
VERMONT LAKE CHAMPLAIN

PHOSPHORUS TMDL PHASE 1

IMPLEMENTATION PLAN

DRAFT AUGUST 2015

**PREPARED BY THE STATE OF VERMONT
FOR THE
U.S. ENVIRONMENTAL PROTECTION AGENCY**



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EXECUTIVE SUMMARY

Vermonters value a clean Lake Champlain. We swim and fish in the lake, we boat on it, we drink its water, and we deeply appreciate its beauty. A clean lake attracts businesses and tourists to the region and is a major driver of the State's economy.

Phosphorus pollution is the greatest threat to clean water in Lake Champlain. Phosphorus is a nutrient that stimulates excessive growth of algae in the lake, turning the water green. In excessive amounts, algae can impair recreational uses, aesthetic enjoyment, the taste of drinking water, and the biological community. In some cases, algal blooms - particularly cyanobacteria (blue-green algae) - can produce toxins that harm animals and people. Phosphorus is found in eroded soil and runoff from farm fields, barnyards, roads, parking lots, and streambanks, and in wastewater discharges. Efforts to reduce all these sources of phosphorus have accelerated over the past ten years but the lake has been slow to improve.

In 2002, the U.S. Environmental Protection Agency (EPA) approved a Lake Champlain Phosphorus Total Maximum Daily Load (TMDL) prepared by the states of Vermont and New York. The TMDL placed caps on the amount of phosphorus allowed to enter each segment of Lake Champlain, and allocated those maximum amounts among the various sources within each major watershed draining to the lake. In 2011, the EPA revoked its approval of the Vermont portion of the Lake Champlain TMDL and is in the process of developing a new TMDL.

Phosphorus loading to Lake Champlain is dominated by "nonpoint sources," which are generated by runoff and erosion across the landscape, as opposed to "point sources" such as wastewater and certain stormwater discharges that are conveyed by a pipe or other discrete conveyance and are more closely regulated. For a TMDL to be approved in a situation where reductions in nonpoint source loading are relied upon to achieve the TMDL, the EPA must find "reasonable assurances" that the necessary nonpoint source reductions will actually occur. Insufficient reasonable assurance was the primary reason given by the EPA for reversing its approval of the 2002 TMDL.

EPA's expectations of Vermont for the new Lake Champlain TMDL are divided into two distinct planning phases. For the first phase, EPA expects Vermont to provide policy commitments relating to nonpoint source phosphorus reductions in a basin-wide scale implementation plan (Phase 1 Plan). After EPA finalizes the TMDL in 2015, it expects the State to develop a sub-basin tactical implementation plan (Phase 2 Plan) for each lake segment. Each tactical sub-basin plan will identify in more detail the specific point source and nonpoint source measures and practices to be implemented by identified dates.

This Vermont Lake Champlain TMDL Phase 1 Implementation Plan was developed by the Vermont Agency of Natural Resources (ANR) and the Vermont Agency of Agriculture, Food, and Markets (AAFM). These agencies have been working diligently to develop the types of policy commitments requested by EPA to provide, or reduce the need for, reasonable assurances in the new TMDL. A proposed set of commitments, the [Draft State of Vermont Proposal for a Clean Lake Champlain](#), was issued for public comment in November, 2013. As part of that

effort, ANR met frequently with other state agencies, including the Vermont Agency of Transportation (VTrans) to refine the proposed commitments. ANR and AAFM, in conjunction with EPA, held six public meetings in December 2013 and took public comments on the draft proposal. Over 500 people attended those meetings. ANR, in partnership with VTrans and the regional planning and development agencies, held 12 additional meetings with municipalities across the State to discuss the draft proposal.

The State received over 100 comments on the November 2013 Proposal for a Clean Lake Champlain as well as a [January 17, 2014 letter from the EPA](#), and used those comments to inform the development of a second and more detailed [March 31, 2014 Draft TMDL Phase 1 Implementation Plan](#). A summary of the public comments and a list of [Frequently Asked Questions](#) with responses are available online. A [May 8, 2014 letter from EPA](#) provided further review and comment on the March 31 draft plan, which guided revisions incorporated into the present document. This newest July 2015 Plan has been updated to conform to Act 64, Vermont's Clean Water Act, which was recently passed by the Vermont Legislature. A copy of Act 64 is included as Appendix F to this Plan. Act 64 also requires that this Plan be updated again no later than three months after EPA's issuance of the final Lake TMDL.

The policy commitments described in Chapter 5 of this Phase 1 Plan are summarized in Table 1 and Figure 1, and address all major nonpoint sources of phosphorus to the lake, including the following:

- Untreated/unmanaged runoff from existing developed lands
- Discharges from farmsteads and agricultural production areas
- Poorly managed cropland
- Unmanaged or poorly managed pasture
- River and stream channel modifications
- Floodplain, river corridor and lakeshore encroachments
- Stormwater runoff from developed lands and construction sites
- Road construction and maintenance
- Forest management practices
- Wetland alteration and loss
- Legacy effects of historic phosphorus loading
- Additional phosphorus contributions anticipated due to climate change

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

The EPA is engaged in modeling to determine the total loading capacities for each lake segment watershed and the wasteload and load allocation numbers for point and nonpoint sources, respectively. Once these numbers are finalized, they will be used to more fully define the level of phosphorus reductions needed by point and nonpoint sources in each of the 12 individual Vermont lake segment watersheds. Therefore, many of the commitments described in this plan are expressed as statewide commitments but will be tailored as to scope, intensity and timing based on individual lake segment assessments during the second phase of implementation planning. DEC will use the models and load allocations still being developed by EPA to further refine these commitments.

Based on EPA modeling results, some uncertainty exists about whether the tasks and commitments presented in this plan will be sufficient to fully achieve the required phosphorus load reductions in the Missisquoi Bay watershed. Additional and enhanced implementation efforts for Missisquoi Bay are described in Chapter 5, Section J and elsewhere in this plan. Vermont is committed to learning as it implements this plan and to adapting management to incorporate lessons learned along the way as a means to address the special challenges presented in the Missisquoi Bay.

In order to implement the programs described in this plan, the State will require additional staff resources and funding. Categories of State funding needs include: (a) staff support in the implementing state agencies, and (b) funding that the State will pass through to communities, businesses, farms and partner organizations.

Act 64, recently passed by the Vermont Legislature, includes both increased fees and revenue generating mechanisms for the funding and implementation of this Plan. In sum, the Act provides:

- (1) Clean Water Fund: The Vermont Clean Water Act imposes a 0.2% increase in Vermont's property transfer tax, which will raise approximately \$5.3 million annually for the purpose of making additional strategic investments in water pollution control. The Act creates a Clean Water Fund and Board to receive and manage the funds and requires an annual Clean Water Investment Report summarizing public investments and results of those investments.
- (2) Ecosystem Restoration Grants: The Vermont Capital Bill increased the amount of funding dedicated to grants under this program dedicated to funding implementation of polluted stormwater runoff control projects to \$3.75 million per year (from a current level of approximately \$2.5 million) for the next two years.
- (3) Increased Agency Capacity: The State of Vermont Fiscal Year 2016 budget includes funding to support eight new positions within AAFM and thirteen new positions within DEC all dedicated to implementation of the Vermont Clean Water Initiative and Lake Champlain TMDL.

TABLE 1 - VERMONT PHASE 1 TMDL PLAN SUMMARY OF VERMONT COMMITMENTS.

** Tasks correspond with the Gantt Chart.*

| Task * | Description | Start Year | End Year |
|---|---|--------------|--------------|
| A. AGRICULTURE | | | |
| <i>Water Quality Permitting Programs – LFO, MFO, CAFO</i> | | | |
| Inspect potential CAFOs | Inspect medium and large farms that could potentially be CAFOs with newly developed VT CAFO permit Inspect 75 potential CAFOs annually | 2014 2019 | 2018 2036 |
| Inspect MFOs and LFOs | MFOs currently inspected a minimum of every 3 years and LFOs annually. MFO inspections increase to a minimum of every 3 years | 2014 2016 | 2016 2036 |
| Update agricultural enforcement MOU | Update the MOU between DEC and AAFM regarding enforcement of agricultural regulations and program coordination | 2015 | 2016 |
| <i>Accepted Agricultural Practice Rule Update and Compliance</i> | | | |
| Amend the Accepted Agricultural Practices | Amend the AAPs to become the Required Agricultural Practices through rulemaking. Rules changes will include: <ul style="list-style-type: none"> • Develop small farm certification program • Increased and consistent buffer sizes to 25' (from 10') • Increased erosion tolerances to all farms to T (from 2T) • 10' buffer requirements for field ditches • Required stabilization of field gully erosion • Strengthening the livestock exclusion requirements. • Develop and require certification of custom manure applicators and ongoing training Develop and require educational trainings for farmers | 2015 | 2016 |
| Expand RAP education and outreach | Begin extensive education and outreach and enforcement of revised Required Agricultural Practices. | 2014 | 2018 |
| Develop the Small Farm Inspection program | Hired first SFO inspector (2014) focusing on Missisquoi Bay and St. Albans Bay Hire three additional inspectors | 2013 2015 | 2014 2016 |
| Increase SFO dairy inspections | Complete evaluation of all farms in Missisquoi Bay and St. Albans Bay watersheds and require BMP installation where needed Complete evaluation of all small dairies in South Lake and require BMP installation where needed Complete evaluation of all small dairies and | 2015 2016 | 2015 2019 |

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| | significant livestock operations in the Lake Champlain Basin and require BMP installation where needed | 2016 | 2020 |
| Require small farm certification | Require small farms to submit annual certification forms | 2017 | 2036 |
| <i>Nutrient Management Planning</i> | | | |
| Increase NMP efforts | Develop small farm NMP matrix and small farm template | 2016 | 2017 |
| | Provide increased cost-share funds for NMP development | 2018 | 2036 |
| | Expand small farm NMP development courses and workshops, trainings for farmers, manure applicators and technical service providers | 2016 | 2036 |
| Mandate manure applicator certification | Mandate certification of custom manure applicators | 2016 | 2036 |
| Improve field practice implementation | Support partners focusing on key areas of field practices Support farmer groups Increase participation in CREP program | 2017 | 2036 |
| Revise RAPs to address tile drains | Revise RAPs to include requirements to reduce nutrients from tile drains | 2018 | 2036 |
| <i>Additional Efforts in Critical Watersheds</i> | | | |
| Increase inspections in critical watersheds | Target CAFO and SFO inspections | 2014 | 2036 |
| | Conduct North Lake Farm Survey in Missisquoi Bay and St. Albans Bay watersheds | 2015 | 2015 |
| | Expand this comprehensive evaluation to other critical watersheds | 2016 | 2020 |
| Increase implementation in critical watersheds | Prioritize personnel in these areas for water quality improvement projects. | 2014 | 2036 |
| | Use \$16M RCPP grant funding to implement high priority practices primarily in these watersheds | 2015 | 2020 |
| Increase technical assistance | Hire consultants on retainer to immediately work with farmers following site-specific farm assessment Target education and support for farmer groups | 2015 | 2017 |
| Develop and pilot ESP | Develop and pilot the Environmental Stewardship Program to incentivize additional practice adoption | 2015 | 2020 |
| Develop and pilot nutrient trading program | Evaluate feasibility of nutrient trading and pilot a trading program | 2016 | 2018 |
| Create grassed waterways program | Target funding to critical source areas in coordination with partners | 2016 | 2036 |
| Tile drain research | NRCS grant funding testing of two treatment media for tile drain outflows on farms in Franklin county. Encouraging farmers to utilize NRCS <i>Edge of Field Monitoring</i> practice to test additional tile treatment options | 2015 | 2017 |

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| Capital Equipment Assistance Program | Reactivate this program to provide funding for the purchase of equipment such as no-till seeders and injectors | 2016 | 2036 |
| B. STORMWATER MANAGEMENT | | | |
| Develop and issue State Highway Stormwater General Permit | Develop and issue general permit to regulate stormwater discharges from the entire state-operated transportation system. | 2015 | 2016 |
| Implement State Highway Stormwater General Permit | Implement the general permit to regulate stormwater discharges from the entire state-operated transportation system. | 2017 | 2036 |
| Develop and issue Municipal Roads Stormwater General Permit | Develop and issue general permit to require development and implementation of stormwater management plans for municipal roads. | 2016 | 2017 |
| Implement Municipal Roads Stormwater General Permit | Implement the general permit to require development and implementation of stormwater management plans for municipal roads. | 2018 | 2036 |
| Develop and issue Existing Developed Lands Stormwater General Permit | Develop and issue general permit to address stormwater from existing developed lands equal to or greater than 3 acres | 2016 | 2018 |
| Implement Existing Developed Lands Stormwater General Permit | Implement the general permit to address stormwater from existing developed lands equal to or greater than 3 acres. | 2018 | 2036 |
| Revise Existing MS4 General Permit | Existing Municipal Separate Storm Sewer System General Permit will be revised following adoption of the TMDL to require existing regulated municipalities to control discharges consistent with the wasteload allocation. Timeframe dependent on TMDL issuance. | 2016 | 2017 |
| Update Vermont Stormwater Management Manual | Projects requiring a state-law based operational stormwater permit must have a stormwater system that meets the requirements of the VSMM. A stakeholder process is currently underway to revise the VSMM to increase the level of phosphorus reduction achieved by approved practices. The final manual must be adopted by rule. | 2014 | 2017 |
| C. NON-REGULATORY STORMWATER MANAGEMENT | | | |
| Implement non-regulatory stormwater management for unregulated sources | Provide technical assistance on stormwater master planning to identify and prioritize actions. Develop stormwater management practices handbook for sub-jurisdictional activities by January 2016. | 2014 | 2036 |
| Support municipal stormwater ordinance adoption | Support municipal adoption of model stormwater ordinances to prevent or minimize stormwater impacts from future development. | 2014 | 2036 |
| Use Green Stormwater Infrastructure to reduce impacts from stormwater runoff | Implement green stormwater infrastructure practices to reduce the volume of runoff and to provide water quality treatment. Develop cooperative agreement with Lake Champlain Sea Grant at the University of | 2013 | 2036 |

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|--|--|------|------|
| | Vermont to enhance green infrastructure technical assistance in Lake Champlain Basin | | |
| D. RIVER CHANNEL STABILITY | | | |
| <i>River Corridor and Floodplain Management</i> | | | |
| Implement a No Adverse Impact Standard | Further develop Program capacity to implement the new state floodplain rule and Flood Hazard Area and River Corridor Protection Procedures. Establish Memoranda of Understanding (MOUs) with other state agencies to regulate developments within their purview to be consistent with the new state floodplain rule. Support the municipal adoption of enhanced model floodplain and river corridor protection bylaws that exceed the NFIP minimum requirements. | 2014 | 2018 |
| Expand technical and regulatory assistance | Implement general permits and establish a regional Certified Floodplain Technician Program to also increase the regulatory and technical assistance capacity for floodplain protection. Develop and implement both field and web-based project authorization capacities and the data management systems for project to tracking. | 2014 | 2022 |
| Establish statewide river corridor mapping. | Implement a statewide river corridor and floodplain mapping center that is developing and maintaining inundation, erosion hazard, and riparian buffer maps as per the adopted Flood Hazard Area and River Corridor Protection Procedures. Develop and carry-out a training program to establish greater statewide capacity for assisting municipalities with river corridor updates. | 2015 | 2036 |
| Update and expand flood inundation mapping | Obtain Light Detection and Ranging (LiDAR) data for the entire state. | 2017 | 2022 |
| Increase the number of land conservation projects | Increase the number of conservation projects which incorporate channel management and riparian buffer provisions (5 addl. projects per year). | 2015 | 2036 |
| Enhance strategic river corridor project identification. | Integrate field assessment data, river corridor plans, and statewide river corridor mapping to support municipal resiliency plans, road erosion assessments, tactical basin plans, and project identification within state, regional, and local hazard mitigation plans. | 2015 | 2022 |
| Enhance incentives for municipal adoption of regulations | Enhance the Flood Resilient Communities Program with funding and technical assistance incentives for municipalities. | 2014 | 2036 |
| Enhance and maintain an education and outreach program | Enhance a "Flood Ready" web page to promote cross-agency flood resiliency planning, peer-to-peer learning, and tools to increase municipal adoption of enhanced floodplain and river corridor protection bylaws and other mitigation measures to minimize flood risks and maximize floodplain function. | 2015 | 2036 |

| <i>Preventing Adverse Channel Modifications</i> | | | |
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| Expand technical and regulatory assistance | Increase the Program's capacity to provide technical and regulatory assistance for stream alterations, including emergency and next-flood protective measures to maximize equilibrium conditions (i.e., river-based storage functions) in the Lake Champlain Basin. Develop and implement both field and web-based project authorization capacities and the data management systems for project and permit tracking. | 2014 | 2022 |
| Establish agricultural streambank stabilization practices. | Work with AAFM and NRCS to establish streambank stabilization practices consistent with the Vermont Stream Alteration Rule for minimizing fluvial erosion hazards as per the Act 65 revisions to 10 V.S.A. §1021. | 2015 | 2017 |
| Increase the number of river and floodplain restoration projects | Capitalize on opportunities to implement restoration projects involving the removal of river, river corridor, and floodplain encroachments and the completion of projects that restore equilibrium conditions. | 2015 | 2036 |
| Expand training, education, and outreach programs | Develop and continually edit standard river management principles and practices (SRMPP) to maximize equilibrium conditions when managing conflicts between human activities and the dynamic nature of rivers. Develop and implement a 3 tiered outreach and training program by offering courses to VTtrans Operations Technicians, municipal roads workers, contractors, and other river technicians. Conduct outreach and train municipalities and contractors in the use of the SRMPP and authorizations under the new ANR Stream Alteration Rules and General Permit that contain equilibrium-based performance standards. | 2014 | 2018 |
| Achieve consistent standards across jurisdictions | Achieve FEMA recognition of state-adopted river management and stream crossing codes and standards for conducting emergency protective measures. | 2014 | 2018 |
| E. FOREST MANAGEMENT | | | |
| Revise Forestry Acceptable Management Practices (AMPs) | Revise AMPs to specify compliance with standards in state stream alteration general permit, referencing stream crossings. Enhance standards for skid trails and truck roads. | 2014 | 2016 |
| Provide incentive financing to reduce pollution risks on logging jobs | Provide qualified logging professionals access to low-interest financing through a Vermont Forestry Direct Link Loan Program to support logging BMPs and equipment. | 2018 | 2036 |
| Abate soil erosion occurring on forest roads | Leverage existing NRCS cost-share practice to address erosion and sedimentation associated with logging roads on private lands. | 2015 | 2036 |
| Enhance forest cover to | Establish forest cover goals, secure public funding to | 2016 | 2036 |

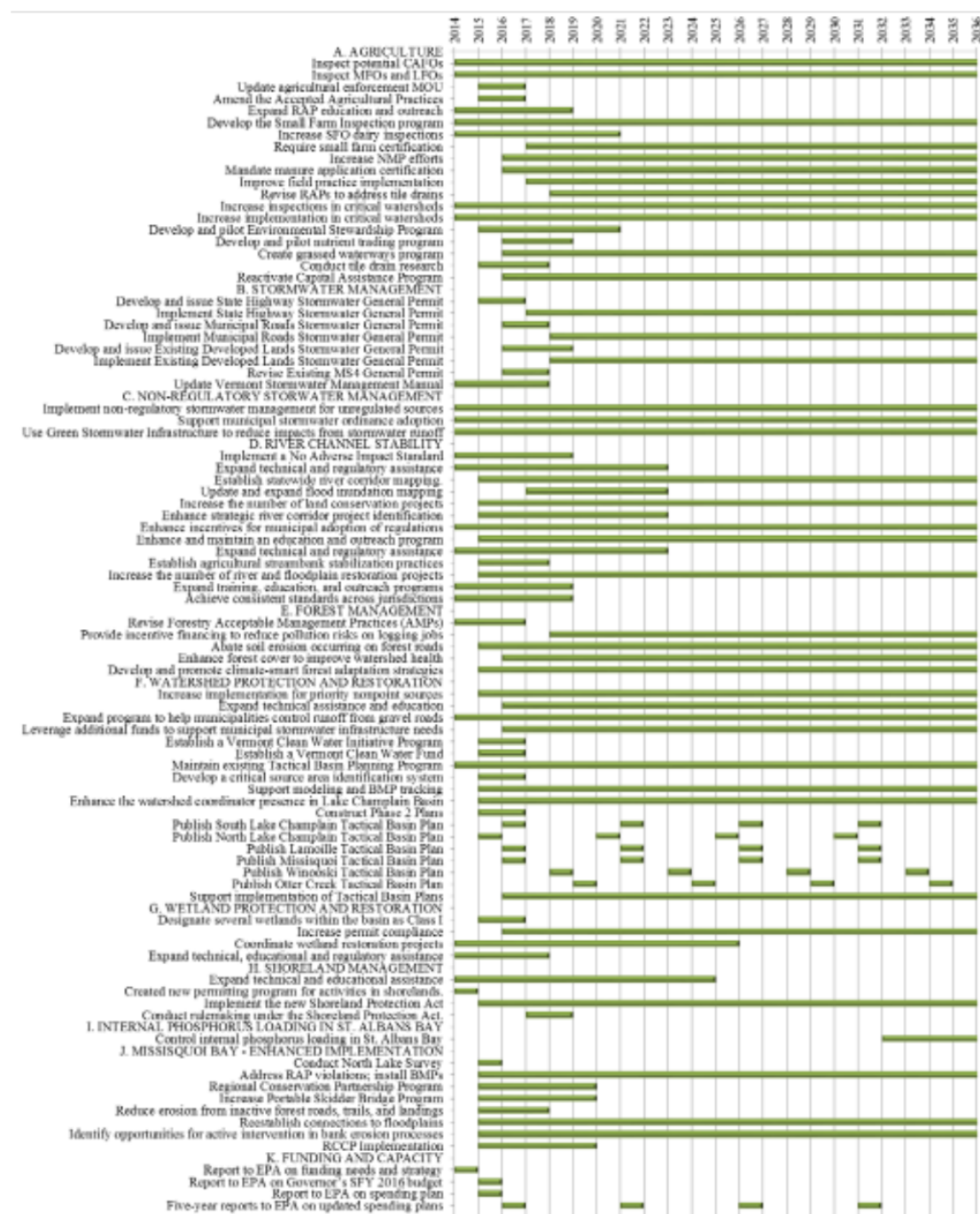
| | | | |
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| improve watershed health | restore riparian buffers and developed land forest cover. Prepare and mitigate impacts to forest cover from invasive tree pests. | | |
| Develop and promote climate-smart forest adaptation strategies | Publish and distribute guide, "Creating and Maintaining Resilient Forests in Vermont: Adapting forests to climate change," to promote climate-smart forestry practices. Create funding priorities within the Working Lands Enterprise Fund to support environmentally sound harvesting technologies. Conduct demonstration projects. | 2015 | 2036 |
| F. WATERSHED PROTECTION AND RESTORATION | | | |
| <i>Ecosystem Restoration Program</i> | | | |
| Increase implementation for priority nonpoint sources | Expand the availability of capital construction funds and support local teams to increase implementation of stormwater mitigation projects across all sectors. | 2015 | 2036 |
| Expand technical assistance and education | Provide grant funding to meet technical and educational assistance needs of municipalities and other local partners. | 2016 | 2036 |
| Expand program to help municipalities control runoff from gravel roads | Expand financial and technical assistance to municipalities in managing road runoff and erosion via the VTrans Vermont Better Back Roads Grant Program. | 2014 | 2036 |
| Leverage additional funds to support municipal stormwater infrastructure needs | Expand the state revolving fund that is dedicated to providing low interest loans and incentives for municipal stormwater management. Provide technical assistance in stormwater asset management. | 2016 | 2036 |
| <i>Vermont Clean Water Initiative</i> | | | |
| Establish a Vermont Clean Water Initiative Program | Create a program that will oversee the ERP and coordinate, manage, track and report on implementation of TMDLs and other priority actions statewide | 2015 | 2016 |
| Establish a Vermont Clean Water Fund | Create a statewide fund to support compliance with water quality requirements and implementation of priority water quality projects using existing grant, contract and loan programs and a board to administer the fund. | 2015 | 2016 |
| <i>Tactical Basin Planning</i> | | | |
| Maintain existing tactical basin planning program | Maintain base program including monitoring and assessment staff, data management staff, and watershed coordinators. Support exist assessment processes, stormwater master planning, stream geomorphic assessment, backroads inventory and assessment, and agricultural environmental management. | 2014 | 2036 |
| Develop a critical source area identification system | Construct an optimized and flexible critical source area modeling tool for tactical BMP implementation. This | 2015 | 2016 |

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| | system would be used by DEC and organizational partners (AAFM, VTRANS, NRCS) in the development of tactical basin plans and tracking of resulting BMP implementation. Such a system will be constructed to incorporate LIDAR, Quickbird satellite imagery and other continually refreshed geodetic source information. | | |
| Support modeling and BMP tracking | Construct a watershed modeling BMP planning tool by 2017 and implement watershed modeling. | 2015 | 2036 |
| Enhance the watershed coordinator presence in Lake Champlain Basin | Enhance basin coverage, and accelerate updates of plan implementation tables with watershed modeling results. | 2015 | 2036 |
| Construct Phase 2 Plans | Tactical Planning staff, in partnership with other Division, AAFM, ACCD, and VTRANS staff will construct the Phase 2 implementation base set of interventions for inclusion into Tactical Basin Plans. | 2015 | 2016 |
| Publish South Lake Champlain Tactical Basin Plan | Publish tactical basin plan in 2014 and every five years thereafter, with interim update in 2017. Identify additional measures as necessary to achieve the required phosphorus load reductions. | 2014 | 2034 |
| Publish North Lake Champlain Tactical Basin Plan | Publish tactical basin plan in 2015 and every five years thereafter, with interim updates in 2017 and 2019. | 2015 | 2034 |
| Publish Lamoille Tactical Basin Plan | Publish tactical basin plan in 2016 and every five years thereafter, with interim updates in 2018 and 2020. | 2016 | 2036 |
| Publish Missisquoi Tactical Basin Plan | Publish tactical basin plan in 2016 and every five years thereafter, with interim updates in 2018 and 2020. Identify additional measures as necessary to achieve the required phosphorus load reductions. | 2016 | 2036 |
| Publish Winooski Tactical Basin Plan | Publish tactical basin plan in 2018 and every five years thereafter, with interim updates in 2020 and 2022. | 2018 | 2032 |
| Publish Otter Creek Tactical Basin Plan | Publish tactical basin plan in 2019 and every five years thereafter, with interim updates in 2021 and 2023. | 2019 | 2032 |
| Support implementation of Tactical Basin Plans by establishing local teams that consist of Regional Planning Commissions, watershed groups and other partners | Create and support local teams that involve RPCs and other partners and conduct municipal BMP outreach, support, implementation, tracking and reporting. | 2016 | 2036 |

| G. WETLAND PROTECTION AND RESTORATION | | | |
|--|---|------|---------|
| Designate several wetlands within the basin as Class I | Enhance state protection for several wetlands within the basin which provide sediment and phosphorus retention or provide erosion control of waterways. | 2015 | 2016 |
| Increase permit compliance | Conduct permit compliance checks on 80% of construction projects within the Lake Champlain Basin. | 2016 | 2036 |
| Coordinate wetland restoration projects | Coordinate with federal, state and local partners to identify and implement restoration opportunities. | 2014 | 2025 |
| Expand technical, educational and regulatory assistance | Enhance ability of program to focus significant time on restoration efforts. | 2013 | 2017 |
| H. SHORELAND MANAGEMENT | | | |
| Expand technical and educational assistance | Implement the Lake Wise Program. Enhance ability of program to focus significant time on restoration efforts. | 2034 | 2024 |
| Created new permitting program for activities in shorelands. | Developed permit program procedures and standards that implemented the provisions in the Shoreland Act. | 2014 | 2014 |
| Implement the new Shoreland Protection Act. | Permit activities in lake shorelands. Establish a contractor training program for work in shorelands. Conduct outreach and technical assistance. | 2015 | 2036 |
| Conduct rulemaking under the Shoreland Protection Act. | As dictated by experience implementing the program, enter rulemaking to clarify or strengthen the requirements of the Shoreland Permit Program. | 2017 | 2018 |
| I. INTERNAL PHOSPHORUS LOADING IN ST. ALBANS BAY | | | |
| Control internal phosphorus loading in St. Albans Bay | Conduct treatment design study, secure permits and funding, and implement in-lake treatment. | 2032 | 2036 |
| J. MISSISQUOI BAY – ENHANCED IMPLEMENTATION | | | |
| AAFMM North Lake Survey | Visits to all livestock operations to assess water quality | 2015 | 2015 |
| Address RAP violations; install BMPs | Farms to install site specific BMPs as required and address RAP violations | 2015 | ongoing |
| Regional Conservation Partnership Program | Target forest landowners to accelerate implementation of NRCS cost-share practices to improve water quality | 2015 | 2019 |
| Increase portable skidder bridge program | Provide portable skidder bridges watershed wide in Missisquoi Bay | 2015 | 2019 |
| Reduce erosion from inactive forest roads, trails and logging landings | Use LiDAR mapping to map eroding, abandoned and retired forest roads, skid trails and log landings to identify restoration projects for funding. | 2015 | 2017 |
| Re-establish connections to floodplains | Enhance effort to identify opportunities for re-establishing connections to floodplains and working with landowners | 2015 | 2036 |
| Identify opportunities for | Enhance effort into identification of opportunities to | 2015 | 2036 |

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| active intervention in bank erosion processes | implement projects involving active intervention to prevent stream back erosion | | |
| RCCP Implementation | Increase EQIP contracts for BMPs, identify and fund new easement parcels and wetland restoration projects | 2015 | 2019 |
| K. FUNDING AND CAPACITY | | | |
| Report to EPA on funding needs and strategy | November 15, 2014: Report to EPA Regarding Funding Needs and Strategy as a component of report to Vermont General Assembly under Act 97 (2014) | 2014 | 2014 |
| Report to EPA on Governor's SFY 2016 budget | January 30, 2015: Provide EPA with a copy of Governor's proposed Vermont Fiscal Year 2016 budget as presented to Vermont General Assembly | 2015 | 2015 |
| Report to EPA on spending plan | June 30, 2015: Provide report to EPA with spending plan for TMDL plan implementation based on federal funds obtained or requested, and funds for plan implementation as contained in the Vermont Fiscal Year 2016 budget as passed by the Vermont General Assembly | 2015 | 2015 |
| Five-year reports to EPA on updated spending plans | June 30, 2016 and every five years thereafter: Provide a report to EPA with an updated spending plan for TMDL plan implementation based on available federal and state funds. | 2016 | 2036 |

FIGURE 1 - GANTT CHART: LAKE CHAMPLAIN TMDL PHASE 1 PLAN COMMITMENTS AND IMPLEMENTATION



CHAPTER 1- INTRODUCTION

A. PHOSPHORUS IMPAIRMENT OF LAKE CHAMPLAIN

Phosphorus pollution is the greatest threat to clean water in Lake Champlain. Phosphorus is a nutrient that stimulates excessive growth of algae in the lake, turning the water green. In excessive amounts, phosphorus and the associated algal growth can impair recreational uses and aesthetic enjoyment, reduce the quality of drinking water, and alter the biological community. In some cases, algal blooms – particularly cyanobacteria (or blue-green algae) can produce toxins that harm animals and people.

Vermont's Water Quality Standards include total phosphorus concentration criteria for each of Vermont's twelve lake segments. These criteria vary among the different lake segments, and are expressed as the annual average phosphorus levels that must be achieved in order to support the many values and uses of the lake.

Long-term monitoring of phosphorus levels throughout Lake Champlain by Vermont and New York with the Lake Champlain basin Program has documented phosphorus concentrations in excess of the water quality standards in most areas of the lake (Figure 2). Despite significant efforts to reduce phosphorus loading to the Lake in recent years, the trend lines are still moving upward.

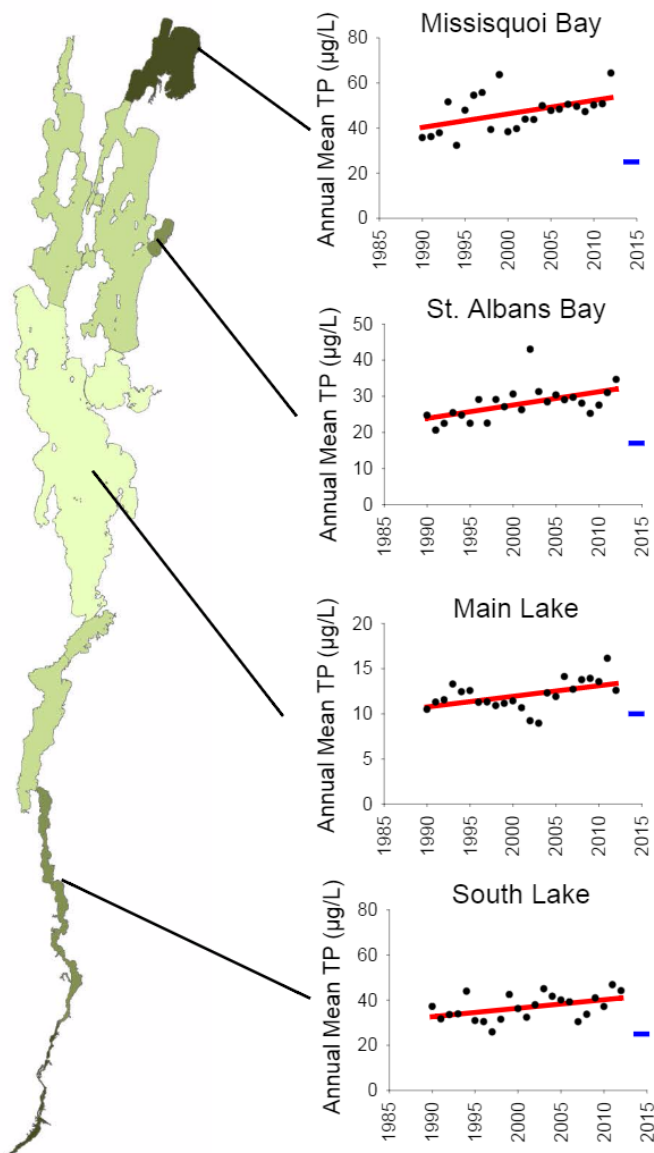


FIGURE 2 - ANNUAL MEAN TOTAL PHOSPHORUS CONCENTRATIONS (TP, MICROGRAMS PER LITER) IN FOUR LAKE CHAMPLAIN SEGMENTS, 1990-2012. SOLID RED LINES ARE STATISTICALLY SIGNIFICANT TREND LINES. DOTTED BLUE LINES ARE THE IN-LAKE PHOSPHORUS WATER QUALITY STANDARD

Excessive phosphorus is delivered to Lake Champlain as a result of the collective activities of all residents of the Lake Champlain basin, past and present. Stormwater runoff from the roofs of homes and driveways and other developed land contributes phosphorus that is washed into streams when it rains or as snow melts. Similarly in an agricultural setting, rain washes soil and manure off of crop lands, pastures, hay lands, and barnyards into nearby streams. Erosion of roadside banks, ditches, and around unstable culverts delivers sediment and phosphorus to the road drainage network and then to nearby streams.

Channelization of streams undertaken to protect development, and encroachment of buildings and roads on floodplains and river corridors, prevents floodwater storage and the attainment of the least erosive, stream equilibrium conditions. Loss of floodplain function increases river bank erosion and the loading of sediments and nutrients such as phosphorus. River bank and bed erosion is also the result of traditional drainage methods that increase runoff directly to streams, thereby increasing volume and velocity of stream flows during storms.

Phosphorus is naturally present in small amounts even in runoff from pristine forest land, but logging activities such as construction of roads and stream crossings can cause erosion of sediment and phosphorus into streams. Finally, inadequately treated wastewater, whether from a septic system or a wastewater treatment facility, also contributes phosphorus to the lake.

As part of the development of the new Lake Champlain Phosphorus TMDL, EPA supported a watershed modeling analysis that produced estimates of the phosphorus contribution from each major source category. As shown in Figure 3, the relative magnitude of each source varies by watershed, but agricultural land, developed land, and streambank erosion are major sources across all watersheds. Forest land appears as a large source in Figure 3 primarily because forests occupy over 70% of the landscape in the basin. Phosphorus runoff rates per acre from forest land are typically very low. On the other hand, some sources such as farmsteads and back roads that appear small in Figure 3 can contribute some of the highest rates of phosphorus loading per acre. Both the total amount of the phosphorus load and the loading rate per unit of land area should be considered in setting phosphorus reduction priorities.

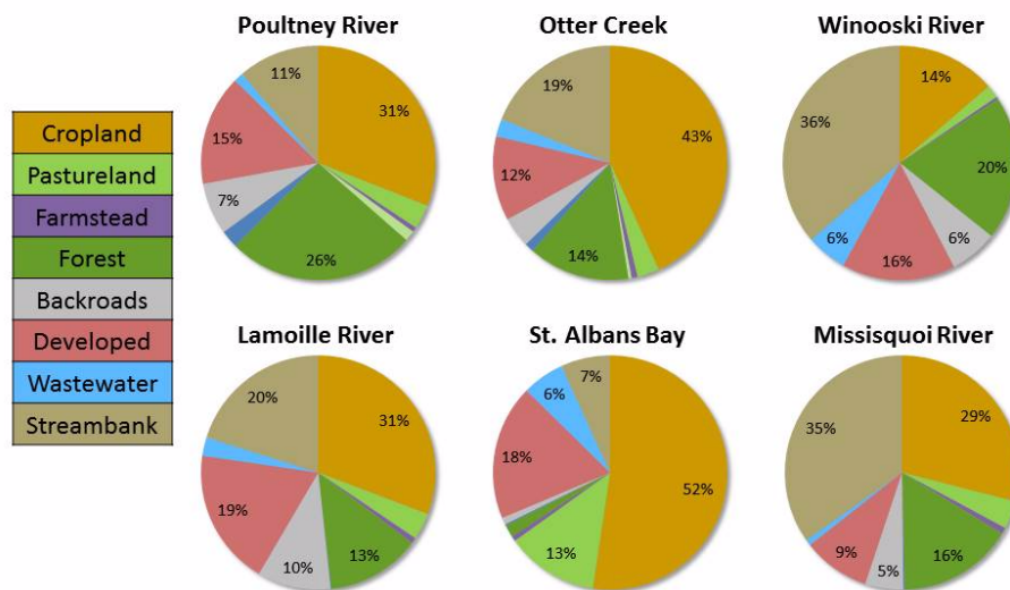


FIGURE 3 - SOURCES OF PHOSPHORUS LOADING TO LAKE CHAMPLAIN FROM VERMONT WATERSHEDS (PRELIMINARY RESULTS FROM EPA/TETRA TECH, 2013)

B. TMDL DEVELOPMENT AND IMPLEMENTATION PLANNING

Section 303(d) of the federal Clean Water Act requires states to develop a total maximum daily load (TMDL) for water bodies that do not currently meet water quality standards. A TMDL is a “pollution budget” that calculates the amount of pollution the water body can tolerate and still maintain water quality standards. This “budget” is comprised of two components – the “wasteload allocation” which describes the amount of phosphorus reductions required from point source discharges, and the “load allocation” which describes the amount of phosphorus reduction required from nonpoint sources. Point sources include discharges from pipes or other discrete conveyances, for example discharges from wastewater treatment facilities or channelized municipal stormwater runoff. Non-point sources include more diffuse overland discharges to waters, such as runoff from agricultural fields, developed lands and back roads, and from stream erosion due to channelization and increased runoff from developed lands.

The 2002 Lake Champlain Phosphorus TMDL was developed and submitted jointly by the States of Vermont and New York to the U.S. Environmental Protection Agency in 2002, following an extensive public participation process in each state. The TMDL built upon a sequence of studies, plans, and agreements completed during the preceding twelve years. A subsequent water quality agreement between Vermont and Quebec was signed in 2002 to define phosphorus load reduction targets and responsibilities for the shared Missisquoi Bay portion of the lake.

The 2002 TMDL included a Vermont-specific implementation plan describing a suite of action items and attendant funding needs to reduce the phosphorus load delivered annually to Lake Champlain. The 2002 implementation plan, as amended in 2010, served as a basis for the efforts of ANR and AAFM by guiding annual funding requests, staffing levels, and program priorities for the past twelve years. Despite these numerous efforts, and in response to a lawsuit filed in federal court by Conservation Law Foundation, EPA reconsidered its previous approval of the 2002 TMDL, and disapproved the Vermont portion of the TMDL in January 2011. One of the bases for this disapproval was EPA’s finding that Vermont had not provided sufficient “reasonable assurances” that reductions in nonpoint sources of phosphorus would be attained. Under federal law, upon such disapproval, EPA is required to establish a new TMDL to meet water quality standards. EPA initiated the process for developing a new TMDL in 2011 in cooperation with the State of Vermont. The New York portion of the 2002 TMDL remains in effect.

In order to ensure efficient and cost-effective implementation of a TMDL, responsible agencies develop an implementation plan. A TMDL implementation plan identifies a suite of measures that will be taken to reduce pollution levels in order to reach the “pollution budget” for both point and non-point sources specified in the TMDL. Conceptually, the TMDL process of establishing a pollution budget is straightforward – uncertainty, however, makes writing a single, detailed, long-term plan that charts a specific course to water quality extremely challenging. Relevant processes and stressors within a watershed are not always fully understood, and the effectiveness of recommended control measures is often highly variable. In order to continue to make progress in reducing pollution and improving water quality, while at the same time minimizing the potential for costly errors, adaptive implementation is essential. The ability to revisit, reevaluate, and modify the implementation plan is fundamental, applying what has been

learned from past watershed-based actions and producing improvements in the landscape and water quality in as efficient and effective a manner as possible. The benefits of this approach include:

- Providing a measure of quality control, given the uncertainty that exists;
- Helping to ensure the most cost effective practices are implemented as soon as possible; and
- Allowing for the routine reevaluation of the adequacy of implementation efforts in achieving the necessary TMDL reductions and water quality standards.

The Lake's 2002 TMDL implementation plan, as amended in 2010, has guided program priorities and annual funding requests and served as the framework for both ANR and AAFM in controlling phosphorus. As a result, numerous water quality programs in ANR and AAFM that existed prior to the TMDL have been substantially expanded and enhanced, and a number of new efforts have begun. These programs work to reduce the phosphorus load delivered to the state's waters from sources such as wastewater discharges, barnyards, agricultural fields, unstable river channels, urban centers, residential areas, construction sites, back roads, and other areas.

The Phase 1 Plan and Phase 2 implementation plans (i.e. tactical basin plans) requested by EPA in its January 17, 2014 letter will build upon the 2002 and 2010 Lake implementation plans and help to further refine and direct efforts and monies spent to reduce phosphorus contributions to Lake Champlain. As described in more detail in Chapters 4 and 5, the Phase 2 basin-specific implementation plans will reflect a tactical basin planning process, which will identify the highest priority projects for each basin and ensure that available funding is prioritized and targeted toward those projects.

C. VERMONT'S TMDL IMPLEMENTATION EFFORTS TO DATE

Since 2002, ANR, AAFM and VTrans, in cooperation with federal, state, and local partners, have made significant progress in implementing practices and programs to reduce phosphorus inputs to the Lake. Examples of Vermont water resource protection programs that have been developed or greatly enhanced over the past decade include:

- Stormwater Management Program (ANR);
- Green Infrastructure/Low Impact Development Program (ANR);
- Vermont Better Back Roads Program (VTrans/ANR);
- River Management Program (ANR);
- Lake Shoreland Program (ANR);
- Wetlands Program (ANR); and
- Agricultural Resource Management Division (AAFMD).

Examples of water quality implementation projects that have received federal/state funding to reduce phosphorus pollution in the Lake include:

- Stormwater runoff mitigation projects;
- River channel, lake shoreland stability projects;
- Road infrastructure stability/runoff mitigation projects;

- Agricultural runoff mitigation projects; and,
- River corridor and wetland easement acquisition.

The original Center for Clean and Clear was established in 2007 to enhance Vermont's commitment to improve water quality in Lake Champlain. That Program brought together resources dedicated to improving water quality that were previously spread among many state programs. In 2011, the former Center was restructured to become the Vermont Department of Environmental Conservation (DEC) Watershed Management Division (WSMD) Ecosystem Restoration Program (ERP). This Program guides the award of state and federal water quality grants and contracts to address high priority water quality needs. Grant and contract recipients include municipalities, watershed organizations, lake associations, conservation districts, and regional planning commissions – important partners in the effort to safeguard the rivers, lakes, ponds, and wetlands of the State.

ERP CAPITAL GRANTS

Since 2002, ERP and its predecessor Clean and Clear have provided capital funds to support construction grants for projects that accelerate the reduction of sediment and nutrient pollution, including phosphorus, from uncontrolled runoff into the State's surface waters. Typical project budgets range from \$5,000 to \$75,000.

ERP directs capital funds toward implementation of priority projects identified in the WSMD Monitoring, Assessment and Planning Program's (MAPP) tactical basin planning process. That process involves the development of plans that assess water quality throughout a basin and identify and prioritize actions to improve water quality. Throughout the process of tactical basin plan development, partner organizations are encouraged to participate in identifying the highest priority projects for state funded support. As a component of the tactical planning process, watershed coordinators serve as facilitators in the development of ERP grant applications. Projects that are specifically identified in Tactical Plans, and associated river corridor, stormwater master plans and other relevant assessment plans, receive higher scoring in the grant application review process.

ERP recently submitted its Annual Report 2013 to the Vermont Legislature. (http://www.watershedmanagement.vt.gov/erp/docs/erp_2013annualreport.pdf). Table 2 and Figure 4 shown below from the Report, illustrates the types of projects that are funded annually by ERP, which include projects in the Lake Champlain basin that result in reductions in phosphorus pollution. In total, 54 grants and contracts, totaling \$2.3 million of State Fiscal Year (SFY) 2013 funds were awarded to municipalities, watershed organizations, natural resources conversation districts, regional planning commissions, and university programs to improve water quality.

These SFY 2013 dollars and projects represent a small fraction of the projects and dollars spent over the past twelve years in reducing phosphorus contributions to the Lake and improving water quality statewide. Table 3 shows both program administration costs and implementation project costs funded by the ERP Program and former Clean and Clear Program. Figure 6 and Table 4 show the percent of ERP funds spent in the Lake Champlain basin from SFY 2006-2013.

TABLE 2 - PROJECTS AND DOLLARS AWARDED BY EACH MAJOR VERMONT WATERSHED, SFY13 FUNDS

| River Basin number and name | Number of Projects | Total SFY13 Amount |
|--|---------------------------|---------------------------|
| (01) Batten Kill-Walloomsac-Hoosic | 0 | \$0 |
| (02) Poultney-Mettawee | 0 | \$0 |
| (03) Otter, Little Otter, Lewis Creek | 9 | \$422,337 |
| (04) Southern Lake Champlain | 1 | \$7,000 |
| (05) Northern Lake Champlain | 5 | \$235,000 |
| (06) Missisquoi | 2 | \$79,873 |
| (07) Lamoille | 6 | \$173,404 |
| (08) Winooski | 12 | \$407,820 |
| (09) White | 1 | \$75,000 |
| (10) Ottauquechee-Black | 4 | \$177,469 |
| (11) West-Williams-Saxtons | 2 | \$91,020 |
| (12) Deerfield | 1 | \$25,320 |
| (13) Lower Connecticut | 0 | \$0 |
| (14) Stevens-Wells-Waits-Ompompanoosuc | 1 | \$85,400 |
| (15) Passumpsic | 2 | \$82,500 |
| (17) Lake Memphremagog | 2 | \$89,163 |
| Multiple Basins ¹ | 6 | \$430,298 |
| TOTAL for SFY13 | 54 | \$2,381,604 |

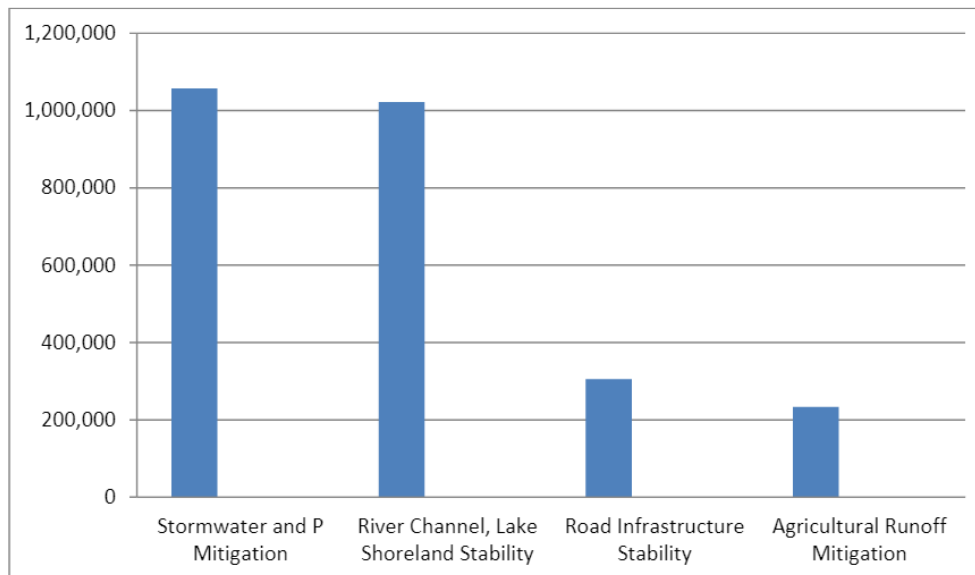


FIGURE 4 - NUMBER OF AGGREGATE SFY13 DOLLARS SPENT BY BROAD PROJECT TYPE

TABLE 3 - ECOSYSTEM RESTORATION: AGENCIES OF AGRICULTURE, TRANSPORTATION, NATURAL RESOURCES

| | SFY05 | SFY06 | SFY07 | SFY08 | SFY09 |
|---|--------------------|--------------------|--------------------|--------------------|--------------------|
| | Total | Total | Total | Total | Total |
| AGENCY OF AGRICULTURE, FOOD & MARKETS | | | | | |
| Agricultural Best Management Practices | \$900,000 | \$1,800,000 | \$1,800,000 | \$1,800,000 | \$1,800,000 |
| Conservation Reserve Enhancement Program | \$750,000 | \$133,500 | \$133,500 | \$150,000 | \$650,000 |
| Nutrient Management Planning (ICM) | \$300,000 | \$500,000 | \$750,000 | \$725,000 | \$493,700 |
| Natural Resources Conservation Districts | \$100,000 | \$200,000 | \$200,000 | \$270,000 | \$190,000 |
| Environmental Farm Water Quality Reg. | \$150,000 | \$133,500 | \$133,500 | \$150,000 | \$150,000 |
| Water Quality Engineering | | \$315,000 | \$65,000 | \$75,000 | \$75,000 |
| Farm Agronomic Practices Cost-share | | \$0 | \$25,000 | \$25,000 | \$70,000 |
| Subtotal | \$2,200,000 | \$3,082,000 | \$3,107,000 | \$3,195,000 | \$3,428,700 |
| AGENCY OF TRANSPORTATION | | | | | |
| Vermont Better Back Roads (Federal Funds make up approximately 50% of funds up to FY2013) | \$254,333 | \$362,700 | \$362,700 | \$523,581 | \$523,581 |
| AGENCY OF NATURAL RESOURCES | | | | | |
| Vermont League of Cities and Towns Municipal Technical Assistance | \$75,000 | \$96,000 | \$96,000 | \$96,000 | \$64,000 |
| Monitoring, Research, Special Projects | \$55,000 | \$30,000 | \$105,000 | \$125,000 | \$125,000 |
| Ecosystem Restoration – Capital Funds | \$1,250,000 | \$1,620,000 | \$1,500,000 | \$1,450,000 | \$1,350,000 |
| Ecosystem Restoration | \$106,225 | \$231,000 | \$431,500 | \$431,500 | \$513,340 |
| Subtotal | \$1,486,225 | \$1,977,000 | \$2,132,500 | \$2,102,500 | \$2,052,090 |
| TOTAL | \$3,940,558 | \$5,421,700 | \$5,602,200 | \$5,821,081 | \$6,004,371 |

**CONTINUED: ECOSYSTEM RESTORATION: AGENCIES OF AGRICULTURE,
TRANSPORTATION, NATURAL RESOURCES**

| | SFY10 | SFY11 | SFY12 | SFY13 | SFY14 | SFY15 |
|---|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| | Total | Total | Total | Total | Total | Total |
| AGENCY OF AGRICULTURE, FOOD & MARKETS | | | | | | |
| Agricultural Best Management Practices | \$1,600,000 | \$1,500,000 | \$1,250,000 | \$1,200,000 | \$0 | \$1,000,000 |
| Conservation Reserve Enhancement Program | \$325,000 | \$316,731 | \$160,964 | \$160,964 | \$177,117 | \$402,132 |
| Nutrient Management Planning (ICM) | \$445,952 | \$150,000 | \$150,000 | \$150,000 | \$150,000 | \$150,000 |
| Natural Resources Conservation Districts | \$190,000 | \$190,000 | \$220,000 | \$302,000 | \$112,000 | \$155,500 |
| Environmental Farm Water Quality Reg. | \$150,000 | \$141,731 | \$214,218 | \$214,218 | \$239,737 | \$357,866 |
| Water Quality Engineering | \$75,000 | \$70,865 | \$20,601 | \$20,601 | \$57,520 | \$34,808 |
| Farm Agronomic Practices Cost-share | \$95,000 | \$366,674 | \$366,674 | \$366,674 | \$381,674 | \$381,674 |
| Subtotal | \$2,880,952 | \$2,736,001 | \$2,382,457 | \$2,414,456 | \$1,118,048 | \$2,481,980 |
| AGENCY OF TRANSPORTATION | | | | | | |
| Vermont Better Back Roads (Federal Funds make up approximately 50% of funds up to FY2013) | \$522,998 | \$522,998 | \$522,998 | \$522,998 | \$440,000 | \$440,000 |
| AGENCY OF NATURAL RESOURCES | | | | | | |
| Vermont League of Cities and Towns Municipal Technical Assistance | \$64,000 | \$50,000 | \$50,000 | \$50,000 | \$50,000 | \$50,000 |
| Monitoring, Research, Special Projects | \$175,000 | \$175,000 | \$175,000 | \$175,000 | \$175,000 | \$175,000 |
| Ecosystem Restoration – Capital Funds | \$1,700,000 | \$1,900,000 | \$2,500,000 | \$2,500,000 | \$2,250,000 | \$2,573,732 |
| Ecosystem Restoration | \$530,340 | \$532,840 | \$342,840 | \$342,840 | \$342,840 | \$342,840 |
| Subtotal | \$2,469,340 | \$2,657,840 | \$3,067,840 | \$3,067,840 | \$2,817,840 | \$3,141,572 |
| TOTAL | \$5,873,290 | \$5,916,839 | \$5,973,295 | \$6,005,295 | \$4,375,888 | \$6,063,552 |

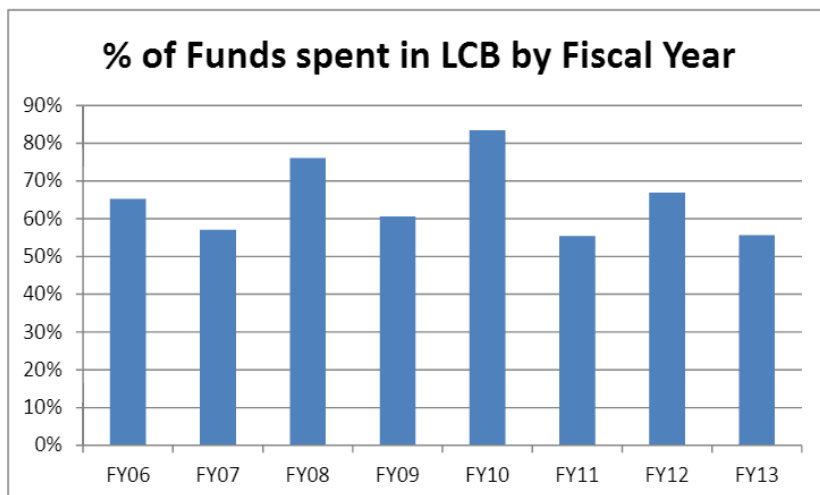


FIGURE 5 - PROGRAM ADMINISTRATION COSTS AND IMPLEMENTATION PROJECT COSTS (SFY 5-15)

TABLE 4 - ECOSYSTEM RESTORATION GRANTS SPENT IN LAKE CHAMPLAIN BY BASIN BY FISCAL YEAR

| Fiscal Year | Number of Grants | Total Amount | % of Total Amount |
|--------------------|------------------|--------------------|-------------------|
| FY06 | 59 | \$1,599,031 | 65% |
| FY07 | 27 | \$1,157,397 | 57% |
| FY08 | 27 | \$800,849 | 76% |
| FY09 | 41 | \$913,340 | 61% |
| FY10 | 37 | \$1,020,362 | 83% |
| FY11 | 34 | \$1,051,743 | 55% |
| FY12 | 37 | \$1,571,969 | 67% |
| FY13 | 35 | \$1,325,434 | 56% |
| Grand Total | 297 | \$9,440,124 | 63% |

SECTION 319 FUNDING

In addition to the dedicated capital construction funds described above, ERP also manages federal Clean Water Act “Section 319” grants. The federal Section 319 program is a national program which provides funds for the abatement of nonpoint sources of water pollution. Section 319 projects generally fall into two categories, either outreach, planning and assessment projects or implementation projects. Table 5 lists Section 319 funded projects for Federal Fiscal Year (FFY) 2006-13 within the Lake Champlain basin.

TABLE 5 - SECTION 319 FUNDED NONPOINT SOURCE PROJECTS IN THE LAKE CHAMPLAIN BASIN

Key: Type of Project:

(I): implementation to address nonpoint source pollution problem

(O): Other nonpoint source effort (e.g. outreach, assessment, inventory or planning)

| Project Name | Grantee | Grant Amount | Type of Project |
|--|--------------------|--------------|-----------------|
| *** FFY2006 *** | | | |
| Backroads sediment control demonstration grants | No. VT RC&D | \$18,000 | I |
| Sucker Brook avulsion restoration project - construction | Town of Williston | \$42,419 | I |
| Wilkins Ravine stormwater mitigation project | Town of Morristown | \$25,950 | I |
| Vermont Pasture Network: grazing for clean water (phase 3) | UVM-CSA | \$39,212 | O |
| Castleton & Hubbardton River watershed restoration project: implementation of high priority recommendations | P-M NRCD | \$23,000 | I |
| Trees for Streams expansion in Lamoille River watershed (YR 2) | Lamoille NRCD | \$10,000 | I |
| Not as Easy as Rye: Alternative strategies to increase cover cropping in Vermont | UVM-EXT | \$32,112 | I |
| Gully stabilization & hydrologic restoration for sediment reduction in Allen Brook | Winooski NRCD | \$45,000 | I |
| Reducing stormwater impacts on heavily developed areas: demonstrating rain gardens throughout the City of Winooski | UVM Sea Grant | \$15,000 | I/O |
| Youth-based watershed restoration | VYCC | \$25,000 | I |

| *** FFY2007 *** | | | |
|--|---------------------------------|----------|-----|
| Logging skidder bridge loan & education pilot program | No. VT RC&D | \$40,000 | I/O |
| Storm sewer mapping & illicit discharges detection (phase 1) | City of St Albans | \$17,145 | O |
| Grazing for clean water-management intensive grazing (YR 4) | UVM-CSA | \$30,000 | O |
| Farmer driven approach to increase adoption of nutrient management practices to improve water quality | UVM-EXT | \$25,089 | O |
| Using low impact development strategies in the St Albans area to educate residential, commercial & municipal landowners on lot-level stormwater management | UVM Sea Grant | \$13,765 | I/O |
| Rock River & Saxe Brook sediment abatement demonstration program | Friends of Missisquoi Bay (FMB) | \$40,000 | I |
| Allen Brook watershed restoration & stormwater mitigation | Winooski NRCD | \$49,135 | I |
| Youth-based watershed restoration | VYCC | \$30,000 | I |
| *** FFY2008 *** | | | |
| Detecting & eliminating illicit discharges to waters impaired by indicator bacteria in central VT | Friends of the Winooski River | \$31,257 | O |
| Youth based watershed restoration program | VYCC | \$40,000 | I |
| Implement Lake Carmi phosphorus reduction plan | Franklin Watershed Committee | \$49,100 | I |
| Safe roads & clean water in Goshen | Town of Goshen | \$35,118 | I |
| West Shore Road lakeshore stabilization | Town of Isle LaMotte | \$37,320 | I |
| Rock River/Saxe Brook sediment abatement demonstration/technical assistance program (YR 2) | FMB | \$20,000 | I |
| Missisquoi NPS reduction fieldwork | MRBA | \$18,900 | I |

| *** FFY2009 *** | | | |
|---|--------------------------------|----------|-----|
| Farmer to farmer education: facilitated discussion groups & on-farm workshops to improve pasture management & water quality | UVM-CSA | \$30,832 | O |
| Youth based watershed restoration program | VYCC | \$35,000 | I |
| Rock River/Saxe Brook sediment abatement plus Mill River/Jewett/Rugg/Stevens Brooks | FMB | \$45,000 | I |
| Allen Brook stream buffer & fish habitat restoration project | Town of Williston | \$7,650 | I |
| Trees for Streams | Lamoille NRCD | \$12,700 | I |
| Tri-district cover cropping program | Winooski NRCD | \$25,000 | I |
| A comprehensive approach to addressing agricultural & urban NPS in the Mettowee River watershed | P-M NRCD | \$12,900 | I |
| Phosphorus, E.Coli, & suspended solids reduction from agricultural drainage tile via steel slag filtration | UVM-P+SS | \$20,000 | O |
| Implement Lake Carmi P reduction plan (YR 2) | FWC | \$45,000 | I |
| *** FFY2010 *** | | | |
| Reducing WQ impacts from rural town roads: workshop series & implementation | NRPC | \$27,900 | I/O |
| Simple phosphorus mitigation projects for small farms | VACD | \$31,454 | I |
| Urban tree canopy projects | City of St Albans & Burlington | \$31,193 | I |
| Trees for Lamoille River drainage streams | Lamoille NRCD | \$10,000 | I |
| Sediment abatement in Rock River/Saxe Brook & St Albans Bay tributaries | FMB | \$42,500 | I |
| Tri-district conservation tillage demonstration program | Winooski NRCD | \$25,000 | I |
| Implement Lake Carmi phosphorus reduction plan (YR 3) | FWC | \$25,000 | I |

| *** FFY2011 *** | | | |
|---|-------------------------------|----------|-----|
| Implementation of the Lake Carmi phosphorus reduction plan (YR 4) | FWC | \$35,000 | I |
| Grazing education for farmers: innovations & classic practices | UVM-CSA | \$31,000 | O |
| Stormwater disconnection in the City of Rutland | Rutland NRCD | \$12,000 | I/O |
| Trees for Streams—expansion | Lamoille NRCD | \$10,800 | I |
| Accelerating adoption of conservation tillage in the northern Lake Champlain basin | UVM-EXT | \$38,741 | I |
| Effectiveness of low-cost/low-tech practices for stormwater in Englesby Brook watershed | Winooski NRCD | \$27,993 | I |
| Reducing WQ impacts from our local roads: workshop series & implementation (YR 2) | Northwest RPC | \$27,200 | O |
| Simple phosphorus mitigation projects for small farms (YR 2) | VACD | \$12,463 | I |
| Phosphorus/sediment reduction in Rock/Saxe (YR 5) & St Albans Bay watershed (YR 3) | Friends of No. Lake Champlain | \$35,321 | I |
| *** FFY2012 & 2013 *** | | | |
| No NPS projects undertaken as DEC did not make available 319 grant funding due to federal budget cuts to this program | n/a | n/a | n/a |

SECTION 604B FUNDING

ERP also manages the State's Clean Water Act Section 604(b) water quality planning grants. ERP makes approximately \$40,000 available annually to regional planning commissions for water quality planning purposes. In 2012, ERP established a process to guide the use of those funds to support planning needs as part of tactical basin plan development. Each year, the grant application identifies eligible planning-related activities to support the three general phases of tactical basin plan development: (1) monitoring and assessment, (2) plan development, and (3) implementation. ERP will continue to link 604(b) grants with tactical basin planning to support a greater targeting of available funds to address priority water quality needs. Appendix D provides a summary of the projects that received 604b grants for FFY 2013.

WATERSHED GRANT FUND (CONSERVATION LICENSE PLATES)

The Vermont Fish and Wildlife Department (FWD) manages the Watershed Grant Fund that is supported by the sale of Vermont's conservation license plates (sales also support the FWD's Nongame Wildlife Fund). The Watershed Grant Fund provides small grants (under \$15,000) to towns, local groups, and regional organizations to implement watershed projects.

CHAPTER 2 - STATUS OF EPA'S DEVELOPMENT OF PHOSPHORUS ALLOCATIONS

The process of developing a new Lake Champlain Phosphorus TMDL for Vermont began when EPA issued its January 24, 2011 disapproval letter for the Vermont portion of the 2002 TMDL in response to a lawsuit filed by Conservation Law Foundation. In reaching its decision, EPA concluded that two legally contested elements of the TMDL were not consistent with federal regulation and guidance. The two reasons cited by EPA for its disapproval were that the TMDL did not provide an: (1) adequate margin of safety and (2) sufficient reasonable assurances that the necessary nonpoint source load reductions would be achieved.

In addition to addressing these legal inadequacies in the TMDL, EPA determined that, once reopened, all aspects of the Vermont TMDL should be reviewed and updated in light of new data, research, and policy considerations. Consequently, EPA has invested significant time and resources in developing new lake and watershed models for Lake Champlain for use in setting new total loading capacities, developing new wasteload and load allocations, evaluating phosphorus load reductions possible from watershed management practices, and considering climate change impacts.

Lake and tributary monitoring data used for the lake model indicated that the current (2001-2010 average) phosphorus load to Lake Champlain from Vermont is 631 metric tons per year (mt/yr). Application of the lake model suggests that the total loading capacity from Vermont is about 418 mt/yr. A net lakewide load reduction of 213 mt/yr is needed from Vermont sources, representing an overall 34% reduction when a 5% margin of safety is provided. However, in order to achieve water quality standards throughout the entire lake, the individual Vermont lake segment total loading capacities must be achieved in each case. The twelve Vermont lake segment watershed phosphorus load reduction targets shown in Table 6 are preliminary results that may still be revised by EPA in the final TMDL.

The percent load reductions required range between 12-64% among the lake segment watersheds (Table 6). In order to assess the potential load reductions obtainable from an enhanced set of watershed management practices, EPA applied a Lake Champlain Scenario Tool (Scenario Tool). The results of this analysis indicated that the percent load reductions achievable from the practices simulated were sufficient to achieve the example TMDL targets in Table 6 in all lake segments except Missisquoi Bay. Enhanced efforts will be required in the Missisquoi Bay watershed.

The preliminary results illustrated in Table 6 demonstrate that achieving the necessary load reductions will present an enormous management challenge. This Phase 1 Plan has been developed with an understanding of the magnitude of the effort needed. Once the basin-specific wasteload and load allocations are finalized by EPA, Vermont will issue Phase 2 basin-specific plans that will further refine Vermont's policy commitments and implementation strategy for all contributing sectors in each lake segment.

Table 6 - PERCENT LOAD REDUCTIONS NEEDED TO MEET TMDL ALLOCATIONS (EPA PRELIMINARY RESULTS)

| Lake Segment | Total | | CSO | Developed | | Forest | Streams | Agriculture |
|--------------------|--------------|-------------------------|--------------|-------------------|--------------|--------------|--------------|-------------|
| | Overall | Wastewater ¹ | | Land ² | | | | |
| 1. South Lake B | 43.4% | 0.0% | | 23.2% | 60.0% | 30.5% | 60.7% | |
| 2. South Lake A | 52.7% | 0.0% | | 20.9% | 5.0% | | 60.2% | |
| 3. Port Henry | 15.8% | | | 10.6% | 5.0% | | 21.1% | |
| 4. Otter Creek | 24.7% | 0.0% | | 19.8% | 5.0% | 40.1% | 47.9% | |
| 5. Main Lake | 21.3% | 61.1% | | 19.7% | 5.0% | 28.9% | 49.1% | |
| 6. Shelburne Bay | 12.5% | 64.1% | | 12.9% | 5.0% | 55.0% | 22.2% | |
| 7. Burlington Bay | 30.5% | 66.7% | 10.0% | 10.7% | 0.0% | | 0.0% | |
| 8. Malletts Bay | 17.6% | 0.2% | | 22.4% | 5.0% | 44.9% | 27.6% | |
| 9. Northeast Arm | 13.0% | | | 8.6% | 5.0% | | 22.0% | |
| 10. St. Albans Bay | 24.3% | 59.4% | | 7.9% | 5.0% | 55.0% | 35.4% | |
| 11. Missisquoi Bay | 64.3% | 51.9% | | 28.1% | 60.0% | 65.3% | 82.6% | |
| 12. Isle LaMotte | 12.4% | 0.0% | | 10.0% | 5.0% | | 22.3% | |
| TOTAL | 33.8% | 42.1% | 10.0% | 20.7% | 23.4% | 43.4% | 52.8% | |

¹Percent change from current permitted loads

² Includes reductions needed to offset future growth

CHAPTER 3 - STRATEGY TO ADDRESS POINT SOURCE POLLUTION

A. INTRODUCTION

As provided by the federal Clean Water Act, a TMDL is a “pollution budget” that describes the amount of pollution a water body can tolerate and still maintain water quality standards. In order to provide reasonable assurances that nonpoint sources will be adequately controlled during TMDL implementation, one must know which phosphorus sources are considered nonpoint sources and which are not. This issue is not always straightforward during TMDL development. For purposes of this Plan, Vermont has made certain assumptions as to which sources are point sources and which are nonpoint sources. The nonpoint sources are subject to reasonable assurances and are addressed in Vermont’s policy commitments in Chapter 5. The point source assumptions are discussed below.

In most TMDLs, EPA considers point source discharges to include all discharges that require permits under the National Pollutant Discharge and Elimination System (NPDES). All other discharges are considered nonpoint sources subject to the reasonable assurances requirement. Vermont is assuming that the following NPDES permitted discharges will be subject to the wasteload allocation in the new TMDL:

- Wastewater treatment discharges subject to NPDES permits;
- Urban stormwater runoff discharges subject to the MS4 NPDES permit;
- Construction site discharges subject to NPDES stormwater permits;
- Industrial stormwater discharges subject to the NPDES “multi-sector” permit;
- Discharges subject to NPDES permits issued pursuant to the federal Clean Water Act’s “residual designation authority” provision; and
- Stormwater discharges from farms covered by a NPDES CAFO permit.

Since the regulatory programs that cover these sources are part of TMDL implementation planning, this Chapter includes a brief discussion of each program.

B. WASTEWATER TREATMENT FACILITIES (WWTFs)

This Plan does not allocate any additional phosphorus reductions to wastewater treatment plants in the Lake Champlain basin. The load associated with these plants is small, approximately three percent of the total load from Vermont. Further, Vermont's communities and businesses have made substantial progress in reducing phosphorus from these plants over the past four decades and it is increasingly difficult to justify further investments in reducing phosphorus from these sources given the relatively high cost of installing additional phosphorus removal. With optimization of operations to maximize phosphorus removal, these plants should remain a minor source of phosphorus pollution for many years to come without any major new capital investments.

We recognize that for EPA to justify approving a TMDL that does not allocate any additional load reduction to wastewater treatment plants, the State must demonstrate that it will reduce phosphorus loads from other sources sufficient for Lake Champlain to meet water quality standards. This Plan includes a broad array of actions sufficient to meet the "reasonable assurances" standard that EPA must apply under the Clean Water Act.

The EPA indicated in a May 8, 2014 letter that it is highly unlikely that the final TMDL would allocate no reductions to wastewater treatment plants in any of the lake segments. If the EPA determines that additional reductions in permitted wastewater loads are required for the TMDL, then the following considerations should apply.

- Any further reductions in wastewater allocations should be targeted only to facilities in those lake segment watersheds where the currently permitted wastewater load represents a higher proportion of the total phosphorus load from all Vermont sources, and where wastewater upgrades would meaningfully reduce the phosphorus reduction burden placed on non-wastewater sources.
- TMDL-based discharge permit limits should be defined as annual average phosphorus loading rates, rather than as concentration limits, in order to allow operational flexibility in attaining the limits.
- New permit requirements should be implemented through compliance schedules that allow sufficient time for planning, budgeting, and engineering, and that take advantage of cost-efficient opportunities to couple phosphorus upgrades with other planned facility construction projects.
- Other forms of flexibility should be available to achieve the wasteload allocations in an optimally cost-effective manner. For example, trades between wastewater treatment facilities within the same lake segment watershed should be allowed, subject to approval by DEC in the discharge permits for those facilities, provided that the aggregate wasteload allocation for that lake segment is not exceeded. Integrated watershed plans and permits that optimally balance phosphorus reduction requirements for wastewater and stormwater discharges in order to achieve the overall wasteload allocation for the watershed should also be possible for urbanized areas, consistent with EPA guidance.

Upon approval of the TMDL, the DEC Wastewater Management Program will begin reissuing National Pollutant Discharge Elimination System (NPDES) permits for the 59 direct discharge facilities in the Lake Champlain watershed on a five year rotation. Each permit will be developed

and issued in synchronization with the DEC Monitoring, Assessment, and Planning Program (MAPP) tactical basin planning cycle. This will ensure that permits are developed using the most up-to-date monitoring and scientific information available.

| LAKE CHAMPLAIN NPDES PERMIT ISSUANCE SCHEDULE | | | | |
|---|------------------|------------|----------------------|---------------------|
| 2016 | 2017 | 2018 | 2019 | 2020 |
| Alburgh | Enosburg Falls | Benson | Barre | Brandon |
| Burlington - Main | Fairfax | Fair Haven | Burlington Electric | Middlebury |
| Ed Weed F.C.S. | Hardwick | Orwell | Burlington – North | Otter Valley U.H.S. |
| Hinesburg | Jeffersonville | Pawlet | Burlington – River | Pittsford |
| NWCF | Johnson | Poultney | Cabot | Pittsford F.C.S. |
| Shelburne Plant #1 | Milton | | Essex Jct. | Proctor |
| Shelburne Plant #2 | Morrisville | | IBM* | Rutland |
| South Burlington - BB | Newport Center | | Marshfield | Salisbury F.C.S. |
| St. Albans | North Troy | | Montpelier | Shoreham |
| | PBM Nutritionals | | Northfield | Vergennes |
| | Richford | | Plainfield | Wallingford F.D. |
| | RockTenn Co. | | Richmond | West Rutland |
| | Sheldon Springs | | South Burlington –AP | |
| | Swanton | | Stowe | |
| | Troy/Jay | | Waterbury | |
| | | | Williamstown | |
| | | | Winooski | |

* The IBM permit was reissued in 2015 in order to facilitate the impending sale of the facility to Global Foundries. The reissued permit contained a reopener clause allowing it to be modified in 2019 in order to implement the requirements of the TMDL following completion of the Tactical Basin Plan for the Winooski River.

C. URBAN STORMWATER - MS4S

There are currently 12 communities and 3 non-traditional entities designated as “municipal separate storm sewer systems” (MS4s) in the entire basin that drains to the Lake. Under the MS4 permitting program, permittees must develop a stormwater management program that includes six Minimum Control Measures (MCMs) designed to reduce the potential for pollutants to enter the MS4 system and discharge to surface waters. The MCMs include public education and outreach, public participation/involvement, illicit discharge detection and elimination, construction site runoff control, post-construction runoff control, and pollution prevention/good housekeeping. The regulated MS4s submit annual reports detailing their progress on MCM implementation.

In addition, 14 of the 15 regulated MS4s discharge to stormwater impaired waters and are required to develop Flow Restoration Plans to implement the stormwater TMDLs. The extensive deployment of stormwater-management infrastructure associated with this requirement will contribute substantially to phosphorus reduction in Lake Champlain. Further, regulated MS4

municipalities are required to track phosphorus reductions associated with the deployment of BMPs.

D. NPDES CONSTRUCTION STORMWATER DISCHARGES

The construction stormwater permit program addresses stormwater runoff from earth disturbance activity of one or more acres of land, and is a requirement of the federal Clean Water Act. In general, compliance with the construction stormwater permit requires the development of an erosion prevention and sediment control plan. The goal of the plan is to minimize the erosion of disturbed land and to minimize or eliminate the discharge of sediment (which carries phosphorus) to waters of the State through the implementation of appropriate erosion prevention and sediment control measures. There are currently approximately 800 active state construction stormwater permits.

E. STORMWATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITIES

The Multi-Sector General Permit (MSGP) 3-9003 addresses stormwater runoff associated with industrial facilities. A facility must obtain coverage under the MSGP if it falls within a Standard Industrial Classification (SIC) code listed in Table D-1 of the permit. All regulated activities are required to implement BMPs such as good housekeeping, erosion prevention, and minimizing exposure; all of which serve to reduce potential pollutant discharges. Facilities manufacturing agricultural chemicals are required to monitor specifically for phosphorus in their stormwater discharges. If monitoring results are above the level set in the permit, the facilities must modify their plans to reduce the phosphorus discharge.

F. RESIDUAL DESIGNATION AUTHORITY DISCHARGES

In 2009, the Department issued a NPDES general permit for stormwater “residually designated discharges” (RDA) pursuant to the authority of the federal Clean Water Act. The RDA General Permit 3-9030 covered certain designated discharges not covered by the MS4 permit in five of the urban stormwater-impaired streams in Chittenden County. Properties were designated if their impervious surface discharged directly to a stormwater impaired stream. Designated properties were divided into three categories. Fifty-three properties without a previously issued state stormwater permit and less than one acre of impervious surface were directed to implement the Small Sites Guide which includes good housekeeping and low impact design practices. Five properties without a previously issued state stormwater permit and more than one acre of impervious had to complete a site assessment, gathering information on current site conditions to be used in the development of the flow restoration plans (FRPs). Twenty sites with previously issued state stormwater permits were required to conduct an Engineering Feasibility Analysis (EFA) to upgrade their existing stormwater treatment practices. The EFA directs property

owners to infiltrate or detain the 1-year design storm, which will provide phosphorus reductions as well as benefiting flows. DEC plans on expanding the RDA permit to the remaining urban stormwater impaired waters in the near future in order to assist in the implementation of the TMDL for Lake Champlain.

G. CONCENTRATED ANIMAL FEEDING OPERATION DISCHARGES

The Vermont statewide concentrated animal feeding operation (CAFO) general permit was issued in June 2013. While the permit is not phosphorus-specific, any farm that discharges pollutants to a surface water body can be required to obtain a permit. The CAFO general permit is for medium farms, but an individual permit can be required for a small or large farm.

The CAFO permit requires farms to properly design, construct, operate, and maintain production areas to control waste and to develop and implement a nutrient management plan, which is available to the public. The permit prohibits a discharge of manure, litter, or wastewater, except when direct precipitation equivalent to or greater than a 25-year, 24-hour storm event causes a discharge.

CHAPTER 4 - CURRENT PROGRAM CAPACITY TO ADDRESS NONPOINT SOURCES

A. INTRODUCTION

Controlling nonpoint source pollution is the key element in reducing phosphorus loads to the Lake and meeting water quality standards. The control of nonpoint source pollution presents a major challenge both in the Lake Champlain basin and nationwide. This is due to the diffuse nature of nonpoint source contributions, which originate from runoff from buildings and parking lots, farm fields, forests, back roads, and stream erosion. These sources can be difficult to identify, quantify and control.

In working to control phosphorus pollution, Vermont has invested heavily in programs to enhance the natural stability of streams and rivers, improve management of Vermont's network of parking lots and roads, protect and restore wetlands, limit polluted runoff from construction sites, implement soil-based conservation practices such as cover cropping, and provide technical and financial assistance to farmers to prevent discharges from barnyards and fields. Despite the magnitude of these efforts, further pollution reductions are needed.

In response to EPA's request for further action, ANR, AAFM, and other state and local partners have spent considerable time evaluating existing state and local "program capacity" to control phosphorus. "Program capacity" is the current legal, regulatory, programmatic, financial, staffing and technical capacity available to meet the TMDL target goals. This evaluation, which included significant stakeholder and public input, was necessary to ensure that future efforts are focused on the highest priority sources in the most cost-effective manner possible. This evaluation also served to identify enhancements needed in existing programs and new programs needed to protect the Lake.

The major categories of policy tools used to implement the TMDL include:

- Regulatory requirements: providing specific legally required steps that must be taken to control pollution and reduce impacts, including permitting programs;
- Financial incentives: linking funding eligibility to specific actions or using subsidies to control pollution and reduce impacts;
- Technical assistance: sharing technical information with state, local and private partners regarding the water quality impacts of their current or planned actions, and suggesting techniques to reduce impacts;
- Monitoring, Assessment and Planning: monitoring and assessing the status of surface waters to ensure that implementation efforts are planned, targeted and funded to ensure the best use of available monies with the highest rate of success.
- Funding: targeting funding efforts geographically, and setting priorities for which practices should be implemented first in order to achieve the greatest benefit at the lowest cost.

- **Education and outreach:** sharing information with stakeholders and the general public in order to create a broad-based understanding of nonpoint source pollution and to foster needed behavior changes.

ANR currently administers a combination of these tools as the foundation upon which TMDL implementation is built. In addition, ANR coordinates with AAFM to ensure regulatory, and technical and financial assistance programs are available to the agricultural community, and with VTrans to ensure water quality controls are provided in road construction and maintenance activities. ANR, AAFM and VTrans also work closely with federal, state and local partners to promote regulatory and voluntary programs to ensure implementation, and to seek necessary funding.

This Chapter describes the most significant existing policy tools to reduce the major sectors of nonpoint pollution -- developed lands and roadways; agriculture, forests, wetland alterations, and stream erosion. The WSMD's Vermont Surface Water Management Strategy describes in much greater detail the full range of current programs for reducing both point and nonpoint sources of surface water pollution in Vermont. The Strategy is available on-line at <http://www.watershedmanagement.vt.gov/swms.html>.

B. DEVELOPED LANDS - STORMWATER

Developed land involves the construction of buildings, roads, parking areas and other impervious surfaces that reduce the infiltration of stormwater and speed the delivery and quantity of runoff into surface waters. The vast majority of existing developed land is not regulated under federal/state stormwater permits, does not manage or treat stormwater, and yet is responsible for significant water quality impacts.

Based on the modeling efforts to date, phosphorus loading from developed areas comprises approximately 13.8% of the total phosphorus contribution to the Lake. When compared to the agricultural sector land use, developed lands contribute a relatively minor portion of phosphorus loading. However, on an acre-for-acre basis, developed land areas generate a disproportionate share of the phosphorus load to the Lake. Hence, numerous statewide and targeted management programs are in place for nonpoint source runoff from developed lands as described below.

OPERATIONAL STORMWATER PERMITS

DEC's Stormwater Program issues separate permits for runoff from impervious surfaces, construction sites and industrial facilities. All new projects, redevelopment projects and expansion projects are evaluated to determine whether coverage under a state stormwater permit and/or a construction permit is needed in order to comply with state law and the federal Clean Water Act. Also, if a new project is industrial in nature or is an existing industrial facility, then it may also need to seek coverage under a Multi-Sector General Permit. Many projects require both a state stormwater permit and a construction permit; some projects may require all three permits.

DEC has issued operational permits under state authority since the late 1970s, with the scope of the permit program expanding substantially over time. Program technical standards were updated in 1980, 1987, 1997, and 2002. The jurisdictional threshold has also been revised over time, and since 2005 it has been set at one acre of impervious cover. Projects requiring permit coverage must design a management system in compliance with the Vermont Stormwater Management Manual (VSMM) standards developed by the Center for Watershed Protection. DEC is currently in a stakeholder process to update the VSMM with a goal of increasing the application of Low Impact Development (LID) practices.

The construction stormwater permit was originally issued in 1997 and was applied to sites with a minimum of five acres of disturbance. In 2006, the permit was reissued to be applied to sites with one acre of disturbance. The Multi-Sector General Permit was originally issued in 2006.

State Stormwater Permit Program (a.k.a. operational or post-construction)

This DEC permit program regulates discharges (runoff) from impervious surfaces (i.e. rooftops, paved/gravel roads, etc.). The Stormwater Permit Program has specific jurisdictional thresholds based on the amount of impervious surface, per the Stormwater Management Rules (Stormwater Management Rule for Non-Stormwater Impaired Waters and Stormwater Management Rule for Stormwater Impaired Waters). In general, projects creating more than one acre of new impervious surface, or projects that expand existing impervious surfaces where the total resulting impervious surface is greater than one acre require permit coverage. Projects requiring permit coverage must apply for coverage under General Permit 3-9015, unless the project is located within a watershed impaired for stormwater, in which case individual permit coverage is required.

Projects that require permit coverage must implement a stormwater management system designed in compliance with the Vermont Stormwater Management Manual (VSMM). The VSMM was developed by the Center for Watershed Protection, and includes sizing criteria to meet water quality, groundwater recharge, channel protection, overbank flood protection and extreme flood control. Table 7 is taken from the VSMM which gives reasonable estimates of phosphorus and other removal efficiencies for the general groups of accepted practices allowed under the permit.

TABLE 7 - POLLUTANT REMOVAL MATRIX FROM THE VERMONT STORMWATER MANAGEMENT MANUAL

| Practice | TSS [%] | TP [%] | TN [%] | Metals ¹ [%] | Bacteria [%] | Hydrocarbons [%] |
|--|-----------------|--------|-----------------|-------------------------|-----------------|------------------|
| Wet Ponds | 80 | 51 | 33 | 62 | 70 | 81 ² |
| Stormwater Wetlands | 76 | 49 | 30 | 42 | 78 ² | 85 ² |
| Filtering Practices | 86 | 59 | 38 | 69 | 37 ² | 84 ² |
| Infiltration Practices ³ | 95 ² | 80 | 51 | 99 ² | N/A | N/A |
| Open Channels ⁴ | 81 | 34 | 84 ² | 70 | N/A | 62 ² |
| Quantity Control Ponds ^{2, 5} | 3 | 19 | 5 | 7.5 | 78 | N/A |

1. Average of zinc and copper. Only zinc for infiltration
 2. Based on fewer than five data points (i.e., independent monitoring studies)
 3. Includes porous pavement, which is not on the list of approved practices for Vermont. At this time, there are no known field studies that have measured sediment removal in infiltration trenches. However, it can logically be presumed that a properly operating infiltration trench will remove nearly 100% of the TSS load associated with the design treatment volume.
 4. Higher removal rates for dry swales.
 5. Quantity control ponds (a.k.a. dry detention basins or vaults) do not meet the WQ_v requirement and must be used in conjunction with acceptable water quality STPs.
 N/A: Data not available
 Removals represent median values from R. Winer (2000) National Pollutant Removal Performance Database for Stormwater Treatment Practices, version 2.

Stormwater Impairments in Vermont's Urban Areas

Twelve of Vermont's waters are listed as impaired due to urban stormwater runoff. These waters fail to meet the Vermont Water Quality Standards. The Department has issued EPA-approved stormwater TMDLs that use long-term flow duration curves as the TMDL targets. The use of flow duration curves has the primary benefit of addressing the physical impacts to the stream channel caused by stormwater runoff such as sediment release from channel erosion and scour from increased flows. DEC has issued EPA-approved hydrologic TMDLs for the twelve urban stormwater impaired watersheds. Remediation of the twelve urban stormwater-impaired waters has commenced through a combination of an enhanced MS4 permit and an RDA permit for impervious surfaces within the impaired watersheds. Under the MS4 permit, permittees must develop a Flow Restoration Plan for any stormwater impaired water to which they discharge. A computer-based best management practice decision support system (BMPDSS) was developed by TetraTech and is being used by VTDEC to help the MS4 communities to identify different BMP options and associated costs. As part of the BMPDSS tool, MS4s can estimate the amount of phosphorus reduced from the BMP options selected.

Stormwater Impairments and Water Quality Remediation Plans

Five mountain watersheds associated with ski area development are listed on the 2012 303(d) List as impaired primarily due to stormwater runoff. One of these watersheds is within the Lake Champlain basin. These mountain watersheds differ substantially from other stormwater impaired areas which are more urbanized “lowland” watersheds in terms of density of development, geographic position, hydrology, impairment source, and land ownership. Based on these factors, DEC is using a non-TMDL approach to remediation, whereby it is working with responsible parties in developing watershed-specific Water Quality Remediation Plans (WQRPs). The watersheds in the Lake Champlain basin cover approximately 1117 acres and will ultimately receive extensive stormwater retrofits in order to alleviate local stream impairments. Implementation of these retrofits to existing impervious areas as well as high erosion areas should result in significant phosphorus reductions.

ILLICIT DISCHARGE DETECTION AND ELIMINATION

In 2000, the Vermont Legislature required DEC to implement a statewide program to promote detection and elimination of improper or illegal connections and discharges. (Sec. 3. 10 V.S.A. § 1264 (b)(9)). Illicit discharges are discharges of wastewater or industrial process water into a stormwater-only drainage system. The Legislature's intent was to expand illicit discharge detection and elimination (IDDE) efforts from the communities—all in the greater Burlington area—required to perform IDDE in compliance with the EPA’s Phase 2 Stormwater Rule to encompass all developed areas of the Vermont. Following the Legislature's mandate, DEC has assisted municipalities not subject to the Phase 2 Stormwater Rule by mapping drainage systems and performing IDDE. This work, funded through ERP water quality grants, federal Section 319 and Lake Champlain Basin Program grants, has been completed for all major municipalities in the Missisquoi, Lamoille and Winooski River Basins (outside the greater Burlington area), the three largest Connecticut River Basin towns and is ongoing in the Otter Creek River Basin.

About twenty-five communities have had GIS drainage maps completed. Stone Environmental, Inc. in conjunction with several watershed associations (Friends of the Winooski River, Friends of the Mad River) has conducted IDDE surveys in thirteen non-designated MS4 communities, ten of which overlap the state mapping effort. Stone identified 497 discharge points, 237 of which were flowing when inspected. A wastewater source was indicated at 28 discharge points. Other types of contamination included petroleum (11 locations), treated drinking water (13 locations), heated water, and road salt. By combining drainage mapping, environmental investigative work, and municipal cooperation, DEC and Stone eliminated seven wastewater discharges, decreasing phosphorus by an estimated 154 kg per year to Lake Champlain and reducing the risk of pathogen exposure.

GREEN STORMWATER INFRASTRUCTURE

Since 2009, DEC has played a critical role in coordination of Vermont's Green Infrastructure Initiative, a statewide effort that seeks to increase the adoption of low impact development (LID) principles and implementation of green stormwater infrastructure (GSI) practices. The Initiative works to implement strategies identified within the GI Strategic Plan, which was developed by the Green Infrastructure Roundtable, an ad hoc group of individuals from the public and private sector who come together on a quarterly basis. The Plan targets four key audiences: design professionals, municipalities, property owners and state agencies.

The Strategic Plan was followed by the signing of Executive Order 06-12 (EO) in March of 2012. The EO further defines the role of State Agencies and calls for the creation of an Interagency Green Infrastructure Council which includes the secretaries of the agencies of Natural Resources, Transportation, Commerce and Community Development, and the Commissioner of Buildings and General Services or their designees. The Council is tasked with identifying opportunities for integration of GSI practices in existing programs, initiating a process for developing GSI technical guidance, establishing a plan for implementing GSI on state properties and projects, identifying agency liaisons, identifying and undertaking GSI research and monitoring, and identifying sustainable funding sources. Members of the Council are also tasked with developing a GSI Implementation Work Plan for their respective Agency/Department. Work plans were completed on July 1, 2013 and lay out opportunities and strategies for moving the GSI initiative forward over the course of the next year. The EO is in effect for five years.

C. DEVELOPED LANDS - TRANSPORTATION

A major sub-sector of the Developed Lands sector consists of state and local highways and roads which contribute significant amounts of phosphorus laden runoff to the Lake. There are over 14,000 miles of public roads in Vermont, nearly all of which require ditches and culverts for drainage. Approximately 80% of these road miles are maintained by Vermont municipalities; three quarters of these municipal roads need erosion control improvements. Two thirds of these roads are unpaved gravel or unimproved roads, and nearly all require ditches and culverts for water drainage. If these structures are not properly constructed and maintained, there is significant potential for erosion of sediment carrying phosphorus into the drainage network and adjoining streams and eventually into the Lake. Water quality improvement and protection has become a major focus in recent years as it relates to the roads network generally and to BMP implementation and project development specifically. Programs of note include:

TITLE 19

VTrans regulates "drain on" activities into the State right-of-way, within its authority under Title 19, and requires proposed dischargers to the right-of-way treat stormwater prior to discharging into the right-of-way. Furthermore, VTrans prohibits the illegal connection or illicit (non-stormwater) discharge to its right-of-way statewide.

VERMONT TRANSPORTATION ROAD AND BRIDGE STANDARDS

The Federal Emergency Management Agency (FEMA) adopted a policy in 1999 that describes municipalities' eligibility for FEMA benefits following federally declared natural disasters. Prior to federally declared disaster declarations (which make available Public Assistance funds for public infrastructure repairs), municipalities are to adopt road infrastructure "codes and standards" (referred to as "Road and Bridge Standards" or "Codes and Standards"). These municipal codes and standards apply to road and stream crossing upgrades and other infrastructure that are not governed by state or federal standards. FEMA provides Public Assistance funding to support rebuilding to those standards.

In 2010, the Vermont Legislature passed Act 110 which modified 19 V.S.A. §309b to establish an incentive program to encourage municipal adoption of codes and standards. That incentive involves increasing state cost share of two grant programs – the Town Highway Class 2 Roadway and Town Highway Structures grant programs. FEMA also required a change to the VTrans' codes and standards template, prohibiting municipalities from modifying its codes and standards for fiscal reasons.

Following a series of federally declared flood disasters in 2008, a number of towns pursuing FEMA Public Assistance reimbursements could not produce copies of their adopted codes and standards. Thus the Act also required municipalities to file an annual certificate of compliance with their codes and standards.

Act 110 also required VTrans to revise its Road and Bridge Standards template to include a suite of practical and cost-effective best management practices (BMPs) to better control road-related stormwater runoff. Those practices address construction, maintenance, and repair of municipal road network. VTrans is to review and revise the standards, as appropriate, every four years to ensure that they are protective of water quality, and the Secretary of the Agency of Natural Resources is to approve all revisions.

Following the recovery from Tropical Storm Irene, the State of Vermont added another incentive to encourage municipalities to adopt the VTrans Road and Bridge Standards. The State modified its policy for managing the State's Emergency Relief and Assistance Fund (ERAF). The new standard, effective for any disaster after October 23, 2014, is structured to encourage municipalities to take four basic steps to prepare their communities before the next disaster; one of those steps involves adopting the most recent VTrans Road and Bridge Standards. Following a federally declared flood disaster, FEMA requires a 25% local match for public assistance funding. Municipalities that do not adopt the four basic steps including adoption of Road and Bridge Standards receive a reduced amount of state aid to cover the local match (7.5% of the repair costs). Municipalities that adopt the steps receive state aid to cover half of the local match (12.5% of the repair costs). Municipalities that adopt the basic steps and the state model floodplain and river corridor protection bylaws receive a large share of state aid (17.5% of the repair costs).

VERMONT BETTER BACK ROADS PROGRAM

Established in 1997, the Vermont Better Back Roads Program provides grants and technical assistance to towns to correct erosion problems and adopt road maintenance practices that protect water quality while reducing long-term highway maintenance costs. Better Backroads financial and technical assistance demonstrates to towns that the proper fixes and maintenance practices are cost-effective. A long-term goal for the Better Backroads Program is to enable and encourage towns to practice best management practices in road maintenance and repairs and institutionalize these practices into town capital budget priorities.

The Vermont Better Back Roads Program is a partnership with the Vermont Local Roads Program, VTrans and ANR. The program is administered by VTrans. After receiving a grant, most towns adopt the recommended practices for future road maintenance work, therefore, the grants leverage improved maintenance practices that both reduce pollution and save towns money. The Better Backroads Program offers improved infrastructure and maintenance practices for eroding ditches, unstable culvert inlets or outlets and eroding roadside banks which can also help prevent flash flood damage during heavy rain events. Grants are provided for two general categories of projects: developing a town-wide inventory of erosion control needs and a capital budget plan to address these needs; and correcting existing erosion control problems.

VTRANS FINANCIAL ASSISTANCE

Over the past decade, VTrans has made significant financial investments to ensure that state highways comply with water quality regulations and to assist municipalities in doing the same for local roads. Examples include:

Municipal Town Highway (TH) Grants

VTrans administers and provides grants to municipalities under the TH Structures, Class 2 Roadway, and TH Emergency Fund appropriations. A significant amount of this funding is tied either directly or indirectly to stormwater related activities. By adopting TH Road and Bridge Standards, municipalities will receive an additional 10% match in funding for the Structures and Class 2 Roadway grants. These Standards include stormwater best management practices directly tied to improving water quality

Town Highway Aid

VTrans administers and provides annual appropriation for State aid to municipalities based on their number of miles of Class 1, 2, and 3 town highways. These funds must be used solely for town highway construction, improvement, and maintenance purposes, following their adopted Town Road and Bridge Standards. A portion of these funds are directly tied to stormwater treatment.

Transportation Alternatives Program

VTrans administers this federally funded program for non-traditional transportation-related projects. One eligible activity under this program involves environmental mitigation of stormwater runoff.

FEMA Public Assistance Program

VTrans administers and provides grants to eligible applicants/owners of publicly-owned facilities who suffered damage during a federally declared disaster (primarily municipal roads/bridges not on federal-aid highways). The vast majority of these grants involve repairs, improvements, and mitigation activities associated with stormwater. FEMA funds 75% and the State & applicant split 25%.

FHWA SAFETEA-LU

VTrans administered the federal Municipal Highway Stormwater Mitigation Grant Program directing funds to municipalities over the past 5 years allowing the implementation of \$5.4 million worth of highway stormwater mitigation, with roughly 50% spent in Chittenden County and 50% spent elsewhere.

D. AGRICULTURE

As estimated by the previously discussed modelling efforts, agricultural nonpoint sources of phosphorus account for approximately 40% of the overall phosphorus load delivered to the Lake from Vermont. Therefore, management efforts in this sector have the potential to contribute to significant reductions.

In Vermont, a strong agriculture conservation partnership exists between state and federal agencies, as well as the non-profit sector that provides non-regulatory outreach and education to the farming community. These partners include USDA/Natural Resources Conservation Service, the University of Vermont Extension System, the VT Association of Conservation Districts, and other non-governmental groups and watershed organizations.

An advisory group was added to this statewide conservation partnership in 2013, with the creation of the Ag Workgroup. The Ag Workgroup members were mostly farmers, with the balance being technical service providers who work directly with farmers. This group provided extensive assistance to the Agency of Agriculture, Food and Markets (AAFM) and DEC in the development of the proposed revisions in the TMDL and stands as an ongoing advisory group to the Agencies.

The major agricultural programs described below include regulatory, technical assistance and funding measures to assist in phosphorus reduction efforts.

REGULATORY PROGRAMS

The Agency of Agriculture, Food and Markets (AAFM) administers a combination of regulatory and voluntary programs, with the goal of protecting water resources and helping Vermont's farming community maintain financial viability. This includes ensuring that farms meet or exceed the standards established by the federal water quality regulations (Clean Water Act) while providing the financial and technical tools in order to do so. The AAFM regulatory programs are set up in a three-tiered structure that is designed to provide a logical progression in regulatory oversight as a farm may increase in size.

Accepted Agricultural Practices

Act 64 requires significant changes to Vermont's Accepted Agricultural Practices, including a name change to "Required Agricultural Practices" or "RAPs," thereby reflecting the fact that these practices are not and never have been optional.

The Vermont Accepted Agricultural Practice Rule (AAPs) requires that all farms in the state, regardless of size and type of operation, adopt and implement a set of minimum conservation practices to protect water quality. These rules were developed in 1995 and updated in 2006. The AAPs were designed to reduce non-point pollutant discharges through implementation of improved farming techniques rather than investments in structures and equipment, however the AAPs do not allow for any discharge from the farm and remediations may be of a high cost. State law requires that these improvements must be practical as well as cost effective for farmers to implement, as determined by the Secretary of Agriculture, and shall be designed to achieve state standards.

Prior to 2013, the AAP program was overseen on a complaint-driven basis due to limited resources and AAFM had never received funding specific to enforcing the AAPs. In recent years, AAFM has investigated between 160 and 215 complaints on small, medium and large farms. The investigations targeted specific complaints or obvious violations and did not include a full AAP compliance assessment.

In 2013, AAFM hired the first inspector specifically charged with AAP education and enforcement. This position is prioritizing outreach and evaluation efforts in the agriculturally impaired watershed of Franklin County. AAFM still continues to respond to complaints as in previous years and intends to hire three additional inspectors in 2015-2016 to further expand this.

Medium Farm Operations

The Medium Farm Operations (MFO) program provides coverage under a single state general permit and is managed by the AAFM. All dairy farms with 200-699 mature animals, whether milking or dry, qualify as a MFO. Other common MFOs include beef operations (300-999 cattle or cow/calf pairs), horse operations (150-499 horses), turkey operations (16,500-54,999 turkeys), and egg facilities (25,000-81,999 laying hens without liquid manure handling system). The general permit prohibits discharges of wastes from a farm's production area to waters of the state and requires manure, compost, and other wastes to be land applied according to a nutrient management plan. AAFM is required to inspect all farms permitted under these rules at least once every five years (increasing to every three years through Act 64) however most are inspected more often and many receive additional technical assistance as practices are implemented. The MFO general permit has been in existence since 2007 and was revised in 2012.

Large Farm Operations Program

Farms with more than 700 mature dairy cows, 1,000 beef cattle or cow/calf pairs, 1,000 youngstock or heifers, 500 horses, 55,000 turkeys, or 82,000 laying hens must obtain a Large Farm Operations (LFO) permit from the AAFM. A LFO permit prohibits the discharge of wastes from a farm's production area to waters of the state and requires the farm to land apply manure,

compost, and other wastes according to a nutrient management plan. Unlike the MFO Program, LFO permits are individual to each farm and also regulate odor, noise, traffic, insects, flies, and other pests, construction siting and setbacks. All LFOs are inspected annually by AAFM.

Concentrated Animal Feeding Operation Permits

The Vermont statewide Concentrated Animal Feeding Operation (CAFO) general permit is administered by the VT Department of Environmental Conservation and is a federal National Pollutant Discharge Elimination System (NPDES) permit. The CAFO permit was issued in June, 2013. Any farm that discharges to a surface waterbody can be required to obtain a permit. The CAFO general permit is for medium farms, and an individual permit can be required for a small or large farm.

The CAFO permit requires farms to properly design, construct, operate, and maintain production areas to control waste and to develop and implement a nutrient management plan, which is available to the public. The permit prohibits a discharge of manure, litter, or wastewater, except when direct precipitation equivalent to or greater than a 25-year, 24-hour storm event causes a discharge. This exception is only allowable when all permit requirements are met.

VERMONT AGENCY OF AGRICULTURE, FOOD AND MARKETS

Best Management Practices Program

The agricultural Best Management Practices (BMP) Program is both a regulatory and funding program for farmers relating to the construction of farm improvements designed to abate non-point source agricultural waste discharges to waters of the state of Vermont. The BMP program identifies farms that present a risk to water quality and where the AAFM has determined that current infrastructure and practices are not sufficient to address the potential risk to water quality. BMPs must be constructed in a manner that meets the federal Water Pollution Control Act and state water quality standards.

Prior to 2015, Vermont statute required the Secretary to determine that sufficient funding was available before requiring a BMP. Act 64 now requires that when BMPs are mandated, the farmer will be made aware of all available resources and it continues to be a goal of AAFM to prioritize available funding where a water quality impact has been identified. Commonly funded production area practices include waste storage facilities, silage leachate systems, milkhouse waste systems, and barnyard runoff collection, most of which are expensive and unaffordable without financial support.

Conservation Reserve Enhancement Program

In partnership with the USDA, the Conservation Reserve Enhancement Program (CREP) is an enhanced version of the federal USDA Conservation Reserve Program and provides supplemental payments with state funding. CREP encourages the installation of conservation buffers along waterways by providing land owners with a yearly rental payment and by covering the cost of planting the buffer. Additionally, CREP covers the cost of installing fencing and livestock watering systems where animals on pasture are excluded from waterways. In 2013, the rental payment rates from the federal government were drastically cut, and this, along with limited support staff, is a contributing factor to the decreased signups for CREP. Since then, soil

rental rates have increased, but support staff for outreach and planning has not increased; currently only part of one person with AAFM works in this program. An evaluation of this program to allow for its continuation and increase is needed and planned for 2016. The federal government provides a 4:1 match for this program, and its value on the Vermont landscape is very high.

Farm Agronomic Practices Program

The Farm Agronomic Practices (FAP) program provides farmers with state financial assistance of up to \$5,000 per farm per year for implementation of soil-based practices that improve soil quality, increase crop production, and reduce erosion and agricultural waste discharges. Eligible practices are nurse crops, strip cropping, conservation crop rotation, alternative manure incorporation, cross-slope tillage, conservation tillage and educational activities. Interest in the FAP program has grown in the past few years and requests for funding far exceed available funds. For this reason, FAP no longer provides funding for cover crops and defers a consistently high number of requests to NRCS funds.

Vermont Agricultural Buffer Program

The Vermont Agricultural Buffer Program (VABP) offers a 5-year maximum rental contract for the installation of conservation grassed buffers on cropland. Unlike the CREP program, VABP allows planting harvestable grassed buffers. Areas in crop fields that are prone to erosion caused by flood events, which can be classified as flood chutes, are also eligible under this program to be planted into grass and harvested.

Nutrient Management Plan Incentive Grants

The Nutrient Management Plan Incentive Grants (NMPIG) previously provided funds for the development of a nutrient management plan (NMP) for a farm and three additional years of updates. Due to increased NRCS funding, AAFM now defers farmers to federal funding for the development and updates of NMPs. However, substantial state funding was allocated to this effort in the past and NMP development and implementation is still considered a high priority for AAFM.

US DEPARTMENT OF AGRICULTURAL FEDERAL PROGRAMS

Federal programs, funded through the US Agriculture Act of 2014 (commonly known as the Farm Bill), assists Vermont farmers in water quality improvements, including reductions in phosphorus loading to Vermont's surface waters. The USDA Natural Resources Conservation Service (NRCS) and the Farm Service Agency (FSA) provide technical and financial support for conservation practices and program implementation, as well as funding through the national Conservation Innovation Grant program.

In 2014, the newly passed Farm Bill reorganized many of the historic conservation programs. Over the next five years, \$18.7 billion has been authorized nationally and due to "regional equity" provisions, Vermont has received substantial water quality improvement funding in recent years. In 2015 NRCS plans on obligating up to \$9.2 million Statewide (estimated at \$6.6 million within the Lake Champlain Basin) for the Environmental Quality Incentives Program (EQIP). This program provides financial assistance to agricultural producers for the funding of

barnyard improvements, manure pit installation, and silage leachate collection systems. In addition, the program will fund the development of Conservation Activity Plans, such as Nutrient Management Plans (NMPs) and Comprehensive Nutrient Management Plans (CNMPs). NRCS also has allocated \$2.47 million dollars toward the acquisition of Agricultural Conservation Easements through the newly authorized Agricultural Land Easement program. It is expected that this money will be used to conserve 17 farms across the state. Finally, through the newly authorized Wetland Reserve Easement Program, NRCS anticipates funding the acquisition and restoration of around 140 acres of previously converted wetlands.

The 2014 Farm Bill also authorized a new funding program, the Regional Conservation Partnership Program (RCPP). RCPP is designed to promote coordination between NRCS and its partners to deliver conservation assistance to landowners. A key goal of RCPP is to increase the number and diversity of partners involved in conservation activities.

In 2014, DEC and AAFM submitted a successful application to the highly competitive RCPP program, and in May 2015, was awarded the second largest grant in the country, \$16 million to fund efforts over 5 years. This was a bi-state application with the State of New York, and funds are being shared with partners in NY who will focus on Lake Champlain drainage water quality improvement. The grant provides over \$20 million as match to the federal funds from 26 partners, many of whom are new to conservation efforts, and bring new opportunities for outreach, education and assistance. The program is being coordinated by DEC, and the State has provided a position to assist with this effort.

RCPP funding will result in over 100 new EQIP contracts for farm and forest management practices, 30 new easements, and over 200 acres of wetlands restored and protected. Each project will directly address water quality, with priority given to projects in the Missisquoi, St. Albans Bay and South Lake watersheds of Lake Champlain. Funds are targeted to conserved lands, which as of the 2014 Farm Bill, are now required to develop and implement a water quality focused conservation plan. Additional technical and financial assistance will be provided to help develop and implement these plans on newly conserved farms as required, but also to incentivize prior conserved farms to address critical water quality concerns.

USDA's RCPP program also provided funds to individual states, and the Vermont Association of Conservation Districts received an \$800,000 award to increase development and implementation of nutrient management plans. Both programs are coordinating their efforts, and also working closely with a third RCPP effort in the Connecticut River Watershed.

USDA allocations have also funded several individual projects in Vermont that directly impact agricultural water quality.

- National Water Quality Initiative (\$80,000). Both projects target funds to eligible farmers in the impaired Rock River and Missisquoi Bay watersheds.
- Edge-of-Field monitoring (approx. \$220,000). Paired watershed research projects that are assessing the water quality improvement value of key farm BMPs such as cover crops, manure aeration, reduced tillage and water and sediment control basins. Funding in 2016 will include evaluation of tile drains.

- Conservation Innovation Grants (\$225,000). These competitive grants are funding a web-based tool for BMP tracking, two grants focusing on soil health, one on the viability of reduced tillage systems on heavy clay soils, and one evaluating cover crops on clay soils as an alternative to fall plowing. An additional grant in 2015 is evaluating media for reducing phosphorus in tile drain outflows.

Each of these programs provides extensive water quality technical assistance as well as critical research and education opportunities.

PARTNER PROGRAMS

In addition to the state and federal-level programs discussed above, there are a number of local programs through Vermont's non-profit partners that are geared toward phosphorus reduction from Vermont farms. In addition to these organizations, numerous nonprofit watershed groups provide extensive outreach, education and implementation assistance.

Vermont Association of Conservation Districts

VACD and its 14 member districts provide education and technical assistance in all natural resource areas, including agriculture, forestry, river management, invasives, stormwater and low-impact development. Districts help agricultural producers by providing non-regulatory assessment and technical assistance, and by leveraging additional funding through grants or other programs.

Conservation District programs include:

- Agricultural Resource Specialists: VACD oversees the Agricultural Resource Specialist (ARS) program, a federal and state funded effort which provides free technical assistance and information to help farmers meet the requirements of the state Accepted Agricultural Practices. ARS works with farmers on developing strategies specific to the farm. If these strategies involve implementation costs, ARS provides information and referrals for State and Federal cost-share programs. VACD has also secured grant funding for small on-farm water quality improvement projects, such as livestock exclusion fencing and animal walkways. The ARS staff conducts the Agricultural Environmental Management Program. This is a statewide, voluntary program that helps farmers assess their risk of water quality impact and identify areas for improvement. Tiered assessments are conducted that cover farmstead water supplies, nutrient management, pesticide use, and many other farm practices. Suggested actions are linked with technical resources for design and implementation and financial resources for cost-share opportunities.
- Land Treatment Planners: Land Treatment Planners (LTPs) assist farmers in developing land treatment plans (LTPs), the foundation of a full nutrient management plan (NMP). LTPs include field inventories and assessments, documentation of soil erosion loss on individual fields ("T"), practices that are or need to be installed to minimize erosion, and field maps. This free program is provided to farmers through a partnership between the USDA NRCS, Conservation Districts, and AAFM. Land treatment planners coordinate

with NRCS or private consultants to complete a NMP, or provide this service to farmers who are taking the UVM Extension NMP development class.

- VACD Implementation Programs: VACD, through grants and pass-through funds, administers many programs that directly benefit agricultural water quality improvement. Examples include:

- Trees for Streams – a state funded effort that installs riparian buffers;
- BMP implementation – small farm projects;
- Livestock exclusion – direct funding to farmers for fencing and water systems;
- Soil, manure and water testing programs;
- Cover crop incentive programs; and
- Equipment rental programs.

Each District works to assess needs and provide services and assistance most appropriate and critical to that region.

- Agronomy and Conservation Assistance Program: The Poultney Mettowee Conservation District supports one of the three Lake Champlain basin agronomists who work one-on-one with agricultural producers on BMP and field practice implementation.

University of Vermont Extension Program

UVM Extension has multiple programs and staff located throughout the Lake Champlain basin. Staff agronomists advise farmers on topics such as crop production to reduce erosion and nutrient loss from fields, farmstead best management practices for improved manure and water management, animal exclusion fencing, field practices such as soil aeration and alternative manure applicator systems, whole-farm nutrient balances and other identified BMPs.

Implementation programs include:

- Agronomy and Conservation Assistance Program: UVM Extension supports two of the three Lake Champlain basin agronomists;
- Champlain Valley Crops, Soil and Pasture Team: provides technical assistance in the southern Lake Champlain watershed with research and practical applications;
- Northwest Crops and Soils Team: provides the best and most relevant crop information, both research based and experiential;
- Research: extensive research on corn trials and short season corn, alternative crops, cover crops, nutrient management and new equipment technologies;
- goCrop: mobile application for nutrient management;
- Equipment: equipment rental and education programs;
- Workshops: workshops, seminars and symposiums of research and program results.

Vermont Housing and Conservation Board/Vermont Land Trust

The Vermont Housing and Conservation Board (VHCB) farmland conservation program has conserved more than 600 farms comprising 144,000 acres since 1987. Landowners work with the Vermont Land Trust (VLT), a private non-profit land conservation organization that raises funds to permanently land, to apply for the purchase of development rights, and an agricultural advisory committee reviews applications and prioritizes purchases. VHCB receives funding from USDA/NRCS, as well as the State of Vermont to assist with land conservation and recent

legislation required that water quality be considered as a priority in agricultural land conservation. In addition, as part of the 2014 Farm Bill, lands conserved with USDA funds must have a conservation plan in place for addressing water quality and natural resource concerns.

VHCB and VLT are working closely with DEC and AAFM to coordinate efforts with the RCPP funding project to increase land conservation and implementation of conservation plans on current and prior conserved farms.

Coordination

In addition to the partners above, there are many strong essential watershed groups and non-profit organizations assisting in the education, outreach and implementation of critical water quality improvement on agricultural land. DEC and AAFM provide resources to assist these efforts and work closely with all partners to ensure coordination of efforts. Both agencies work to ensure consistent communication of programs, resources and regulations, and to maximize the value of each partner in water quality improvement efforts.

E. FORESTRY

Sediment, which carries phosphorus, is the most common pollutant associated with timber harvesting. Soil is carried by rainwater after timber harvesting equipment and trees dragged or carried over the ground loosen and expose the soil. Bare ground exposed during harvesting operations can be eroded by rainwater and enter nearby streams. Stream crossing used during harvesting are a particular area of concern. An estimated 16% of the total phosphorus load delivered to Lake Champlain comes from forestland. With forest covering more than 4.6 million acres state-wide and representing 78% of Vermont's total land base, forestry is an important area of focus for reducing phosphorus loading to state waters. The most significant programs that address forestry practices and phosphorus loading are described below.

VERMONT ACCEPTABLE MANAGEMENT PRACTICES (AMP)

In 1987, Vermont adopted the Acceptable Management Practices (AMPs) for Maintaining Water Quality on Logging Jobs in Vermont. The AMPs are intended to prevent any mud, petroleum procedures and woody debris (logging slash) from entering State waters and to otherwise maintain water quality and minimize erosion. Since adoption of the AMPs, the Vermont Department of Forests, Parks and Recreation (FPR) has worked with the Vermont forest industry to support DEC's Compliance and Enforcement Division in an effort to eliminate discharges resulting from logging operations.

In 1990, a Memorandum of Understanding (MOU) between the Enforcement Division and FPR was developed to establish a process that FPR and the forest industry may use to assist loggers or landowners when there is a discharge. Under the MOU, five AMP Technical Advisory Teams were created to directly assist any logger or landowner when there is a potential discharge, complaint or request for assistance. Enforcement would be pursued in instances where:

- There is substantial failure to comply with the AMPs which has resulted or is likely to result in substantial environmental degradation;
- Efforts to obtain voluntary compliance have been unsuccessful; and
- There is a history of non-compliance with the AMPs coupled with discharges to State waters.

The MOU and this process have been successful in reducing water quality impacts, including erosion, in connection with logging operations in Vermont.

PORTABLE SKIDDER BRIDGE INITIATIVE

The goals of this initiative are three-fold;

- Inform loggers, landowners and foresters about the benefits of using portable skidder bridges through workshops and presentations, field demonstrations, informational brochures, static displays, video and web production, and news articles;
- Provide portable skidder bridges to loggers for purchase, loan and rental using a variety of means and partners; and
- Provide assistance and support for existing and start-up businesses that would fabricate and sell portable skidder bridges.

Portable skidder bridges are designed and intended for use as temporary structures for crossing streams during logging. They are becoming widely viewed as a Best Management Practice for controlling nonpoint source pollution associated with timber harvesting operations. They create less stream bank and stream bed disturbance as compared to other alternatives such as culverts or poled fords. Portable skidder bridges will reduce the potential for sedimentation, channeling, and degradation of aquatic habitat to occur.

F. RIVER AND FLOODPLAIN MANAGEMENT

An estimated 22.3% of the total nonpoint phosphorus load delivered to the Lake comes from stream erosion and the loss of floodplain function. While fluvial systems are dynamic by nature, the DEC has documented stressors including channel confinement, straightening, berming, dredging and armoring that have precipitated channel evolution to an extent and rate beyond the natural deposition and erosion processes expected in a post-glacial environment like Vermont. The evolution of stream channels, driven largely by flood events, may take decades to occur. Therefore, erosive stages of the evolution process will result in increases in phosphorous loads from some stream segments before equilibrium or least erosive conditions occur. Managing rivers toward equilibrium conditions and allowing access to floodplains, by avoiding the development of buildings, roads, and other investments in the floodplain or river corridor, provides for climate adaptation and reduces sediment transport and phosphorus pollution. Reducing the need to channelize rivers in attempts to protect encroachments, allows rivers to evolve back and remain in their least erosive, equilibrium condition. Rivers have the energy to perform the work of restoration, with or without human intervention, and therefore, the nutrient

load reduction sought through restoration is also achieved through corridor and floodplain protection.

The goal of DEC's Rivers Program is to resolve conflicts between human investments and the dynamics of rivers in an environmentally and economically sustainable manner. The Program supports and implements channel assessment and management practices that recognize the functions and value of floodplains, conservation flows, and streams in their equilibrium condition. The Program provides regulatory review and technical assistance for protection, management, and restoration projects that affect the flow and physical nature of streams and rivers. The objective is to guide and encourage projects that provide increased property and infrastructure protection and maintain or restore the ecological functions, economic values, and restorative processes of river and floodplain systems.

Act 64 passed with only minor policy and program development in the areas of river and floodplain management. This is due to the fact that, since 2010, four separate legislative acts focused on stream stability and floodplain function with the goals of reducing Vermont's vulnerability to flood and fluvial erosion hazards and improving water quality. Vermont laws establish stream equilibrium and river corridor protection as explicit management objectives. These new public policies have put the DEC Rivers Program in the vanguard of implementing an avoidance-centric approach to watershed restoration by protecting floodplain and riparian features where natural fluvial process enhances and sustains water, sediment, and nutrient storage.

The aftermath and recovery from Tropical Storm Irene in 2011 and 2012 reminded everyone that unregulated, post-flood channel management can erase decades of progress in restoring stream equilibrium. Consequently, Act 138 (2012) gave municipalities the authority to conduct instream emergency protective measures as long as they were consistent with rules established by the ANR. State policies focused on flood hazard mitigation now address stream erosion.

The major sub-programs within DEC's Rivers Program that manage rivers, river corridors and floodplains, thereby reducing phosphorus loading to the Lake, are described below.

RIVER CORRIDOR AND FLOODPLAIN PROTECTION PROGRAM

Regulatory Programs

The Program has established state floodplain rules that set a high standard of "no adverse impact" (NAI) in floodplains and river corridors and address all developments exempt from municipal regulation, including state buildings and transportation facilities, utility projects, and agricultural structures. Flood Hazard Area and River Corridor Protection Procedures have also been adopted by the Department to guide the regulation of Act 250 and Section 248 developments; establish map amendment and revision procedures; and river corridor best management practices (e.g., establishment and maintenance of riparian buffers).

In summary, to meet the No Adverse Impact Standard, a proposed project shall not:

- (A) Be located within a river corridor;
- (B) Decrease storage capacity within the FEMA-designated Flood Hazard Area without providing compensatory storage to offset the impacts of the proposal.

(C) Increase flood elevations or velocities for adjacent landowners.

With the primary objective being the protection of undeveloped floodplain and river corridors, the Rules and Protection procedures spell out exceptions to the NAI standard that acknowledge and encourage infill and redevelopment. The Program has established a general permit to expedite authorization of low risk activities under the new Rule.

The Program is currently staffed with Floodplain Managers and River Scientists that each cover approximately one third of the state reviewing projects subject to municipal floodplain and river corridor bylaws (in accordance 24 VSA Chap.117, Section 4424); regulating activities under the new Rule; providing floodway determinations; and making NAI regulatory recommendations for Act 250 projects. At present only 30% of Vermont towns actively seek floodplain manager regulatory assistance, which results in approximately 50 municipal floodplain projects per manager per year. Larger municipal and Act 250 projects often require extensive interaction with project proponents and consultants including pre-application design consultation, site visits, formal project review, and attending District Commission and Development Review Board Hearings.

Technical Assistance Programs

Technical assistance is available to communities wishing to better protect floodplains and river corridors from potential encroachments that will cause conflicts with stable channel functions and potentially increase future flood and erosion damages. In addition, the Program provides support to the state agencies, communities, watershed associations, Regional Planning Commissions (RPCs) and individuals to help plan for, design and implement floodplain restorations, as well as flood hazard avoidance, reduction, mitigation and recovery planning and projects.

Under an annual cooperative agreement with the Federal Emergency Management Agency (FEMA), DEC provides technical support to 248 communities enrolled in the National Flood Insurance Program (NFIP). The River Corridor and Floodplain Protection Program provides technical assistance on floodplain management, flood hazard and river corridor mapping, and flood insurance. In addition, the Program is required to conduct community compliance reviews and serve in a liaison capacity on FEMA enforcement actions. Floodplain Managers and River Scientists work with multiple municipal planning commissions toward the adoption of enhanced river corridor and floodplain bylaws.

Technical assistance is also provided through a “Flood Ready” web page which provides all manner of planning and implementation tools to increase Vermont municipal adoption of enhanced floodplain, river corridor, and riparian buffer protection bylaws and other mitigation measures to minimize flood and erosion risks and maximize floodplain function.

Financial Incentives

As required by Act 138, a Flood Resilient Communities Program has been established to create funding and technical assistance incentives for municipalities to adopt regulations for floodplains, river corridors, and riparian buffers. For example, the Emergency Relief and

Assistance Fund (ERAF) increases the state cost share recovery in municipalities where enhanced bylaws have been adopted.

Program engineers, floodplain managers and scientists provide technical assistance and state funding, and use FEMA flood hazard and pre-disaster mitigation grants to assist non-government entities and municipalities with the planning and implementation of flood and erosion hazard mitigation projects. Mitigation projects and the Program's assistance are increasingly used as leverage to get landowners and communities involved in greater river corridor and floodplain protection.

Assessment, Planning, and Funding

The River Scientists each cover 5 or 6 major watersheds in Vermont and work with the Program's partners to conduct stream geomorphic assessments and develop river corridor plans. This science informs a host of activities across the Program and Division including tactical basin planning, regulatory work, and technical assistance in the development and prioritization of river protection and restoration projects, i.e., for ERP and other funding. They also support a robust planning program with any community willing to seek the hazard mitigation and water quality benefits of dynamic equilibrium streams and floodplains.

The scientists are responsible for development, quality assurance and upkeep of river corridor maps in their respective watersheds. The Program leverages state and federal funding to develop Phase 2 stream geomorphic assessment data and river corridor plans that identify river corridor protection and restoration projects consistent with the achievement of equilibrium conditions. A statewide river corridor map layer has been completed as of January 2015 providing a delineated corridor for every stream over 2 square miles in drainage. The publication of a statewide layer has created a level playing field with respect to implementing regulations and promoting incentive programs. As yet, the Program's extensive stream geomorphic data and river corridor planning outputs have not been attributed to the statewide layer, limiting the identification of strategic protection and restoration projects at the basin or statewide level.

The Program has recently developed a mapping program with two staff who works on the FEMA RiskMAP program, updating NFIP maps, and assisting municipal bylaws revisions coincident with the map updates. With FEMA mapping money becoming scarce, the mapping program has focused on the development of river corridor maps to support the municipal adoption of enhanced model floodplain and river corridor protection bylaws that exceed the NFIP minimum requirements.

A River Corridor Easement Program has been established by the Rivers Program to conserve river reaches identified as high priority sediment and nutrient attenuation areas. The opportunity to purchase river corridor easements was created to augment the state and municipal fluvial erosion hazard zoning, which, if adopted, avoids future encroachment and flood damage, but does not re-strict channelization practices. The key provisions of a river corridor easement are the purchase of channel management rights and the maintenance of an undisturbed riparian buffer. The Program works closely with state and federal farm service agencies, the Vermont Housing and Conservation Board, and land trust organizations to combine corridor easements with other land conservation programs. The purpose of the river corridor easement is to allow the

river to re-establish a natural slope, meander pattern, boundary conditions, and access to floodplains in order to provide flood inundation and fluvial erosion hazard mitigation benefits, improve water quality through hydrologic, sediment and nutrient attenuation, and protect riparian habitats and the natural processes which form them.

FEMA pre-disaster and hazard mitigation planning funds in Vermont are being used to help communities develop strategic hazard mitigation plans to restore, remove, or retrofit infrastructure likely to become damaged during or after floods. Recent Stafford Act amendments (44 CFR Part 201.6) required local governments to adopt Hazard Mitigation Plans in order to retain eligibility for certain FEMA grant programs. The State Hazard Mitigation Plan and 12 Regional (multi-jurisdictional) Hazard Mitigation Plans all set high priority on mitigation and avoidance of fluvial erosion hazards through river corridor protection. In this way, Vermont hazard mitigation planning is complementary to water quality objectives and can be a powerful local planning tool.

Education and Outreach

The Program, in cooperation with a host of planning organizations and the Vermont League of Cities and Towns, conducts outreach and education and annually reports on the status and impact of river corridor zoning and easements, including development of river corridor mapping. The regional scientists, working with DEC Watershed Coordinators, educate communities about stream instability and fluvial erosion hazards, and provide incentives for their adoption and implementation of river corridor plans and bylaws. The Program has provided the RPCs and municipalities with a suite of Enhanced Model Flood Hazard Area Regulations including river corridor protection. These Program activities are conducted pursuant to 10 V.S.A. Chapters 32 and 49, and 24 V.S.A Chapter 117 as amended by Acts 110 and 138 (passed in 2010 and 2012).

The establishment of a “Flood Ready” web page has promoted cross-agency, flood resiliency planning (Act 16) by offering peer-to-peer learning and community progress barometers in the Flood Resilient Communities Program.

The program uses three river flumes at public meetings, fairs, workshops, and trainings. These live demonstrations have transformed the education and outreach around river dynamics and the impacts of human activities with respect to erosion and sedimentation. Conservation Districts are now purchasing flumes and developing curricula to educate both adults and school children in their communities.

RIVER MANAGEMENT PROGRAM

Regulatory Programs

Regulation and permitting is conducted pursuant to 10 V.S.A., Chapters 41 and 32 and Section 401 of the Clean Water Act. State Stream Alteration Rules and a General Permit have been adopted that establish first-in-the-nation equilibrium and connectivity standards and regulate next-flood and emergency protective measures. This new regulatory program is supported by the publication and continual refinement of standard river management principles and practices (SRMPP) to maximize equilibrium conditions when managing conflicts between human activities and the dynamic nature of rivers.

In summary, to meet the equilibrium and connectivity standards, a proposed project shall not:

- (A) Result in conditions that cause or perpetuate the unnatural aggrading (raising) or degrading (lowering) of the channel bed elevation.
- (B) Create a significant disconnect in the stream bed, banks, or floodplain that will cause damage related to erosion or deposition in the stream; or create a barrier to the movement of aquatic life.

Technical Assistance Programs

River Management Engineers are experienced in river dynamics, conflict resolution, and the environmental damage and human suffering that occur when projects fail during floods. It is their day-to-day field exposure to Vermont river systems and the people and communities that live along them that has created accountability back and forth between the service provider and the communities they serve and toward sustainable relationships at larger natural and economic scales. The number of stream alteration permits issued in a year is a small fraction of the field visits and face to face technical assistance provided to help project proponents understand the eventual river response and the risks they create to the environment, themselves, and their neighbors. On average, Vermont has experienced a flood disaster every year for the past twenty years and a major regional-scale (>100 year) flood every 15 years. The River Management Engineers work with local officials in putting things back together after a disaster.

The River Management Program provides technical assistance to landowners, municipalities, non-governmental organizations and other agencies to help determine the appropriate stream channel management practices necessary to resolve and avoid conflicts with river systems. The practices selected are designed to recognize and accommodate, to the extent feasible, the stream's natural stable tendencies (equilibrium conditions). The conflicts are resolved with the recognition of a stream's long-term physical response to past and proposed management practices. The resulting work is intended to provide increased property and infrastructure protection and maintain or enhance the ecological functions, economic values, and restorative processes of the river system.

Financial Incentives

The State has yet to achieve FEMA recognition of the state-adopted river management and stream crossing codes and standards for conducting emergency protective measures. This is an important goal because to date FEMA Public Assistance funding, rather than serving as an incentive for post-flood restorative practices and right-sized structures, is perpetuating activities and structures that exacerbate stream instability and erosion hazards.

Assessment, Planning, and Funding

The River management Engineers, working with the river scientists, capitalize on opportunities to implement projects involving the removal of river, river corridor, and floodplain encroachments (e.g., floodplain fills, undersized stream crossings, flood-damaged structures, or dams) and the restoration of floodplain functions. Elevating stream beds and reconnecting floodplains is increasingly recommended by the Engineers as a restoration alternative when working to stabilize road embankments.

Education and Outreach

The fluvial geomorphic-based river management principles and practices necessary to mitigate flood hazards and maximize equilibrium conditions are not well understood outside of the Program. This creates inefficiencies and compliance issues particularly in post-flood situations. The Program is working to develop training and outreach programs for VTrans, municipalities and contractors in the use of practices that will meet the DEC's equilibrium-based performance standards.

A River and Roads Training Program has been developed through the Tier 2 level. Tier 1 is an online course that introduces the science and management principles and practices. Tier 2 training is a 2-3 day session with classroom and field exercises. Thus far all VTrans operations staff, many municipal road workers, contractors, and other professionals have attended. Detailed Tier 3 project design trainings have not yet been developed. The Program has also begun outreach and training of municipal officials on the web-based authorization process for emergency protective measures under the new ANR Stream Alteration Rules and General Permit designed to maximize technical assistance during post-flood recovery.

STREAMFLOW PROTECTION PROGRAM

Regulatory Programs

The Streamflow Protection Program issues Section 401 water quality certifications to moderate or cease streamflow and reservoir level fluctuations, including those associated with hydroelectric projects and other dams. In their extremes, peaking operations at hydropower stations result in rapid increases in downstream discharges in river reaches which are vulnerable to erosion under higher velocity flows. Large daily to seasonal decreases in reservoir water levels may result in the erosion of saturated shoreline soils. The Streamflow Protection Program considers these impacts and seeks flow regimes that maximize the stability of stream banks and shorelines.

The goal of the Streamflow Protection Program is to maintain conservation flows necessary to protect aquatic habitat and stream ecology. In addition to conservation flows, the Program aims to protect components of the natural flow regime, including the timing, frequency, duration and magnitude of both high and low flow events and their influence on the physical and biological attributes of a stream or river.

Technical Assistance Programs

Program staff partner with the Public Service Department and have developed guidance for small hydro power developers. Providing this guidance is important at a time when there are numerous drivers or incentives for small-scale, independent, non-carbon burning power production. Small power developers often do not have access to the professional environmental and engineering consultants that the large power producers or utilities may have. These projects may result in the same type of bed and bank erosion as larger dams and diversions. The Program, also works with the Lakes Program, providing technical assistance to lake shore owners concerned about water level fluctuations as the source of erosion along their shoreline and effects on the near shore habitat. Additionally, the Program has partnered with NGO partners to develop guidance for project managers of dam removal projects.

Assessment, Planning, and Funding

Dam inventory data, maintained by the Program, is provided to support the DEC tactical basin planning process. The Program has supported efforts to assess, design, and find the funding for numerous restoration projects identified in tactical planning, and from the work of the state Dam Task Force, comprised of NGOs and state and federal agencies.

Each year, the Program identifies priority stream sections where flow studies are completed to determine compliance with flow criteria in the Vermont Water Quality Standards. These studies are primarily done below unlicensed hydropower projects and for the basis to determine the remedial actions necessary. Over time, the Program has also sponsored statewide studies of production capacity and environmental impacts of both existing and potential hydropower sites.

G. WETLANDS PROTECTION

The Vermont Wetlands Program in DEC is responsible for identifying and protecting wetlands which provide significant functions and values for the people of Vermont. Wetlands function as water quality protection, flood storage, wildlife habitat, erosion control, and have recreational value. The goal of the Wetlands Program is to achieve no net loss of significant wetlands or wetland function through regulatory and nonregulatory means. This goal is mainly achieved by assisting the Vermont public and professional community in avoiding impacts to wetlands and wetland buffers through personal contact with District Wetland Ecologists. The number of wetland permits issued in a year is a small fraction of the field visits and face to face technical assistance provided to help effectively avoid and minimize wetland impacts.

Wetlands are natural flood regulators which temporarily store floodwaters and then slowly release waters downstream. While floodwaters are being stored in wetlands, sediments and nutrients, including phosphorus settle and are retained. As much as 80-90% of sediments in water may be removed while moving through natural wetlands, resulting in cleaner water. A recent study (Wang et. al., 2010) using the Soil and Water Assessment Tool (SWAT) coupled with the hydraulic equivalent wetland concept (HEW) concluded that the loss of 10-20% of the wetlands in their study watershed would lead to an increase in sediment discharge by 40% and total phosphorus load by 18%. Indeed, wetlands are one of the most important microtopographic features abating non-point source nutrients across a watershed. Between 1780 and 1980 Vermont lost over 35% of its natural wetlands, subsequently losing phosphorus sinks throughout the Champlain Basin. The potential increase in phosphorus retention from restoring the natural hydrology of these lost wetlands would be substantial for the health of Lake Champlain.

In 2006, the Agency of Natural Resources commissioned a study to identify and prioritize wetland restoration opportunities in the basin, and this plan was finalized on December 31, 2007. Since that time, data from the plan have been widely distributed to federal, state, and local governmental and non-profit organizations with an expressed interest in wetland restoration and protection. Program staff visited with numerous communities and groups to give locally-focused presentations on the plan results, and to highlight funding mechanisms for landowners interested in restoration. Opportunities for wetland gains and restoration occasionally occur as a result of repairing a violation, through mitigation to offset permitted impacts, or as a result of voluntary

measures. VANR currently works with federal, state, and local partners to offer technical assistance and financial incentives to encourage landowner implementation of wetland conservation and restoration opportunities, retain forested buffers, and discourage land conversion. These partners include but are not limited to NRCS, the Army Corps of Engineers, Ducks Unlimited, and VFWS.

In May, 2009, Vermont passed legislation (Act 31) to strengthen the State's wetlands protection statute. A key change to the statute transferred authority from the former Water Resources Panel of the Natural Resources Board to VANR to make administrative determinations to re-classify wetlands for protection. Before the authority transfer, VANR was only able to protect mapped wetlands which included an estimated 61% of wetlands across the state. Now VANR is able to protect thousands of additional wetland acres. Act 31 also allows VANR to update wetland mapping and interpret jurisdictional buffer zone widths to accommodate individual wetland needs. The updated Vermont Wetland Rules which reflect the change in statute began September of 2010. Since the rule changes, VANR has been working to increase the wetlands program capacity to fully realize the new jurisdictional ability.

Vermont also recognizes the importance of maintaining native plant vegetated buffers along streams, lakes, and wetlands to maintain water quality. Buffers filter and absorb nutrients in runoff and support the integrity of stream banks to help guard against erosion. Healthy vegetated buffers offer additional benefits such as support fish habitat function, provide habitat and movement corridors for wildlife. The Vermont Wetlands Program often recommends the inclusion of buffers during project review under other authorities, such as Act 250 and Section 248 reviews and water quality certifications under Section 401 of the federal Clean Water Act.

H. SHORELAND MANAGEMENT

Development on lake shorelands, including Lake Champlain, is the densest residential development in the state. Studies in Vermont have shown that the majority of shoreland development includes the removal of most of the natural vegetation on the shore. The 2013-2014 session of the Vermont Legislature passed a Shoreland Protection Act that requires DEC to establish a permit program for development within 250 feet of the water's edge on lakes greater than 10 acres or in size. The Act establishes a 100 foot wide protected naturally vegetated area, the regulation of the creation of cleared or impervious areas, and the use of low-impact development best management practices when needed. The Act will ensure that new shoreland development will have minimal impact on the lake in terms of phosphorus and sediment runoff and degradation of aquatic habitat. In addition, areas proposed for redevelopment will not increase their impact on lake and water quality.

LAKE WISE PROGRAM

Lake Wise is a new addition to the Lakes and Ponds Program that provides outreach and technical assistance around shoreland management. Launched in the summer of 2013, the Program provides on-site review of shoreland conditions and recommendations for lessening the impact of existing shoreland development on a lake. Previously, handouts, workshops and

technical assistance were available to the public, and the Lake Wise Program improves on these efforts by updating and consolidating web-based and written information. More importantly, the program is designed to recognize and reward good shoreland management by providing landowners with an attractive sign to post on their property that indicates they are “Lake Wise.” Landowners wishing to retrofit their property into one that meets the Lake Wise standards are given a list of BMPs that can be easily implemented. Participation will be tracked and a cumulative benefit of the program in terms of improved property management will be calculated.

MUNICIPAL REGULATION

The WSMD has a long history of providing technical assistance to towns wishing to improve lake protection through effective shoreland management through the town zoning process. For many years DEC staff provided model bylaws, information, technical review, workshops and meetings with planning commissions, select boards and regional planning commissions to inform and encourage towns to adopt effective shoreland management measures. In 2004, DEC began funding a position at the Vermont League of Cities and Towns to provide assistance to towns on a variety of municipal measures that reduce flood damage and nutrient and sediment pollution, and including shoreland ordinance review and assistance. The Lakes and Ponds Program works closely with VLCT to review and develop model standards for shoreland management and assist with review and outreach as needed.

SHORELAND STABILIZATION

As part of promoting good shoreland management, and in particular to promote the value of a well vegetated shore in flood resilience and protection of aquatic habitat, the WSMD supports the use of vegetated stabilization means over those that are primarily structural where technically feasible. WSMD staff participated in the development of “The Shoreline Stabilization Handbook” (Northwest Regional Planning Commission, St Albans VT) and subsequently funded workshops and outreach about the handbook’s stabilization designs. Since the Lake Champlain basin floods of 2011, DEC has funded a grants program managed by the Regional Planning Commissions to promote and demonstrate the use of vegetated stabilization measures.

I. INTEGRATED BASIN PLANNING AND FUNDING - A FRAMEWORK FOR TMDL IMPLEMENTATION

INTRODUCTION

As described above, multiple programs are in place to both prevent and reduce excess phosphorus runoff to Lake Champlain. However, without an overall plan to identify, prioritize, fund and implement the necessary phosphorus control measures, time and money are likely to be wasted. In order to promote the most efficient and cost-effective implementation of phosphorus controls, DEC’s Watershed Management Division (WSMD) has developed a coordinated watershed assessment, planning, project identification and funding effort. The development of “tactical basin plans” by the WSMD’s Monitoring, Assessment and Planning Program, supported by targeted funding efforts provided by the WSMD’s Ecosystem Restoration Program, provides the required synergy between identified priority projects and available funding.

This integration between planning and funding began in 2010, when the WSMD reorganized itself to promote the implementation of integrated water resources management. This reorganization provides a coordinated, efficient means of managing water resource issues through entire watersheds, with the primary objective of maximizing environmental benefit and water resource protection. This reorganization effort included four primary components:

- As a first step, the WSMD integrated its monitoring, assessment and planning sections into a new Monitoring, Assessment and Planning Program (MAPP). Effective watershed management begins with effective planning, which must have a solid, scientific foundation for decision-making. The water resource planning process is closely linked to and dependent upon monitoring and assessment activities. The creation of MAPP enhanced integration of monitoring, assessment and planning.
- The second step in promoting integrated watershed management was the WSMD's development of the Vermont Surface Water Management Strategy. The Strategy serves as an overall guide during the development of basin plans by focusing management, planning, regulatory and funding efforts on basin-specific stressors, thereby allowing for prioritization of efforts to maximize environmental gain. The Strategy is used by basin planners, stakeholders and the public to identify and collectively prioritize the stressors impacting each basin and sub-basin. This strategy and its periodic updates satisfy provisions of Act 64 which call for development of a comprehensive water quality management strategy
- The third step, described in detail below, is the tactical basin planning process, which is WSMD's revised approach to watershed-specific management planning. This new process was created based on years of planning and resource management experience by the WSMD. The WSMD recognizes that the tactical basin planning process needs "buy in" from a large constituency, including federal, state, local agencies, the Legislature, watershed councils, planning groups, and the public. Over the past several years, the WSMD has engaged all of these constituencies in discussions regarding the benefits of the tactical planning process. The implementation of the tactical planning process described herein, as augmented by Chapter 5F, satisfies provisions of Act 64 regarding basin plan development.
- The fourth step, described more fully below, was the transformation of the former Clean and Clear Program into the WSMD's Ecosystem Restoration Program (ERP) which now works closely with MAPP to identify priority projects in each basin and link available funding to ensure cost-effective and timely implementation.

TACTICAL BASIN PLANNING

As part of the state's Surface Water Management Strategy, Vermont uses tactical basin planning to identify the highest-priority opportunities for sediment and nutrient load reductions in surface waters. The current process for developing and implementing tactical basin plans is described in this section, whereas details on the planning process to implement the Lake Champlain TMDL are set forth in Chapter 5.F.

At present, tactical basin planning uses monitoring and assessment results, combined with sector-specific planning processes, to identify and prioritize implementation projects.

As defined in [Vermont's Surface Water Management Strategy](#), a stressor is a phenomenon with quantifiable deleterious effects on surface waters resulting from the delivery of pollutants (or the production of a pollutant within a waterbody) or an increased threat to public health and safety. Stressors result from certain activities on the landscape, although occasionally natural factors result in stressors being present. Managing stressors requires management of associated activities, and the Surface Water Management Strategy articulates [10 specific stressors](#) that are managed with unique sets of programmatic and implementation tools. When landscape activities are appropriately managed, stressors are reduced or eliminated, resulting in the objectives of the Strategy being achieved, and goals met. Of these 10 stressors, five: land erosion; channel erosion; non-erosion nutrient and organic loading; thermal stress; and to a degree flow alteration, are responsible for the phosphorus runoff which pollutes Lake Champlain.

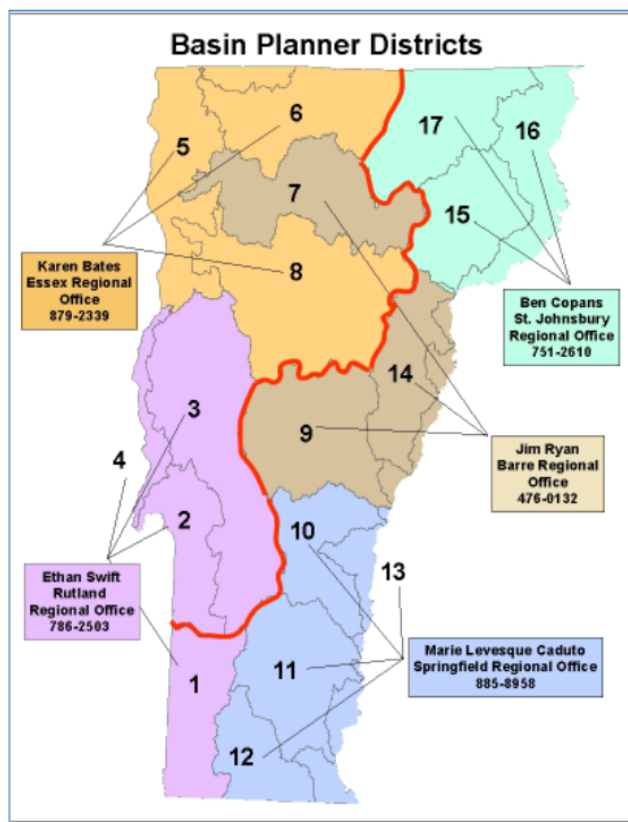


FIGURE 6 - WATERSHED PLANNING DISTRICTS, WITH ASSOCIATED COORDINATORS. BASINS 2 THROUGH 8 COMPRISE THE CHAMPLAIN BASIN

WSMD relies on tactical basin plans to ensure that funds are directed to the highest-merit implementation opportunities based on identification, targeting, and treatment of specific sites on the landscape determined to be at greatest risk of delivering nutrient and sediment loading to surface waters. These critical sources are identified within land use categories including agricultural land, urban and developed land, road networks, and river corridors. Tactical basin planning is carried out by a group of WSMD planners, each of which is assigned a district

comprised of three major watershed planning units. Watershed planning districts are shown in Figure 7.

Within each planning district, the responsible WSMD planner develops a tactical basin plan on a five-year recurring cycle. Tactical basin planning is WSMD's approach to integrate and focus TMDL implementation for all watersheds in Vermont that are subject to TMDLs. With respect to the Champlain TMDL, the core component of the tactical plan is the Chapter 4, implementation table. The table outlines the priorities of DEC, and partner organizations, for protection or restoration of specific stream or lake/pond segments affected by discrete and specific pollution sources, which are addressed by application of one or more suites of interventions outlined in the Surface Water Management Strategy. The implementation table serves to notify municipalities and partner organizations, such as Conservation Districts, Regional Planning Commissions, Watershed Associations, and other nonprofits of the types and locations of projects that WSMD will support with Ecosystem Restoration Program grants or promote to other funding sources where DEC has leverage.

The implementation table is updated to support implementation in each basin. The planners biennially review the progress attained in the implementation of specific items, and during that time, conduct public outreach to revisit the projects identified, and insert new priority items that were more recently identified. As such, the implementation table is a living chronicle of the identified priority interventions needed to implement sediment and nutrient load reductions in the Champlain watersheds.

Tactical Basin Planning - Component Processes:

In addition to water quality testing, there are five specific assessment processes that are integrated in producing a tactical basin plan. The priorities identified by each assessment are integrated into priorities for implementation. Each assessment process also yields critical on-the-ground information on the types of stressors at play. In sum, the assessment processes used in developing tactical basin plans include:

- Water Quality Monitoring (WQMon);
- Stream Geomorphic Assessment (SGA);
- Stormwater Master Planning (SWMP);
- Better Back Roads Capital Inventories (BBRCI);
- Agricultural Environmental Management (AEM); and
- Stormwater Mapping and Illicit Detection Discharge and Elimination (IDDE).



FIGURE 7 - EXAMPLE STRESSOR TARGETING MAP SUMMARIZING THE SOUTH LAKE CHAMPLAIN TACTICAL BASIN PLAN.

Figure 8 shows an example where subwatersheds have been prioritized by stressor, based on the assessment processes listed above, for the South Lake Champlain basin.

Current Implementation Mechanisms

Thus far, the mechanisms by which tactical basin plans are developed and implemented are described in detail in the Vermont Surface Water Management Strategy, Chapter Four, at: http://www.watershedmanagement.vt.gov/wqd_mgtplan/swms_ch4.htm. The process of implementing the actions identified in the tactical plans relies on a business process developed in 2011 in DEC, which ties the disbursement of Ecosystem Restoration Program funds to the specific priorities outlined in the implementation tables of tactical plans. DEC envisions that the Vermont Clean Water Fund will bolster implementation by enhancing the Ecosystem Restoration Program and other state clean water funding programs.

Tactical Basin Planning Schedule

The schedule for issuance of tactical basin plans is found in the Vermont Surface Water Management Strategy, Chapter Four, at:

http://www.watershedmanagement.vt.gov/wqd_mgtplan/swms_ch4.htm.

This schedule as revised for this Phase I Plan is summarized as follows:

| | <u>Completion Date</u> |
|---|------------------------|
| 1. Complete South Lake Champlain Tactical Plan | March, 2014 |
| 2. Complete North Lake Direct Tactical Plan | June, 2015 |
| 3. Complete Lamoille Tactical Plan | September, 2016 |
| 4. Update 2013 Missisquoi Tactical Plan | December, 2016 |
| 5. Update 2014 South Lake Champlain Tactical Plan | December, 2017 |
| 6. Update 2012 Winooski Tactical Plan | December, 2018 |
| 7. Update 2012 Otter Creek Tactical Plan | December, 2019 |

Current Capability of Tactical Basin Plans to address the Lake Champlain TMDL

The robustness of the implementation table in a tactical basin plan is predicated upon the availability of up to date surface water monitoring and watershed assessment results. As each tactical basin plan is brought forward for revision, either biennially for implementation table review or as a full five-year revision, the revision benefits from the availability of new monitoring data and assessment information. The watershed assessments are scheduled therefore so that they precede each iteration of a tactical basin plan. Table 8 describes the current priority status of assessments for each major Lake Champlain watershed in Vermont.

TABLE 8 - PRIORITY FOR ASSESSMENTS UNDERTAKEN IN SUPPORT OF TACTICAL BASIN PLANNING, BY MAJOR WATERSHED, BASED ON CURRENT TACTICAL PLAN STATUS

| | WQMon | SGA | SWMP | BBR | AEM | IDDE |
|----------------------|--|----------|--------|--------|------------|--------|
| Missisquoi | Medium | Low | Low | Medium | High | Low |
| North Lake Champlain | Medium | Low | Low | Medium | Medium | Low |
| Lamoille | High | Moderate | Low | High | High | Low |
| Winooski | Medium | Low | Medium | Medium | Medium | Low |
| Otter Creek | Medium | Low | High | High | High (SFO) | Medium |
| South Lake Champlain | High | Low | High | High | High (SFO) | Low |
| | <p>Low: Majority of subwatersheds or relevant land use areas have coverage for the assessment type.</p> <p>Medium: Half or more of subwatersheds have coverage for the assessment type.</p> <p>High: Over half of the subwatersheds are in need of this assessment type.</p> | | | | | |

Current Funding Sources to Support Tactical Basin Planning

The watershed planners are currently supported by existing appropriations of general funds. Development of tactical basin plans is reliant on consistent support of the watershed assessment processes for agricultural land, urban and developed land, road networks, and river corridors, and necessitates that funding is available to support the partner organizations that undertake these assessments.

ECOSYSTEM RESTORATION PROGRAM FUNDING

The original Center for Clean and Clear was established in 2007 to enhance Vermont's commitment to improve water quality in Lake Champlain. Clean and Clear brought together resources dedicated to improving water quality that were previously spread among many state programs. In 2008, the former Center was restructured into the WSMD's Ecosystem Restoration Program to guide the award of state water quality grants and contracts to municipalities, watershed organizations, conservation districts, regional planning commissions, and other partners across the entire state. As part of the Ecosystem Restoration Program's ongoing efforts to reduce surface water pollution from nutrients and sediment, the state budget has included capital funds to support ecosystem restoration projects.

It is the goal of WSMD to ensure that implementation priorities identified in tactical basin plans become priority items to be funded using ERP's grant monies or other available funds. To this end, the process by which ERP and other water quality planning and remediation funds are

distributed are aligned with the tactical planning process. Throughout the process of plan development, partner organizations are encouraged to participate in a meaningful prioritization exercise to identify the highest priority items for funding support. DEC Watershed coordinators also serve as facilitators in the development of ERP grant applications. Projects that are specifically identified in tactical plans and associated watershed assessments receive higher scoring in DEC's grant allocation rubric.

In addition to dedicated ERP funds, ERP also manages "Section 319" grants. In 1987, Congress enacted Section 319 of the Clean Water Act which established a national program to abate nonpoint sources of water pollution. These grants are made possible by the federal funds provided to DEC by EPA, and are available to assist in the implementation of projects to promote restoration of water quality by reducing and managing non-point source pollution in Vermont waters. Projects generally fall into two categories, either outreach, planning and assessment projects or implementation projects. For the most part, Section 319 grants are awarded for the control of sediment and nutrients for the improvement of localized water quality, either through direct implementation or through planning efforts that set the stage for project identification and implementation. Overall, these types of management efforts can have significant benefits in the control of phosphorus loading to the Lake.

Finally, ERP administers a small planning grant program, which consists of federal pass through dollars (about \$40,000 annually) provided by EPA under Section 604b of the federal Clean Water Act. These funds are granted to regional planning commissions for water quality planning purposes. For the last few years, in an effort to coordinate implementation and funding through tactical basin planning, ERP has announced that 604b grants are only available for a specific set of identified monitoring, assessment, planning and implementation related projects. ERP will continue to support the regional planning commissions by linking 604b grants with these types of projects. Beginning in state FY2017, ERP will augment the 604b funding with new state funds, as directed by Act 64, the Vermont Clean Water Act, to expand the regional planning commissions' capacity to provide planning assistance during the tactical basin planning process.

CHAPTER 5 - VERMONT COMMITMENT TO FURTHER REDUCE NONPOINT SOURCES

Over the past twelve years, Vermont has spent millions of dollars to reduce nonpoint sources of phosphorus to Vermont's surface waters, including Lake Champlain, and has developed comprehensive stormwater, rivers, wetlands, and agricultural programs to tackle this issue. Despite significant reductions in nonpoint sources, additional work is needed to restore the Lake and meet water quality standards.

As described in Chapter 1 of this Plan and shown in Figure 3, the most significant remaining nonpoint sectors of phosphorus include agricultural lands, developed lands, backroads, forests and streambank erosion. Before EPA will approve its new Lake TMDL, it has requested that Vermont provide additional policy commitments to further reduce nonpoint sources of phosphorus to the Lake. These commitments will allow EPA to find that there are "reasonable assurances" that nonpoint sources will be reduced so as to meet the TMDL load allocation target and water quality standards.

The State recognizes that periodic revisions are an integral element of the Lake Champlain phosphorus cleanup. Armed with experiences gained through more than twelve years of implementation efforts, ANR and AAFM, with assistance from VTrans, were well positioned to respond to EPA's request by:

- Reviewing the effectiveness of programs and strategies currently employed to improve Lake Champlain water quality;
- Identifying targeted program enhancements and new actions to further reduce phosphorus loading to the Lake; and
- Developing a prioritized schedule for implementation to most cost effectively and efficiently implement additional phosphorus reduction efforts.

In November 2013, ANR and AAFM distributed for public comment a draft "State of Vermont Proposal for a Clean Lake Champlain"

(http://www.watershedmanagement.vt.gov/erp/champlain/docs/2013-11-20_DRAFT_Proposal_for_a_Clean_Lake_Champlain.pdf). The Proposal included suggestions for enhancing existing programs and developing new programs to continue to reduce nonpoint sources. In developing this proposal, ANR met frequently with other state agencies, including VTrans, to refine these commitments. ANR and AAFM, in conjunction with EPA, held six public meetings and took public comments on the draft Proposal; over 500 people attended those meetings. ANR, in partnership with VTrans and the regional planning and development agencies, held 12 additional meetings with municipalities across the State to discuss the draft proposal. The State received over 100 comments, most of which were in support of increasing protection for the Lake and the proposed policy options in the Proposal. These comments were taken into consideration in developing this Phase 1 Plan. A summary of these public comments is available online at: http://www.watershedmanagement.vt.gov/erp/champlain/docs/2014-04-01Final_Summary_of_Public_Comment_Champlain_TMDL.pdf. In addition, a list of Frequently Asked Questions is available online at: <http://www.watershedmanagement.vt.gov/erp/champlain/docs/RestoringLakeChamplain-FrequentlyAskedQuestions.pdf>.

The commitments described below are designed to address the major sectors of phosphorus loading to the Lake in an efficient and cost effective manner. As shown in Figure 3, the relative magnitude of each sector varies by watershed, but agricultural land, developed land, and streambank erosion are major sources across all watersheds. Forest land appears as a large source in Figure 3 primarily because forests occupy over 70% of the landscape in the basin, although phosphorus runoff rates per acre from forest land are typically very low. On the other hand, some sources such as farmsteads and back roads that appear small in Figure 3 can contribute some of the highest rates of phosphorus loading per acre. Both the total amount of the phosphorus load and the loading rate per unit of land area were considered in developing Vermont's policy commitments, which will determine phosphorus reduction priorities over the next twenty years. Vermont believes that twenty years is a reasonable goal for implementation of these commitments given the enormity of this task and realities of existing funding.

Each commitment includes a description of the new program or enhancement to an existing program, the implementation mechanism, and the implementation steps and timeframe. The Gantt Chart in the Executive Summary summarizes the proposed implementation milestones and timeframes.

It is important to understand that EPA's TMDL development is ongoing. Once EPA's wasteload and load allocation numbers for point and nonpoint sources are finalized, they will be used to more fully define the level of phosphorus reductions needed by sources in each of the thirteen individual lake segments. Therefore, many of the commitments described in this Plan are expressed as statewide commitments but will be tailored as to scope, intensity and timing based on individual lake segment assessments during the second phase of implementation plans. DEC will use the models and load allocations still being developed by EPA to further refine these commitments.

A. AGRICULTURAL PROGRAMS

The Vermont Agency of Agriculture, Food & Markets (AAFM) is the lead Agency in Vermont in addressing agricultural nonpoint source pollution. The Agency has several regulatory programs in place to manage nonpoint source pollution and is proposing revisions to these programs in order to more comprehensively address agricultural pollution concerns in Vermont, including Lake Champlain. These proposed revisions embody the vision of the Agency to meet water quality goals and will be applied, as informed by tactical basin planning and adaptive management, to achieve the required reductions in phosphorus.

Substantial improvements have been made in recent years as AAFM has increased permit and inspection programs along with enforcement efforts. AAFM recognizes that a lag time exists between installation of BMPs and resulting phosphorus reductions. For example; development of the Medium Farm Operations (MFO) general permit in 2007, generated a significant amount of technical and financial assistance that resulted in extensive practice implementation but due to the nature of the practices, there may be a lag time before reductions of phosphorus are seen. Implementation of the full suite of practices in nutrient management plans, such as crop rotations, erosion improvement and cover crops requires time to gain the full practice benefits.

AAFM is committed to continued and strengthened efforts focused on ensuring that medium and large farms meet permit standards and to bring the small farm operations under similar inspection and compliance efforts. Further details are described below.

The proposed revisions to agricultural compliance and implementation programs are the result of over two years of outreach efforts. AAFM and DEC worked with the agricultural community in 2012 conducting meetings, focus groups, and discussions to recruit feedback on agricultural water quality improvement. Over 100 recommendations were submitted, and the Ag Workgroup was developed in January 2013 to review these recommendations and provide feedback to AAFM and DEC in development of the agricultural section of the TMDL. The Ag Workgroup consisted of 25 members; mostly farmers as well as technical service providers who work with farmers. The members were a broad representation of Vermont agriculture; small, medium, and large farms, dairy and non-dairy, crop, and organic. AAFM and DEC profoundly thank these members for their extensive and valuable input and has continued to ask for their assistance as an ongoing advisory group.

WATER QUALITY PERMITTING PROGRAMS – LFO, MFO, CAFO

DESCRIPTION

Vermont has three permitting programs regulating the management of agricultural wastes to prevent contamination of surface waters – the Medium and Small Farm Operation Rules and supporting Medium Farm Operations (MFO) General Permit and the Small or Medium Farm Individual Permits, the Large Farm Operations (LFO) Rules and Individual Permits, and a Concentrated Animal Feeding Operations (CAFO) Permit.

Medium and small farm operations permits

The Medium and Small Farm Operational Rule, managed by the Vermont Agency of Agriculture, Food and Markets (AAFM), applies a Vermont state general permit to farms with animal numbers that meet the minimum thresholds, such as dairy farms with 200-699 mature animals, 300-999 cattle or cow/calf pairs, 150-499 horses, 16,500-54,999 turkeys, and 25,000-81,999 laying hens without liquid manure handling system. The rule also provides for an individual permit for small or medium farms that meet specific criteria, such as utilizing new or innovative technologies or a history of non-compliance.

The Medium and Small Farm Operation Rule prohibits and prevents discharges of wastes from a farm's production area to waters of the state and requires manure, compost, and other wastes to be land applied according to a nutrient management plan. Prior to Act 64, AAFM was required by law to inspect all farms permitted under these rules at least once every five years (20% annually) and many farms are visited more often, due to permit compliance needs, project management assistance, and practice implementation. Due to the passage of Act 64, MFOs will now be inspected a minimum of once every three years.

The MFO general permit has been in existence since February, 2007 and was revised in 2012. Currently, there are 142 farms under the MFO general permit throughout Vermont, and approximately 104 of these farms are in the Vermont portion of the Lake Champlain basin.

Large farm operations permit

The LFO program, also managed by the AAFM, applies an individual permit to farms with animal numbers that meet the minimum thresholds, such as having more than 700 mature dairy cows, 1,000 beef cattle or cow/calf pairs, 1,000 young-stock or heifers, 500 horses, 55,000 turkeys, or 82,000 laying hens without a liquid manure handling system. An LFO permit prohibits and prevents the discharge of wastes from a farm's production area to waters of the state and requires the farm to land apply manure, compost, and other wastes according to a nutrient management plan. An LFO permit also regulates odor, noise, traffic, insects, flies, and other pests, construction siting, and setbacks. AAFM inspects all LFOs throughout Vermont and the Lake Champlain basin annually. The LFO Rules have been in effect since 1999, and were updated in 2007. There are 27 permitted LFOs in Vermont, 17 of which are in the Lake Champlain basin.

Inspections of MFO and LFO

AAFM currently has three inspectors and a supervisor who also assists with inspections of the MFO and LFO permitted farms. In 2012, AAFM changed the inspection protocol for MFO/LFO inspections to include increased spot checks of field practices. Through this requirement, inspectors visit a minimum of three fields at each inspection, confirming compliance with the farm's mandatory nutrient management plan. This increases the length of time to complete each inspection but ensures better compliance with the mandatory nutrient management plans on these farms. In 2015, the Agency has focused on assessing the quality of nutrient management plans being provided to farmers by certified planners in addition to how well farmers comply with plans in practice. This information is the foundation for establishing a sound program of certified nutrient management planners and re-establishing the expectations on record keeping and notification when farms alter their plans.

AAFM will increase the number of inspections, increase time on farms with field checks and accommodate for future size and technology growth of permitted farms. AAFM will coordinate enforcement information to ensure consistent progress, and maintain a database to ensure ranking of high priority farms.

Small farm inspections and compliance

2014 was the first year that AAFM had a staff person solely dedicated to small farm inspections. The number of inspectors at the Agency will increase to seven from four in 2015-2016 which will allow for increased inspection of small farms. Small farms have not been inspected regularly in the past, and Act 64 requires development and implementation of an inspection and certification process for small farms.

Enforcement

The passage of Act 64 increased the ability of AAFM to enforce on water quality regulations. This new authority allowed for emergency assistance orders to protect water quality, mandatory corrective actions and the authority of AAFM to require the reduction of livestock where livestock waste exceeds farm capacity and no remediation is possible. This legislation also provides AAFM with civil enforcement authority to enjoin activities, order corrective actions and levy civil penalties of up to \$85,000 for violations.

Also under this new legislation, the Vermont Property Valuation and Review can remove agricultural land or a farm building from the Vermont Use Value Appraisal program if the owner/operator has been identified by AAFM as out of compliance with water quality requirements or not in compliance with an enforcement order for an agricultural water quality violation.

CAFO permit

The CAFO general permit is a federal Clean Water Act permit for MFOs managed by the Vermont Department of Environmental Conservation (DEC) since June 2013. It requires farms to properly design, construct, operate, and maintain production areas to control waste. The permit prohibits a discharge of manure, litter, or wastewater, except when direct precipitation equivalent to or greater than a 25-year, 24-hour storm event causes a discharge. Any farm, regardless of size, that directly discharges to a surface water body could be required to obtain a CAFO individual permit. There are currently no CAFO permitted farms in Vermont. The CAFO program manager inspects a minimum of 12 farms each year per agreements with EPA, but consistently achieves a higher rate. The farms are chosen based on discussion with AAFM and review of past water quality concerns and are of all sizes. Priority is given to farms with previous violations and those in priority watersheds. DEC will increase this level of inspection with a focus on farms in critical watersheds in the Lake Champlain Basin.

IMPLEMENTATION MECHANISM

AAFM and DEC will continue to prepare annual compliance reports as required to meet the goals outlined below in the implementation steps. The compliance reports will contain state-verified information, including but not limited to compliance with nutrient management plan requirements, and the nature of any documented discharges. DEC, AAFM and the Attorney General's office have also increased regular coordination, resulting in substantial enforcement and penalty actions in 2014.

IMPLEMENTATION STEPS AND TIMEFRAME

1. DEC, in cooperation with AAFM, will conduct inspections of potential CAFOs.

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|---|------------|
| A. Minimum of 12 inspections annually in Lake basin | 2014-18 |
| B. Minimum of 75 inspections annually | after 2019 |

2. AAFM will inspect all LFOs and MFOs within the Lake Champlain basin

| | |
|---|-------------------|
| A. All LFOs | Annually |
| B. All MFOs | Every three years |
| C. Enhance MFO inspection protocols | 2014 |
| D. Enhanced NMP compliance (3 field checks) | 2014 |

3. DEC and AAFM will continue to conduct on-farm multi-agency inspections to ensure consistency in the inspection process

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|--|-------------|
| A. Agencies will conduct a minimum of 10 joint inspections | Annually |
| B. DEC and AAFM will hold trainings for inspection staff | Bi-annually |

4. AAFM and DEC will continue to produce compliance reports that will be shared between agencies Annually
5. DEC and AAFM will continue to coordinate inspection and enforcement actions per the 2007 MOU and has begun quarterly compliance meetings to increase coordination.
 - A. DEC and AAFM representatives will meet to share current activity Monthly
 - B. DEC, AAFM, Attorney General and DEC Compliance & Enforcement Division (CED) will meet to share current activity Quarterly
 - C. DEC and AAFM will update the 2007 MOU 2016

ACCEPTED AGRICULTURAL PRACTICE RULE UPDATE AND COMPLIANCE

DESCRIPTION

Act 64 requires significant changes to Vermont's Accepted Agricultural Practices, including a name change to the "Required Agricultural Practices" or "RAPs", reflecting the fact that these practices are not and never have been optional. The Vermont Accepted Agricultural Practice Rule (AAPs), require that all farms in the state, regardless of size and type of operation, adopt and implement a set of minimum conservation practices to protect water quality. Examples include the winter spreading ban which forbids spreading between December 15 and April 1, no allowance for any direct discharges, minimum 10' buffers along surface waters, no stacking or storage of manure on lands subject to annual overflow, and mortality management requirements. The AAPs do not currently require a written nutrient management plan (NMP), however the rules require compliance with many aspects of nutrient management planning, including required soil tests every five years, applying nutrient applications consistent with soil tests, and meeting 2T (soil erosion tolerance). Education and enforcement of these provisions of the AAPs has been limited due to lack of resources. The AAPs will be revised and strengthened in 2016 and renamed to RAPs.

To date the AAP program has not been inspection-based like the MFO and LFO programs due to limited resources. AAFM has never received funding specific to enforcing the AAPs, rather this program is essentially driven by internal or external reports of possible violations and was previously dependent on investigative staff whose primary focus was pesticide, feed, and fertilizer work per their funding sources.

State-initiated and public complaints about suspected rule violations result in site investigations to determine compliance with the rule. With the current staffing level, AAFM performs approximately 120 investigations annually. The investigations target specific complaints or obvious violations and do not involve evaluating the entire farm operation to determine the extent of AAP compliance. Understanding this staff resource limitation and the water quality need to ensure compliance with the AAPs, AAFM committed to a targeted small farm inspection program, and has already taken steps to start this process. Additional budget funding in 2014 allowed for AAFM to hire a small farm inspector who is focusing outreach and evaluation efforts in the priority watersheds of St. Albans and Missisquoi Bay. Since hiring, this inspector has visited more than 200 farms, providing education about the AAPs and assessing water quality needs for following assistance, and where appropriate, enforcement

Act 64 also provides funding for an additional three inspectors who will be hired in 2015-16. AAFM will expand its small farm inspection program; initially prioritizing dairy farms, but will also address any significant livestock farms that are in priority watersheds. Significant livestock farms will be determined based on size, location, proximity to water, and any potential or actual water quality concerns.

In June, 2015, AAFM initiated the *North Lake Farm Survey*. Through this process, AAFM staff were redirected from their statewide territories to focus on all known agricultural operations in the priority Missisquoi Bay and St. Albans Bay watersheds in Franklin and Orleans Counties. Each farm is being visited for an assessment of water quality concerns and needs. Farms are being informed of water quality concerns and resources available for assistance. Farms with direct discharges are being referred to DEC as required by state statute. Approximately 350 livestock operations are being visited.

This same process will be duplicated in additional watersheds. All small dairies in South Lake will be evaluated by the end of 2019. All small dairies and significant livestock operations in the Lake Champlain basin will be evaluated by the end of 2020. AAFM intends on training staff to conduct whole farm inspections as part of the investigation process. AAFM believes that each inspector can address 75 farms per year (including inspection and enforcement).

Vermont recognizes that further reductions of agricultural nonpoint source pollution will necessitate taking additional, aggressive actions pertaining to the AAPs to reduce water pollution and achieve a more consistent and equitable regulatory environment for all farms. AAFM also recognizes the enormous need for education about the current regulations as well as any proposed additional requirements, and are working closely with non-regulatory partners who can, and have already taken steps to help with that outreach.

Act 64 requires specific changes to the AAPs. These changes, as described below, will go through public comment and rulemaking with implementation required by the Legislature by July 2016. Each action will require extensive outreach and education towards implementation of the rules and remediation of water quality problems. Upon completion, AAFM has the immediate authority to enforce any violations, and does not need additional statutory changes to proceed with compliance.

Update AAPs to require changes in buffers, gullies, and erosion

Currently MFOs and LFOs are required to have 25 foot buffers and meet an erosion standard of “T”, while small farms are allowed to have 10 foot buffers, with 25 feet at points of runoff, and meet “2T”. Research has proven the value of larger buffers for water quality, and reducing the erosive loss from fields and gullies has been well documented and provides a great potential for decreasing sedimentation to surface water. The RAPs will require consistent buffers across farm sizes, manure setbacks of 25 feet on all perennial streams, 10 foot buffers on field ditches, stabilization of field borne gully erosion, and reducing the field tolerable soil loss for fields in annual crop production to “T”.

All MFO and LFO farms, and SFOs that have nutrient management plans (NMPs) through state and/or federal cost-share programs must meet the federal NRCS 590 standard which includes the requirement that any watercourse, regardless of flow, that can be determined to be significantly transporting nutrients or sediments must be buffered 25' from annual crop production and manure application. There is currently no buffer requirement specific to intermittent streams in the AAPs, however the AAPs state that a farm cannot apply wastes directly into surface water or have over- applications of nutrients that cause runoff of wastes into surface waters. The proposed changes to the AAPs are intended to level these requirements and limit confusion. The enforcement of this new standard will be accomplished with field spot checks on farms in the NMP cost-share programs and inspections on the permitted farms to ensure compliance with the NMP.

These changes are important for water quality improvement but also for the agricultural community. The Ag Workgroup which provided extensive input to the process for amending the AAPs recommended consistency among farms in regulations where possible. These rule changes will require extensive outreach and education to farmers, especially changes in regards to erosion tolerance. Many small farms are not aware of their current erosion rates, and lack the technical knowledge and software to determine this and the appropriate practices changes without assistance. Management changes will be necessary on many farms to meet the required "T" level.

Update AAPs to require changes in livestock exclusion regulations

The AAPs currently require that adequate vegetation be maintained on streambanks by limiting animal access and trampling. The proposed change to the AAPs will explicitly exclude livestock from perennial streams where erosion is prevalent and in all production areas. This change will clarify the requirement for livestock exclusion in critical source areas.

The Agency believes that targeting the highest priority locations for livestock exclusion will yield the greatest cost-benefit for water quality. With limited resources to implement a wide variety of non-point source agricultural pollution strategies, targeting resources to the highest priorities is the best strategy for the near term phosphorus reduction benefits. EPA estimated that pasture accounts for 3.8% of the total phosphorus loading to Lake Champlain and AAFM believes this AAP change will significantly reduce a major portion of this. Extensive research has clearly demonstrated that eroding land is a substantial contributor to nutrient loading, and this approach of targeting eroding banks will provide focused attention to the higher benefit opportunities. Prioritizing these targeted areas will also provide the opportunity to focus remaining resources on addressing the cropland loadings which are estimated to be 35.2% of the total Lake loading.

Under this proposed change in the AAPs, erosion at any section of a stream where animals have access, except at defined stream crossings, would trigger the requirement for mandatory exclusion. Exclusion would be required for the length of the stream and will address any areas where erosion is of high potential, and will not be limited only to the eroding section. The Secretary will evaluate any questionable sites on a case-by-case basis and maintain the option of requiring exclusion where *any* water quality impacts exist.