2019) requires the state to address gaps and publish methods to estimate total phosphorus load reductions for all clean water project types implemented in the Lake Champlain and Lake Memphremagog basins by November 1, 2021. Act 76 of 2019 also requires setting a schedule to publish methods for estimating other water quality impairments (i.e., non-phosphorus impairments) by November 1, 2023.

[16] Note that the number of "miles of municipal road drainage and erosion control improvements" outputs with phosphorus load reduction estimates are associated with state funding as well as some local/municipal funding. Results of road erosion remediation projects completed with local funding and state funding are combined for this report.

Developed Lands and Road Project Examples

Figure 28. Installation of sub-surface infiltration chambers treats runoff along Water Street in the Town of Northfield. Project funded by a DEC Clean Water Initiative Program grant. (Source: Central Vermont Regional Planning Commission)

Figure 29. Operation of a grader-mounted compactor decreases erosion on gravel roads in the Town of Stowe. Equipment purchased through a DEC Clean Water Initiative Program grant. (Source: Town of Stowe)

Figure 30. Before (left) and after (right) the conversion of a paved swale into a gravel wetland to treat runoff from the parking lot at the Hazen Union School in Town of Hardwick. Project funded by a DEC Clean Water Initiative Program grant. (Source: Caledonia County Natural Resources Conservation District)

Figure 31. During (left) and after (right) the construction of stone-lined drainage ditch in the Town of West Windsor. Project funding provided by VTrans Better Roads Program. (Source: VTrans)

1.C.3. Results of Wastewater Treatment Projects

Wastewater treatment projects decrease nutrients (e.g., phosphorus and nitrogen) and other pollutants from municipal wastewater systems through treatment upgrades, combined sewer overflow (CSO) abatement, and refurbishment of aging infrastructure.

Wastewater treatment projects contribute to and count toward progress for a combination of the following requirements and co-benefits:

- Implements TMDL requirements
- Implements Vermont Clean Water Act (Act 64 of 2015) requirements
- Supports compliance with municipal wastewater discharge permits
- Supports compliance with the 2016 Combined Sewer Overflow (CSO) Rule
- Protects public health and safety
- Improves flood resiliency and flood hazard mitigation

The following section summarizes project outputs (e.g., number of upgrades completed) associated with state-funded wastewater treatment projects. Wastewater treatment facilities measure changes in pollutants of concern as part of wastewater discharge permit requirements. Phosphorus discharges, as reported in Discharge Monitoring Reports, from Vermont facilities that drain to Lake Champlain are summarized in Part 2 of this report.

Wastewater Treatment Project Outputs

Table 10. Outputs of state-funded/financed wastewater treatment project development (i.e., planning and design) efforts completed statewide, SFY 2016-2020

Project Development Measures	2016	2017	2018	2019	2020	Total
Number of preliminary (30%) designs completed	–	4	4	8	6	22
Number of final (100%) designs completed	4	4	8	1	2	19
Number of municipal wastewater asset management plans completed	–	2	4	4	–	10

Table 11. Outputs of state-funded/financed wastewater treatment projects constructed statewide, SFY 2016-2020

Project Output Measures	2016	2017	2018	2019	2020	Total
Number of combined sewer overflow abatements completed	4	1	–	1	3	9
Number of sewer extensions completed	–	1	–	–	–	1
Number of wastewater collection systems refurbished	–	1	1	2	2	6
Number of wastewater treatment facilities refurbished	–	–	1	2	2	5
Number of wastewater treatment facility upgrades completed	1	4	1	–	–	6

EXPLANATION OF TABLES

State grants and low interest loans capitalized through the Vermont and U.S. Environmental Protection Agency (EPA) Clean Water State Revolving Fund (CWSRF) finance municipal wastewater improvements. The measures in the tables describe the number and type of municipal wastewater improvement projects completed and closed each fiscal year. Often these projects are very large and take a long time to complete so results can vary widely year to year. Some projects improve treatment within facilities while others may extend sewer service to address failed or failing septic systems in designated centers.

Wastewater Treatment Project Pollutant Load Reductions

Wastewater treatment facilities treat phosphorus and nitrogen, as well as many other pollutants, from the communities they serve. Facility operators monitor for pollutants of concern depending on the discharge permit requirements and report these data to the State of Vermont through Discharge Monitoring Reports. Facilities in the Lake Champlain and Lake Memphremagog basins monitor for total phosphorus, and facilities in the Connecticut River basin (drains to Long Island Sound) monitor for nitrogen. Due to the complexity of these treatment systems, the results of individual state-funded wastewater improvement projects summarized in this section cannot be directly connected to changes in pollutants discharging from the facility to surface waters, with the exception of wastewater treatment facility upgrades for specific pollutants (e.g., phosphorus treatment upgrade). Refer to Part 2 of this report on Lake Champlain TMDL progress for phosphorus treatment by Vermont wastewater treatment facilities that drain to Lake Champlain.

Table 12. Extent of wastewater treatment project outputs with total phosphorus load reduction estimates in the Lake Champlain and Lake Memphremagog basins, SFY 2016-2020

Project Output Measures	Lake Champlain and Lake Memphremagog Basins		
	Outputs with Phosphorus Load Reduction Estimates	Total Project Outputs	Percent Outputs with Phosphorus Load Reduction Estimates
Number of combined sewer overflow abatements completed	0	3	0%
Number of sewer extensions completed	0	0	0%
Number of wastewater collection systems refurbished	0	5	0%
Number of wastewater treatment facilities refurbished	0	0	0%
Number of wastewater treatment facility upgrades completed	Based on Discharge Monitoring Reports required under DEC permits; see report Part 2 for changes in wastewater load in the Lake Champlain basin		

EXPLANATION OF TABLE

Results of individual state-funded wastewater improvement projects, summarized in this section, cannot be directly connected to changes in pollutants discharging from any given facility, at-large, to surface waters. Rather, change in pollutant loading may be monitored through Discharge Monitoring Reports (depending on facility permit requirements). However, the state is in the process of establishing methods to estimate change in total phosphorus loading associated with combined sewer overflow abatement.

Wastewater Treatment Project Example

Figure 32. Installation of a reinforced concrete pipe (left) and stormwater separation system (right) to abate combined sewer overflows (CSOs) in the City of Rutland. Project financed by the Clean Water State Revolving Fund. (Source: Otter Creek Engineering)

NATURAL RESOURCES

1.C.4. Results of Natural Resource Restoration Projects

Natural resource restoration projects involve the restoration and protection of "natural infrastructure" functions that prevent and abate nutrient and sediment pollution. Natural infrastructure includes floodplains, river channels, lakeshores, wetlands, and forest lands.

Projects that restore and protect natural infrastructure count toward progress for a combination of the following requirements and co-benefits:

- Implements TMDL requirements
- Improves flood resiliency and flood hazard mitigation for public health and safety
- Supports outdoor recreation opportunities and economy
- Improves habitat function and biodiversity
- Mitigates future restoration costs by cost effectively restoring or protecting natural ecosystem functions

Natural Resource Restoration Project Outputs

Table 13. Outputs of state-funded natural resource restoration project development (i.e., planning and design) efforts completed statewide, SFY 2016-2020.

Project Development Measures	2016	2017	2018	2019	2020	Total
Stream miles assessed by Stream Geomorphic Assessment or River Corridor Plan	113	29	72	9	–	223
Number of natural resources restoration projects identified	125	17	136	316	36	630
Acres of river corridor scoped for easement	17	14	–	280	–	311
Number of preliminary (30%) designs completed	10	–	–	22	9	41
Number of final (100%) designs completed	9	6	24	5	3	47

Table 14. Outputs of state-funded natural resource restoration projects implemented statewide, SFY 2016-2020

Project Output Measures	2016	2017	2018	2019	2020	Total
Acres of forested riparian buffer restored through tree plantings adjacent to surface waters	85	32	60	58	13	248
Acres of riparian corridor conserved and restored through easements	141	208	236	5	90	680
Acres of floodplain restored	1	2	4	1	25	33
Acres of lakeshore restored	<1	–	9	1	<1	10
Stream miles reconnected for stream equilibrium/fish passage	32	100	124	157	33	446
Acres of wetland restored and conserved through easements	–	131	44	229	167	571
Acres of forestland conserved with special water quality protections	58	172	598	63	63	954
Miles of forest road drainage and erosion control improvements	–	1	–	8	3	12
Number of stream crossings improved	–	–	1	19	10	30
Square feet of gully erosion remediated	–	–	50,660	135	305	51,100

EXPLANATION OF TABLES

State funds have incentivized the restoration or conservation of over 500 wetland acres, 600 riparian corridor acres, and 900 forestland acres through conservation easements since SFY 2016, supporting water quality, flood resiliency, and habitat functions. In the same reporting period, over 400 stream miles have been reconnected for stream equilibrium and fish passage by the removal of dams and removal or upgrades of undersized culverts. State funds have also resulted in over 200 acres of forested riparian buffer plantings, which capture sediment and pollutant runoff from the landscape and protect streambanks from erosion.

Natural resources restoration projects are voluntary, and results may vary year-to-year depending on landowner willingness to participate and other factors. This highlights the need to continue building our partner capacity and outreach to increase participation.

Natural Resource Restoration Pollutant Load Reductions

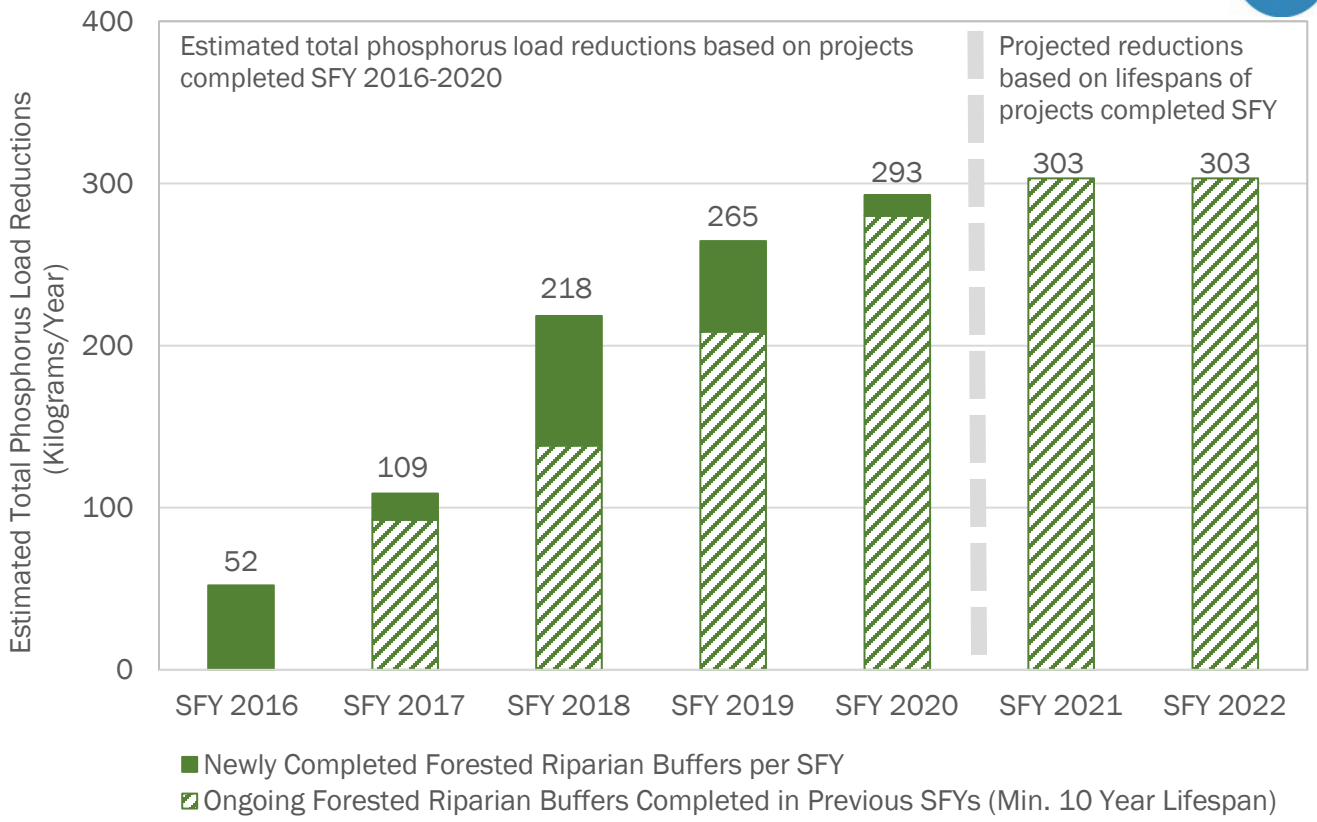


Figure 33. Annual estimated total phosphorus load reductions (kilograms per year) associated with state-funded forested riparian buffer restoration projects implemented in the Lake Champlain and Memphremagog basins, SFY 2016-2020[17]

EXPLANATION OF FIGURE

Estimated total phosphorus load reductions associated with the restoration of forested riparian buffers have increased significantly since SFY 2016. Buffer plantings are voluntary and often sited on privately owned lands, contingent on landowner willingness to participate. Therefore, annual gains in estimated total phosphorus load reductions (i.e., newly completed forested riparian buffers per SFY) are variable. However, buffer plantings have relatively longer lifespans, especially if properly established and maintained, meaning practices will continue to perform in future years and phosphorus load reductions will continue.

Projected estimated total phosphorus load reductions associated with projects completed SFY 2016-2020, based on projects' anticipated lifespan (noted in legend), are shown to the right of the dashed line. Practices must be maintained for phosphorus load reductions to continue in future years. See Appendix E for a summary of methods used to estimate pollutant load reductions.

[17] Note that estimated total phosphorus load reductions from newly implemented practices are prorated based on the practice installation date and do not necessarily represent the full average annual load reduction of the practice. For example, if a practice was installed March 1, 2020, the estimated total phosphorus load reduction reported in SFY 2020 would only represent 4 out of 12 months of the annual average performance, but the full annual average performance would be in effect for SFY 2021.

Table 15. Extent of natural resources restoration project outputs with total phosphorus load reduction estimates in the Lake Champlain and Lake Memphremagog basins, SFY 2016-2020

Project Output Measures	Lake Champlain and Lake Memphremagog Basins		
	Outputs with Phosphorus Load Reduction Estimates	Total Project Outputs	Percent Outputs with Phosphorus Load Reduction Estimates
Acres of forested riparian buffer restored through tree plantings adjacent to surface waters	114	203	56%
Acres of riparian corridor conserved and restored through easements	39	334	12%
Acres of floodplain restored	3	11	28%
Acres of lakeshore restored	0	11	0%
Stream miles reconnected for stream equilibrium/ aquatic organism passage	0	41	0%
Acres of wetland conserved and restored through easements	0	568	0%
Acres of forestland conserved with water quality protections	0	343	0%
Miles of forest road drainage and erosion control improvements	0	7	0%
Number of stream crossings improved	1	15	7%
Square feet of gully erosion remediated	0	50,900	0%

EXPLANATION OF TABLE

Natural resources restoration pollutant reductions can currently only be estimated for total phosphorus loading in the Lake Champlain and Lake Memphremagog basins for forested riparian buffer restoration practices, which can be a component of several natural resource restoration practices (e.g., acres of floodplain restored). Estimated pollutant reductions for other practice types, drainage basins (e.g., Connecticut River basin), and pollutants (e.g., total nitrogen) are currently unavailable due to lack of project data and/or methods to estimate pollutant reductions. As a result, not all the statewide project outputs displayed in Table 14 are associated with estimated pollutant load reductions. See Appendix E for more information on the methods used to estimate pollutant load reductions.

The Clean Water Service Delivery Act (Act 76 of 2019) requires the state address gaps and publish methods to estimate total phosphorus load reductions for all clean water project types implemented in the Lake Champlain and Lake Memphremagog basins by November 1, 2021. Act 76 of 2019 also requires setting a schedule to publish methods for estimating other water quality impairments (i.e., non-phosphorus) by November 1, 2023.

Natural Resource Restoration Project Examples

Figure 35. Before (left) and after (right) the removal of the Cold Spring Brook Park dam in the Town of Weston, which restored over 351 linear feet of stream and reconnected 0.2 acres of floodplain. Project funded by a DEC Clean Water Initiative Program grant. (Source: Weston Community Association)

Figure 36. Before (left) and after (right) the installation of Vermont's first crib-wall staircase to remediate erosion at a lakeshore access point in Waterbury Center State Park. Project funded by DEC Clean Water Initiative Program grant. (Source: Vermont Youth Conservation Corps)

Figure 34. Before (left) and after (right) the installation of encapsulated soil lifts to naturally stabilize and reduce erosion along Black Pond Road in Town of Hubbardton. Project funded by a DEC Clean Water Initiative Program grant. (Source: Northwoods Stewardship Center)

1.D. Cost Effectiveness of State Clean Water Investments

The Results of Clean Water Investments Section (1.C.) of this report summarizes the results of state-funded clean water projects completed during SFY 2016 to SFY 2020. Projects completed during the reporting period totaled approximately $116 million in state funds, of which approximately $11.3 million were associated with projects that have estimated total phosphorus load reductions. The cost effectiveness of projects *with* estimated total phosphorus load reductions is expressed as the state cost per kilogram of estimated total phosphorus load reduction over the lifespan of the project. If projects are maintained beyond their anticipated lifespan, cost effectiveness estimates would improve. Local and federal leveraged funds associated with state-funded projects are not included in this calculation to focus analysis of cost effectiveness on the state investment. The "violin plot", shown in Figure 37, summarizes the cost effectiveness of state clean water investments in reducing phosphorus pollution by project type.

Cost Effectiveness of State Investments

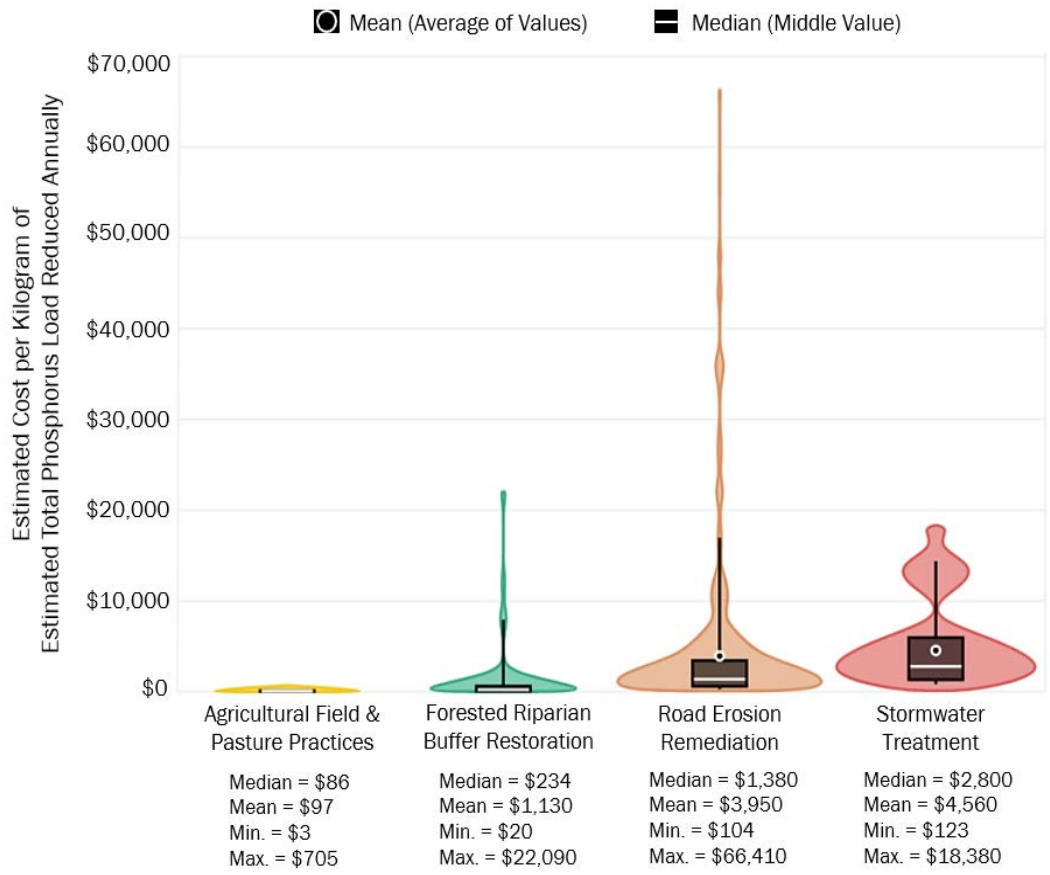


Figure 37. State investment per estimated kilogram of total phosphorus load reduced annually over the lifespan of each project type, based on clean water projects funded through State of Vermont agencies completed SFY 2016-2020 (excludes local and federal leveraged funds)[18]

FIGURE GUIDE

The violin plots, pictured at left, combine a box plot (see black rectangles/lines) and a density plot (see colored shapes).

A box plot shows the minimum, maximum, median, and average cost effectiveness values.

A density plot shows the relative number of projects falling into each range of cost effectiveness. Wider sections of the colored shapes represent more projects than thinner sections.

[18] The figure above shows cost-effectiveness based on state funding *only*. Visit the Clean Water Interactive Dashboard to view cost-effectiveness of state-funded projects including leveraged local and federal funds.

EXPLANATION OF FIGURE

Achieving Vermont's water quality goals, such as those outlined in the Lake Champlain TMDL, requires action across all land use sectors. The key is to target funds to the most cost-effective projects within each land use sector. The State of Vermont employs science-based assessments to identify and prioritize projects and incorporates those prioritized actions in Tactical Basin Plans. The figure above shows the variation and distribution of cost effectiveness for projects where cost data and estimated total phosphorus load reductions are available at the project-level only.

Agricultural field and pasture practices (e.g., cover crops, conservation tillage, agricultural riparian buffers) are generally the most cost-effective at reducing total phosphorus loading, costing a median of $86 per kilogram of estimated total phosphorus load reduced annually. These practices also have the lowest variability in cost, ranging only from $3 to $705 per kilogram of estimated total phosphorus load reduced annually. Agricultural field and pasture practices, however, generally have shorter lifespans (i.e., generally one year) compared to structural projects (i.e., generally 10-20 years).

Forested riparian buffer restoration is also a relatively cost-effective practice, costing a median of $234 per kilogram of estimated total phosphorus load reduced annually. Riparian buffers have longer lifespans (i.e., minimum 10 years) than most agricultural field and pasture projects, but the range of cost effectiveness is greater for forested riparian buffer restoration with practices costing between $20 and $22,000 per kilogram of estimated total phosphorus load reduced annually. Note that riparian buffers on agricultural lands are included under "agricultural field and pasture projects". The "forested riparian buffer restoration" category refers to buffer plantings on all other land uses (e.g., mixed forest, developed lands).

Road erosion remediation projects have the greatest variability in cost effectiveness, ranging from $104 to $66,000 per kilogram of estimated total phosphorus load reduced annually. Despite the large range, most road projects are clustered near the median of $1,380 per kilogram of estimated total phosphorus load reduced annually. The large range in the cost effectiveness of road practices may be result of municipalities remediating the highest priority, most complex road segments (and therefore most expensive road segments) first to comply with the Municipal Roads General Permit.

Stormwater treatment is the relatively most expensive per unit phosphorus load reduced compared to other project types shown in the figure, costing a median of $2,280 per kilogram of estimated total phosphorus load reduced annually. The range of cost effectiveness for stormwater practices ($123-$18,380 per kilogram of estimated total phosphorus load reduced annually), however, is lower than the range for road erosion remediation. Stormwater practices are engineered structural practices that can incur high construction costs, but these practices have relatively longer lifespans and can achieve phosphorus load reductions for 20 years or more, if properly maintained. Additionally, the state only funds installation of stormwater treatment practices associated with treatment of *existing* impervious surfaces that achieve a net reduction in nutrient pollution (i.e., stormwater retrofits), such as treatment required under the operational stormwater General Permit 3-9050 or "three-acre permit". Incorporating stormwater treatment into an already developed landscape is necessary but somewhat expensive due to inherent site constraints. This points to the importance of integrating stormwater mitigation as part of new development and redevelopment moving forward.

It should be noted that wastewater treatment is not included in this figure, as reductions from wastewater treatment are not measured at the project-level. Estimated total phosphorus load reductions from agricultural barnyard and production area management projects are also not included because production area phosphorus load reductions are estimated based on compliance status for the whole production area and not at the individual project-level. Estimated total phosphorus load reductions from practices implemented using CEAP-funded equipment are not included because state cost data are associated directly with equipment purchases rather than cost of implementing practices. Estimated total phosphorus load reductions associated with agricultural practices implemented without financial assistance from AAFM are also not included here because the state funded technical assistance rather than practice implementation.

Part 2: Lake Champlain TMDL Progress Report

Lake Champlain, Vermont's largest lake, does not meet the State of Vermont Water Quality Standards primarily due to excess phosphorus loading from the landscape. The Lake Champlain restoration plan, titled *Phosphorus Total Maximum Daily Loads for Vermont Segments of Lake Champlain* (i.e., Lake Champlain TMDLs) identifies phosphorus load reductions that must be achieved in all 12 segments of Lake Champlain to meet State of Vermont water quality standards.[19] The overall Lake Champlain TMDL requires a total phosphorus load reduction of 212.4 metric tons per year. Part 2 of this report summarizes Vermont's progress toward meeting that goal.

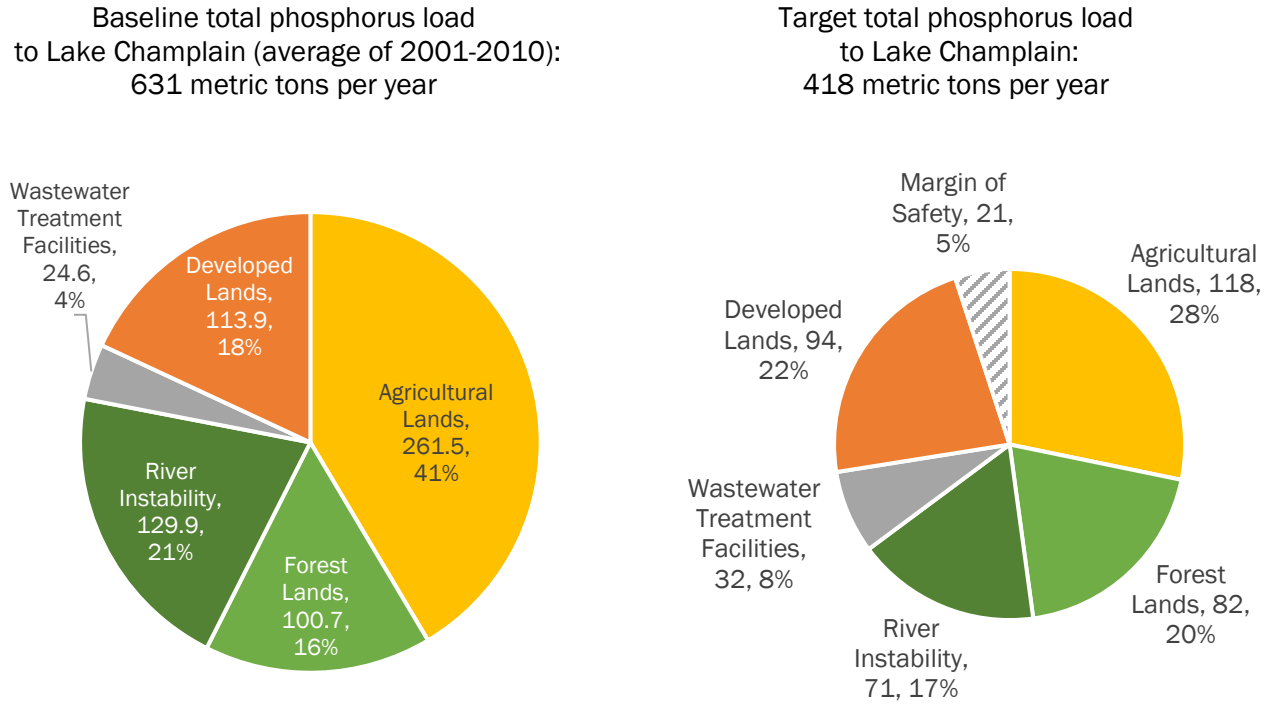


Figure 38. Lake Champlain TMDL baseline (left) and target (right) total phosphorus load (requires a total reduction of 212.4 metric tons per year)[20]

The Lake Champlain TMDL contains an Accountability Framework intended to ensure adequate progress toward reducing phosphorus pollution to Lake Champlain. The Framework sets a schedule (see Figure 39) for U.S. Environmental Protection Agency (EPA) to issue report cards on the State of Vermont's progress throughout the 20-year implementation timeframe (2017-2038). EPA will determine satisfactory progress based on the status of implementation plans known as "Tactical Basin Plans." Tactical Basin Plans are updated on a five-year rotating basis and include Implementation Tables with

[19] Phosphorus Total Maximum Daily Loads for Vermont Segments of Lake Champlain available at: https://dec.vermont.gov/watershed/restoring/champlain.

[20] The wastewater treatment facilities baseline shows actual phosphorus discharge levels during the TMDL baseline period of 2001-2010. The former 2002 Lake Champlain TMDL wastewater phosphorus limit was 55.8 metric tons. The 2016 Lake Champlain TMDLs lowered the maximum permittable wastewater phosphorus limit to 32.3 metric tons, which achieves the overall required phosphorus load allocation while allowing for some development and growth over the TMDL implementation timeframe. If any wastewater treatment facility exceeds 80 percent of its maximum permit limit for more than 90 days, the facility is required to upgrade to assure discharges remain below the permit limit.

priority actions to implement the Lake Champlain TMDL. EPA will issue interim report cards halfway through the five-year planning cycle and final report cards at the end of the five-year planning cycle. The Southern Lake Champlain Tactical Basin Plan is due this year for an interim report card. The progress report on Southern Lake Champlain is included in Appendix B of this report covering January 1, 2018 through June 30, 2020.

This Lake Champlain TMDL Progress Report presents the following data and information to support EPA's determination of satisfactory progress and provide transparency to the public on the State of Vermont's efforts restoring Lake Champlain.

1. **Lake Champlain TMDL performance measures**: Estimated total phosphorus load reductions in effect SFY 2016-2020 basin-wide associated with projects/best management practices through federal funding programs, state funding programs, and regulatory programs. Estimated total phosphorus load reductions by lake segment can be found in Appendix C.
2. **External variables affecting phosphorus loading to Lake Champlain**: Data summarized include climate change, human population change, land use change, and agricultural considerations.
3. **Monitored phosphorus loading to Lake Champlain**: Monitored total phosphorus load from Vermont tributaries of Lake Champlain relative to the Lake Champlain TMDL target phosphorus load allocation.
4. **Interim status of Southern Lake Champlain Tactical Basin Plan Implementation Table**: See Appendix B.

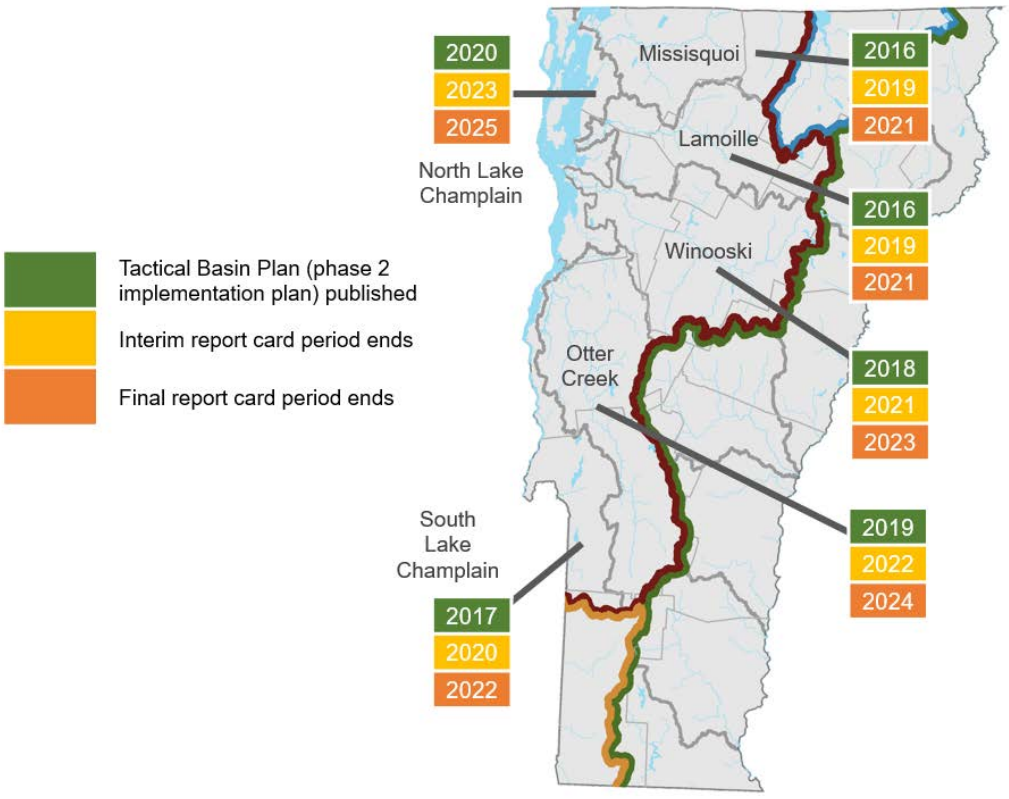


Figure 39. Lake Champlain TMDL Accountability Framework schedule by Tactical Basin Plan watershed

2.A. Lake Champlain TMDL Performance Measures

This Lake Champlain TMDL Progress Report includes total phosphorus load reduction estimates associated with activities/projects completed through three program categories: state funding programs, federal funding programs, and regulatory programs, shown in Figure 40. Table 16, below, lists federal funding programs and regulatory programs included in Part 2.

Collectively, state and federal funding programs and regulatory programs drive clean water efforts. The State of Vermont coordinates across agencies to track these efforts and monitor progress. The overlapping program categories captured in clean water tracking are depicted in Figure 40.

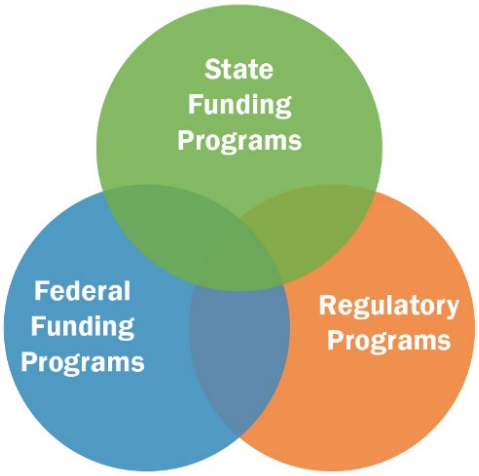


Figure 40. Program categories included in the scope of Vermont's Lake Champlain TMDL tracking and reporting

Table 16. State funding programs, federal funding programs, and regulatory programs within the scope of the SFY 2020 Lake Champlain TMDL Progress Report (Part 2) and planned future additions

Program Category	Included in this Report	Planned Future Additions
State Funding Programs	Refer to Table 1, Part 1	
Federal Funding Programs	U.S. Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) agricultural practices Lake Champlain Basin Program	USDA-NRCS forest and wetland practices USDA NRCS nutrient management planning assistance USDA NRCS land conservation
Regulatory Programs	Production area compliance for Large, Medium, and Certified Small Farm Operations Operational Stormwater Permits Wastewater National Pollutant Discharge Elimination System (NPDES) Permits Municipal Roads General Permit (MRGP) (new in SFY 2020)	Cropland and pasture Required Agricultural Practices (RAPs) compliance Operational Stormwater General Permit 3-9050 (i.e., "three-acre permit") Municipal Separate Storm Sewer System (MS4) Permit Transportation Separate Storm Sewer System (TS4) Permit

Estimated Total Phosphorus Load Reductions by Program Category

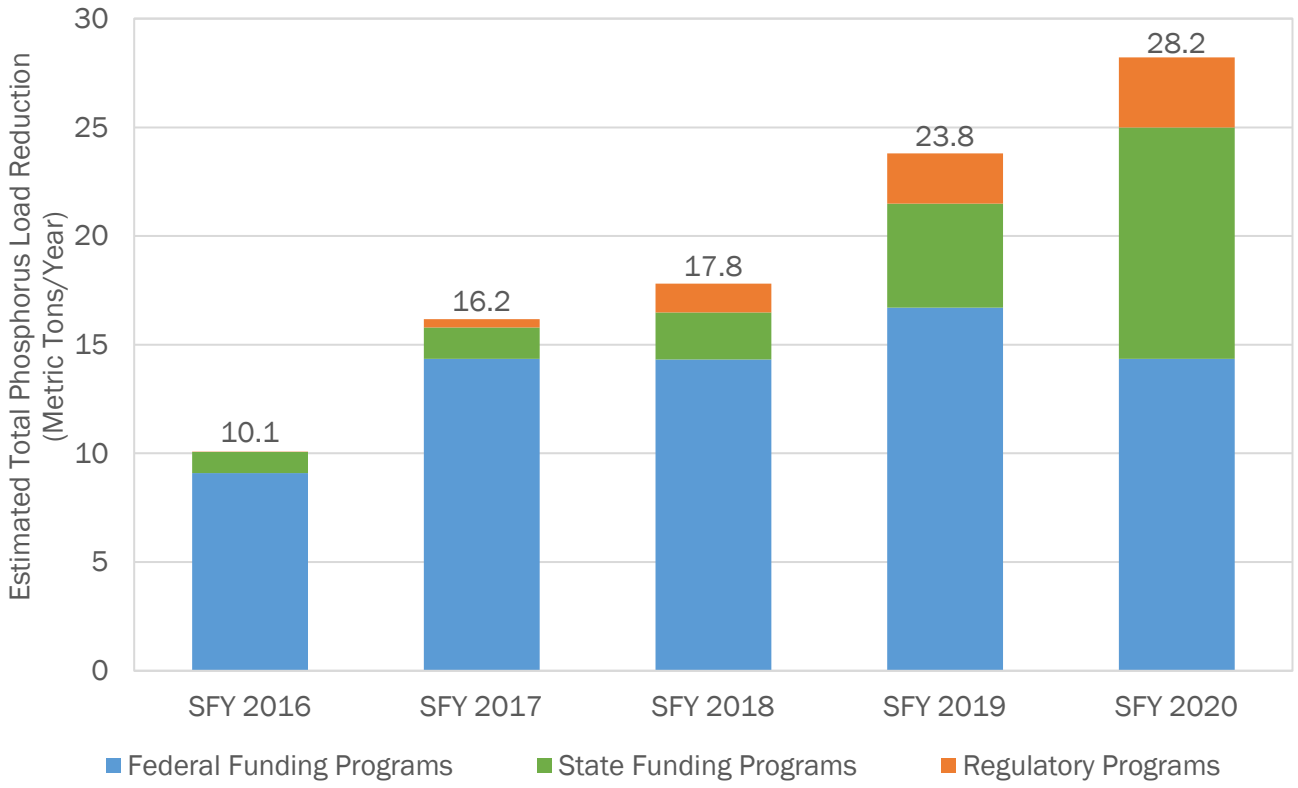


Figure 41. Annual estimated total phosphorus load reductions (metric tons per year) associated with clean water projects/activities in the Lake Champlain basin completed/in effect SFY 2016-2020 shown by program category. Annual phosphorus load reductions are cumulative for all completed/operational projects based on start date and anticipated lifespan. Results of USDA-NRCS-funded projects completed since SFY 2010 that are still in effect SFY 2016-2020 are included.

EXPLANATION OF FIGURE

This figure highlights the importance of state, local, and federal partners coordinating to make consistent progress reducing phosphorus pollution to Lake Champlain. Together, state and federal funding programs are incentivizing projects and best practices and offsetting some of the costs of regulatory compliance.

Phosphorus load reductions driven by regulatory program compliance are anticipated to grow in the coming years, as regulatory programs are incrementally rolled out (see Table 16 for anticipated regulatory program data additions to this report). In this reporting period, the state is already beginning to capture the results of some regulatory programs including farmers' efforts to manage barnyard/ production areas to RAP standards; municipalities' efforts to bring roads up to Municipal Roads General Permit (MRGP) standards; and landowners' efforts to mitigate polluted runoff from developed lands in compliance with operational stormwater permits.

The state is improving its ability to fully track projects/activities and estimate associated total phosphorus load reductions. New in SFY 2020, the state established/updated methodologies to estimate phosphorus reductions for agricultural conservation practices, MRGP implementation, and incorporated USDA-NRCS-funded "forage and biomass" conservation practice data (omitted in error from the previous report). Appendix E summarizes methods used to estimate pollutant reductions.

Estimated Total Phosphorus Load Reductions by Land Use Sector

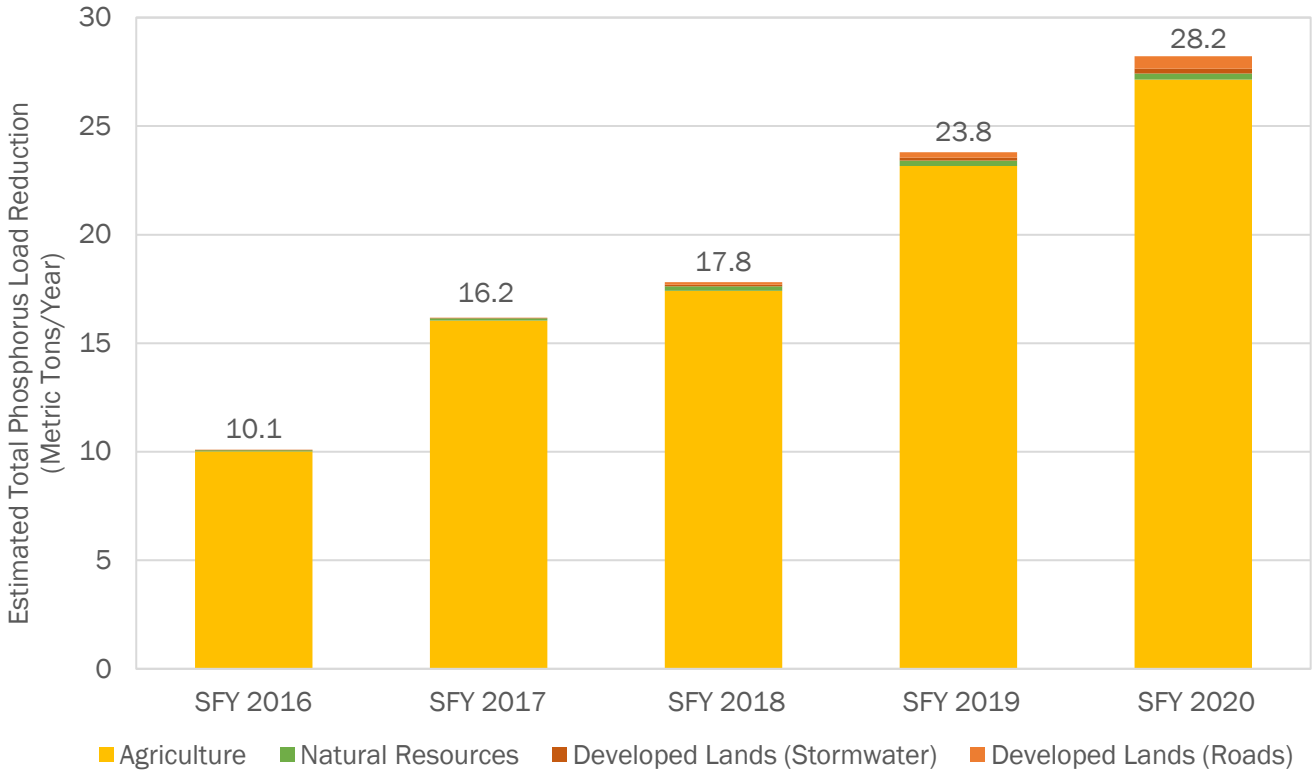


Figure 42. Annual estimated total phosphorus load reductions (metric tons per year) associated with clean water projects/activities in the Lake Champlain basin completed/in effect SFY 2016-2020 shown by land use sector. Annual phosphorus load reductions are cumulative for all completed/operational projects based on start date and anticipated lifespan. Results of USDA-NRCS funded projects completed since SFY 2010 that are still in effect SFY 2016-2020 are included.

EXPLANATION OF FIGURE

Estimated total phosphorus load reductions have nearly tripled from SFY 2016 to 2020 with over 97 percent of reductions associated with agricultural projects for three reasons:

- Agricultural conservation practices are highly cost-effective in treatment of phosphorus;
- Substantial federal funds leveraged through the USDA-NRCS layer on top of state funds to support this work (approximately $18.5 million in Federal Fiscal Year 2020 statewide); and
- Methods are currently in place to estimate phosphorus load reductions associated with most types of agricultural conservation practices, while other land use sectors have gaps in methods to estimate phosphorus reductions (see Appendix E for summary of methods to estimate pollutant reductions).

It is important to note that 96 percent of the agricultural reductions in SFY 2020 are associated with annual practices (one-year lifespan). If this level of effort is not maintained each year, the phosphorus reductions will not carry through to future years. Structural projects, such as stormwater treatment practices or forested riparian buffers, in contrast, have longer term lifespans (10-20 years or more if properly maintained) and phosphorus reductions achieved by these projects will continue in future years. Refer to Figure 43 on the following page for estimated total phosphorus load reductions within the context of the Lake Champlain TMDL baseline and target.

Estimated Total Phosphorus Load Reductions Relative to TMDL Baseline and Target

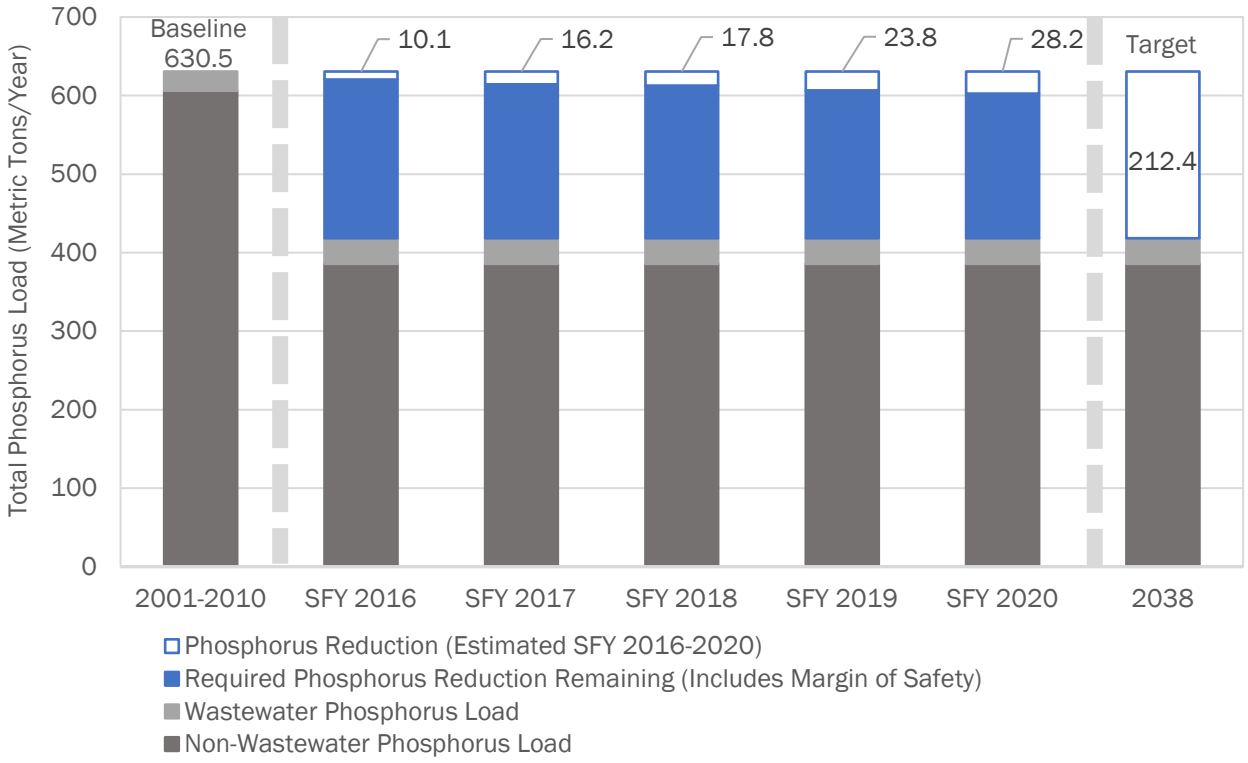


Figure 43. Estimated total phosphorus load reductions achieved/in effect during SFY 2016-2020 shown in the context of the Lake Champlain TMDL total phosphorus load baseline (2001-2010, at left) and target total phosphorus load (year 2038, at right) in metric tons per year.

EXPLANATION OF FIGURE

Total phosphorus loading to Lake Champlain from Vermont was modeled to be 631 metric tons per year during the Lake Champlain TMDL baseline period of 2001 to 2010. The TMDL states total phosphorus loading to Lake Champlain must be reduced by 212 metric tons per year by 2038 to achieve Vermont's water quality standards. The TMDL further allocates phosphorus reduction targets by "lake segment" watershed. Refer to Appendix C or visit the Clean Water Interactive Dashboard via the Clean Water Portal for data displayed above broken down by lake segment watershed.

Estimated total phosphorus load reductions associated with clean water projects/activities are trending in the right direction, representing a cumulative total of approximately 28 metric tons in SFY 2020 – 13 percent of the required reduction. This result is expected to increase substantially in the coming years for the following reasons:

1. Programs are ramping up to increase the pace of phosphorus reductions: The Lake Champlain TMDL timeframe began in 2017 and its phase 1 implementation plan included a "ramping-up" phase of regulatory, financial, and technical assistance programs. New regulatory programs are now in place that will drive phosphorus reductions from agriculture and developed lands, with meaningful progress expected in the coming years. For example, the Stormwater General Permit 3-9050, commonly referred to as the "three-acre permit," was finalized September 1, 2020 and represents completion of the final phase 1 Lake Champlain TMDLs implementation plan milestone. The three-acre permit requires improved stormwater treatment at more than 700 sites in the Lake Champlain basin with three or more acres of impervious surfaces (i.e., hard surfaces

EXPLANATION OF FIGURE CONTINUED

like roofs and parking lots) that were previously unpermitted or permitted before 2002. Affected landowners in the Lake Champlain basin are required to obtain permit coverage by no later than 2023.

2. Gaps in the state's ability to quantify phosphorus reductions for all projects: Prior year estimated total phosphorus load reductions have changed compared to the *Vermont Clean Water Initiative 2019 Performance Report* due to improved clean water project tracking and accounting. The State of Vermont is expanding its ability to quantify phosphorus reductions for all project types; however, some gaps still exist (described in Appendix E). The Clean Water Service Delivery Act (Act 76 of 2019) requires the state to address gaps and publish methods to estimate phosphorus reductions for clean water projects by November 1, 2021. Efforts are ongoing to address these gaps by the statutory deadline, including floodplain, river, and wetland restoration projects, forestry management practices, and more.

Monitored Total Phosphorus Load from Vermont Wastewater Treatment Facilities in the Lake Champlain Basin

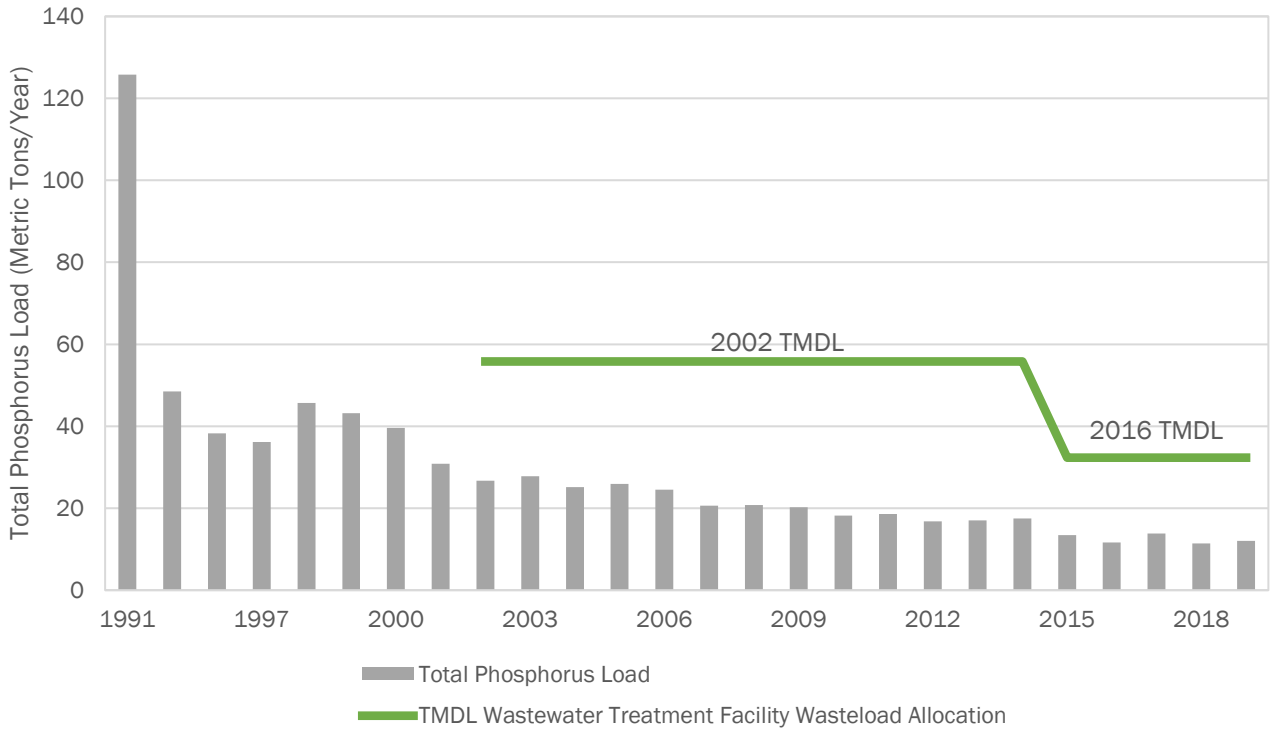


Figure 44. Total phosphorus load (metric tons per year) from Vermont wastewater treatment facilities draining to Lake Champlain relative to TMDL wastewater treatment facility wasteload allocation, calendar year 1991-2019

EXPLANATION OF FIGURE

Vermont wastewater treatment facilities contributed approximately 24.6 metric tons per year during the TMDL baseline period (2001-2010), representing approximately 4 percent of total phosphorus load from Vermont sources to Lake Champlain. During the baseline period, cumulative wastewater treatment facility discharge was already well below the wasteload allocation (i.e., maximum permitted phosphorus limit) of 55.8 metric tons required under the former 2002 Lake Champlain TMDL. The updated 2016 Lake Champlain TMDL for Vermont reduced the wastewater treatment facility wasteload allocation from 55.8 to 32.3 metric tons, which achieves the overall required phosphorus load allocation while allowing for some development and growth over the TMDL implementation timeframe. Discharge monitoring indicates Vermont wastewater treatment facilities in the Lake Champlain basin contributed approximately 12 metric tons of total phosphorus load to Lake Champlain in calendar year 2019 — 20 metric tons below the maximum permit limit of 32 metric tons.

All Vermont facilities that drain to Lake Champlain are required to optimize operations for phosphorus treatment and some facilities are required to complete phosphorus treatment upgrades to meet individual facility permit limits. If any wastewater treatment facility exceeds 80 percent of its maximum permit limit for more than 90 days, the facility is required to upgrade to assure discharges remain below the permit limit.

2.B. External Variables Affecting Phosphorus Loading to Lake Champlain

Excess phosphorus loading into Lake Champlain can lead to unsightly and potentially harmful algae blooms (e.g., cyanobacteria) limiting recreational uses due to health concerns. The majority (96 percent) of phosphorus loading to Lake Champlain is from nonpoint sources, transported from the landscape to waterways by rainfall and snowmelt. Due to the nature of nonpoint source pollution, many variables can affect the amount of phosphorus load delivered to Lake Champlain. This section of the report summarizes data on external variables that may affect phosphorus loading to Lake Champlain, including climate change, human population change, land use change, and agricultural considerations.

CLIMATE CHANGE AND CYANOBACTERIA

Cyanobacteria, also known as blue-green algae, are a natural component of surface waters. They provide important ecological services including photosynthesis and the transfer of nitrogen from the atmosphere to the aquatic environment through nitrogen fixation. They also can produce potent toxins harmful to people and animals. For this reason, the Vermont Department of Health recommends avoiding contact with cyanobacteria.

Climate change is predicted to affect several key factors that regulate cyanobacteria growth – temperature, nutrient availability, and water stability. Warmer summer temperatures and shorter, warmer winters will increase the length of time that cyanobacteria can proliferate each year. Already, the cyanobacteria monitoring program on Lake Champlain since 2003 has documented that blooms are occurring earlier in the summer and persisting later into the fall. The monitoring season now begins about two weeks earlier than it did in 2003 and documents blooms occurring into mid-October. In 2019, blooms persisted into late October. Moreover, scientists in Vermont and elsewhere are noting the incidence of cyanobacteria blooms at lower-than-expected phosphorus concentrations, indicating that the factors noted above are equally important in driving the incidence of bloom condition.

Weather conditions influence the amount of nutrients like phosphorus that reach surface waters. The increasingly heavy precipitation events expected because of climate change are likely to wash more phosphorus into lakes and ponds.

Timing of precipitation events may also change, with more occurring during the warmer months of the year when cyanobacteria are actively growing and using phosphorus. Cyanobacteria's ability to regulate buoyancy will allow it to move toward sunlight under the calm conditions that often accompany hot summer days and during turbid conditions after intense rainfall.

Climate change is expected to increase opportunities for cyanobacteria growth in Vermont. For example, water temperature in Lake Champlain reached a record-breaking 79 degrees Fahrenheit on June 23, 2020.[21] The reality is that the State of Vermont will have little control over weather patterns and precipitation. Therefore, Vermont will need to focus on land-use management and control of nutrient loading to surface waters to reduce the number of cyanobacteria blooms.

[21] National Weather Service data on Lake Champlain extremes and temperature from the Burlington, VT weather station, available at: https://www.weather.gov/btv/lakeTemp?year=2020.

Climate Change

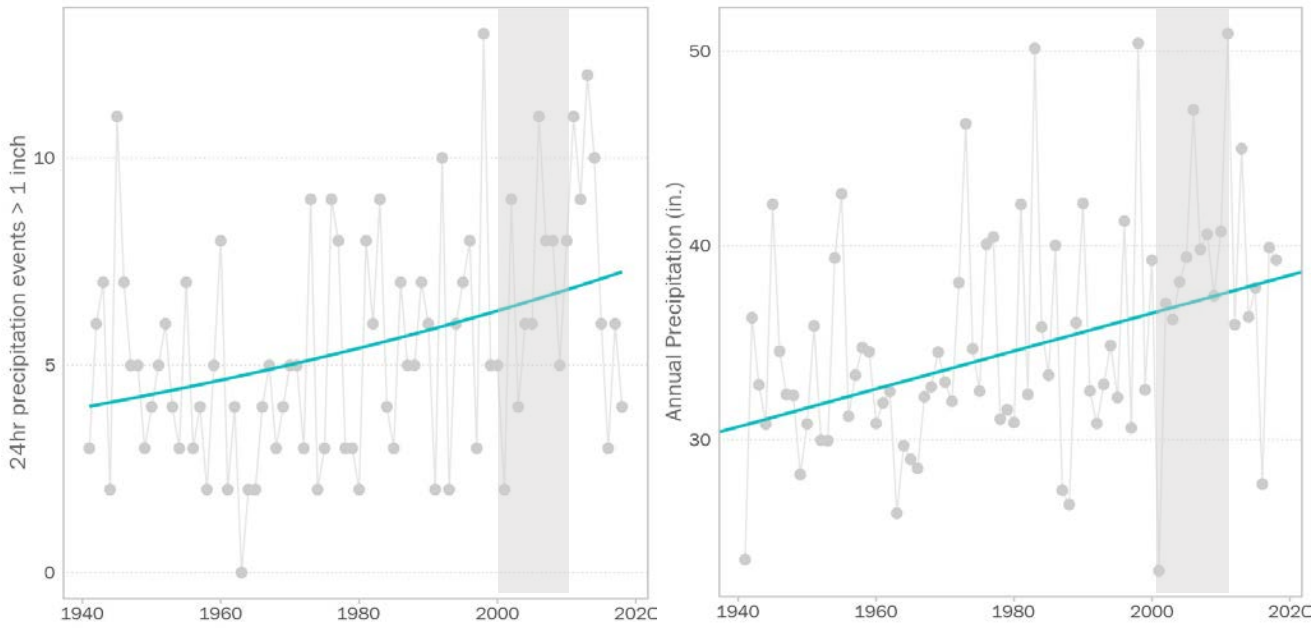


Figure 45. Change in number of days with precipitation greater than one inch (left), change in annual total precipitation (right) using Burlington to represent Vermont portion of Lake Champlain basin, 1940-2018 (gray shading represents Lake Champlain TMDL 2001-2010 baseline period and blue line represents trend)

EXPLANATION OF FIGURES

Climate data indicate statistically significant increase 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:

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

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

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

Source: National Oceanic and Atmospheric Administration, Burlington International Airport climate station

Frequency Updated: Every 2 years

Land Use Change in Lake Champlain Basin

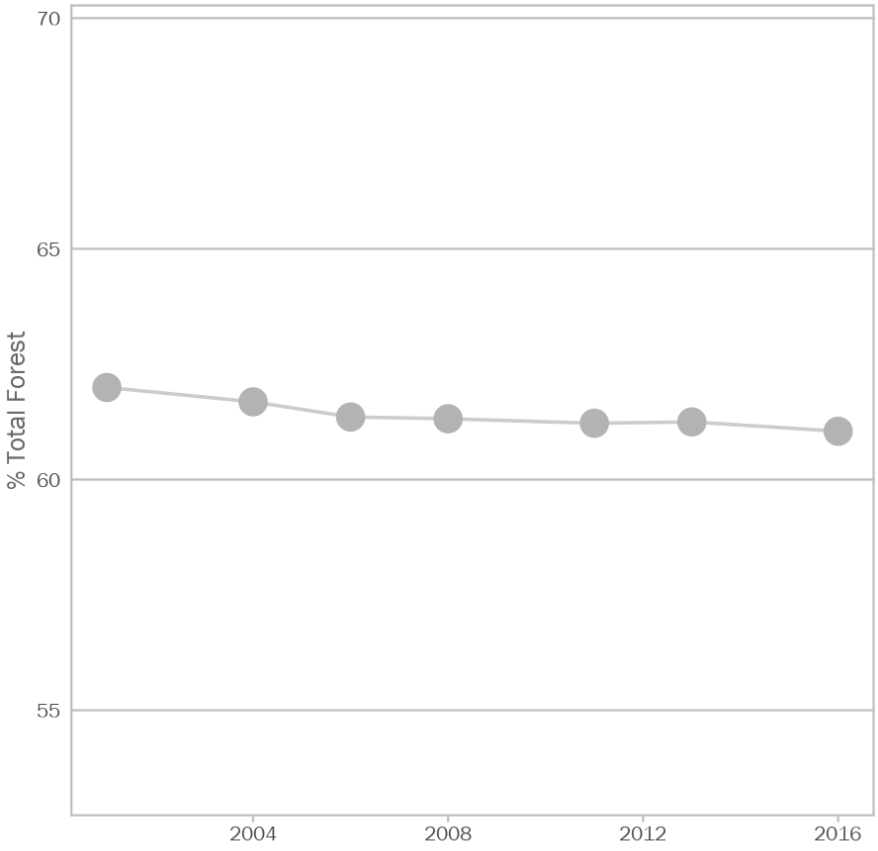


Figure 46. Percent of forested land use in Vermont portion of Lake Champlain Basin, 2001-2016

EXPLANATION OF FIGURE

Land use data from 2001 to 2016 show an approximate 1 percent decrease in forested land cover in the Lake Champlain basin since the TMDL baseline period (2001-2010). The forestland decrease represents 44 square miles – approximately three times the area of the City of Burlington. Forested lands produce the lowest yield of phosphorus and greatest benefit to water quality of all land uses.

This land use change may result in:

- Conversion of forested land to other land uses less protective of water quality (e.g., developed or agricultural lands).

This highlights the importance of efforts underway to protect and restore forested lands:

- Conservation easements help maintain water quality benefits of forest lands; and
- Use Value Appraisal (UVA) Program provides tax incentives for private landowners to keep woodlands intact.

Source: National Land Cover Dataset

Frequency Updated: 4 years

Agricultural Considerations – Milk Prices

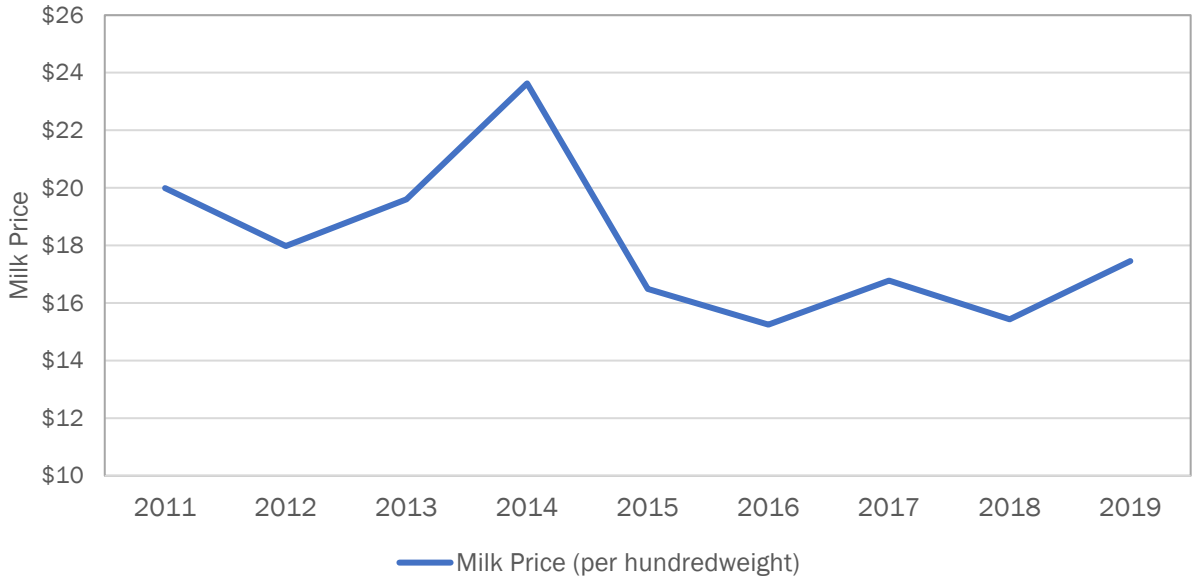


Figure 47. Change in Vermont average milk price per hundredweight (100 pounds), calendar year 2011 through 2019

EXPLANATION OF FIGURE

Farmers expect variability in milk prices, however, the extended length of low milk prices since 2015 have presented challenges for dairy farmers. During this timeframe, farmers have maintained milk production levels and may be operating at a loss to stay in business, as the average cost of production is often well above the price received.

Consistently low milk prices directly affect farmers' ability to:

- Pay bills and justify any additional costs, such as water quality improvements. Even with substantial state and federal funding, farmers are challenged to meet their portion of the cost of implementing agricultural conservation practices and improvements to infrastructure supporting water quality at dairy operations.

This highlights the importance of agricultural financial and technical assistance efforts, for example:

- AAFM and USDA-NRCS offer substantial technical and financial assistance to farmers to implement agricultural conservation practices and to install infrastructure improvements at barnyards/production areas;
- State and federal funds also support agricultural partners and non-profits such as University of Vermont Extension, State Natural Resource Conservation Districts, and the Vermont Association of Conservation Districts, who work one-on-one with farmers to support water quality; and
- The Vermont Farm and Forest Viability Program as well as the UVM Farm Viability Program provide business advice and financial consultation to farmers to improve farm economic viability and assist with long term planning.

Source: AAFM

Frequency Updated: Quarterly

2.C. Monitored Total Phosphorus Loading to Lake Champlain

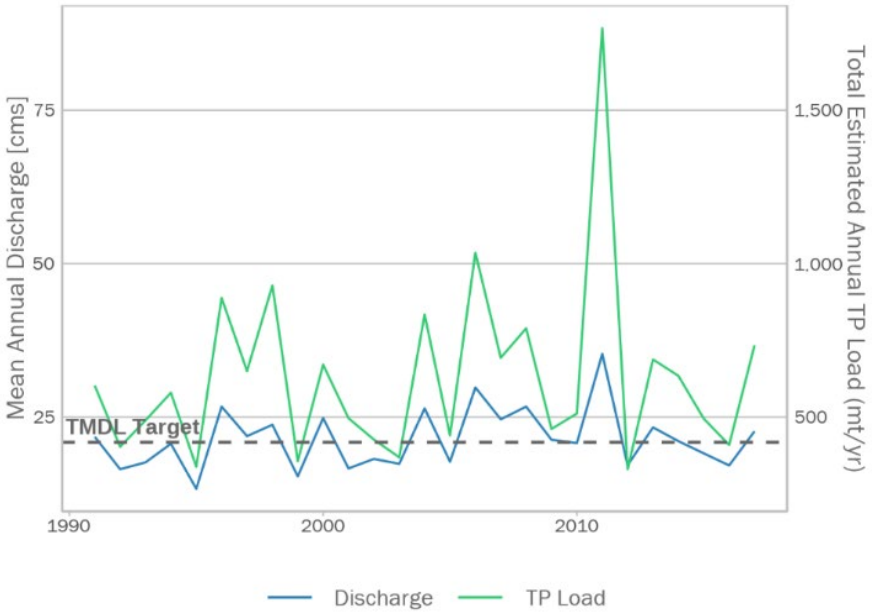


Figure 48. Monitored average annual flow (cubic meters per second) and estimated total phosphorus (TP) load (metric tons per year) from Vermont tributaries to Lake Champlain relative to the TMDL total phosphorus target, 1991-2017

EXPLANATION OF FIGURE

Lake Champlain tributary streamflow and water quality concentrations can be used to estimate total phosphorus loading to the lake. Phosphorus loading fluctuates due to a variety of factors, such as land use and precipitation patterns. Higher amounts of precipitation move more phosphorus from the land to the rivers, where it is ultimately carried downstream to Lake Champlain. As a result, annual phosphorus loading patterns closely follow annual river flow or discharge patterns. The graph above reflects how closely these are correlated. For example, the notable spike in total phosphorus load and discharge in 2011 is associated with Tropical Storm Irene. The target total phosphorus load is 418 metric tons per year, which is the maximum amount of phosphorus Lake Champlain can receive annually and meet State of Vermont water quality standards. This figure shows total phosphorus load, at times, less than 418 metric tons when annual average discharge (i.e., flow) was very low.

Additional regulatory, project delivery, and funding mechanisms, as well as long-term revenue sources to support clean water projects, have been established with the passage of the Vermont Clean Water Act (Act 64) in 2015 and the Clean Water Service Delivery Act (Act 76) in 2019. The components of these acts have varying timelines for implementation. In many cases, full implementation of these programs may not be fully realized for a decade or more. One example of this is the Municipal Roads General Permit (MRGP), which requires municipalities to meet MRGP standards for all hydrologically connected road segments by 2036.

As new regulations take effect and implementation of clean water projects ramps up, it is expected that decreased loading will be first measurable at a local level in individual smaller rivers and streams. While targets may be met at the local scale, it will take many years – possibly decades – before cumulative improvements are observable in larger tributaries and subsequently in Lake Champlain.

Source: VTDEC, U.S. Geological Survey, Lake Champlain Basin Program

Frequency Updated: 2 years, monitored continuously (2020 data are under review for the next report)

Appendices

A. Summary of Vermont Water Quality Priorities and Projects by Watershed

B. South Lake Champlain (Basins 2 & 4) TMDL Implementation Interim Progress Report

C. Estimated Total Phosphorus Load Reductions by Lake Champlain Segment Watershed

D. Results of Operational Stormwater Permits

E. Summary of Methods Used to Estimate Pollutant Reductions

F. SFY 2020 Ecosystem Restoration Grant Program Projects

Appendix A: Vermont Water Quality Priorities and Projects by Watershed

Appendix A fulfills the reporting requirement of 10 V.S.A. § 1389a, and includes:

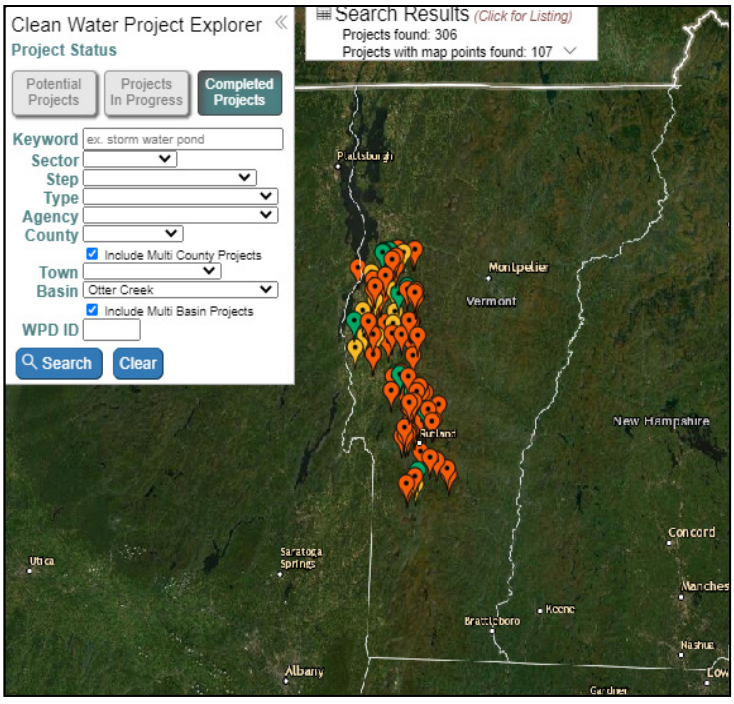
- A summary of the Tactical Basin Planning process that prioritizes projects for implementation;
- A summary of water quality problems or concerns in each major basin of the state; and
- A summary of projects funded and completed by State of Vermont agencies and federal partners in each Tactical Basin Planning watershed.

Summaries for each of the fifteen Tactical Basin Planning watersheds, organized alphabetically by watershed name, present the following data for state fiscal years (SFY) 2016 to 2020:

- Total dollars awarded by State of Vermont agencies to clean water projects by sector and state fiscal year;
- Summary of project results[1] funded by State of Vermont agencies for completed clean water projects by sector and state fiscal year;
- Summary of project results funded by federal partners (i.e., Lake Champlain Basin Program, U.S. Department of Agriculture Natural Resources Conservation Service) for completed clean water projects by sector and by state fiscal year; and
- Summary of annual estimated total phosphorus load reductions associated with completed clean water projects funded by State of Vermont and federal partners in the Lake Champlain and Lake Memphremagog watersheds by sector and state fiscal year.

Explore Clean Water Project Data Online

Clean water project data summarized in this report are made available to the public through the "Clean Water Portal[2]." The Portal's "Clean Water Projects Explorer" allows interested parties to search for and learn more details about individual state-funded clean water projects. The Explorer also contains potential projects identified through Tactical Basin Planning – Vermont's science-based framework to identify and prioritize clean water projects. An example query of completed clean water projects in the Otter Creek watershed using the Explorer tool is shown on the right. New to the Portal in 2021 is the "Clean Water Interactive Dashboard" (CWID). CWID is an online tool that allows interested parties to interact with Performance Report data on investments, project outputs, estimated pollutant load reductions and project cost effectiveness.



1 Project output values that apply across multiple Tactical Basin Planning watersheds are divided among those watersheds. Thus, the sum of project output values of all watershed summaries may not exactly equal statewide project outputs due to rounding of split values.
2 The Clean Water Portal is available at: https://anrweb.vt.gov/DEC/cleanWaterDashboard/

Vermont Tactical Basin Planning:

The science-based framework to assess, plan and implement priority clean water projects

Given the significant costs of restoring and safeguarding water quality, the state must spend its resources efficiently and effectively. State agencies utilize Tactical Basin Plans, where possible, to identify projects that will provide the greatest return on investment for clean water.

Tactical Basin Plans identify and prioritize clean water projects across multiple sectors, including stormwater, rivers, roads, and wastewater treatment, based on scientific monitoring data and assessment results. The prioritized lists of projects necessary to achieve clean water goals, found in each Tactical Basin Plan, are complemented by an online Watershed Projects Database, which is continuously updated (visit: anrweb.vt.gov/DEC/CleanWaterDashboard/WPDSearch.aspx).

Tactical Basin Planning is integral to identifying priority projects to achieve clean water targets described in clean water restoration plans, known as Total Maximum Daily Loads (TMDLs), the Vermont Clean Water Act, and the 2016 Combined Sewer Overflow (CSO) Rule.

Community and stakeholder engagement is a key component of Tactical Basin Plan development and implementation. Local partners, including municipalities, natural resources conservation districts, regional planning commissions, and watershed organizations, also utilize Tactical Basin Plans to target their clean water activities/projects.

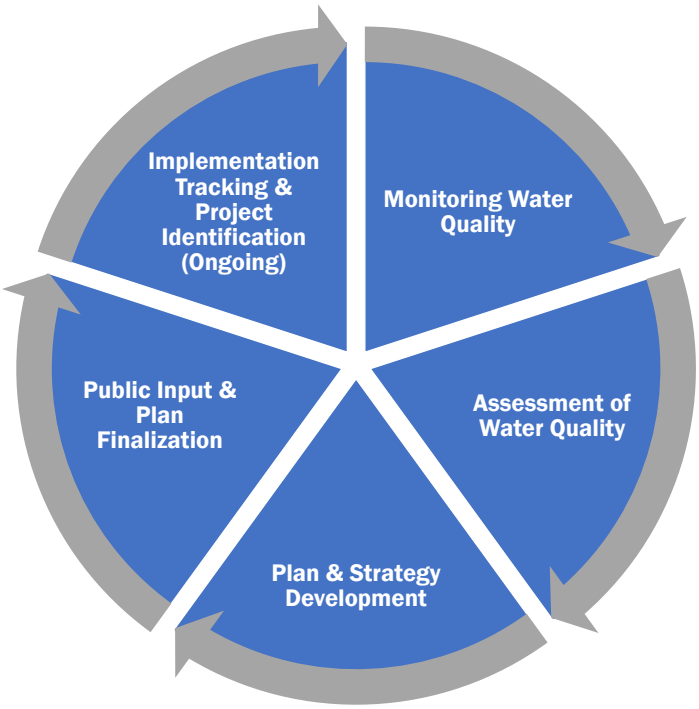
Clean water projects are prioritized in Tactical Basin Plans using the following criteria:

1. Expected environmental benefit and cost effectiveness based on:
   a. Nutrient and sediment pollution reduction,
   b. Improved flood resiliency, and
   c. Improved habitat function.

2. Expected feasibility based on:
   a. Partner capacity and local support, and
   b. Funding availability.

Five-Year Tactical Basin Planning Cycle

Tactical Basin Planning process engages key partners in developing strategies to address water quality issues by sector.



Monitoring and assessment identifies water quality issues.

LAKE CHAMPLAIN BASIN

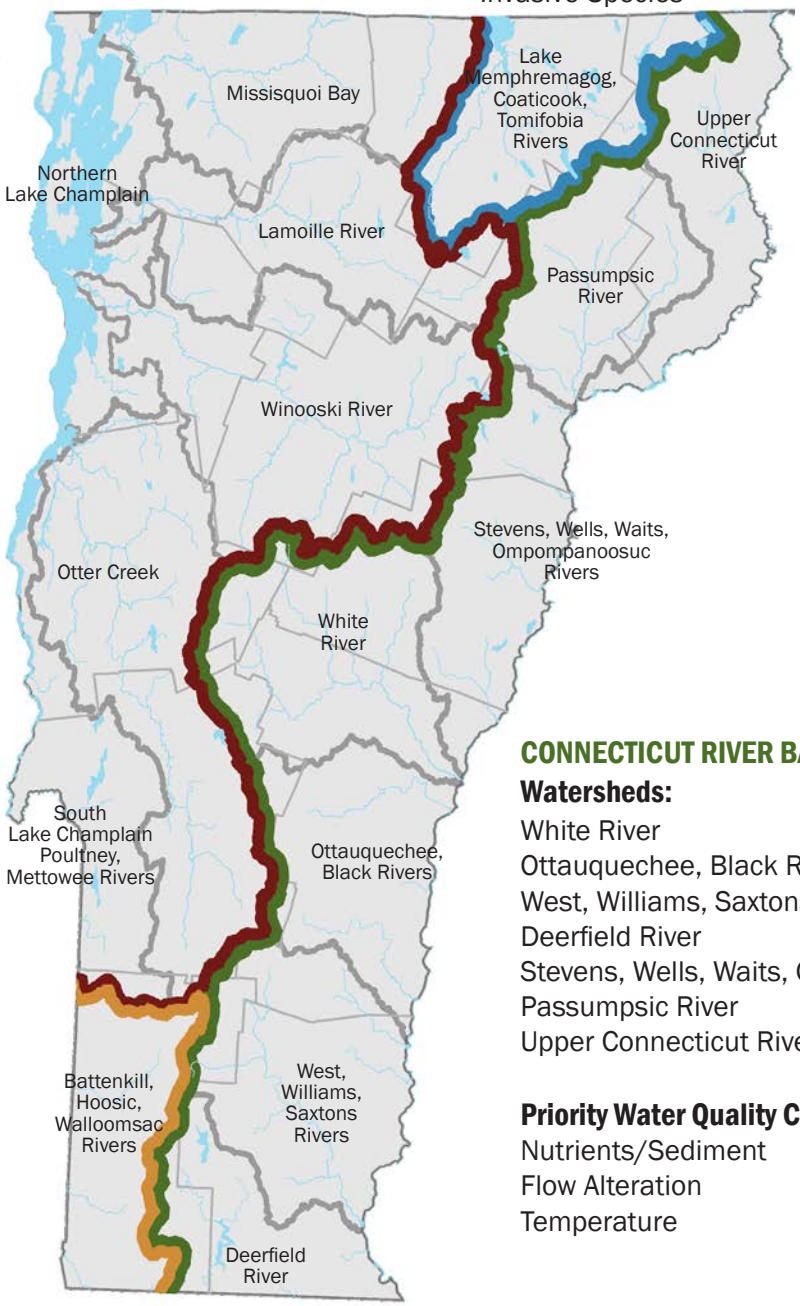
Watersheds:
Northern Lake Champlain
Missisquoi Bay
Winooski River
South Lake Champlain, Poultney, Mettowee Rivers
Otter Creek
Lamoille River

Priority Water Quality Concerns:
Nutrients/Sediment
Bacteria (*E. coli*)
Invasive Species

LAKE MEMPHREMAGOG BASIN

Watersheds:
Lake Memphremagog, Coaticook, Tomifobia Rivers

Priority Water Quality Concerns:
Nutrients/Sediment
Flow Alteration
Invasive Species



HUDSON RIVER BASIN

Watersheds:
Battenkill, Hoosic, Walloomsac Rivers

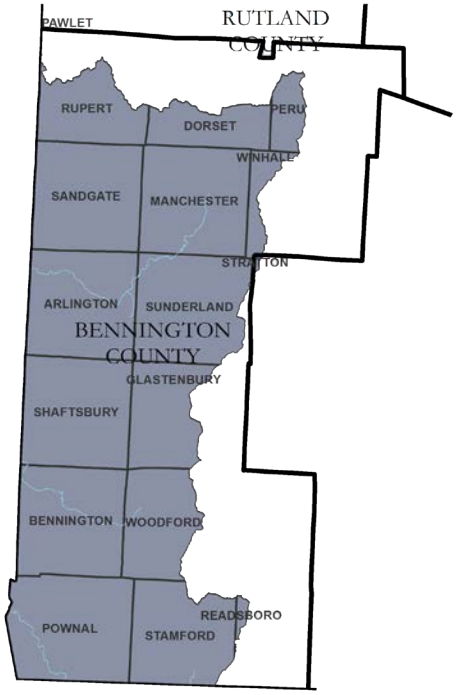
Priority Water Quality Concerns:
Nutrients/Sediment
Habitat
Temperature

CONNECTICUT RIVER BASIN

Watersheds:
White River
Ottauquechee, Black Rivers
West, Williams, Saxtons, Connecticut Rivers
Deerfield River
Stevens, Wells, Waits, Ompompanoosuc Rivers
Passumpsic River
Upper Connecticut River

Priority Water Quality Concerns:
Nutrients/Sediment
Flow Alteration
Temperature

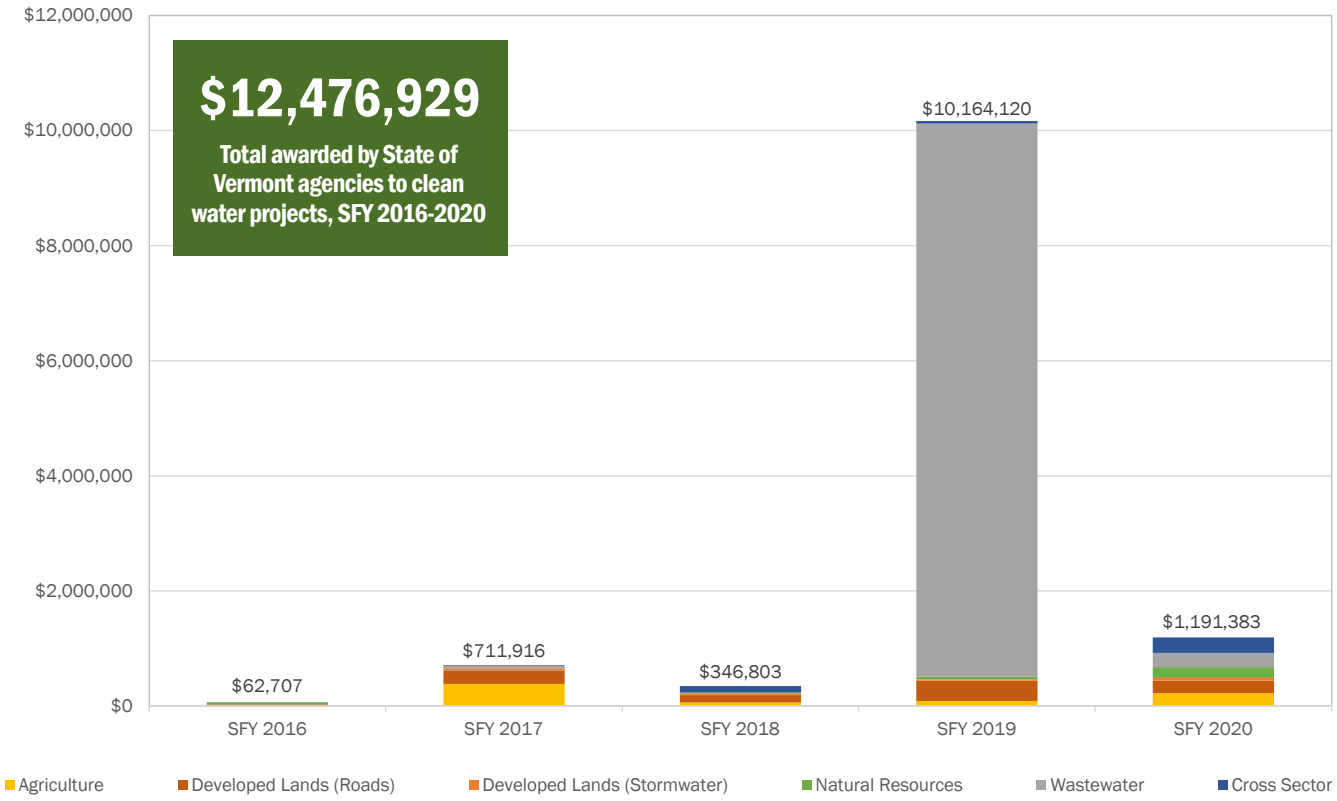
Battenkill, Walloomsac, Hoosic (Hudson) Rivers Watershed Investments



Towns in the Watershed

Arlington	Sandgate
Bennington	Shaftsbury
Glastenbury	Stamford
Manchester	Sunderland
Pownal	Woodford
Rupert	

Dollars awarded by State of Vermont agencies to clean water projects in the Hudson River watershed, by sector and state fiscal year (SFY).



Battenkill, Walloomsac, Hoosic (Hudson) Rivers Watershed Results

State-Funded Project Outputs:

Results of clean water projects funded by State of Vermont agencies completed, SFY 2016-2020, by sector, in the Hudson River watershed.
Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

STATE AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural land treated by conservation practices	–	–	155	13	–	168
Acres of agricultural land treated by forest and grass buffers	–	–	–	–	–	–
Acres of pasture with livestock excluded from surface waters	–	–	–	–	6	6
Number of barnyard and production area practices installed	–	–	–	–	–	–
Acres of water quality protections within newly conserved agricultural lands	–	3	–	–	–	3
Estimated acres of agricultural land treated through equipment	–	–	–	–	–	–
Acres of agricultural conservation practices reported through technical assistance	–	–	1	1	30	32

NATURAL RESOURCES

STATE NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	1	1	–	3	<1	5
Acres of riparian corridor conserved and restored through easements	–	–	–	–	–	–
Acres of floodplain restored	–	–	–	–	–	–
Acres of lakeshore restored	–	–	–	–	–	–
Stream miles reconnected for stream equilibrium/fish passage	–	–	–	–	–	–
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Acres of forestland conserved with water quality protections	–	–	–	–	–	–
Miles of forest road drainage and erosion control improvements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–
Square feet of eroding gully remediated	–	–	–	27	–	27

STORMWATER

ROADS

STATE DEVELOPED LANDS PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	–	–	–	–
Miles of municipal road drainage and erosion control improvements	–	<1	3	4	2	9
Number of municipal road drainage and stream culverts replaced	–	3	6	9	4	22
Cubic yards of Class IV road gully erosion remediated	–	–	–	–	–	–
Cubic yards of catch basin outlet erosion remediated	–	–	–	–	–	–
Acres stabilized through use of hydroseeder/mulcher equipment per year	–	–	12	<1	–	12

WASTEWATER

STATE WASTEWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Number of combined sewer overflow abatements completed	–	–	–	–	–	–
Number of sewer extensions completed	–	–	–	–	–	–
Number of wastewater collection systems refurbished	–	–	–	–	–	–
Number of wastewater treatment facility refurbished	–	–	–	1	–	1
Number of wastewater treatment facility upgrades completed	–	–	–	–	–	–

Battenkill, Walloomsac, Hoosic (Hudson) Rivers Watershed Investments

Federal-Funded Project Outputs:

Results of clean water projects funded by federal partners completed, SFY 2016-2020, by sector, in the Hudson River watershed[3]. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

EXTERNAL PARTNER AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural conservation practices implemented (excluding other practices)[4]	189	26	–	191	39	445
Acres of agricultural land treated by forest and grass buffers[4]	–	–	–	–	–	–
Acres of pasture with livestock excluded from surface waters[4]	–	–	–	–	–	–
Number of barnyard and production area practices installed[4]	9	4	14	–	–	27
Acres of agricultural conservation practices reported through technical assistance[4]	71	188	–	–	–	259

NATURAL RESOURCES

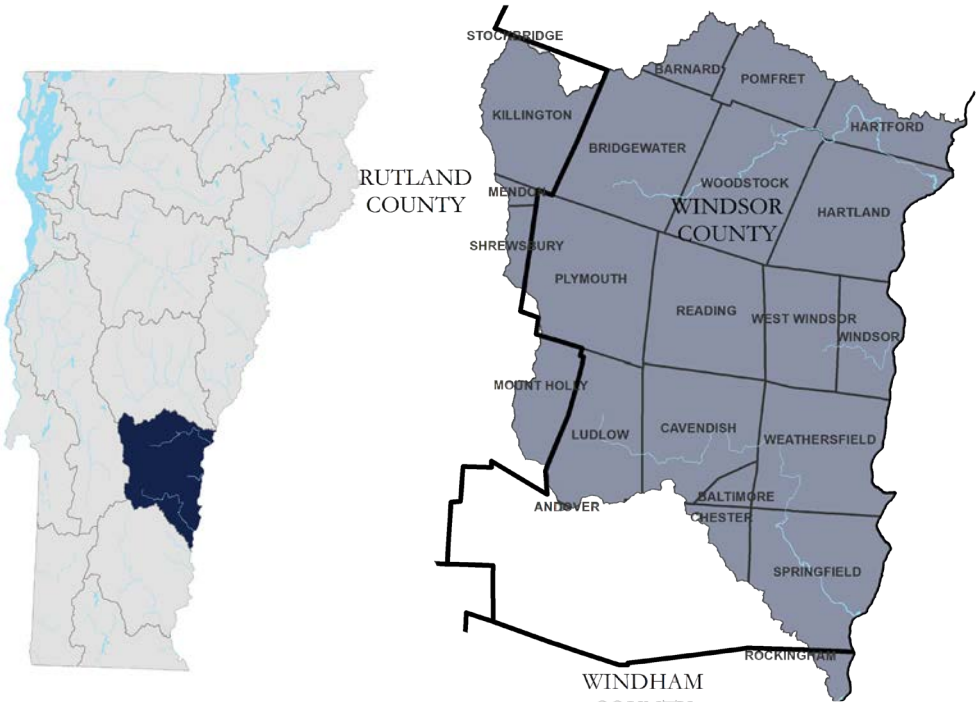
EXTERNAL PARTNER NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	–	–	–	–	–	–
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–

STORMWATER

EXTERNAL PARTNER STORMWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	–	–	–	–

3 Federal partner funding sources include Lake Champlain Basin Program and U.S. Department of Agriculture Natural Resources Conservation Service
4 Funded by U.S. Department of Agriculture Natural Resources Conservation Service

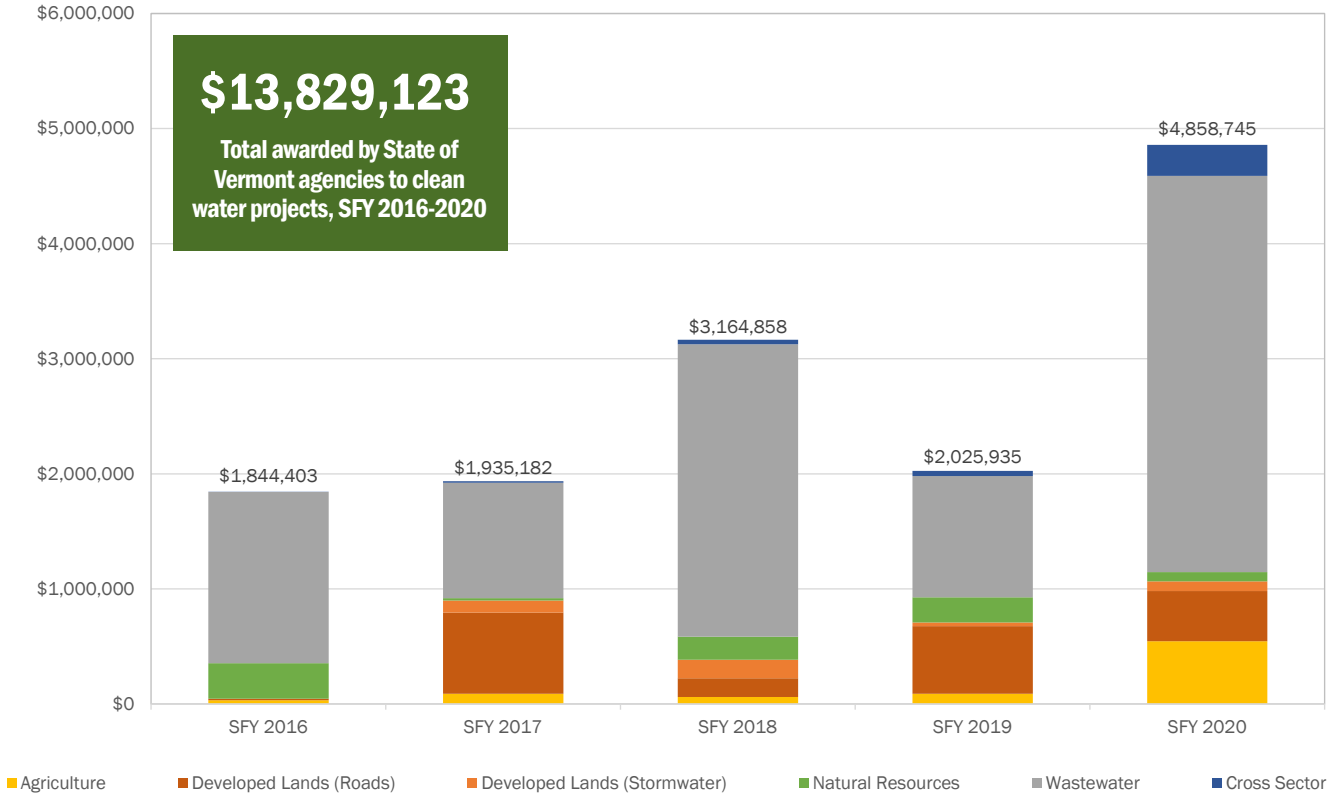
Black, Ottauquechee Rivers Watershed Investments



Towns in the Watershed

Baltimore	Pomfret
Bridgewater	Reading
Cavendish	Springfield
Hartland	Weathersfield
Killington	West Windsor
Ludlow	Windsor
Plymouth	Woodstock

Dollars awarded by State of Vermont agencies to clean water projects in the Black, Ottauquechee Rivers watershed, by sector and state fiscal year (SFY).



Black, Ottauquechee Rivers Watershed Results

State-Funded Project Outputs:

Results of clean water projects funded by State of Vermont agencies completed, SFY 2016-2020, by sector, in the Black, Ottauquechee Rivers watershed. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

STATE AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural land treated by conservation practices	–	–	–	43	47	90
Acres of agricultural land treated by forest and grass buffers	–	–	–	–	–	–
Acres of pasture with livestock excluded from surface waters	–	–	–	–	–	–
Number of barnyard and production area practices installed	–	–	–	–	–	–
Acres of water quality protections within newly conserved agricultural lands	–	–	–	–	–	–
Estimated acres of agricultural land treated through equipment	–	–	–	158	34	192
Acres of agricultural conservation practices reported through technical assistance	–	–	–	–	13	13

NATURAL RESOURCES

STATE NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	1	1	1	1	1	5
Acres of riparian corridor conserved and restored through easements	47	–	–	–	–	47
Acres of floodplain restored	1	–	–	1	–	2
Acres of lakeshore restored	–	–	–	–	–	–
Stream miles reconnected for stream equilibrium/fish passage	–	–	–	26	–	26
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Acres of forestland conserved with water quality protections	58	–	–	–	–	58
Miles of forest road drainage and erosion control improvements	–	1	–	–	<1	1
Number of stream crossings improved	–	–	–	–	4	4
Square feet of eroding gully remediated	–	–	–	–	–	–

STORMWATER

ROADS

STATE DEVELOPED LANDS PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	–	3	–	3
Miles of municipal road drainage and erosion control improvements	–	<1	2	6	2	10
Number of municipal road drainage and stream culverts replaced	–	3	1	7	8	19
Cubic yards of Class IV road gully erosion remediated	–	–	–	–	–	–
Cubic yards of catch basin outlet erosion remediated	–	–	–	36	–	36
Acres stabilized through use of hydroseeder/mulcher equipment per year	–	–	–	–	220	220

WASTEWATER

STATE WASTEWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Number of combined sewer overflow abatements completed	2	1	–	1	1	5
Number of sewer extensions completed	–	1	–	–	–	1
Number of wastewater collection systems refurbished	–	–	–	–	–	–
Number of wastewater treatment facility refurbished	–	–	–	–	1	1
Number of wastewater treatment facility upgrades completed	–	–	–	–	–	–

Black, Ottauquechee Rivers Watershed Results

Federal-Funded Project Outputs:

Results of clean water projects funded by federal partners completed, SFY 2016-2020, by sector, in the Black, Ottauquechee Rivers watershed[3]. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

EXTERNAL PARTNER AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural conservation practices implemented (excluding other practices)[4]	126	52	99	113	148	538
Acres of agricultural land treated by forest and grass buffers[4]	–	–	–	–	–	–
Acres of pasture with livestock excluded from surface waters[4]	–	–	–	–	–	–
Number of barnyard and production area practices installed[4]	2	1	13	5	7	28
Acres of agricultural conservation practices reported through technical assistance[4]	–	–	–	–	–	–

NATURAL RESOURCES

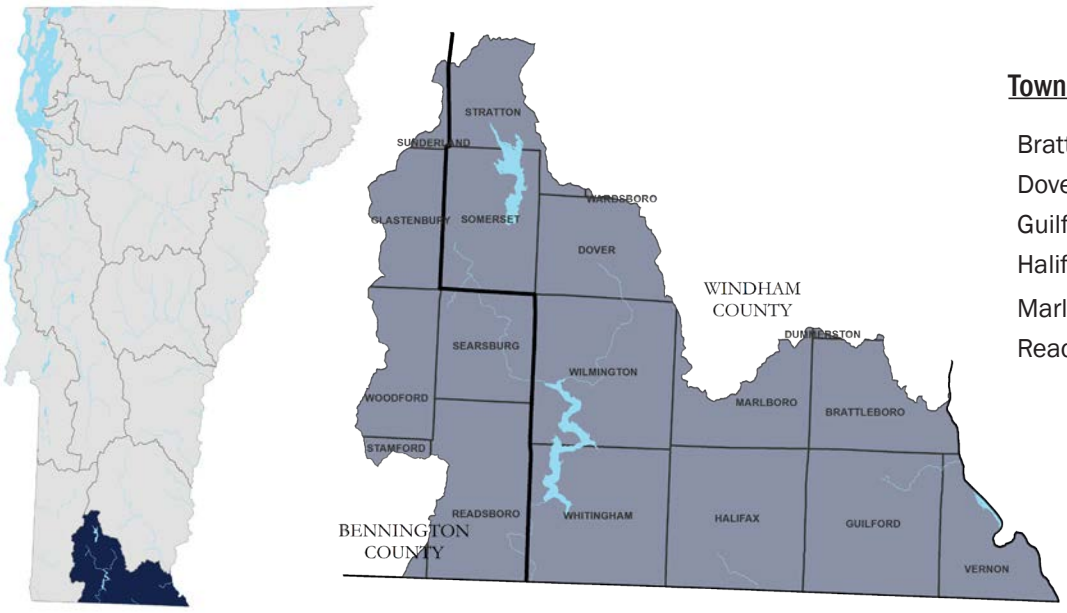
EXTERNAL PARTNER NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	–	–	–	–	–	–
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–

STORMWATER

EXTERNAL PARTNER STORMWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	–	–	–	–

3 Federal partner funding sources include Lake Champlain Basin Program and U.S. Department of Agriculture Natural Resources Conservation Service
4 Funded by U.S. Department of Agriculture Natural Resources Conservation Service

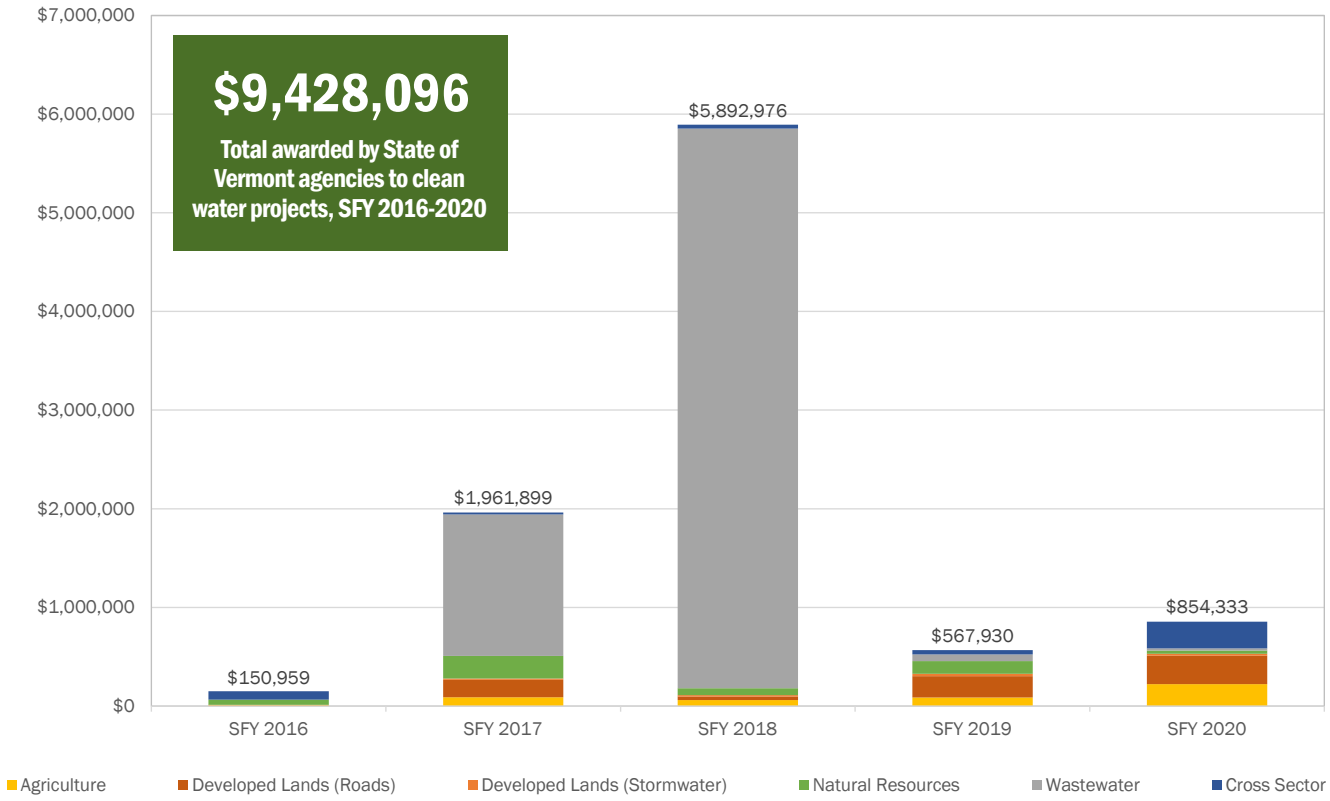
Deerfield River Watershed Investments



Towns in the Watershed

Brattleboro	Searsburg
Dover	Somerset
Guilford	Vernon
Halifax	Whitingham
Marlboro	Wilmington
Readsboro	

Dollars awarded by State of Vermont agencies to clean water projects in the Deerfield River watershed, by sector and state fiscal year (SFY).



Deerfield River Watershed Results

State-Funded Project Outputs:

Results of clean water projects funded by State of Vermont agencies completed, SFY 2016-2020, by sector, in the Deerfield River watershed.
Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

STATE AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural land treated by conservation practices	–	–	–	224	83	307
Acres of agricultural land treated by forest and grass buffers	–	–	–	–	–	–
Acres of pasture with livestock excluded from surface waters	–	–	–	–	–	–
Number of barnyard and production area practices installed	–	–	–	–	–	–
Acres of water quality protections within newly conserved agricultural lands	–	–	–	–	–	–
Estimated acres of agricultural land treated through equipment	–	–	–	–	–	–
Acres of agricultural conservation practices reported through technical assistance	–	–	–	–	–	–

NATURAL RESOURCES

STATE NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	2	1	–	1	–	4
Acres of riparian corridor conserved and restored through easements	–	–	–	–	–	–
Acres of floodplain restored	–	–	–	–	13	13
Acres of lakeshore restored	–	–	5	<1	–	5
Stream miles reconnected for stream equilibrium/fish passage	–	–	–	–	–	–
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Acres of forestland conserved with water quality protections	–	–	–	–	–	–
Miles of forest road drainage and erosion control improvements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–
Square feet of eroding gully remediated	–	–	–	–	–	–

STORMWATER

ROADS

STATE DEVELOPED LANDS PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	–	–	–	–
Miles of municipal road drainage and erosion control improvements	–	<1	3	1	1	5
Number of municipal road drainage and stream culverts replaced	–	2	–	3	–	5
Cubic yards of Class IV road gully erosion remediated	–	–	–	–	–	–
Cubic yards of catch basin outlet erosion remediated	–	–	–	–	–	–
Acres stabilized through use of hydroseeder/mulcher equipment per year	–	–	–	–	–	–

WASTEWATER

STATE WASTEWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Number of combined sewer overflow abatements completed	–	–	–	–	–	–
Number of sewer extensions completed	–	–	–	–	–	–
Number of wastewater collection systems refurbished	–	–	–	–	–	–
Number of wastewater treatment facility refurbished	–	–	–	–	1	1
Number of wastewater treatment facility upgrades completed	–	–	–	–	–	–

Deerfield River Watershed Results

Federal-Funded Project Outputs:

Results of clean water projects funded by federal partners completed, SFY 2016-2020, by sector, in the Deerfield River watershed[3]. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

EXTERNAL PARTNER AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural conservation practices implemented (excluding other practices)[4]	201	186	373	223	309	1,292
Acres of agricultural land treated by forest and grass buffers[4]	–	–	–	–	–	–
Acres of pasture with livestock excluded from surface waters[4]	–	–	–	–	–	–
Number of barnyard and production area practices installed[4]	3	12	–	12	–	27
Acres of agricultural conservation practices reported through technical assistance[4]	7	–	–	–	–	7

NATURAL RESOURCES

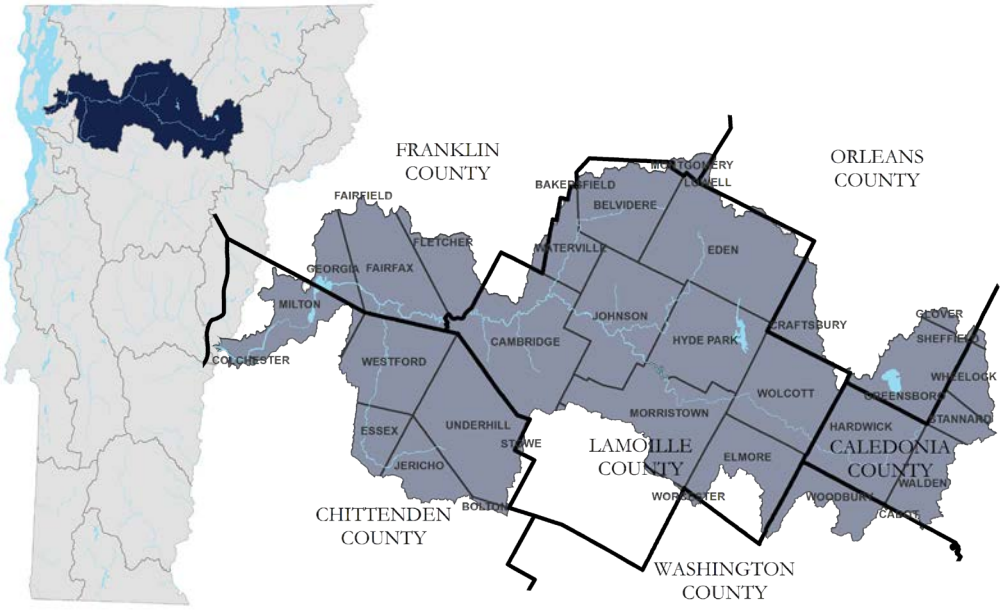
EXTERNAL PARTNER NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	–	–	–	–	–	–
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–

STORMWATER

EXTERNAL PARTNER STORMWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	–	–	–	–

3 Federal partner funding sources include Lake Champlain Basin Program and U.S. Department of Agriculture Natural Resources Conservation Service
4 Funded by U.S. Department of Agriculture Natural Resources Conservation Service

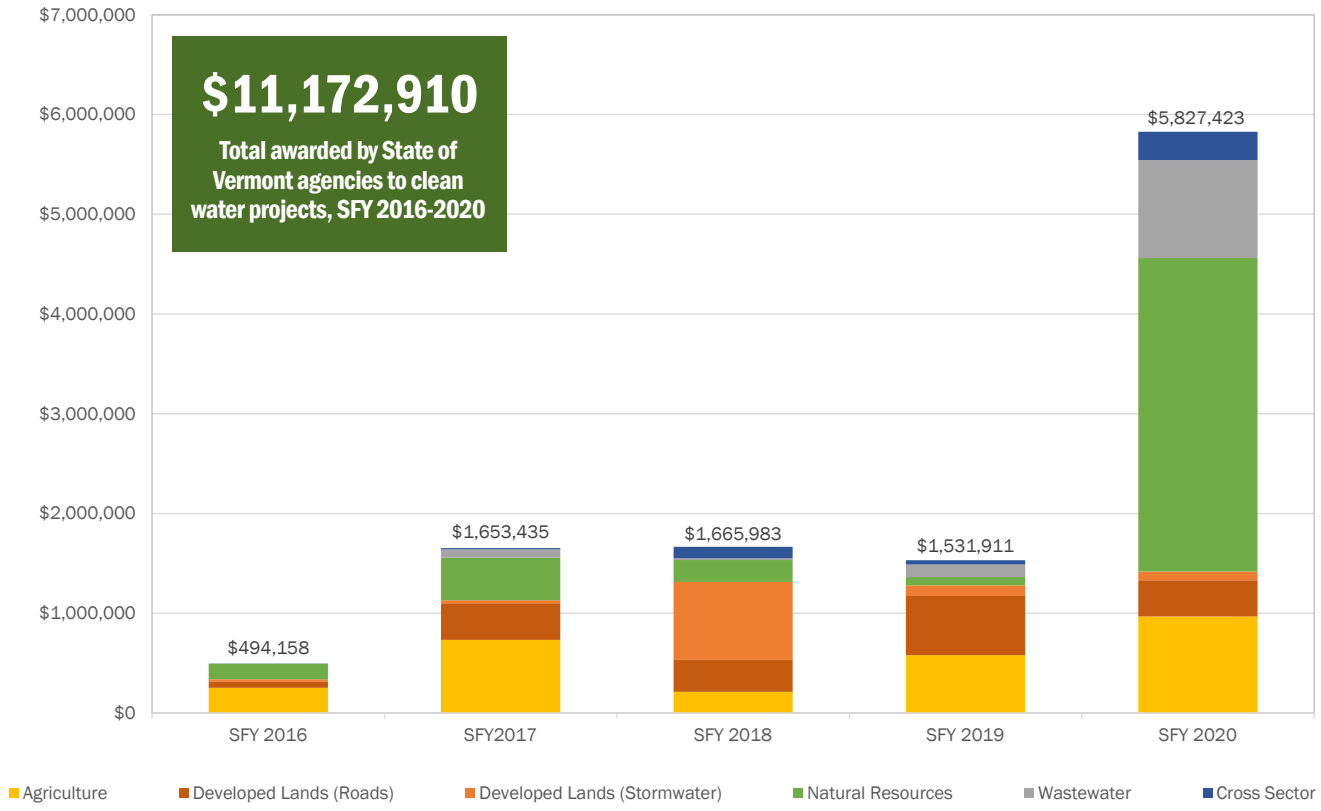
Lamoille River Watershed Investments



Towns in the Watershed

- Belvidere
- Cambridge
- Eden
- Elmore
- Fairfax
- Fletcher
- Greensboro
- Hardwick
- Hyde Park
- Jericho
- Johnson
- Morristown
- Stannard
- Underhill
- Waterville
- Westford
- Wolcott

Dollars awarded by State of Vermont agencies to clean water projects in the Lamoille River watershed, by sector and state fiscal year (SFY).



Lamoille River Watershed Results

State-Funded Project Outputs:

Results of clean water projects funded by State of Vermont agencies completed, SFY 2016-2020, by sector, in the Lamoille River watershed.
Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

STATE AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural land treated by conservation practices	189	87	182	1,057	618	2,133
Acres of agricultural land treated by forest and grass buffers	–	14	100	–	–	114
Acres of pasture with livestock excluded from surface waters	–	9	27	–	10	46
Number of barnyard and production area practices installed	15	30	2	3	9	59
Acres of water quality protections within newly conserved agricultural lands	–	–	42	12	5	59
Estimated acres of agricultural land treated through equipment	–	153	486	817	997	2,453
Acres of agricultural conservation practices reported through technical assistance	–	–	–	–	–	–

NATURAL RESOURCES

STATE NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	1	1	1	8	–	11
Acres of riparian corridor conserved and restored through easements	21	35	35	–	–	91
Acres of floodplain restored	–	–	<1	–	–	–
Acres of lakeshore restored	–	–	–	–	–	–
Stream miles reconnected for stream equilibrium/fish passage	–	–	–	–	–	–
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Acres of forestland conserved with water quality protections	–	15	15	–	–	30
Miles of forest road drainage and erosion control improvements	–	–	–	1	–	1
Number of stream crossings improved	–	–	–	2	–	2
Square feet of eroding gully remediated	–	–	–	27	–	27

STORMWATER

ROADS

STATE DEVELOPED LANDS PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	4	10	14	2	30
Miles of municipal road drainage and erosion control improvements	–	1	7	4	1	13
Number of municipal road drainage and stream culverts replaced	–	1	32	9	11	53
Cubic yards of Class IV road gully erosion remediated	–	–	–	–	–	–
Cubic yards of catch basin outlet erosion remediated	–	–	–	–	–	–
Acres stabilized through use of hydroseeder/mulcher equipment per year	–	–	1	81	–	82

WASTEWATER

STATE WASTEWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Number of combined sewer overflow abatements completed	–	–	–	–	–	–
Number of sewer extensions completed	–	–	–	–	–	–
Number of wastewater collection systems refurbished	–	–	–	–	–	–
Number of wastewater treatment facility refurbished	–	–	–	–	–	–
Number of wastewater treatment facility upgrades completed	–	–	–	–	–	–

Lamoille River Watershed Results

Federal-Funded Project Outputs:

Results of clean water projects funded by federal partners completed, SFY 2016-2020, by sector, in the Lamoille River watershed[3]. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

EXTERNAL PARTNER AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural conservation practices implemented (excluding other practices)[4]	1,733	1,880	2,295	2,041	1,326	9,275
Acres of agricultural land treated by forest and grass buffers[4]	–	–	100	–	–	100
Acres of pasture with livestock excluded from surface waters[4]	–	–	–	–	–	–
Number of barnyard and production area practices installed[4]	89	32	46	5	28	200
Acres of agricultural conservation practices reported through technical assistance[4]	38	–	–	116	53	207

NATURAL RESOURCES

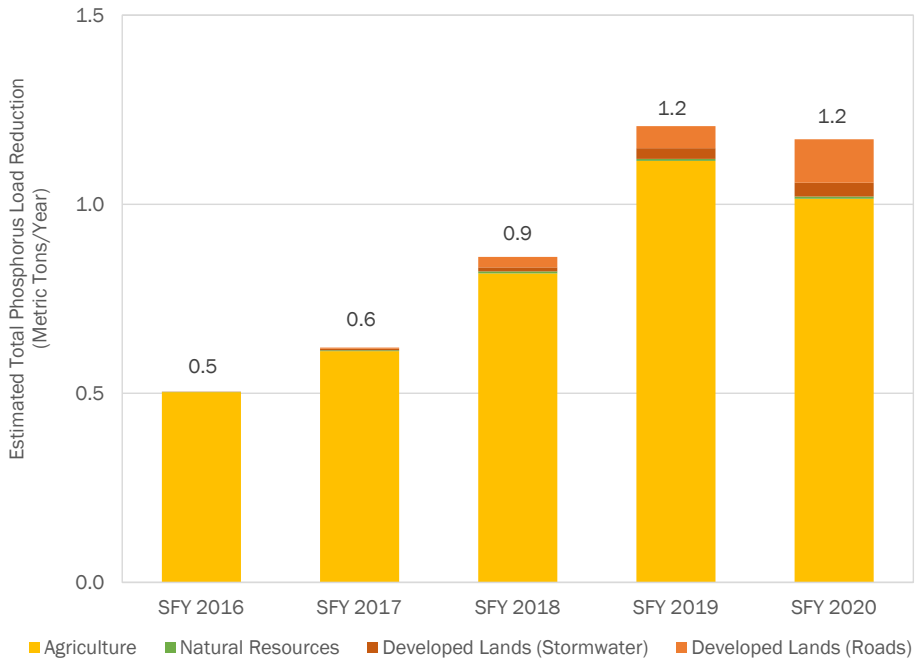
EXTERNAL PARTNER NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	–	–	–	–	–	–
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–

STORMWATER

EXTERNAL PARTNER STORMWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	2	2	–	–	–	4

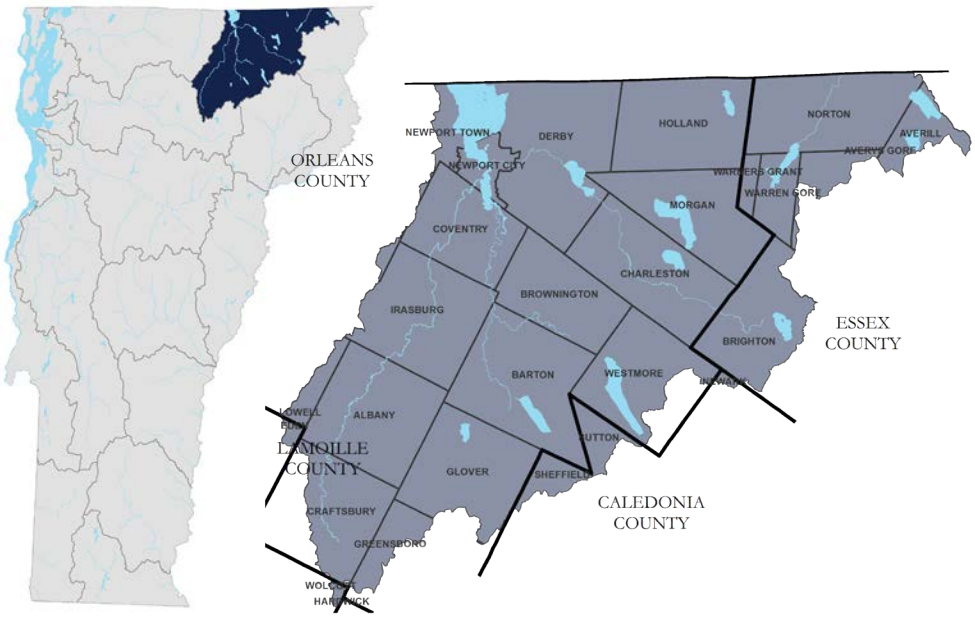
State and Federal Estimated Total Phosphorus Load Reductions:

Annual estimated total phosphorus load reductions (metric tons per year) of clean water projects funded by State of Vermont and federal partners, SFY 2016-2020, by sector, in the Lamoille River watershed. Note: Does not include estimated total phosphorus load reductions of projects funded, but not yet completed.



3 Federal partner funding sources include Lake Champlain Basin Program and U.S. Department of Agriculture Natural Resources Conservation Service
4 Funded by U.S. Department of Agriculture Natural Resources Conservation Service

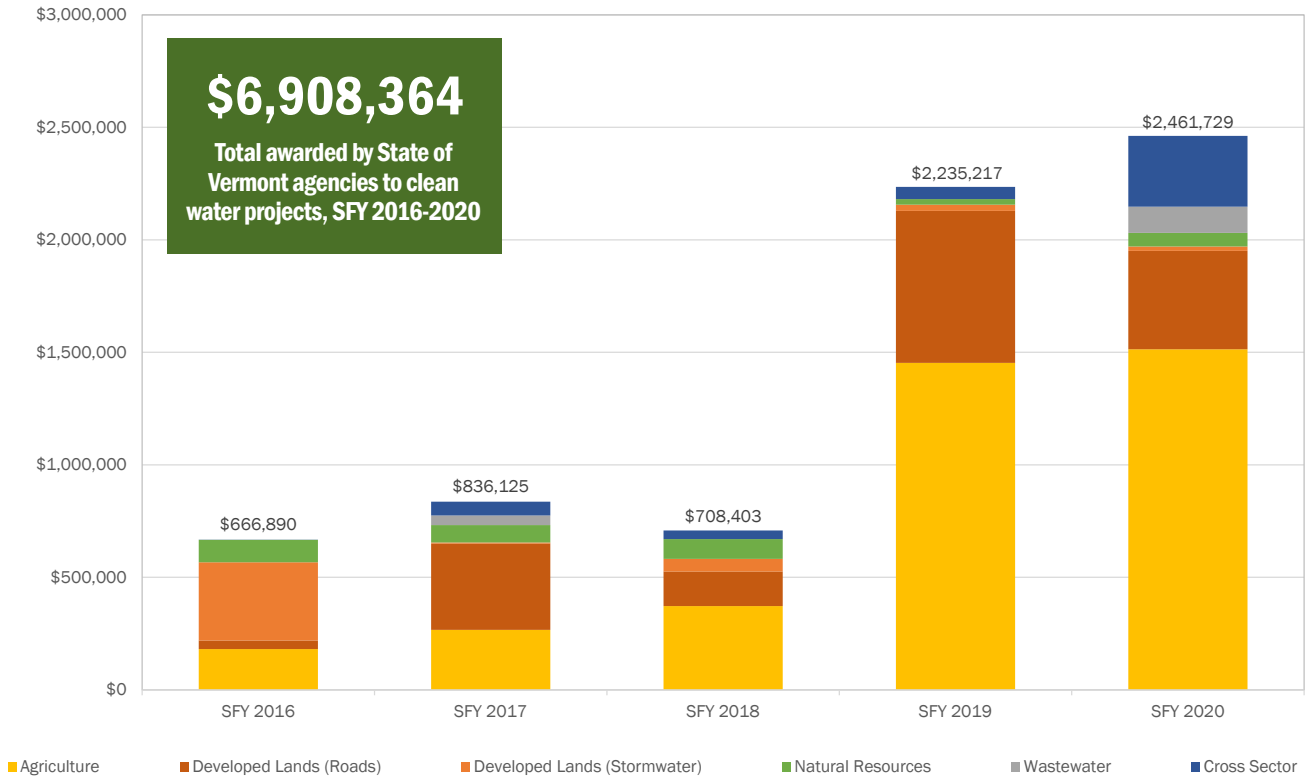
Lake Memphremagog Watershed Investments



Towns in the Watershed

Albany	Holland
Barton	Irasburg
Brighton	Morgan
Brownington	Newport City
Charleston	Norton
Coventry	Warners Grant
Craftsbury	Warren Gore
Derby	Westmore
Glover	

Dollars awarded by State of Vermont agencies to clean water projects in the Lake Memphremagog watershed, by sector and state fiscal year (SFY).



Lake Memphremagog Watershed Results

State-Funded Project Outputs:

Results of clean water projects funded by State of Vermont agencies completed, SFY 2016-2020, by sector, in the Lake Memphremagog watershed. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

STATE AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural land treated by conservation practices	650	146	2,209	903	2,863	6,771
Acres of agricultural land treated by forest and grass buffers	–	–	20	–	–	20
Acres of pasture with livestock excluded from surface waters	–	–	–	–	–	–
Number of barnyard and production area practices installed	7	2	5	17	12	43
Acres of water quality protections within newly conserved agricultural lands	–	–	–	6	–	6
Estimated acres of agricultural land treated through equipment	–	–	22	549	719	1,290
Acres of agricultural conservation practices reported through technical assistance	–	–	–	–	–	–

NATURAL RESOURCES

STATE NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	4	6	15	1	–	26
Acres of riparian corridor conserved and restored through easements	–	–	–	–	–	–
Acres of floodplain restored	–	–	–	–	–	–
Acres of lakeshore restored	<1	–	<1	–	–	–
Stream miles reconnected for stream equilibrium/fish passage	–	–	–	–	–	–
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Acres of forestland conserved with water quality protections	–	29	–	–	–	29
Miles of forest road drainage and erosion control improvements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–
Square feet of eroding gully remediated	–	–	–	–	200	200

STORMWATER

ROADS

STATE DEVELOPED LANDS PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	7	–	–	7
Miles of municipal road drainage and erosion control improvements	–	3	4	10	5	22
Number of municipal road drainage and stream culverts replaced	–	11	12	17	41	81
Cubic yards of Class IV road gully erosion remediated	–	–	–	–	–	–
Cubic yards of catch basin outlet erosion remediated	–	–	–	–	–	–
Acres stabilized through use of hydroseeder/mulcher equipment per year	–	–	1	8	–	9

WASTEWATER

STATE WASTEWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Number of combined sewer overflow abatements completed	–	–	–	–	–	–
Number of sewer extensions completed	–	–	–	–	–	–
Number of wastewater collection systems refurbished	–	–	–	–	–	–
Number of wastewater treatment facility refurbished	–	–	–	–	–	–
Number of wastewater treatment facility upgrades completed	–	–	–	–	–	–

Lake Memphremagog Watershed Results

Federal-Funded Project Outputs:

Results of clean water projects funded by federal partners completed, SFY 2016-2020, by sector, in the Lake Memphremagog watershed[3]. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

EXTERNAL PARTNER AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural conservation practices implemented (excluding other practices)[4]	172	2,331	2,673	4,214	1,678	11,068
Acres of agricultural land treated by forest and grass buffers[4]	–	–	–	–	–	–
Acres of pasture with livestock excluded from surface waters[4]	–	–	–	–	–	–
Number of barnyard and production area practices installed[4]	35	59	18	85	74	271
Acres of agricultural conservation practices reported through technical assistance[4]	–	–	–	874	3	877

NATURAL RESOURCES

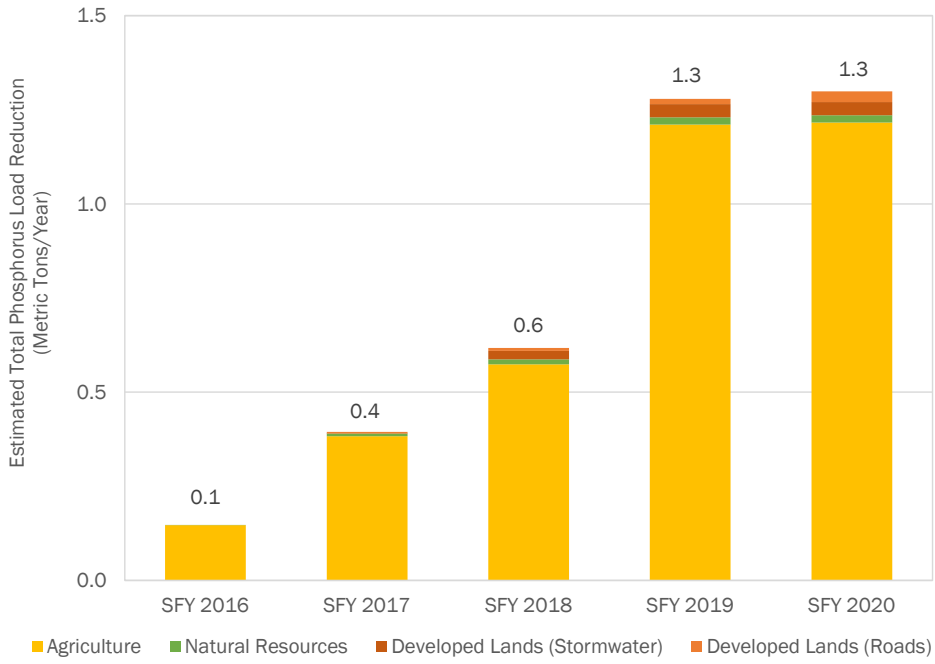
EXTERNAL PARTNER NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	–	–	–	–	–	–
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–

STORMWATER

EXTERNAL PARTNER STORMWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	–	–	–	–

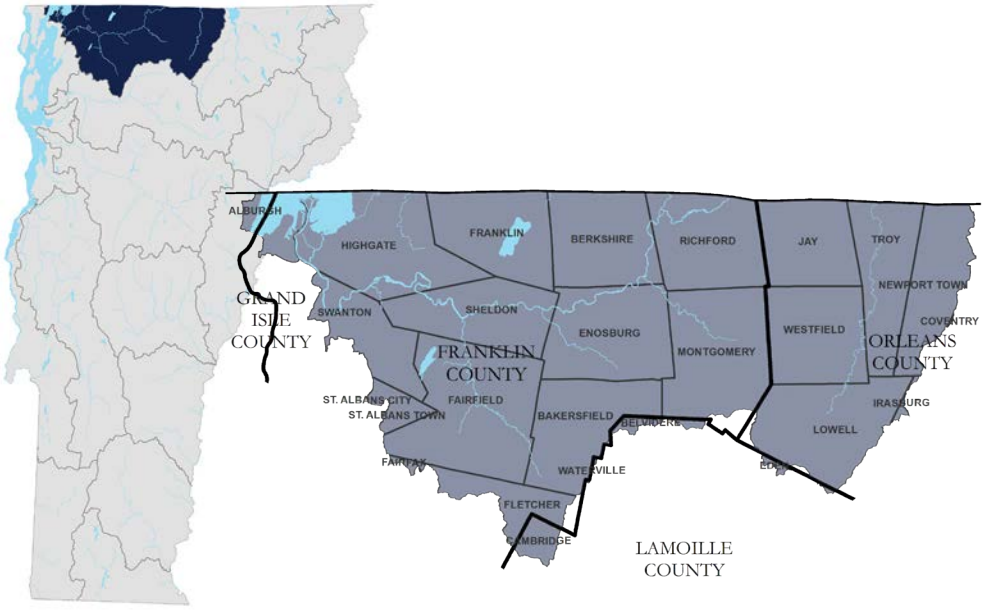
State and Federal Estimated Total Phosphorus Load Reductions:

Annual estimated total phosphorus load reductions (metric tons per year) of clean water projects funded by State of Vermont and federal partners, SFY 2016-2020, by sector, in the Lake Memphremagog watershed. Note: Does not include estimated total phosphorus load reductions of projects funded, but not yet completed.



3 Federal partner funding sources include Lake Champlain Basin Program and U.S. Department of Agriculture Natural Resources Conservation Service
4 Funded by U.S. Department of Agriculture Natural Resources Conservation Service

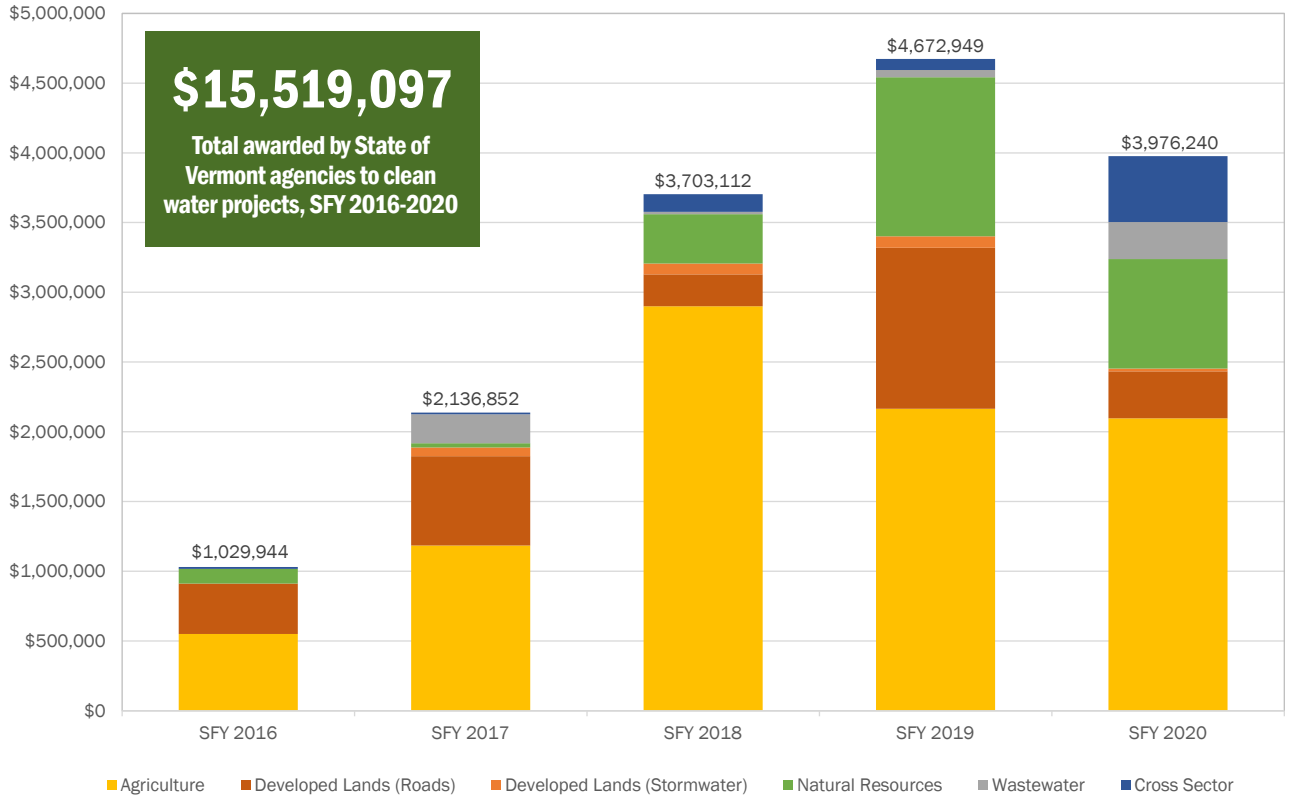
Missisquoi Bay Watershed Investments



Towns in the Watershed

Bakersfield	Montgomery
Berkshire	Newport Town
Enosburg	Richford
Fairfield	Sheldon
Franklin	Swanton
Highgate	Troy
Jay	Westfield
Lowell	

Dollars awarded by State of Vermont agencies to clean water projects in the Missisquoi Bay watershed, by sector and state fiscal year (SFY).



Missisquoi Bay Watershed Results

State-Funded Project Outputs:

Results of clean water projects funded by State of Vermont agencies completed, SFY 2016-2020, by sector, in the Missisquoi Bay watershed.
Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

STATE AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural land treated by conservation practices	210	760	2,794	4,545	4,531	12,840
Acres of agricultural land treated by forest and grass buffers	97	–	85	–	–	182
Acres of pasture with livestock excluded from surface waters	97	–	47	47	–	191
Number of barnyard and production area practices installed	9	15	33	28	31	116
Acres of water quality protections within newly conserved agricultural lands	–	36	3	115	14	168
Estimated acres of agricultural land treated through equipment	–	745	1,193	4,545	3,704	10,187
Acres of agricultural conservation practices reported through technical assistance	–	–	–	465	–	465

NATURAL RESOURCES

STATE NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	–	1	12	3	4	20
Acres of riparian corridor conserved and restored through easements	–	38	51	–	48	137
Acres of floodplain restored	–	–	–	–	–	–
Acres of lakeshore restored	–	–	–	–	–	–
Stream miles reconnected for stream equilibrium/fish passage	–	–	1	–	–	1
Acres of wetland conserved and restored through easements	–	–	–	–	87	87
Acres of forestland conserved with water quality protections	–	–	–	–	–	–
Miles of forest road drainage and erosion control improvements	–	–	–	5	–	5
Number of stream crossings improved	–	–	–	–	–	–
Square feet of eroding gully remediated	–	–	–	27	–	27

STORMWATER

ROADS

STATE DEVELOPED LANDS PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	20	–	–	–	20
Miles of municipal road drainage and erosion control improvements	<1	<1	4	3	6	13
Number of municipal road drainage and stream culverts replaced	–	9	7	6	8	30
Cubic yards of Class IV road gully erosion remediated	–	–	–	–	–	–
Cubic yards of catch basin outlet erosion remediated	–	–	1	–	–	1
Acres stabilized through use of hydroseeder/mulcher equipment per year	–	–	–	8	–	8

WASTEWATER

STATE WASTEWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Number of combined sewer overflow abatements completed	–	–	–	–	–	–
Number of sewer extensions completed	–	–	–	–	–	–
Number of wastewater collection systems refurbished	–	–	–	–	–	–
Number of wastewater treatment facility refurbished	–	–	–	–	–	–
Number of wastewater treatment facility upgrades completed	–	–	1	–	–	1

Missisquoi Bay Watershed Results

Federal-Funded Project Outputs:

Results of clean water projects funded by federal partners completed, SFY 2016-2020, by sector, in the Missisquoi Bay watershed[3]. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

EXTERNAL PARTNER AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural conservation practices implemented (excluding other practices)[4]	8,889	8,568	9,534	6,718	6,979	40,688
Acres of agricultural land treated by forest and grass buffers[4]	39	4	–	–	3	46
Acres of pasture with livestock excluded from surface waters[4]	–	–	–	–	–	–
Number of barnyard and production area practices installed[4]	130	125	92	127	160	634
Acres of agricultural conservation practices reported through technical assistance[4]	73	15	806	700	135	1,729

NATURAL RESOURCES

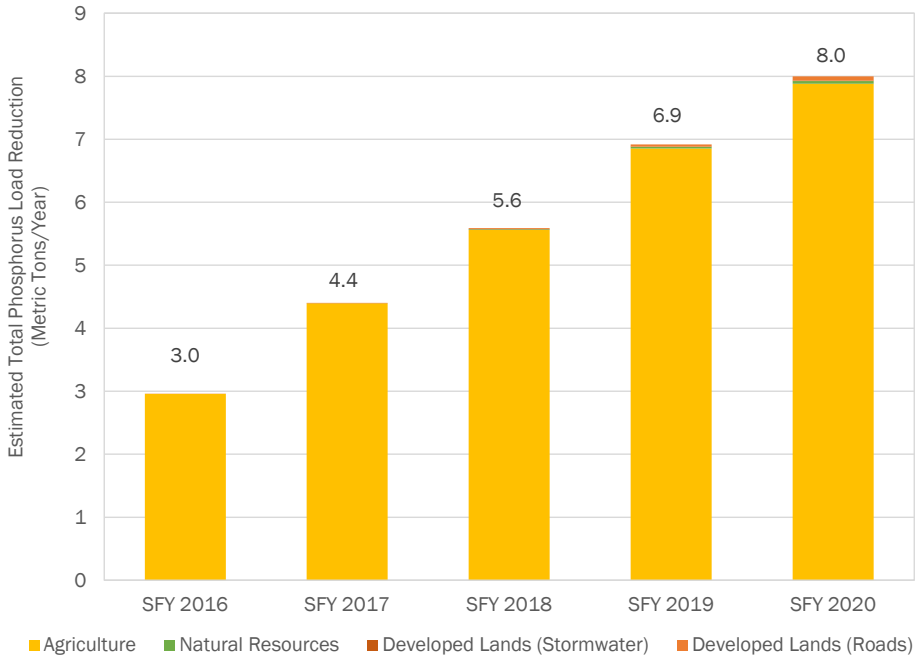
EXTERNAL PARTNER NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	–	–	–	–	2	2
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	1	1

STORMWATER

EXTERNAL PARTNER STORMWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	–	–	–	–

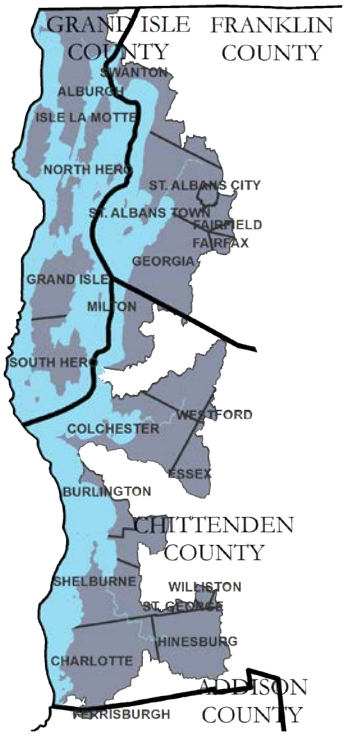
State and Federal Estimated Total Phosphorus Load Reductions:

Annual estimated total phosphorus load reductions (metric tons per year) of clean water projects funded by State of Vermont and federal partners, SFY 2016-2020, by sector, in the Missisquoi Bay watershed. Note: Does not include estimated total phosphorus load reductions of projects funded, but not yet completed.



3 Federal partner funding sources include Lake Champlain Basin Program and U.S. Department of Agriculture Natural Resources Conservation Service
4 Funded by U.S. Department of Agriculture Natural Resources Conservation Service

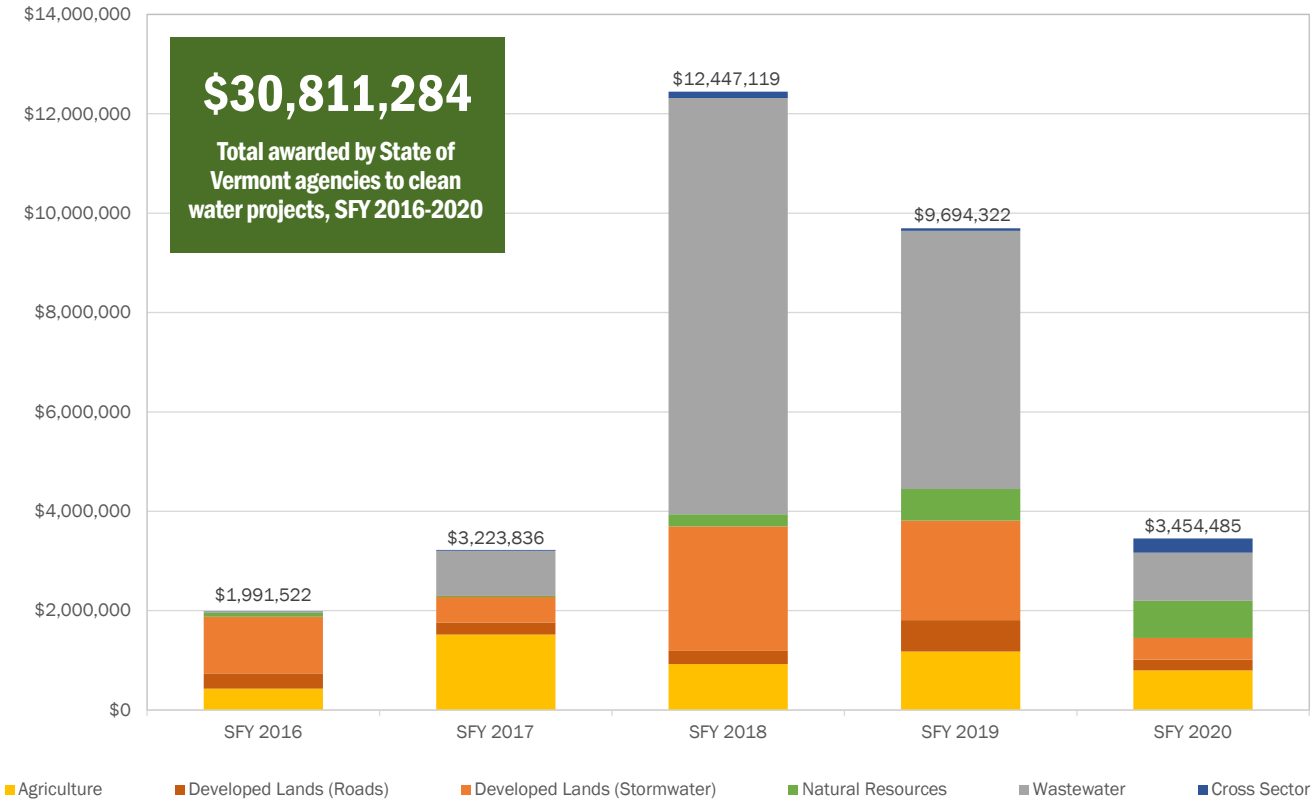
Northern Lake Champlain Watershed Investments



Towns in the Watershed

Alburgh	Milton
Burlington	North Hero
Charlotte	Shelburne
Colchester	South Burlington
Georgia	South Hero
Grand Isle	St. Albans City
Hinesburg	St. Albans Town
Isle La Motte	

Dollars awarded by State of Vermont agencies to clean water projects in the Northern Lake Champlain watershed, by sector and state fiscal year (SFY).



Northern Lake Champlain Watershed Results

State-Funded Project Outputs:

Results of clean water projects funded by State of Vermont agencies completed, SFY 2016-2020, by sector, in the Northern Lake Champlain watershed. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

STATE AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural land treated by conservation practices	229	615	457	1,840	2,045	5,186
Acres of agricultural land treated by forest and grass buffers	–	81	–	–	–	81
Acres of pasture with livestock excluded from surface waters	–	81	–	–	–	81
Number of barnyard and production area practices installed	17	3	8	4	9	41
Acres of water quality protections within newly conserved agricultural lands	–	20	14	8	140	182
Estimated acres of agricultural land treated through equipment	–	153	2,075	3,217	2,850	8,295
Acres of agricultural conservation practices reported through technical assistance	–	–	1	41	13	55

NATURAL RESOURCES

STATE NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	–	9	4	3	–	16
Acres of riparian corridor conserved and restored through easements	–	–	–	–	–	–
Acres of floodplain restored	–	–	–	–	5	5
Acres of lakeshore restored	–	–	–	–	–	–
Stream miles reconnected for stream equilibrium/fish passage	–	–	–	–	30	30
Acres of wetland conserved and restored through easements	–	–	–	17	–	17
Acres of forestland conserved with water quality protections	–	–	8	–	3	11
Miles of forest road drainage and erosion control improvements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–
Square feet of eroding gully remediated	–	–	7,100	27	–	7,127

STORMWATER

ROADS

STATE DEVELOPED LANDS PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	<1	–	1	72	8	81
Miles of municipal road drainage and erosion control improvements	–	–	2	5	<1	7
Number of municipal road drainage and stream culverts replaced	–	–	2	17	–	19
Cubic yards of Class IV road gully erosion remediated	–	–	–	–	–	–
Cubic yards of catch basin outlet erosion remediated	–	–	–	–	–	–
Acres stabilized through use of hydroseeder/mulcher equipment per year	–	–	–	–	–	–

WASTEWATER

STATE WASTEWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Number of combined sewer overflow abatements completed	–	–	–	–	2	2
Number of sewer extensions completed	–	–	–	–	–	–
Number of wastewater collection systems refurbished	–	–	–	–	1	1
Number of wastewater treatment facility refurbished	–	–	–	–	–	–
Number of wastewater treatment facility upgrades completed	–	–	–	–	–	–

Northern Lake Champlain Watershed Results

Federal-Funded Project Outputs:

Results of clean water projects funded by federal partners completed, SFY 2016-2020, by sector, in the Northern Lake Champlain watershed[3]. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

EXTERNAL PARTNER AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural conservation practices implemented (excluding other practices)[4]	5,111	5,942	6,439	4,760	3,252	25,504
Acres of agricultural land treated by forest and grass buffers[4]	17	–	–	–	–	17
Acres of pasture with livestock excluded from surface waters[4]	7	–	–	–	–	7
Number of barnyard and production area practices installed[4]	80	63	56	66	39	304
Acres of agricultural conservation practices reported through technical assistance[4]	930	122	94	680	68	1,894

NATURAL RESOURCES

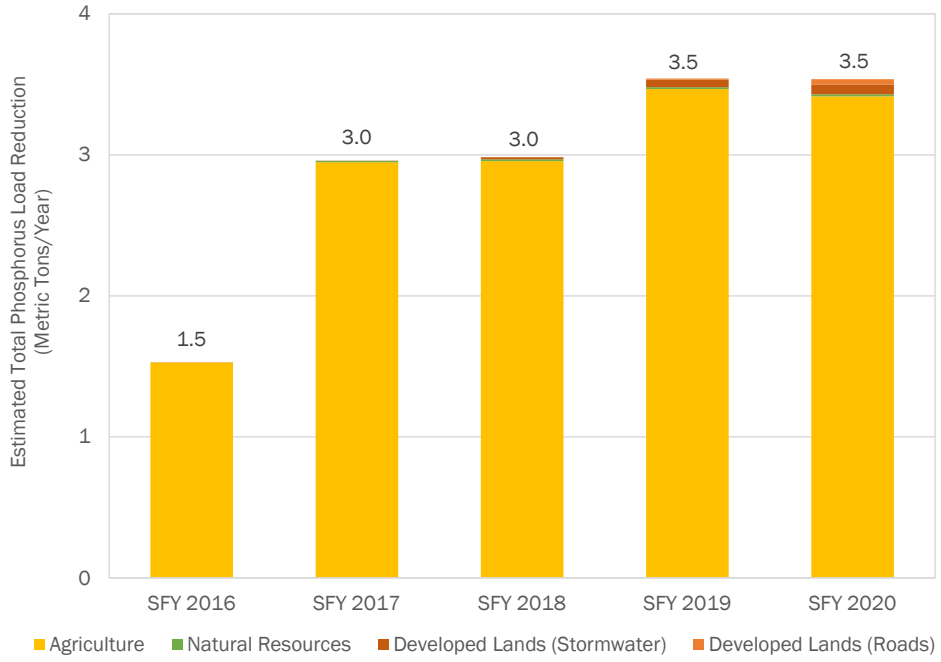
EXTERNAL PARTNER NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	–	–	–	2	–	2
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–

STORMWATER

EXTERNAL PARTNER STORMWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	2	1	–	6	9

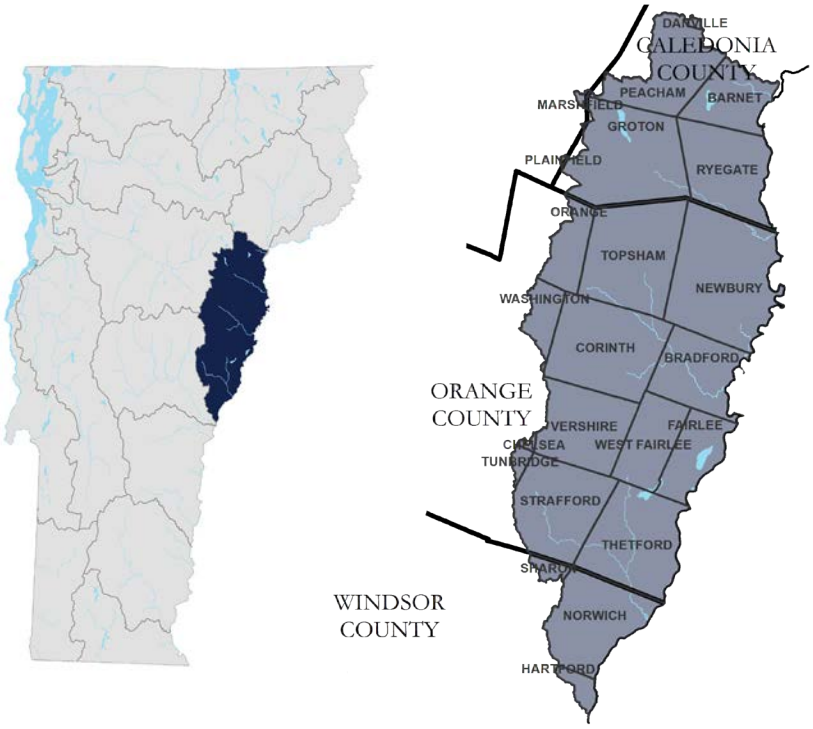
State and Federal Estimated Total Phosphorus Load Reductions:

Annual estimated total phosphorus load reductions (metric tons per year) of clean water projects funded by State of Vermont and federal partners, SFY 2016-2020, by sector, in the Northern Lake Champlain watershed. Note: Does not include estimated total phosphorus load reductions of projects funded, but not yet completed.



3 Federal partner funding sources include Lake Champlain Basin Program and U.S. Department of Agriculture Natural Resources Conservation Service
4 Funded by U.S. Department of Agriculture Natural Resources Conservation Service

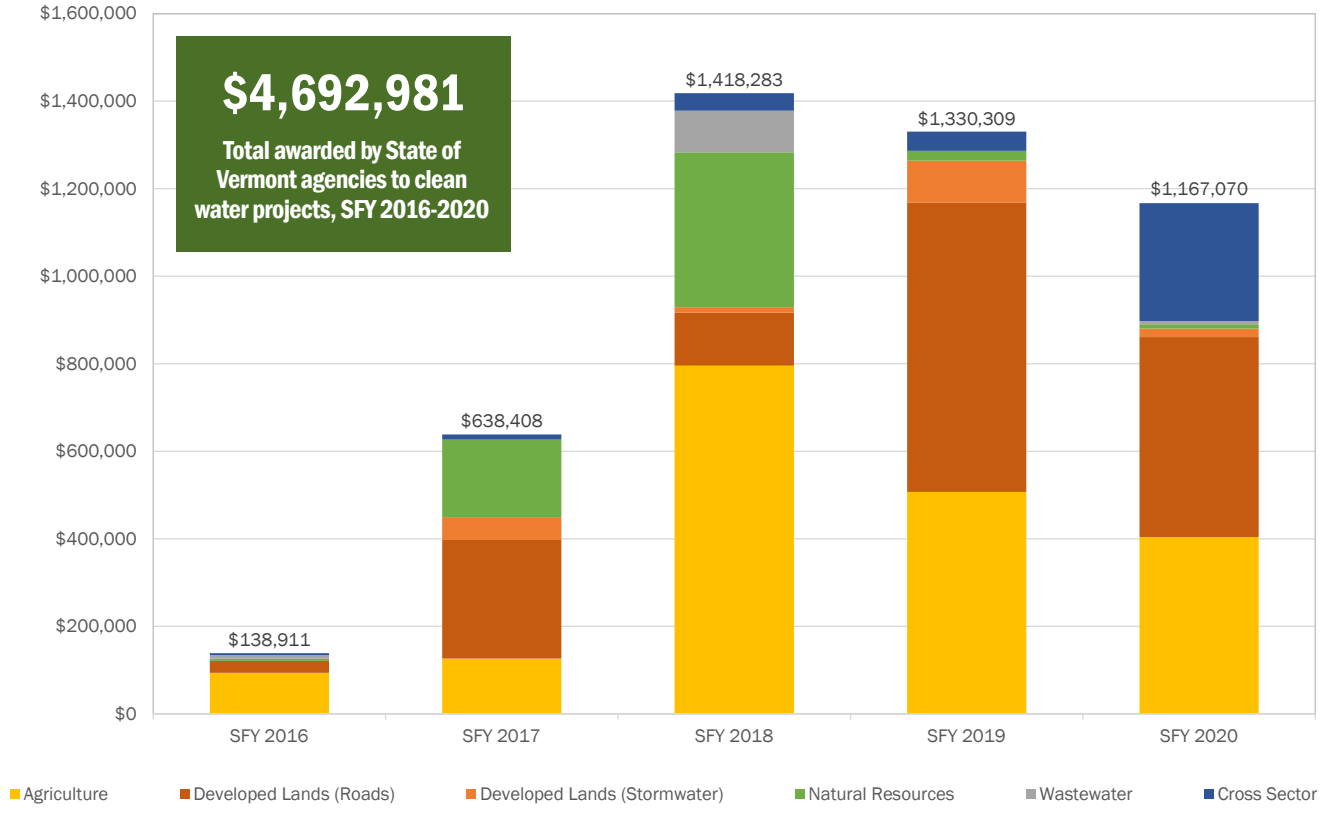
Ompompanoosuc, Stevens, Waits, Wells Rivers Watershed Investments



Towns in the Watershed

Barnet	Peacham
Bradford	Ryegate
Corinth	Strafford
Fairlee	Thetford
Groton	Topsham
Newbury	Vershire
Norwich	West Fairlee

Dollars awarded by State of Vermont agencies to clean water projects in the Ompompanoosuc, Stevens, Waits, Wells Rivers watershed, by sector and state fiscal year (SFY).



Ompompanoosuc, Stevens, Waits, Wells Rivers Watershed Results

State-Funded Project Outputs:

Results of clean water projects funded by State of Vermont agencies completed, SFY 2016-2020, by sector, in the Ompompanoosuc, Stevens, Waits, Wells Rivers watershed. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

STATE AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural land treated by conservation practices	508	177	–	117	513	1,315
Acres of agricultural land treated by forest and grass buffers	40	67	–	–	–	107
Acres of pasture with livestock excluded from surface waters	40	22	–	–	–	62
Number of barnyard and production area practices installed	1	2	11	3	3	20
Acres of water quality protections within newly conserved agricultural lands	–	–	27	7	–	34
Estimated acres of agricultural land treated through equipment	–	266	–	472	290	1,028
Acres of agricultural conservation practices reported through technical assistance	–	–	–	7	10	17

NATURAL RESOURCES

STATE NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	2	1	13	3	<1	19
Acres of riparian corridor conserved and restored through easements	–	32	87	–	–	119
Acres of floodplain restored	–	–	–	–	–	–
Acres of lakeshore restored	–	–	–	–	–	–
Stream miles reconnected for stream equilibrium/fish passage	28	–	–	44	–	72
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Acres of forestland conserved with water quality protections	–	–	–	–	–	–
Miles of forest road drainage and erosion control improvements	–	–	–	1	–	1
Number of stream crossings improved	–	–	–	6	–	6
Square feet of eroding gully remediated	–	–	–	–	–	–

STORMWATER

ROADS

STATE DEVELOPED LANDS PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	–	–	–	–
Miles of municipal road drainage and erosion control improvements	–	<1	4	7	2	13
Number of municipal road drainage and stream culverts replaced	–	4	–	25	3	32
Cubic yards of Class IV road gully erosion remediated	–	–	104	33	–	137
Cubic yards of catch basin outlet erosion remediated	–	–	–	–	–	–
Acres stabilized through use of hydroseeder/mulcher equipment per year	–	–	1	–	–	1

WASTEWATER

STATE WASTEWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Number of combined sewer overflow abatements completed	–	–	–	–	–	–
Number of sewer extensions completed	–	–	–	–	–	–
Number of wastewater collection systems refurbished	–	–	–	–	–	–
Number of wastewater treatment facility refurbished	–	–	1	–	–	1
Number of wastewater treatment facility upgrades completed	–	–	–	–	–	–

Ompompanoosuc, Stevens, Waits, Wells Rivers Watershed Results

Federal-Funded Project Outputs:

Results of clean water projects funded by federal partners completed, SFY 2016-2020, by sector, in the Ompompanoosuc, Stevens, Waits, Wells Rivers watershed[3]. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

EXTERNAL PARTNER AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural conservation practices implemented (excluding other practices)[4]	705	1,867	2,908	2,761	1,499	9,740
Acres of agricultural land treated by forest and grass buffers[4]	–	66	–	–	8	74
Acres of pasture with livestock excluded from surface waters[4]	–	3	–	–	–	3
Number of barnyard and production area practices installed[4]	20	4	64	30	13	131
Acres of agricultural conservation practices reported through technical assistance[4]	15	78	<1	–	–	93

NATURAL RESOURCES

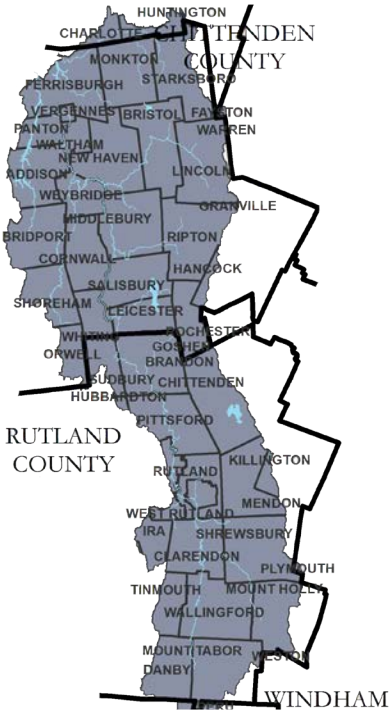
EXTERNAL PARTNER NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	–	–	–	–	–	–
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–

STORMWATER

EXTERNAL PARTNER STORMWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	–	–	–	–

3 Federal partner funding sources include Lake Champlain Basin Program and U.S. Department of Agriculture Natural Resources Conservation Service
4 Funded by U.S. Department of Agriculture Natural Resources Conservation Service

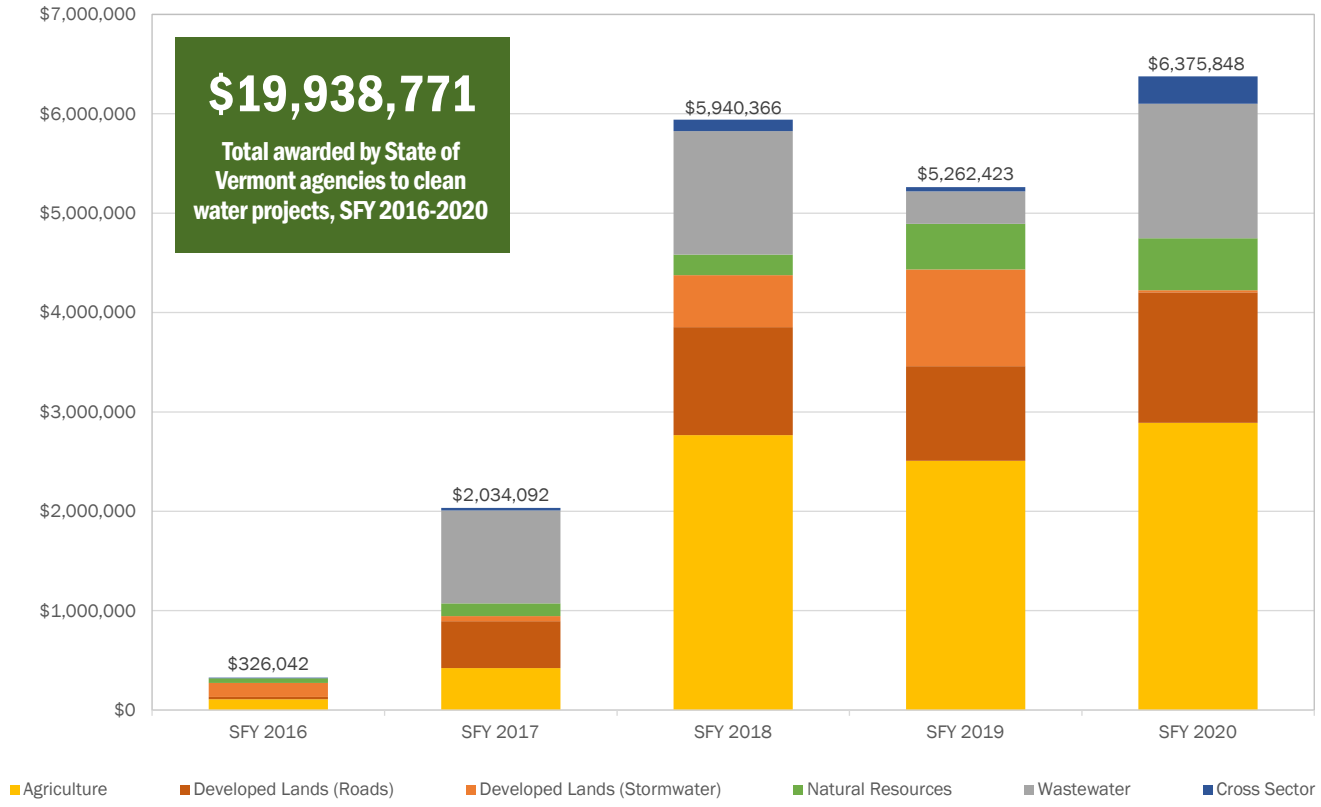
Otter Creek Watershed Investments



Towns in the Watershed

Addison	Lincoln	Rutland City
Brandon	Mendon	Salisbury
Bridport	Middlebury	Shoreham
Bristol	Monkton	Shrewsbury
Chittenden	Mount Holly	Starksboro
Clarendon	Mount Tabor	Sudbury
Cornwall	New Haven	Tinmouth
Danby	Panton	Vergennes
Ferrisburgh	Pittsford	Wallingford
Goshen	Proctor	Waltham
Ira	Ripton	Weybridge
Leicester	Rutland	Whiting

Dollars awarded by State of Vermont agencies to clean water projects in the Otter Creek watershed, by sector and state fiscal year (SFY).



Otter Creek Watershed Results

State-Funded Project Outputs:

Results of clean water projects funded by State of Vermont agencies completed, SFY 2016-2020, by sector, in the Otter Creek watershed. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

STATE AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural land treated by conservation practices	995	695	1,127	2,756	3,101	8,674
Acres of agricultural land treated by forest and grass buffers	–	–	23	–	–	23
Acres of pasture with livestock excluded from surface waters	–	–	23	–	–	23
Number of barnyard and production area practices installed	–	5	12	8	21	46
Acres of water quality protections within newly conserved agricultural lands	–	–	33	297	–	330
Estimated acres of agricultural land treated through equipment	–	153	696	1,918	2,115	4,882
Acres of agricultural conservation practices reported through technical assistance	–	–	14	198	651	863

NATURAL RESOURCES

STATE NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	8	1	3	5	–	17
Acres of riparian corridor conserved and restored through easements	–	–	–	–	–	–
Acres of floodplain restored	–	–	–	–	–	–
Acres of lakeshore restored	–	–	–	–	–	–
Stream miles reconnected for stream equilibrium/fish passage	–	–	–	–	–	–
Acres of wetland conserved and restored through easements	–	131	–	182	80	393
Acres of forestland conserved with water quality protections	–	–	–	–	–	–
Miles of forest road drainage and erosion control improvements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–
Square feet of eroding gully remediated	–	–	–	–	–	–

STORMWATER

ROADS

STATE DEVELOPED LANDS PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	10	2	9	–	21
Miles of municipal road drainage and erosion control improvements	–	<1	7	9	2	18
Number of municipal road drainage and stream culverts replaced	–	5	6	31	9	51
Cubic yards of Class IV road gully erosion remediated	–	–	–	–	–	–
Cubic yards of catch basin outlet erosion remediated	–	–	–	–	–	–
Acres stabilized through use of hydroseeder/mulcher equipment per year	–	–	–	–	–	–

WASTEWATER

STATE WASTEWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Number of combined sewer overflow abatements completed	1	–	–	–	–	1
Number of sewer extensions completed	–	–	–	–	–	–
Number of wastewater collection systems refurbished	–	–	–	1	–	1
Number of wastewater treatment facility refurbished	–	–	–	–	–	–
Number of wastewater treatment facility upgrades completed	–	–	–	–	–	–

Otter Creek Watershed Results

Federal-Funded Project Outputs:

Results of clean water projects funded by federal partners completed, SFY 2016-2020, by sector, in the Otter Creek watershed[3]. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

EXTERNAL PARTNER AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural conservation practices implemented (excluding other practices)[4]	8,237	11,214	9,409	10,424	5,554	44,838
Acres of agricultural land treated by forest and grass buffers[4]	–	3	–	–	–	3
Acres of pasture with livestock excluded from surface waters[4]	–	–	–	–	–	–
Number of barnyard and production area practices installed[4]	151	90	98	59	73	471
Acres of agricultural conservation practices reported through technical assistance[4]	132	479	4,134	4,520	3,448	12,713

NATURAL RESOURCES

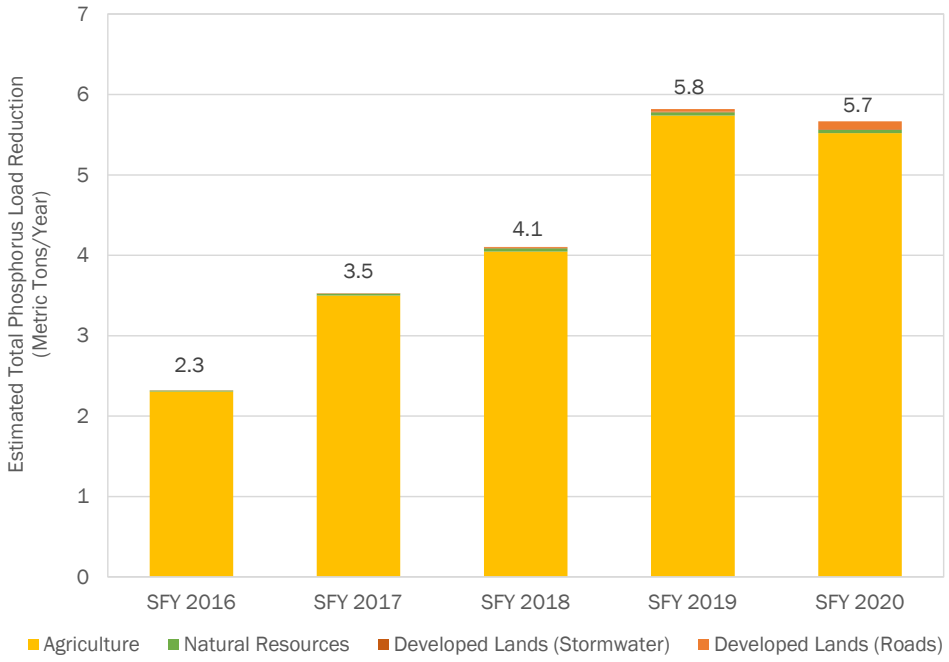
EXTERNAL PARTNER NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	–	–	–	–	–	–
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–

STORMWATER

EXTERNAL PARTNER STORMWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	2	–	–	–	–	2

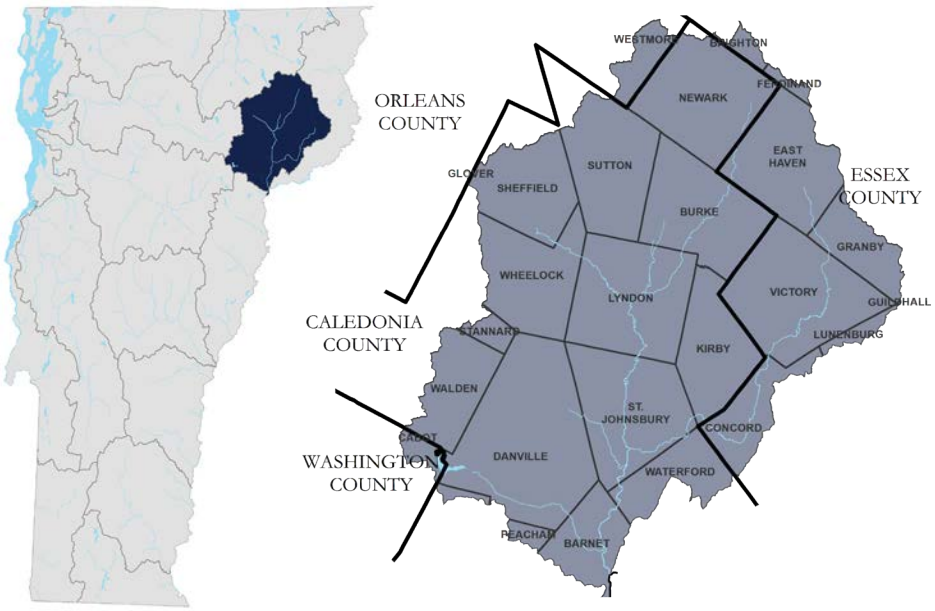
State and Federal Estimated Total Phosphorus Load Reductions:

Annual estimated total phosphorus load reductions (metric tons per year) of clean water projects funded by State of Vermont and federal partners, SFY 2016-2020, by sector, in the Otter Creek watershed. Note: Does not include estimated total phosphorus load reductions of projects funded, but not yet completed.



3 Federal partner funding sources include Lake Champlain Basin Program and U.S. Department of Agriculture Natural Resources Conservation Service
4 Funded by U.S. Department of Agriculture Natural Resources Conservation Service

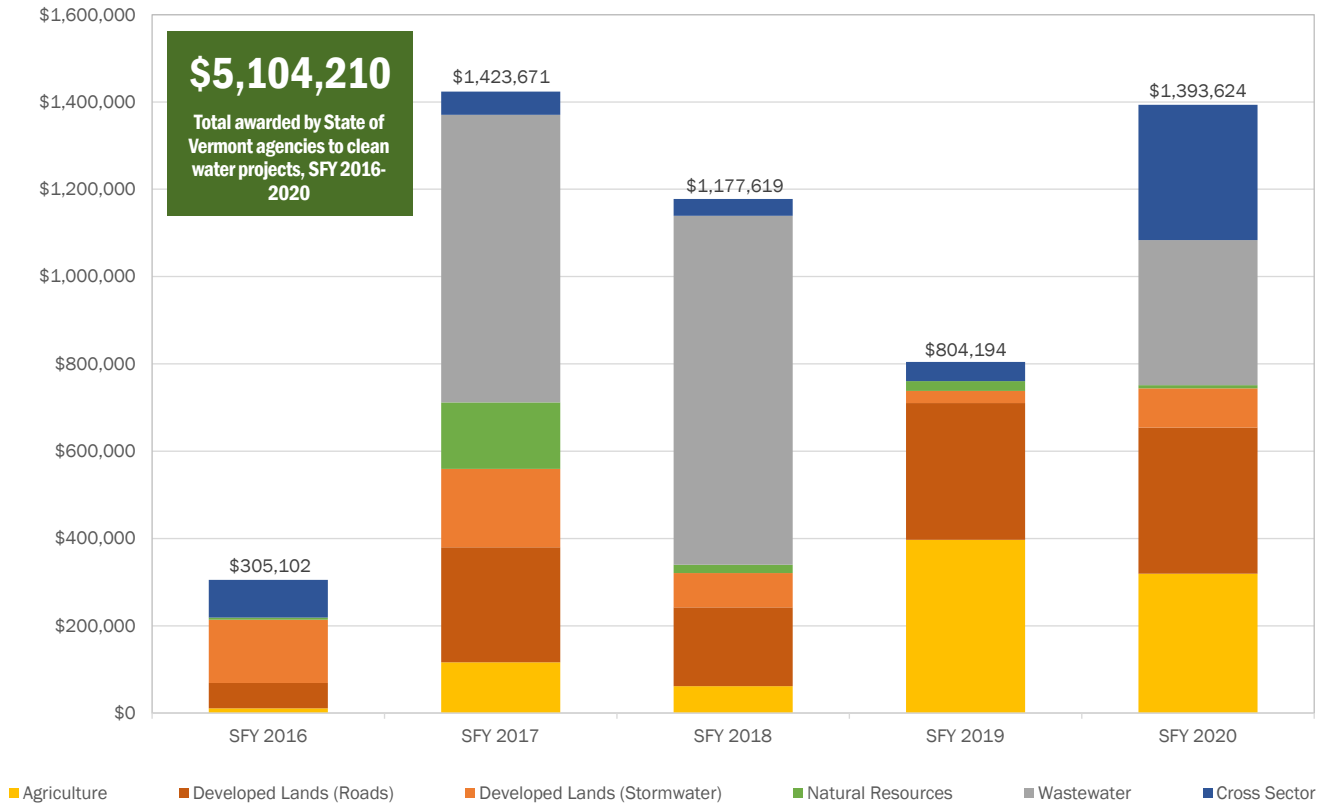
Passumpsic River Watershed Investments



Towns in the Watershed

Burke	Sheffield
Danville	St. Johnsbury
East Haven	Sutton
Kirby	Victory
Lyndon	Walden
Newark	Wheelock

Dollars awarded by State of Vermont agencies to clean water projects in the Passumpsic River watershed, by sector and state fiscal year (SFY).



Passumpsic River Watershed Results

State-Funded Project Outputs:

Results of clean water projects funded by State of Vermont agencies completed, SFY 2016-2020, by sector, in the Passumpsic River watershed.
Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

STATE AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural land treated by conservation practices	–	–	–	190	721	911
Acres of agricultural land treated by forest and grass buffers	30	–	–	–	–	30
Acres of pasture with livestock excluded from surface waters	30	–	–	–	–	30
Number of barnyard and production area practices installed	–	–	1	1	11	13
Acres of water quality protections within newly conserved agricultural lands	–	–	–	–	–	–
Estimated acres of agricultural land treated through equipment	–	–	–	58	239	298
Acres of agricultural conservation practices reported through technical assistance	–	–	–	–	–	–

NATURAL RESOURCES

STATE NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	1	1	–	1	–	3
Acres of riparian corridor conserved and restored through easements	–	–	–	–	–	–
Acres of floodplain restored	–	–	–	<1	–	–
Acres of lakeshore restored	–	–	–	–	–	–
Stream miles reconnected for stream equilibrium/fish passage	–	–	99	–	–	99
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Acres of forestland conserved with water quality protections	–	–	–	–	–	–
Miles of forest road drainage and erosion control improvements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–
Square feet of eroding gully remediated	–	–	–	–	–	–

STORMWATER

ROADS

STATE DEVELOPED LANDS PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	41	–	3	<1	45
Miles of municipal road drainage and erosion control improvements	–	1	4	4	1	10
Number of municipal road drainage and stream culverts replaced	–	16	18	15	5	54
Cubic yards of Class IV road gully erosion remediated	–	–	–	–	–	–
Cubic yards of catch basin outlet erosion remediated	–	–	–	57	–	57
Acres stabilized through use of hydroseeder/mulcher equipment per year	–	–	1	–	–	1

WASTEWATER

STATE WASTEWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Number of combined sewer overflow abatements completed	1	–	–	–	–	1
Number of sewer extensions completed	–	–	–	–	–	–
Number of wastewater collection systems refurbished	–	–	–	–	–	–
Number of wastewater treatment facility refurbished	–	–	–	–	–	–
Number of wastewater treatment facility upgrades completed	–	–	–	–	–	–

Passumpsic River Watershed Results

Federal-Funded Project Outputs:

Results of clean water projects funded by federal partners completed, SFY 2016-2020, by sector, in the Passumpsic River watershed[3]. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

EXTERNAL PARTNER AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural conservation practices implemented (excluding other practices)[4]	1,371	1,710	2,081	1,599	1,184	7,945
Acres of agricultural land treated by forest and grass buffers[4]	29	–	–	–	–	29
Acres of pasture with livestock excluded from surface waters[4]	–	–	–	–	–	–
Number of barnyard and production area practices installed[4]	37	36	10	36	12	131
Acres of agricultural conservation practices reported through technical assistance[4]	738	438	379	450	22	2,027

NATURAL RESOURCES

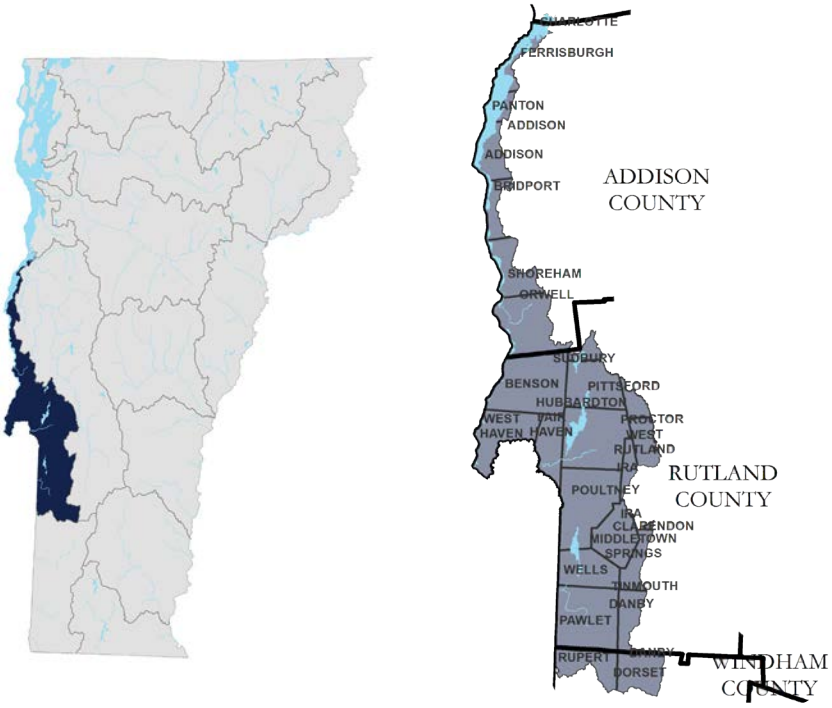
EXTERNAL PARTNER NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	–	–	–	–	–	–
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–

STORMWATER

EXTERNAL PARTNER STORMWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	–	–	–	–

3 Federal partner funding sources include Lake Champlain Basin Program and U.S. Department of Agriculture Natural Resources Conservation Service
4 Funded by U.S. Department of Agriculture Natural Resources Conservation Service

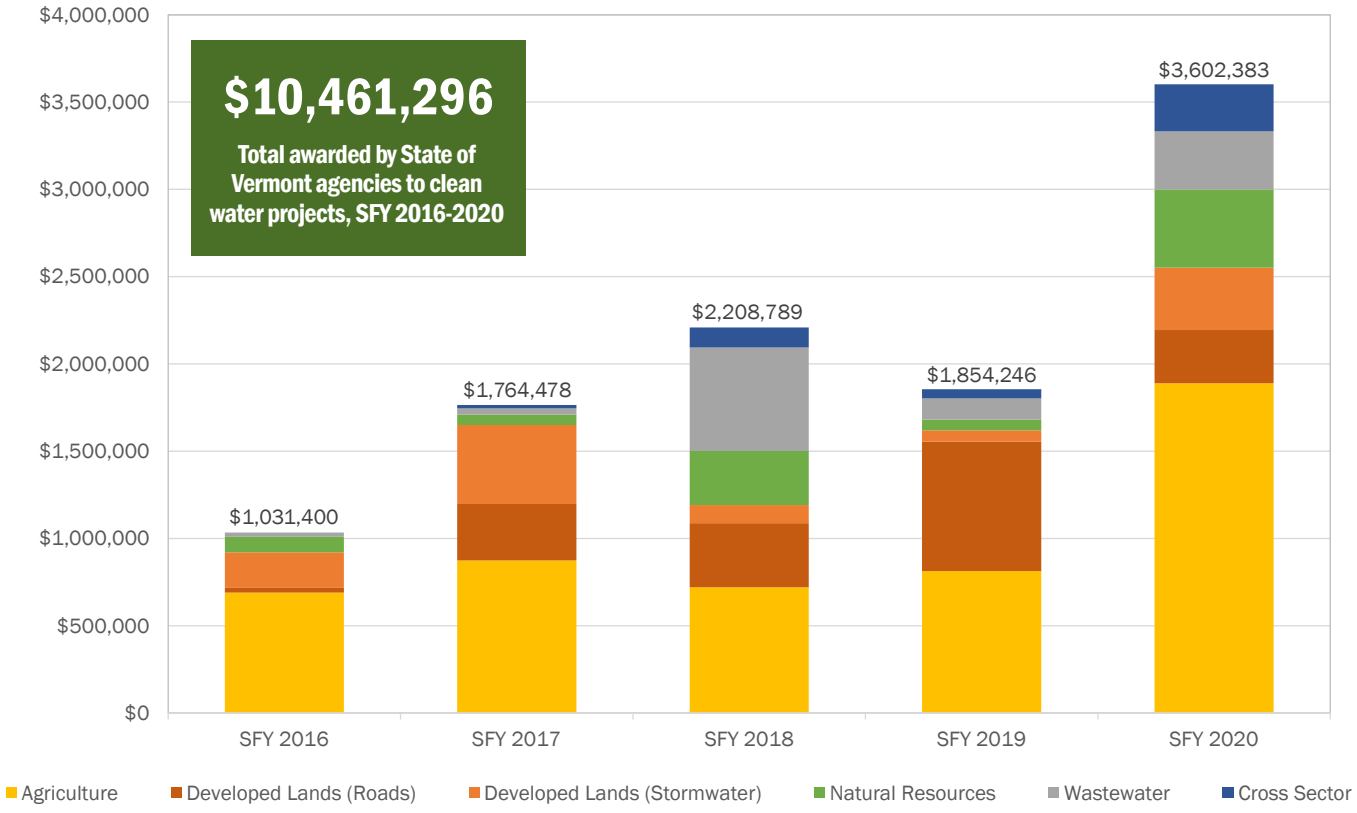
South Lake Champlain, Poultney, Mettowee Rivers Watershed Investments



Towns in the Watershed

Benson	Orwell
Castleton	Pawlet
Dorset	Poultney
Fair Haven	Wells
Hubbardton	West Haven
Middletown Springs	West Rutland

Dollars awarded by State of Vermont agencies to clean water projects in the South Lake Champlain, Poultney, Mettowee Rivers watershed, by sector and state fiscal year (SFY).



South Lake Champlain, Poultney, Mettowee Rivers Watershed Results

State-Funded Project Outputs:

Results of clean water projects funded by State of Vermont agencies completed, SFY 2016-2020, by sector, in the South Lake Champlain, Poultney, Mettowee Rivers watershed. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

STATE AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural land treated by conservation practices	1,945	237	398	1,400	1,905	5,885
Acres of agricultural land treated by forest and grass buffers	–	–	–	–	–	–
Acres of pasture with livestock excluded from surface waters	–	–	–	–	–	–
Number of barnyard and production area practices installed	–	15	10	2	7	34
Acres of water quality protections within newly conserved agricultural lands	–	34	–	25	24	83
Estimated acres of agricultural land treated through equipment	–	153	316	766	2011	3,246
Acres of agricultural conservation practices reported through technical assistance	–	–	–	839	971	1,810

NATURAL RESOURCES

STATE NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	2	1	1	18	5	27
Acres of riparian corridor conserved and restored through easements	–	–	–	–	–	–
Acres of floodplain restored	–	–	–	–	–	–
Acres of lakeshore restored	–	–	5	<1	–	5
Stream miles reconnected for stream equilibrium/fish passage	–	–	4	–	–	4
Acres of wetland conserved and restored through easements	–	–	40	25	–	65
Acres of forestland conserved with water quality protections	–	109	93	–	–	202
Miles of forest road drainage and erosion control improvements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–
Square feet of eroding gully remediated	–	–	43,560	–	–	43,560

STORMWATER

ROADS

STATE DEVELOPED LANDS PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	–	–	35	35
Miles of municipal road drainage and erosion control improvements	–	2	5	7	1	15
Number of municipal road drainage and stream culverts replaced	–	12	20	34	5	71
Cubic yards of Class IV road gully erosion remediated	–	–	–	–	–	–
Cubic yards of catch basin outlet erosion remediated	–	–	–	–	–	–
Acres stabilized through use of hydroseeder/mulcher equipment per year	–	–	–	–	15	15

WASTEWATER

STATE WASTEWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Number of combined sewer overflow abatements completed	–	–	–	–	–	–
Number of sewer extensions completed	–	–	–	–	–	–
Number of wastewater collection systems refurbished	–	–	–	1	–	1
Number of wastewater treatment facility refurbished	–	–	–	-	–	–
Number of wastewater treatment facility upgrades completed	–	–	–	–	–	–

South Lake Champlain, Poultney, Mettowee Rivers Watershed Results

Federal-Funded Project Outputs:

Results of clean water projects funded by federal partners completed, SFY 2016-2020, by sector, in the South Lake Champlain, Poultney, Mettowee Rivers watershed[3]. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

EXTERNAL PARTNER AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural conservation practices implemented (excluding other practices)[4]	2,081	3,545	3,623	3,522	3,607	16,378
Acres of agricultural land treated by forest and grass buffers[4]	–	–	–	–	–	–
Acres of pasture with livestock excluded from surface waters[4]	–	–	–	–	–	–
Number of barnyard and production area practices installed[4]	33	60	59	40	63	255
Acres of agricultural conservation practices reported through technical assistance[4]	543	1,440	164	763	713	3,623

NATURAL RESOURCES

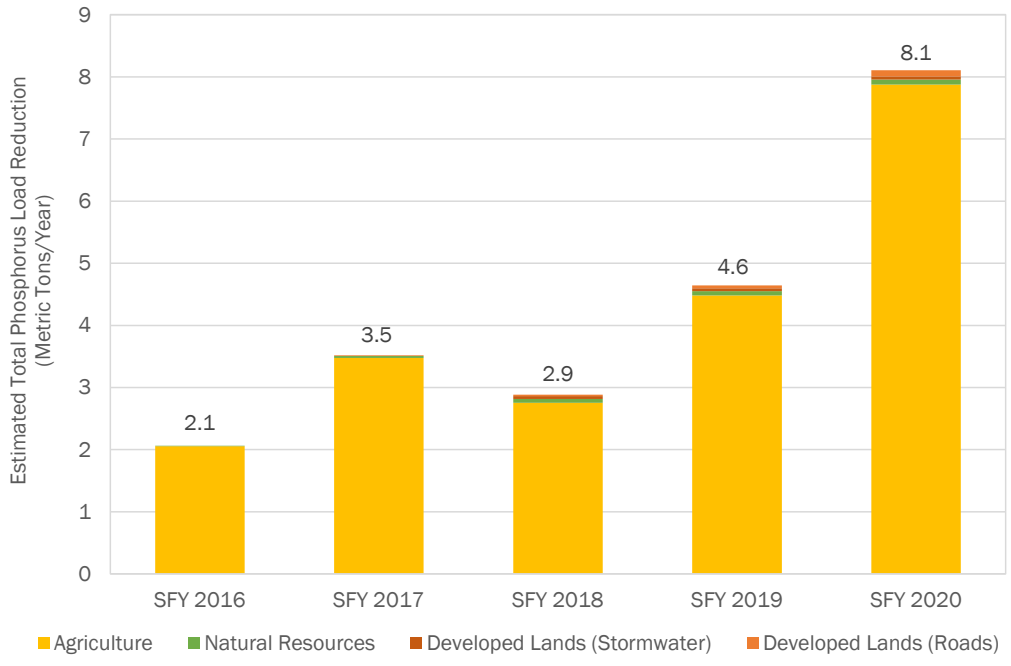
EXTERNAL PARTNER NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	–	–	6	–	–	6
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–

STORMWATER

EXTERNAL PARTNER STORMWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	–	–	–	–

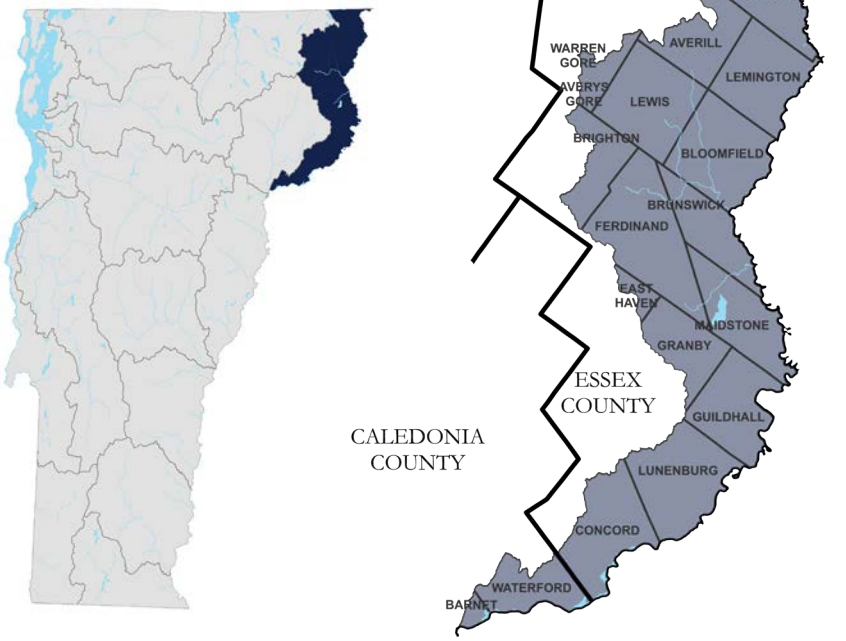
State and Federal Estimated Total Phosphorus Load Reductions:

Annual estimated total phosphorus load reductions (metric tons per year) of clean water projects funded by State of Vermont and federal partners, SFY 2016-2020, by sector, in the South Lake Champlain, Poultney, Mettowee Rivers watershed. Note: Does not include estimated total phosphorus load reductions of projects funded, but not yet completed.



3 Federal partner funding sources include Lake Champlain Basin Program and U.S. Department of Agriculture Natural Resources Conservation Service
4 Funded by U.S. Department of Agriculture Natural Resources Conservation Service

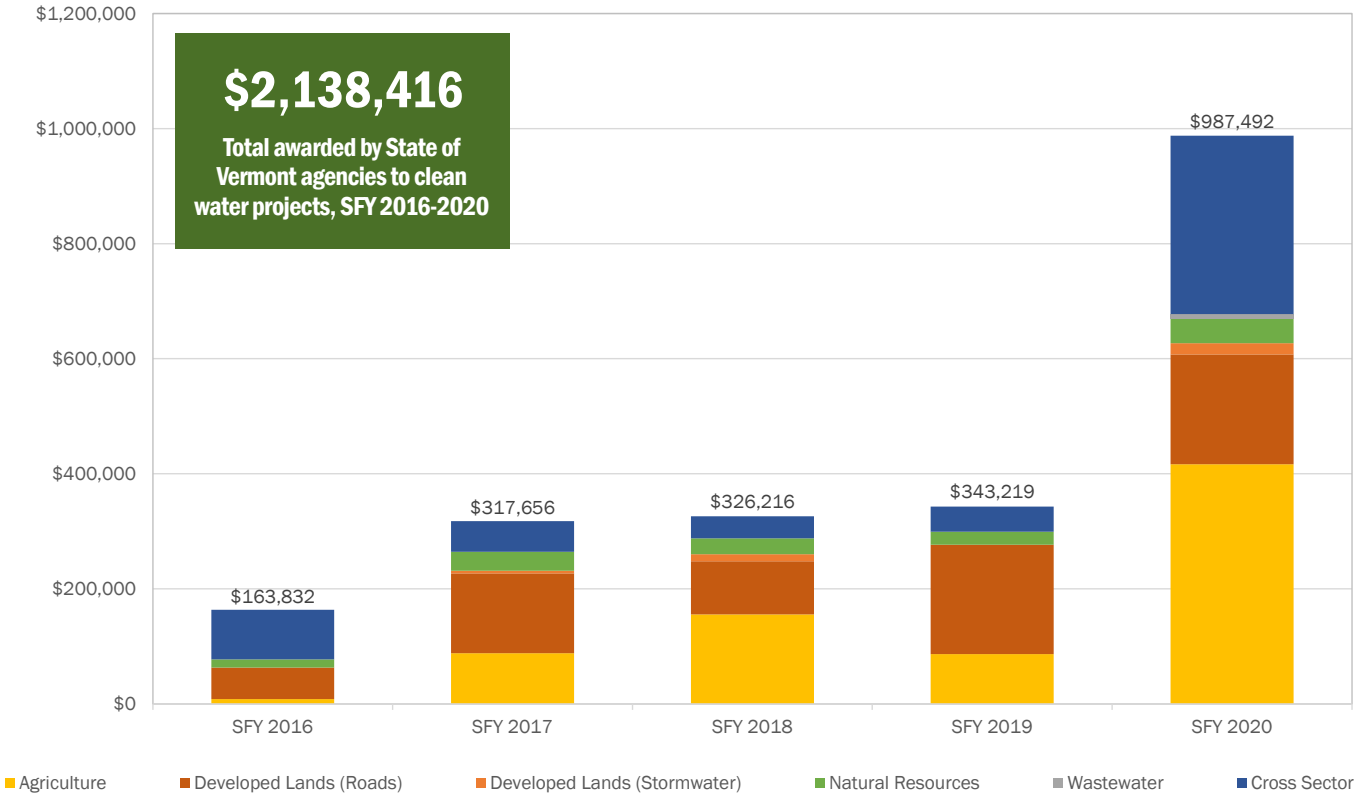
Upper Connecticut River Watershed Investments



Towns in the Watershed

Averill	Granby
Averys Gore	Guildhall
Bloomfield	Lemington
Brunswick	Lewis
Canaan	Lunenburg
Concord	Maidstone
Ferdinand	Waterford

Dollars awarded by State of Vermont agencies to clean water projects in the Upper Connecticut River watershed, by sector and state fiscal year (SFY).



Upper Connecticut River Watershed Results

State-Funded Project Outputs:

Results of clean water projects funded by State of Vermont agencies completed, SFY 2016-2020, by sector, in the Upper Connecticut River watershed. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

STATE AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural land treated by conservation practices	–	–	–	–	29	29
Acres of agricultural land treated by forest and grass buffers	–	–	–	–	–	–
Acres of pasture with livestock excluded from surface waters	–	–	–	–	–	–
Number of barnyard and production area practices installed	–	–	–	–	1	1
Acres of water quality protections within newly conserved agricultural lands	–	–	6	–	–	6
Estimated acres of agricultural land treated through equipment	–	–	–	–	–	–
Acres of agricultural conservation practices reported through technical assistance	–	–	–	–	–	–

NATURAL RESOURCES

STATE NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	–	1	–	1	–	2
Acres of riparian corridor conserved and restored through easements	73	7	–	–	–	80
Acres of floodplain restored	–	–	–	–	7	7
Acres of lakeshore restored	–	–	–	–	–	–
Stream miles reconnected for stream equilibrium/fish passage	–	–	–	–	–	–
Acres of wetland conserved and restored through easements	–	–	4	–	–	4
Acres of forestland conserved with water quality protections	–	–	–	–	–	–
Miles of forest road drainage and erosion control improvements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–
Square feet of eroding gully remediated	–	–	–	–	–	–

STORMWATER

ROADS

STATE DEVELOPED LANDS PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	1	2	2	1	6
Miles of municipal road drainage and erosion control improvements	–	15	3	6	4	28
Number of municipal road drainage and stream culverts replaced	–	–	–	–	–	–
Cubic yards of Class IV road gully erosion remediated	–	–	–	–	–	–
Cubic yards of catch basin outlet erosion remediated	–	–	–	–	–	–
Acres stabilized through use of hydroseeder/mulcher equipment per year	–	–	1	–	–	1

WASTEWATER

STATE WASTEWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Number of combined sewer overflow abatements completed	–	–	–	–	–	–
Number of sewer extensions completed	–	–	–	–	–	–
Number of wastewater collection systems refurbished	–	–	–	–	–	–
Number of wastewater treatment facility refurbished	–	–	–	–	–	–
Number of wastewater treatment facility upgrades completed	–	–	–	–	–	–

Upper Connecticut River Watershed Results

Federal-Funded Project Outputs:

Results of clean water projects funded by federal partners completed, SFY 2016-2020, by sector, in the Upper Connecticut River watershed[3]. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

EXTERNAL PARTNER AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural conservation practices implemented (excluding other practices)[4]	76	492	724	403	361	2,056
Acres of agricultural land treated by forest and grass buffers[4]	–	–	–	–	–	–
Acres of pasture with livestock excluded from surface waters[4]	–	–	–	–	–	–
Number of barnyard and production area practices installed[4]	34	–	–	4	9	47
Acres of agricultural conservation practices reported through technical assistance[4]	–	–	<1	6	–	6

NATURAL RESOURCES

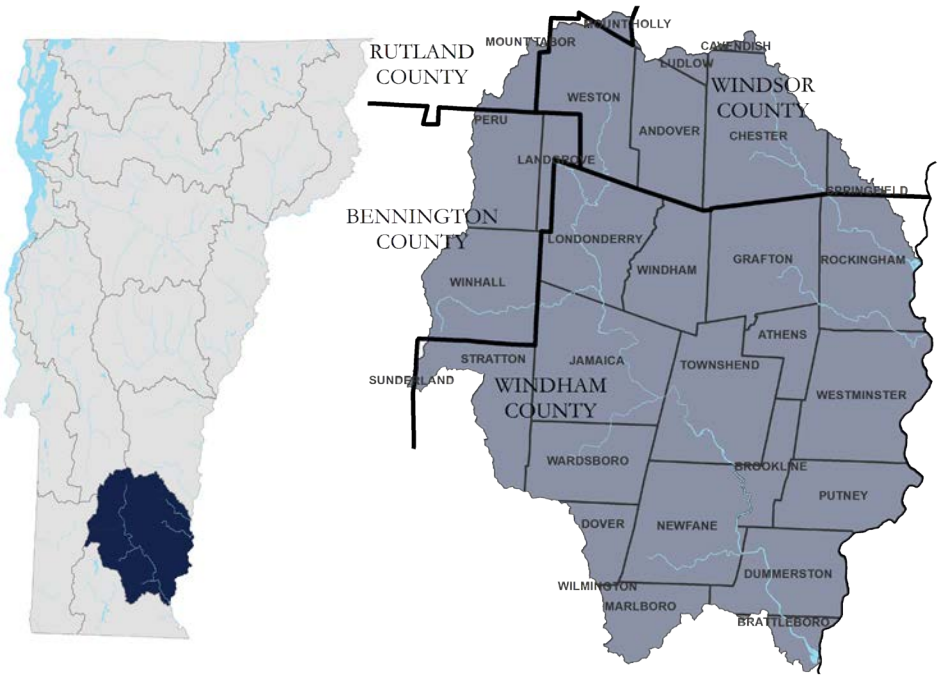
EXTERNAL PARTNER NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	–	–	–	–	–	–
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–

STORMWATER

EXTERNAL PARTNER STORMWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	–	–	–	–

3 Federal partner funding sources include Lake Champlain Basin Program and U.S. Department of Agriculture Natural Resources Conservation Service
4 Funded by U.S. Department of Agriculture Natural Resources Conservation Service

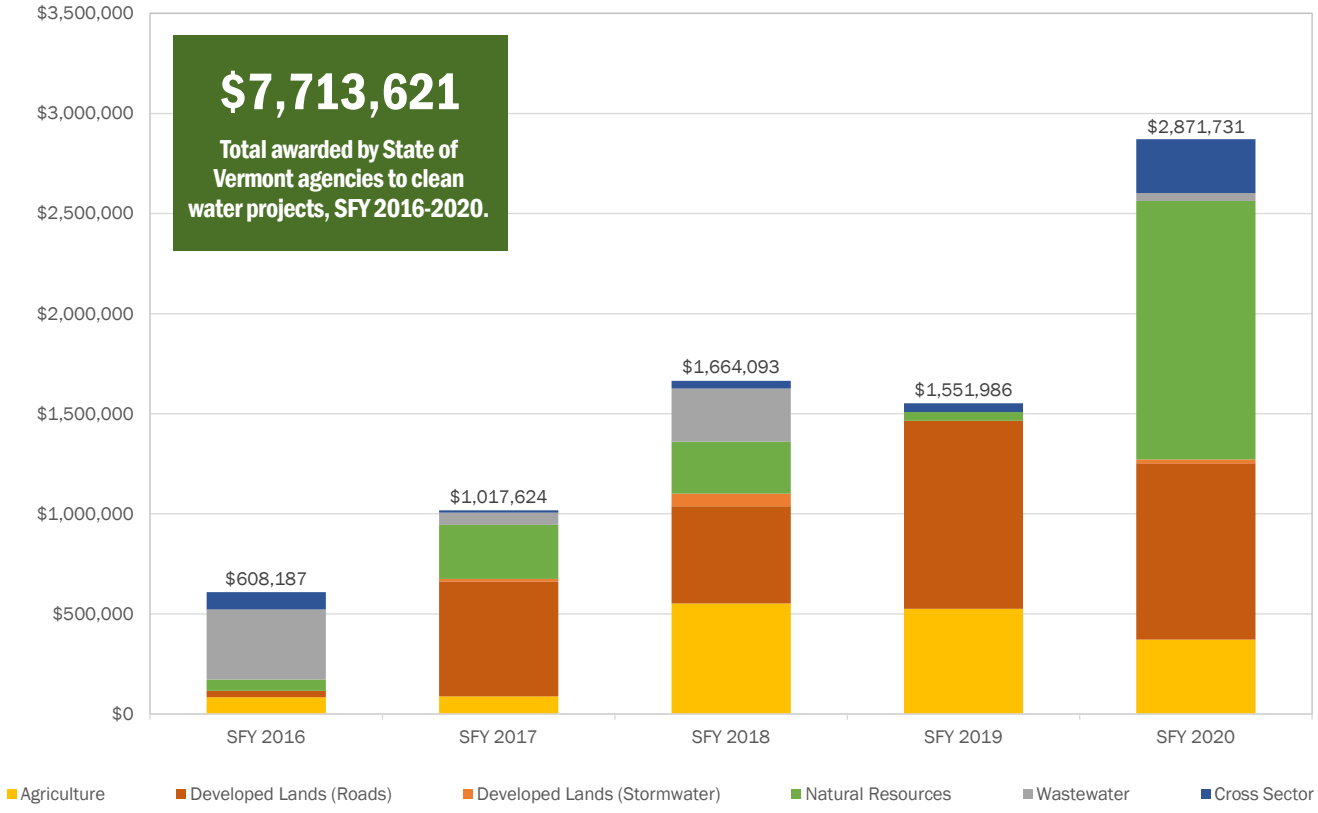
West, Williams, Saxtons, Connecticut Rivers Watershed Investments



Towns in the Watershed

Andover	Peru
Athens	Putney
Brookline	Rockingham
Chester	Stratton
Dummerston	Townshend
Grafton	Wardsboro
Jamaica	Westminster
Landgrove	Weston
Londonderry	Windham
Newfane	Winhall

Dollars awarded by State of Vermont agencies to clean water projects in the West, Williams, Saxtons, Connecticut Rivers watershed, by sector and state fiscal year (SFY).



West, Williams, Saxtons, Connecticut Rivers Watershed Results

State-Funded Project Outputs:

Results of clean water projects funded by State of Vermont agencies completed, SFY 2016-2020, by sector, in the West, Williams, Saxtons, Connecticut Rivers watershed. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

STATE AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural land treated by conservation practices	–	–	–	40	163	203
Acres of agricultural land treated by forest and grass buffers	–	–	–	–	–	–
Acres of pasture with livestock excluded from surface waters	–	–	–	–	–	–
Number of barnyard and production area practices installed	–	–	4	–	2	6
Acres of water quality protections within newly conserved agricultural lands	–	–	–	34	–	34
Estimated acres of agricultural land treated through equipment	–	–	–	–	–	–
Acres of agricultural conservation practices reported through technical assistance	–	–	–	–	–	–

NATURAL RESOURCES

STATE NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	2	1	2	1	<1	6
Acres of riparian corridor conserved and restored through easements	–	14	–	–	–	14
Acres of floodplain restored	–	–	–	–	<1	<1
Acres of lakeshore restored	–	–	–	–	–	–
Stream miles reconnected for stream equilibrium/fish passage	–	–	20	–	3	23
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Acres of forestland conserved with water quality protections	–	16	5	–	26	47
Miles of forest road drainage and erosion control improvements	–	–	–	–	3	3
Number of stream crossings improved	–	–	–	–	6	6
Square feet of eroding gully remediated	–	–	–	–	–	–

STORMWATER

ROADS

STATE DEVELOPED LANDS PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	–	–	–	–
Miles of municipal road drainage and erosion control improvements	–	1	5	9	4	19
Number of municipal road drainage and stream culverts replaced	–	2	–	7	–	9
Cubic yards of Class IV road gully erosion remediated	–	–	44	–	–	44
Cubic yards of catch basin outlet erosion remediated	–	–	–	–	–	–
Acres stabilized through use of hydroseeder/mulcher equipment per year	–	–	–	–	–	–

WASTEWATER

STATE WASTEWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Number of combined sewer overflow abatements completed	–	–	–	–	–	–
Number of sewer extensions completed	–	–	–	–	–	–
Number of wastewater collection systems refurbished	–	–	1	–	–	1
Number of wastewater treatment facility refurbished	–	–	–	–	–	–
Number of wastewater treatment facility upgrades completed	–	–	–	–	–	–

West, Williams, Saxtons, Connecticut Rivers Watershed Results

Federal-Funded Project Outputs:

Results of clean water projects funded by federal partners completed, SFY 2016-2020, by sector, in the West, Williams, Saxtons, Connecticut Rivers watershed[3]. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

EXTERNAL PARTNER AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural conservation practices implemented (excluding other practices)[4]	296	457	244	551	632	2,180
Acres of agricultural land treated by forest and grass buffers[4]	2	–	–	–	–	2
Acres of pasture with livestock excluded from surface waters[4]	–	–	–	–	–	–
Number of barnyard and production area practices installed[4]	14	5	4	10	18	51
Acres of agricultural conservation practices reported through technical assistance[4]	314	–	–	–	–	314

NATURAL RESOURCES

EXTERNAL PARTNER NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	–	–	–	–	–	–
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–

STORMWATER

EXTERNAL PARTNER STORMWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	–	–	–	–

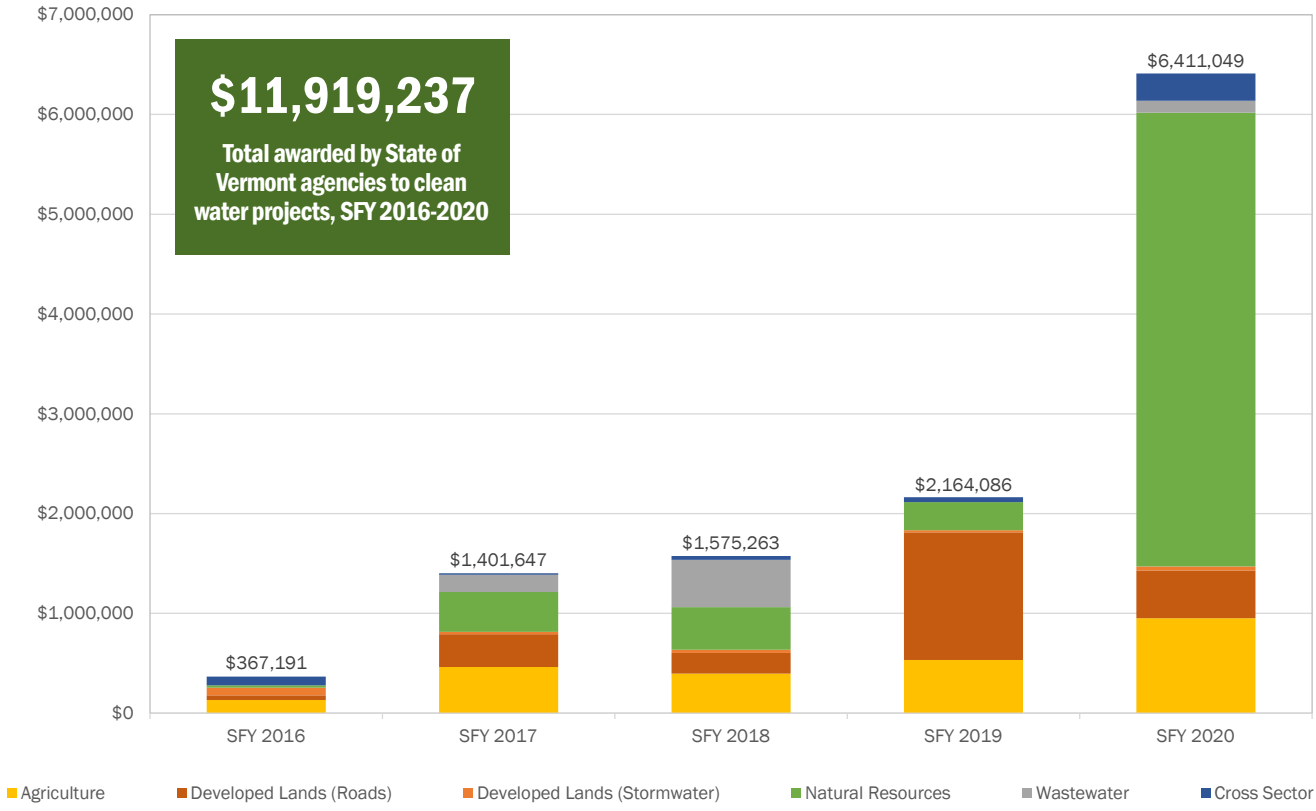
3 Federal partner funding sources include Lake Champlain Basin Program and U.S. Department of Agriculture Natural Resources Conservation Service
4 Funded by U.S. Department of Agriculture Natural Resources Conservation Service

White River Watershed Investments

Towns in the Watershed

Barnard	Randolph
Bethel	Rochester
Braintree	Roxbury
Brookfield	Royalton
Chelsea	Sharon
Granville	Stockbridge
Hancock	Tunbridge
Hartford	Washington
Pittsfield	

Dollars awarded by State of Vermont agencies to clean water projects in the White River watershed, by sector and state fiscal year (SFY).



White River Watershed Results

State-Funded Project Outputs:

Results of clean water projects funded by State of Vermont agencies completed, SFY 2016-2020, by sector, in the White River watershed. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

STATE AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural land treated by conservation practices	222	–	–	128	431	781
Acres of agricultural land treated by forest and grass buffers	21	11	–	–	–	32
Acres of pasture with livestock excluded from surface waters	21	6	–	–	–	27
Number of barnyard and production area practices installed	–	9	7	4	3	23
Acres of water quality protections within newly conserved agricultural lands	–	21	–	9	29	59
Estimated acres of agricultural land treated through equipment	–	266	559	82	420	1,327
Acres of agricultural conservation practices reported through technical assistance	–	–	–	3	1	4

NATURAL RESOURCES

STATE NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	13	5	5	3	<1	26
Acres of riparian corridor conserved and restored through easements	–	32	63	–	–	95
Acres of floodplain restored	–	–	–	–	–	–
Acres of lakeshore restored	–	–	<1	–	–	–
Stream miles reconnected for stream equilibrium/fish passage	–	98	–	87	–	185
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Acres of forestland conserved with water quality protections	–	3	457	–	16	476
Miles of forest road drainage and erosion control improvements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–
Square feet of eroding gully remediated	–	–	–	27	–	27

STORMWATER

ROADS

STATE DEVELOPED LANDS PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	–	–	–	–
Miles of municipal road drainage and erosion control improvements	–	<1	6	6	2	14
Number of municipal road drainage and stream culverts replaced	–	14	13	23	13	63
Cubic yards of Class IV road gully erosion remediated	–	–	–	–	–	–
Cubic yards of catch basin outlet erosion remediated	–	–	–	–	–	–
Acres stabilized through use of hydroseeder/mulcher equipment per year	–	–	–	–	14	14

WASTEWATER

STATE WASTEWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Number of combined sewer overflow abatements completed	–	–	–	–	–	–
Number of sewer extensions completed	–	–	–	–	–	–
Number of wastewater collection systems refurbished	–	–	–	–	–	–
Number of wastewater treatment facility refurbished	–	–	–	1	–	1
Number of wastewater treatment facility upgrades completed	–	–	–	–	–	–

White River Watershed Results

Federal-Funded Project Outputs:

Results of clean water projects funded by federal partners completed, SFY 2016-2020, by sector, in the White River watershed[3]. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

EXTERNAL PARTNER AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural conservation practices implemented (excluding other practices)[4]	289	295	1,749	643	708	3,684
Acres of agricultural land treated by forest and grass buffers[4]	6	–	–	–	–	6
Acres of pasture with livestock excluded from surface waters[4]	–	–	–	–	–	–
Number of barnyard and production area practices installed[4]	11	33	38	9	9	100
Acres of agricultural conservation practices reported through technical assistance[4]	31	–	–	–	–	31

NATURAL RESOURCES

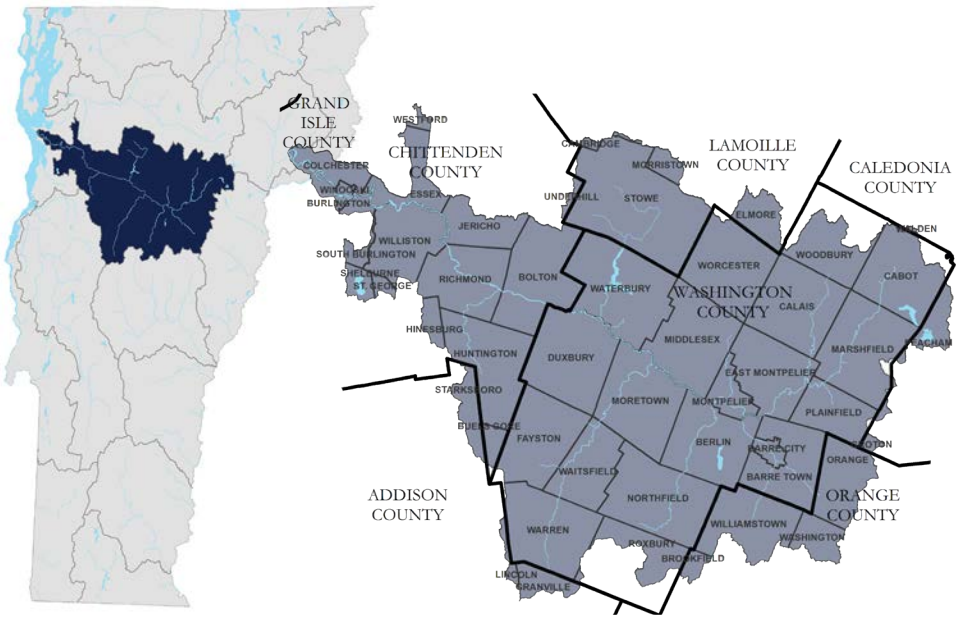
EXTERNAL PARTNER NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	–	–	–	–	–	–
Acres of wetland conserved and restored through easements	–	–	–	–	–	–
Number of stream crossings improved	–	–	–	–	–	–

STORMWATER

EXTERNAL PARTNER STORMWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	–	–	–	–	–

3 Federal partner funding sources include Lake Champlain Basin Program and U.S. Department of Agriculture Natural Resources Conservation Service
4 Funded by U.S. Department of Agriculture Natural Resources Conservation Service

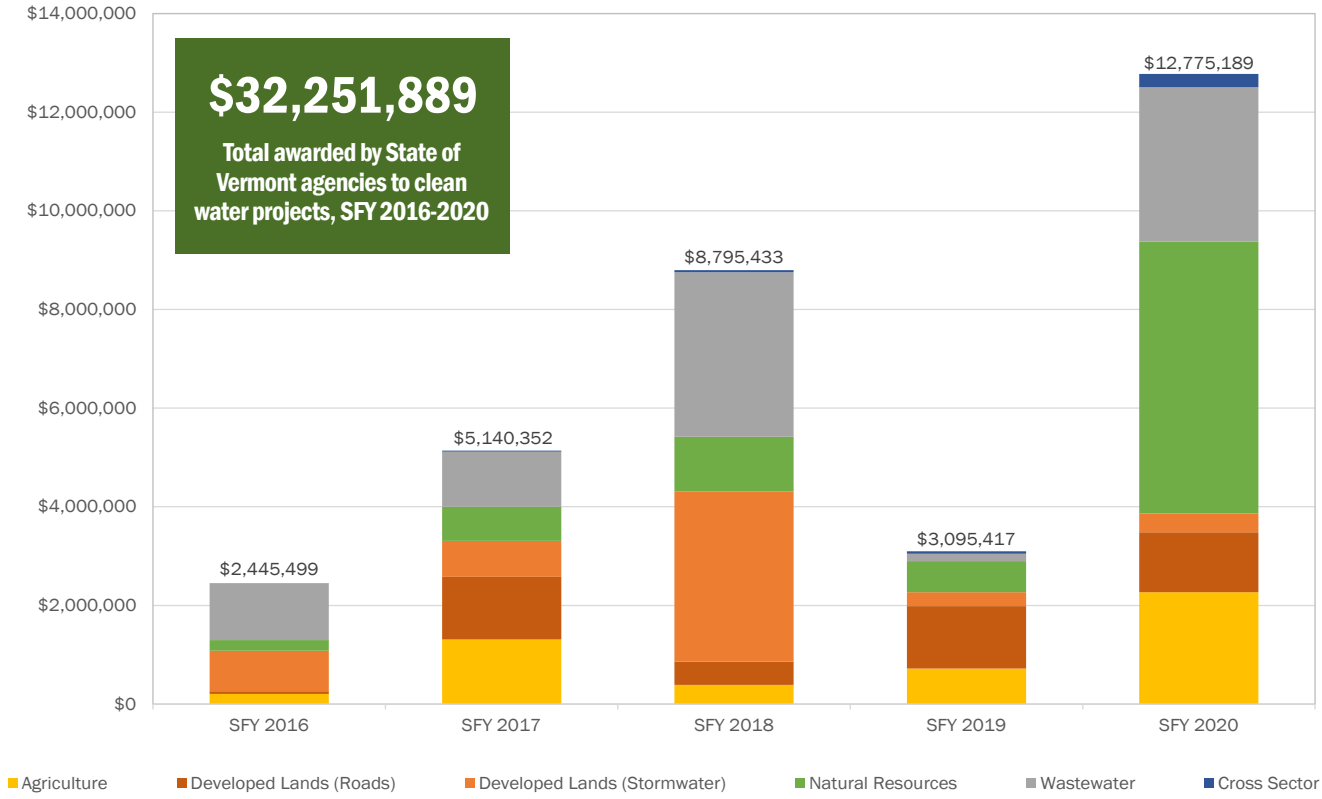
Winooski River Watershed Investments



Towns in the Watershed

Barre City	Moretown
Barre Town	Northfield
Berlin	Orange
Bolton	Plainfield
Buels Gore	Richmond
Cabot	St. George
Calais	Stowe
Duxbury	Waitsfield
East Montpelier	Warren
Essex	Waterbury
Fayston	Williamstown
Huntington	Williston
Marshfield	Winooski
Middlesex	Woodbury
Montpelier	Worcester

Dollars awarded by State of Vermont agencies to clean water projects in the Winooski River watershed, by sector and state fiscal year (SFY).



Winooski River Watershed Results

State-Funded Project Outputs:

Results of clean water projects funded by State of Vermont agencies completed, SFY 2016-2020, by sector, in the Winooski River watershed. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

STATE AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural land treated by conservation practices	517	544	586	1,310	2,570	5,527
Acres of agricultural land treated by forest and grass buffers	69	27	–	–	–	96
Acres of pasture with livestock excluded from surface waters	69	–	–	–	–	69
Number of barnyard and production area practices installed	10	5	3	7	10	35
Acres of water quality protections within newly conserved agricultural lands	–	2	75	–	38	115
Estimated acres of agricultural land treated through equipment	–	153	68	1,440	1,142	2,803
Acres of agricultural conservation practices reported through technical assistance	–	–	1	2	–	3

NATURAL RESOURCES

STATE NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	47	5	4	9	3	68
Acres of riparian corridor conserved and restored through easements	–	51	–	5	42	98
Acres of floodplain restored	–	2	4	–	–	6
Acres of lakeshore restored	–	–	–	<1	<1	<1
Stream miles reconnected for stream equilibrium/fish passage	4	2	–	–	–	6
Acres of wetland conserved and restored through easements	–	–	–	5	–	5
Acres of forestland conserved with water quality protections	–	–	20	63	18	101
Miles of forest road drainage and erosion control improvements	–	–	–	2	–	2
Number of stream crossings improved	–	–	1	11	–	12
Square feet of eroding gully remediated	–	–	–	–	105	105

STORMWATER

ROADS

STATE DEVELOPED LANDS PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	–	11	17	31	33	92
Miles of municipal road drainage and erosion control improvements	<1	1	9	10	3	23
Number of municipal road drainage and stream culverts replaced	–	7	14	36	8	65
Cubic yards of Class IV road gully erosion remediated	–	–	112	<1	–	112
Cubic yards of catch basin outlet erosion remediated	–	–	1	691	–	692
Acres stabilized through use of hydroseeder/mulcher equipment per year	–	–	–	2	–	2

WASTEWATER

STATE WASTEWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Number of combined sewer overflow abatements completed	–	–	–	–	–	–
Number of sewer extensions completed	–	–	–	–	–	–
Number of wastewater collection systems refurbished	–	1	–	–	1	2
Number of wastewater treatment facility refurbished	–	–	–	–	–	–
Number of wastewater treatment facility upgrades completed	1	4	–	–	–	5

Winooski River Watershed Results

Federal-Funded Project Outputs:

Results of clean water projects funded by federal partners completed, SFY 2016-2020, by sector, in the Winooski River watershed[3]. Note: Does not include results of projects funded, but not yet completed.

AGRICULTURE

EXTERNAL PARTNER AGRICULTURE PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of agricultural conservation practices implemented (excluding other practices)[4]	3,602	2,403	3,980	2,172	1,660	13,817
Acres of agricultural land treated by forest and grass buffers[4]	1	–	1	–	–	2
Acres of pasture with livestock excluded from surface waters[4]	1	–	–	–	–	1
Number of barnyard and production area practices installed[4]	47	32	24	33	12	148
Acres of agricultural conservation practices reported through technical assistance[4]	–	–	–	–	–	–

NATURAL RESOURCES

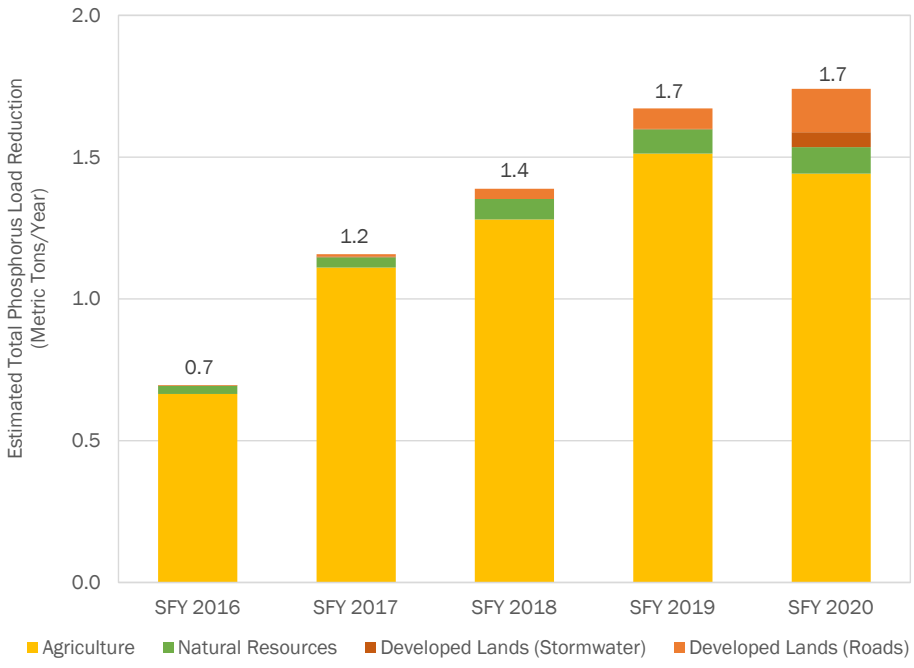
EXTERNAL PARTNER NATURAL RESOURCES PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of forested riparian buffer restored	4	–	–	4	–	8
Acres of wetland conserved and restored through easements	–	–	11	–	–	11
Number of stream crossings improved	–	–	–	–	–	–

STORMWATER

EXTERNAL PARTNER STORMWATER PROJECT OUTPUTS	2016	2017	2018	2019	2020	TOTAL
Acres of existing impervious surface treated by stormwater practices	<1	–	2	2	–	4

State and Federal Estimated Total Phosphorus Load Reductions:

Annual estimated total phosphorus load reductions (metric tons per year) of clean water projects funded by State of Vermont and federal partners, SFY 2016-2020, by sector, in the Winooski River watershed. Note: Does not include estimated total phosphorus load reductions of projects funded, but not yet completed.



3 Federal partner funding sources include Lake Champlain Basin Program and U.S. Department of Agriculture Natural Resources Conservation Service
4 Funded by U.S. Department of Agriculture Natural Resources Conservation Service

Appendix B. South Lake Champlain (Basins 2 & 4) TMDL Implementation Interim Progress Report

The Accountability Framework of the 2016 *Phosphorus Total Maximum Daily Loads (TMDL) for Vermont Segments of Lake Champlain* ensures TMDL implementation moves forward at a steady rate. A major driver of the Accountability Framework is the Vermont Department of Environmental Conservation's (DEC) development of basin-specific Tactical Basin Plans (TBP). TBPs are developed on a five-year rotating basis and include Implementation Tables that identify priority actions needed to implement the TMDL. It is through review of the Implementation Tables, and the progress made in accomplishing the tasks, that U.S. Environmental Protection Agency (EPA) intends to track implementation progress in each basin. Interim reviews, also known as "report cards," occur midway through a five-year planning cycle and allow EPA to evaluate progress in the basin.

Appendix B is the interim report card for the South Lake Champlain Basin. The 2.5-year reporting period began in January 2018 coincident with the publication of the South Lake Champlain TBP[1] and goes through June 30, 2020. Data in this report align with this 2.5-year period except where noted as Clean Water Reporting Framework (CWRF) data reflecting the SFY 2017–SFY 2020 granting period.

The following sections describe the Implementation Tables for the basin and include information to help EPA assess the status of each action item listed. A status condition is provided for each item (e.g., complete, ongoing, etc.) as well as a narrative description of actions taken. In some instances, performance measures based on implementation data are included to provide a quantitative measure of implementation. However, estimations of total phosphorus loading reductions to the lake are not presented as part of this exercise. Instead, estimated total phosphorus load reductions are presented in Appendix A of the *Vermont Clean Water Initiative Annual Performance Report* to allow comparison to the TMDL phosphorus allocations. Based on the data in this Performance Report, projects completed/in effect through state and federal funding, and regulatory programs in SFY 2017-2020 resulted in an estimated total phosphorus load reduction of 8,108 kilograms (8.1 metric tons) in SFY 2020 in the South Lake Champlain watershed. Estimated total phosphorus load reductions in SFY 2020 include results of projects implemented since SFY 2017 with lifespans that carry into SFY 2020.

Basins 2 & 4 Status Update

The TBP strategies were evaluated and their associated actions were assigned a status condition using the rationale described in Table 1. Of the 59 strategies identified to date, 14 have been completed, 12 are in progress, 2 have not been started, and 31 are ongoing (Figure 1).

[1] The 2017 South Lake Champlain Tactical Basin Plan available at: https://dec.vermont.gov/sites/dec/files/wsm/mapp/docs/mp_TacticalBasinPlan_Basin02-04_SouthLakeChamplain_FINAL_2017-12-31.pdf

Table 1. Status conditions assigned to strategies and actions in the TBP Implementation Table (Table 2)

Action Status	Description	Example
Complete	A discrete action with a clear end point that has been implemented	Provided 3 trainings to partners to evaluate 5 properties for Lake Wise assessments
In Progress	A discrete action with a clear end point that is in progress or in the queue	Of the 8 high priority projects identified through the Castleton SWMP, 3 have been implemented and 2 are in progress
Ongoing	A programmatic or multi-layered action and is in progress, but has no defined end date	Towns are replacing culverts when funding is available
Not Started	A discrete or programmatic strategy that has not been initiated or taken up	A project that is stalled due to lack of funding

Actions identified as "in progress" were evaluated based on their likelihood of being completed by 2022, when the Phase III content for the Lake Champlain Phosphorus TMDL will be developed. Of the 12 actions that are in progress, two (16percent) have a high likelihood of being completed, five (42percent) have a medium likelihood of being completed, and five (42percent) have a low likelihood of being completed by 2022 (Figure 1).

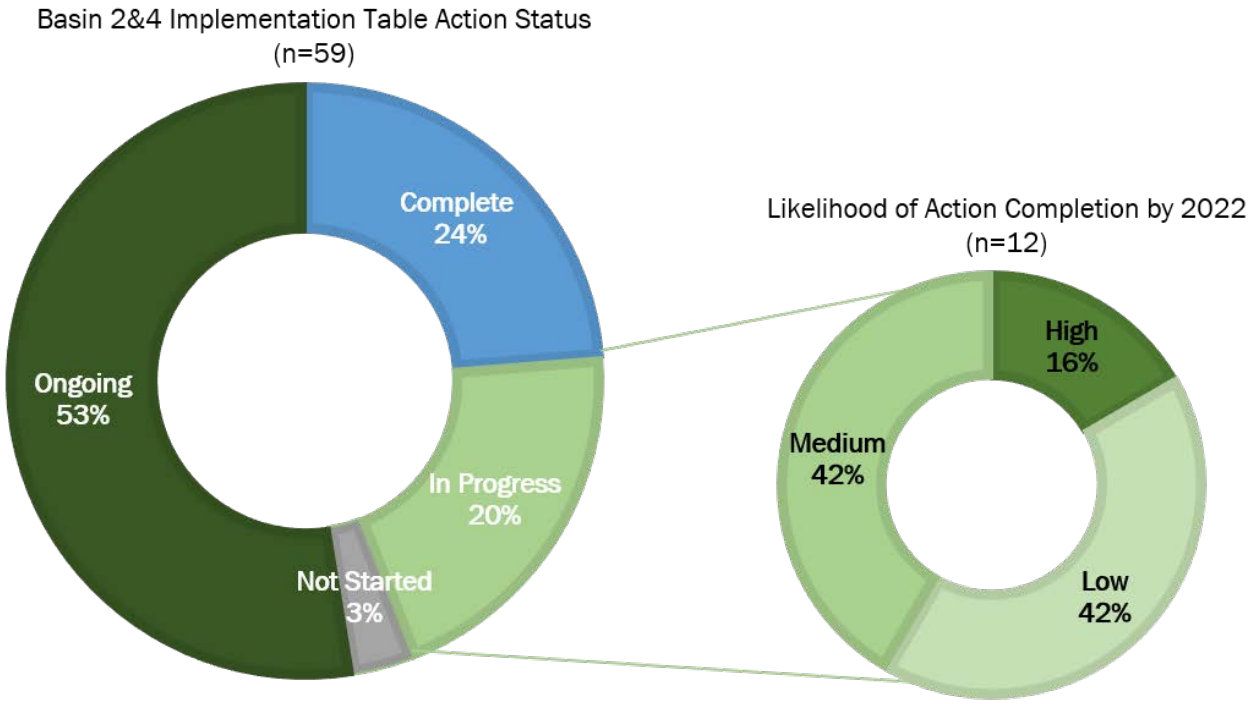


Figure 1. Basins 2 & 4 Implementation Table action status and likelihood of action completion by 2022, where 'n' represents the number of actions

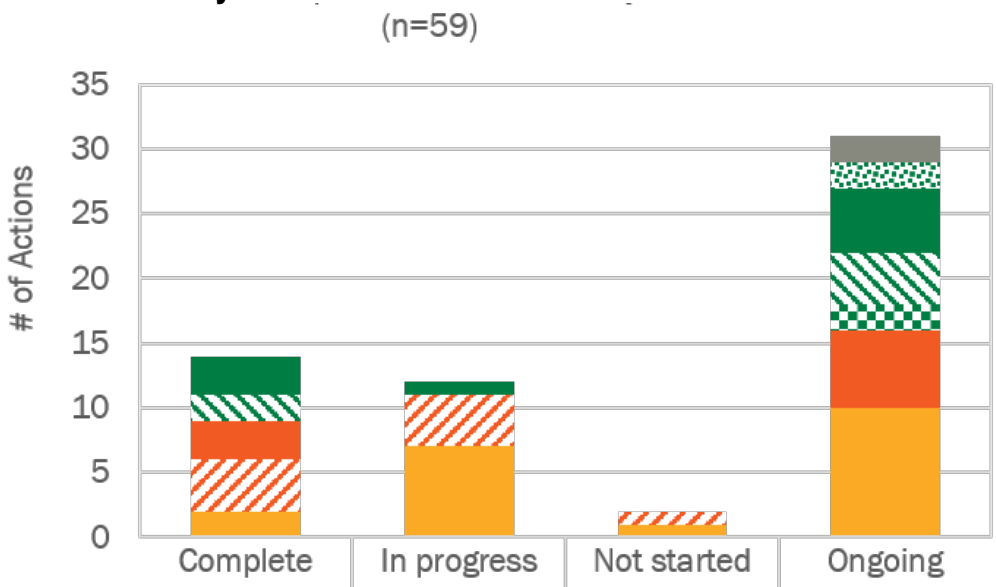
The actions with a high likelihood of being completed are those that have received funding, have a strong partner, local support, and positive momentum. They are also farther along in the process. In addition, some actions are regulatory and are required to be completed. Actions that have a medium likelihood of completion have been initiated and may have received funding, but the end date for completion is beyond 2022. In many cases, medium likelihood actions have support, but may be lacking funding or an entity to bring the project to fruition. These projects are next in line to be completed once the high likelihood actions are complete, which will free up capacity for entities that carry out the projects. Actions with low likelihood of completion by 2022 are those that require significant funding and resources to complete. In some cases, support exists, and funding may be available, but the capacity to develop the actions is lacking.

In summary, the major barriers to completion of Implementation Table actions by 2022 are the capacity to develop and implement projects, and interest and support by crucial partners. At this point, funding is not a major hurdle to complete projects unless related to capacity building. Currently, capacity constraints are being addressed, in part, with TBP support grants, which fund Natural Resource Conservation Districts (NRCDs), Regional Planning Commissions (RPCs), and watershed organizations to develop and implement projects.

The roll-out of the Clean Water Service Delivery Act (Act 76) will increasingly support the delivery of clean water services and increase regional capacity to develop and implement projects that fulfill actions identified in the Phase II Lake Champlain Phosphorus TMDL Implementation Table. The Act 76 factsheet developed by DEC explains the fundamental aspects of the Act[2]. For the South Lake Champlain Watershed, the passage of Act 76 and the support of partner organizations to carry out the Act, will increase capacity for clean water projects over the remaining years of this TBP cycle. Notwithstanding the challenges identified with completing projects within a five-year timeframe, 76 percent of the actions have been completed or are ongoing. Of the 12 actions that are in progress, 10 have a high or medium likelihood of completion by 2022.

[2] Act 76 Fact Sheet available here: https://dec.vermont.gov/sites/dec/files/WID/Act76/Act-76-Fact-Sheet.pdf

Basin 2 & 4 Implementation Status by Sector



	Complete	In progress	Not started	Ongoing
Wastewater	0	0	0	2
Wetlands	0	0	0	2
Rivers	3	1	0	5
Lakes	2	0	0	4
Forests	0	0	0	2
Developed Lands - Roads	3	0	0	6
Developed Lands - Other	4	4	1	0
Agriculture	2	7	1	10

Figure 2. Implementation status of strategies in Basins 2 & 4 by land use sector, where 'n' represents the number of actions

In addition, actions were evaluated based on status by land use sector (Figure 2). Overall, progress has been made in each sector. Only two actions out of 59 have not been started.

Lakes projects are only classified as "ongoing". One reason for this is that funding around lake best management practices is presently more limited than for other sectors, and the actions are completely voluntary. However, lake communities are usually motivated and supportive of initiatives for clean water, but lack the capacity and funding to get the initial buy-in. The focus of Act 76 on funding of the highest-value, non-regulatory projects is expected to increase focus on these opportunities, by providing a funding source to bring Lake Wise actions to the completion stage. Related increased project development funding and the improvement of outreach strategies around local river protection regulations is expected to help bring river actions to completion. Continued outreach and funding to municipalities for the remediation of priority stormwater projects and road segments identified in the Implementation Table, will promote completion of developed lands priorities. The Vermont Agency of Transportation (VTrans) administered Better Roads Program and Municipal Roads Grants-in-Aid Program help fund municipal road projects to meet this objective. In addition, the DEC-administered Grants-in-Aid Small Equipment program provides municipalities with equipment necessary to implement MRGP required practices. The necessities for project

completion point to a need for increased capacity to manage and develop these projects with the assurance that funding will be available to move them to the implementation stage. Further clarification is provided in the "explanation" column of the Basins 2 & 4 Implementation Table Interim Status Report (Table 2) for each action.

Basins 2 & 4 Implementation Table Interim Status

The interim status report (Table 2) was compiled by the Water Investment Division's Watershed Planning Program using data from the DEC, NRCDs, RPCs, and additional watershed partners involved in project development and implementation for the 2.5-year planning period except where noted as SFY 2017- SFY 2020. The Implementation Table is not an exhaustive list of water quality projects that lead to phosphorus reductions. See Appendix A of the *Vermont Clean Water Initiative Annual Performance Report* for full reporting of quantified estimated total phosphorus load reductions associated with state funding, federal funding, and regulatory programs. These data are also made available to the public through the "Clean Water Portal."[3] The Portal's Clean Water Projects Explorer allows interested parties to search for and learn more details about individual state-funded clean water projects. The Explorer contains potential projects identified through Tactical Basin Planning, as well as ongoing and completed projects. The Portal also contains the Clean Water Interactive Dashboard – an online tool that allows interested parties to examine and filter Performance Report data on investments, project outputs, estimated pollutant load reductions and project cost effectiveness.

[3] Clean Water Portal can be accessed here: https://anrweb.vt.gov/DEC/cleanWaterDashboard/.

Table 2. Basins 2 & 4 Implementation Table Interim Status Report; includes data from a) SFY 2017 to SFY 2020 and b) calendar year 2018-2020

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Map parcels that will come under the three-acre stormwater (SW) permit and outreach to affected property owners.	Basin wide	Castleton, Dorset, Fair Haven, Pawlet, Poultney, Rupert, West Haven, West Rutland	Developed Lands - Other	Complete	100	The 2019 SW Program general permit for SW from "three-acre sites" applies to sites with three or more acres of impervious surface and lacking a SW permit based on the 2002 Vermont Stormwater Management Manual. The Program has identified and notified affected owners[4]. Basins 2 & 4 parcels will need to apply for permit coverage by 2023.	1	NA
Complete Stormwater Master Plans (SWMP) for the towns of Castleton, Dorset, Fair Haven, Poultney, and West Rutland. Identify highest priority projects for implementation.	Castleton River Headwaters, Lake Bomoseen Watershed, Lower Castleton River Watershed	Castleton, Fair Haven, West Rutland	Developed Lands - Other	In Progress	50	The 2016 Castleton Headwaters SWMP assessed 30,608 acres, identified 12 potential projects, five 30 percent designs were completed. The 2019 Lake Saint Catherine SWMP assessed 20,871 acres, identified 20 projects, and six 30percent designs were completed. Poultney-Mettowee Natural Resources Conservation District (PMNRCD) received Design and Implementation Block Grants to implement six projects, which are in the final design stages now. The 2020 Poultney River Watershed SWMP is in progress. A Dorset SWMP has not started but may be combined with a Mettowee SWMP or the Bennington County Conservation District may complete it.	2	Medium

[4] List of three-acre sites identified by the Stormwater Program: https://dec.vermont.gov/sites/dec/files/wsm/stormwater/docs/9050/3acreList_09252020.pdf

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Develop 90% designs for the highest priority projects identified in the Lake Bomoseen and Lake Saint Catherine (LSC) SWMP.	Lake Bomoseen, Wells Brook-LSC	Castleton, Hubbardton, Wells, Poultney, Tinmouth, Middletown Springs	Developed Lands - Other	In Progress	50	The 2016 Lake Bomoseen SWMP assessed 24,770 acres, identified 48 potential projects, and 20 were ranked as high priority. Six were selected for conceptual designs, two have final designs, and one was implemented. PMNRCD plans to complete more projects in 2021-22. The 2019 LSC SWMP assessed 20,871 acres, identified 20 projects, and six 30percent designs were completed. PMNRCD received Design and Implementation Block Grants to implement six projects, which are in final design stages now.	3, 5	High
Create a Southern Champlain SW Collaborative to provide outreach to landowners about SW Best Management Practices (BMPs) including Green Stormwater Infrastructure (GSI) practices.	Basin wide-	All towns	Developed Lands - Other	Complete	100	The intent of this strategy was met through SWMP initiatives (e.g., the Castleton Headwaters SWMP and at LSC and Lake Bomoseen). The Lake Champlain Basin Program and Lake Champlain Sea Grant funded these efforts and five PMNRCD staff participated in outreach, Lake Wise assessments, and lake shoreline BMP implementation. In addition, outreach efforts were completed to landowners in Pawlet to introduce 13 SW projects identified in the 2016 Flower Brook SWMP. Landowners 'voted' on BMPs to install in Pawlet and towns participated in SWMP project ranking discussions.	4	NA

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Identify and correct potentially failed septic systems identified by IDDE assessment.	Basin wide	Pawlet	Developed Lands-Other	Complete	100	Pawlet IDDE report completed in 2016[5] Only one illegal connection was found and the cost to repair was prohibitive.	6	NA
Support brownfields restoration efforts that mitigate surface water pollution generated from these sites.	Basin wide	Rutland City	Developed Lands-Other	Complete	100	The Rutland Regional Planning Commission (RRPC) Brownfields program completed eight Environmental Site Assessments (ESA) in and around the City of Rutland. Sites include the former College of St. Joseph campus and Lynda Lee Fashions building in Rutland City. The former College of St. Joseph property is adjacent to the Otter Creek and there will be a limited cleanup of the site in association with redevelopment occurring in 2021.	7	NA
Complete annual Lake Wise trainings to develop capacity for local partners to evaluate properties for Lake Wise Assessments.	Priority sub-basins including lakes with increasing nutrients trends or elevated levels (including Beebe, Bomoseen, Saint Catherine, and Sunrise)	Castleton, Fair Haven, West Rutland	Lakes	Complete	100	The DEC Lakes and Ponds Program trained five PMNRCD staff members to conduct Lake Wise evaluations in 2018 and 2019.	8	NA

[5] Pawlet IDDE Report: https://anrweb.vt.gov/PubDocs/DEC/Stormwater/Town%20Reports%20and%20Maps/Pawlet/Pawlet%20IDDE%20Report.pdf

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Complete Lake Watershed SWMPs and Lake Wise assessments for Beebe, Bomoseen, Burr, Hortonia, Saint Catherine, Sunrise or other stressed lakes and implement priority projects.	Priority sub-basins including lakes with increasing nutrients trends or elevated levels (including Beebe, Bomoseen, Saint Catherine, and Sunrise)	Hubbardton, Castleton, Sudbury, Poultney, Wells, Benson, Orwell	Lakes	Ongoing	100	Lake SWMPs are complete for Beebe, Bomoseen, Hortonia, Burr, Saint Catherine. The remaining lakes are covered by the Poultney River SWMP. Eight Lake Wise assessments[6] are complete for Lake Bomoseen and more are planned. PMNRCD will reach out to the other lakes and coordinate with the Watershed Planner and the DEC Lakes and Ponds Program. LSCA received funds to implement 10 projects identified in Lake Wise assessments and PMNRCD received funds to implement six projects identified in Lake Wise assessments. They are working together to implement approximately 20 projects in 2020-21.	9, 10, 11	NA
Complete Lake Wise assessments and implement priority projects at Bomoseen State Park to increase the visibility of BMP practices.	Lake Bomoseen Watershed	Castleton, Fair Haven, Hubbardton, Benson	Lakes	Complete	100	A 2017 shoreline planting project was implemented at Bomoseen State Park. Plantings were focused in areas being impacted by camping and recreation and fencing was installed to redirect foot traffic and protect the newly planted areas.	12	NA

[6] https://dec.vermont.gov/watershed/lakes-ponds/lakeshores-lake-wise/lakewisemap

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Develop and evaluate the new Lake Watershed Action Plan (LWAP) process to identify and address sources of nutrients to lakes.	Priority sub-basins including lakes with increasing nutrients trends or elevated levels (including Beebe, Bomoseen, Saint Catherine, and Sunrise)	Wells, Poultney	Lakes	Ongoing	100	Lake watershed assessments were completed for Lake Bomoseen and Lake Saint Catherine. Due to continued community interest, PMNRCD and LSCA are pursuing 2020 Lake Champlain Basin Program (LCBP) funding to complete the DEC's LWAP for Lake Saint Catherine.	13	NA
Provide education and outreach to towns and communities about Municipal Road General Permit (MRGP) regulations. Prioritize implementation of projects that address road segments with significant water quality impacts.	Basin wide-all hydrologically connected surface waters	All towns	Developed Lands - Roads	Ongoing	100	The RRPC and Addison County RPC (ACRPC) transportation planners have monthly meetings with town select boards and road commissioners. In addition, a 2018 erosion control workshop had 70 attendees and highlighted the importance of erosion control applications and new technologies/solutions to address erosion around homes, rivers, lakes, roads, and construction sites. RRPC staff are working with towns to prioritize MRGP projects and to-date, implementation is approximately 30percent for projects addressing known water quality issues.	14, 15	NA

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Update road erosion inventory (REI) template to incorporate MRGP requirements and highlight projects with water quality benefits. Support towns in completing at least five REIs and implementing priority road projects with the most significant water quality benefits.	Basin wide- All hydrologically connected surface waters	All towns	Developed Lands - Roads	Complete	100	ACRPC created a MRGP compatible REI application and RPCs are prioritizing road projects in each town based on the REI results and MRGP requirements. All REIs are complete, and information is tracked in the MRGP Implementation Table Portal. During SFY 2017-2020, 15,464 hydrologically connected road were segments inventoried, 10,064 hydrologically connected road segments meet MRGP standards, 5,730 hydrologically connected road segments were identified for improvements, and 488,277 linear feet of road drainage were improved in the basin. Towns are using a combination of Regional Transportation Funds, VTrans Better Roads grants, DEC Grants-in-Aid funds, and their own municipal funds to implement projects to meet MRGP standards.	16, 17, 18	NA
Complete ANR bridge and culvert surveys and replace structures identified as barriers to AOP and/or that are geomorphically incompatible.	Basin wide- focus in the East Creek and other Lower Champlain Direct watersheds	All towns	Developed Lands - Roads	Ongoing	100	ANR bridge and culvert surveys are complete. In the basin, 289 municipal road drainage and stream culverts were replaced. USFWS and DEC continue working to prioritize high priority culvert replacements. In addition, as culverts are replaced on State and town roads, they are reviewed by the Rivers Program to ensure structures meet current standards for geomorphic compatibility. Towns are replacing culverts when funding is available.	19	NA

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Implement six minimum control measures (MCMs) required in the State TS4 permit.	Basin wide	All towns	Developed Lands - Roads	Ongoing	100	Per Part 6 of the TS4 Permit, VTrans is implementing and enforcing a 2018 SWMP, which includes six MCMs designed to reduce the discharge of pollutants from the TS4 to the maximum extent practicable, to protect water quality, and to satisfy the appropriate water quality requirements of the CWA. Implementation of the six MCM is ongoing. The BMPs that are being implemented by VTrans to address these six MCMs are included in Part 6.0 of the SWMP[7] (2018). A summary of annual reporting requirements and progress for each MCM is provided in Tabs 6.0, 6.1, and 6.3.a of the 2019 Annual Report Workbook[8].	20, 21	NA

[7] https://anrweb.vt.gov/PubDocs/DEC/Stormwater/PublicNotice/7892-9007/VTrans%20Final%20SWMP%20-%20December%205%202017.pdf

[8] https://vtrans.vermont.gov/sites/aot/files/SupportServices/VTrans_annual_rpt_wrkbk_2019.pdf

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Complete assessments necessary to support the development of a phosphorus control plan (PCP) for the South Champlain Basin early in the next TS4 permit cycle.	Basin wide	All towns	Developed Lands - Roads	Ongoing	100	VTrans submitted the generalized PCP on April 1st, 2020. It included identification of VTrans owned parcels, calculation of P base loads, P reduction targets for each segment of Lake Champlain as well as plans to investigate higher P source areas and develop P loading rates to help prioritize the highest source areas. A VTrans ArcGIS story map[9] details this information more fully. On October 1st, 2020, VTrans submitted their first implementation plan, where they seek to meet approximately 25percent of the total P reduction target in four years. There will be three subsequent four-year implementation plans that will each seek to meet approximately 25percent of the reduction target, with the goal of fully meeting their reduction targets by 2036. The 2020 implementation plan focused on the Missisquoi basin, and subsequent plans will focus on one or more lake segments including the South Lake Champlain basin.	21	NA
Identify funding to complete "Park and Ride" SW treatment practices.	Basin wide	All towns	Developed Lands - Other	Not started	0	No progress recorded toward this project.	22	Low

[9] https://www.arcgis.com/apps/MapJournal/index.html?appid=af0d93d2e55f42f1803ca79e0c492f3f

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Develop and implement SW practices to address runoff from Route 30 that is entering Lakes Bomoseen and Saint Catherine (including Little Lake).	Lake Bomoseen Watershed, Poultney River Watershed	Castleton, Hubbardton, Wells, Poultney	Developed Lands - Other	In progress	50	The Lake Bomoseen SWMP identified a project focused on the Edgewater Resort and associated Route 30 drainage with about one acre of impervious (including ½ acre of gravel) contributing sediment and nutrients directly to the lake under Route 30. PMNRCD will work with the landowner to implement the project. The LSC SWMP identified a project on Fern Cliff Road (6), which has a final design and is funded ($10,106) through a DEC Block Grant. It addresses runoff along Tucker Road and Route 30, and an eroded 18" culvert. PMNRCD will complete the project in 2021. Additionally, the LSCA and PMNRCD applied for LCBP funds to complete a LWAP for LSC, which will evaluate the culverts crossing Route 30 and other hydrologically connected roads and address runoff from culverts and road ditches.	23	Medium
Create South Lake Champlain farmer workgroup to support the implementation of Required Agricultural Practices (RAP), agricultural BMPs, and education and outreach (E&O) to meet TMDL requirements in high priority catchments.	Basin wide	All towns	Agriculture	Ongoing	100	South Lake Farmer workgroup was not created, but PMNRCD and UVM are engaging farms through other stakeholder groups and there is the potential to leverage more, e.g., the Champlain Valley Farmer Coalition. During SFY 2017-2020, a total of 37 E&O and technical assistance (TA) meetings reached 1,290 participants in the basin.	24, 25, 32	NA

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Create a tracking system for Certified Small Farm Operations (CSFOs) that need Nutrient Management Plans (NMP) or that have up-to-date NMP, schedule to keep these up-to-date.	Basin wide	All towns	Agriculture	Complete	100	AAFM RAPs require CSFOs to submit an annual certification form by January 31st of each year, which includes the status of the CSFO's NMP. This information is available to Agricultural Clean Water Initiative Program (AgCWIP) partners for the purpose of NMP E&O and TA. Additionally, PMNRCD created an internal tracking system, surveyed the farming community, and is assisting 43 farms that need NMPs. PMNRCD assists an additional 22-24 farms annually with NMP updates.	26	NA
Support eight farmers in developing NMPs through UVM Extension's Digging In course and the development of NMPs for all certified farms through NRCS CAPS funding.	Basin wide	All towns	Agriculture	Ongoing	100	State and federal funds support the work of NRCDs and UVM Extension to provide NMP courses and TA to farms developing and implementing NMPs. PMNRCD works with an average of 20 farms per year and Agronomy & Conservation Assistance Program (ACAP)/AgCWIP report shows six NMPs serving 18 farms between SFY 2017-2020. Additionally, PMNRCD assists an average of 2-3 farms per year who do not want to attend the class, but the District is limited by capacity.	27, 28	NA

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Generate funding so partners can work with priority farms NMPs and installing practices to address issues identified in NMP and Land Treatment Plans (LTPs).	Basin wide	All towns	Agriculture	Ongoing	100	Starting in SFY 2018, AAFM launched the AgCWIP made possible by the Vermont Clean Water Fund. Natural Resources Conservation Districts and UVM Extension staff working in the basin are recipients of AgCWIP grant awards, which include funding to provide TA for NMP and BMP implementation. PMNRCD implements NMPs, assists farms with applications to BMP and Pasture/Fence (PWSF) grants with VAAFM, and follow up work. PMNRCD also uses their own funding (private and federal funds) to install farm BMPs based on NMP/LTP. During the next 2.5 years, we will work to track BMP data linked to these funds.	29	NA
Include local dairy nutritionist in the (proposed) South Lake agricultural workgroup to support partners in make the bridge from NMP to feed & forage management.	Basin wide	All towns	Agriculture	In progress	75	A nutritionist position is unlikely and PMNRCD is meeting the strategy intent through E&O and TA visits. During SFY 2017-2020, nine nutrition workshops and feed/forage management TA visits were conducted in the basin.	30	Low

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Evaluate additional BMPs that could be used on hay land to reduce loading from this land use. Provide outreach to farmers to support effective BMPs.	Flower Brook, Poultney River, Mettowee River, Hospital Creek, Whitney Creek, East Creek	Pawlet, Danby, Tinmouth, Poultney, Fair Haven, West Haven, Middletown Springs, Tinmouth, Ira, Castleton, Pittsford, West Rutland, Hubbardton, Benson, Sudbury, Wells, Rupert, Dorset, Addison, Bridport, Shoreham, and Orwell.	Agriculture	Ongoing	100	The VT Agricultural Tracking and Accounting group assesses and analyzes the BMPs for reduction efficiencies and effectiveness in collaboration with state and federal agencies involved in developing and submitting data for state P accounting. New 2020 recommendations for BMPs eligible to be installed on hay lands from that inter-agency group include: 1. Multiple lines of evidence suggest that soil aeration may not be associated with reductions in total P loads from hay fields in VT. As a result, the workgroup decided to not adopt a P reduction efficiency for soil aeration practices. 2. Using a statistically driven approach to develop and evaluate P reduction efficiencies, a 40percent manure injection reduction efficiency was determined. 3. A 24 percent reduction efficiency was determined for pastures under the Grazing Management BMP. The AAFM Farm Agronomic Practices (FAP) Program and NRCS Environmental Quality Incentives Program (EQIP) fund hay land and pasture practices including: No Till, Pasture and Hay Land Renovation, Rotational Grazing, and Manure Injection. From SFY 2017 to 2020, 3,698 acres of agricultural land were treated by conservation practices in the basin.	31	NA

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Develop SW BMPs for farms and provide technical and financial support for farms to implement these to address runoff from impervious surfaces in farm production areas.	Basin wide	All towns	Agriculture	In progress	25	Technical and financial assistance is available to farmers to reduce production area runoff of agricultural wastes through the AAFM BMP Program and NRCS EQIP. Examples of barnyard and production area practices implemented on farms to address agricultural waste runoff are heavy use area protection, waste storage facilities, clean water diversions, and roof runoff structures. From SFY 2017 to 2020, 28 barnyard and production area practices were installed in the basin.	33	Low

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Increase conservation equipment available for rental or through custom applicators to allow farmers to follow NMPs including equipment to measure crop yields, manure application rates, take soil samples, and to implement practices such as no-till drills, manure injectors, tine weeder air seeders.	Basin wide	All towns	Agriculture	In progress	50	Starting in SFY 2018, AAFM expanded the Conservation Equipment Assistance Program (CEAP) to provide opportunities for farmers, custom applicators, and non-profit organizations to receive grant funding for conservation equipment. Between SFY18 and SFY20, CEAP provided funding to 10 farmers and partners in the basin to purchase conservation equipment. To date, farms have implemented approximately 3,000 acres of conservation practices by acquiring conservation equipment through the program. In addition to the CEAP program, PMNRCD has one no-till drill and 12 portable truck scales (6 for PMNRCD and six for UVM Ext in Middlebury). PMNRCD recently purchased forage moisture meters that are being used for yield measurements. PMNRCD staff will soil sample for farmers on an as-needed basis after they have a complete NMP with priority given to those farms that have participated in the RCPP NMP program.	34	Medium

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Promote existing programs and develop programs to reduce financial match requirements for farmers to implement priority water quality improvement practices in coordination with Farm Viability Program.	Basin wide	All towns	Agriculture	In progress	50	AAFM provides funding through the AgCWIP program to UVM Extension Farm Viability Program/Agricultural Business Team to assist farms with certification and regulatory requirements, RAPs, and farm business planning, WQ financial plans for BMP implementation, as well as grant funding opportunities and coordination. These services are available for South Lake Champlain farmers.	35, 40	Medium
Develop equine specific programming including support for installing horse manure compost bins and making pasture improvements.	Basin wide	All towns	Agriculture	Complete	100	PMNRCD created a RAP packet for Horse Owners, which it distributes to horse owners, stables, and at RAP workshops. Copies have also been left at the various town offices. From SFY 2017 to 2020, five RAP and pasture improvement workshops and two compost bins were implemented in the basin.	36	NA
Complete targeted water quality sampling on farms to identify source areas and evaluate nutrient reductions achieved through BMP implementation.	Basin wide with focus on East Creek, Stony Creek, Braisted Brook, Wards Creek, Hospital Creek, Dead Creek, Wells Brook, and Poultney River	Orwell, Addison, Bridport, Shoreham, Ferrisburgh, Panton, West Haven, and Pawlet	Agriculture	In progress	25	As BMPs are funded and implemented in the basin, PMNRCD will work with farms to bracket monitor agricultural BMPs. DEC will continue to monitor water quality in the receiving waters.	37	Low

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Increase the participation of Dairy Farms in the Caring Dairy Program, as well as new AAFM Vermont Environmental Stewardship program to highlight farms with good water quality practices.	Basin wide	All towns	Agriculture	In progress	25	No farms in the basin participate in the Caring Dairy program, in part, because farms must belong to Dairy Farmers of America, which is mostly comprised of farms in northern VT. In 2018, AAFM began a pilot of the Vermont Environmental Stewardship Program (VESP)[10]. From August 2018 to August 2020, eight farms were assessed by conservation planners in categories such as soil health, water quality, air quality, and pesticide management. One South Lake Champlain farm is enrolled in the pilot program. Final evaluations and assessments are underway to determine VESP certifications for the pilot farms and evaluation criteria for the full launch of the program.	39	Low
Develop Farm Conservation Corp program to support implementation of BMPs which can be done efficiently by hand labor.	Basin wide	All towns	Agriculture	Not Started	0	No progress recorded toward this project.	41	Low

[10] https://agriculture.vermont.gov/vesp

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Support local land trusts and conservation organizations in conserving forest blocks that are important for protecting water quality in headwater streams.	Basin wide	All towns	Forests	Ongoing	100	From January 2018 to July 2020, the Vermont Land Trust conserved 792 acres of forest land across the following towns: Addison, Benson, Bridport, Danby, Ferrisburgh, Orwell, Pawlet, Rupert, Shoreham, and West Haven. In the next 2.5 years, PMNRCD plans to target conservation in high quality forest blocks, e.g., the landscape assessment in the Flower Brook watershed.	42	NA
Coordinate workshops on minimizing water quality impacts of maple sugaring operations. Consider GSI/ infiltration BMPs to mitigate changes in hydrology due to RO water discharges.	Basin wide	All towns	Agriculture	Ongoing	100	The VT Maple Sugar Makers' Association partners with UVM Extension to host 3 workshops per year reaching approximately 200 attendees/event. At the workshops, they offer sessions and information on sugar house RO water discharges.	43	NA
Host workshops on the new Acceptable Management Practices (AMP), as well as resources available for addressing logging road issues which could be held at local lumberyards.	Basin wide	All towns	Forests	Ongoing	100	VT Dept. of Forests, Parks, and Recreation has hosted workshops on the AMPs and responded to two AMP complaints and two technical assistance calls from 2018 to 2020. Neither of the complaints had evidence of discharge. PMNRCD has held landowner meetings, provided resources, and identified projects within forested land in the Flower Brook Watershed.	44	NA

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Use LiDAR data when available to identify gullies that may have been caused by historical logging operations to evaluate restoration potential.	Basin wide	All towns	Forests	Ongoing	100	A project completed in 2017 used LiDAR to identify and map forest roads, trails, and log landings on private forests in VT, with specific focus on the South Lake watershed. The project confirmed that LiDAR can be used to: visualize forest roads, locate sites with high erosion potential, reveal landscape-level patterns of pollution loading, and highlight units that require further analysis. A subsequent consulting project is currently underway (focusing on the South Lake and Missisquoi Basins) that will further assess forestlands to identify and prioritize legacy erosion associated with critical source areas within forests. Ground truthing of this landscape analysis will be used to calibrate this prioritization framework of critical source areas to address legacy erosion in high priority basins (e.g., South Lake Champlain and Missisquoi Bay) to achieve target load allocations for lake segments that will not meet reduction targets through VT AMP compliance alone. During SFY 2017-2020, 43,560 square feet of gully erosion were remediated.	45	NA
Continue to support local skidder bridge rental program and increase usage of bridges.	Basin wide	All towns	Forests	Ongoing	100	PMNRCD does not have an active skidder bridge program. The DFPR is currently focused on providing loggers with assistance to build and own their own bridges. During SFY 2017-2020, 16 stream crossings were improved because of skidder bridge use in the basin.	46	NA

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Stream Geomorphic Assessments (SGAs) and River Corridor Plans (RCPs) and identify projects with focus on stressed and impaired segments.	Basin wide-focus on Castleton River, Mettowee River, Poultney River, East Creek	Castleton, Fair Haven, Ira, Poultney Wells, Orwell, Benson, Addison, Bridport, Shoreham	Rivers	Complete	100	SGAs complete-Castleton River (2007), Mettowee River (2005 and 2007), Poultney River (2006), Lewis Brook and Finel Hollow Brook Phase 2 SGA (2006), Poultney Tributaries Phase 1 SGA (2007), Poultney Trib.-Vail Brook Phase 2 SGA (2007) RCPs complete-Poultney River (2006), Town of Castleton (2007), East Creek (2011) Others- Poultney-Hubbardton River Debris Project (2006), Poultney-Hubbardton Alternatives Analysis (2006)	47, 48	NA
Complete preliminary engineering for projects identified in existing and new SGAs, Bridge & Culvert inventories, and RCPs.	Basin wide-focus on Castleton River, Poultney River, East Creek Watershed	Castleton, Fair Haven, Poultney, Wells, Orwell, Benson, Addison, Bridport, Shoreham	Rivers	Ongoing	100	From SFY 2017 to 2020, 186 preliminary (30 percent) designs were completed, four river corridor/floodplain encroachments removed or retrofitted, and 37.4 stream miles were reconnected for stream equilibrium/aquatic organism passage. All culverts and bridges are assessed and 289 municipal road drainage and stream culverts were replaced in the basin. Partners are working to replace those with known AOP issues. Nine priority projects were identified the in Castleton RCP (2007) and PMNRCD will begin project development in 2021.	49	NA

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Complete priority river corridor easement projects along priority reaches where the greatest stream equilibrium can be achieved.	Priority Sub-Basins include Poultney (lower) and Castleton Rivers	All towns	Rivers	Ongoing	100	River corridor easements depend, in part, on landowner willingness. The Watershed Planner, PMNRCD, and Rivers program staff will work to identify willing landowners to implement easements. This action will be carried out as opportunities present themselves for conservation and restoration.	50	NA
Continue buffer plantings along rivers in priority locations through CREP, Trees for Streams program, and USFWS buffer planting efforts.	Priority Sub-Basins include Poultney (lower) and Castleton Rivers	All towns	Rivers	Ongoing	100	From SFY 2017 to 2020, 12,967 linear feet and 125.93 acres of riparian corridor buffer were planted/restored in the basin using state funds. From 2018 to 2020, PMNRCD planted approximately 9,000 stems in riparian buffers in the basin. These plantings were funded by Pur Projet (a private foundation), Trees for Streams, and USFWS. Large scale plantings were completed in the Flower Brook watershed, along the Indian River, and on Lewis Brook. Smaller scale plantings were completed along tributaries of the Mettowee and Poultney Rivers.	51	NA

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Enhance USFWS, USFS, and USDA-NRCS programs to encourage more efficient means to convert and revegetate cleared lands to floodplain forest.	Priority Sub-Basins include Poultney (lower) and Castleton Rivers	All towns	Rivers	Ongoing	100	From SFY 2017 to 2020, 10.75 acres of floodplain were reconnected/restored using state funds in the basin. The VT Regional Conservation Partnership Program (RCPP) has been extended for an additional five years and has $1 million set aside for forestry practices that relate to water quality improvement. Funds can be used for revegetation as well as other forest practices, including road improvement, culverts, and crossings. This action will be carried out as opportunities present themselves for conservation and restoration.	52	NA
Coordinate outreach to basin towns on adopting River Corridor Zoning.	Basin wide	All towns	Rivers	In progress	10	The only town in this basin to adopt river corridor protections is Pawlet. No other town is interested and the RRPC has found it difficult to get support for river corridor zoning or even adding protections in towns' flood regulations. Outreach will be focused on the remaining towns, but it is unlikely that these towns will adopt river corridor standards by 2022.	53	Low

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Identify wetland restoration opportunities and outreach to landowners of wetlands identified as priority restoration sites.	Basin wide	All towns-focus on wetlands in Sudbury, Poultney, Benson, Ferrisburgh, Orwell, Addison, Panton, Clarendon, Bridport, West Rutland, Dorset, Fair Haven	Wetlands	Ongoing	100	During SFY 2017-2020, 578.35 acres of wetland were restored in the basin using state funds. These activities are ongoing and the DEC Wetlands Program supports this outreach to landowners. From 2018 to 2020 (calendar year), 368 properties or projects were reviewed by the Wetlands Program in the basin. In addition, the District Wetland Ecologist conducted approximately 580 site visits during this period and hosted six education & outreach events with 131 attendees in the basin. Updated Lake Champlain wetland restoration site prioritization modeling was completed in 2018 utilizing RCPP funds. The updated maps identify potential wetland restoration areas with the highest likelihood of P attenuation and are available on the ANR Atlas and the Wetland Inventory Mapper. Partners such as NRCDs, NRCS, VLT, TNC and DFW are using these maps and a subset of project packets to help target wetland restoration outreach. For example, DFW has initiated a wetland restoration and acquisition initiative with funding from EPA through the Lake Champlain Basin Program. The primary focus of this project is wetland restoration on new and existing DFW acquisitions with a goal of 40 percent lands restored.	54, 55	NA

Strategy Description	Priority Subbasin(s)	Priority Towns	Sector	Status	Percent Complete	Explanation	Crosswalk to Plan Strategy Number	Likelihood of Completion
Review WWTF facilities and issue permits that meet these new phosphorus limits. Support towns pursuing phosphorus optimization, expansion projects, and upgrades.	Basin wide	Benson, Castleton, Fair Haven, Poultney, Pawlet	WW	Ongoing	100	Benson, Castleton, Fair Haven, Poultney, and Pawlet permits were renewed on July 1, 2019. Therefore, they have each been reviewed for reasonable potential regarding phosphorus criteria during the permitting process and per the current permits are required to pursue phosphorus optimization. If upgrades are needed that will be discussed with towns by the end of 2020.	56, 57	
Identify non-functioning dams that are creating geomorphic discontinuity and aquatic organism/ fish passage barriers and pursue removal.	Castleton River, Mettowee River, North Breton Brook	Castleton, Hubbardton	Rivers	Ongoing	100	The VFWD owns the Pelletier Dam on North Breton Brook in Castleton. A 100 percent engineered design and all required permits for removal were completed in 2020. It is ready for removal and funding is being identified. Other potential dams for removal include: Kit Wallace Dam, Austin Pond Dam on Lake Bomoseen in Hubbardton, the Mettowee river low head dams, and several on Pond Hill Brook.	58	NA
Review status of flow-altered waterbodies and, where necessary, take steps toward restoring more natural water level fluctuations and downstream flows.	Lake Bomoseen-Outlet Stream	Castleton	Rivers	Complete	100	The Lake Bomoseen outlet stream is the only waterbody in the basin on the 2020 flow-altered list. The Lake Bomoseen Dam is owned by the State and operated daily by a contractor on behalf of the State to maintain the water level in the lake in compliance with the May 1983 Water Resources Board Order. The order requires the lake level to be maintained at spillway gage zero plus or minus three (3) inches, with the desired level on the plus side in the summer. At this point, there are no plans to alter this operation.	59	NA

Appendix C. Estimated Total Phosphorus Load Reductions by Lake Champlain Segment Watershed

The Lake Champlain TMDL Progress Report, Part 2 of the *Vermont Clean Water Initiative 2020 Performance Report*, summarizes the State of Vermont's progress implementing the *Phosphorus Total Maximum Daily Loads for Vermont Segments of Lake Champlain* (i.e., Lake Champlain TMDL). The report presents estimated total phosphorus load reductions achieved by clean water projects, completed/in effect SFY 2016-2020, within the context of the Lake Champlain TMDL baseline (2001-2010) and target (2038). Total phosphorus load must be reduced by 212.4 metric tons per year from Vermont sources for Lake Champlain to meet State of Vermont water quality standards. The TMDL further allocates phosphorus reduction targets by "lake segment" watershed, which differ slightly from the Tactical Basin Planning watersheds, as shown in Figure 1. This Appendix presents estimated total phosphorus load reductions achieved/in effect for the SFY 2016-2020 reporting period by lake segment watershed compared to the target reduction. Table 1 summarizes the estimated percentage of required total phosphorus load reduction achieved within the SFY 2016-2020 reporting period by lake segment watershed.

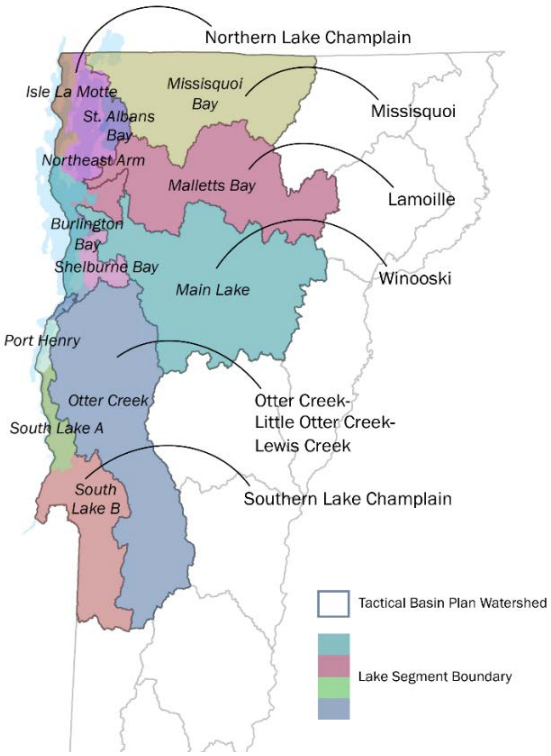


Figure 1. Lake segment watershed boundaries as specified in the Lake Champlain TMDL (shaded areas) compared to Tactical Basin Plan watershed boundaries (dark blue outline)

Table 1. Estimated percentage of required total phosphorus load reduction achieved, SFY 2016-2020, by lake segment watershed (shading represents relative closeness to meeting 100 percent of the target)

Lake Segment	SFY 2016	SFY 2017	SFY 2018	SFY 2019	SFY 2020
Burlington Bay	0.00%	0.00%	0.02%	0.07%	0.03%
Isle La Motte	0.1%	2%	3%	3%	8%
Main Lake	3%	5%	5%	6%	7%
Malletts Bay	5%	6%	9%	12%	12%
Missisquoi Bay	3%	5%	6%	8%	9%
Northeast Arm	16%	47%	51%	57%	54%
Otter Creek	7%	11%	12%	18%	17%
Port Henry	7%	19%	10%	18%	26%
Shelburne Bay	8%	14%	8%	12%	17%
South Lake A	8%	14%	12%	19%	39%
South Lake B	3%	4%	4%	5%	6%
St. Albans Bay	23%	35%	39%	50%	46%
Lake Champlain Basin-Wide	5%	8%	8%	11%	13%

EXPLANATION OF TABLE

The level of progress is variable by lake segment watershed for the following reasons:

1. Lake segment size and level of phosphorus reduction required varies: The TMDL allocated phosphorus loading capacity based on each lake segment watersheds land use characteristics and the reduction required for the receiving lake segment to meet State of Vermont water quality standards. The level of effort required and the magnitude of phosphorus loading ranges by lake segment. For example, the TMDL requires an 87.7 metric ton reduction for Missisquoi Bay to meet water quality standards while Shelburne Bay requires a 1.2 metric ton reduction. Tactical Basin Plans target clean water efforts to portions of the Lake Champlain basin with the greatest need for phosphorus reduction.
2. Clean water projects are targeted in priority watersheds: The state must spend its resources efficiently and effectively given the significant cost of restoring and safeguarding water quality. Tactical Basin Plans inform where to prioritize efforts to reduce phosphorus pollution to Lake Champlain. The progress in the Northeast Arm and St. Albans Bay lake segment watersheds are notably high compared to other lake segments due, in part, to higher levels of funding in these watersheds. St. Albans Bay watershed is a priority watershed under the National Water Quality Initiative where U.S. Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) has been targeting agricultural technical and financial assistance to farmers since 2016.
3. Gaps in the state's ability to quantify phosphorus reductions for all projects: The State of Vermont is expanding its ability to quantify estimated total phosphorus load reductions for all project types. Phosphorus reductions associated with most agricultural practice types can be quantified, while gaps for many natural resources restoration project types still exist. This is one reason why lake segments dominated by agricultural efforts will show greater progress than those targeting natural resources restoration. Efforts are ongoing to address these gaps, including two contracts in place related to floodplain, river, and wetland restoration and forestry management practices. The Clean Water Service Delivery Act (Act 76 of 2019) requires the state to address gaps and publish methods to estimate clean water project phosphorus reductions within the Lake Champlain and Lake Memphremagog basins by November 1, 2021. See Appendix E for summary of methods used to estimate pollutant reductions.
4. Programs are ramping up to increase the pace of phosphorus reductions: The Lake Champlain TMDL timeframe began in 2017 and its implementation plan included a "ramping-up" phase of regulatory and financial and technical assistance programs. New regulatory programs are now in place that will drive phosphorus reductions from agricultural sources, developed lands, and roads. For example, Stormwater General Permit 3-9050 (i.e., "3-acre permit") requires stormwater treatment from sites with three or more acres of impervious surfaces – hard surfaces such as roofs and roads – that are unpermitted or permitted before 2002. In addition, the Municipal Roads General Permit (MRGP) requires municipalities to complete Road Erosion Inventories by the end of 2020 for road segments adjacent to and intersecting surface waters (i.e., hydrologically connected) and establishes a schedule to bring those road segments into full permit compliance by 2038. Lake segments dominated by developed lands are expected to see the benefits of these programs in the coming years.

This evaluation of progress, along with Tactical Basin Planning accounting and gap analysis, will help inform "adaptive management" such as where state and federal agencies and partners target future financial and technical assistance efforts to ensure adequate progress across all lake segment watersheds and land use sectors.

Lake Champlain TMDL Progress by Lake Segment

The following figures show estimated total phosphorus load reductions achieved by clean water projects/activities completed/in effect SFY 2016-2020 per lake segment (see Figure 2) in the context of the TMDL total phosphorus load baseline (2001-2010) and target (2038). TMDL total phosphorus loading baselines, for both wastewater and non-wastewater loads, were established using water quality monitoring data from 2001 to 2010. Total phosphorus load reduction targets, which are required to meet State of Vermont water quality standards, vary by lake segment. These data can be further examined online using the Clean Water Interactive Dashboard via the Clean Water Portal.[1]

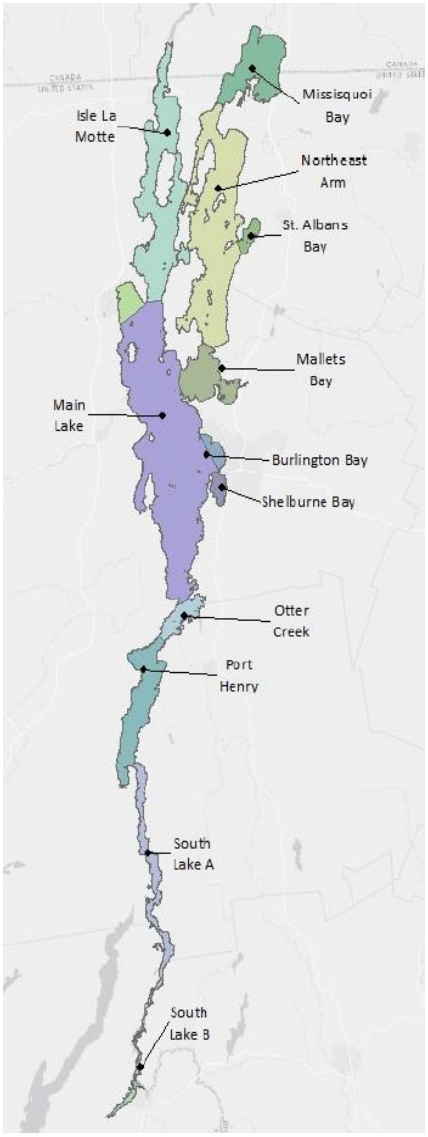


Figure 2. Lake Champlain TMDL lake segments boundaries

[1] The Clean Water Portal may be accessed here: https://anrweb.vt.gov/DEC/cleanWaterDashboard/

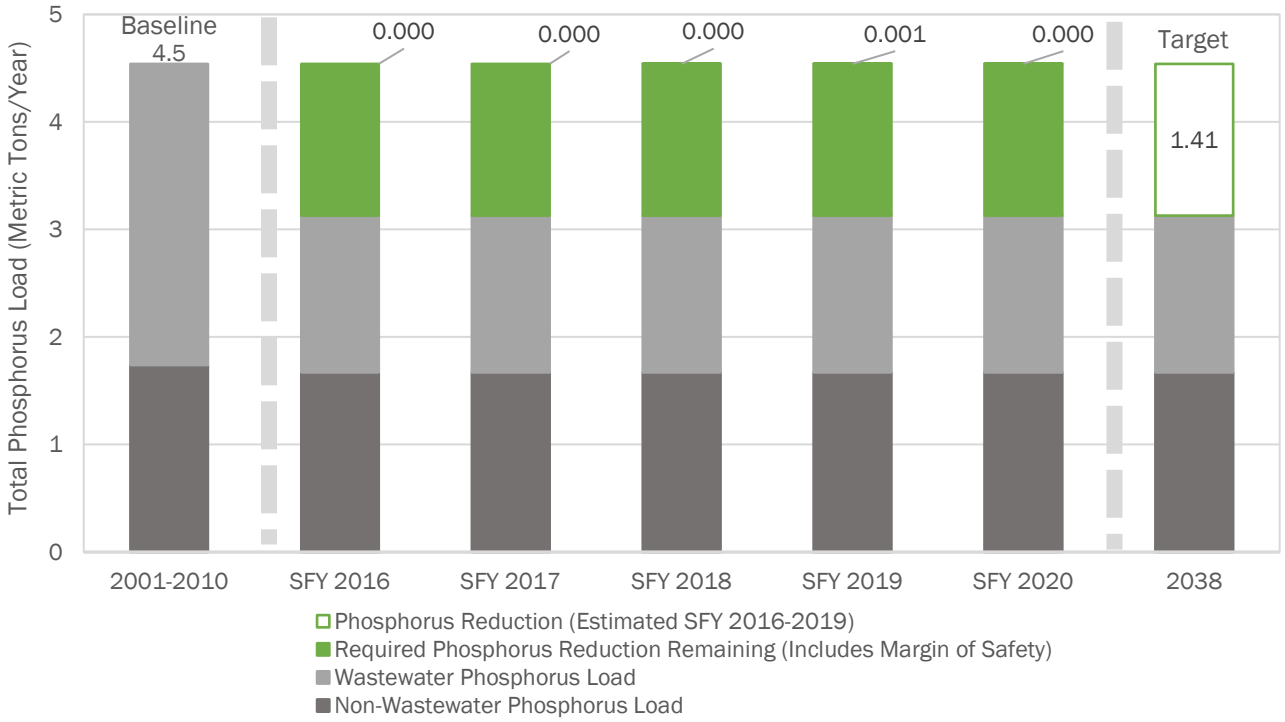


Figure 3. Estimated total phosphorus load reductions (metric tons per year) achieved/in effect for the SFY 2016-2020 reporting period in the context of the Lake Champlain TMDL total phosphorus load baseline (2001-2010, at left) and target phosphorus load (year 2038, at right) in the "**Burlington Bay**" lake segment watershed

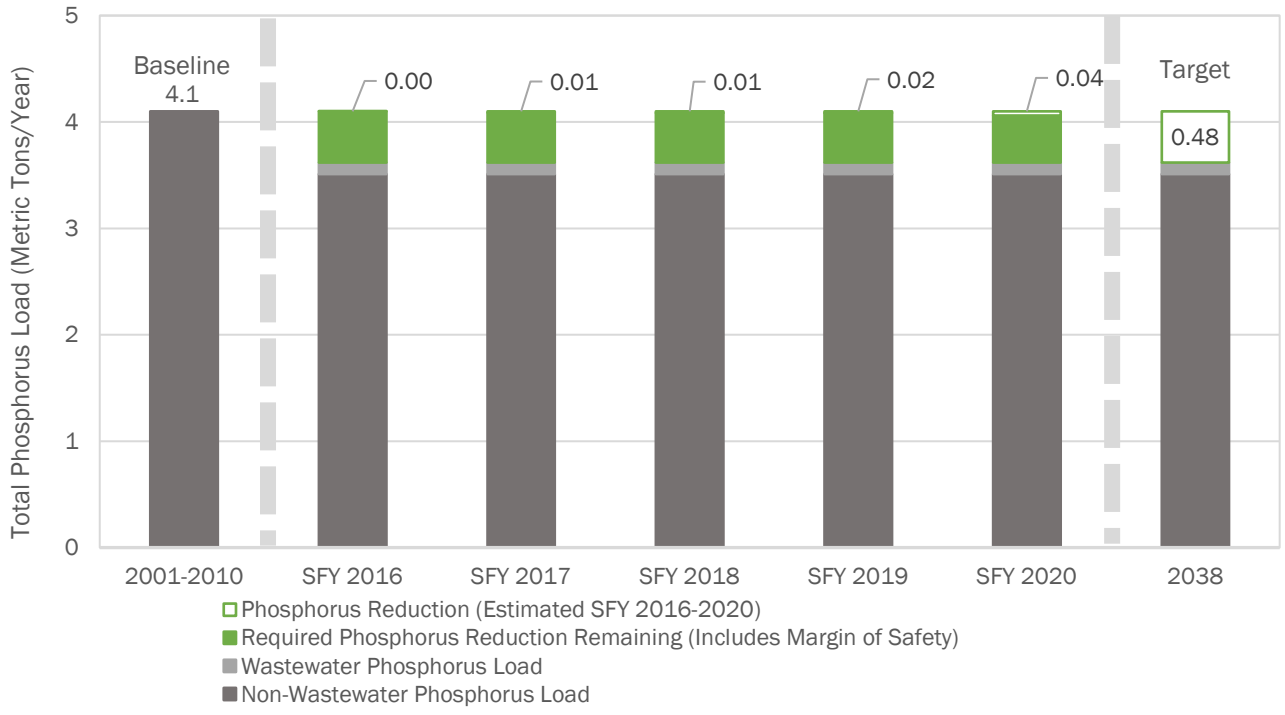


Figure 4. Estimated total phosphorus load reductions (metric tons per year) achieved/in effect for the SFY 2016-2020 reporting period in the context of the Lake Champlain TMDL total phosphorus load baseline (2001-2010, at left) and target phosphorus load (year 2038, at right) in the "**Isle La Motte**" lake segment watershed

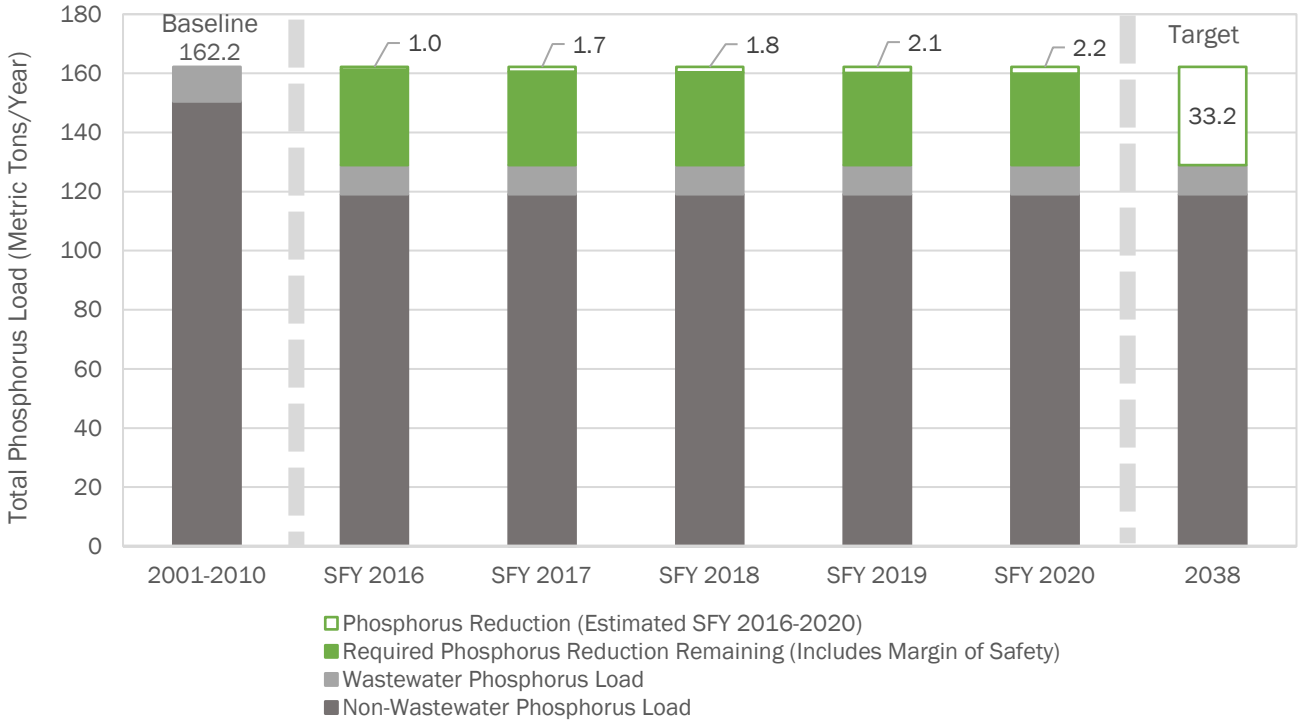


Figure 5. Estimated total phosphorus load reductions (metric tons per year) achieved/in effect for the SFY 2016-2020 reporting period in the context of the Lake Champlain TMDL total phosphorus load baseline (2001-2010, at left) and target phosphorus load (year 2038, at right) in the "**Main Lake**" lake segment watershed

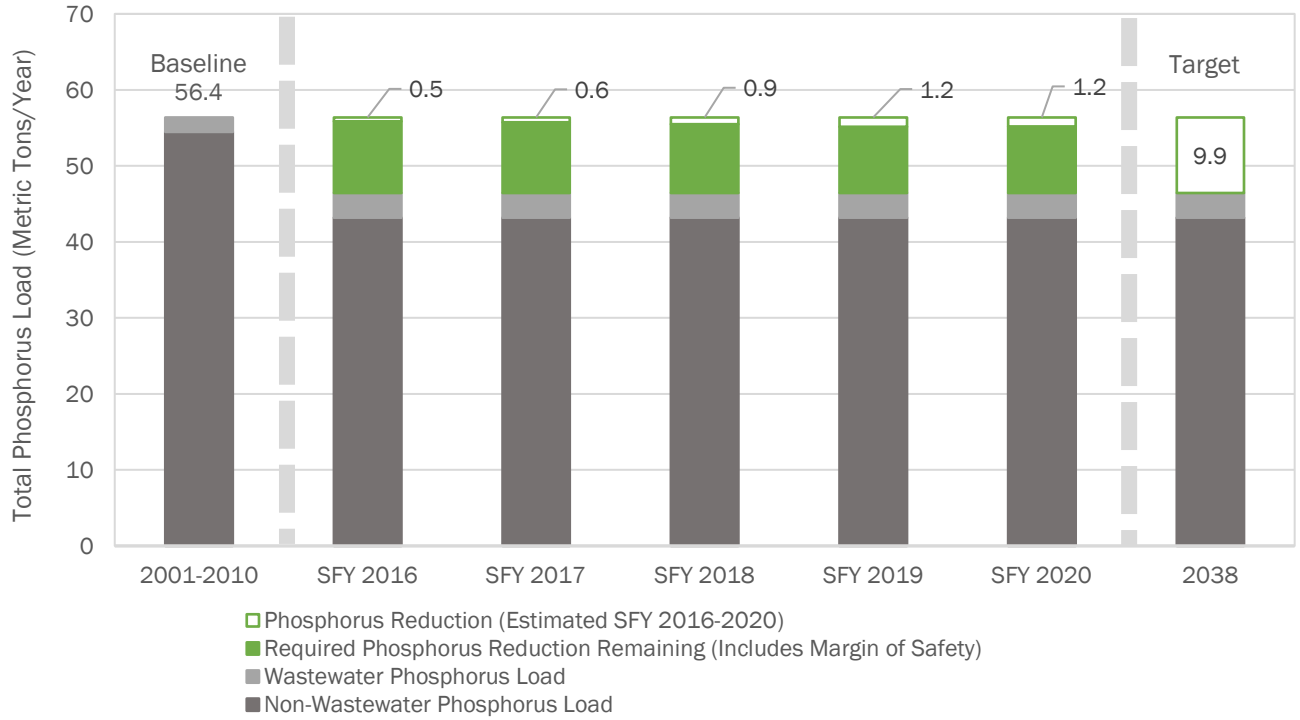


Figure 6. Estimated total phosphorus load reductions (metric tons per year) achieved/in effect for the SFY 2016-2020 reporting period in the context of the Lake Champlain TMDL total phosphorus load baseline (2001-2010, at left) and target phosphorus load (year 2038, at right) in the "**Malletts Bay**" lake segment watershed

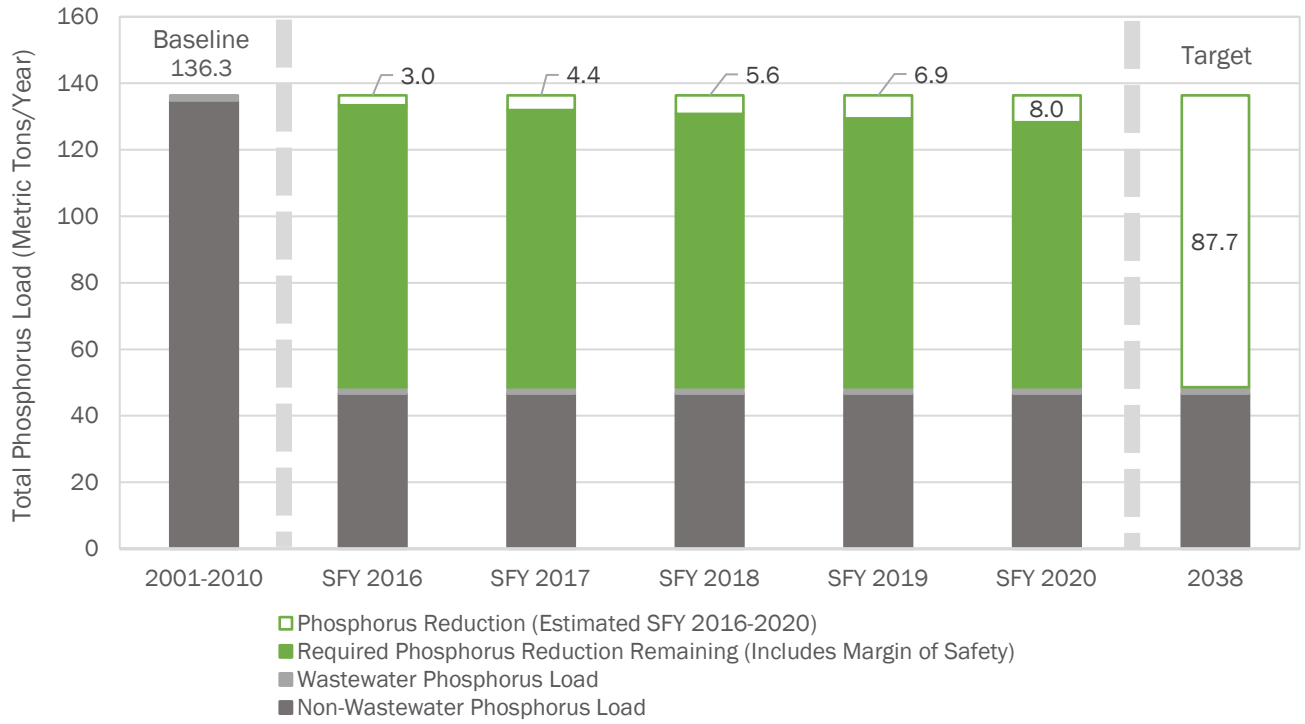


Figure 7. Estimated total phosphorus load reductions (metric tons per year) achieved/in effect for the SFY 2016-2020 reporting period in the context of the Lake Champlain TMDL total phosphorus load baseline (2001-2010, at left) and target phosphorus load (year 2038, at right) in the "**Missisquoi Bay**" lake segment watershed

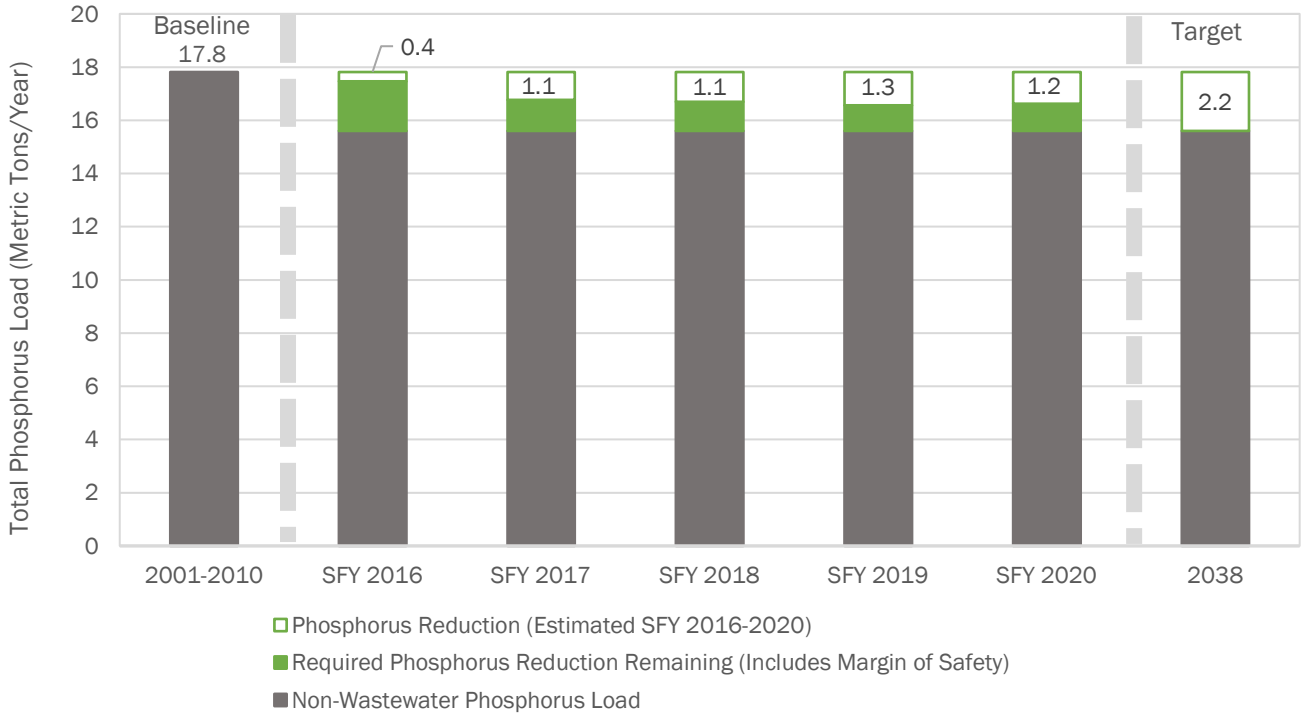


Figure 8. Estimated total phosphorus load reductions (metric tons per year) achieved/in effect for the SFY 2016-2020 reporting period in the context of the Lake Champlain TMDL total phosphorus load baseline (2001-2010, at left) and target phosphorus load (year 2038, at right) in the "**Northeast Arm**" lake segment watershed

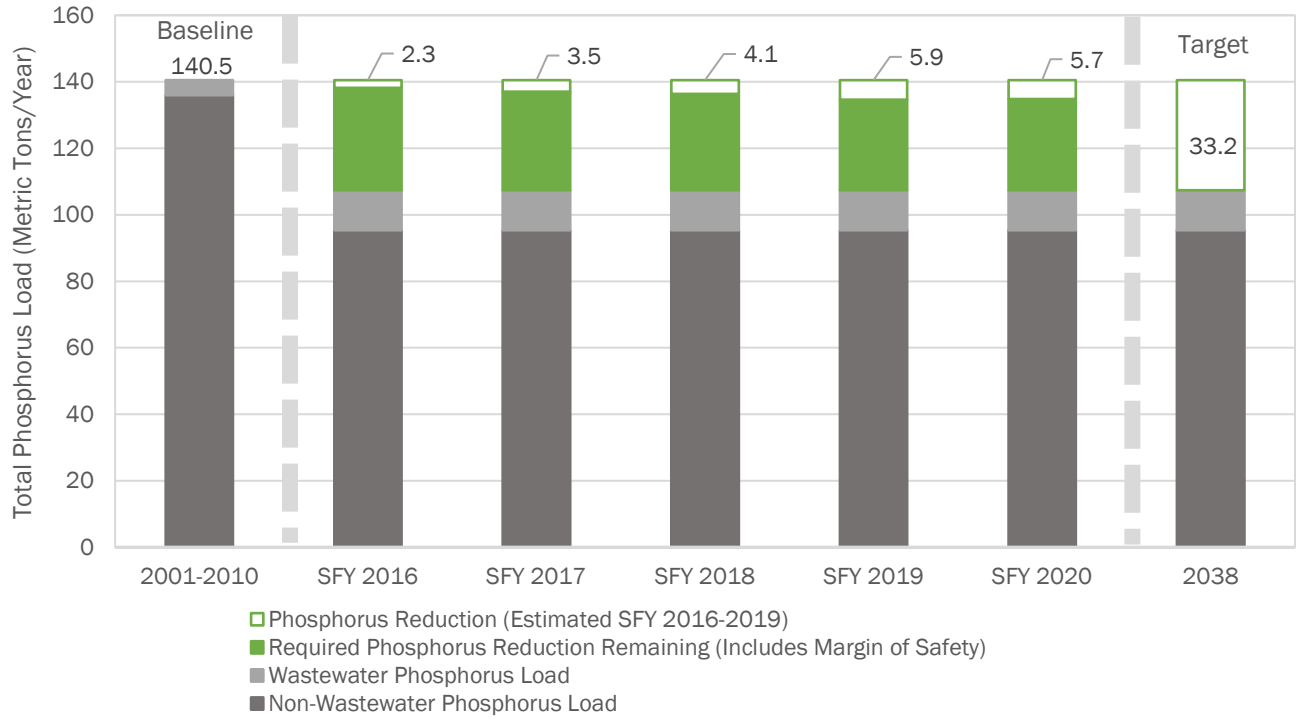


Figure 9. Estimated total phosphorus load reductions (metric tons per year) achieved/in effect for the SFY 2016-2020 reporting period in the context of the Lake Champlain TMDL total phosphorus load baseline (2001-2010, at left) and target phosphorus load (year 2038, at right) in the "**Otter Creek**" lake segment watershed

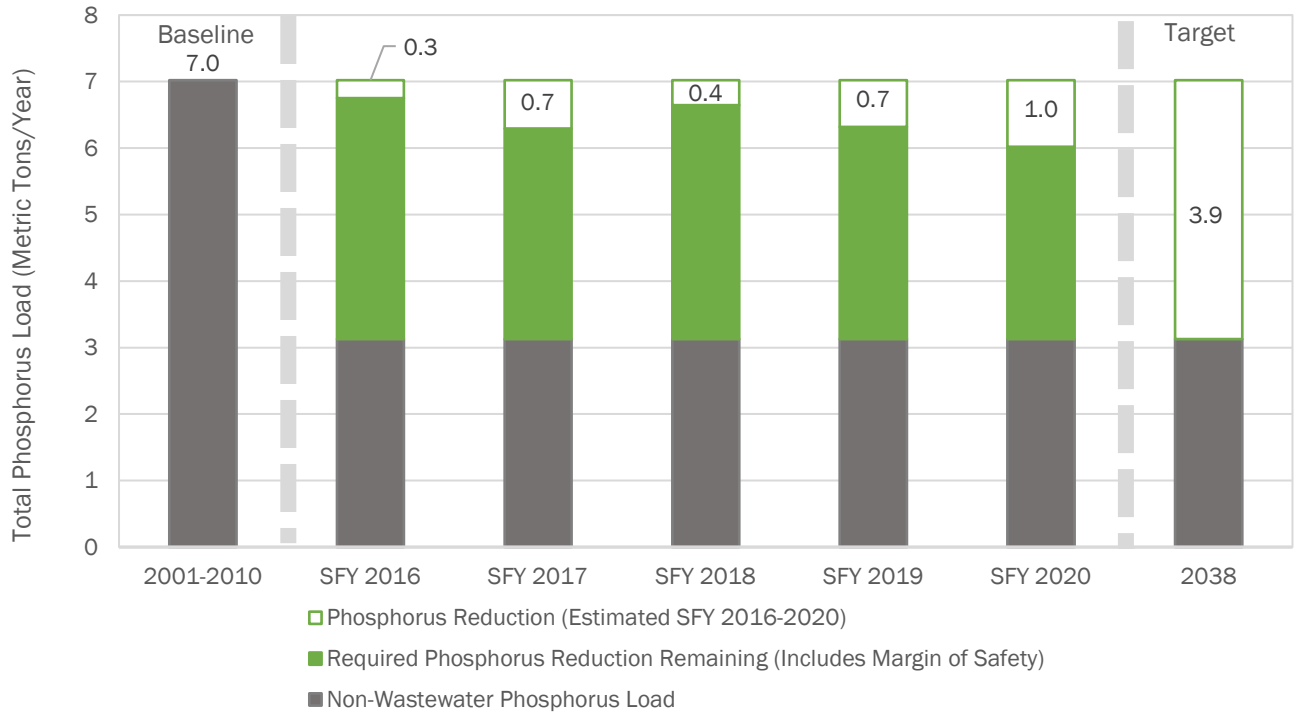


Figure 10. Estimated total phosphorus load reductions (metric tons per year) achieved/in effect for the SFY 2016-2020 reporting period in the context of the Lake Champlain TMDL total phosphorus load baseline (2001-2010, at left) and target phosphorus load (year 2038, at right) in the "**Port Henry**" lake segment watershed

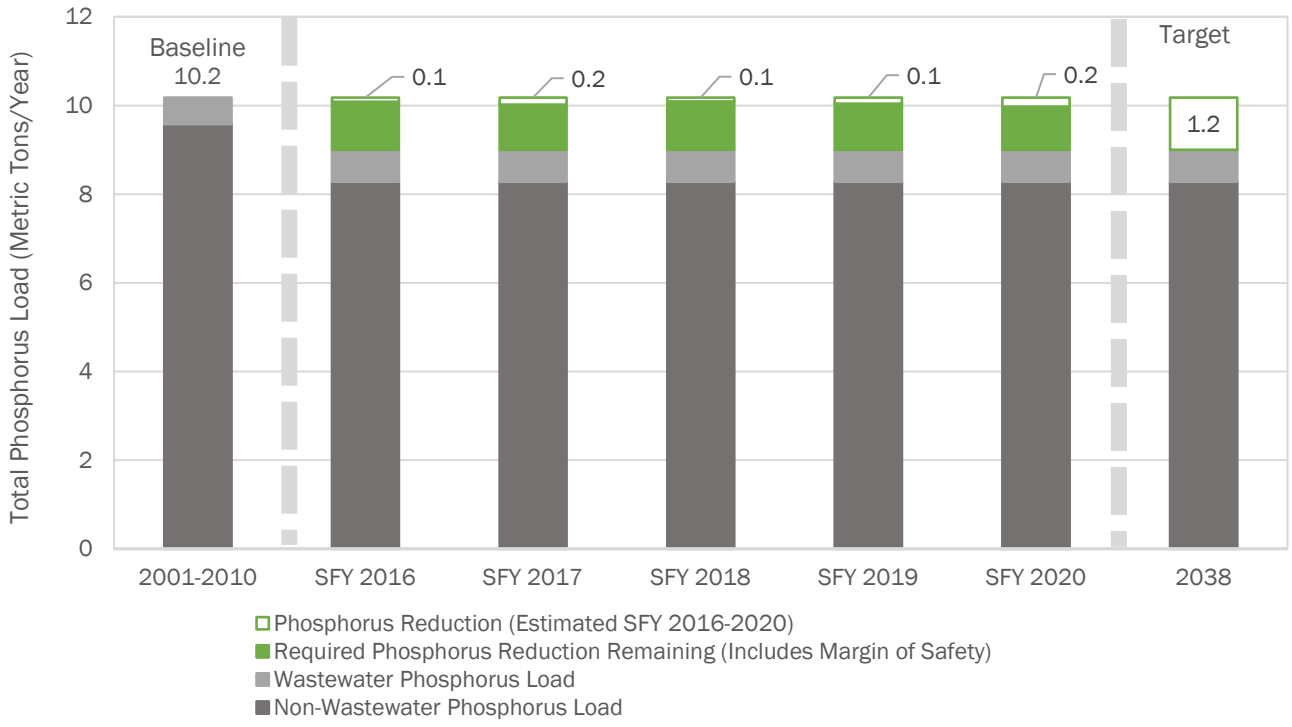


Figure 11. Estimated total phosphorus load reductions (metric tons per year) achieved/in effect for the SFY 2016-2020 reporting period in the context of the Lake Champlain TMDL total phosphorus load baseline (2001-2010, at left) and target phosphorus load (year 2038, at right) in the "**Shelburne Bay**" lake segment watershed

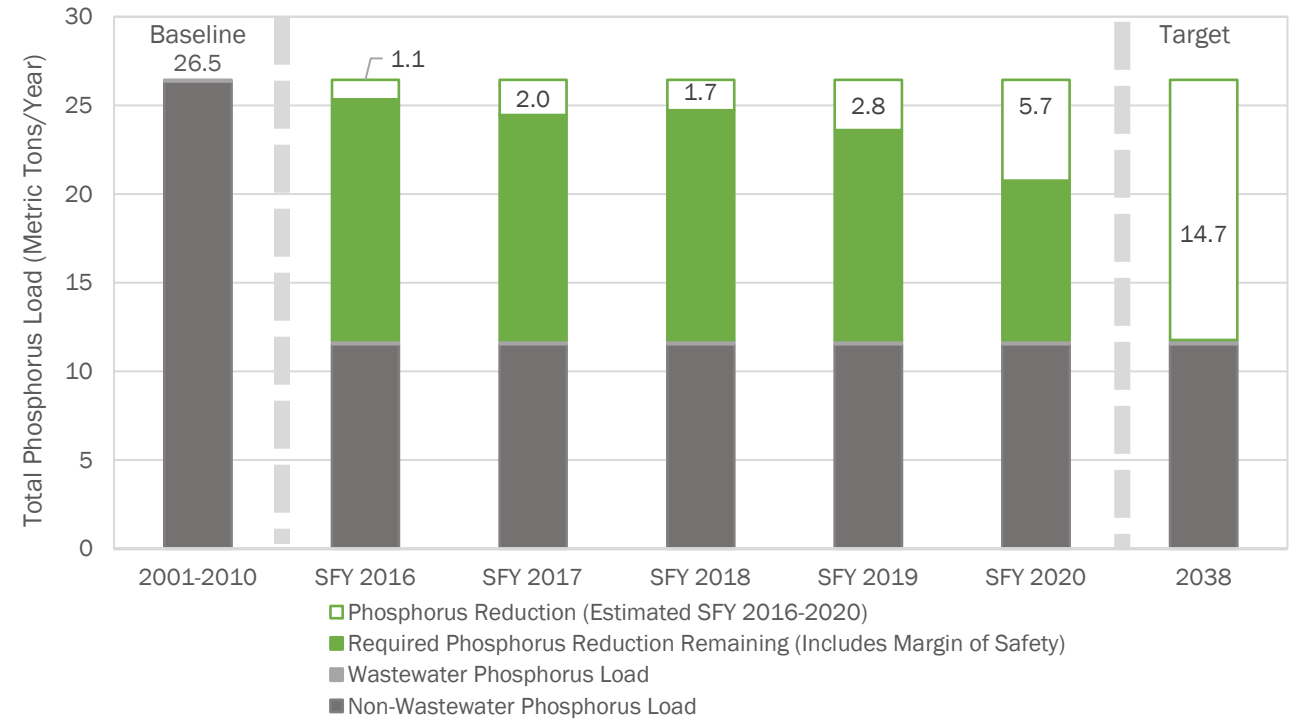


Figure 12. Estimated total phosphorus load reductions (metric tons per year) achieved/in effect for the SFY 2016-2020 reporting period in the context of the Lake Champlain TMDL total phosphorus load baseline (2001-2010, at left) and target phosphorus load (year 2038, at right) in the "**South Lake A**" lake segment watershed

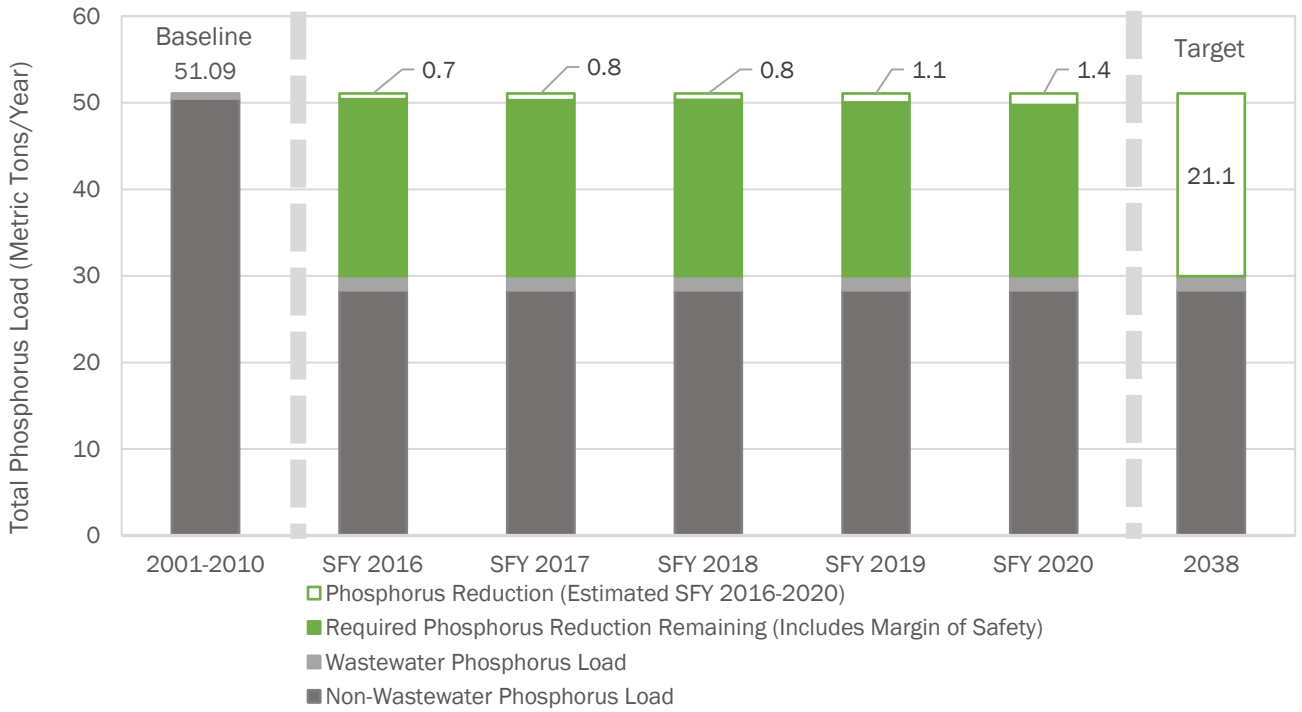


Figure 13. Estimated total phosphorus load reductions (metric tons per year) achieved/in effect for the SFY 2016-2020 reporting period in the context of the Lake Champlain TMDL total phosphorus load baseline (2001-2010, at left) and target phosphorus load (year 2038, at right) in the "**South Lake B**" lake segment watershed

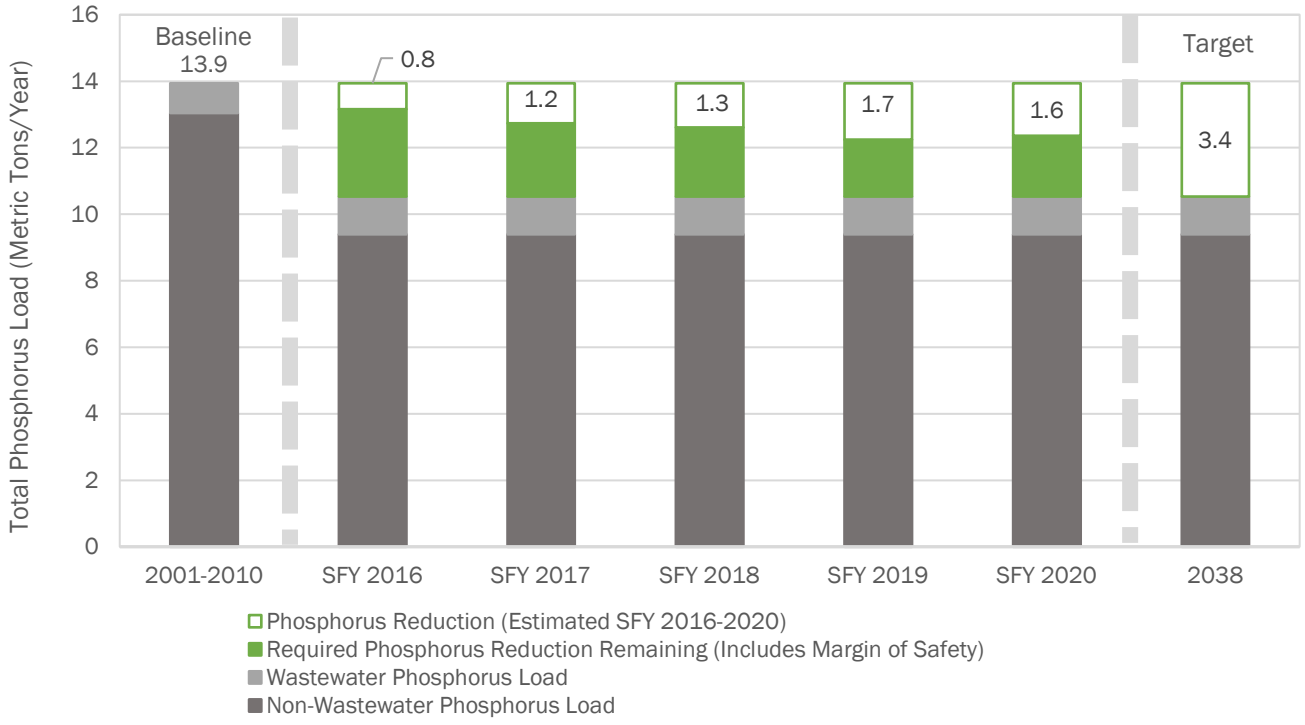


Figure 14. Estimated total phosphorus load reductions (metric tons per year) achieved/in effect for the SFY 2016-2020 reporting period in the context of the Lake Champlain TMDL total phosphorus load baseline (2001-2010, at left) and target phosphorus load (year 2038, at right) in the "**St. Albans Bay**" lake segment watershed

Appendix D. Results of Operational Stormwater Permits

The purpose of this Appendix is to summarize the contributions that Operational Stormwater permits have made toward meeting Vermont's water quality goals.

Scope of Data	
Data include:	Stormwater permit data includes new or amended operational stormwater permits issued in state fiscal year (SFY) 2018 -2020. Permits authorize new, redeveloped, and existing impervious surfaces meeting regulatory thresholds. DEC tracks permit issuance, not actual construction of impervious. Actual construction and change in phosphorus load may occur one to several years behind authorization under the permit.
Data does not include:	Phosphorus load data from outside the Lake Champlain and Memphremagog basins.
Future improvements:	More precise tracking of the drainage area and size of each practice is needed to improve the accuracy of the reductions. Permitted retrofit projects should be flagged if funded by a grant program.

Table 1. Stormwater treatment practice types installed to comply with new operational stormwater permits in SFY 2018-2020 and average estimated phosphorus removal rates

Practice Tier	Definition and examples	Average Phosphorus Removal	Permitted in SFY 2018[1]	Permitted in SFY 2019[1]	Permitted in SFY 2020[1]
Tier 1 practices	Infiltrating practices, impervious disconnection	>80%	149	107	230
Tier 2 practices	Gravel Wetlands and bioretention with underdrains	60-80%	20	37	55
Tier 3 practices	Wet ponds, filters and dry swales not designed to infiltrate	50-60%	47	18	15
2002 VSMM[2] practices	Grass lined channels, non-structural credits	<50%	48	0	0
Total number of practices permitted			264	162	300
Average total phosphorus load removal of permitted practices[3]			48% /72%[4]	70.1%	67.6%

[1] The stormwater management database tracks if a practice is present in a drainage area, not the number of practices. The real number of practices is higher.

[2] VSMM is defined as Vermont Stormwater Management Manual.

[3] Phosphorus removal efficiencies were assigned to each practice assuming that it was sized to meet the water quality volume. See Appendix F for phosphorus removal efficiencies.

[4] Average Phosphorus removal was 48% for treatment practices permitted under the 2002 Vermont Stormwater Management Manual (VSMM) and 72% for treatment practices permitted under the 2017 VSMM.

Figure 1: Percent stormwater treatment practices by tier for new operational stormwater permits issued in SFY 2020

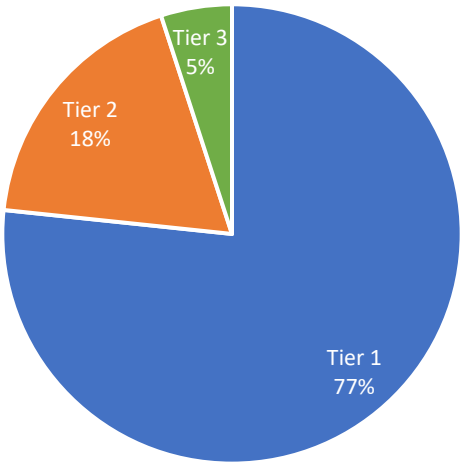


Table 2. Impervious surface area covered by operational stormwater permits issued in SFY 2018-2020 by large drainage areas as shown in the map to the right

Permitted Impervious Surface Type	SFY 2018	SFY 2019	SFY 2020
Lake Champlain			
New impervious (acres)	127.9	87.6	171.7
Redeveloped impervious (acres)	20.6	24	29.6
Existing impervious (acres)	19.6	0.8	6.2
Total impervious (acres)	168.1	112.3	207.5
Percent of impervious permitted	70%	74.6%	74.2%
Lake Memphremagog			
New impervious (acres)	10.2	1.1	12.1
Redeveloped impervious (acres)	3.2	0	2.5
Existing impervious (acres)	1.5	0	9.8
Total impervious (acres)	14.9	1.1	34
Percent of impervious permitted	6%	0.8%	8.7%
Other Drainage Areas			
New impervious (acres)	28.1	26.1	43.7
Redeveloped impervious (acres)	9.5	8	3.5
Existing impervious (acres)	20.7	3.1	0.5
Total impervious (acres)	58.3	37.1	47.6
Percent of impervious permitted	24%	24.7%	17%

Table 3. Estimated change in total phosphorus load associated with operational stormwater permits in the Lake Champlain and Memphremagog basins (kilograms/year), SFY 2018-2019

Estimated Change in Total Phosphorus Load	SFY 2018	SFY 2019	SFY 2020
Lake Champlain			
Increase in phosphorus from operational permits, prior to treatment[5] (kilograms/year)	103.3	90.7	172.7
Phosphorus reduced by treatment practices (kilograms/year)	101.6	115.2	202.0
Net change in phosphorus of operational permits (kilograms/year)	0.5	-26.7[6]	-29.3[6]
Lake Memphremagog			
Increase in phosphorus from operational permits, prior to treatment[7] (kilograms/year)	42.6	1.5	79.0
Phosphorus reduced by treatment practices (kilograms/year)	30.0	0.8	51.8
Net change in phosphorus of operational permits (kilograms/year)	12.6	0.7	27.2

[5] Permitted impervious and phosphorus load calculations include both new and amended permit authorizations. For amended permits, only the increased impervious acres and phosphorus load relative to the previous permit are summarized here. Phosphorus increase from new development assumed that the permitted area was forested prior to development. Redeveloped and existing impervious does not result in a phosphorus change.

[6] A net reduction in phosphorus in Lake Champlain is likely due to treatment of redeveloped impervious.

[7] Permitted impervious and phosphorus load calculations include both new and amended permit authorizations. For amended permits, only the increased impervious acres and phosphorus load relative to the previous permit are summarized here. Phosphorus increase from new development assumed that the permitted area was forested prior to development. Redeveloped and existing impervious does not result in a phosphorus change.

Appendix E. Summary of Methods Used to Estimate Nutrient Pollutant Reductions

Clean water projects target nutrient and sediment pollution to waterbodies and improve water quality over the long term. While measured water quality parameters are the ultimate indicator of progress, it will take time for Vermont's waters to realize the benefits of clean water projects. To provide incremental measures of accountability, the State of Vermont estimates pollutant reductions associated with clean water projects installed across state and federal funding and regulatory programs in Vermont.

Pollution reduction estimates are modeled at the individual clean water project-level, as measuring pollutant reductions at the project level through water quality monitoring would be cost-prohibitive. Most clean water project pollutant reduction estimates are based on the following:

1. **Estimated total pollutant load from land being treated, prior to treatment by a project or practice.** This is based on the area of land draining to the practice or project and the average pollutant loading rate from the land use. These pollutant loading rates are currently only available for the Lake Champlain and Lake Memphremagog basins.

2. **Average annual pollutant reduction performance – referred to as the "efficiency" – of the project type.** This is often expressed as a percent of total load reduced and is based on research of project performance relevant to conditions in Vermont.

The average annual pollutant reduction efficiency for a project is applied to the pollutant load delivered from the land draining to the project to estimate the average annual pollutant reduction, as illustrated in Figure 1. The ability to estimate the pollutant reduction of a project can be limited by lack of data on pollutant loading rates for the land treated and/or lack of information on the performance of a project in treating pollution.

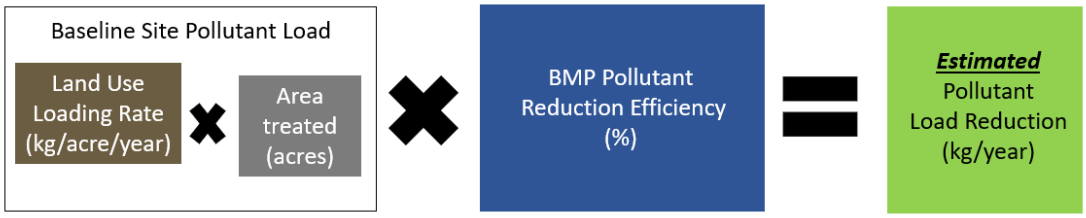


Figure 1. General method used to estimate pollutant reductions from clean water projects

Table 1 below summarizes the State of Vermont's current ability to estimate nutrient load reductions by drainage basin and project type. Tables 2-4 define project categories, data requirements, and average annual pollutant reduction efficiencies for project types associated with pollutant reduction estimates. Full descriptions of the current methods used for estimating pollutant reductions are documented in Clean Water Project Tracking and Accounting Standard Operating Procedures (SOPs), available at https://dec.vermont.gov/water-investment/cwi/projects/tracking-accounting.

Table 4. Summary of Vermont's ability in SFY 2020 to estimate nutrient pollution reductions by project type, drainage basin, and nutrient of concern.

Key
Currently have ability to estimate nutrient pollution reduction
Do not currently have ability to estimate nutrient pollution reduction

Project Type	Lake Champlain	Lake Memphremagog	Connecticut River
Agricultural cropland/pasture conservation practices	Phosphorus	Phosphorus	Nitrogen
Agricultural riparian buffers	Phosphorus	Phosphorus	Nitrogen
Barnyard and production area management practices	Phosphorus	Phosphorus	Nitrogen
River and floodplain restoration	Phosphorus	Phosphorus	Nitrogen
Non-agricultural riparian buffer restoration	Phosphorus	Phosphorus	Nitrogen
Lakeshore restoration	Phosphorus	Phosphorus	Nitrogen
Wetland restoration	Phosphorus	Phosphorus	Nitrogen
Forest erosion control practices	Phosphorus	Phosphorus	Nitrogen
Stormwater treatment practices	Phosphorus	Phosphorus	Nitrogen
Road erosion control practices	Phosphorus	Phosphorus	Nitrogen
Wastewater treatment upgrades[8]	Phosphorus	Phosphorus	Nitrogen
Combined sewer overflow abatement	Phosphorus	Phosphorus	Nitrogen
Summary of status to expand methods to estimate nutrient pollutant reductions	Clean Water Service Delivery Act (Act 76 of 2019) requires addressing gaps and publishing methods to estimate phosphorus reductions for clean water projects implemented in the Lake Champlain basin by November 1, 2021.	Act 76 of 2019 requires addressing gaps and publishing methods to estimate phosphorus reductions for clean water projects implemented in the Lake Memphremagog basin by November 1, 2021.	U.S. EPA-supported efforts are underway to develop methods to estimate nitrogen reductions for clean water projects implemented in the Long Island Sound basin. Act 76 of 2019 requires setting a schedule to publish methods for other (i.e., non-phosphorus) impairments by November 1, 2023.

[8] Wastewater treatment facility operators directly measure pollutants in order to comply with discharge permit requirements. Wastewater pollutant reductions are calculated by wastewater facilities.

Table 5. Agricultural clean water project types, definitions, data requirements, and average annual total pollutant load reduction efficiencies are shown below. Complete standard operating procedures for estimating phosphorus reductions from agricultural best management practices will be available by November 2021. A schedule for establishing nitrogen load reduction efficiencies will be established by November 2023.

Project Type	Definition and Practice Standards	Data Requirements	Area Treated Definition	Total Phosphorus Load Reduction Efficiency	Total Nitrogen Load Reduction Efficiency
Barnyard & Production Area Management	Exclusion of clean water runoff from the production area and management of the remaining runoff in a way that minimizes its pollution. This involves complete containment and/or control and management of all wastes, including covered barnyards and/or diversion of runoff/silage waste to manure storage facilities. Production area includes barnyards, heavy-use areas, waste storage, feed storage, and access roads. Phosphorus reductions estimated based on compliance status as assessed via AAFM inspections.	Production area acres Water quality/premises ID Compliance status Date of inspection Size operation of premises HUC12 watershed location	Production area acres	80%	To be reviewed
Livestock Exclusion	Exclusion of livestock from surface waters by installing fence or another barrier. May include acceptable alternatives such as structures providing limited access for watering or fencing to limit access for livestock stream crossing.	Acres of pasture excluded HUC12 watershed location Field HSG (optional) Field average slope (optional)	Acres of pasture excluded (If exclusion results from buffers, 5x buffer acres)	55%	To be reviewed
Forested Riparian Buffer	Areas of woody vegetation (shrubs and trees) located adjacent to surface waters that filter out pollutants from runoff. Minimum 25-foot width, no manure application, no gully erosion or channelized flow.	Field land use (default cropland) Buffer acres HUC12 watershed location Field HSG type (optional) Field average slope (optional)	5x buffer acres	40% plus loading reduction from converting cropland to forest	To be reviewed

Project Type	Definition and Practice Standards	Data Requirements	Area Treated Definition	Total Phosphorus Load Reduction Efficiency	Total Nitrogen Load Reduction Efficiency
Filter Strip Riparian Buffer	Areas of grasses or hay located adjacent to surface waters that filter out pollutants from runoff. Minimum 25-foot width, no manure application, no gully erosion or channelized flow.	Field land use (default cropland) Buffer acres HUC12 watershed location Field HSG type (optional) Field average slope (optional)	5x buffer acres	40% plus loading reduction from converting cropland to grass/hay	To be reviewed
Conservation Crop Rotation, Change in Crop Rotation, Strip Cropping	Land that is managed to change crop types cyclically over time with the intention of reducing soil erosion and/or improving long-term soil health and quality, typically between an annual crop (e.g., corn, soybeans) and a perennial crop (e.g., hay). May involve change from continuous cropland to crop rotation or extending duration of perennial crop in existing crop rotation.	Field land use (default cropland) Practice acres HUC12 watershed location Field HSG type (optional) Field average slope (optional)	Practice acres	19-25% (depends on land use, soil, and slope)	To be reviewed
Conservation Tillage, Reduced Till, No Till	Any tillage and planting system that leaves a minimum of 30% of the soil surface covered with plant residue after the tillage or planting operation (e.g., reduced till, no-till). For silage corn, this could involve required application of a cover crop or use of zip-till, zone-till or minimum tillage equipment.	Field land use (default corn) Practice acres HUC12 watershed location Field HSG type (optional) Field average slope (optional)	Practice acres	10-50% (depends on soil and slope)	To be reviewed
Cover Crop, Nurse Crop	Establishing a seasonal cover on annual cropland for soil erosion reduction and conservation purposes. Seasonal cover consists of a crop of winter rye or other herbaceous plants seeded at a minimum rate of 100 lbs/ac or at the highest recommended rate to provide effective soil coverage. When categorized as nurse crop, accounted for as cover crop, but typically used to begin crop rotation and often accounted for as a system with crop rotation.	Field land use (default corn) Practice acres HUC12 watershed location Field HSG type (optional) Field average slope (optional)	Practice acres	25-30% (depends on slope)	To be reviewed

Project Type	Definition and Practice Standards	Data Requirements	Area Treated Definition	Total Phosphorus Load Reduction Efficiency	Total Nitrogen Load Reduction Efficiency
Forage and Biomass, Corn to Hay	Conversion of cropland to hay. Typical Forage and Biomass duration 5 years.	Field land use (default cropland) Practice acres HUC12 watershed location Field HSG type (optional) Field average slope (optional)	Practice acres	70-80% (depends on slope)	To be reviewed
Manure Injection	Mechanical application of organic nutrient sources (e.g., manures, composted materials) into the root zone with surface soil closure or minimal soil disturbance at the time of application.	Field land use Practice acres HUC12 watershed location Field HSG type (optional) Field average slope (optional)	Practice acres	40%	To be reviewed
Manure Incorporation	Mixing of organic nutrient sources (e.g., manures, composted materials) into the soil profile within 72 hours of manure application.	Field land use Practice acres HUC12 watershed location Field HSG type (optional) Field average slope (optional)	Practice acres	23%	To be reviewed
Grazing Management	A range of pasture management and grazing techniques to improve the quality and quantity of the forages grown on pastures and reduce the impact of animal travel lanes, animal concentration areas or other degraded areas. Pastures are required to have a vegetative height of 3 inches or greater	Field land use Practice acres HUC12 watershed location Field HSG type (optional) Field average slope (optional)	Practice acres	24%	To be reviewed

Project Type	Definition and Practice Standards	Data Requirements	Area Treated Definition	Total Phosphorus Load Reduction Efficiency	Total Nitrogen Load Reduction Efficiency
Soil Aeration	Punching of holes, pits, or slots into the soil to promote soil infiltration/adsorption of manure mainly on grassland.	Field land use Practice acres HUC12 watershed location Field HSG type (optional) Field average slope (optional)	Practice acres	Inconclusive evidence to adopt efficiency value	To be reviewed
Grassed Waterways	Stabilizing areas prone to field gully erosion by establishing grass-lined swales.	Field land use Practice acres HUC12 watershed location Field HSG type (optional) Field average slope (optional)	To be reviewed	To be reviewed	To be reviewed
Reduced Phosphorus Manure, Nutrient Management Plan Implementation	A 20% reduction of the total phosphorus content applied to fields, through either manure or fertilizer. This can be accomplished by reducing the amount of manure/fertilizer applied or by altering livestock feed formulation or treating manure prior to application.	Field land use Buffer acres HUC12 watershed location Field HSG type (optional) Field average slope (optional)	To be reviewed	To be reviewed	To be reviewed

Table 6. Developed Lands (Stormwater and Roads) clean water project types, definitions, data requirements, and average annual total pollutant load reduction efficiencies are shown below. Complete standard operating procedures for estimating phosphorus reductions from stormwater practices are available at https://dec.vermont.gov/water-investment/cwi/projects/tracking-accounting. A schedule for establishing nitrogen load reduction efficiencies will be established by November 2023.

Project Type	Definition and Practice Standards	Data Requirements	Area Treated Definition	Total Phosphorus Load Reduction Efficiency	Total Nitrogen Load Reduction Efficiency
Infiltration Trench	Provides storage of runoff using the void spaces within the soil, sand, gravel mixture within the trench for infiltration into the surrounding soils.	Latitude & longitude Developed impervious acres draining to practice Developed pervious acres draining to practice Storage volume Infiltration rate	Acres draining to practice	Average 90% (depends on storage volume and infiltration rate)	To be reviewed
Subsurface Infiltration	Provides storage of runoff using the combination of storage structures and void spaces within the washed stone within the system for infiltration into the surrounding soils.	Latitude & longitude Developed impervious acres draining to practice Developed pervious acres draining to practice Storage volume Infiltration rate	Acres draining to practice	Average 90% (depends on storage volume and infiltration rate)	To be reviewed
Surface Infiltration	Provides storage of runoff through surface ponding (e.g., basin or swale) for subsequent infiltration into the underlying soils.	Latitude & longitude Developed impervious acres draining to practice Developed pervious acres draining to practice Storage volume Infiltration rate	Acres draining to practice	Average 93% (depends on storage volume and infiltration rate)	To be reviewed

Project Type	Definition and Practice Standards	Data Requirements	Area Treated Definition	Total Phosphorus Load Reduction Efficiency	Total Nitrogen Load Reduction Efficiency
Rain Garden, Bioretention (no underdrains)	Provides storage of runoff through surface ponding and possibly void spaces within the soil, sand, washed stone mixture that is used to filter runoff prior to infiltration into underlying soils.	Latitude & longitude Developed impervious acres draining to practice Developed pervious acres draining to practice Storage volume Infiltration rate	Acres draining to practice	Average 93% (depends on storage volume and infiltration rate)	To be reviewed
Rain Garden, Bioretention (with underdrain)	Provides storage of runoff by filtering through an engineered soil media. The storage capacity includes void spaces in the filter media and temporary ponding at the surface. After runoff passes through the filter media it discharges through an underdrain pipe.	Latitude & longitude Developed impervious acres draining to practice Developed pervious acres draining to practice Storage volume	Acres draining to practice	Average 47% (depends on storage volume)	To be reviewed
Gravel Wetland	Provides surface storage of runoff in a wetland cell that is routed to an underlying saturated gravel internal storage reservoir (ISR). Outflow is controlled by an orifice that has its invert elevation equal to the top of the ISR layer and provides retention of at least 24 hours.	Latitude & longitude D Developed impervious acres draining to practice Developed pervious acres draining to practice Storage volume	Acres draining to practice	Average 61% (depends on storage volume)	To be reviewed
Porous Pavement (with infiltration)	Provides filtering of runoff through a filter course and temporary storage of runoff within the void spaces of a subsurface gravel reservoir prior to infiltration into subsoils.	Latitude & longitude Developed impervious acres draining to practice Developed pervious acres draining to practice Storage volume Infiltration rate	Acres draining to practice	Average 90% (depends on storage volume and infiltration rate)	To be reviewed

Project Type	Definition and Practice Standards	Data Requirements	Area Treated Definition	Total Phosphorus Load Reduction Efficiency	Total Nitrogen Load Reduction Efficiency
Porous Pavement (with impermeable underlining or underdrain)	Provides filtering of runoff through a filter course and temporary storage of runoff within the void spaces prior to discharge by way of an underdrain.	Latitude & longitude Developed impervious acres draining to practice Developed pervious acres draining to practice Storage volume Filter course depth	Acres draining to practice	Average 70% (depends on storage volume and filter course depth)	To be reviewed
Sand Filter (with underdrain)	Provides filtering of runoff through a sand filter course and temporary storage of runoff through surface ponding and within void spaces of the sand and washed stone layers prior to discharge by way of an underdrain.	Lat Latitude & longitude Developed impervious acres draining to practice Developed pervious acres draining to practice Storage volume	Acres draining to practice	Average 47% (depends on storage volume)	To be reviewed
Wet Pond	Provides treatment of runoff by routing through permanent pool.	Latitude & longitude Developed impervious acres draining to practice Developed pervious acres draining to practice Storage volume	Acres draining to practice	Average 53% (depends on storage volume)	To be reviewed
Extended Dry Detention Basin	Provides temporary detention storage for the design storage volume to drain in 24 hours through multiple outlet controls.	Latitude & longitude Developed impervious acres draining to practice Developed pervious acres draining to practice Storage volume	Acres draining to practice	Average 12% (depends on storage volume)	To be reviewed

Project Type	Definition and Practice Standards	Data Requirements	Area Treated Definition	Total Phosphorus Load Reduction Efficiency	Total Nitrogen Load Reduction Efficiency
Grass Conveyance Swale	Conveys runoff through an open channel vegetated with grass. Primary removal mechanism is infiltration.	Latitude & longitude Developed impervious acres draining to practice Developed pervious acres draining to practice Storage volume	Acres draining to practice	Average 19% (depends on storage volume)	To be reviewed
Mechanical Broom Sweeper[9]	A vehicle with a rotating broom the brushes street sediment and debris into a hopper.	TMDL drainage area Developed impervious acres swept Developed pervious acres swept Sweeping frequency	Acres swept	1-5% (depends on frequency)	To be reviewed
Vacuum-assisted Sweeper[1]	A vehicle with a vacuum for removing street sediment and debris.	TMDL drainage area Developed impervious acres swept Developed pervious acres swept Sweeping frequency	Acres swept	2-8% (depends on frequency)	To be reviewed
High Efficiency Regenerative Air Vacuum Sweeper[1]	A vehicle that uses a blast of air to dislodge with a vacuum for removing street sediment and debris from the road surface, which is then vacuumed into a hopper.	TMDL drainage area Developed impervious acres swept Developed pervious acres swept Sweeping frequency	Acres swept	2-10% (depends on frequency)	To be reviewed

[9] Tracking mechanisms for non-structural stormwater practices are being established for future reporting.

Project Type	Definition and Practice Standards	Data Requirements	Area Treated Definition	Total Phosphorus Load Reduction Efficiency	Total Nitrogen Load Reduction Efficiency
Enhanced leaf collection on Streets with ≥ 17% Tree Cover[1]	Use of any sweeper technology on streets with ≥ 17% tree cover at least four times in the fall to remove the majority of leaf fall.	TMDL drainage area Developed impervious acres swept Developed pervious acres swept Sweeping frequency	Acres swept	17%	To be reviewed
Catch Basin Cleaning[10]	Removal of sediment and debris from catch basins.	TMDL drainage area Developed impervious acres treated Developed pervious acres treated	Acres draining to catch basin	2%	To be reviewed
Road Erosion Remediation on Gravel and Paved Open Drainage (Uncurbed) Roads	Installation of a suite of practices to correct road related erosion problems for gravel and paved roads and road drainage culverts. Practices are intended to improve Municipal Roads General Permit compliance status and may include drainage ditch installation and upgrades, turnouts, removal of high road shoulders, and stabilization of drainage culverts.	Road segment ID and length Road type (paved, unpaved) Hydrologic connectivity Road slope Municipal Roads General Permit compliance status before & after implementation	Road segment length	Not compliant → partially compliant: 40% Partially compliant → fully compliant: 40% Not compliant → fully compliant 80%	To be reviewed

[10] Tracking mechanisms for non-structural stormwater practices are being established for future reporting.

Project Type	Definition and Practice Standards	Data Requirements	Area Treated Definition	Total Phosphorus Load Reduction Efficiency	Total Nitrogen Load Reduction Efficiency
Road Erosion Remediation on Class 4 Roads	Correction of gully erosion on Class 4 road surface and shoulder resulting in full Municipal Roads General Permit compliance. Gully erosion is defined as erosion equal to or greater than 1 foot in depth.	Road segment ID and length Hydrologic connectivity Road slope Volume of gully erosion Municipal Roads General Permit compliance status before & after implementation	Road segment length	20-40% (depends on pre-construction erosion volume and road slope)	To be reviewed
Catch Basin Outlet Stabilization on Paved, Curbed Roads	Correction of erosion at catch basin outlet by stabilizing flow path from outlet to surface waters.	Catch basin outlet ID Volume of erosion Municipal Roads General Permit compliance status before & after implementation	NA	Calculated based on volume of erosion prior to stabilization	To be reviewed

Table 7. Natural resource restoration clean water project types, definitions, data requirements, and average annual total phosphorus load reduction efficiencies are shown below. Complete standard operating procedures for estimating phosphorus reductions from natural resource restoration projects will be available by November 2021. A schedule for establishing nitrogen load reduction efficiencies will be established by November 2023.

Project Type	Definition and Practice Standards	Data Requirements	Area Treated Definition	Total Phosphorus Load Reduction Efficiency	Total Nitrogen Load Reduction Efficiency
Forested Riparian Buffer Restoration (Non-Agricultural)	Restoration of riparian buffer along rivers and lakeshores. Buffers consist of native woody vegetation (trees and shrubs) with a minimum of 300 stems per acre and a minimum width of 35-feet.	Latitude & longitude of buffer endpoints Buffer acres Buffer length Buffer average width	Buffer drainage area as determined by hydrologic software	50%	To be reviewed
River Channel and Floodplain Restoration	Restoration of river channel and or floodplain to its least erosive condition (i.e., equilibrium condition). Restoration work includes removing/retrofitting river corridor and floodplain encroachments and instream structures, dam removal, and establishing river corridor easements.	In development	In development	In development	To be reviewed
Wetland Restoration	Implementation of wetland and buffer area restoration and protection projects to promote water quality benefit, encourage flood resiliency, and provide habitat benefits.	In development	In development	In development	To be reviewed
Forest Erosion Control	Implementation of forest logging road, trail, and/or stream crossing Acceptable Management Practices (AMPs) project(s) to address erosion to control nutrient and sediment pollution at prioritized locations.	In development	In development	In development	To be reviewed
Lakeshore Restoration	Implementation of lake shoreland habitat restoration projects and/or lakeshore nutrient/sediment pollution reduction practices at priority locations.	To be reviewed	To be reviewed	To be reviewed	To be reviewed

Appendix F. SFY 2020 Ecosystem Restoration Grant Program Projects

This table displays clean water projects funded through Vermont Department of Environmental Conservation's Clean Water Initiative Program grants and contracts in SFY 2020, including Ecosystem Restoration Grants. Grants and contracts were included in the SFY 2020 reporting period if agreements were executed/signed in SFY 2020.

Sector Key

Ag	Agricultural pollution prevention project	Roads	Developed lands road erosion remediation
All	Cross sector (project spans multiple sectors)	SW	Developed lands stormwater treatment
NR	Natural Resource Project	WW	Wastewater treatment

Counties	Towns	Partner	Summary Title	Sector	State Funds	Watersheds
Addison	Multiple Towns	United States Geological Survey (USGS)	USGS Lake Champlain Sub-watershed Conservation Effects Assessment Program	Ag	$59,440	Otter Creek
Addison	Bridport	Vermont Land Trust	Provencher Bridport Parcel Wetland Restoration Project	NR	$75,795	Otter Creek, South Champlain
Addison	Starksboro	Lewis Creek Association	2019 LaRosa Volunteer Monitoring - Lewis Creek Bracketed Water Quality Sampling	All	$3,903	Otter Creek
Addison, Chittenden	Multiple Towns	Lewis Creek Association	2019 LaRosa Volunteer Monitoring - Southern Chittenden County River Watch	All	$1,785	North Champlain
Addison, Chittenden, Franklin, Grand Isle, Lamoille,	Multiple Towns	Vermont Department of Forests Parks and Recreation	Implementation Support Program for Forestry Accepted Management Practices	NR	$450,000	Lake Champlain

Counties	Towns	Partner	Summary Title	Sector	State Funds	Watersheds
Rutland, Washington						
Addison, Chittenden, Franklin, Grand Isle, Lamoille, Rutland, Washington	Multiple Towns	Vermont Fish and Wildlife Department	Program to Expand and Accelerate Wetland Conservation and Restoration in Vermont's Lake Champlain Basin	NR	$1,700,652	Lake Champlain
Addison, Chittenden, Franklin, Grand Isle, Lamoille, Rutland, Washington	Multiple Towns	Vermont Land Trust	Wetland Restoration Scoping for Vermont Land Trust Lands	NR	$42,045	Missisquoi Bay, North Champlain, Otter Creek
Addison, Chittenden, Franklin, Grand Isle, Lamoille, Rutland, Washington	Multiple Towns	Watershed Consulting	Forestland Analysis to Support TMDL Tracking, Accounting, and Target-Setting	NR	$99,960	Lake Champlain
Addison, Rutland, Windsor	Multiple Towns	Vanasse Hangen Brustlin Inc.	Wetland Mapping of the Northern Otter Creek Basin	NR	$97,660	Otter Creek
Bennington	Arlington	Bennington County Conservation District	Arlington Memorial High School Stormwater Management	SW	$27,125	Batten Kill, Walloomsac and Hoosic
Bennington	Bennington	Bennington County Conservation District	Woodford-Packers Floodplain Restoration - Design	NR	$37,876	Batten Kill, Walloomsac and Hoosic

Counties	Towns	Partner	Summary Title	Sector	State Funds	Watersheds
Bennington	Dorset	Vermont Youth Conservation Corps	Riparian Buffer Stewardship - Poultney Mettowee Natural Resources Conservation District - Dorset	NR	$1,795	South Champlain
Caledonia	Lyndon	NorthWoods Stewardship Center	Northern Vermont University Soccer Field Vegetated Swale	SW	$6,637	Passumpsic
Caledonia, Essex, Orleans	Multiple Towns	NorthWoods Stewardship Center	2020 Northwoods Conservation Corps Work Crew Block Grant	All	$121,268	Memphremagog, Northern Connecticut, Passumpsic
Chittenden	Burlington	Burlington City	Englesby Stormwater Detention Pond Retrofit	SW	$50,000	North Champlain
Chittenden	Burlington	Vermont Youth Conservation Corps	Burlington Shmanska Park Erosion Control Installation	SW	$7,178	Winooski
Chittenden	Hinesburg	Lewis Creek Association	Hinesburg Garage Beecher Hill Brook Floodplain Restoration	NR	$342,126	North Champlain
Chittenden	Hinesburg	Vermont Youth Conservation Corps	Hinesburg Class IV Road Erosion Control	Roads	$10,050	North Champlain
Chittenden	Richmond	Friends of the Winooski River	Richmond School Access Drive Gravel Wetland	SW	$94,598	Winooski
Chittenden	Richmond	Vermont Youth Conservation Corps	Richmond Boat Access Stabilization	NR	$7,178	Winooski

Counties	Towns	Partner	Summary Title	Sector	State Funds	Watersheds
Chittenden	Westford	Vermont Youth Conservation Corps	Westford Logging Road BMPs	NR	$7,178	Lamoille
Chittenden	Williston	Williston Town	Meadowridge Stormwater Improvements - Phase 2	SW	$158,877	Winooski
Chittenden, Franklin, Grand Isle, Lamoille	Multiple Towns	Northwest Regional Planning Commission	2019 Partnership Project Development Block Grant - Northwest Regional Planning Commission	All	$38,191	Lamoille, Missisquoi Bay, North Champlain
Essex	Brighton	NorthWoods Stewardship Center	Island Pond Fish & Wildlife Access Area Stormwater Management	NR	$4,425	Memphremagog
Essex	Brighton	NorthWoods Stewardship Center	Spectacle Pond Fish & Wildlife Access Area Stormwater Management	NR	$6,637	Memphremagog
Essex	Concord	Essex County Natural Resources Conservation District	Folsom Ave and High St Gravel Wetland	SW	$61,100	Passumpsic
Essex	Maidstone	Essex County Natural Resources Conservation District	Maidstone Lake Shoreland Erosion Assessment Phase 2	NR	$20,200	Northern Connecticut
Essex	Maidstone	NorthWoods Stewardship Center	Maidstone Lake Stormwater BMP Installation - Project 2018h	NR	$4,425	Northern Connecticut
Essex	Maidstone	NorthWoods Stewardship Center	Maidstone Lake Stormwater BMP Installation - Project 2019a	NR	$2,212	Northern Connecticut

Counties	Towns	Partner	Summary Title	Sector	State Funds	Watersheds
Essex	Maidstone	NorthWoods Stewardship Center	Maidstone Lake Stormwater BMP Installation - Project 2019b	NR	$6,637	Northern Connecticut
Essex	Maidstone	NorthWoods Stewardship Center	Maidstone Lake Stormwater BMP Installation - Project 2019c	NR	$2,212	Northern Connecticut
Essex	Warren's Gore	NorthWoods Stewardship Center	Norton Pond Fish & Wildlife Access Area Stormwater Management	NR	$4,425	Memphremagog
Franklin	Franklin	Franklin Town	2020 Lake Carmi Aeration System Operation and Maintenance	NR	$21,000	Missisquoi Bay
Franklin	Franklin	University of Vermont	2019 Lake Carmi Agronomy and Conservation Practice Assistance Services	Ag	$30,000	Missisquoi Bay
Franklin	Bakersfield, Berkshire	Franklin County Natural Resources Conservation District	2019 LaRosa Volunteer Monitoring - Missisquoi Watershed Bracketed Water Quality Sampling	All	$2,293	Missisquoi Bay
Franklin	Franklin	Franklin Watershed Committee	2019 LaRosa Volunteer Monitoring - Lake Carmi Watershed Sampling	All	$3,477	Missisquoi Bay
Franklin	Franklin	University of Vermont	Lake Carmi Aeration – Water Quality Monitoring	All	$150,000	Missisquoi Bay
Franklin	Franklin	Vermont Agricultural and Environmental Laboratory	DEC Lakes Program Analytics - Lake Carmi Aeration Monitoring	All	$22,000	Missisquoi Bay

Counties	Towns	Partner	Summary Title	Sector	State Funds	Watersheds
Franklin	Franklin	Vermont Agricultural and Environmental Laboratory	Groundwater Influence on Nutrient Levels in the Lake Carmi Watershed	All	$10,000	Missisquoi Bay
Franklin	Highgate	Friends of Northern Lake Champlain	Rock River Monitoring	All	$4,000	Lake Champlain
Franklin	Highgate	NorthWoods Stewardship Center	Highgate Portage Trail Stormwater Management	Roads	$15,487	Missisquoi Bay
Franklin	Sheldon	Vermont Land Trust	Parent Property River Corridor Easement - Sheldon	NR	$262,947	Missisquoi Bay
Franklin, Orange, Orleans, Washington, Windsor	Multiple Towns	Vermont Land Trust	2020 Vermont Land Trust River Corridor Easement Design & Implementation	NR	$294,143	Missisquoi Bay, White, Winooski
Franklin, Orleans	Berkshire, Richford, Westfield	Missisquoi River Basin Association	2019 LaRosa Volunteer Monitoring - Missisquoi River Water Quality Monitoring	All	$1,215	Missisquoi Bay
Lamoille	Eden	Vermont Youth Conservation Corps	Lake Wise Implementation-Lake Eden - Private Site 1	NR	$2,393	Lamoille
Lamoille	Eden	Vermont Youth Conservation Corps	Lake Wise Implementation-Lake Eden - Private Site 2	NR	$2,393	Lamoille
Lamoille	Eden	Vermont Youth Conservation Corps	Lake Wise Implementation-Lake Eden Fish & Wildlife Access Area	NR	$2,393	Lamoille

Counties	Towns	Partner	Summary Title	Sector	State Funds	Watersheds
Lamoille	Cambridge	Vermont River Conservancy	River Corridor Easement - Nuzzo Property, Lamoille River	NR	$70,945	Lamoille
Lamoille	Elmore	Lamoille County Conservation District	Lake Elmore Watershed Assessment	SW	$34,782	Lamoille
Lamoille	Johnson	Lamoille County Conservation District	Johnson and Johnson Village Stormwater Master Plan	SW	$32,228	Lamoille
Orange	Randolph	Vermont Technical College	Vermont Technical College Main Campus Stormwater Treatment	SW	$20,440	White
Orange	Washington	Winooski Natural Resources Conservation District	Hands Mill Dam Removal - Preliminary Design	NR	$41,371	Winooski
Orleans	Multiple Towns	Orleans County Natural Resources Conservation District	2019 LaRosa Volunteer Monitoring - Lake Memphremagog & Sterns Brook Water Quality Monitoring	All	$4,500	Memphremagog
Orleans	Morgan	NorthWoods Stewardship Center	Seymour Lake Fish & Wildlife Access Area Stormwater Management	NR	$17,700	Memphremagog
Orleans	Troy	Vermont Youth Conservation Corps	Missisquoi Riparian Buffer Planting - North Troy 1	NR	$2,393	Missisquoi Bay
Orleans	Troy	Vermont Youth Conservation Corps	Missisquoi Riparian Buffer Planting - North Troy 2	NR	$2,393	Missisquoi Bay

Counties	Towns	Partner	Summary Title	Sector	State Funds	Watersheds
Orleans	Troy	Vermont Youth Conservation Corps	Missisquoi Riparian Buffer Planting - Troy	NR	$2,393	Missisquoi Bay
Orleans	Westmore	NorthWoods Stewardship Center	Lake Willoughby Erosion Control Pathway - Fountainside Site	NR	$15,487	Memphremagog
Orleans	Westmore	NorthWoods Stewardship Center	Lake Willoughby Erosion Control Pathway - Lakeside Site	NR	$11,062	Memphremagog
Orleans	Westmore	NorthWoods Stewardship Center	Pisgah South Trailhead Stormwater Management	SW	$2,212	Passumpsic
Rutland	Chittenden	Rutland Regional Planning Commission	Wild Cat Road Wetland Restoration and Alternatives Analysis	NR	$36,377	Otter Creek
Rutland	Hubbardton	NorthWoods Stewardship Center	Hubbardton Encapsulated Soil Lifts	NR	$19,912	South Champlain
Rutland	Pawlet	Vermont Youth Conservation Corps	Riparian Buffer Stewardship - Poultney Mettowee Natural Resources Conservation District - Pawlet	NR	$1,795	South Champlain
Rutland	Pawlet	Vermont Youth Conservation Corps	Riparian Buffer Stewardship - Poultney Mettowee Natural Resources Conservation District - West Pawlet	NR	$1,795	South Champlain
Rutland	Poultney	Poultney-Mettowee Natural Resources Conservation District	Poultney River Watershed Stormwater Master Plan	SW	$50,167	South Champlain

Counties	Towns	Partner	Summary Title	Sector	State Funds	Watersheds
Rutland	West Haven	Vermont Youth Conservation Corps	Riparian Buffer Stewardship - Poultney Mettowee Natural Resources Conservation District - West Haven	NR	$1,795	South Champlain
Rutland	West Rutland	Rutland County Natural Resources Conservation District	Young's Brook Dam Removal - Final Design	NR	$52,350	Otter Creek
Statewide	Statewide	Chittenden County Regional Planning Commission	2020 Tactical Basin Planning Services - Regional Planning Commissions	All	$250,000	Statewide
Statewide	Statewide	Hoyle & Tanner Assoc.	Cost Effectiveness and Operation & Maintenance Standards of Clean Water Projects in Vermont	All	$99,911	Statewide
Statewide	Statewide	Northbridge Environmental Management	3-Acre Stormwater Permit Financing Development	SW	$251,747	Statewide
Statewide	Statewide	Southern Windsor County Regional Planning Commission	Clean Water Design and Implementation Block Grant-Southwest Regional Planning Commission	All	$1,500,000	Statewide
Statewide	Statewide	University of Vermont	Lake Champlain Sea Grant Green Infrastructure Cooperative	All	$50,000	Statewide
Statewide	Statewide	Vermont Association of Conservation Districts	Agricultural Natural Resource Restoration Promotion	Ag	$100,000	Statewide
Statewide	Statewide	Vermont League of Cities & Towns	Stormwater Utilities and Green Stormwater Infrastructure	All	$50,000	Statewide

Counties	Towns	Partner	Summary Title	Sector	State Funds	Watersheds
Statewide	Statewide	Vermont Natural Resources Council	2020 Tactical Basin Planning Services - Natural Resource Conservation Districts	All	$80,000	Statewide
Statewide	Statewide	Vermont Natural Resources Council	Clean Water Design and Implementation Block Grant - Natural Resources Conservation Council	All	$925,000	Statewide
Statewide	Statewide	Vermont Rural Water Association	Municipal Wastewater Treatment Facility Education and Outreach	WW	$110,000	Statewide
Statewide	Statewide	Vermont Youth Conservation Corps	2020 Work Crew Block Grant - Vermont Youth Conservation Corps	All	$93,733	Statewide
Statewide	Statewide	Watersheds United Vermont	2019 Train the Trainer Block Grant Program - Watersheds United Vermont	All	$26,994	Statewide
Statewide	Statewide	Watersheds United Vermont	2020 Partnership Project Development Block Grant - Watersheds United Vermont	All	$201,250	Statewide
Statewide	Statewide	Watersheds United Vermont	Clean Water Design and Implementation Block Grant- Watersheds United Vermont	All	$575,000	Statewide
Statewide	Statewide	Stone Environmental	Statewide Illicit Discharge Detection Elimination for Smaller Towns	SW	$43,988	Statewide
Washington	Montpelier	Vermont Youth Conservation Corps	Montpelier Culvert BMPs - Gould Hill	Roads	$4,785	Winooski

Counties	Towns	Partner	Summary Title	Sector	State Funds	Watersheds
Washington	Montpelier	Vermont Youth Conservation Corps	Montpelier Culvert BMPs - Lague Drive	Roads	$4,785	Winooski
Washington	Montpelier	Vermont Youth Conservation Corps	Montpelier Culvert BMPs - State Street	Roads	$4,785	Winooski
Washington	Moretown	Central Vermont Regional Planning Commission	Moretown Elementary School Stormwater Design	SW	$39,395	Winooski
Washington	Northfield	Friends of the Winooski River	Camp Wihakowi Dam Removal	NR	$315,305	Winooski
Washington	Warren	Vermont Youth Conservation Corps	Warren Culvert BMPs	Roads	$4,307	Winooski
Windham	Dummerston	Windham Regional Commission	Crosby Brook Dam Removal - Implementation	NR	$70,725	West, Williams and Saxtons
Windham	Grafton	Vermont Youth Conservation Corps	Saxton River Riparian Restoration	NR	$4,307	West, Williams and Saxtons
Windham	Guilford	Vermont River Conservancy	Green River Floodplain Restoration	NR	$19,500	Deerfield
Windham	Wilmington	Vermont Youth Conservation Corps	Lake Raponda Shoreline Erosion Control	NR	$7,178	Deerfield

Counties	Towns	Partner	Summary Title	Sector	State Funds	Watersheds
Windsor	Bethel	Vermont Fish and Wildlife Department	Route 107 Floodplain Restoration - Implementation	NR	$121,802	White
Windsor	Bethel	White River Partnership	Bilodeau River Corridor Easement - Third Branch White River	NR	$52,656	White
Windsor	Bethel	White River Partnership	River Corridor Easement - Third Branch White River - Bethel	NR	$91,882	White
Windsor	Bethel, Royalton	White River Partnership	2019 LaRosa Volunteer Monitoring - White River Water Quality Monitoring	All	$4,261	White
Windsor	Ludlow	Southern Windsor County Regional Planning Commission	Ludlow Stormwater Master Plan	SW	$38,526	Black and Ottauquechee
Windsor	Norwich	NorthWoods Stewardship Center	Norwich Dam Removal Planting	NR	$2,212	Stevens, Wells, Waits and Ompompanoosac
Windsor	Plymouth	Two Rivers-Ottauquechee Regional Commission	Pingree Flats Wetland Workshop	NR	$13,006	Black and Ottauquechee
Windsor	Royalton	Vermont Youth Conservation Corps	White River Partnership Riparian Planting	NR	$7,178	White
Windsor	Royalton	White River Partnership	Upper and Lower Eaton Dam Removal	NR	$60,207	White

Counties	Towns	Partner	Summary Title	Sector	State Funds	Watersheds
Windsor	Weathersfield	Connecticut River Conservancy	Culvert Replacement - 519 South Mountain Rd, Perkinsville	Roads	$29,705	Black and Ottauquechee
Windsor	Weathersfield	Southern Windsor County Regional Planning Commission	Springfield Reservoir Dam Removal - Final Design	NR	$59,457	Black and Ottauquechee
Windsor	Weston	Weston Community Association	Cold Spring Brook Park Dam Removal	NR	$75,000	West, Williams and Saxtons
Windsor	Windsor	Southern Windsor County Regional Planning Commission	Paradise Park Stormwater Mitigation	SW	$25,975	Black and Ottauquechee