VERMONT

Vermont Department of Environmental Conservation *Agency of Natural Resources*

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March 31, 2014

(Via Electronic Mail)

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United States Environmental Protection Agency, Region One
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Boston, MA 02109-3912

Subject: Draft Phase One Plan: Lake Champlain Total Maximum Daily Load

Dear Mr. Perkins:

In response to your letters dated January 17, 2014 and February 13, 2014, please find enclosed a draft "Phase One Plan". The Department has developed this plan to satisfy the requirements of the federal Clean Water Act's total maximum daily load (TMDL) being developed by EPA. This plan is designed to reduce pollution into the Lake using an approach that is comprehensive, covering the major sources of phosphorus runoff, and targeted, taking advantage of information and tools developed over the past decade to address the most critical areas. The Department's Draft Phase One Plan has also been developed with the goal of prioritizing the most cost-effective and common sense approaches using a mix of policy tools including regulations, funding and incentives, and education and outreach.

I am not yet confident that the Department's current draft of the plan will meet the load reductions expected in the TMDL, due to the fact that EPA has not yet provided, as planned, the preliminary modeling results showing the phosphorus reduction targets. Further, we may want to revise these proposals once we receive EPA's promised cost effectiveness analysis describing the relative cost per pound of phosphorus removed for various pollution control practices.

Request:

We request that EPA provide comments, including preliminary modeling results and the cost effectiveness analysis, on this Phase One Plan in time for the Department to fully consider and make appropriate revisions to this Phase One Plan prior to submitting the Plan to Vermont Governor Peter Shumlin for his consideration. You have requested that Governor Shumlin provide a letter of commitment to accompany the final Phase One Plan by April 30. In the event that you are not able to provide comments prior to April 15, we request an extension of time for the Governor's submission to allow time to fully consider any of your concerns.

A Brief History:

As you review the attached Plan, it may be helpful to recall the timeline of activities and work leading to the Plan's development:

1. EPA withdrew its prior approval of the State of Vermont's 2002 Lake Champlain Phosphorus TMDL in January 2011;
2. EPA and its consultant Tetratech developed scientific models of phosphorus loading in the Lake Champlain watershed as well as a model showing the reductions of phosphorus load associated with a range of pollution control strategies, work that began in 2011 and is not yet complete;
3. You have joined me to appear by telephone or in person before committees of relevant jurisdiction in the Vermont General Assembly on the TMDL process in each of the past four legislative sessions;
4. You joined me in Vermont in the Fall of 2011 for a series of public meetings across the Lake Champlain Basin to gather Vermonters' suggestions for ways to reduce pollution into the Lake;
5. EPA and the Department met numerous times from 2011 to 2013 as EPA developed scientific models and cost effectiveness estimates, and the Department developed a menu of policy options reflecting available scientific, monitoring and cost effectiveness information and which reflected and public input;
6. The Department and Agency of Agriculture, Food and Markets met numerous times with the farm community and other interested persons to develop a set of practical recommendations for reducing phosphorus into the lake;
7. In November 2013, DEC released a "Draft Proposal for a Lake Champlain" for public comment with an outline of proposed actions. The Department and EPA, along with Vermont's Agency of Agriculture, held a series of well-attended public meetings across the watershed to explain and receive comments on this proposal;
8. On January 17 and February 13 off this year, EPA provided comments on the Department's draft proposal, mostly positive, indicating that the proposal was "broad in scope and ambition, appropriately reflecting the challenge of restoring the health of Lake Champlain" and
9. In those same letters, EPA also requested more detail regarding the Department's proposal in the form of a draft Phase One Plan by March 31, and a final Phase One Plan accompanied by a letter of commitment from Governor Shumlin by April 30. The attached plan is in response to the first deadline in that request.

An Overview:

The Department's draft Phase One Plan includes all of the proposals for controlling polluted runoff included in our November 2013 draft, spelled out in greater detail. In addition, we have added some additional non-regulatory elements in an effort to achieve the reduction targets. Further, we have added a specific element of this plan relating to climate change in response to EPA's request. Similarly, we have added new elements relating to Missisquoi Bay, St. Albans Bay, and the South Lake segment.

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. We will use the models and load allocations still being developed by EPA to further refine these commitments.

This draft Phase One Plan does not allocate any phosphorus reductions to wastewater treatment plants in the Lake Champlain Basin. The load associated with these plants is small, approximately three percent, and is dwarfed by other sources. 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 the water quality standard for phosphorus. The attached Plan includes a broad array of actions sufficient to meet the "reasonable assurances" standard that EPA must apply under the Clean Water Act.

A Schedule and Accountability:

DEC is proposing the following schedule for implementation of the TMDL:

1. Department seeks authority and funding for implementation of the Phase One Plan: 2014-2016
2. Department develops and implements Phase Two Plans for each basin (tactical basin plans): 2016-2036.

The Department 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 fund plans as a means of keeping costs and funding burdens down.

The Department anticipates that EPA will propose an accountability framework and is proposing a schedule including five year milestones for reporting and evaluating progress towards goals in the implementation plans. You indicated in your January 17, 2014 letter that consequences for failing to make adequate progress could involve (a) requiring wastewater treatment plants to meet phosphorus effluent limits based on limits of technology and to obtain offsets for the remaining phosphorus loads, and (b) expansion of federal Clean Water Act permit coverage to cover a larger scope of activities (separate storm sewer systems, developed areas subject to residual designation authority, and animal feedlot operations).

Funding and Capacity:

While the Department is already committing significant resources to controlling water pollution into Lake Champlain, we will need additional capacity, as will our partners Agency of Agriculture, Food and Markets, Agency of Transportation, and Department of Forests, Parks and Recreation in order to fully implement this Plan. Some of our proposals also envision passing funding through to communities and farmers to provide incentives or assistance for undertaking the necessary investments in pollution control. Upon receiving EPA's approval of the Phase One Plan as proposed, the Department will work with our state agency partners to request additional federal funds, and will seek additional state funding as necessary.

Overview of Lake Champlain Basin Water Quality Issues:

In order to understand this proposal, it is important to recognize that Vermont's small, rural population and largely undeveloped landscape presents a unique challenge, different than in many other parts of New England which are much more heavily developed. Vermont is a rural state with a population of just over 600,000. The population density of the Lake Champlain Basin as a whole is 61 people per square mile. At 8,234 square miles, this drainage area is remarkably large, measuring nineteen times larger than the surface area of the Lake itself. Ninety percent of the water that enters Lake Champlain flows through the Lake's drainage basin before it reaches the lake. Land cover is dominated by forested land (~ 60%) and agricultural land (~30%). Impervious cover across the basin is estimated at three percent. Any effective plan must recognize these facts and constraints.

Summary of Proposed Actions:

A. Farms: Agriculture is the largest source of phosphorus load into Lake Champlain, estimated to be approximately forty percent of the total load. Reducing polluted runoff from farms is by far the most cost effective investment we can make in reducing phosphorus. The Department, in partnership with the Agency of Agriculture, Food and Markets is proposing to (1) Increase inspections and compliance efforts for all farms with a focus on small farms which have been largely unregulated in the past; (2) Implement a livestock exclusion program through regulation and incentives; (3) Update regulations governing farm stormwater control practices; and (4) Update requirements for and increase investment in nutrient management planning.

B. Transportation: Transportation related stormwater pollution constitutes approximately ten percent of the total phosphorus load and it is second only to agriculture as the most cost-effective investment. The Department is proposing to undertake two major new programs: (1) A "TS4" permit for state roads modeled on the Municipal Separate Storm Sewer System Permit ("MS4") under which the entire state road network will be regulated under a general permit that allows our state transportation agency to operate under one stormwater permit; and (2) A Municipal Roads Stormwater General Permit requiring the development and implementation of stormwater management plans for local roads. We are evaluating options for increasing state transportation funds, and are building a strong local roads technical assistance program with the Vermont Agency of Transportation.

C. River Stability: River and streambank erosion is estimated to constitute over twenty percent of the phosphorus load into the lake. As a consequence of climate change, Vermont is experiencing an increase in extreme weather patterns with a significant and measurable increase in the frequency and intensity of precipitation. Following the floods in 2011, the region experienced an object lesson in the sheer amount of sediment that flows off of the landscape during flood events. In 2011, for instance, 75% of the phosphorus load into the lake from the Winooski River sub-basin was associated with just two storm events.

   The Department's recommendations in this category for long-term reductions involve restoring stream and river equilibrium through giving our rivers "room to move." Much of the cost of addressing river and streambank erosion is in the form of land conservation and strategic floodplain restoration. The benefits go well beyond water quality and include a substantial reduction in flood damage. Using data from recent flood events, DEC is establishing updated

standards for state land use permits (Act 250), development exempt from municipal regulation, and state development in floodplains. DEC is also promoting adoption of these updated standards by local governments through the National Flood Insurance Program.

D. Developed Land: Although the Lake Champlain basin has a small percentage of developed land (~3-5%), stormwater runoff from developed lands (apart from transportation) makes up about ten percent of the total phosphorus load into the lake. The costs of various practices ("best management practices") vary widely and DEC is proposing an approach under which towns and cities will be able to develop plans which allow them to prioritize stormwater control projects to optimize investments and to implement those plans over time. DEC is proposing a new general permit for existing developed lands including a first stage in which sites with greater than three acres of impervious cover will be required to obtain permit coverage, and a second stage in which municipal stormwater systems where high density (greater than 7%) impervious cover exceeds fifteen acres. The permit will require stormwater management and phosphorus control plans. We are also implementing an Executive Order promoting the use of green stormwater infrastructure.

E. Other: DEC's plan also includes components to make up the remaining portion of the phosphorus load. The proposal includes actions relating to (1) improving forest harvesting practices, improving forest health and restoring forest lands, (2) restoring and conserving wetlands, (3) protecting and restoring lake shorelands, and (4) expanding state funding for local and regional stormwater pollution management programs.

Conclusion:

The Department has developed a comprehensive and strategic proposal and look forward to your feedback. As noted at the outset, we request that EPA provide comments as soon as possible so that the state has time to consider comments to the Phase One Plan before submitting to the Governor, and so that the Governor has time to fully evaluate this proposal before we finalize. We understand that EPA Region One has recently faced an unexpected loss of staff working on this project and will understand if you need some additional time beyond April 15 to get comments to the State. If that occurs, we simply ask that you give us a proportional extension of time for the Governor's commitment letter.

Sincerely,

David K. Mears, Commissioner
Vermont Department of Environmental Conservation

3/31/14 DRAFT
FOR EPA REVIEW

EPA LAKE CHAMPLAIN

PHOSPHORUS TMDL

VERMONT PHASE 1 PLAN

VERMONT

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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 and in excessive amounts can impair recreational uses, aesthetic enjoyment, the taste of drinking water, and the biological community. In some cases, algal blooms – particularly cyanobacteria or blue-green algae - can produce toxins that harm animals and people.

Since the passage of the federal Clean Water Act in the 1970s, Vermont has made significant gains in controlling end of pipe or "point source discharges" of phosphorus through permits for wastewater treatment facilities and collected urban stormwater. The State and federal government have collectively invested over $600 million for wastewater treatment. This investment continues to pay substantial dividends to public health and safety, local economies, and the environment. Likewise, since the inception of Vermont's stormwater program in 1978, significant monies have been spent by state, municipal, town and private entities to control channelized runoff from parking lots, roadways and other impervious surfaces.

In addition to controlling wastewater and urban stormwater discharges, Vermont has invested heavily in controlling phosphorus contributions to the Lake from "nonpoint sources," which include more diffuse sources such as:

- Stormwater runoff from developed lands, roadways, agricultural lands, and construction and logging activities;
- Non-erosion related phosphorus contributions from over-fertilization of cropland, poorly managed storage and spreading of manure, under-treated domestic waste and sewage; and
- River and stream channel erosion from activities that affect a channel's hydrology or later the floodplain and river or stream channel.

Over the past twelve years Vermont has worked extensively to control these nonpoint sources. Vermont has developed a comprehensive stormwater program that has actively worked with public and private entities to control stormwater runoff from developed lands, such as rooftops, driveways and roadways. The State has reduced stream bank and bed erosion that contributes sediment carrying phosphorus, actively implemented river corridor and wetlands restoration projects, and worked diligently with farmers to reduce barnyard and cropland runoff to our waterways.

Despite these efforts, over time the collective contributions of phosphorus from the activities of more than 600,000 Vermonters still significantly impact Lake Champlain. Stormwater runoff from the roofs of homes and driveways contributes small amounts of phosphorus that are washed into streams en masse when it rains or as snow melts. In the agricultural setting, rain washes soil and manure off of crop and hay lands and barnyards and into nearby streams. Streams have also become unstable, due to traditional practices intended to protect buildings, roads, and other investments. These practices were attempts to drain and contain floodwater, keeping streams from spilling into their floodplains, but have also caused streams to shift from their least erosive, equilibrium condition to a highly erosive condition. River bed and bank erosion is increased and the storage of fine sediment on floodplains is reduced, thereby increasing the loading of sediments and nutrients, such as phosphorus, to the Lake. River bed and bank erosion is also the result of traditional drainage methods that increase runoff directly to streams, thereby increasing volume and velocity of stream flows. Finally, treated wastewater, whether it comes through a septic system or a wastewater treatment facility, continues to contribute phosphorus to the Lake.

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 to address the Lake's phosphorus impairment. The TMDL placed a cap on the amount of phosphorus allowed to enter Lake Champlain, and allocated that maximum amount among the various sources, both "point" and "nonpoint," within each major watershed draining to the lake. The 2002 TMDL included a Vermont-specific implementation plan describing a suite of actions and funding to reduce the annual phosphorus load to Lake Champlain. The implementation plan served as a basis for the efforts of the Vermont Agency of Natural Resources (ANR) and Vermont Agency of Agriculture, Food and Markets (AAFM) by guiding annual funding requests, staffing levels, and program priorities. Between 2002 and 2013, Vermont invested millions of dollars to improve water quality in the lake, and in turn leveraged significant federal funding. The State invested in programs to enhance the natural stability of streams and rivers, improve management of Vermont's vast network of municipal and town roads, protect and restore wetlands, limit polluted runoff from developed lands and 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 this unprecedented commitment of Vermont to restoring the Lake, in 2011 the EPA revoked its approval of the Vermont portion of the Lake Champlain TMDL in response to a lawsuit by Conservation Law Foundation. EPA is currently in the process of developing a new TMDL, which will include new phosphorus allocations for both point and nonpoint sources. For this new TMDL to be approved, EPA must find "reasonable assurances" that the necessary nonpoint source phosphorus reductions will actually occur. Insufficient reasonable assurance was the primary reason given by the EPA for reversing its approval of the 2002 TMDL. In most cases, program commitments, funding, technical assistance and regulatory requirements provide reasonable assurance that the nonpoint source component of the TMDL will be achieved. Point source controls are assured through permitting programs, such as permits for wastewater treatment plants and municipal stormwater permits.

By letters dated January 17, 2014 and February 13, 2014, EPA has asked Vermont to provide policy commitments to implement additional nonpoint source control measures to support EPA's new TMDL. EPA's expectations are divided into two distinct planning phases. For the first phase, EPA expects Vermont to provide final policy commitments relating to nonpoint source phosphorus reductions in a basin-wide scale implementation plan (Phase 1 Plan) by March 31, 2014. After EPA finalizes the TMDL later in 2014, it expects the State to develop numerous sub-basin implementation plans (i.e. Phase 2 Plans) for each lake segment. Each sub-basin plan will identify in more detail the basin-specific point source and nonpoint source measures and practices to be implemented by identified dates.

ANR and AAFM have already been working diligently over the past year to develop the types of policy commitments requested by EPA. A draft proposed set of commitments, the November 20, 2013 draft State Proposal for a Clean Lake Champlain (Appendix D), was issued for public comment. As part of this 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 and took public comments on the draft State Proposal for a Clean Lake Champlain; 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 and used these comments to inform the development of this Phase 1 Plan. A summary of these public comments is provided in addition, a list of Frequently Asked Questions is provided in Appendix G.

The policy commitments described in Chapter 5 of this Plan, and summarized in Table 1, build on the draft November 2013 State Proposal for a Clean Lake Champlain. These policy commitments will work to further reduce major nonpoint sources of phosphorus, including:

- Untreated/unmanaged runoff from existing developed lands;
- Discharges from farmsteads & 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 modifications;
- Legacy effects of historic phosphorus loading; and
- Additional phosphorus contributions anticipated due to climate change.

These commitments include new and enhanced regulation, funding and financial incentives, and technical assistance, and build on work already done by the State to reduce phosphorus contributions to the Lake over the past 12 years. They address all major sectors of nonpoint phosphorus pollution shown in Figure 1, and include new and increased efforts from nearly every sector of society, including state government, municipalities, farmers, developers, businesses and homeowners.

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 fund plans as a means of keeping costs and funding burdens down. DEC is proposing the following general schedule for implementation of the TMDL:

1. DEC seeks authority and funding for implementation of this Phase 1 Plan 2014-16
2. DEC develops and implements Phase 2 Plans for each basin (tactical basin plans) 2016-36.

The Gantt Chart shown in Appendix E describes in more detail proposed schedules for implementation of Vermont's policy commitments.

It is important to understand that EPA's TMDL development is ongoing and that EPA is actively engaged in modelling to determine 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 source and nonpoint 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.

The restoration of Lake Champlain is not a short-term proposition – measured in months or even a handful of years. The Lake's current condition reflects over a century of human influence on the Vermont landscape, as well as those of adjacent areas of Quebec and New York – with a total of more than 8,000 square miles draining to the lake. Likewise, it will take decades to restore the Lake and will be a shared responsibility of everyone – municipalities, farmers, homeowners, businesses, developers, the public, and regional, state, and federal agencies alike. Such a large task will only succeed with the collective support and effort of current and future generations of Vermonters.

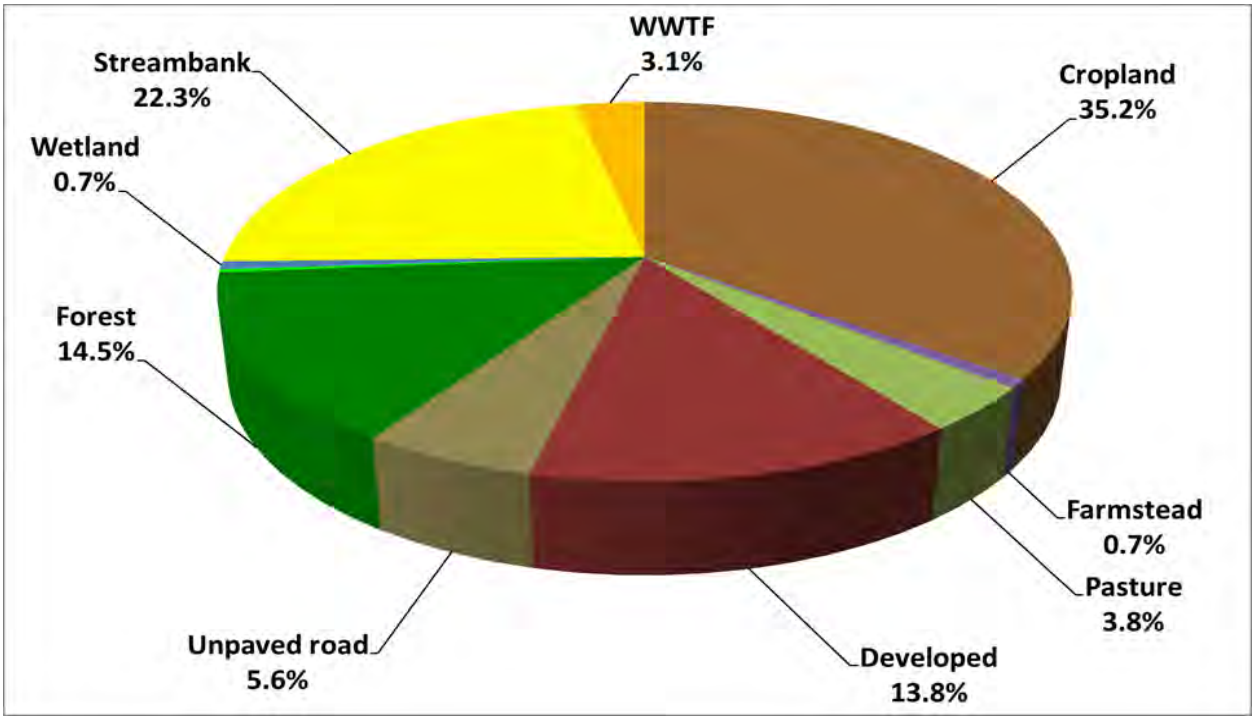

FIGURE 1 - SOURCES OF PHOSPHORUS LOADING TO LAKE CHAMPLAIN FROM VERMONT WATERSHEDS (FROM EPA/TETRA TECH, 2013)

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

AGRICULTURE	
Commitment/Strategy	**Description**
Increase inspections	Increase the inspections of medium and small farms.
Amend the VT regulatory Accepted Agriculture Practices	Complete rulemaking to add a small farm certification program, consistent buffer sizes and erosion tolerances to all farms, buffer requirements for field ditches, requirement for stabilization of gully erosion and strengthening of the livestock exclusion requirements.
Increase the Small Farm Inspection program (AAFM)	Work toward increasing the number and frequency of small farm inspections.
Develop and implement livestock exclusion program	Develop declining cost-share/incentive program to increase implementation of livestock exclusion practices.
Increase nutrient management planning and implementation of farm and field practices and technologies	Develop matrix for NMPs and small farm NMP template. Assist in plan development. Increase cost-share for NMP development, increase funding for NMP classes for farmers and technical service providers, develop manure applicator certification classes and process. Increase education, technology needs and research needs for NMP development.
Increase implementation of water quality improvement projects in critical watersheds	Prioritize personnel in these areas, secure additional targeted funding to these watersheds and critical source areas.

STORMWATER MANAGEMENT	
Commitment/Strategy	**Description**
Implement State Highway Stormwater General Permit	General permit to regulate stormwater discharges from the entire state-operated transportation system.
Implement Municipal Roads Stormwater General Permit	General permit to require development and implementation of stormwater management plans for municipal roads.
Implement Existing Developed Lands Stormwater General Permit	General permit to address stormwater from existing developed lands.
Implement Non-Regulatory Stormwater Management	Provide technical assistance to municipalities on stormwater master planning as a tool to identify and implement priority actions to control unregulated stormwater runoff.
Provide technical assistance to municipalities in stormwater ordinance development and adoption	Enhance outreach and technical assistance to support municipal adoption of model stormwater ordinances to prevent or minimize stormwater impacts from future development.
Use Green Stormwater Infrastructure to reduce the volume and water quality impacts from stormwater runoff	Increase adoption of low impact development (LID) principles and implement green stormwater infrastructure practices, which utilize and mimic natural processes to reduce the volume of runoff and to provide water quality treatment.

RIVER CHANNEL STABILITY	
Commitment/Strategy	**Description**
River Corridor and Floodplain Management	
Establish a No Adverse Impact Standard in state and local regulations	Adopt state floodplain rules to include river corridor protection to address developments exempt from municipal regulation.
	Revise the State Act 250 Floodway Procedure to include NAI standard
	Establish MOUs with other state agencies to regulate developments within their purview.
	Support the municipal adoption of enhanced model floodplain and river corridor protection bylaws that exceed the NFIP minimum requirements.
Expand technical and regulatory assistance	Provide project reviews and technical assistance to a greater number of communities each year.
	Establish general permits to simplify regulatory processes.
	Establish regional Certified Floodplain Technician Program.
Establish a river corridor and floodplain mapping center	Develop and maintain statewide maps.
	Obtain Light Detection and Ranging (LiDAR) data.
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).
Establish incentives for municipal adoption of regulations	Establish the Flood Resilient Communities Program with funding and technical assistance incentives for municipalities.
Establish and maintain an education and outreach program	Establish 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.
Preventing Adverse Channel Modifications	
Expand technical and regulatory assistance	Regulate stream alterations, including emergency and next-flood protective measures to maximize equilibrium conditions.
	Establish a River Operations Center within an ANR Incident Command System prepared to manage and authorize emergency measures in large scale flood disasters.
Increase the number or 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.
Expand education and outreach program	Develop 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 VTrans 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.
Achieve consistent standards across jurisdictions	Achieve FEMA recognition of state-adopted river management and stream crossing codes and standards for conducting emergency protective measures.

FOREST MANAGEMENT	
Commitment/Strategy	**Description**
Revise Acceptable Management Practices (AMPs) to Maintain Water Quality on Logging Jobs	Require compliance with standards set forth in the state stream alteration general permit.
	Strengthen enforceable standards and provide metrics for AMPs pertaining to stream crossings.
	Enhance stream buffer guidance. Provide metrics for desirable residual stand density stand structure and crown cover.
	Better clarification provided for selection and spacing of water diversions on skid trails and truck roads both during and immediately after logging.
	Increase seeding/mulching requirements of exposed soil adjacent to streams and other bodies of water from 25 feet to 50 feet.
	Enhanced options and guidance with metrics provided for soil stabilization to establish temporary and permanent ground cover.
	Amend state rule.
	Publish revised AMP manual.
Develop a program to provide incentive financing to reduce non-point source pollution risks on timber harvesting operations.	Qualified Logging Professionals would be eligible to obtain low-interest financing from participating banks through a Vermont Forestry Direct Link Loan Program. The purpose of providing this financial incentive is to increase the use of BMPs and environmentally friendly logging equipment in the logging industry.
Abate soil erosion occurring on forest legacy roads.	Leverage existing NRCS cost-share practice to address soil erosion and sedimentation associated with logging roads on private lands.
Maintain & enhance healthy forest cover at a watershed scale to improve watershed health through water interception, filtration, evapotranspiration, and nutrient attenuation.	Establish forest cover goals.
	Use public funding to restore forest riparian buffers.
	Use public funding to restore developed land forest cover.

	Prepare and mitigate impacts to forest cover from invasive tree pests.
Develop climate-smart forest adaptation strategies	Publish and distribute the draft forest adaptation strategy document: "Creating and Maintaining Resilient Forests in Vermont: Adapting forests to climate change." Promote strategies, implement policy, create funding priorities within the Working Lands Enterprise Fund, establish demonstration areas and take watershed specific actions.

WATERSHED PROTECTION AND RESTORATION PROGRAMS	
Commitment/Strategy	**Description**
Ecosystem Restoration Program	
Increase the number of projects to reduce nutrient and sediment pollution from priority unmanaged and unregulated sources of runoff and soil erosion	Expand the availability of capital construction funds in order to increase implementation of stormwater mitigation projects across all sectors, including agriculture and developed lands. Restructure ERP program by placing all WSMD grant and project management in ERP.
Expand technical assistance and education	Provide grant funding to meet technical and educational assistance needs of municipalities and other local partners.
Extend greater assistance to municipalities to control runoff and erosion along gravel roads	Provide greater financial, technical, and educational assistance to municipalities via the VTrans Vermont Better Back Roads Grant Program.
Leverage additional federal and local funds to provide municipalities with capital funds to support stormwater infrastructure needs	Establish a new state revolving fund that is dedicated to providing low interest loans and incentives for municipal stormwater management. Provide technical assistance in stormwater asset management and manage the stormwater loan program.
Vermont Clean Water Improvement Fund	
Establish a dedicated source of funding to support TMDL implementation and address priority actions to achieve clean water statewide	Create a statewide program to administer a fund dedicated to achieving the State's clean water goals.
Tactical Basin Planning	
Existing tactical planning program	Maintenance of base program to include monitoring and assessment staff, data managmenent staff, and watershed coordinators. Support of existing assessment processes; stormwater master planning, stream geomorphic assessment, backroads inventory and assessment, and agricultural environmental management.
Critical Source Area identification system for tactical BMP implementation	Optimized and flexible critical source area modeling tool will be constructed. This 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.
Modeling and BMP Staff support	Construct and implement watershed modeling, and construct and implement BMP tracking.
Enhance watershed coordinator presence in Lake Champlain basin	Enhance Basin coverage, and accelerate updates of Plan implementation tables with watershed modeling results.
Phase 2 Plan Construction	Tactical Planning staff, in partnership with other Division, AAFM, ACCD, and VTRANS staff will construct the Phase 2 implementation plans.
Ongoing Tactical Plan Development	Tactical plans will be re-written every five years, and updated mid-stream, to insert next highest priority phosphorus reduction opportunities.
Regional Planning Commission Support for Tactical Plan implementation	RPC watershed planning support staff for municipal BMP outreach, support, and implementation.
Watershed Association Support for Tactical Plan implementation	Small grants program to provide organizational support for Champlain Basin watershed organizations, to support landowner outreach and promote BMP's installations on non-agricultural lands.

WETLAND PROTECTION AND RESTORATION	
Commitment/Strategy	**Description**
Expand technical, educational, and regulatory assistance	Enhance ability of program to focus significant time on restoration efforts.

SHORELAND MANAGEMENT	
Commitment/Strategy	**Description**
Expand technical, educational and regulatory assistance	Enhance ability of program to focus significant time on restoration efforts.

INTERNAL PHOSPHORUS LOADING IN ST. ALBANS BAY	
Commitment/Strategy	**Description**
Control internal phosphorus loading in St. Albans Bay	Conduct treatment design study and in-lake treatment.

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 the Lake's twelve 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.

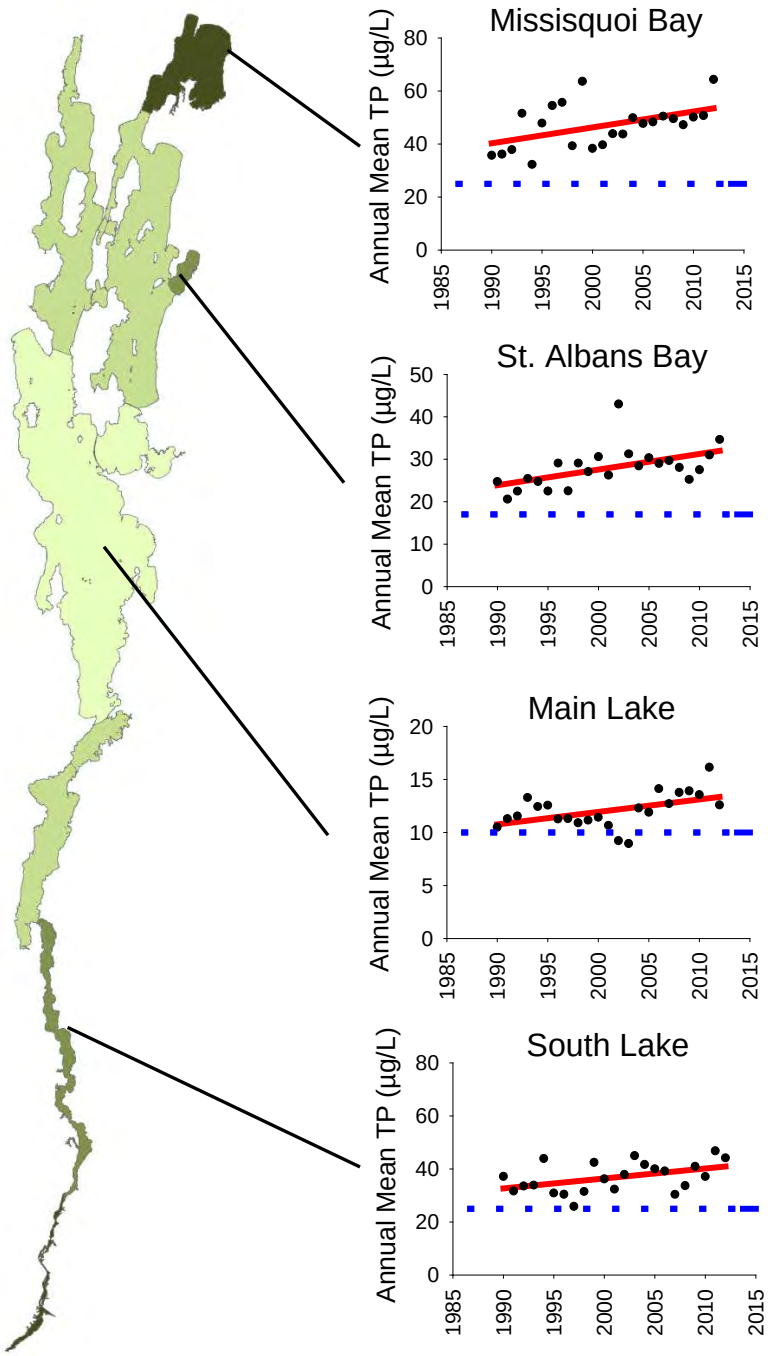

FIGURE 2 - ANNUAL MEAN TOTAL PHOSPHORUS CONCENTRATIONS (TP, MICROGRAMS PER LITER) IN FOUR LAKE CHAMPLAIN SEGMENTS, 1990-2012. SOLID RED LINES ARE STATISTICALLY SIGNIFICANT TREND LINES. DOTTED BLUE LINES ARE THE IN-LAKE PHOSPHORUS WATER QUALITY STANDARD

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.

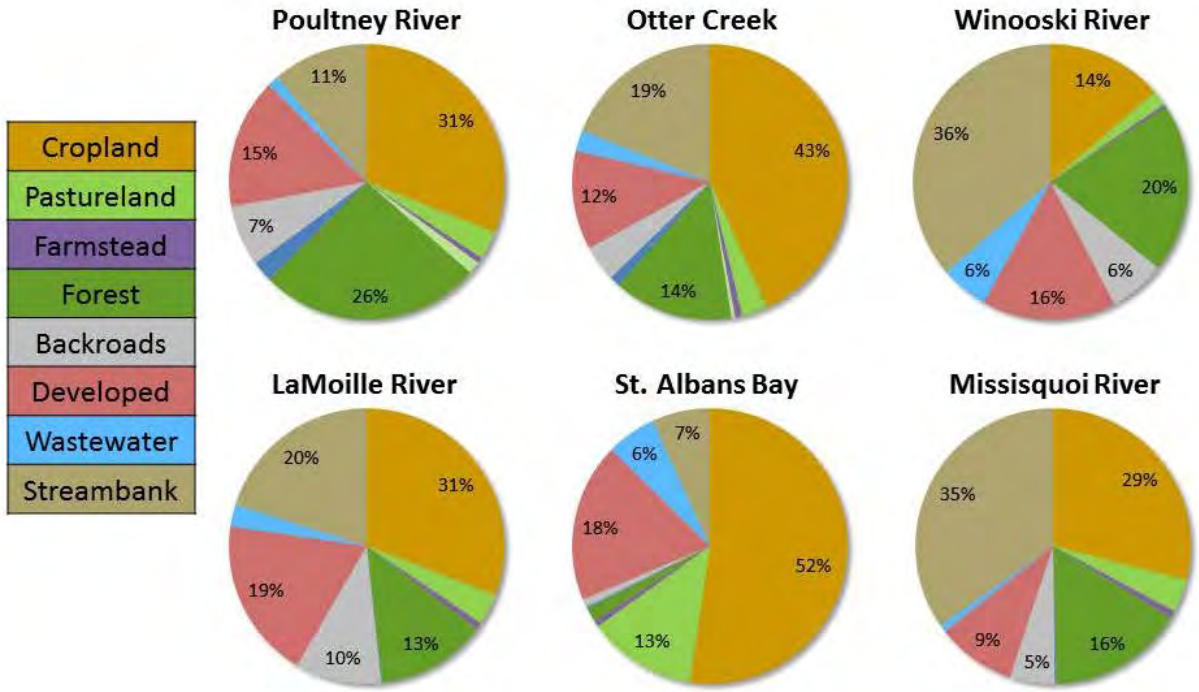

FIGURE 3 - SOURCES OF PHOSPHORUS LOADING TO LAKE CHAMPLAIN FROM VERMONT WATERSHEDS (FROM EPA/TETRA TECH, 2013)

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 and Phase 2 Plans requested by EPA in its January 17, 2014 letter will build upon the 2002 and 2010 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 feed into 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 (AAFM).

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 CONSTRUCTION GRANTS

Since 2002, ERP and its predecessor 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. The table and figure from the Report shown below (**Error! Reference source not found.** and Figure 4) illustrate 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, fifty-four 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 funding by the former Clean and Clear Program and the ERP Program. Figure 5 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**

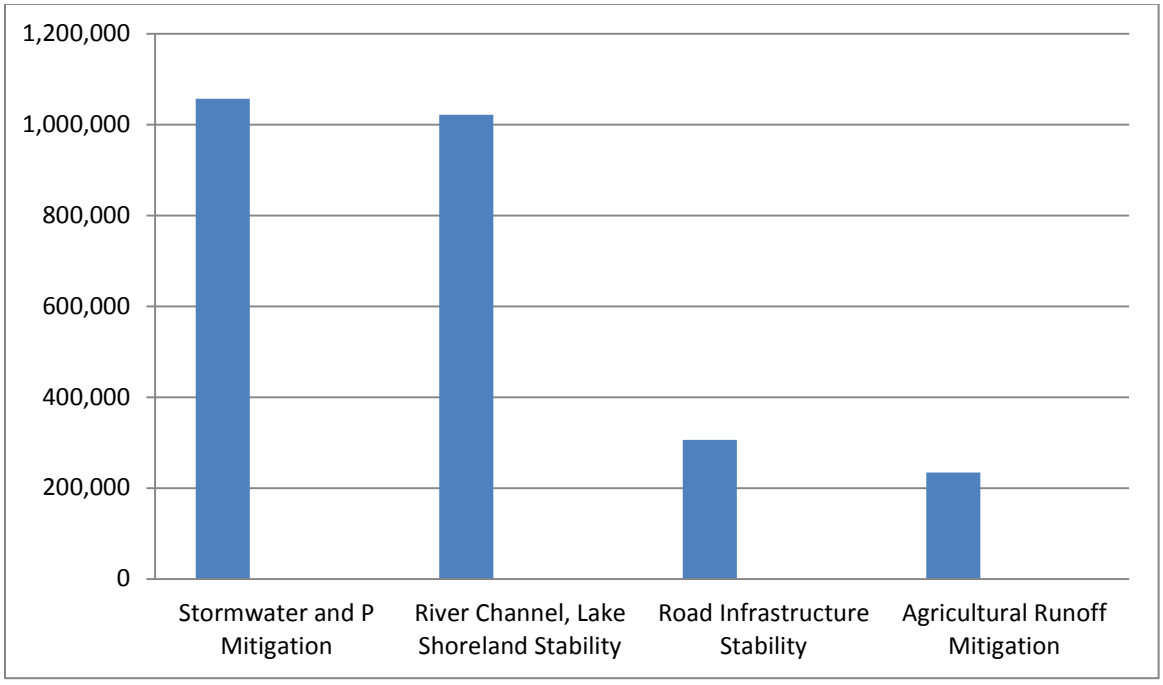

FIGURE 4 - NUMBER OF AGGREGATE SFY13 DOLLARS SPENT BY BROAD PROJECT TYPE

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	$1,356,225	$1,851,000	$1,931,500	$1,881,500	$1,863,090
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	$2,230,340	$2,432,840	$2,842,840	$2,842,840	$2,592,840	$2,916,572
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**	**$6,005,294**	**$4,375,888**	**$6,063,552**

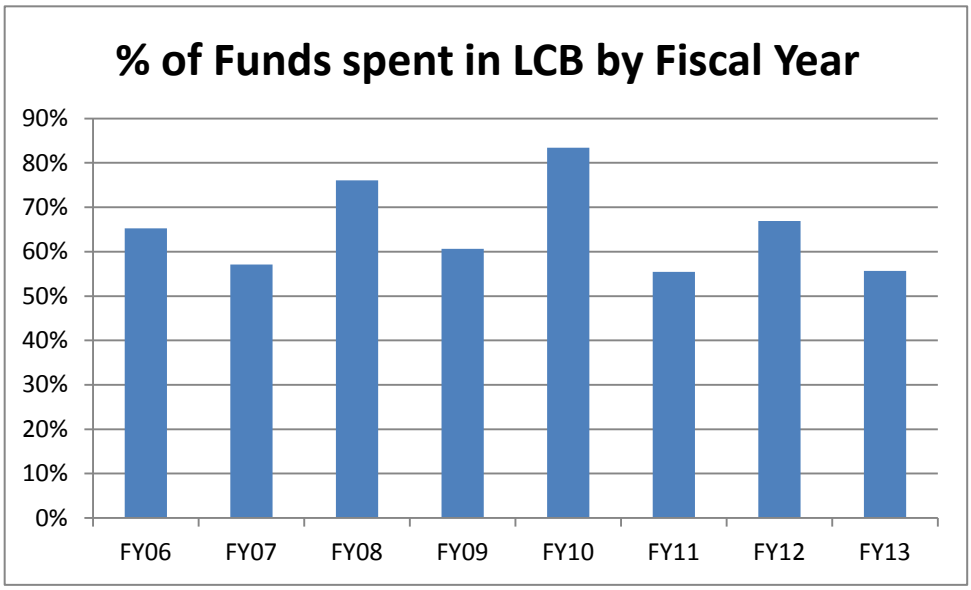

FIGURE 5 - PROGRAM ADMINISTRATION COSTS AND IMPLEMENTATION PROJECT COSTS (SFY 5-15)

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

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	n/a	n/a	n/a

Key, Type of Project:
(I): implementation to address nonpoint source pollution problem
(O): Other nonpoint source effort (e.g. outreach, assessment, inventory or planning)

SECTION 604B FUNDING

ERP also manages the State's Clean Water Act Section 604(b) water quality planning grants. ERP makes available approximately $40,000 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: (a) monitoring and assessment, (b) plan development, and (c) 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 C 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 (conservation plate 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.

The lake modeling analyses developed by EPA are still ongoing, but EPA presented preliminary results at a series of public meetings in Vermont in December 2013. Tributary monitoring data used for the lake model indicated that the current (2001-2010 average) phosphorus load to Lake Champlain from Vermont is 533 metric tons per year (mt/yr), distributed among the various lake segment watersheds as shown in Table 6.

Application of the lake model suggests that the total loading capacity from Vermont is about 343 mt/yr. A net lake wide load reduction of 199 mt/yr is needed from Vermont sources, representing an overall 39% reduction when a 5% margin of safety is provided. However, in order to achieve water quality standards throughout the entire lake, the thirteen individual lake segment total loading capacities must be achieved in each case. The thirteen lake segment watershed loading targets shown in Table 6 are preliminary and specific to the management scenario simulated in this example. The individual lake segment load reduction amounts will vary depending on the wastewater treatment facility plant discharge policy and other allocation decisions ultimately chosen by EPA.

The percent load reductions required in this lake model example range between 26-66% among the lake segment watersheds, with the exception of Burlington Bay where loads are dominated by a single wastewater treatment facility discharge. 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 South Lake B and Missisquoi Bay. Additional efforts will be required in those lake segments.

EPA has not yet determined the final wasteload allocation for point sources and load allocation for nonpoint sources for the TMDL and is still engaged in lake and watershed modelling. However, the preliminary results illustrated in Table 6 demonstrate that achieving the necessary load reductions for nonpoint sources is essential to restoring the Lake and that it 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 - PHOSPHORUS LOAD REDUCTIONS REQUIRED IN VERMONT LAKE SEGMENT WATERSHEDS (EPA PRELIMINARY RESULTS, DECEMBER 2013) COMPARED WITH REDUCTIONS ACHIEVABLE FROM AN EXAMPLE SCENARIO INVOLVING ENHANCED BEST MANAGEMENT PRACTICE (BMP) IMPLEMENTATION AND WASTEWATER DISCHARGES AT THEIR 2001-2010 AVERAGE LEVELS.

Lake Segment	Current Vermont Load (mt/yr)	Total Loading Capacity (mt/yr)	Net Load Reduction Required (mt/yr)	Percent Reduction Required with 5% Margin of Safety	Percent Reduction Achievable from a BMP Scenario
1. South Lake B	41.2	23.9	17.3	45%	35%
2. South Lake A	3.7	2.1	1.5	45%	58%
3. Port Henry	2.8	2.1	0.7	28%	72%
4. Otter Creek	137.1	105.5	31.6	27%	37%
5. Main Lake	143.9	104.4	39.6	31%	32%
6. Shelburne Bay	9.0	6.5	2.5	31%	38%
7. Burlington Bay	3.0	2.9	0.1	6%	9%
9. Malletts Bay	53.6	41.7	11.9	26%	38%
10. Northeast Arm	1.2	1.0	0.3	27%	44%
11. St. Albans Bay	9.3	5.4	4.0	45%	55%
12. Missisquoi Bay	124.7	44.3	80.4	66%	40%
13. Isle LaMotte	3.5	2.7	0.8	27%	57%
TOTAL	533	343	190	39%	

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 and EPA has not yet made a final decision for the Lake TMDL. Therefore, 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 many 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. In some cases, however, EPA will decide to include certain NPDES permitted discharges in the load allocation portion of the TMDL. Since EPA has not made this decision for the Lake TMDL, Vermont is assuming that the following NPDES permitted discharges will be subject to the wasteload allocation in the new TMDL and are not subject to reasonable assurances:

- Wastewater treatment discharges subject to NDPES 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, and is dwarfed by other sources. 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 the water quality standard for phosphorus. This Plan includes a broad array of actions sufficient to meet the "reasonable assurances" standard that EPA must apply under the Clean Water Act.

Upon approval of the TMDL, WSMD's 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 WSMD's 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.

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" 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 (CAFO) DISCHARGES

The Vermont statewide 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 are 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 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, wetlands, 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, develop 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 [%]	Hydro-carbons [%]
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 as impaired primarily due to stormwater runoff on the 2012 303(d) List. 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 2Stormwater 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 supported a Green Infrastructure (GI) coordinator position that plays 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 ROW. 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 requires 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, which will be 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 the number of miles of Class 1, 2, and 3 town highways in each. 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 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 (AAP)
The Vermont Accepted Agricultural Practice Rule (AAPs), initially adopted in 1995 and updated in 2006, 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. The program was previously overseen on a complaint-driven basis due to limited resources and AAFM has never received funding specific to enforcing the AAPs. Prior to 2013, AAFM performed approximately 120 investigations annually. The investigations targeted specific complaints or obvious violations; they did not involve evaluating the entire farm operation to determine extent of AAP compliance.

In 2013, AAFM hired the first small farm operation (SFO) inspector. 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.

The AAPs provide a required level of management for all Vermont farms. 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 those remediations may be of a high cost. State law requires that these practices must be practical as well as cost effective for farmers to implement.

Medium Farm Operations (MFO)
The MFO program provides coverage under a single state general permit and is managed by the Vermont Agency of Agriculture, Food and Markets (AAFM). All dairies 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 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 (LFO)
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 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 (CAFO) Permits
The Vermont statewide CAFO general permit is administered by the VT Department of Environmental Conservation and is a federal NPDES permit (National Pollutant Discharge Elimination System). 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, 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.

TECHNICAL ASSISTANCE AND FUNDING PROGRAMS - VERMONT AGENCY OF AGRICULTURE, FOOD AND MARKETS

Best Management Practices Program (BMP)
The agricultural BMP Program provides funds to farmers for construction of farm improvements designed to abate non-point source agricultural waste discharges to waters of the state of Vermont. Such construction must meet standards that are consistent with goals of the federal Water Pollution Control Act and with state water quality standards. While farmers may realize an economic benefit from BMPs, it is unlikely that they will be affordable without governmental cost sharing. Commonly funded production area practices include waste storage facilities, silage leachate systems, milkhouse waste systems, and barnyard runoff collection.

Alternative Manure Management Program (AMM)
The AMM Program provides funding to farmers interested in implementing new technologies dedicated to enhancing water quality and improving waste management. Projects funded through this program have included solid separation, nutrient removal, and waste treatment systems.

Conservation Reserve Enhancement Program (CREP)
In partnership with the USDA, the CREP Program is an enhanced version of the federal USDA Conservation Reserve Program and provides increased 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. 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 (FAP)
The FAP provides farms with state financial assistance for implementation of soil-based practices that improve soil quality, increase crop production, and reduce erosion and agricultural waste discharges at up to $5,000 per farm per year. Eligible practices are cover cropping, 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.

Nutrient Management Incentive Grant Program (NMPIG)
The NMPIG currently provides for the development of a nutrient management plan (NMP) for a farm and three additional years of updates. Plans must meet the USDA/NRCS 590 standard to receive payment. Farms with NMP's that have completed the NMPIG or farms that developed their plans through alternate means can apply for annual update payments for up to three years. AAFM is considering not funding NMPs through this program in the future and instead directing producers to the higher cost-share through the USDA EQIP program.

Vermont Agricultural Buffer Program (VABP)
This buffer program 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.

US DEPARTMENT OF AGRICULTURAL FEDERAL PROGRAMS

Federal programs, funded through the US Agriculture Act of 2014 (commonly known as the Farm Bill), assist 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. $18.7 billion has been authorized nationally over the next five years, and due to "regional equity" provisions, Vermont has received substantial water quality improvement funding in recent years. In 2013, NRCS obligated $7.6M for the Environmental Quality Incentives Program (EQIP) which provides up to 80% cost share funding for barnyards, manure pits and sileage leachate systems as well as nutrient management plans. $4 million was obligated in the Farm and Ranchland Protection Program (FRPP) for 23 easements (3,000 acres), that had 63% prime and statewide ag soils. The Wetland Reserve Program (now combined with other programs in the new Farm Bill) funded 284 acres of restoration, however funding was far below normal due to delayed appropriations and the federal shutdown.

USDA allocations have also funded several valuable individual projects in Vermont. In 2013, over $500,000 went towards the America's Great Outdoors initiative and the NRCS National Water Quality Initiative which provided focused funding to eligible producers in the Rock River and Missisquoi Bay watersheds. Additional EQIP funding went towards the "edge-of-field"

monitoring projects that are assessing the water quality improvement value of several key BMPs on VT farms. The Conservation Innovation Grant program provided $220,000 in several grants that will develop a web-based tool for optimizing BMPs on farms, two grants that focus on soil health, one that will demonstrate reduced tillage systems and their viability on heavy clay soils, and one that will validate the effectiveness of cover crops as an alternative to fall plowing. 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 securing funding (through grants or other programs). Conservation District programs include:

Agricultural Resource Specialists

VACD oversees the 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 Practice (AAP) regulations. The Agricultural Resource Specialist works with farmers on developing strategies specific to the farm, accommodating seasonal changes and soil characteristics. If strategies involve implementation costs, the Resource Specialist 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.

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 (LTP)

Land Treatment Planners are VACD staff who assist farmers in developing land treatment plans, the foundation of a full nutrient management plan (NMP). 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.

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.

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 working to provide technical assistance in the southern Lake Champlain watershed with research and practical applications;
- Northwest Crops and Soils Team that provides the best and most relevant crop information, both research based and experiential;
- Extensive research on corn trials and short season corn, alternative crops, cover crops and nutrient management;
- goCrop mobile application for nutrient management;
- Equipment rental and education programs; and
- Workshops, seminars and symposiums of research and program results.

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 14.5 % of the total nonpoint phosphorus load delivered to the Lake comes from forestland. With forest covering more than 4.6 million acres 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.

VERMONT HEAVY CUTTING LAW

The Vermont Legislature passed the "heavy cutting law" in 1998. The purpose of the law is to monitor and regulate the amount and approach to heavy cutting undertaken in Vermont. Heavy cutting is defined as cutting below the "C" line in excess of forty acres or 80 acres in a two-mile radius. The "C" line is a silvicultural stocking level provided for in US Forest Service guidelines for managing various forest types. This level establishes the minimum stocking for stands of trees that would allow stands to return to a fully stocked condition. The AMPs (see above) are among the requirements of this law.

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.

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. 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 flood resilience 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 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.

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 MANAGEMENT PROGRAM

Under an annual cooperative agreement with the Federal Emergency Management Agency (FEMA), DEC provides technical support to 242 communities enrolled in the National Flood Insurance Program (NFIP). The River Corridor and Floodplain Management Program provides technical assistance, education and outreach on floodplain management, flood hazard 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. DEC's River Corridor and Floodplain Management Program provides floodway determinations to Act 250 District Commissions and the Public Service Board for Section 248 proceedings. In addition, staff provide river corridor and floodplain development reviews for municipal permits in accordance 24 VSA Chap.117, Section 4424. Technical assistance is available to communities wishing to better protect 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 Vermont Division of Emergency Management and Homeland Security (DEMHS), communities, watershed associations, Regional Planning Commissions (RPCs) and individuals to help plan for, design and implement flood hazard avoidance, reduction, mitigation and recovery planning and projects.

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. FEMA pre-disaster mitigation planning funds in Vermont are also be 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, hazard mitigation planning is complementary to water quality objectives and can be a powerful local planning tool.

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 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. 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).

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 provision of a river corridor easement is the purchase of channel management rights. 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, 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.

The Program currently has one mapping and municipal planning coordinator, three scientists, and three floodplain managers. To date the mapping coordinator has been working on the FEMA RiskMAP program, updating NFIP maps, and assisting municipal bylaws revisions coincident with the map updates. Since FEMA mapping money has become scarce, the mapping coordinator is now focused on the development of river corridor maps, which are currently available to a limited geographical area, and creating model bylaws and other outreach materials to promote river corridor and floodplain protection to support flood resilience planning required by Act 16.

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 carry-out a robust citizen education and outreach program which is critical to any community's willingness to seek the hazard mitigation and water quality benefits of dynamic equilibrium streams and floodplains. The scientists are also responsible for development, quality assurance and upkeep of river corridor maps in their respective watersheds.

The Floodplain Managers each cover approximately one third of the state providing floodway determinations for ten Act 250 projects per manager per year, and each have the responsibility to conduct project reviews for 80+ municipalities. At present only 30% of Vermont towns actively seek floodplain manager 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. Floodplain Manager also spend time working with

multiple municipal planning commissions toward the adoption of enhanced river corridor and floodplain bylaws and coordinating resolution of NFIP compliance issues with FEMA. The Floodplain Managers also provide technical assistance to VT Buildings and General Services, VTrans, and the Agency of Agriculture, Food, and Markets on municipally-exempt developments under their jurisdiction and assisting those 20+ towns that are administering River Corridor bylaws.

RIVER MANAGEMENT PROGRAM

The River Management Program provides regulatory review and 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. Regulation and permitting is conducted pursuant to 10 V.S.A., Chapters 41 and 32 and Section 401 of the Clean Water Act.

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.

STREAMFLOW PROTECTION PROGRAM

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

The Streamflow Protection Program issues 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 steam banks and shorelines.

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 loosing 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.

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. There currently are no state regulations on shoreland development that provide for retention of natural vegetation and phosphorus and sediment runoff avoidance or control. Only about 20% of towns in Vermont have local regulations that provide minimal shoreland protection, and only 2.5% (10 towns) have municipal regulations the Agency considers sufficient shoreland protection (e.g. a vegetated buffer width of 100 feet). DEC's current shoreland protection and management role is largely based on outreach and technical assistance.

LAKE WISE PROGRAM

Lake Wise is a new addition to the Lakes and Ponds Program that provides outreach and technical assistance around shoreland management. 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 improving and consolidating web-based and written information. In addition, 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. 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 holistic 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.

- 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 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. 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.

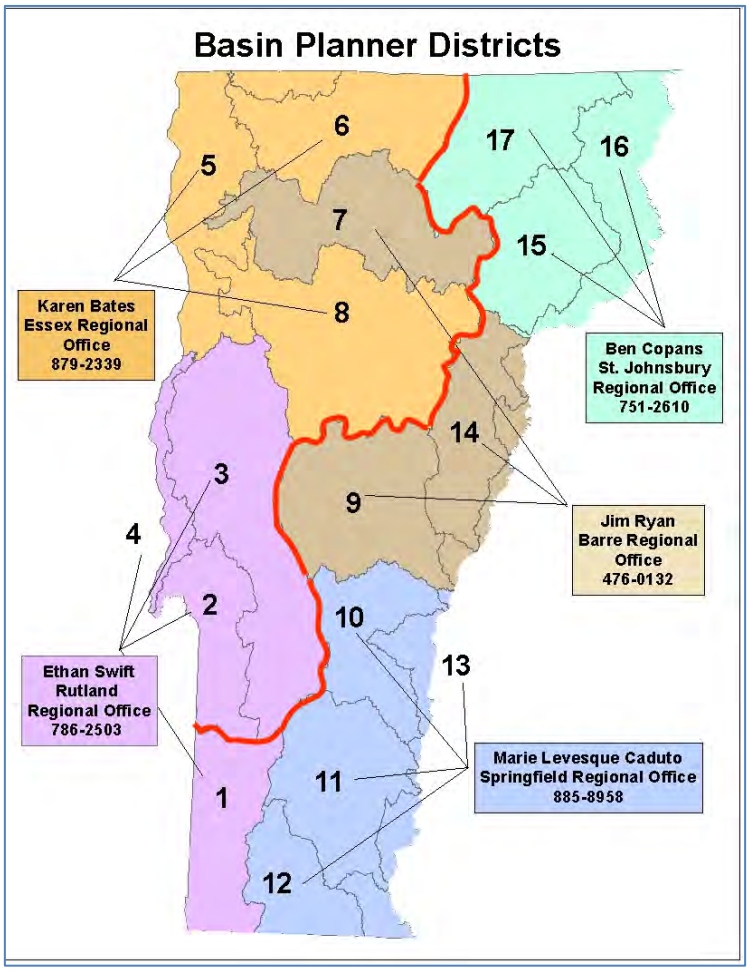

FIGURE 6 - WATERSHED PLANNING DISTRICTS, WITH ASSOCIATED COORDINATORS. BASINS 2 THROUGH 8 COMPRISE THE CHAMPLAIN BASIN

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 6**Error! Reference source not found.**.

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 so-called 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 partner organizations 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, as a report card of 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 Backroads Capitol Inventories (BBRCI);
- Agricultural Environmental Management (AEM); and
- Stormwater Mapping and Illicit Detection Discharge and Elimination (IDDE).

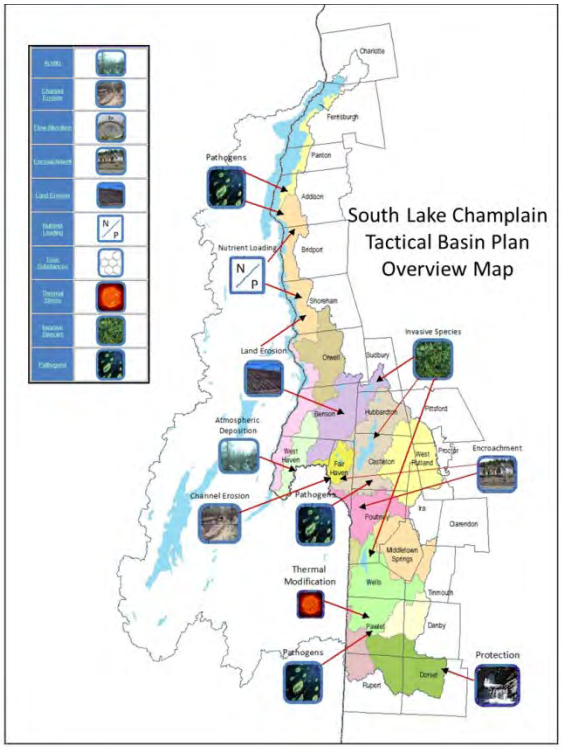

FIGURE 7 - EXAMPLE STRESSOR TARGETING MAP SUMMARIZING THE SOUTH LAKE CHAMPLAIN TACTICAL BASIN PLAN.

Figure 7 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

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 Funds to the evaluation by each planner of the value of proposed funding applications to address the specific priorities outlined in the tactical plans. DEC envisions that funding associated with a Clean Water Improvement Fund will most appropriately be allocated following the priorities outlined by tactical plans, relying on a similar business process.

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 is summarized as follows:

	Completion Date
1. Complete South Lake Champlain Tactical Plan	March, 2014
2. Complete North Lake Direct Tactical Plan	December, 2014
3. Complete Lamoille Tactical Plan	September, 2016
4. Update 2013 Missisquoi Tactical Plan	December, 2016
5. Update 2014 South Lake Champlain Tactical Plan	December, 2016
6. Update 2012 Winooski Tactical Plan	December, 2017
7. Update 2012 Otter Creek Tactical Plan	December, 2017

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
	Low: Majority of subwatersheds or relevant land use areas have coverage for the assessment type. Medium: Half or more of subwatersheds have coverage for the assessment type. High: Over half of the subwatersheds are in need of this assessment type.					

Current Funding Sources to Support Tactical Basin Planning

The watershed planners are currently supported by existing appropriations of general funds and Ecosystem Restoration Program operational 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 has been re-engineered to align 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 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 grant are only available for a specific set of identified monitoring, assessment, planning and implementation related projects. ERP will continue to link 604b grants with these types of projects as it seeks to foster synergize between prioritized water quality projects and available funding.

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 1and 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 implementing any program as expansive as 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." 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 provided in Appendix F. In addition, a list of Frequently Asked Questions is provided in Appendix G.

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 part of the development of the new 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, 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 Appendix E summarizes the proposed implementation milestones and timeframes.

It is important to understand that EPA's TMDL development is ongoing and that EPA is actively engaged in modelling to determine 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 source and nonpoint 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 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, however implementation of these strategies is completely contingent upon receiving adequate resources.

These proposed revisions are the result of over a year 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; 75% were farmers and the remainder were 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 will continue 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 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 rules also provide 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. AAFM is required by law to inspect all farms permitted under these rules at least once every five years. However, many farms are visited more often, due to permit compliance needs. The MFO general permit has been in

existence since February, 2007 and was revised in 2012. Currently, there are 152 farms under the MFO general permit throughout Vermont, and approximately 116 of these farms are in the Vermont portion of the Lake Champlain basin.

Large farm 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 19 permitted LFOs in Vermont, 13 of which are in the Lake Champlain basin.

Inspections of MFO and LFO

There are currently four inspectors with AAFM who administer the MFO and LFO permits. 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 2014, the Agency is increasing nutrient management compliance checks for grants provided for the development or update of NMPs, which includes many MFOs and LFOs. The goal is to review 10 fields on a subset of these farms for adherence to the implementation component of the NMP grant and follow up would include permit enforcement on farms that are under a MFO or LFO permit.

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.

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. 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.

IMPLEMENTATION MECHANISM

AAFM and DEC will 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.

IMPLEMENTATION STEPS AND TIMEFRAME

1. DEC, in cooperation with AAFM, will conduct CAFO inspections	
A. Minimum of 12 CAFO inspections annually in Lake basin in first 2 years	
B. Minimum of 75 CAFO inspections annually	after 2017
2. AAFM will inspect all LFOs and MFOs within the Lake Champlain basin	
A. All LFOs	Annually
B. MFOs	20%/year min
C. Enhance MFO inspection protocols	2014
D. Minimum of 25% of MFOs inspected annually	after 2017
3. DEC and AAFM will conduct on-farm multi-agency inspections to insure consistency in the inspection process	
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 produce compliance reports that will be shared between agencies	Annually
5. DEC and AAFM will coordinate inspection and enforcement actions per the 2007 MOU	
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

DESCRIPTION

The Vermont Accepted Agricultural Practice Rule (AAPs), initially adopted in 1995 and updated in 2006, 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. 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 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.

To date the AAP program has not been inspection-based like the MFO and LFO programs due to limited resources. The investigative staff for the AAP rules are primarily focused on pesticide, feed, seed and fertilizer work per their funding source. AAFM has never received funding specific to enforcing the AAPs, rather this program is essentially driven by internal or external reports of possible violations. State-initiated and public reports 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; they 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 has committed to a targeted small farm inspection program, and has already taken steps to start this process. One small farm inspector position was requested and approved in the 2014 budget of the AAFM. In the fall of 2013, AAFM filled this position and is prioritizing outreach and evaluation efforts in a priority watershed of Franklin County, VT.

AAFM will expand its small farm inspection program, and initially will prioritize dairy farms, but will also address any livestock farms that are in priority watersheds. All small dairies in Missisquoi, St. Albans Bay and South Lake will be evaluated by the end of 2017. All small dairies in the Lake Champlain basin will be inspected by the end of 2019. AAFM will continue to utilize the existing staff that currently perform investigations into suspected AAP violations on non-dairy farms based on internal and external reports. AAFM intends on training staff to conduct whole farm inspections as part of the investigation process.

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.

The following actions related to the AAPs will require rulemaking, a process which will take approximately 12 months, and would be initiated in the fall of 2014 with an expected implementation date of winter 2015-16. AAFM is committed to rule making for certain activities regardless of whether additional resources are provided (livestock exclusion, buffers, gullies and erosion for example), however other areas are completely contingent upon AAFM receiving additional staff resources (i.e. SFO certification).

All of the below actions will be effective immediately upon completion of the rulemaking process. 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.

Initiate an AAP compliance certification process for all small farms
Currently, small farmers are not required to submit any type of certification of compliance (COC) with the AAPs (unlike MFOs and LFOs which must submit annual reports). If provided additional staffing resources, AAFM would require all small farms that meet certain criteria to submit a certification form once every five years that indicates compliance with the AAPs. Criteria for a mandatory COC would be determined through discussion with the Ag Workgroup, other agricultural partners, and the public rule making process. Currently the AAPs must be met by all farmers, regardless of size or farm type, however, the cost-benefit of water quality improvement decreases substantially with smaller farm size and animal numbers. It is expected that the COC requirement would be based on either animal numbers or density and include all crop farmers.

A web-based online submission option would ideally be available for COC compliance for farmers with internet accessibility. AAFM is currently in the process of developing a water quality database which may expand the ability for online submission of MFO and LFO reports. Ideally, technical staff will have the ability to assist landowners with submission during field visits.

Update AAPS to require changes in buffers, gullies, and erosion
Currently MFO 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 the erosive loss from fields and gullies has been well documented and provides a great potential for decreasing sedimentation to surface water. The AAPs will be revised to require consistent buffers 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".

These changes are important for water quality improvement but also for the agricultural community. The Ag Workgroup recommended consistency among farms in regulations where possible. This rule change will require extensive outreach and education to the agricultural community, especially for erosion tolerance. Many small farms are not aware of their current erosion rates, and lack the knowledge and software to determine this without technical

assistance. Management changes may be necessary on some 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 of implementing livestock exclusion on all perennial streams where erosion is prevalent and in all production areas will significantly reduce a major portion of this 3.8% and provide 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, except at defined stream crossings, where animals have access, 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.

IMPLEMENTATION MECHANISM

The rulemaking process will be conducted through the Vermont Legislature to enable the proposed changes to the state regulatory Accepted Agricultural Practices.

IMPLEMENTATION STEPS AND TIMEFRAME

Note: All efforts will begin in prioritized critical source areas and targeted priority watersheds. Priority watersheds are those most impacted by agricultural activities.

1. Begin rulemaking process to update the AAP rule with additional practices and begin implementation by all small farms in the Lake Champlain basin.
    A. A minimum 25 foot perennial vegetated buffers along all perennial streams
    B. 10-foot perennial vegetated buffers along field ditches
    C. Stabilization of field borne gully erosion
    D. All farms meet "T" for tolerable soil loss, as defined by the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS), for the prevalent soil type and applied to all farm fields in annual crop production
    E. Increased livestock exclusion requirements
    F. Development of a small farm certification process

2016

2. Begin small farm evaluation process in priority watersheds
   A. Evaluate/inspect all small dairies in Missisquoi, St. Albans Bay and South Lake — 2017-19
   B. Evaluate/inspect all small dairies and significant livestock Operations in Lake Champlain basin — 2018-20
3. Develop small farm certification of compliance (COC) process
   A. Determine threshold level for COC requirement — 2016
   B. Develop online COC process — 2016
   C. Conduct an extensive education and outreach process for COC — 2016-19
   D. Require SFO to submit certification — 2019
4. Require livestock exclusion where erosion exists
   A. Develop a livestock exclusion incentive program that will include a declining scale cost-share with a time provision to encourage early adoption — 2016

NUTRIENT MANAGEMENT PLANNING

DESCRIPTION

Nutrient Management Plans

Currently MFOs and LFOs are required through the state permits to develop, update and implement a nutrient management plan (NMP) that meets the USDA/NRCS "590" standard. Small farms that have received USDA cost-share funding for a waste management system are also required to have a 590 NMP. Both AAFM and NRCS provide funding to help develop and update these plans.

A 590 plan includes a nutrient application plan, with additional requirements to minimize nutrient runoff into surface waters. The full document includes maps, soil and manure test results, current and planned crop yields, location of sensitive areas, each field's tolerable soil loss ("T"), field phosphorus indices (to calculate potential for phosphorus runoff and nitrogen losses), and other possible requirements and goals. The plan can be quite large depending on farm size, requires a level of knowledge and equipment for certain calculations, and can be expensive to develop despite cost-share funding. Few small farms voluntarily choose to develop a 590 plan, however all small farms are required to have much of the information that would be in a plan available upon inspection (such as soil testing, tolerable erosion calculations (T) and nutrient application rates). AAFM inspectors review NMPs at the time of inspection on MFOs and LFOs and started in 2013 spot checking a minimum of three fields during each inspection to evaluate compliance with the plan. However, further enforcement, especially of small farm compliance with the AAPs, has been limited by a lack of resources.

The Ag Workgroup recommended that a matrix be developed that would look at not only farm size and number of animals but also animal density, proximity to water and other factors related to potential nutrient runoff. Farms above these criteria would be required to create a 590 standard plan. Farms below would either be required to either use a small farm NMP template (to be developed) or meet current AAPs (for very small operations that do not require an NMP).

The matrix will be developed in the next year in consultation with the agricultural technical service provider community and the Ag Workgroup. The threshold for NMPs will coordinate with guidelines for small farm certification of compliance.

Field Practices and nutrient management.
Nutrient management planning involves careful application of nutrients to cropland and pastures to ensure that nutrients do not exceed the needs of the crop and contribute to water quality impairments. Substantial work has been done in the Lake Champlain basin in the past five years to educate farmers about new or different land practices due to the assistance of agronomists and technical service providers, and to provide funding for the purchase of equipment such as manure injectors that increase retention of nutrients on the fields. (Current work is documented in earlier sections of this plan). It is essential that the current valuable staff working directly with farmers continue in that capacity. Examples of field practices determined by AAFM and DEC to be of greatest value to water quality and in need of continued resources include:

- Cover Crops
  Cover cropping is a challenge on heavy clay soils that require tillage and even on non-heavy soils when weather does not allow for seeding in a timely manner for adequate fall cover. A new program to introduce aerial seeding by helicopter is showing promise and alternatives to seeding cover crop such as this need continued funding, as does increased education about shorter day corn options.

- Reduced tillage
  The AAFM Capital Equipment Assistance Program (CEAP) has provided funding for on-farm purchase of tools such as no-till planters that are increasing the acreage dedicated to reduced tillage practices that decrease soil erosion and provide cover to bare fields. Education about this practice is crucial to adoption by traditional farmers.

- Manure injection or aeration
  CEAP has also provided funding for the purchase of manure injection equipment. Increased use of this tool is crucial especially in areas with high slopes and proximity to surface water. More importantly, manure injectors are able to apply nutrients into hay ground versus the typical surface application which can be prone to runoff.

- Improving soil health and quality through reduced compaction
  Improving soil quality by decreasing compaction and increasing soil health increases the infiltration of water, reducing erosion and nutrient runoff. Reduced compaction can be attained through changes in land practices such as reduced tillage and precision nutrient management that decreases use of heavy equipment.

- Precision nutrient application
  In addition to improving soil quality, precision nutrient application also allows for site-specific (in-field) detailed application of nutrients using GPS technology on farm equipment. This is initially expensive to install but can more specifically allocate nutrients to decrease any potential for excess runoff.

- Management of farm roads.
  Many farm roads, including roads that access sugaring operations, are highly compacted areas and can act as conduits for nutrient runoff. Additional resources should be allocated for road management similar to forest road practices.

- Controlled tile drainage
  Tile drains are currently being installed in VT by farmers to increase productivity. While well drained fields are less likely to have gully erosion; research has shown that drainage from tile can contain high nutrient levels, especially dissolved phosphorus. Education about control structures as well as appropriate installation and management of tile drains is necessary.

- CREP program
  The federal Conservation Reserve Enhancement Program provides an annual compensation rate for removing environmentally sensitive land from production and adding practices such as extended buffers. Vermont is able to leverage a 4:1 return on state investment in this program; however producer enrollment has dramatically decreased in recent years due to cuts in the rental rate payments, and limited resources for outreach and education to producers.

Implementation of all BMPs must increase but with limited resources, AAFM will need to prioritize efforts by focusing on potential critical source areas that have a high risk of causing or contributing to phosphorus loading. Critical source area mapping has been conducted in some parts of the Lake Champlain watershed, and with the increased use of LIDAR, mapping will continue for the remainder of the area. Agency personnel and partners will all focus on critical source areas in their inspections and implementation.

Research

Implementation of current practices will be encouraged, funded and incentivized, but additional research is also needed to continue improvements in nutrient management. AAFM and DEC will continue to encourage and support initiatives that show promise through funding and collaboration. Some current examples of areas of interest to the agencies for continued research include but are not limited to:

- On-farm digesters that increase the use of manure as bedding and the transport of P off-farm
- An evaluation of the P-index to increase its value as a nutrient management tool, and standardization between states
- An evaluation of tools other than RUSLE that will be more applicable as a water quality measurement
- Precision nutrient application (indicated above)
- Alternative buffers and cover crops that will provide necessary water quality needs but have other potential value

Partner Assistance
AAFM and DEC acknowledge the value of other governmental partners (USDA/NRCS, US Fish and Wildlife), educational partners (UVM Extension System) and non-profit partners (VACD, watershed groups, farmer coalitions), and private for-profit consulting firms, all of whom by nature of their non-regulatory status, have connections in the agricultural community. Collaborating with these partners and assisting in their support are critical to the success of this effort. AAFM assumes the operational capacity of key federal partners such as the US Department of Agriculture Natural Resource Conservation Service (NRCS) remains constant at current levels in development of this implementation plan. AAFM and DEC also support increased funding to partners for the critical educational needs as new regulations are required of agricultural producers.

IMPLEMENTATION MECHANISM

A matrix will be developed to assess the need for USDA standard nutrient management plan, development of a small farm NMP, or compliance with AAP regulations. State partners will assist with BMP implementation on farms, and new field practices to decrease runoff and erosion potential.

IMPLEMENTATION STEPS AND TIMEFRAME

1. Increase development and implementation of Nutrient Management Plans
   - A. Develop NMP matrix and SFO template — 2016-18
     - i. Provide outreach and education — Ongoing
     - ii. Provide for conservation plan development — 2017-19
   - B. Provide increased cost-share funds for NMP development — 2018
   - C. Expand small farm NMP development courses/workshops through partners such as UVM Extension — 2017
   - D. Work with partners to develop and offer a NMP training program for TSPs — 2017
   - E. Work with partners to develop and offer a training program for manure applicators — 2017
   - F. Mandate certification of manure applicators — 2018

2. Improve field practice implementation
   - A. Support AAP and BMP implementation on small farms by key partners and staff who will focus on the 8 key areas of field practices indicated above — Ongoing
     - i. Increase support for non-regulatory SFO outreach — 2016
   - B. Increase targeted outreach in the key watershed areas of St. Albans Bay Missisquoi Bay and South Lake — 2017
   - C. Support current farmer groups Farmers Watershed Alliance, Champlain Valley Farmers Coalition and support a third startup in South Lake. — 2017
     - i. Provide farmer groups with BMP funds for outreach and small project implementation — 2017

D. Increase participation in the CREP program in key watersheds
   i. Utilize shared partnerships in priority watersheds to Increase outreach
   ii. Coordinate with USDA/FSA to increase the rental payments 2019-21

ADDITIONAL EFFORTS IN GAP WATERSHEDS (MISSISQUOI BAY, ST. ALBANS BAY, SOUTH LAKE)

DESCRIPTION

Higher nutrient loading from agricultural runoff in the three subwatersheds of Missisquoi Bay, St. Albans Bay and South Lake will require that additional measures be implemented in these areas. Priority will be given to these areas through increased education, outreach and funding opportunities, targeted funding, and higher cost-share opportunities. Specific practices are described above.

IMPLEMENTATION MECHANISM

Additional funding and outreach will be targeted to critical source areas in the priority watersheds of Missisquoi Bay, St. Albans Bay and South Lake.

IMPLEMENTATION STEPS AND TIMEFRAME

1. Target CAFO inspections in these watersheds 2016
2. Inspect SFO in these areas
3. Provide targeted funding for BMP and NMP implementation in these watersheds 2017
   i. NRCS funding can be prioritized through Local Work Group ranking
   ii. State cost-share may increase to 90% on a case-by-case basis
   iii. Higher rental payment rates for CREP projects in these watersheds
4. Provide targeted education in these watersheds 2017-19
   A. Provide support for the 2 current farmer groups (Farmers Watershed Alliance and Champlain Valley Farmers Coalition)
   B. Provide support to start a farmer group in the South Lake Region
   C. Increase CREP outreach for Missisquoi Bay and South Lake
5. Develop a targeted program for these watersheds that provides increased compensation and incentive opportunities for producers who implement additional practices such as:
   A. Cover crop floodplains
   B. Do not apply phosphorus to any fields that test high on the P-index

C. Do not spread manure within 48 hours of rainfall on fields within 200' of surface water

D. Incentive program will be developed with assistance from partners and the Ag Workgroup 2016

B. STORMWATER MANAGEMENT

Stormwater runoff from roads and existing developed lands will be addressed in a staged and prioritized manner through a system of watershed-based stormwater permitting using a combination of state law and NPDES-based regulatory authority.

STORMWATER RUNOFF FROM STATE ROADS

DESCRIPTION

The first stage of implementation will include permitting all state and municipal roads to achieve the necessary level of pollutant reduction to meet TMDL targets. Permitting will generally involve requirements to develop management plans, followed by an implementation scheduled informed by the relative significance of the source, on a watershed basis. A proposed implementation schedule is attached.

The State highway system may be addressed via a TS4 Stormwater General Permit. The TS4 is a NPDES-based Transportation Separate Storm Sewer System (TS4 GP) General Permit designed to regulate stormwater discharges from the entire state-operated transportation system. The TS4 would regulate all stormwater discharges from the transportation network by consolidating the permit requirements from the existing Municipal Separate Storm Sewer System (MS4), Multi-sector General Permit (MSGP) and post-construction stormwater permits. Implementation of a comprehensive TS4 GP approach could allow for the prioritization of maintenance, upgrade of stormwater infrastructure, and implementation of remediation activities based on environmental benefit. Stormwater management practices will be consistent with the Vermont Stormwater Management Manual, with an emphasis on surface infiltration where feasible to maximize phosphorus reduction.

IMPLEMENTATION MECHANISM

The State will establish a TS4 Stormwater General Permit.

IMPLEMENTATION STEPS AND TIMEFRAME

1.	Issue TS4 General Permit	2016
2.	DEC to administer permit program	2016
3.	VTrans to implement program	2017-36

DESCRIPTION

The first stage of implementation will include permitting all state and municipal roads to achieve the necessary level of pollutant reduction to meet TMDL targets. Permitting will generally involve requirements to develop management plans, followed by an implementation schedule informed by the relative significance of the source on a watershed basis.

Vermont municipalities maintain approximately 11,000 miles of road; 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. Road structures, particularly along gravel roads, can cause erosion and sedimentation into adjoining streams. Stormwater runoff from paved roads can accumulate and deliver debris, oils, salts, and other chemicals, sediment, nutrients, and other pollutants to surface waters. Paved roads can also affect the volume of stormwater runoff being generated, which in turn, can alter the hydrology and ecological health of receiving waters.

DEC will issue a stormwater general permit covering municipal roads. The permit will require development of management plans based on local road conditions including road slope, connectivity to receiving waters, and other factors, that identify the type and scope of BMPs necessary for the municipality. The management plan will include an implementation schedule informed by sub-watershed phosphorus reduction priorities. At a minimum, BMPs shall be as protective as those identified in the Town Road and Bridge Standards and focused on the prevention of erosion and the transport of sediment containing phosphorus.

IMPLEMENTATION MECHANISM

DEC will use existing authorities to develop a permit program for issuing a municipal road stormwater permit and reporting requirements. The program will emphasize the use of road-related best management practices. The State will first issue a letter of intent prior to the issuance of the new permit.

IMPLEMENTATION STEPS AND TIMEFRAME

1.	Issue Municipal Road general permit	2016-20
2.	DEC to administer permit program with VTrans to provide technical assistance, training and funding support	2017-36

STORMWATER RUNOFF FROM EXISTING DEVELOPED LANDS

DESCRIPTION

Stormwater runoff from existing developed land will be addressed in a staged and prioritized manner through a system of watershed-based stormwater permitting using a combination of state law and NPDES-based regulatory authority.

The first stage of implementation will require permit coverage for all stormwater discharges on sites where impervious surfaces exceed 3 acres. Additionally, impervious surfaces discharging to municipal stormwater systems where such impervious surfaces exceed 15 acres, in aggregate, and the density of impervious surface is greater than 7%, shall be addressed by a stormwater permit, issued to the municipality and requiring implementation of a stormwater management and phosphorus control plan. These are preliminary criteria that may require refinement during future implementation plans to ensure targets are met.

Existing facilities with greater than 3 acres of impervious surface permitted prior to the adoption of the 2002 Stormwater Manual will be subjected to feasibility-based upgrade requirements during their next permit renewal cycle which ranges from 0-10 years.
Stormwater management practices will be consistent with the Vermont Stormwater Management Manual, with an emphasis on surface infiltration where feasible to maximize phosphorus reduction.

Existing facilities discharging within a regulated Municipal Separate Storm Sewer System (MS4) are required to develop Flow Restoration Plans for stormwater-impaired waters in accordance with the MS4 General Permit. 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.

IMPLEMENTATION MECHANISM

The State will establish a general permit program to address stormwater from existing developed land.

IMPLEMENTATION STEPS AND TIMEFRAME

1. Issue Develop Lands General Permit	2016-20
2. DEC to administer program	2016

STORMWATER RUNOFF FROM NEW DEVELOPMENT

DESCRIPTION

DEC's Stormwater Program administers a post-construction stormwater permit program pursuant to state statute. Regulated projects are required to implement BMPs in accordance with the Vermont Stormwater Management Manual (VSMM). The VSMM was initially developed by the Center for Watershed Protection, and is currently undergoing revision to increase the use of green-stormwater infrastructure practices, and to increase the required levels of phosphorus removal in approved practices. DEC is currently mid-way through a contractor-assisted stakeholder process to develop revisions to the VSMM. The final revised VSMM will then be adopted via state rulemaking process. The final adopted Manual will employ state-of-the-art stormwater BMPs designed to maximize phosphorus removal. These practices combined with Vermont's regulatory program that requires permits for all new and redevelopment projects with over one acre of impervious surface, as well as expansions greater than 5,000 square feet, will prevent substantial phosphorus loading.

IMPLEMENTATION MECHANISM

This strategy is implemented via DEC's post-construction stormwater permit program.

IMPLEMENTATION STEPS AND TIMEFRAME

1. Complete VSMM stakeholder process
2. Develop Draft Revised VSMM
3. Public Comment on VSMM
4. Final VSMM commence rule making
5. Adopt Final VSMM with enhance phosphorus removal 2016

C. NON-REGULATORY STORMWATER MANAGEMENT FOR NON-MS4 MUNICIPALITIES

NON-REGULATORY STORMWATER MANAGEMENT

DESCRIPTION

About three percent of the land area in the Lake Champlain basin is impervious surface (such as driveways, sidewalks, streets, and parking lots), but these areas generate a disproportionate amount of the phosphorus loading to Lake Champlain. Only six percent of this impervious surface area in the Lake Champlain basin is currently subject to regulation under a state operational stormwater permit, and only 12 percent of the impervious area is covered by the Municipal Separate Storm Sewer System (MS4) permit.

Stormwater Master Planning (SWMP) is an analytical process designed to prevent and reduce stormwater runoff from the impervious areas that are currently not regulated by the DEC. The process serves as the basis for targeting management actions in areas of the developed landscape

thought to be critical sources of phosphorus. The process directs a variety of mitigation actions, including Green Stormwater Infrastructure and Low Impact Development approaches, and promotes municipal adoption of the Vermont League of Cities and Town's model stormwater ordinance to protect water quality and save municipalities money by avoiding the increasing costs of collecting and treating stormwater runoff. Recommended actions identified by a stormwater master planning process are then integrated into tactical basin plans

IMPLEMENTATION MECHANISM

DEC is using existing authorities to manage the program. DEC will develop, employ, and offer trainings for municipalities and other partners on the stormwater master planning protocol as a tool to identify and prioritize stormwater remediation actions.

IMPLEMENTATION STEPS AND TIMEFRAME

DEC will develop a non-regulatory stormwater management program that promotes unregulated stormwater management practices according to the following schedule:

1. Provide technical assistance to municipalities on stormwater master planning as a tool to identify priority actions and integrate project priorities into tactical basin planning process	Ongoing
2. Provide technical and financial assistance to municipalities on stormwater project implementation	Ongoing
3. Enhance outreach and technical assistance to support municipal adoption of model stormwater ordinances to prevent or minimize stormwater impacts from future development	Ongoing

MILESTONES FOR PARTIAL IMPLEMENTATION

1. Establish a DEC Municipal Stormwater Technical Assistance Program to provide technical assistance to non-MS4 municipalities in Green Infrastructure and stormwater master planning	2016
2. Develop and finalize a standardized Stormwater Master Planning protocol	2016
4. Provide technical assistance to municipalities on stormwater master planning	Ongoing
5. Provide technical and financial assistance to municipalities on stormwater project implementation	Ongoing
3. Integrated priority actions identified in stormwater master planning into tactical basin planning for project implementation	Ongoing
4. Complete stormwater master planning for 10 percent of Non-MS4 municipalities in the Lake Champlain basin, integrate into tactical basin plans priority-ranked lists of problem sites and proposed corrective actions, and present plans to municipalities	2020
5. Complete stormwater master planning for 20 percent of non-MS4 municipalities in the Lake Champlain basin, integrate into tactical basin plans priority-ranked lists of problem sites and proposed corrective actions, and present plans to municipalities	2025
6. Complete stormwater master planning for 30 percent of	

non-MS4 municipalities in the Lake Champlain basin, integrate into tactical basin plans priority-ranked lists of problem sites and proposed corrective actions, and present plans to municipalities	2030
7. Provide technical and financial assistance to municipalities on stormwater project implementation	Ongoing
8. Conduct outreach and technical assistance to support municipal adoption of model stormwater ordinances to prevent or minimize stormwater impacts from future development	Ongoing

GREEN INFRASTRUCTURE INITIATIVE

DESCRIPTION

Since 2009, ANR has supported a Green Infrastructure (GI) Coordinator position within DEC through various funding mechanisms. This position plays 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 GSI 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 and lists major objectives for each:

- Design Professionals: Design professionals (Engineers, Landscape Architects, Architects, Design/Build Contractors) statewide are trained in promoting and utilizing LID principles and GSI practices;
- Municipalities: Help municipalities recognize the impacts from stormwater runoff and work to mitigate the effects;
- Property Owners: Property owners voluntarily implement GSI practices on their property(s); and,
- State Agencies: State Agencies secure and commit funding to develop policies and programs to support GSI.

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.

Finding ways to incorporate LID and GSI into the framework of the Vermont Stormwater Management Manual (VSMM) is an identified task in ANR's Implementation Work Plan. The existing manual has been seen as a barrier to GSI implementation for some time. In response to this, the Stormwater Program is currently undergoing a process to revise the manual. The purpose of this is two-fold: to incorporate and incentivize LID and GSI concepts and to enhance nutrient removal rates. The revised Stormwater Manual will be adopted via rulemaking as described above.

IMPLEMENTATION MECHANISM

ANR will continue to support the Green Infrastructure Initiative to implement the GSI Strategic Plan and the ANR Implementation Work Plan.

IMPLEMENTATION STEPS AND TIMEFRAME

1. ANR will implement and continue to revise the Strategic Plan and Agency work plans	Annually
2. Establish a DEC Green Stormwater Infrastructure program to provide technical assistance to municipalities;	2015
3. Review existing state processes and programs and develop a plan for incorporating GSI concepts	2015
4. Research the use of GSI in other states to meet regulatory requirements	2015
5. Provide training opportunities to ANR staff and external partners to increase knowledge of GSI	Annually
6. Provide technical assistance and financial support for GSI projects;	Ongoing
7. Develop process for auditing GSI on state properties and explore opportunities to enhance or utilize additional practices	2016
8. Work with partners to enhance and disseminate model LID Bylaws	Annually
9. Revise and redistribute Vermont Low Impact Development	2016
Guide for Residential and Small Sites	2016
10. Develop GSI design standards for downtowns, subdivisions, and state owned properties	2018
11. Convene GI Roundtable	Quarterly
12. Convene GI Council	Quarterly
13. Revise Strategic Plan and Agency Implementation Work Plans	Annual/Semi-Annual

D. RIVER CHANNEL STABILITY

MINIMIZING RIVER CORRIDOR AND FLOOD PLAIN ENCROACHMENTS

DESCRIPTION

Managing rivers and floodplains to attain and maintain dynamic equilibrium conditions (i.e., the vertically stable and least erosive conditions achieved when there is a balance between erosion and deposition processes) provides for greater flood resilience and public safety while reducing sediment and nutrient pollution. Avoiding new buildings or public infrastructure in river corridors and floodplains and maintaining native plant-vegetated buffers are essential to attaining and maintaining equilibrium conditions. Avoiding new encroachments decreases adverse river channel modifications and increases the capacity of valley landforms to store floodwaters, sediments, and phosphorus. Floodplains, wetlands, and meanders with vegetated buffers: (a) dampen flood energy and soil erosion by moderating stream flow velocities when floodwaters spill onto them; (b) allow for sediment deposition on floodplains during floods, which account for the greatest volumes of sediment over time; and (c) moderate streambank failures due to the root strength, root depth, and root density of the vegetated buffer.

With respect to implementing the Lake Champlain TMDL, the current River Corridor and Floodplain Management Program is limited in the following areas:

- Developments in floodplains and river corridors, exempt from municipal regulation, are not currently regulated. In addition, ANR has not completed MOUs with other state agencies to regulate developments within their purview to be consistent with the National Flood Insurance Program (NFIP). This lack of oversight results in new encroachments and threatens the State's NFIP eligibility. Act 250 developments which are regulated by the State are only being held to the minimum standards of the NFIP which essentially allows development in flood hazard areas (outside the floodway) with minimal floodproofing requirements.

- It would be helpful to train and certify floodplain technicians to assist municipalities and landowners in floodplain protection and to promote enhanced model bylaws that exceed the NFIP minimum requirements.

- Floodplain mapping is very limited and very antiquated in eight counties. Light Detection and Ranging (LiDAR) data would help modernize inundation and river corridor mapping for streams and lakeshores. Statewide river corridor mapping would also help the implementation of planning regulatory, corridor best management practice, and funding incentive programs.

- The Program would benefit from an outreach program to promote cross-agency, flood resiliency planning, peer-to-peer learning, and community progress barometers to increase Vermont municipal adoption of enhanced floodplain and river corridor protection bylaws and other mitigation measures to minimize flood risks and maximize floodplain function.

Minimizing river corridor and floodplain encroachments will not only serve as a back-stop to limit future increases in phosphorus loading, but, overall, is the most effective form of stream restoration and the reduction of the existing load. River dynamics ensures that, given the space, rivers will evolve, under their own power, to a least erosive form (i.e. equilibrium conditions).

IMPLEMENTATION MECHANISM

DEC will use existing statutory authority to manage the program, including the development of Floodplain Rules and General Permits, Inter-Agency Floodplain Management MOUs, and River Corridor Protection Procedures.

IMPLEMENTATION STEPS AND TIMEFRAME

1. Establish state floodplain rules that set a standard of no adverse impact (NAI) in floodplains and river corridors and address all developments exempt from municipal regulation. Regulate Act 250 developments to this higher standard. Establish Memoranda of Understanding (MOUs) with other state agencies to regulate developments within their purview to be consistent with the new state floodplain rule. Adopt River Corridor Protection Procedures.

2016-18

2. Review all development proposals (under state and municipal jurisdiction) on floodplains in the Lake Champlain basin. Establish general permits and a regional Certified Floodplain Technician Program to increase the regulatory and technical assistance capacity for floodplain protection. This river corridor and floodplain management program would also provide technical assistance to a greater number of communities each year to restore floodplains (where opportunities arise) and secure the municipal adoption of enhanced model floodplain and river corridor protection bylaws that exceed the NFIP minimum requirements.

2016-22

3. Secure funding to obtain Light Detection and Ranging (LiDAR) data to modernize inundation and river corridor mapping statewide for streams and lakeshores.

2017-22

4. Develop and maintain statewide maps as per adopted River Corridor Procedures that establish map amendment and revision procedures and river corridor best management practices.

2016

5. Increase the role of land conservation in river corridor and floodplain protection and restoration (i.e., securing river corridor and riparian buffer provisions in land conservation projects).

2016-36

6. Establish the Flood Resilient Communities Program with funding and technical assistance incentives for municipalities to adopt regulations for floodplains and river corridors (e.g., the Emergency Relief and Assistance Fund (ERAF), effective 10/2014, will increase the state cost share recovery in municipalities where enhanced bylaws have been adopted).

2016-36

7. Establish a "Flood Ready" web page to promote cross-agency, flood resiliency planning (Act 16) by offering peer-to-peer learning, community progress barometers in the Flood Resilient Communities Program, and all manner of planning and implementation tools to increase Vermont municipal adoption of enhanced floodplain and river corridor protection bylaws and other mitigation measures to minimize flood risks and maximize floodplain function.

2016-36

PREVENTING ADVERSE RIVER CHANNEL MODIFICATIONS

DESCRIPTION

Widespread and historic stream channelization (i.e., entrenchment with dredging, berming, straightening, and armoring practices) has resulted in increased erosion and therefore increased sediment and nutrient loading. Land drainage activities and structural controls such as riprap may prevent flooding and erosion at one site, but increase erosion downstream and contribute to destabilizing the stream system. These activities increase the power of floods thereby increasing stream bed and bank erosion, property damages, and risks to public safety. Valley streams and rivers in the Champlain drainage were, by nature, evolving to a least erosive, equilibrium condition where sediment erosion and deposition (storage) are in balance. Now, due to channelization, they function primarily as transport (or non-storage) streams. The floodplain deposition of fine sediment, so critical to nutrient retention, has been drastically reduced (>50%) throughout the Lake Champlain basin. Stream alteration activities that result in conditions that depart from, further depart from, or impede the attainment of an equilibrium condition should be limited.

With respect to implementing the Lake Champlain TMDL, the current River Management Program is limited in the following areas:

- 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 needs to establish training and outreach programs for municipalities and contractors in the use of the practices that will meet the DEC's equilibrium-based performance standards.

- FEMA does not currently recognize state-adopted river management and stream crossing codes and standards for conducting emergency protective measures.

- An Incident Command System is needed to manage and authorize emergency measures in large scale flood disasters (i.e., when most modern-day channelization occurs). A network of river scientists, engineers, and habitat restoration specialists are needed to assist VTrans and municipalities as resident experts on larger disaster recovery sites.

IMPLEMENTATION MECHANISM

DEC will use existing statutory authority to manage the program, including the implementation of Stream Alteration Rules and General Permits, River Management Training Programs and MOUs regarding inter-agency coordination during flood response periods.

IMPLEMENTATION STEPS AND TIMEFRAME

1. Provide technical assistance and regulate stream alterations, including emergency and next-flood protective measures to maximize equilibrium conditions (i.e., river-based storage functions).

   2016-18

2. Establish a River Operations Center within an ANR Incident Command System prepared to manage and authorize emergency measures in large scale flood disasters (i.e., when most modern-day channelization occurs). This Center would include a network of river scientists, engineers, and habitat restoration specialists, to assist VTrans and municipalities as resident experts on larger disaster recovery sites.

   2016-18

3. 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). Target restoration and protection funds to high priority critical source areas identified in tactical basin plans or river corridor plans, recognizing that restoration measures will vary from avoidance-based to active interventions, depending on site characteristics, plan recommendations, and willing landowners.

   2016-36

4. Develop standard river management principles and practices (SRMPP) to maximize equilibrium conditions when managing conflicts between human activities and the dynamic nature of rivers. Achieve FEMA recognition of state-adopted river management and stream crossing codes and standards for conducting emergency protective measures, and promote the municipal adoption of these codes and standards (e.g., with the Vermont Transportation Agency's Road and Bridge Standards).

   2016

5. Develop and implement a 3 tiered outreach and training program by offering courses to VTrans Operations Technicians, municipal roads workers, contractors, and other river technicians.

   2016-36

6. 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;

   2016-36

E. FOREST MANAGEMENT

ACCEPTABLE MANAGEMENT PRACTICES

DESCRIPTION

Vermont adopted rules in 1987 for Acceptable Management Practices (AMPs) for Maintaining Water Quality on Logging Jobs in Vermont. The AMPs are intended and designed to prevent any mud, petroleum products and woody debris (logging slash) from entering the waters of the State and to otherwise minimize the risks to water quality. The AMPs are scientifically proven methods for loggers and landowners to follow for maintaining water quality and minimizing erosion.

Vermont Department of Forests, Parks, and Recreation (FPR) has begun the process of updating the AMPs. Key modifications include:

- Require compliance with standards set forth in the DEC Rivers Program's stream alteration general permit
- Strengthen standards pertaining to stream crossing practices. The proposed standards include:
    - Better management of ditch water on approaches to stream crossings. The proposal is to prohibit drainage ditches along truck roads from terminating directly into streams and to specify a minimum distance for installing turn-outs. Drainage ditches approaching stream crossings must be turned out into the buffer strip a minimum of 25 feet away from the stream channel, as measured from the top of the bank.
    - Better management of surface water runoff from skid trails and truck roads on downhill approaches to stream crossings. The proposal is to prevent surface runoff from entering the stream at stream crossings from skid trails and truck roads and to specify a minimum distance for installing surface water diversion practices, such as drainage dips. Surface runoff is to be diverted into the buffer strip at a minimum distance of 25 feet from the stream channel, as measured from the top of the bank.
    - Better management of stream crossings after logging. The proposal is to prevent erosion and to specify a minimum distance from the stream for diverting runoff. Upon removal of the temporary stream crossing structures, the site is to contain water bars 25 feet from the stream channel on downhill approaches to the stream crossing to divert runoff into the buffer to capture sediment before entering the stream. Additionally, all exposed soil, at a minimum of 50 feet on each side of the crossing, must be stabilized with seed and mulch according to existing application rates.

- Include a new AMP to address the management of petroleum products and other hazardous materials on logging operations. Such materials must be stored in leak-proof containers, place outside of buffer strips, and must be removed when logging is completed.
- Enhanced stream buffer guidance in the AMPs. Metrics have been included for desirable residual stand density, stand structure and crown cover.
- Enhanced options and guidance with metrics provided for soil stabilization to establish temporary and permanent ground cover.
- Better clarification provided for selection and spacing of water diversions on skid trails and truck roads both during and immediately after logging.
- Increased seeding/mulching of exposed soil adjacent to streams and other bodies of water from 25 feet to 50 feet.

Sediment and other pollution discharges on logging jobs are subject to enforcement under the State's water pollution control statute (10 V.S.A. 1259(a)). The DEC Compliance and Enforcement Division conducts necessary enforcement actions under a Memorandum of Understanding with FPR. The circumstances and outcomes of field inspections are documented and summarized in annual reports.

Vermont's Use Value Appraisal Program, also known as the "Current Use Program," provides property tax benefits to forest land owners enrolled in the program. To maintain eligibility in the Use Value Appraisal program, all timber harvesting operations on enrolled land must comply with the AMPs. Harvesting operations on forest land owned or controlled by the ANR and land enrolled in the Forest Legacy Program must also adhere to the AMPs. Similar water quality protection requirements apply to logging operations on the Green Mountain National Forest.

As shown in Table 9, AMPs or equivalent requirements are mandatory on nearly 60 percent of the 4.6 million acres of forest land in the state, and a similar percentage applies to forest land within the Lake Champlain basin in Vermont. This percentage is expected to increase over time as: (a) the U.S. Forest Service conducts new land acquisitions within the Green Mountain National Forest proclamation boundary; (b) land acquisitions by VANR; (c) enrollment of forest land into the Forest Legacy Program and the Current Use Program. Between 2007 and 2012, acreage enrolled in the Current Use Program within the Lake Champlain basin increased from 600,207 acres to 679,207 acres, showing an approximate 12 percent increase.

TABLE 9 - AMOUNT OF STATE AND LAKE CHAMPLAIN BASIN FORESTLANDS SUBJECT TO WATER QUALITY MANAGEMENT PRACTICES

Forest Land Category	State Acres (Approximate)	Lake Champlain basin Acres (Approximate)
Use Value Appraisal	1,780,000	710 ,670
Agency of Natural Resources	475,650	186,570
Forest Legacy Program	50,630	11,570
Green Mountain National Forest	400,000	265,490
Sub-Total	2,706,280	1,174,300
Total forest in state	4,591,000	1,953,420

Phosphorus inputs will be reduced by:

- Requiring compliance with standards set forth for perennial streams in the state stream alteration general permit.
- Strengthening enforceable standards in the AMPs for stream crossing practices
- Strengthening enforceable standards in the AMPs for managing surface runoff from truck roads and skid trails.

IMPLEMENTATION MECHANISM

FPR is undertaking a rulemaking process to update the AMPs and revise the AMP manual.

IMPLEMENTATION STEPS AND TIMEFRAME

1. Update AMP Rule and AMP manual 2015

INTERIM MILESTONES

1. Technical Steering Committee (TSC) formed 2012
2. Initial draft revision completed 2012
3. ANR comments solicited 2012
4. Public Stakeholder Meetings held 2013
5. Final recommendations submitted by TSC to Director of Forests 2013
6. Additional round of comments received from ANR 2013
7. ANR legal review 2014
8. Initiate State Rulemaking 2014
9. Release revised AMP manual 2016
10. Conduct workshops 2016

CREATE A VERMONT FORESTRY DIRECT LINK LOAN PROGRAM – INCENTIVE FINANCING TO REDUCE NON-POINT SOURCE POLLUTION RISKS ON TIMBER HARVESTING OPERATIONS.

DESCRIPTION

Qualified Logging Professionals would be eligible to obtain low-interest financing from participating banks through a Vermont Forestry Direct Link Loan Program. The purpose of providing this financial incentive is to increase the use of BMPs and environmentally friendly logging equipment in the logging industry. This, in turn, will help to protect and improve water quality in and around logging operations.

FPR will: 1) determine the items that are eligible for financing, 2) ensure that the logger meets qualification requirements 3) ensure that the logger retains, on file, a BMP check list for each operation, and 4) monitor the improvements and practices of the logger.

DEC and the Vermont Municipal Bond Bank (VMBB) will: 1) enter into a memorandum of understanding with FPR to implement the program, 2) work with local banks to participate in the program, and 3) provide oversight within the context of managing the Vermont Forestry Direct Link Loan Program.

Phosphorus inputs will be reduced through increased use of low-impact harvesting systems and other technologies to protect forest water resources.

IMPLEMENTATION MECHANISM

FPR and DEC will coordinate this initiative.

IMPLEMENTATION STEPS AND TIMEFRAME

1. EPA augments VT State Clean Water Revolving Fund and requests DEC to allocate funds to this program	2017
2. DEC and VMBB will enter into a memorandum of understanding with FPR to implement the program	2017
3. DEC and VMBB will work with local banks to participate in the program	2017
4. FPR will determine the items that are eligible for financing and develop the BMP checklist for loggers	2018
5. Launch program	2018

ADDITIONAL ACTIONS TO REDUCE PHOSPHORUS LOADINGS IN THE MISSISQUOI BAY AND SOUTH LAKE SUB-WATERSHEDS

DESCRIPTION

The Vermont NRCS Forest Trails and Landings Cost-share Practice 655 has been in place since 2010. To date, more than $423,000 has been allocated to qualifying forest landowners to address soil erosion and sedimentation associated with logging roads and log landings. Since the program started, 29 miles of logging roads have been stabilized and improved. NRCS reimburses qualifying landowners up to 75% of the cost for implementing this practice. A pilot project will be launched to focus outreach efforts and additional cost-share assistance in these two sub-watersheds to increase enrollment in this practice resulting in reduced P contributions associated with forestland. FPR has two foresters, partially funded through NRCS to assist landowners with forestry cost-share practices. They will be directed to lead a focused effort in these two sub-watersheds to increase enrollment in this NRCS practice. After this 5-year pilot project has been completed, this program will be expanded throughout the Lake Champlain basin for the remaining 15 years of the TMDL plan. State funds will be used to leverage federal NRCS funds. This proposal hinges on continued funding from NRCS. The State will provide an additional 25% for cost-share practice over a 5-year period to make this a no-cost practice for landowners.

Based upon the past rate of accomplishment and with a focused effort, it can be expected that an additional 25-30 miles of logging roads will be stabilized within a 5-year timeframe, thus reducing phosphorus inputs.

IMPLEMENTATION MECHANISM

FPR will coordinate this initiative.

IMPLEMENTATION STEPS AND TIMEFRAME

1. Focus and enhance outreach efforts for sign-ups	2020
2. Allocate funds to qualifying forest landowners	2020
3. Implement projects	2020

HEALTHY FOREST COVER STRATEGY

DESCRIPTION

Forests produce the cleanest water of any land use. Research indicates that on a watershed scale and for riparian forest buffers water quality impacts can be seen when forest cover goes below 65% and 70% respectively. Vermont is approximately 75% forested with fluctuations from watershed to watershed, and site to site. A forest cover strategy of **no net forest cover loss** supports the creation of a system to promote forest cover goals in priority zones, including riparian and developed areas, coupled with mechanisms to ensure the health, maintenance and conservation of existing cover. Healthy forests translate into functional ecosystems that bind phosphorus and water, preventing additional runoff. Given that 86% of Vermont forests are

privately owned and managed, successfully achieving our no net loss of forest cover relies on landowners reaping some financial benefits from their forestlands. Economic incentives for forest products, therefore, become an integral part of keeping healthy forestland.

Estimating Phosphorus Reductions and Other Benefits

- Healthy forest cover in the Lake Champlain watershed will improve watershed health through water interception, filtration and evapotranspiration, and nutrient attenuation.
- Trees and forests reduce stormwater runoff by capturing and storing rainfall in the canopy, thereby reducing runoff volumes and delaying the onset of peak flows. Research studies suggest forest canopy interception measured for conifer stands ranges from 15% to 51% of annual precipitation, and interception in hardwood stands ranges from 8% to 20%.
- The growth of tree roots, as well as the decomposition of roots and leaf litter, increase soil infiltration rates and overall infiltration capacity.
- Through evapotranspiration trees draw moisture from the soil surface, providing an increased soil water capacity. Conifers transpire 10-12% of precipitation, while deciduous trees during leaf-on transpire up to 25% of precipitation.
- Trees and forests directly reduce soil and water phosphorus through root uptake; 1 acre of riparian forest buffer will remove 2 lbs of phosphorus and 2,500 lbs of sediment annually.
- Forest cover reduces soil erosion by buffering the impact of raindrops on barren surfaces.
- In addition to these water quality benefits, trees and forests provide a host of ecological, social and economic benefits including wildlife habitat, forest based industry, improved health and well-being, and recreation and aesthetic values.

IMPLEMENTATION MECHANISM

FPR will implement the following general strategies for no net loss of forest cover in the watershed.

1. Watershed Forest Cover Goals
2. Restore Riparian Forest Buffers
3. Restore Developed Land Forest Cover
4. Prepare and Mitigate Impacts to Forest Cover from Invasive Tree Pests

IMPLEMENTATION STEPS AND TIMEFRAME

Watershed Forest Cover Goals

1. Target: no net forest loss in the watershed
    a. Assess current forest cover and prioritize forest cover conservation for surface water protection — 2016
    b. Support local forest conservation planning
        i. Provide data on forest cover and high priority forest land for surface water protection
        ii. Assist regional and municipal planning groups to encourage the retention of priority forests for surface water protection
        iii. Consider legislation that would include maintaining forest cover as part of town plans for surface water protection — Ongoing

c. Increase funding specifically for forest land conservation and target high priority forests for surface water protection.
d. Promote and support the state's smart growth initiatives, and seek innovative incentive strategies to conserve forest cover. 2015
e. Promote economic incentives through programs such as the Working Lands Initiative to improve landowner financial gains to keep and maintain healthy forest cover. Ongoing

Restore Riparian Forest Buffers

2. Target: 70% forest canopy cover within riparian forest buffers on 50% of the riparian buffer miles. Buffer is 35 feet on each side of the waterway.
    a. Analyze existing riparian buffers for forest cover and identify additional areas for planting or regenerating 2016
    b. Prioritize areas for riparian forest buffer enhancement in each watershed 2016
    c. Offer incentive programs for planting and regeneration, and maintaining healthy cover:
        i. WHIP, EQUIP already support effort. Consider dedicating Trees for Streams funds and watershed grants 2016
    d. Work with local NGOs to implement restoration and outreach.
    e. Target initial work in South Lake and Missisquoi watersheds
    f. Establish educational outreach mechanism to reach landowners in targeted areas Ongoing
    g. Establish monitoring program for compliance 2016

Restore Developed Lands Forest Cover

3. Target: 40% forest cover in Vermont's urban landscape zones (ULZ)* on 50% of developed lands or 22,066 acres in the Lake Champlain basin. ULZ is based on housing parcel sizes between 0 to 5 acres (Table 10).
    a. Complete detailed developed land forest cover assessments for all ULZ areas in the watershed 2016
    b. Assist communities with ULZs to adopt a local goal to increase developed land forest cover 2016
    c. Assist communities with ULZs to take action on their forest cover goal with supportive local policies and programs to preserve, enhance and expand forest cover i.e. tree protection ordinances, standards for development, and stormwater tree credits Ongoing
    d. Continue to support community engagement and education in planting and caring for trees Ongoing
    e. Continue to support communities to establish capacity and procedures for long-term maintenance and health of forest cover Ongoing

TABLE 10 - PERCENT FOREST COVER IN VERMONT'S URBAN LANDSCAPE ZONE

	Vermont	Lake Champlain basin
Acres in Urban Landscape Zone	61,235.7	44,133
Total area of ULZ with mean of * 34% or higher tree cover	10,322.5	4,727
Percent total area of ULZ with mean of *34% or higher tree cover	17	10.7
* 34% is used as our acceptable limit as research suggests canopy cover is underestimated by 6 percent.		

Prepare and Mitigate Impacts to Forest Cover from Invasive Tree Pests

4. Target: Mitigate the impact of emerald ash borer on ash canopy within the Lake Champlain basin.
    a. Conduct insect detection surveys — 2015
    b. Implement policies and management practices to slow the impact of emerald ash borer — Ongoing
    c. Identify and prioritize areas where ash plays a vital role in canopy cover and water quality protection — 2015
    d. Assist high-priority communities to develop invasive tree pest preparedness plans
    e. Develop criteria for tree replacement and site restoration.
    f. Identify replacement tree species for high priority sites and secure replacement plant materials
    g. Work with partners to plant and maintain new trees — 2016
    h. Develop compliance protocol using tree replacement standards or payments into a tree management fund — 2016

CLIMATE-SMART FOREST ADAPTATION STRATEGIES

DESCRIPTION

Forest management has been based on an historical understanding of forest response to given treatments. Under climate change, meeting forest management goals is less certain than it has been in the past. Increased temperatures, heavy precipitation events, mild winters, and extreme wind and ice storms are all predicted to increase. The best risk management at this point in time is to manage forests to be more resilient to a variety of weather conditions, and to build forest harvest plans that account for extreme weather influences.

IMPLEMENTATION STEPS AND TIMEFRAME

Publish and distribute the draft forest adaptation strategy document: "Creating and Maintaining Resilient Forests in Vermont: Adapting forests to climate change."

1. Promote recommended forest adaptation strategies to foresters and landowners to implement climate-smart practices that maintain healthy forest cover, sustain ecological functions such as water holding capacity of forests, and promote water quality	2015
2. Develop and implement a policy to use climate-smart forestry practices on state lands	2015
3. Create funding priorities through the Working Lands Initiative (Working Lands Enterprise Fund (WLEF)) for new forest harvesting technologies that improve protection of soil and water	2016
4. Establish 3 demonstration areas on state land to train foresters and landowners on climate-smart forest management techniques that can then be implemented on the 86% of Vermont's forestlands that are privately owned	2017
5. Identify vulnerable forest stands within the Lake Champlain basin, develop forest health strategies to maintain forest cover and water holding capacity, and identify funding to implement strategies on priority forests	2018

F. WATERSHED PROTECTION AND RESTORATION PROGRAMS

ECOSYSTEM RESTORATION PROGRAM

DESCRIPTION

DEC's Ecosystem Restoration Program (ERP), first established in 2005, manages a competitive grant program to reduce nutrient and sediment pollution into the Lake Champlain basin and other surface waters of the state from nonpoint sources. The grant program has received sustained funding over time. The program awards approximately 50-60 grants each year, totaling roughly $2 million of state capital construction funds. Grant recipients include municipalities, watershed and lake organizations, regional planning commissions, and other local and regional partners. Two-thirds of the grants are for projects within the Lake Champlain basin. The objectives of the ERP grant program are to:

- Reduce unmanaged stormwater runoff from developed areas;
- Reduce runoff from farms and timberlands;
- Upgrade road networks with best road-related stormwater management practices; and,
- Restore and protect floodplains, river corridors, wetlands, and riparian areas along rivers, streams, lakes, ponds, and wetlands.

ERP funding will be managed to further two primary goals: (1) coordinating and prioritizing funding of water pollution control projects more effectively, and (2) investing a greater level of funding in stormwater pollution control. DEC proposes to (a) create a new fund that will complement existing funding mechanisms and (b) ensure that the funds are managed in a coordinated and transparent manner, consistent with the priorities identified in tactical basin plans.

IMPLEMENTATION MECHANISM

The Program continues to seek annual state capital bill appropriations and dispensing funds for implementation of priority actions, as described in DEC's tactical basin plans and other state-sanctioned prioritization plans.

IMPLEMENTATION STEPS AND TIMEFRAME

DEC will undertake the following actions:

1. Develop an annual capital budget for clean water funding that addresses nonpoint source needs	annual
2. Dispense funds for implementation of priority actions	annual
3. Transition grant and contract management to professional grant and contract auditors/managers	2018
4. Expand the capital construction fund-based grant/contracts program	2018
5. Extend the VBBR grants program	2020
6. Continue to manage the process for the awarding, monitoring, and reporting of grants and contracts	Annually
7. Manage grants and contracts, monitor and report on project implementation	Ongoing

8. Conduct technical assistance on nonpoint source controls Ongoing

VERMONT CLEAN WATER IMPROVEMENT FUND

DESCRIPTION

The Vermont Clean Water Improvement Fund is a concept to establish a dedicated source of funding that targets priority water quality improvement projects to help the State meet its' anticipated obligations under the Lake Champlain TMDL. The Fund can be created using existing resources and programs, and lays the foundation should additional resources become available. The Fund would make strategic investments using existing programs to enable the State to effectively implement stormwater runoff control measures and river corridor protection strategies pertaining to TMDL implementation.

- Manage direct loans and grants under the State Revolving Loan Fund (SRF), the fund supported by an annual EPA capitalization grant, state matching funds, and principal and interest repayments on past SRF loans. In addition to continuing to fund repair, replacement and operation of existing wastewater treatment systems, the Fund could provide low interest loans, forgivable principal loans, or grant funding for:
    - Stormwater runoff pollution control projects, including green infrastructure projects
    - Match for state grant-funded stormwater control projects
    - Projects required by for stormwater permit or TMDL compliance
    - Decentralized sewage treatment systems or onsite septic repair and replacement
    - Agricultural runoff control projects, such as equipment purchase for direct seed/no till conservation practices
    - Capital projects to improve municipal road networks, and
    - Infrastructure planning and asset management for all water system infrastructure
- Support grant-making as part of DEC's ERP. ERPoffers municipalities, landowners, state agencies, and other partners increased access to funds for project implementation
- Support VTrans' Vermont Better Back Roads Program, a grant program to help municipalities implement best management practices pertaining to runoff from roads
- Bolster technical and educational assistance to municipalities, farmers, loggers and foresters, developers, businesses, and landowners in practices to reduce nonpoint source pollution runoff and improve flood resilience. The objective is to support:
    - Priority technical assistance initiatives, such as ANR's Green Infrastructure Initiative and tactical basin planning that targets highest priority capital projects
    - Priority agricultural programs, such as an emerging small farm assistance program at AAFM, the University of Vermont (UVM) Extension/Poultney-Mettowee Conservation District's Agronomy and Conservation Assistance Program (ACAP), and ongoing technical assistance from the state Conservation Districts that make up the Vermont Association of Conservation Districts
    - Watershed protection work of key partners including the Regional Planning Commissions, the water resources coordinator at the Vermont League of Cities and Towns Municipal Assistance Program, the natural resources conservation districts, watershed-based groups, and lake associations

- Technical assistance to loggers, landowners, and foresters about best management practices, such as the use of portable skidder bridges, for controlling runoff from timber harvesting operations, and,
- Educational assistance from organizations such as the Vermont Youth Conservation Corps, the Student Conservation Association, and the North Woods Stewardship Center.

IMPLEMENTATION MECHANISM

DEC will continue to work with the Administration and the Vermont General Assembly to investigate ways to support the establishment of a Clean Water Improvement Fund.

IMPLEMENTATION STEPS AND TIMEFRAME

DEC will undertake the following actions:

1.	Secure legislation to support the creation of the Clean Water Improvement Fund	2016

MILESTONES FOR PARTIAL IMPLEMENTATION

1.	Develop a concept paper on the elements of a Clean Water Improvement Fund	2016
2.	Develop an administrative framework for managing the Fund	2016
3.	Establish funding mechanism to support the Clean Water Improvement Fund	2016
4.	Create a Clean Water Improvement Fund Advisory Committee	2016
5.	Establish administrative controls to manage billing, monitoring progress, reporting and enforcement	2016

TACTICAL BASIN PLANNING AND CRITICAL SOURCE AREA TARGETING – STRATEGY FOR TARGETED IMPLEMENTATION

DESCRIPTION

As discussed above, there are multiple programs 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) developed a tactical basin planning process to coordinate watershed assessment, planning, project identification and funding. The identification of priority implementation projects in tactical basin plans is now directly linked to targeted funding efforts provided by WSMD's Ecosystem Restoration Program (ERP). This linkage provides synergy between identified priority projects and available funding.

With respect to implementing the Lake Champlain TMDL, each associated Lake subwatershed tactical basin plan will include an implementation table. This table will outline the priorities of DEC, and partner organizations, for protection or restoration of specific stream/river or lake segments affected by specific pollution sources, including phosphorus. The table will also describe the type of BMP or other implementation strategies that are needed. The implementation table serves to notify partner organizations of the types and locations of projects that DEC will support with ERP grants or promote to other funding sources where DEC has leverage.

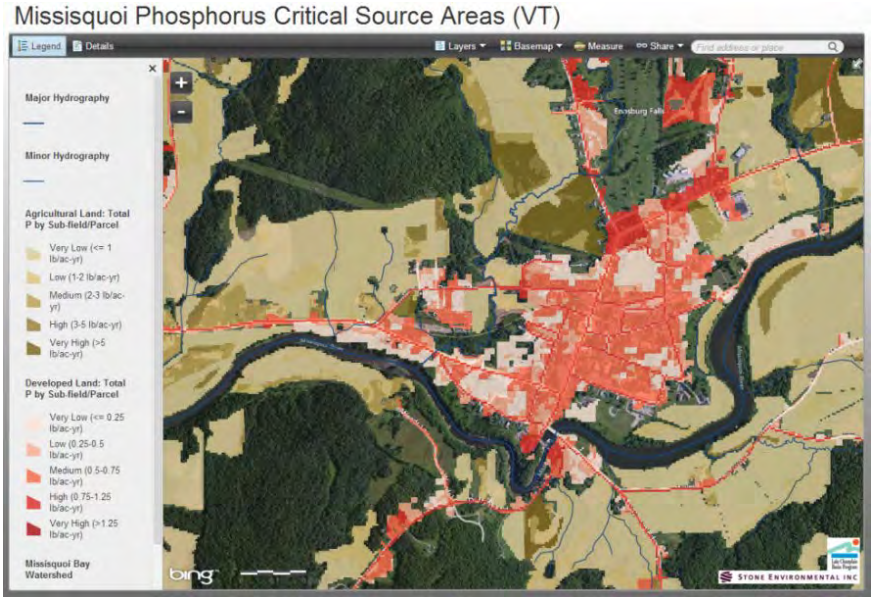

FIGURE 8 - CRITICAL PHOSPHORUS SOURCE AREAS FOR DEVELOPED AND AGRICULTURAL LAND, IN THE VICINITY OF ENOSBURG FALLS, VT, IN THE MISSISQUOI RIVER BASIN.

The implementation table is updated, as a report card of implementation in each basin. DEC's basin planners biennially review the progress attained in implementation, 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 Lake Champlain watersheds.

Expanding Capacity for Watershed Modeling and Integration

The five sector-specific assessment processes (see Chapter 4) that are integrated to produce current tactical basin plans yield prioritized prospective projects to address multiple stressors. At present, these assessments are targeted using non-empirical approaches, based to a degree on the organizational interest and availability of partners who would conduct the assessment. The tactical planning process is presently conducted at the scale of individual waters and subwatersheds. For comprehensive management to occur at the scale of the Lake Champlain TMDL, there is a need for additional geographically-based prioritization approaches to target assessments where they are not yet in-place, and where general water quality monitoring data are not available. For example, it is easy to target a Better Back Roads project in a municipality in which impaired waters have been identified using biological monitoring, and available SGA

implicates road runoff. Absent this information, where should implementation be targeted first, to achieve the most effective phosphorus reductions? DEC intends to answer this fundamental question by significantly increasing reliance on high-resolution spatial landscape modeling to target assessments and BMP implementation by adapting tools such as those described in the following.

Missisquoi Bay Basin SWAT Model

The 2011 Lake Champlain basin Program (LCBP) project to map critical phosphorus source areas in the Missisquoi Bay Watershed provides an example of a technologically evolved approach to generating on-the-ground areas for implementation. This 2012 assessment integrated a SWAT (Soil Water Assessment Tool) modeling effort with an in-stream channel erosion model called B-Stem (Bank and Toe Stability Erosion Model) to map critical runoff source contributing areas at a scale of 30 meters. The tool separates out critical source areas among developed and agricultural areas, mapping likely phosphorus runoff. Using that tool, DEC, LCBP, and AAFM have been able to prioritize outreach and implementation of specific watershed fixes at specific farms, and to more precisely target the need for specific for AEM, IDDE, and SWMP/BBRCI work. This is the type of information that permits the development of highly targeted BMP implementation. Figure 9 shows the total estimated yield of phosphorus from the area surrounding Enosburg Falls. Modeling results of such precision are not, however, available in other parts of the Lake Champlain basin.

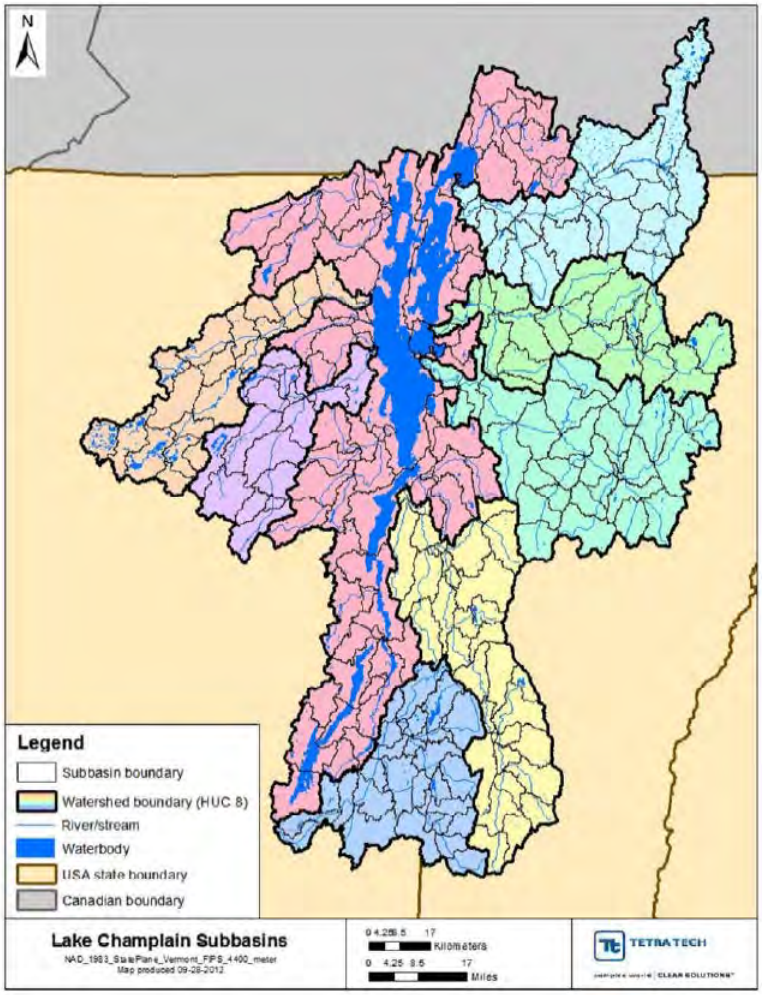

FIGURE 9 - HUC-12 SUBWATERSHEDS MODELED BY USEPA TO PRODUCE ESTIMATED PHOSPHORUS LOADS AND LOAD REDUCTION POTENTIAL, FOR THE LAKE CHAMPLAIN TMDL

USEPA Scenario Tool

For the entire Lake Champlain basin, the USEPA has contracted the development of a HUC-12[1] level SWAT analysis (Figure 9) to substantiate the reasonable assurances for the TMDL analysis. The results of this analysis have been used to develop an estimation of current phosphorus loads, by major and sub-watershed, and by land-use sector. As a companion to the modeling effort, a "scenario tool" has been developed to allow planners to rapidly obtain more focused estimates of phosphorus loading at the HUC-12 level, by presenting the specific loads associated with particular land uses. This tool presents the relative effectiveness of a suite of management practices to reduce phosphorus. The Scenario Tool has been used to derive a set of scenarios by which the Lake TMDL load allocation may be attained. While the Scenario Tool is not as precise as the Missisquoi Bay Basin Critical Source Area (CSA) Model, it does presents a dataset which may be used to target sub-watersheds for follow-on specific planning and implementation, as shown below.

An examination of the Scenario Tool output for the Otter Creek (Figure 10) indicates that the areas of greatest phosphorus export occur in the northwest, or downstream-most areas of the watershed. For each subwatershed identified, the Scenario Tool provides the range of P export by land use. The highlighted subwatershed, which comprises part of the Little Otter Creek, is one dominated by corn-hay and hay lands. In addition, the largest phosphorus export category for this subwatershed is unpaved roads. Combining these two findings indicates that AEM and BBRCI assessments would be targeted in this watershed, and as early as possible within the planning cycle.

The Scenario Tool, while a good starting point to target specific assessments and then BMP's,, does not provide the same type of geographically explicit nutrient load estimation as the Missisquoi Bay Basin CSA model.

[1] A HUC, or Hydrologic Unit Code, is a coding scheme developed by the Natural Resources Conservation Service, and used by watershed managers, to define watersheds of varying scales. The Otter Creek is an example of a HUC-8 sized watershed, while the New Haven River is a good example of a HUC-12-sized watershed that is part of the Otter Creek Watershed.

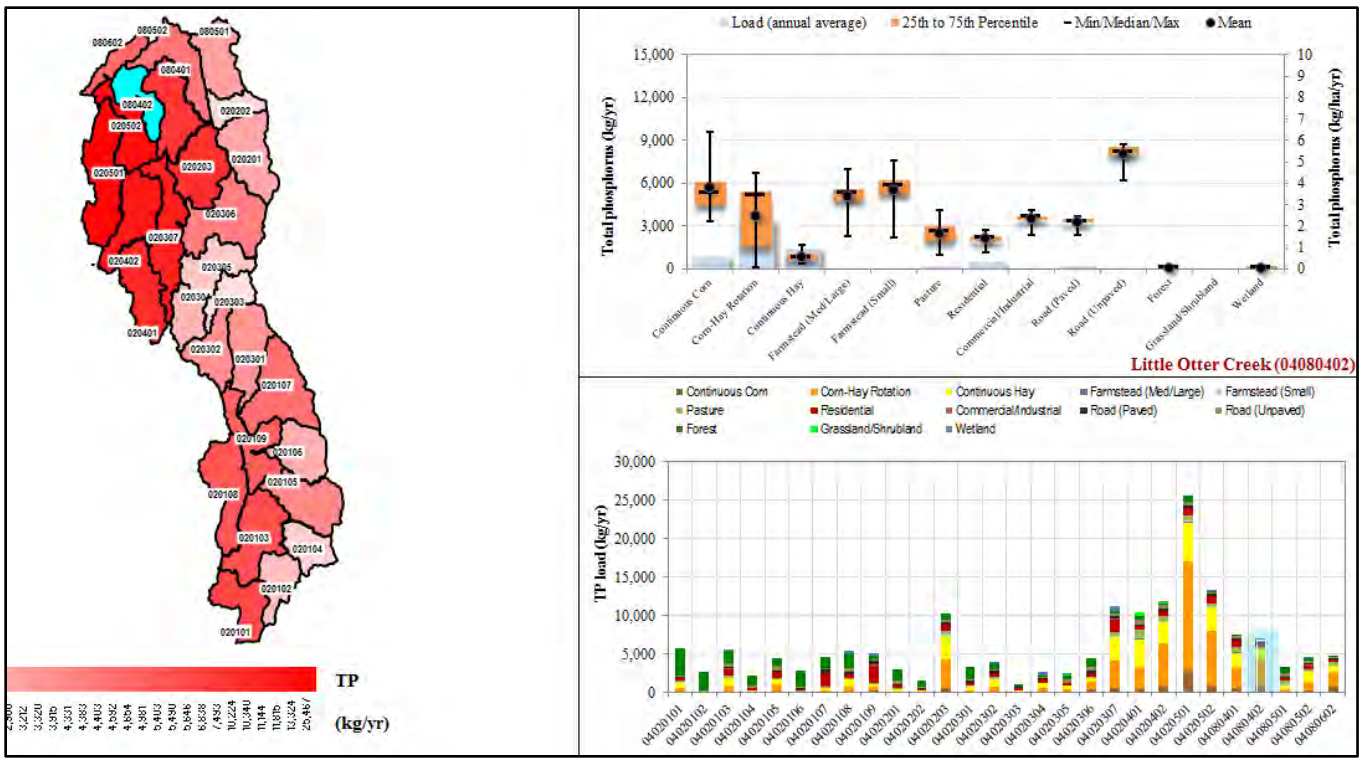

FIGURE 10 - LITTLE OTTER CREEK SUB-WATERSHED OR THE OTTER CREEK (LEFT, BLUE), SHOWING PHOSPHORUS EXPORT BY LAND USE (LOWER RIGHT, HIGHLIGHTED BAR) RELATIVE TO OTHER SUBWATERSHEDS, AND ESTIMATED TOTAL LOADS BY LAND USE SECTOR (UPPER RIGHT).

Critical Source Area Assessment – Gravel Roads

As part of the tactical basin planning process, DEC has worked with certain partners to implement a three step protocol for identifying gravel road sediment and nutrient critical source areas. The approach has been executed in several areas of Vermont including the White River watershed, Mad River watershed, Kingsbury Branch of the Winooski watershed and portions of the Poultney-Mettawee watershed. The first step is a GIS level rivers and road erosion query. Step two includes a field level road erosion field inventory and road erosion prioritization. The final step includes a refined and targeted BBRCI where specific remediation projects are identified for high priority road erosion segments. Due to ongoing severe weather events and flash floods, DEC encourages that this process occur at 5 year intervals for each town.

GIS analyses integrate stream and road slope, proximity, and crossing attributes in an effort to spatially locate road segments that could be potential sources of sediment and nutrients entering waterways. These queries are undertaken at the municipal level and include all road classes of unpaved, municipally maintained roads. This analysis can reduce the initial total of road segments to be inventoried in greater detail by two-thirds and road miles by nearly half. Road erosion inventories are then undertaken, and detailed field evaluation identifies sheet, rill, and gully erosion entering waterways from road surfaces, drainage networks and stream crossings. Roads are walked, segmented, evaluated, mapped by GPS, photographed and then prioritized into high, medium, and low categories. Preliminary road erosion remediation plans, sketches/designs, and cost estimates are then prepared for road segments identified as high priorities (and in some cases, medium priorities) for each municipality.

IMPLEMENTATION MECHANISM

Integrated Critical Source Area Asessments - Tactical Basin Planning and Implementation

To implement the TMDL in a manner envisioned by DEC, including the ability to repeatably and flexibly identify the highest-priority BMP installations for any given tactical planning cycle, an optimized and flexible critical source area modeling tool must be constructed for the Lake Champlain basin. This system would be used by DEC and organizational partners (AAFM, VTRANS, and Natural Resource Conservation Service (NRCS)) in the development of tactical basin plans, and tracking of resulting BMP implementation. Such a system will be constructed to:

- Be continually maintained, with update cycles co-incident with the five year tactical planning cycle for each Lake Champlain watershed;
- Incorporate the most up-to-date land cover and use, LiDAR-derived topography; Quickbird or equivalent satellite imagery, which can be used to track changes in land use and impervious cover;
- Incorporate key physical factors driving the export of phosphorus, including source proximity and effective connection to surface waters;
- Overlay available stream geomorphic assessment information to determine the likelihood for controllable phosphorus by addressing stream disequilibrium;
- Geographically target project or BMP-level implementation options derived from the other assessment types identified in Chapter 4; and
- Cross-reference prospective critical source areas that are specific to land-use sectors with these projects or BMPs to produce the next five-year iteration of implementation steps.

Tracking BMP implementation and estimating phosphorus reduction

The purpose of BMP tracking is twofold: 1) Create an ongoing geographic portrayal of project and BMP-level implementation; and 2) maintain an accounting of nutrient reductions likely achieved by these installations.

Agricultural BMP Tracking

At present, AAFM is building a multi-organizational geospatial database. The purpose of this database is to track and plan agricultural BMP planning and implementation efforts in Vermont among nine partner organizations working to improve water quality by reducing agricultural non-point source pollution. This is the first database that will house USDA NRCS BMP implementation data next to State agency and other partner data. Since NRCS is the largest supplier of financial and technical assistance for agricultural BMP implementation, it is crucial to include their activity when reporting on BMP implementation progress. Further, each partner is currently reporting separately, which can lead to the double counting of implementation activity for projects that are funded by more than one partner.

This database would allow Vermont to accurately track progress made, plan future progress, coordinate implementation activities among partners, and allow for enhanced success in meeting agricultural BMP implementation and water quality goals. Current funding for the project allows for the development and implementation of the database, which will occur over the next two years (implemented by end of 2015). Long-term term maintenance for the database will also be

needed. Confidentiality provisions pursuant to section 1619 will necessarily limit the public presentation of BMP's implemented. However, it is envisioned that nutrient reductions achieved will be presented at relevant geographic scales sufficiently large to mask proprietary information.

Non-Agricultural BMP Tracking

DEC intends to develop co-incident capability to track BMP implementation for non-agricultural BMPs. DEC will develop a primary system that will document the location and value of all BMP for projects supported by DEC dollars, which will be tied to the critical source area assessment system. Using data exchange capabilities, projects and BMP implementation tracked by the agricultural BMP database can be married to DEC's system, at the appropriate summary level. In addition, for road networks, DEC will incorporate BMP tracking either directly, or through data exchange approaches, in partnership with VTRANS.

The phosphorus reduction potential attributable to tactical basin planning is a function of the specific BMPs identified. EPA's Scenario Tool also provides an initial set of nutrient reduction values associated with specific BMPs. DEC will continue to work with EPA and other partners to develop appropriate measures of P reduction associated with BMPs. For those practices contained within the Scenario Tool, the phosphorus removal efficiencies, with some adjustment, may serve as a good starting point for documentation of aggregate phosphorus reductions. Aggregated phosphorus reduction achievements can be reflected by tactical basin plans as they are updated.

Capacity for Implementation

The watershed planners who are responsible for development and implementation of tactical basin plans face a formidable workload associated with the implementation of the Champlain TMDL. The roles of the watershed coordinators are threefold: 1) development of the plans on a five-year recurring basis; 2) updating of the implementation table on a biennial basis; 3) support for implementation of projects or BMPs on the ground. While watershed coordinators are not the only staff persons involved in directing BMP implementation, this work can be a significant component of their annual workplan. Regional Planning Commissions and watershed organizations are core partners in the implementation of tactical basin plans, and therefore the Lake Champlain TMDL.

Timeline to Initiate	Purpose
Existing	Watershed planning.
Fall, 2015	-Develop framework for a basin-wide Critical Source Area assessment, targeting, and tracking system. -Coordinate RFP for construction of the system. -Conduct watershed modeling analyses using system to develop the Phase 1 initial subwatershed prioritization, and to develop the first five-year increment of projects for insertion into Tactical Basin Plans.
Fall, 2015	-Integrate results of WQMon, SWMP, SGA, AEM, and BBRCI projects with CSA analyses -Implement BMP tracking system component of the system for all DEC funded projects supported via the Ecosystem Restoration Program. -Implement accounting for nutrient reductions associated with BMP implementation.
Fall 2016	Identify planners dedicated to support of tactical planning in the Lake Champlain basin, with specific focus on Missisquoi Basin, and on South Lake Champlain.
Fall 2016	To support regional watershed planning for municipal BMP outreach, support, and implementation.
Fall 2016	To provide organizational support for Champlain Basin watershed organizations, to implement landowner outreach and BMP's installations.

IMPLEMENTATION STEPS AND TIMEFRAME

Task	Timeline	Milestone
Completion of South Lake Champlain basin Tactical Plan	May, 2014	Plan issued
Completion of North Lake Champlain Direct Basin Tactical Plan	Dec., 2014	Plan issued
Initial development of modeling capacity	Fall, 2014 through Fall, 2015	Modeling and GIS analysts on staff.
Development of Phase 2 Overall Tactical Actions Plan	Spring 2016	Initial Phase Plan based on Scenario Tool and initial coarse modeling.
Development first five-year implementation scenarios – Lamoille, Missisquoi, South Lake Champlain	Summer through Fall 2016	Geospatial and tabular representation of intervention locations and BMP options.

Completion of Lamoille Basin Tactical Plan – Implementation Table to reflect first five-year Phase 2 cycle	Dec., 2016	Plan issued, Implementation Table to reflect first five-year Phase 2 cycle. All active basin plans for the LC Basin reflect modern Tactical Plan Design.
Update Missisquoi Tactical Plan	Dec., 2016	Implementation Table to reflect first five-year Phase 2 cycle.
Update South Lake Champlain Tactical Plan	Dec., 2016	Implementation Table to reflect first five-year Phase 2 cycle.
Development first five-year implementation scenarios Winooski, Otter	Winter, 2016 to Spring, 2017	Geospatial and tabular representation of intervention locations and BMP options.
Update Winooski Tactical Plan	Dec., 2017	Implementation Table to reflect first five-year Phase 2 cycle.
Update Otter Creek Tactical Plan	Dec., 2017	Implementation Table to reflect first five-year Phase 2 cycle.
As of Dec., 2017, all tactical basin plans in the Lake Champlain plans watershed now include first-five-year Phase 2 implementation actions.		

PHOSPHORUS DETERGENT AND FERTILIZER USAGE

DESCRIPTION

Vermont has had a law in effect since 1978 prohibiting the sale of household cleaning agents (e.g., laundry detergents) containing more than a trace amount of phosphorus (10 V.S.A §1382). Effective in 2010, the exemption given to automatic dishwasher detergents was removed from the statute. This change was estimated to reduce wastewater phosphorus loading to Lake Champlain by 0.8 - 3.2 metric tons per year.

Vermont adopted legislation effective in 2012 (10 V.S.A §1266b) that prohibits the application of phosphorus fertilizer to turf unless the grass is being established during the first growing season, or a soil test indicates the need for phosphorus. Fertilizer applications to impervious surfaces or within 25 feet of surface waters are prohibited.

IMPLEMENTATION MECHANISM

Vermont has already passed legislation. No additional action is necessary.

G. WETLAND PROTECTION AND RESTORATION

DESCRIPTION

One of the most commonly cited functions of wetlands is the ability to maintain and improve water quality and flood storage of adjacent streams, rivers, and lakes. 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 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.

The economic benefits from the ecosystem services that natural wetlands offer can be significant to Vermont communities. For example, the town of Middlebury experienced approximately $3 million in damages from Tropical Storm Irene. The Gund Institute at the University of Vermont estimated that the Otter Creek wetlands complex upstream of Middlebury helped the town *avoid* an additional $5 million in flood damages.

Between 1780 and 1980 Vermont has lost over 35% of its natural wetlands, subsequently loosing phosphorus sinks throughout the Lake 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. It is imperative that ANR include protection for natural wetland services and encourage wetland restoration to increase wetland water quality protection in this Phase 1 Plan.

The Vermont Wetlands Program is responsible for identifying and protecting wetlands which provide significant functions and values for the people of Vermont. Wetlands often 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.

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.

In May, 2009, the State of 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.

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.

IMPLEMENTATION MECHANISM

Because opportunities for wetland restoration occasionally arise as a result of supportive field visits, it is important all District Wetland Ecologists have the capacity to handle such requests. DEC's goal is to have sufficient staffing such that all Ecologists may provide technical assistance to landowners and municipalities in restoring wetlands. The Program will station one District Ecologist in the Lake Champlain basin, to dedicate a significant amount of his/her time towards restoration coordination with federal, state and local partners.

The State of Vermont categorizes wetlands into three classes: Class I, Class II, and Class III. Class I wetlands are exceptional or irreplaceable in their contribution to Vermont's natural heritage and, therefore, merit the highest level of protection. This protection includes larger protected buffer zones and more rigorous standards for permitting impacts. As of February of 2014, there were only three wetlands with this rigorous protection status. The Wetlands Program has identified several exceptional or irreplaceable wetlands within the Lake Champlain basin which function as erosion and flood control of streams and improve water quality. These wetlands will be sent through the rulemaking process to designate as Class I so that their core is preserved and the impaired fringes have the opportunity to restore.

ANR will work 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.

IMPLEMENTATION STEPS AND TIMEFRAME

DEC will enhance wetland conservation and restoration using the following schedule:

1. DEC continues to implement wetlands rules	Ongoing
2. DEC will work 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	Ongoing

MILESTONES FOR PARTIAL IMPLEMENTATION

1. Establish new Wetland Rules	2010
2. Initiate rules for Class I designation of two large wetlands in the Lake Champlain basin.	2015
3. DEC to conduct site visits for wetland protection, conduct permitting, and track enforcement actions and outcomes within the Lake Champlain basin	Ongoing
4. Conduct permit compliance checks on 80% of construction projects within the Lake Champlain basin	2016
5. DEC will work with federal and state agencies and local partners to identify and implement wetland conservation and restoration opportunities, targeting Missisquoi and South Lake basins	2020
6. DEC will work with federal and state agencies and local partners to identify and implement wetland conservation and restoration opportunities, targeting other priority watersheds subject to increases in runoff from land uses	2025
7. DEC will work with federal and state agencies and local partners to identify and implement wetland conservation and restoration opportunities, targeting watersheds in Lake Champlain basin that are at risk of land conversion	2025
8. Create technical assistance/public education program to work with landowners, municipalities, regional planning commissions, Conservation districts, businesses, and environmental groups to support protection and restoration of vegetated buffers and aquatic habitat function, targeting Lake Champlain basin	2020
9. Expand technical assistance/public education program to work with landowners and other partners to support protection and restoration of vegetated buffers and aquatic habitat function, targeting the rest of the State and aligned with tactical basin planning	2025

H. SHORELAND MANAGEMENT

DESCRIPTION

The 2013-2014 session of the Vermont Legislature is currently considering a Shoreland Protection Bill that would require DEC to establish a permit program for development within 250 feet of the water's edge on lakes 10 acres or greater in size. While the details of the bill are still under discussion as of March 2014, the current version of the bill as passed by the Senate calls for regulation of the creation of cleared or impervious areas by maintenance of natural vegetation (wooded areas) and the use of low-impact development best management practices. The bill 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.

IMPLEMENTATION MECHANISM

The bill would establish a permit program to be administered by DEC's Lakes and Ponds Program. The current version of H.526 as passed the Vermont Senate includes development review standards in the statute and the program could be implemented shortly after passage.

IMPLEMENTATION STEPS AND TIMEFRAME

1.	Continue to participate in the legislative process to ensure the bill provides reasonable shoreland protection	2014
2.	Create a permit program that meets the statutory requirements	2014
3.	Provide information to the public on permit requirements in advance of the permit program effective date	2014
4.	Begin permit program implementation July 1, 2014, the implementation date in current version of H.526	2014
5.	Ensure coordination with the Lake Wise program such that the Lake Wise BMPs can be used as mitigation measures in project review and that Lake Wise is used effectively to promote property management improvements where projects are not falling under jurisdiction of the statute	Ongoing

I. ADDRESSING INTERNAL PHOSPHORUS LOADING IN ST. ALBANS BAY

DESCRIPTION

The 2002 Lake Champlain Phosphorus TMDL included a discussion of the internal phosphorus loading problem in St. Albans Bay. The Bay has been subject to excessive phosphorus loading over a period of many decades, resulting in severe algae blooms during the summer. A major phosphorus removal upgrade of the St. Albans City Wastewater Treatment Facility in 1987 significantly reduced phosphorus loading to the Bay. However, phosphorus concentrations in the Bay did not decline as expected after the treatment plant upgrade. Internal phosphorus loading from phosphorus stored in the Bay's sediments, along with ongoing, excessive phosphorus loading from the Bay's watershed, were found to be responsible for the continued high phosphorus concentrations in St. Albans Bay.

The phosphorus modeling analysis used to derive the total loading capacity for St. Albans Bay in the 2002 Lake Champlain TMDL assumed that net internal loading to the Bay would decline to zero over time once external watershed loads were reduced. The same calculation has been used in EPA's lake modeling analysis for the new Lake Champlain TMDL. This assumption was considered to be conservative since most other Lake Champlain segments have negative net internal loading rates (i.e., there is net sedimentation of phosphorus).

To test the assumption that internal loading would decline within a reasonable time period without in-lake intervention, DEC sponsored research on the phosphorus content of St. Albans Bay sediments and the chemical mechanisms that lead to its release into the water column. The study by Druschel et al. (2005) concluded that there remains a substantial reservoir of phosphorus in the sediments of St. Albans Bay which has the potential to contribute phosphorus to the water in the Bay for a long period of time into the future.

In light of these findings, DEC initiated a Phase 1 Feasibility Study for the Control of Internal Phosphorus Loading in St. Albans Bay which was completed by ENSR Corp. (2007). The study evaluated several alternative methods for controlling internal loading in the Bay as to technical feasibility, cost, and environmental impacts. Methods evaluated included circulation, dredging, chemical phosphorus inactivation in the sediments, and tributary dosing.

After considering the results of the Phase 1 Feasibility Study along with other research information on St. Albans Bay, DEC began to pursue a Phase 2 Project Design Study with the U.S. Army Corps of Engineers. The purpose of the Phase 2 Study was to develop a detailed design for an in-lake treatment project including refined cost estimates, and to prepare a full environmental evaluation with all information needed for state and federal permitting. The specific treatment methods to be evaluated by the Phase 2 study were sediment phosphorus inactivation with aluminum compounds within the Black Creek Wetland and inner St. Albans Bay (approximately 700 acres), and hydraulic dredging of an area limited to the open-water portion of the Black Creek Wetland. However, the Phase 2 study was never conducted because of difficulties in gaining Corps of Engineers funding for the work.

Phosphorus concentrations in the tributary streams draining to St. Albans Bay are among the highest in the Lake Champlain basin because of uncontrolled nonpoint sources in the Bay's watershed. If these external phosphorus sources are not adequately reduced before an in-lake treatment takes place, the longevity and effectiveness of an internal treatment would be seriously compromised. The 2002 Lake Champlain TMDL stated that progress in reducing nonpoint source phosphorus loading to St. Albans Bay should be a prerequisite before any in-lake treatment is attempted to control internal phosphorus loading. The Phase 1 Feasibility Study consultant's report reiterated this strong recommendation.

Based on the extensive research and modeling done on internal phosphorus dynamics in St. Albans Bay, it is unlikely that control of external watershed phosphorus loading sources alone will result in the full attainment of water quality standards in the Bay. An in-lake treatment to control internal phosphorus loading will likely be necessary as a final step in the restoration of the Bay.

The Phase 2 Project Design Study should be conducted when all watershed phosphorus reduction steps applicable to St. Albans Bay are nearing substantial completion. The cost estimates presented below for the Phase 2 Study and the treatment project itself were derived from the findings of the Phase 1 Feasibility Study.

IMPLEMENTATION MECHANISM

Design and implementation of an in-lake treatment project for St. Albans Bay.

IMPLEMENTATION STEPS AND TIMEFRAME

1. Complete Phase 2 Project Design Study, including detailed in-lake treatment design and full environmental permitting information needs	2033
2. Secure treatment project funding	2034
3. Secure environmental permits	2034
4. Conduct in-lake treatment	2035

CHAPTER 6 - CLIMATE CHANGE AND RESILIENCE

A. INTRODUCTION

Climate trend data for Vermont and regionally serve as a helpful guide in understanding risks associated with climate change impacts we face today and in the future, and actions we need to take to minimize those risks. Scientists have documented changes in Vermont's climate over the past 50 years. Trends indicate warmer surface temperatures and precipitation patterns. Referencing "Vermont Climate Change Indicators," (Betts, A., 2001a) in the 2013 VANR report, *Climate Change Adaptation Framework*, average air temperatures over the past 50 years have increased approximately 4.5 degrees Fahrenheit -- a rate of 0.4 degrees Fahrenheit per decade. These trends are projected to continue.

Warmer surface temperatures are changing precipitation patterns and snowpack. More precipitation is falling as rain during the winter months, reducing snowpack. Trend data show earlier snow melt and peak flow of spring runoff. (Karl et al, 2009; Hayhoe et al. 2007).

Trends towards more frequent high intensity precipitation events are a particular concern for the northeast region. Precipitation in Vermont has increased by 15-20 percent over the past 50 years, and increases in more frequent and intensive severe weather are projected to continue. (Betts 2011a, UCS 2006, Hayhoe et al. 2007, Karl et al. 2009). The VANR 2011 report entitled, *Resilience: A Report on the Health of Vermont's Environment*, released in the aftermath of Tropical Storm Irene, reported that storms "release 67 percent more rain than they did 50 years ago."

Lake Champlain's phosphorus loading problems are largely associated with stormwater runoff and erosion across all sectors – developed areas, roads, agricultural and forest lands. Climate change impacts on precipitation appear to magnify the effects of our land uses on water quality, placing a greater burden on already stressed ecological systems. The greater frequency of severe precipitation events, brought on by climate change, couple with increases in impervious surfaces will generate more stormwater runoff and erosion, and more water quality degradation.

Therefore, the climate change strategy included in this Phase 1 Plan is a "no regrets" strategy built on known actions designed to secure multiple objectives and benefits. The actions described below will:

- Benefit the public;
- Focus on reducing impacts from stormwater runoff, erosion, and flooding; and
- Include policies that restore and safeguard the hydrology of watersheds and the natural and beneficial functions of floodplains, river corridors, wetlands, riparian buffer areas, and lake shorelands.

Vermont knows all too well, following the aftermath of Tropical Storm Irene, about the potential devastating impacts caused by severe flooding. Flooding can disrupt the local and state economies, displace businesses, raise public health concerns, degrade water quality, threaten infrastructure (such as transportation networks, wastewater treatment facilities, and water supplies), damage agricultural production and private property, and hurt recreation. Thus, Vermont's "no regrets" or "best bet" climate adaptation actions described here are pragmatic programs and activities that are designed to enhance flood resilience, minimize impacts from stormwater runoff, and improve water quality.

While much uncertainty remains about climate change and how, where, magnitude and extent of climate change impacts on precipitation, temperature, and other variables, such as soil moisture (especially important for vegetation generally as well as agricultural productions, and forest management), uncertainty should not be an excuse for inaction. Uncertainty requires a process of reevaluation of progress, incorporation of monitoring and assessment data, and adjustment of actions. This Phase 1 Plan, specifying actions and milestones, allows for an adaptive management approach. This approach accommodates new information and provides a means to minimize negative consequences of climate change.

Additionally, the cost of inaction may be far higher than the costs associated with minimizing the negative consequences of climate change. Vermont has experienced, on average one federally declared flood disaster each year for the past twenty years, and the costs of recovery are significant. The year 2011 will forever be remembered by the spring flooding in Lake Champlain and the devastation caused by Tropical Storm Irene. Irene took the lives of six people, destroyed more than 500 miles of state roads, damaged 200 bridges, and destroyed 1,000 homes. The State and federal governments spent more than $565 million in flood recovery, which does not capture the recovery costs borne by local communities and private landowners. (Irene: Reflections on Weathering the Storm, and Irene By The Numbers, and an article by the Huffington Post and the Associated Press).

Such severe storm events can also cause significant increases in phosphorus loading to Lake Champlain. In fact, the majority of the annual phosphorus load to Lake Champlain comes during a relatively few major runoff events each year. The spring floods during 2011 carried 62 percent of the annual phosphorus load from the Winooski River (Figure 11). Tropical Storm Irene brought another 13 percent of the annual load during just a few days in late summer.

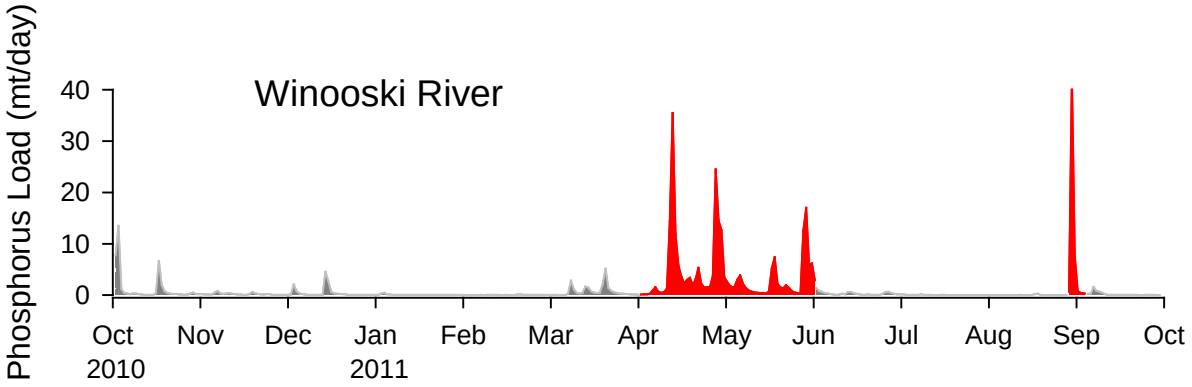

FIGURE 11 - DAILY PHOSPHORUS LOAD TO LAKE CHAMPLAIN FROM THE WINOOSKI RIVER (METRIC TONS PER DAY) DURING WATER YEAR 2011. LOADS DURING THE SPRING FLOODS AND TROPICAL STORM IRENE ARE HIGHLIGHTED IN RED

Vermont's approach is a precautionary response to climate change-driven impacts projected for this region. Major storm events are predicted to occur with increasing frequency and severity in the future in the Lake Champlain region as reinforced by the United States National Climate Assessment, released in draft form in January, 2014. This draft assessment reports, "Floods are projected to intensify in most regions…especially in areas that are expected to become wetter, such as the Midwest and the Northeast….More intense runoff and precipitation generally increase river sediment, nitrogen, and pollutant loads." (United States Global Change Research Program, page 107.)

The next segment to this Chapter lays out a discussion of the climate response modeling report prepared for EPA by Tetra Tech, Inc. in May 2013. The purpose of that study was to analyze projected future phosphorus loading to Lake Champlain due to climate change.

The degree and extent of impact associated with climate change is a function of *localized factors* – the current condition of Vermont's landscape that either heightens or minimizes its vulnerability to stormwater runoff and erosion. Therefore, the final segment to this chapter describes the State's measures to offset the projected climate change-induced phosphorus loading. These actions will also provide for cleaner water for this and future generations, while helping to make our communities, businesses, farms, and forests more resilient to the economic and social impacts caused by flooding.

B. SUMMARY AND PERSPECTIVE ON THE TETRA TECH CLIMATE RESPONSE MODELING REPORT

A Lake Champlain basin SWAT Climate Response Modeling report was prepared for EPA by Tetra Tech, Inc. in May 2013. The analysis used the Soil and Water Assessment Tool (SWAT) watershed model in concert with six regionally downscaled climate change scenarios based on several different underlying global climate change models. The purpose of the study was to facilitate the analysis of climate change impacts on future phosphorus loading to Lake Champlain for consideration during the development of the Lake Champlain Phosphorus TMDL.

The report analyzed changes in annual flows and total phosphorus loading rates for each major tributary to Lake Champlain by comparing baseline period rates (1980-2010) with future predictions for the period of 2040-2070. For the Lake Champlain basin as a whole, the median predicted changes across all six climate scenarios were a 12.5% increase in annual flow volume and a 29.8% increase in total phosphorus loading rate. These predicted changes varied among the individual tributaries, with predicted flow rate increases ranging from 7.8% to 26.6%, and predicted increases in phosphorus loading rates ranging from 2.7% to 54.6% (**Error! Reference source not found.**).

The Tetra Tech analysis did not, however, take into account the increases in the Lake's assimilative capacity for phosphorus that would accompany the increased flow rates. As a result, the future phosphorus loading rate predictions in Table 11 overstate the extent to which climate change could cause phosphorus concentration increases in the lake. A direct analysis of the interplay between future increased flow volumes and tributary phosphorus loads would require a mass balance modeling analysis of the lake similar to what was done for the development of the TMDL. However, an indication of the combined effects of flow and phosphorus loading increases on the in-lake phosphorus concentrations can be provided by calculating changes in the flow-weighted average phosphorus concentration in each tributary (i.e., the total annual phosphorus loading rate divided by the total annual flow rate).

Changes in the flow-weighted average tributary phosphorus concentrations were calculated from the Tetra Tech predictions and shown in Table 11. Median changes in the flow-weighted average tributary phosphorus concentrations were estimated to be 15.4% for the basin as a whole, with a range among individual tributaries of -7.6% to 27.7%. These predicted changes in average inflow phosphorus concentrations are substantially more modest than the predicted loading rate increases, but still represent a potentially significant future source of phosphorus that will require adaptation measures in the watershed in order to achieve phosphorus concentration standards in the Lake.

TABLE 11 - AMEDIAN PREDICTED CHANGES IN ANNUAL FLOW RATES, TOTAL PHOSPHORUS (TP) LOADING RATES, AND FLOW-WEIGHTED AVERAGE TP CONCENTRATIONS IN LAKE CHAMPLAIN TRIBUTARIES RESULTING FROM CLIMATE CHANGE.

Tributary	Flow Rate[a]	TP Loading Rate[a]	Flow-Weighted Average TP Concentration
Poultney	13.9%	34.6%	18.2%
LaPlatte	22.1%	54.6%	26.6%
Lewis	12.8%	42.0%	25.8%
Little Otter	14.9%	46.8%	27.7%
Otter	12.2%	35.5%	20.7%
Winooski	8.8%	23.0%	13.0%
Lamoille	14.6%	43.4%	25.2%
Missisquoi	12.0%	25.2%	11.8%
Rock	26.3%	42.7%	12.9%
Pike	26.6%	17.1%	-7.5%
Mettawee/Barge Canal	14.2%	39.0%	21.8%
Ausable	7.8%	6.6%	-1.1%
Little Ausable	25.5%	37.7%	9.7%
Saranac	11.1%	2.7%	-7.6%
Salmon	18.1%	33.4%	13.0%
Boquet	11.4%	30.5%	17.1%
Great Chazy	15.0%	20.1%	4.4%
Little Chazy	15.7%	19.4%	3.2%
Lake Champlain watershed	12.5%	29.8%	15.4%

Values are the medians of the predictions of six regionally downscaled climate change scenarios. The modeled future period of 2040-2070 was compared with the baseline period of 1980-2010, except for the LaPlatte River.

[a]Median percent change in flows and TP loads are from TetraTech (2013).

[b]Percent changes in flow-weighted average TP concentration were calculated as ((1+[Load percent change])/(1+[Flow percent change]))-1.

C. ACTIONS TO MINIMIZE THE CURRENT AND FUTURE WATER QUALITY IMPACTS OF CLIMATE CHANGE

The final segment to this Chapter discusses specific actions the State of Vermont will take to minimize current and future climate change-induced phosphorus load impacts. Most of these actions are already included as part of this Phase 1 Plan, since climate change is expected to exacerbate the contribution of nutrient loading from land-based, nonpoint sources. Along the theme of a "no-regrets" strategy, actions to minimize the water quality impacts of climate change in Vermont are comparable to actions that minimize impacts from stormwater runoff and erosion.

AGRICULTURAL PROGRAMS

Background

A robust agricultural-based economy is important to Vermonters. Agriculture in this State supports a working landscape that offers important aesthetic, cultural, environmental, and recreational benefits. Yet climate change poses a number of threats to the State's agricultural economy. (The Potential Impacts of Climate Change on Agriculture in Vermont). The seasonal shift in temperature and precipitation patterns will affect not only water quality but also crop production, milk productivity and the spread of pests and pathogens.

Increased erosion due to increases in precipitation amounts, frequency and intensity, and the resultant runoff is arguably the greatest concern to water quality impacts due to the soil and nutrient loss. However, as crop production is affected by increased temperatures and rainfall, producers may make crop management decisions, such as conversion of forested land to cropland. This could potentially increase the acreage to annual crops but may increase stormflows by as much as 10% (Hewlett, 1982). Producers may change to different crops that may have a greater or lesser ability to retain soil on fields (hayland versus annual crops). As increased crop production is needed, producers are increasing the acreage in tile drainage, which may decrease the nutrient runoff that occurs from field and gully erosion but can add dissolved phosphorus and hydrology concerns through high volume outflows.

Actions

Many of the current recommendations in Vermont's policy commitments in this Plan will have a positive impact on water quality as climate change becomes a greater challenge in the future.

- The proposed changes to the AAPs will increase buffer widths, require buffers on field ditches, and require stabilization of field gullies. Increased precipitation will have a dramatic effect on field runoff and these requirements will substantially decrease the water quality impacts.
- Licensing of manure application operators will increase the knowledge of these companies, and require training and oversight that will decrease the over-application of manure in sensitive areas, and prior to heavy rainfall events.
- Additional agency inspectors will increase compliance of nutrient management and field practices

- An increase in the technical staff in the field to help implement good land practices such as reduced tillage, cover crops, and alternative manure management has already proven to be an asset to implementation of BMPs already proven to have value in water quality.
- Nutrient management planning will increase and be required on all farms. As a result all farms of a substantial size and animal density will be required to document their nutrient applications, soil tests, and other field practices that will decrease any potential for nutrient runoff.
- Focused outreach and BMP funds will be directed to critical source areas in watersheds of Missisquoi Bay, St. Albans Bay and South Lake. Upcoming maps developed with LiDAR technology allow for mapping of high potential runoff areas, down to partial field levels, and prior targeted outreach to these producers resulted in increased site-specific BMP implementation in Franklin County.
- Specific funding for Vermont, site-specific research into new technologies and methodologies will provide local information to producers to help with cost-effective management decision-making.

While these proposed commitments will all address increased precipitation and land use changes due to climate change, additional work is needed to ensure that farmers have the necessary education, tools and resources to address climate change impacts in a way that will improve water quality and protect their investments and livelihoods.

It is also important that this work is done in a way that will address the individual needs of each farm, and recognize the human behavior impacts of implementing change. The Agricultural Work Group that was formed by DEC and AAFM to help develop the proposed changes in the TMDL, listed as one of their three priorities, strategies that allow farmers the option to develop "smart" tailored plans. They recognized that flexibility in programs and requirements is necessary to appropriately address the uniquely individual needs and concerns on Vermont farms. A timely recent survey conducted by the UVM *RACC* effort (*Research on Adaptation to Climate Change),* showed that the ability to have control over decisions was the most statistically significant driver in creating change, *above* the impact of regulatory control. In developing programs that will address future issues, providing options as well as resources will be critical to successfully protecting our water quality.

Recommendations

In determining how to efficiently move forward in addressing the temperature and rainfall effects of future climate change, three key areas stand out as having the greatest potential to help mitigate the potential negative impacts of climate change on water quality; soil health, tile drain issues, and increased implementation of key BMPs.

Soil Health

Improving soil health is a long-term process that provides extensive and multiple benefits in addressing climate change issues. Good soil health results in increased organic matter, increased soil pore space for water infiltration, increased soil water holding capacity, and decreased flow speed and volume to surface waters. Increased organic matter also helps address drought adaptation that also may result from climate change. For every percent increase in organic matter, another inch of water is available to plants, increasing production and decreasing the

need for additional land converted to crops (Emerson, 1995). Soil resiliency hinges on infiltration – rainfall that infiltrates does not run off, cannot cause erosion, and can potentially be stored for plant use. The major problem is not runoff but infiltration.

Proposed actions

- Provide specific soil health training to outreach staff for their work with individual farmers.
- Increase demonstration projects and events to educate about biological approaches to compaction that can improve infiltration, specific soil quality BMPs and resources available to help with practice changes.
- Coordinate with UVM Extension Ag/Climate Change specialist on specific education programs for producers to increase knowledge of soil health.
- Coordinate with USDA/NRCS and their new healthy soils initiative "*Unlock the Secrets of Soil"*, which has extensive new educational materials and tools for helping farmers recognize the value of soil health.
- Use CSA mapping to evaluate priority areas for landscape infrastructure such as storage ponds that can increase water holding capacity that will address drought and prevents runoff of nutrients and sediment and related erosion. Use new personnel to work with landowners in key areas (potentially headwaters)
- Develop an incentive program that provides additional resources to producers who implement management changes that improve soil health. (This will be part of a larger incentive effort).

Tile Drains

As farms increase in size, a need for increased production per acre is a factor in the dramatic increase in the installation of tile drains in many sections of the Lake Champlain basin. While there is no method for accurately tracking this practice, NRCS estimates as much as 50% of agricultural fields in some watersheds may contain tile drains (Potter, 2012). When installed and managed appropriately, tile drainage can be an important part of environmental farm management and can dramatically reduce soil erosion and phosphorus losses from fields by decreasing surface runoff and increasing infiltration (Fraser and Fleming, 2001). However, timing and quantity of field nutrient applications, as well as soil quality and installation methods all affect the impacts of tile drains. Many studies have shown that tile drain outflows can contain high levels of dissolved phosphorus as well as nitrogen. These levels can be affected by timing of manure application around rainfall events, and the macropores in the soil that affect nutrient passage through soil to the drains. Tile outflows can also negatively impact stream channels by increasing the velocity of outflow to the receiving water, and resulting soil erosion.

Miner Institute in Chazy, NY is currently conducting an extensive research project on the impacts of tile drains and possible BMPs that may be implemented to address these. The Lake Champlain basin Program has recently allocated funds for a literature review of the subject to help inform policy makers, educators and producers about management of tile drains. USDA/NRCS recently added a practice standard (782) that will provide cost-share for systems that intercept tile flow and reduce the concentration of phosphorus to receiving waters. Each of these efforts has potential to improve the management of tile drains in Vermont and will be included in outreach and coordination.

Proposed actions

- Conduct demonstration projects on Vermont farms in priority watershed to demonstrate well-installed and managed tile drain systems, and compare water quality impacts.
- Work with partners to develop an extensive education program on the impacts and potential improvements to tile drain installation and management that would include an educational conference, factsheets, website additions and mailings.
- Provide training to outreach staff to assist them in providing education to producers and increase implementation of NRCS tile drain practice.
- Coordinate with partners to share results of tile drain research.

INCREASE IMPLEMENTATION OF KEY BEST MANAGEMENT PRACTICES

Many traditional BMPs that improve water quality will also help in mitigating the effects of climate change. As rainfall amounts and intensity increase, these BMPs will become even more necessary and more valuable. Specific BMPs such as conservation tillage, buffers, cover crops and alternative manure management will help address these climate concerns. In one Vermont study, conservation tillage decreased agricultural stormwater runoff by between 50-63% (Claussen and Potter, 1990). A Canadian study showed that soil loss can decrease from 8 tons/acre/year on some fields with conventional tillage to less than 1 ton with no-till practices (Herbek, www2.ca.uky.edu). No-till practices can also increase organic matter in fields from 2.5 to 4.1% (Quarles, 1994).

These particular BMPs help by decreasing field erosion, improving soil health and infiltration, and decreasing nutrient runoff. However, some of these practices require very site-specific adaption, resources and education. Transitioning from conventional to reduced or no-till requires individual technical assistance and an understanding of the long-term benefits. Alternative manure management technologies such as manure injection are extremely expensive and require financial assistance to producers. Larger buffers take valuable land out of production and compensation through programs such as CREP must be commensurate with the lost crop value. Cover crops in heavy clay soils can be challenging to implement and accept.

Proposed actions

- Continue to secure necessary BMP, FAP and CEAP (equipment cost-share) implementation funds for specific practices.
- Incentivize practice implementation by providing additional funding and benefit opportunities for BMPs that are implemented in priority watersheds, sensitive riparian areas and other critical source areas. Development of a comprehensive incentive program that will address priority areas will be done by 2015.
- Provide extensive outreach and education about the results of the “edge of field monitoring” research currently funded in Vermont that is evaluating critical BMPs in side-by-side watershed studies.
- Provide adequate ongoing training for technical staff about BMP information, available resources and site-specific implementation opportunities.

Summary
Vermont is fortunate to have current support from partners and other agencies that will provide assistance in our ability to share timely and appropriate new technologies and practices to address climate change in the future. The "edge of field monitoring" project that was funded with USDA/NRCS funds is an example of this. UVM Extension hired an agricultural climate change expert in 2013 who has brought educational and research knowledge and opportunities from the Chesapeake Bay area. USDA Secretary Vilsack recently announced that one of the national "climate hubs" will be located in Durham, NH, and will build capacity to provide information and guidance on technologies and risk management practices at the regional and local scale to partners and producers.

DEC and AAFM also intend to continue to recruit funds for additional outreach methods such as online training programs for producers, demonstration sites and educational workshops and materials to provide a diverse and flexible way for all producers to receive knowledge and technical assistance.

STORMWATER MANAGEMENT

Background
Any project that exceeds the jurisdictional threshold for stormwater in Vermont is required to adhere to the standards set forth in the Vermont Stormwater Management Manual (VSMM). The current version of the VSMM was adopted in 2002 and presents a unified approach for designing and sizing stormwater treatment practices to meet specified treatment standards for water quality, channel protection, groundwater recharge, overbank flood protection, and extreme flood control. The unified sizing approach is intended to manage the entire frequency of storms anticipated over the life of the stormwater management system and the associated development.
From a climate change/flood resilience perspective, there are two issues associated with the current version of the VSMM:

- Under the unified sizing approach, stormwater treatment practices are designed according to a targeted design storm. The magnitude of the design storm is based on a probability distribution of observed precipitation events over a period of many decades. These precipitation values may not reflect the trend of greater frequency of severe storm events throughout the Northeast. There is growing concern that using the rainfall data currently in the VSMM to design and size stormwater infrastructure may result in permitted systems that are undersized and therefore not well suited for handling future rainfall events and meeting pollution mitigation targets. Undersized structures can contribute to channel erosion and localized flooding, need more frequent maintenance, and, most significantly in the context of this TMDL, are less effective at removing pollutants from stormwater runoff.

- To meet design standards, designers/engineers are often steered towards gray infrastructure practices. Gray infrastructure can be defined as "that which is manmade and part of the built environment." Examples of stormwater, gray infrastructure include stormwater pipes, catch basins, and detention ponds. Gray infrastructure systems are

centralized by design and predominantly capture, pipe, and convey stormwater from one location to another or control peak flows. There are advantages of alternative methods of stormwater minimization and management, such as low impact development (LID) and green stormwater infrastructure (GSI). These methods are largely designed to treat and infiltrate stormwater on-site where feasible. They rely on natural process that mimic pre-development hydrology to help to reduce flashy streamflow regimes, caused by stormwater runoff, that can increase stream instability and pollutant loading from streambank bed and bank scouring.

Reducing water quality impacts from road runoff is another strategy with climate resilience benefits. 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.

Actions

DEC's Stormwater Program has identified two major actions associated with regulated stormwater infrastructure development – incorporate current precipitation data and promote green stormwater infrastructure. These actions ensure that permitted stormwater infrastructure is appropriately designed and adequately sized to effectively manage predicted increases in stormwater runoff. Stormwater systems designed and managed per standards that incorporate current precipitation data as well as LID and GSI, ensure resilience against increases in higher intensity precipitation, higher precipitation volumes, and snowmelt events:

- Require recent and localized rainfall data, where possible, to size stormwater practices. An important step toward greater climate adaptation and flood resilience is to ensure that any permitted stormwater system is designed and sized using data that accurately reflects precipitation trends in the Northeast. This data should include: (a) current data and the past 10 years of record; (b) local and regional precipitation data, including the Northeast Regional Climate Center Extreme Precipitation data; and (c) where appropriate, location-specific data to account for regional variation in precipitation patterns.
- Promote greater use of, LID principles and GSI practices in the VSMM. The Stormwater Program is currently updating the VSMM to incorporate and incentivize LID and GSI concepts. As described in a University of New Hampshire study entitled, "Economic and Adaptation Benefits of Low Impact Development," successful application of GSI has the potential to reduce stormwater runoff enough to reduce the need for conventional and costly drainage and treatment infrastructure, reduce the number of culverts deemed undersized that otherwise would need to be replaced, improve onsite storage of rainwater and snowmelt that can reduce and delay the runoff peak discharge, and minimize hydrologic impacts to the stream channel from stormwater runoff.

A third action pertains to managing runoff from municipal road networks. Act 110, passed in 2010, required that VTrans undergo rulemaking to include in the model Road and Bridge Standards practical and cost-effective best management practices to better control road-related stormwater runoff. Those practices address construction, maintenance, and repair of municipal road network. Actions to incentivize adoption and compliance with these standards include:

- Towns are to file an annual certificate of compliance with their codes and standards. VTrans is to review and revise the standards, as appropriate, via rulemaking 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;
- Act 110 established 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;
- 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, which will be 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.

RIVER CHANNEL STABILITY

Background

With the increased risk of severe weather events causing water quality degradation as well as economic and public safety impacts, it becomes increasingly important to manage rivers to meet and maintain dynamic equilibrium conditions. Equilibrium refers to the condition in which a stream channel achieves a naturally stable slope, meander pattern, channel dimensions (width and depth), and access to its floodplain. This condition is the least erosive, even at flood stage. This policy requires that floodplains and river corridors are protected and reserved for flooding, and that stream channels themselves are managed in ways that are consistent with the objective of achieving equilibrium conditions over time. Well-functioning floodplains under an equilibrium condition keep people and infrastructure out of harm's way, reduce property damages and flood recovery costs, reduce the need to channelize rivers in order to protect encroachments and, specific to the Lake Champlain TMDL's goals, reduce nutrient and sediment loading by minimizing erosion.

Actions

The following commitments described in this Phase 1 Plan support the State policy to manage rivers towards long-term establishment and maintenance of dynamic equilibrium:

- Reserve, restore, and maintain floodplains and river corridors for flood storage and pollutant attenuation by minimizing floodplain encroachment:
    - Established a river corridor easement program to conserve river reaches identified as high priority nutrient and sediment attenuation areas. The key provision of a river corridor easement is the purchase of channel management right;
    - Act 110 (enacted in 2010, effective 2011) established, as State policy, the management of rivers and streams to achieve and maintain dynamic equilibrium, the least erosive and naturally stable stream condition. The Act established a river corridor and floodplain management program, integrating floodplain management under the FEMA National Flood Insurance Program with fluvial erosion hazard avoidance, river corridor, buffer protection, and river science;

- Act 138 (effective 2012), directs ANR to create new state floodplain rules for activities exempt from municipal regulation, increase regulatory oversight and technical assistance in floodplain protection, and improve floodplain mapping;
- Act 138 also directs the creation of a Flood Resilient Communities Program to create financial incentives to encourage municipal adoption of bylaws that protect river corridors, floodplains, shorelands, and buffers;
- The State policy for managing the State's Emergency Relief and Assistance Fund (ERAF), described above, added an incentive to encourage municipal adoption of the state model floodplain and river corridor protection bylaws; Effective in October, 2014, those municipalities that adopt such measures will receive a large share of state aid (from 12.5% to 17.5% of the repair costs) following federally declared flood disasters; and
- Act 16, enacted in 2013 and effective in 2014, requires that municipal and regional land use plans include protection and restoration of floodplains and upland forested area in order to moderate impacts from flooding.

- Ensure that stream alteration activities are aligned with and do not depart from attainment of stream equilibrium condition:
  - Act 110 also modified stream alteration statutes expanding state jurisdiction to all perennial streams (i.e., those with year-round flows). Prior to Act 110, the regulations only applied to streams with a watershed greater than 10 square miles;
  - Act 138 required the adoption of rules and a stream alteration general permit to regulate Emergency Protective Measures (effective in 2014);
  - Effective in 2014, the VTrans Road and Bridge Standards, clarify that the VTrans Hydraulics Manual (which provide the VTrans technical analysis for sizing of stream crossings), and the Stream Alterations General Permit, are aligned to support the management of streams, including stream crossings, to achieve equilibrium conditions. Sizing stream crossings based on equilibrium conditions minimize erosion, scour, and structure failure. It also improves connectivity that supports aquatic organism passage;
  - Act 138 required that DEC develop a comprehensive "rivers and roads" training program. The targeted audience includes municipal, state and federal transportation network professionals, municipal employees, regional planning commissions and contractors. The goal of the training program is to explain how to design, construct and maintain roads and bridges to create greater river stability and more flood resistant transportation infrastructure. DEC, in partnership with VTrans and FWD, is developing a three-tiered training course. Tier 1 (introductory level) and Tier 2 (intermediate level) are currently available; Tier 3 (advanced level) training, focused on design and construction, will be available in early 2015. DEC will release in 2014 a document entitled, "Standard River Management Principles and Practices: Guidance for Managing Vermont's Rivers Based on Channel and Floodplain Function." This document will serve as the technical foundation and reference document for the Tier 3 training.
- Restoring and protecting native woody vegetation in riparian buffers;

- Increases in nutrient and sediment pollution loading, unstable streambanks, and loss of ecological function result when woody riparian vegetation if removed from the riparian or near stream area. Best management practices entail restoring and maintaining an undisturbed area that consists of trees, shrubs, groundcover plants, and the duff layer. ANR adopted Riparian Buffer Guidance in December, 2005, which articulates a framework for Agency recommendations in the Act 250 process. The Agency is currently updating the Buffer Guidance in tandem with adopting River Corridor Procedures and revising the Agency Floodway Procedures used in Act 250.

CLIMATE-SMART FOREST ADAPTATION STRATEGIES

Background

Forest management has been based on an historical understanding of forest response to given treatments. Under climate change, meeting forest management goals is less certain than it has been in the past. Increased temperatures, heavy precipitation events, mild winters, and extreme wind and ice storms are all predicted to increase. The best risk management at this point in time is to manage forests to be more resilient to a variety of weather conditions, and to build forest harvest plans that account for extreme weather influences.

Actions

Publish and distribute the draft forest adaptation strategy document: "Creating and Maintaining Resilient Forests in Vermont: Adapting forests to climate change."

6. Promote recommended forest adaptation strategies to foresters and landowners to implement climate-smart practices that maintain healthy forest cover, sustain ecological functions such as water holding capacity of forests, and promote water quality.
7. Develop and implement a policy to use climate-smart forestry practices on state lands.
8. Create funding priorities through the Working Lands Initiative (Working Lands Enterprise Fund (WLEF)) for new forest harvesting technologies that improve protection of soil and water.
9. Establish 3 demonstration areas on state land to train foresters and landowners on climate-smart forest management techniques that can then be implemented on the 86% of Vermont's forestlands that are privately owned.
10. Identify vulnerable forest stands within the Lake Champlain basin, develop forest health strategies to maintain forest cover and water holding capacity, and identify funding to implement strategies on priority forests.

WETLAND PROTECTION AND RESTORATION

Background

Global wetlands store carbon at an amount similar to total atmospheric carbon. Wetlands are able to accumulate carbon from agriculture, forestry, and other land uses by storing sediment and organic materials. The emission of carbon dioxide is slowed by vegetation intake of carbon and by the anaerobic conditions which slow organic decomposition by hundreds or thousands of years. Studies have estimated that 6% of global carbon emissions can be attributed to the destruction of artic and tropical peatlands alone. The protection and restoration of wetlands is a crucial component in offsetting climate change impacts in Vermont.

Wetlands are more sensitive to climate change than other landscape and deep water features in Vermont. A change in inches in water table depth can cause the presence or absence of a wetland in marginally wet sites. Wetland fragmentation and low biodiversity make many wetland plant communities less robust and adaptable to changes in climate. Vermont wetlands which are especially sensitive to climate change include: peatlands, seasonal wetlands (including vernal pools), spruce/fir swamps, wetlands with small watersheds, and wetlands surrounded by high nutrient and sediment load.

Climate impacts on wetland functions are expected to be significant, including hydrologic stresses from earlier spring runoff and hotter and drier summer months. Less consistent precipitation will expose peatlands and cause an increase in carbon dioxide release due to faster decomposition. More intense storm events will increase sediment and pollutants which may overwhelm the water quality protection function of the wetland. Stressors to wetland plant communities will make wetlands more susceptible to invasive species adapted to warmer climates. Loss or degradation of wetland function could, in turn, degrade water quality of the streams and lakes that benefit from the wetlands' natural filtering capacity. The expected increased groundwater withdrawal to support future irrigation needs, brought about from climate change-induced drier summer months may also lead to further wetland loss.

Wetland management, conservation, and restoration are effective and cost-effective climate adaptation strategies that:

- Enhance wetlands' filtering capacity of pollutants;
- Reduce carbon dioxide emissions;
- Minimize flood hazards by absorbing and attenuating floodwaters;
- Protect populations of species at their range extent;
- Promote groundwater recharge, which, in turn supports base flow in streams, which is particularly important during hotter and drier summer months; and,
- Sustain fish and wildlife habitat and support recreational activities that depend on them.

Programs to support the restoration and maintenance of vegetated buffers along waterways are also important strategies that:

- Reduce sediment load in waterways by slowing water velocities and stabilizing banks;
- Support cold-water aquatic organisms through shading;
- Increase resilience of native plant communities by preventing invasive plant establishment;

- Protect adult habitat of sensitive vernal pool dependent species; and,
- Increase and maintain carbon sequestration by vegetation.

Actions

Promote wetland conservation and restoration:

- Promote adequate buffers and protection to maximize their capacity to attenuate floodwaters, sediment and pollutants. DEC is able to change size of wetland buffers to accommodate this need;
- Focus protection and restoration efforts on wetlands which effectively sequester carbon, such as bogs. DEC has identified several peatlands throughout the State and will increase their protection standards. In 2012, the Wetlands Program established centennial sites to monitor and study climate change impacts to wetlands;
- Establish a wetlands technical assistance program to implement wetlands conservation and restoration projects with local and federal partners; and
- Strengthen wetland protection statute
    - Act 31 (enacted in May, 2009) strengthened the State's wetlands protection statute, to give DEC the authority to conduct: (a) administrative determinations to re-classify wetlands; (b) update wetland mapping, and, (c) interpret jurisdictional buffer zone widths to accommodate wetland function needs.

SHORELAND MANAGEMENT

Background

Shoreland management plays an important role in providing climate change resiliency along lakeshores. Naturally vegetated shoreland are known to be more resistant to erosion during flooding events. Eroding shorelands are a source of sediment and phosphorus to the lake, although the exact quantity of these pollutants due to shoreland erosion has not been studied or estimated. During the Spring of 2011 floods in Lake Champlain, shoreland erosion was much more common in areas where the woodland had been removed and replaced with lawn, than in areas where natural vegetation had been left in place. Structural stabilizations can deflect wave energy to adjacent shore areas, thus increasing erosion potential on neighboring properties. In addition, structural stabilization measures were in some cases overtopped by the flood waters and eroded from behind.

Well vegetated shorelands provide sustainable stability by making use of the "ecosystem services" of a variety of species and root types which resist erosion due to high water level and wave action. Numerous trunks and stems absorb and break up wave energy, minimizing its impact on the soil layer itself. Shoreland which are yet undeveloped generally has reached an equilibrium where erosion is minimal or non-existent. Where development or other land uses have removed the woodlands, stabilization measures may need to be implemented. Bio-technical and bio-engineering designs can be used to implement stabilization projects. Such projects are ideally designed to mimic the natural shore and be self-sustaining over time.

Actions

Promote well vegetated shorelands as sustainable erosion prevention along Lake Champlain:

- Require the use of stabilization methods that incorporate vegetation through the Lake Encroachment Program or the Shoreland Permit Program (currently under consideration in the Vermont legislature);
- Provide technical and grant support to project demonstrating and implementing vegetative shoreland stabilization measures;
- Incorporate BMPs for vegetative shoreland stabilization measures into the Lake Wise Program to provide technical assistance to landowners; and
- Continue to coordinate with the River Management Program on the development of model municipal shoreland ordinances that meet federal flood protection standards and provide good shoreland management to benefit both flood resiliency and pollution abatement.

D. CONCLUSION

Vermont faces important decisions about how to effectively minimize or avoid impacts from climate change. In 2010, The Nature Conservancy published a report entitled, "Climate Change in the Champlain Basin: What natural resource managers can expect and do." (Stager, J.C, M. Thill, 2010). That report's conclusions underscore an important message that the best strategies to minimize undesirable impacts from climate change are already known; such strategies do not require a new set of conservation tools. That report provides a comprehensive list of climate-ready strategies, among which are the following that address the anticipated water quality impacts from climate change:

- Acceleration of best management practices across land uses to reduce runoff and erosion;
- Stormwater control structures that reduce erosion and nutrient transport;
- Stormwater control regulations that use the current precipitation period of record;
- River corridor and floodplain protection;
- Policy that supports establishment and maintenance of stream equilibrium conditions;
- Re-establishment and maintenance of vegetated buffer zones along rivers, wetlands, and lakes to support streambank integrity, minimize erosion and runoff, and provide shade;
- More accurate flood hazard mapping;
- Wetland conservation;
- Ecologically sound and sustainable shoreland erosion mitigation strategies,
- Forestland conservation; and,
- Public education.

The climate change policy recommendations described in this Chapter incorporates all of these recommendations.

Climate change is projected to increase intensity and frequency of storm events, thereby exacerbating the delivery of phosphorus loading to Lake Champlain from existing, traditional sources or stressors. The three major stressors that comprise most of the nutrient loading to Lake Champlain, described in the Vermont Surface Water Management Strategy include: (a) land erosion from developed lands, agricultural lands, construction, and logging operations; (b) non-erosion-related nutrient loading from sources such as over-fertilization of cropland or poor manure management practices; and (c) stream channel erosion.

Promoting greater resilience in the Lake Champlain basin to the water quality impacts of climate change requires actions that reduce loadings from these traditional stressors. Actions described in this Chapter are designed to accomplish that objective. These actions also enhance flood resilience locally and statewide – a top priority of the State and an important "co-benefit" of the implementation of the Lake Champlain TMDL. Thus, investments in the implementation of this Plan to achieve clean water will also pay dividends in contributing toward reduction in the State's vulnerabilities to climate change.

CHAPTER 7 - IMPLEMENTATION SCHEDULE AND ACCOUNTABILITY FRAMEWORK

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 fund plans as a means of keeping costs and funding burdens down. DEC is proposing the following general schedule for implementation of the TMDL:

1. Department seeks authority and funding for implementation of the Phase 1 Plan	2014-16
2. Department develops and implements Phase 2 Plans for each basin (tactical basin plans)	2016-36

Detailed implementation schedules for Vermont's policy commitments are included in the Gantt Chart in Appendix E.

EPA views the Phase 1 and Phase 2 Plans as the core of a broader, ongoing accountability framework by which EPA will assess Vermont's progress toward fulfilling the pollution reduction targets identified in the final TMDL. In its January 17, 2014 letter, EPA asked that Vermont discuss the State's commitment to track implementation progress and to enter both BMP installations and programmatic progress into a tracking tool that EPA is helping to develop.

DEC is proposing a schedule including five year milestones for reporting and evaluating progress towards goals in the implementation plans. EPA indicated in its January 17, 2014 letter that consequences for failing to make adequate progress could involve (a) requiring wastewater treatment plants to meet phosphorus effluent limits based on limits of technology and to obtain offsets for the remaining phosphorus loads, and (b) expansion of federal Clean Water Act permit coverage to cover a larger scope of activities (separate storm sewer systems, developed areas subject to residual designation authority, and animal feedlot operations).

As discussed previously in Chapter 5, DEC intends to develop the capability to track BMP implementation for non-agricultural BMPs, to complement ongoing efforts by the agricultural resource agencies to develop an agricultural BMP tracking system. DEC will develop a system to document the location and value of all BMP projects supported by federal or state dollars, which will be tied to the Critical Source Area Assessment System. Using data exchange capabilities, implementation projects tracked by the agricultural BMP database will also eventually be married to DEC's system. In addition, for road network projects, DEC will incorporate BMP tracking either directly, or through data exchange approaches, in partnership with VTRANS.

In order to track numeric estimates of phosphorus reductions achieved, VT will partner with EPA, by leveraging the EPA Scenario Tool discussed in Chapter 5, and the proposed EPA spreadsheet-based tracking tool. The Scenario Tool presents a range of BMP effectiveness values and anticipated load reductions for a suite of BMPs. The spreadsheet tool is intended to translate these into phosphorus reduction estimates. Vermont is committed to developing and maintaining robust data systems to track implementation of projects and program commitments, and will work with EPA to translate these to phosphorus load reductions.

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APPENDICIES

APPENDIX A - *EPA JANUARY 17, 2014 LETTER*

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
5 POST OFFICE SQUARE, SUITE 100
BOSTON, MA 02109-3912

January 17, 2014

David Mears, Commissioner
Vermont Department of Environmental Conservation
1 National Life Drive, Main 2
Montpelier, VT 05620-3520

Chuck Ross, Secretary
Vermont Agency of Agriculture, Food and Markets
116 State Street
Montpelier, VT 05620-2901

Dear Commissioner Mears and Secretary Ross:

The purpose of this letter is threefold: to provide comments on the draft "State of Vermont Proposal for a Clean Lake Champlain" (the "Proposal"); to provide the Vermont agencies with a clear understanding of the Environmental Protection Agency's expectations for the development of plans to implement the required phosphorus reductions in the revised Total Maximum Daily Load (TMDL) for Lake Champlain; and to describe an accountability framework to ensure those reductions are achieved.

The State Proposal

EPA applauds the substantial efforts the State has made in developing the Proposal. It is broad in scope and ambition, appropriately reflecting the challenge of restoring the health of Lake Champlain. As we have learned from the Scenario Tool, it will take an aggressive application of all of the measures in the Proposal to achieve water quality standards. Generally the Proposal lacks the specific details of what will be done by when. We appreciate that fleshing out the details is an iterative process and that the public outreach conducted in December, the comments you will receive this month, and analyzing information about things like unit costs are part of that process.

Climate change is another area that needs to be addressed throughout the Proposal. We suggest that relevant sections in the document include a discussion of how the implementation approach will take climate change into account. Climate adaptation and flood resilience should be addressed for each major category of practices. The report should note the phosphorus increases projected in EPA's climate change analysis, and explain how certain BMP, AAP, AMP

measures can and will be designed to be effective for higher intensity rainfall events. We suggest including a stand-alone section that summarizes the efforts the State has already undertaken to prepare and adapt to climate change (e.g., new culvert sizing specifications, etc.) and the additional things the State will be doing moving forward. EPA's additional comments on many of the programs in the draft Proposal are provided in an attachment.

Implementation Planning

We recognize that the level of detail necessary for implementation planning will take time to develop. The following are EPA's expectations divided into distinct planning phases. For the first phase EPA expects the state agencies to revise the Proposal and provide final policy commitments in a basin-wide scale implementation plan (Phase I Plan) by March 31, 2014. EPA expects the Phase I Plan to include a description of the authorities, actions, and, to the extent possible, control measures that will be implemented to achieve the nonpoint source target loads. EPA expects the Phase I Plan to identify a schedule for accomplishing reductions including dates for enhancing programs and implementing key actions to achieve these reductions, with all such actions to be implemented as soon as possible and by no later than a date to be discussed further. These actions include, but are not limited to, adopting new regulatory authorities, improving compliance with existing regulations, and securing additional resources for personnel, grant or cost-share programs. Ideally, EPA would like to see a high level project management chart (e.g., Gantt chart) that shows the intended schedule for each of the program elements.

Each of the programs identified in the Proposal is described as applicable across the Vermont portion of the Lake Champlain basin. For each of those programs, EPA expects that the State will identify and commit to implement specific pollutant reduction controls and actions in successive two-year milestones. We anticipate that some programs can be implemented quickly while others will need to be developed. For those items that depend on new funding, please prioritize actions into items that will be funded in the first two years, the next two years, and so on. EPA expects that the Phase I Plan will be followed by a commitment letter from the Governor by April 30, 2014.

EPA is seeking these commitments this spring because the State has expressed a clear preference to retain some flexibility in the TMDL's Waste Load Allocation (for point sources). As noted in my October 23, 2013 letter to Commissioner Mears, under these conditions in order for the TMDL to be issued consistent with EPA's regulations, it must provide reasonable assurances that the nonpoint source control measures will achieve expected load reductions. A satisfactory Phase I Plan and associated commitment letter will provide reasonable assurances.

After the TMDL has been finalized later this year, EPA expects the State to develop sub-basin implementation plans (Phase II Plans/Tactical Basin Plans), which more explicitly indicate what measures or practices will be applied in specific areas by certain dates. This spatial and temporal targeting of phosphorus loads to a finer scale will help local decision-makers (e.g., municipal governments, conservation districts, watershed associations) better understand the

contribution to and responsibilities for reducing pollutant loads. EPA expects the State to update these basin plans every five years, consistent with Vermont's current basin planning process, to take advantage of the latest information on phosphorus sources and control options applicable to each watershed. Additional suggestions regarding the Tactical Basin Plans are included in the attachment.

Accountability Framework

EPA views the Phase I and Phase II Implementation Plans the core of a broader, ongoing accountability framework by which EPA will assess progress toward fulfilling the pollution reduction targets identified in the TMDL. EPA expects that the State will identify and commit to implement specific pollutant reduction controls and actions in each of the successive two-year milestone periods included in the Plans. Prior to the start of each milestone period, EPA will evaluate whether the actions identified for that period are sufficient to achieve the pollutant reduction specified for the end of that two-year period, and whether the State has fulfilled the commitments identified in the previous period. EPA expects that the successive Plans and two-year milestone periods will contain increasingly greater source sector and geographic load reduction specificity, more rigorous assurances that load reductions will be achieved, and more detailed and transparent reporting to the public. EPA expects this accountability framework, including development of the Phase I Plans prior to the establishment of the TMDL and the State's commitment to produce detailed Phase II Plans and adopt two-year milestones, will strengthen the assurance that the TMDL point and nonpoint source allocations can and will be achieved and maintained.

EPA Commitments

EPA will continue to work in close collaboration with your agencies over the coming months as we develop the draft Waste Load and Load Allocations. This ongoing collaboration should provide opportunities for give and take as you digest comments on the Proposal and work to develop the Phase I Plan. If the Phase I Plan does not meet the expectations outlined above, EPA may take any of a number of actions. As noted in my October 22nd letter, likely options may include, but are not limited to setting Waste Load Allocations that would push Waste Water Treatment Plant discharges to the limit of available technology and require offsets for the plants' remaining phosphorus loads, and expansion of permit coverage to bring more sources under direct regulatory control (e.g., expand MS4 coverage, use Residual Designation Authority to capture currently unregulated point source stormwater dischargers, designate certain AFOs to be CAFOs subject to NPDES permitting). Similarly, if the State does not submit or fulfill its two-year milestones for phosphorus reductions, EPA may take any of a number of actions including, but not limited to, designating additional sources to be subject to NPDES permits.

EPA recognizes and applauds the substantial efforts the State is proposing to take to enhance program capacity and meet the necessary phosphorus reduction targets. We look forward to continuing to work with you to achieve a clean Lake Champlain.

Sincerely,

Stephen S. Perkins
Office of Ecosystem Protection

Attachment

cc: Kari Dolan, VT DEC

Additional EPA Comments on the State of Vermont's November 20, 2013 draft Proposal for a Clean Lake Champlain

1) EPA has estimated that lake restoration will require, at a minimum, an aggressive version of the actions included in the State's proposal. A few lake segments will require more effort. Therefore, it's very important that the State's final Phase I plan be at least as comprehensive as the November draft -- anything less extensive than these actions could significantly weaken the reasonable assurance that needed phosphorus reductions will be achieved.

2) Include schedules and milestones throughout, with indications of which parts of an action will be completed when. For those items that depend on new funding, prioritize actions into items that will be funded in the first two years, the next two years, etc. Ensure that major, substantial actions are funded in the early years. The two-year milestones must be measurable accomplishments that can be readily tracked, such as funding sources established, key personnel hired, numbers of farms inspected, new categories of stormwater covered by permits, numbers and percentages of needed management practices implemented, etc.

3) Include in each section a discussion of how the implementation approach will take climate change into account. Climate adaptation and flood resilience should be addressed for each major category of practices. The report should note the phosphorus increases projected in EPA's climate change analysis, and explain how BMP, AAP, AMP, and other management measures will be designed to be effective for higher intensity rainfall events and greater annual flow volumes. A stand-alone section should be added to the report to summarize the efforts Vermont has already undertaken to prepare/adapt to climate change (e.g., new culvert sizing specifications, etc.) and the additional things the state will be doing moving forward.

4) For the agricultural section, as part of the schedule and milestones additions, please indicate the full number of agricultural inspectors needed to complete inspections of all small farms by a certain date (preferably 2015), and include a strategy for securing the funding and staff needed, with clear milestones and schedules for completing all inspections and achieving compliance with AAPs. Likewise, please specify all other staff, such as agricultural engineers and agronomists, needed to carry out other aspects of the agricultural section of the proposal, and the schedule for hiring these staff. Agricultural staff currently funded through the Lake Champlain Basin Program should be included in this plan, as the Basin Program funding for these staff is anticipated to be temporary and non-sustainable.

5) The proposal to relax the winter manure spreading ban raises concern. EPA's preliminary review of research on this topic indicates that few if any BMPs can prevent significant nutrient loading to waters from manure spreading on frozen ground. Rather than relaxing the spreading ban, we recommend greater use of

nutrient management plans to guard against heavy spreading in the spring during wet conditions and other inappropriate times.

6) For stormwater treatment practices for existing development (retrofits), include a discussion of the level of treatment (e.g., the types of practices and runoff depth to be designed for) to be required through the new permit initiative. For the phosphorus reduction scenarios generated by the scenario tool, EPA assumed use of stormwater practices that would achieve a 50% - 70% phosphorus reduction from applicable impervious area. Please add this information to the proposal so that EPA can be assured that the stormwater aspects of the State's proposal will achieve a comparable level of phosphorus reduction. Also, it's important that the criteria for triggering the need for retrofits be at least as aggressive as those indicated in the November 20th proposal.

7) Also regarding stormwater, please include a section that addresses new requirements anticipated for existing MS4s. Currently, stormwater management is presented in the context of expanding permit coverage to areas not presently regulated. Even though this would be somewhat outside the central focus on reasonable assurance for nonpoint sources, it's important to include the existing regulated stormwater sources for completeness purposes, and to avoid giving the unintended impression that nothing further will be required from existing MS4s. EPA's scenario tool simulations include significant additional reductions from existing MS4s as part of the package that allows phosphorus reduction goals to be met in applicable lake segments.

8) Please add a section that addresses new initiatives for stormwater from new development. Include a description of how the current revisions to the stormwater manual will require the use of practices with higher phosphorus removal efficiencies in the Lake Champlain basin. With all the effort to reduce phosphorus loads from existing sources, it's important that new sources are also adequately addressed. It is much less expensive to implement phosphorus controls during the initial project construction stage than as post-development retrofit projects.

9) The river channel stability section addresses the need to minimize further river corridor and floodplain encroachments. This topic is very important to include as minimizing future encroachments will be critical to allowing natural progress towards stream equilibrium conditions. Likewise, the section on preventing adverse channel modifications is also important, as stream channelization (such as berming and straightening) decreases stream stability and increases phosphorus loads from streams. However, an additional section (perhaps a subsection 4.3) is needed to cover actions that will accelerate this progress toward equilibrium conditions for river and stream reaches where intervention is deemed appropriate based on geomorphic assessments. This additional section should especially include actions related to re-establishing stream and river access to floodplains and should lay out a

systematic approach that makes use of the river corridor plans and related information to identify opportunities, secure easements where needed, and complete floodplain restoration projects on an on-going basis. This section should also address the State's plans to support efforts to stabilize banks where appropriate, although EPA recognizes such interventions need to be approached carefully and typically only in cases supported by suitable geomorphic assessments. EPA's analysis suggests a large percentage of the phosphorus load to the lake comes from stream channel erosion, so it's important that the State adequately address how this source will be addressed. While EPA understands it will take time for streams to approach equilibrium conditions, and that natural and passive stream "evolution" will be a big part of the solution, we also believe it is very important for Vermont to adequately document steps the State will take to accelerate this process where appropriate.

10) Please include plans for addressing the internal phosphorus load in St. Albans Bay. EPA's scenario runs simulating the potential reduction from nonpoint sources in the St. Albans Bay watershed estimate that phosphorus targets can be achieved as long as the Bay's internal phosphorus source (from bottom sediments) is ultimately reduced as well. While EPA acknowledges that internal phosphorus controls will not be effective until watershed sources are adequately reduced (as has been affirmed in several St. Albans Bay studies), for completeness purposes, we believe this topic must be addressed in the State's proposal.

11) Tracking progress: a section should be added that discusses the State's commitment to track implementation progress and enter both BMP installations and programmatic progress into a tracking tool that EPA is helping to develop.. Among other things, this tracking should support reporting on achievement of the two-year milestones.

12) Revise and expand the section on tactical basin plans to address how either these plans or separate TMDL implementation plans will make use of the TMDL phosphorus data for each subwatershed and include a detailed strategy and schedule for implementing all practices needed to achieve phosphorus reduction goals. The basin plans must include detailed descriptions of where and when practices will be implemented, identification of critical sources areas (CSAs), and whether actions will be funded with cost-share funds or grant funds, required via regulatory programs such as AAPs or new stormwater permits, or whether they will be accomplished through enforcement of existing requirements. The proposal should indicate dates by which each basin plan will be completed, and VDEC should commit to completing all plans within no more than two to three years of TMDL issuance.

    Given the importance of the basin planning step, we are including below an outline of key elements that should be included in each plan. Note that these plans must

include all actions needed to attain phosphorus reduction targets and the full time-frame for implementation, but plans should be organized into 5-year increments (consistent with the existing tactical planning process). If full implementation is expected to take 15 years, for example, the plan could be divided into three 5-year increments. The activities planned for all phases must be identified up front, with more detail included for the first 5-year increment. Subsequent increments could be updated with additional detail during the final years of the previous 5-year increment. This approach allows for use of the latest and best information in each subsequent phase, such as refined estimates of source characterizations (especially for CSAs) and the effectiveness of management practices. The plans should lay out the TMDL targets (the total reduction needed), the phosphorus load reduction expected from each 5-year increment, and the management practices to be applied in each 5-year increment. The overall process will provide both clear expectations of future work planned and documentation of quantified load reduction estimates already achieved at regular intervals (i.e., each 5-year increment).

Outline of Recommended Elements for Initial Basin Implementation Plans:

- Description of implementation process (the 5-year increment approach);
- Summarize reductions needed from the TMDL;
- Identify broad source categories and respective estimated phosphorus loads based on TMDL analysis;
- Identify TMDL wasteload allocations (WLAs) and associated reductions needed;
- Identify TMDL load allocations (LA) and associated reductions needed;
- Provide master implementation schedule for all phases (increments) including timetable for developing implementation plans for each phase and accountable implementation and load reduction milestones;
- Results of CSA analysis (GIS analysis at a minimum) to be conducted as part of the initial plan development;
- Basis and documentation of any revisions/refinements in information used to estimate source loading rates and P load reduction credits for management practices;
- Inventory of phosphorus reduction practices already implemented in all applicable source categories, together with estimates of phosphorus load reductions achieved;
- Revised estimate of outstanding load reduction to be achieved (TMDL reduction less reduction already achieved by existing practices);
- Phosphorus load reduction to be achieved during the first 5-year implementation period;
- Description, location, and schedule for practices/actions selected to achieve the phosphorus reduction amount assigned to the first 5-year period. EPA's scenario tool and/or a separate DEC analysis (with adequate documentation) can be used to confirm that the level of implementation will be sufficient to achieve the needed reduction.

- Any additional resources (staff and funds) and regulatory mechanisms needed to accomplish all of the implementation activities consistent with achieving the full 5-year phosphorus load reduction;
- Identification of year-2 and year-4 implementation milestones (what actions will be completed by each of those periods);
- Description of the method to be used to track progress on implementation actions;
- Description of how water quality trends will be monitored over time; and
- Identification of any immediate and long term research needs important to the development of future phases of implementation plans.

Outline for all future 5-year increments of implementation plans:

- Same elements as described above (although some of the broader items such as those related to TMDL requirements could be referenced from the first iteration);
- Refinements to existing CSA analysis if applicable; and
- Basis and documentation for any revisions/refinements to information used to estimate source loading rates and P load reduction credits for management practices.

APPENDIX B – *EPA FEBRUARY 13, 2014 ADDENDUM LETTER*

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
5 POST OFFICE SQUARE, SUITE 100
BOSTON, MA 02109-3912

February 13, 2014

David Mears, Commissioner
Vermont Department of Environmental Conservation
1 National Life Drive, Main 2
Montpelier, VT 05620-3520

Chuck Ross, Secretary
Vermont Agency of Agriculture, Food and Markets
116 State Street
Montpelier, VT 05620-2901

Dear Commissioner Mears and Secretary Ross:

The purpose of this letter is to augment my January 17, 2014 letter, calling specific attention to the need to focus on additional measures for South Lake and Missisquoi Bay.

As noted in the January 17 letter, based on the results of the Scenario Tool, EPA believes it will take an aggressive application of all of the measures in the Proposal to achieve water quality standards. However, the Scenario Tool also indicates that for two lake segments, Missisquoi Bay and the South Lake, additional measures will be required beyond those described in the Proposal. Please ensure that your final Proposal includes a description of the additional actions or measures that will be taken in these lake segment watersheds. EPA is available to assist in evaluating the effectiveness of potential additional measures using the Scenario Tool. For example, EPA's preliminary analysis suggests some additional phosphorus reductions may be achieved from forest lands with increased implementation of certain forest management practices. These reductions from forested areas will help, and it's important that they be added to the Proposal, but additional reductions will also be needed from other sectors. Agricultural land is the dominant phosphorus source in these watersheds, and it is therefore essential that the Proposal include an especially strong commitment to phosphorus reductions from agricultural lands in these watersheds. An evaluation of the suite of proposed additional measures with the Scenario Tool should be included to demonstrate that these measures, in combination with the measures proposed in November will be sufficient to achieve the reduction targets in these critical segments. If the effects of certain proposed measures are not feasible for simulation using the Scenario Tool, then the alternative basis for determining their effectiveness should be described in the Proposal.

As always, EPA stands ready to assist your agencies in this effort.

Sincerely,

Stephen S. Perkins
Office of Ecosystem Protection

cc: Kari Dolan, VT DEC
Laura DiPietro, VT AAFM

APPENDIX C – *SUMMARY OF REGIONAL PLANNING COMMISSION GRANTS UNDER SECTION 604B FOR FFY 2013*

MONITORING AND ASSESSMENT RELATED PROJECTS

ADDISON COUNTY REGIONAL PLANNING COMMISSION (ACRPC) $3,636.36

ACRPC will continue its monitoring and assessment assistance to the Addison County River Watch Collaborative under their LaRosa grant. ACRPC will actively provide technical assistance and presentation of results to member municipalities. Outreach materials and maps developed under previous 604b funding will be used in ACRWC targeted communities. In addition, ACRPC will assist the ACRWC Coordinator to improve the ACRWC web paged hosted on the ACRPC website.

CENTRAL VERMONT REGIONAL PLANNING COMMISSION (CVRPC) $3,636.36

CVRPC will continue the assessment of Class 3 and 4 town roads in the Dog River watershed. Class 3 and especially class 4 town roads are typically located on steeper grades in narrower valleys and are often located in very close proximity to waterways and river; infrastructure conflicts as a result of this are more prevalent. The purpose of the assessment is to locate and identify water quality threats associated with these public roads, conduct an inventory of these class 3 and 4 town roads, prioritize restoration projects and develop recommendations for remediation. This assessment will draw upon existing work and protocols created as part of similar projects already completed in the Winooski Basin.

WINDHAM REGIONAL COMMISSION (WRC) $3,636.36

WRC proposes to identify undeveloped stream corridors and undeveloped shorelands on ponds and lakes greater than 10 acres in the Windham Region portion of upper West River, Saxtons and Williams River watersheds (upper Basin 11), and the middle Connecticut River direct watershed (middle Basin 13). Stream segments will be characterized with stream order, segment length, ownership (public, private conserved, or private unconserved), and land use district and conservation priority based upon town and regional plans. Identification of undeveloped stream corridors and shorelands will be performed through a GIS analysis using E911 ESITE data, VTrans road centerline data, Conserved Lands data, the Vermont Hydrography Dataset, aerial photographs, and town and regional plans. The final product will be a set of maps and a brief report outlining the analysis procedure and providing results and statistics.

LAMOILLE COUNTY PLANNING COMMISSION (LCPC) $3,636.40

LCPC will develop a flood resilience element, including flood risk maps, for its Regional Plan. This project will build upon efforts already in progress to update the Natural Resources element of the Regional Plan and to update local hazard mitigation plans for five Lamoille County towns. The flood resilience element developed in this effort will reference and be used for discussions during local hazard mitigation plan updates. Part of this project will involve the development of a spatial flood risk analysis. This analysis will use methods recommended and described on the flood resiliency planning website, and will result in maps and tables depicting the number of different structure types (single family homes, mobile homes, commercial/industrial, etc.) in different flood risk categories (floodway, 100-year flood zone, 500-year flood zone, and fluvial erosion hazard zone).

NORTHWEST REGIONAL PLANNING COMMISSION (NRPC) $3,636.36

NRPC will implement portions of the Missisquoi Basin Plan and participate in the development of the Upper Lake Champlain Tactical Basin Plan. For the Missisquoi Basin, tasks will include participating in the Upper Missiquoi and Trout River Wild and Scenic Designation Committee and providing assistance for projects identified in municipal stormwater management plans. For the Upper Lake Champlain basin, tasks will include participating on the tactical basin plan stakeholder group and holding a series of public forums to gather local input for the tactical basin plan.

NORTHEASTERN VERMONT DEVELOPMENT ASSOCIATION (NVDA) $3,636.36

NVDA will work with Danville and Burke to improve and strengthen water quality protection language in their respective plans and regulatory documents. This may include the town plan (including a resiliency element), zoning bylaw, and flood hazard area bylaw. Geomorphic data has been collected on streams in both towns and updated maps and corridor plans are expected in March of 2014.

Burke has completed assessments on the East Branch and sections of the West Branch and Calendar Brook. Additional data is being collected on the West Branch through West Burke village and the Dishmill Brook draining Burke Mountain per their request. With a new corridor plan for Dishmill Brook, and an updated corridor plan for the West Branch, the town will have a complete dataset to begin discussing any needed bylaw changes. After serious flood damages in 2011, Danville requested support in their flooding bylaws. The town had no data on any streams and minimal information from their FEMA maps. Assessments were launched on the Sleepers River and its tributaries as well as the Water Andric. A corridor plan will be completed by March of 2014 prepared by the consultant for this project, Fitzgerald Environmental Associates.

SOUTHERN WINDSOR COUNTY REGIONAL PLANNING COMMISSION (SWCRPC) $3,636.36

SWCRPC will address the new flood resiliency element for the Regional Plan, and encourage and assist towns within the SWCRPC Region to build flood resilient communities. The activities will allow RPC staff to develop appropriate planning protection language to be incorporated into the RPC Regional Plan and town plans. The new floodplain management language will focus future planning protections on flood resiliency and emergency preparedness.

TWO RIVERS-OTTAUQUEECHEE REGIONAL COMMISSION (TRORC) $3,636.36

TRORC will draft a regional flood resilience plan. With the completion of this regional plan chapter, we will ensure that our Regional Plan is consistent with the new state planning goals and requirements.

In addition to drafting a flood resilience chapter for our regional plan, we wish to create a flood resilience chapter template that towns can use and include in their town plans. By providing our towns with a flood resilience chapter template, we will be helping them comply with the new state planning goals and requirements. Our work on this template will also investigate how towns can use components of their Hazard Mitigation Plan to create and satisfy the requirements of the flood resilience chapter.

IMPLEMENTATION RELATED PROJECTS

BENNINGTON COUNTY REGIONAL COMMISSION (BCRC) $3,636.36

BCRC will host a “regional” workshop where town and regional planners will be informed about Act 16 and how it will affect their local planning efforts. BCRC will also develop the river corridor maps for our member towns and will present these maps to those planning commissions that are updating their Town Plans. Additional technical assistance will be offered to those towns that express an interest.

RUTLAND REGIONAL PLANNING COMMISSION (RRPC) $3,636.36

RRPC will develop a flood resilience element for its Regional Plan. It will also work with all 27 municipalities in the Region to complete a Flood Resilience Plan Checklist (found in: Disaster Recovery and Long-Term Resilience Planning in Vermont U.S. EPA Smart Growth Implementation Assistance Project Policy Memo for the Mad River Valley, August 2013; p.22). This preliminary checklist provides a menu of steps that could be taken to improve flood resiliency and is intended to help a municipality get started in a self-assessment. This data is beneficial to the towns’ individual (local) hazard mitigation and emergency operations plan(s) as well as the town plan and the update of the Regional Plan. RRPC will also facilitate a training workshop to inform local officials about flood resiliency, Act 16, how it affects town plans, the municipal checklist and how it can help, and local ha

APPENDIX D – *STATE OF VERMONT PROPOSAL FOR A CLEAN LAKE CHAMPLAIN (NOVEMBER 20, 2013)*

State of Vermont Proposal for a Clean Lake Champlain

Draft for Discussion

November 20, 2013

Vermont Department of Environmental Conservation

Vermont Agency of Agriculture, Food, and Markets

CONTENTS

1.0. Introduction

Vermonters value a clean Lake Champlain. We swim and fish in the lake, we boat on it, we drink its water, and we generally like being around it. A clean lake attracts businesses and tourists to the region and provides 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 and making it unsuitable at times for swimming or drinking. Phosphorus is found in eroded sediment 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 recover. There are many reasons for this and some are beyond our immediate control, but the biggest reason is that we have not done enough.

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 a cap on the amount of phosphorus allowed to enter Lake Champlain, and allocated that maximum amount 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 and are more closely regulated. For a TMDL to be approved in this situation, the EPA must find "reasonable assurances" that the necessary nonpoint source phosphorus reductions will actually occur. Insufficient reasonable assurance was the primary reason given by the EPA for reversing its approval of the 2002 TMDL.

In order to ultimately achieve a clean Lake Champlain and to provide reasonable assurances in the new Lake Champlain TMDL, the Vermont Agencies of Natural Resources and Agriculture, Food, and Markets are proposing the following set of policy commitments for consideration. These proposed policies address all major sources of phosphorus to Lake Champlain and involve new and increased efforts from nearly every sector of society, including state government, municipalities, farmers, developers, and homeowners. All of us contribute to the phosphorus problem and we must commit to act together. We expect that these proposed policies will be discussed and refined during the coming months. Reasonable schedules should be established that give municipalities, farmers, developers, and the State time to plan for the higher levels of effort and expense that will be required. This proposal is a first step in this process.

2.0. Agricultural Programs

2.1. Water Quality Permitting Programs – LFO, MFO, CAFO

Description

Vermont has three permitting programs to assist farmers with managing their waste 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.

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 rules also provide for an individual permit for small or medium farms that meet specific tests, 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. AAFM is required by law to inspect all farms permitted under these rules at least once every five years. However, many farms are visited more often, due to permit compliance needs. The MFO general permit has been in existence since February, 2007 and was revised in 2012. Currently, there are 155 farms under the MFO general permit throughout Vermont, and 116 of these farms are in the Vermont portion of the Lake Champlain basin.

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 20 permitted LFOs in Vermont, 13 of which are in the Lake Champlain basin.

The CAFO general permit is a federal Clean Water Act permit for MFOs managed by the Vermont Department of Environmental Conservation (DEC). 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.

Implementation Mechanism

AAFM and DEC will maintain adequate staffing to implement the three permitting programs as designed and prepare annual compliance reports. 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. AAFM will continue to inspect all LFOs annually and all MFOs at least once every five years. DEC currently conducts a minimum of 12 inspections annually.

DEC finalized the CAFO general permit on June 21, 2013. AAFM and DEC commit to the continued implementation of the agricultural water quality permitting programs.

Implementation Steps

1. DEC, in cooperation with AAFM, will conduct CAFO inspections statewide;
2. AAFM will inspect all LFOs within the Lake Champlain basin;
3. AAFM will inspect MFOs within the Basin;
4. DEC and AAFM will conduct on-farm multi-agency inspections to insure consistency in the inspection process;
5. DEC and AAFM will hold trainings for inspection staff; and,
6. AAFM and DEC will produce annual compliance reports.

2.2. Accepted Agricultural Practice Rule Update and Compliance

Description

The Vermont Accepted Agricultural Practice Rule (AAPs), initially adopted in 1995 and updated in 2006, 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. The program is not inspection-based like the MFO and LFO programs due to limited resources. Rather this program is essentially driven by internal or external notifications of possible violations. State-initiated and public notifications about suspected rule violations result in site investigations to determine compliance with the rule.

AAFM performs approximately 120 investigations annually. The investigations target specific complaints or obvious violations; they do not involve evaluating the entire farm operation to determine extent of AAP compliance. As described above, AAFM administers compliance inspection programs for MFOs and LFOs.

Vermont recognizes that further reductions of agricultural nonpoint source pollution will necessitate the following actions pertaining to the AAPs to reduce water pollution and achieve a more consistent and equitable regulatory environment for all farms:

1. Modify the AAPs Rule and Implementation Strategies to:
    a. Conduct whole farm inspections of small farm to improve overall AAP compliance;
    b. Initiate an AAP compliance certification process for all small farms;
    c. Include additional and improved farming management practices on lands planted to annual crops, such as a minimum 25 foot vegetated buffers (in grass or trees) along all perennial streams and 10-foot vegetated buffers (in grass or trees) along field ditches;
    d. Include a requirement for all farms to complete a nutrient management plan (NMP) matrix, which will direct farms that meet a specific threshold to develop and implement a 590 NRCS standard NMP;
    e. Include a requirement to stabilize field gully erosion caused by site-specific agricultural management practices;
    f. Explicitly exclude livestock from perennial streams where erosion is prevalent and in all production areas (see livestock exclusion program below);
    g. Improve soil quality, further reduce soil loss, and decrease the impacts of soil erosion on water quality by: adopting a standard less than or equal to an average soil loss tolerance of "T," as defined by the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS), for the prevalent soil type and applied to all farm fields in annual crop production;

AAFM will need to offer greater oversight and assistance to farms to improve AAP compliance. To enhance effectiveness of BMP implementation, AAFM will need to prioritize effort, focusing on potential "critical source areas" – areas at risk of causing or contributing to phosphorus loading – in impaired watersheds or watersheds determined by DEC as having water quality concerns from agricultural runoff. AAFM assumes the operational capacity of key federal partners such as the US Department of Agriculture Natural Resource Conservation Service (NRCS) remains constant at current levels.

Implementation Mechanism

AAFM will undertake a rulemaking process to update the AAPs rule with additional practices and achieve substantial compliance with AAPs by all livestock-based small farms in agriculturally impaired watersheds within the Lake Champlain basin.

Implementation Steps

1. Support AMP and BMP implementation on small farms using key partners including UVM extension, NRCS, non-profit organizations, VACD;
2. Establish financial incentives for BMP implementation using state cost share rates (including combined federal and state rates) and technical assistance from partner organizations, structured to encourage early adoption of BMP practices;
3. Complete inspections of small livestock farms in in agriculturally impaired watersheds;
4. Complete inspections of small livestock farms in agriculturally impaired watersheds throughout Vermont;
5. Report on SFOs compliance with the AAPs; and,
6. Continue to perform investigations into suspected AAP violations with AAFM enforcement agents.

2.3. Livestock Exclusion from Surface Waters Program

Description

Livestock with unmanaged access to streams cause phosphorus, nitrogen, sediment, and pathogen pollution by depositing manure in the water and by trampling and destabilizing the stream banks. Reducing this source of pollution requires installation of fencing, water systems and crossings, or other control methods.

Confinement of dairy operations has reduced the number of livestock with access to surface water. Additionally, farms operating under a AAFM permit are required to fence livestock out of streams in all production areas. The AAPs currently require that adequate vegetation must be maintained. This regulation could result in the need for livestock exclusion fencing. The extent of livestock access to streams beyond these changes to farming operations and rules is unknown. A 2010 Report on Livestock Access to Streams[1 2] estimated that the minimum total cost of excluding all livestock (such as dairy, beef, and equine) is approximately $33-$78 million, depending on the type of fencing. Therefore, the program will evaluate the need and direct outreach and implementation resources to the highest priority areas.

The use of incentives has the potential to secure early participation in the program. Therefore, the program will adopt a declining cost-share with time provision following the inspection and identification of the need. The provision will offer 90 percent cost-share for the first year following inspection, declining to 75 percent and 50 percent in the subsequent second and third years of the program. The program will maintain a 50 percent cost share thereafter.

Implementation Mechanism

AAFM will design and implement a livestock exclusion incentive program that consists of a declining scale cost-share policy to encourage early adoption of livestock exclusion practices at unmanaged and unstable riparian areas.

AAFM will: (a) revise the AAPs to include specific language referencing livestock exclusion on perennial streams where erosion is present and in all production areas, regardless of farm size or type; (b) develop a performance-based policy for a livestock exclusion program, in cooperation with DEC and other partners; and (c) exclude livestock from all eroding perennial streambanks.

[1] 1 2010 report conducted by Vermont agricultural field staff, farmers, researchers and agency personnel.

Implementation Steps

1. Add performance-based livestock exclusion policy in revised AAPs;
2. Create, market, and implement a livestock exclusion incentive program that consists of a declining scale cost-share with a time provision to encourage early adoption of livestock exclusion practices;
3. Include the use of third party certified livestock grazing plans in the livestock exclusion policy;
4. Mandate livestock exclusion from perennial streams where an eroding bank exists and where adequate vegetative cover is not maintained (except at defined crossings and lands managed under approved livestock grazing plans);
5. Mandate livestock exclusion from surface waters in production areas (except at defined crossings and lands managed under approved livestock grazing plans); and,
6. Use inspections and develop resource plans to increase technical assistance.

2.4. Nutrient Management Plan (NMP) Assistance and Requirements

Description

The current nutrient management planning program delivers technical assistance to help all farmers manage soils, apply fertilizers, and manage animal waste in ways to improve crop yield and quality, reduce the costs of fertilizer, reduce phosphorus loss from farm fields, and reduce runoff that can contaminate water quality. Implementation of nutrient management plans have been shown to save farmers money. The program involves farmer outreach, training, and certification, and applicator training workshops. The program focuses on the source, rate, method, placement, and timing of nutrient applications, with an emphasis on assisting small farms.

Nutrient management plans contain many aspects of land management, including tolerable soil loss erosion requirements, nutrient indices, nutrient application rates, and additional conservation practices. The tolerable soil loss requirement for specific soil types caps the amount of soil erosion that is allowed to occur in a field. In order to meet the soil loss requirements, farms may be required to use conservation practices such as cover cropping, reduced tillage and alternative planting methods. The NMP also requires that fields with a phosphorus and/or nitrogen index that demonstrate higher risk of nutrient losses must adopt alternative conservation practices to reduce the risk of phosphorus and/or nitrogen losses. Examples of additional management practices that may be required to reduce the risk of nutrient losses include: installing edge of field buffers, limiting the number of manure applications, and in cases where the indices are very high, stopping manure or fertilizer application until the risk of nutrient losses is reduced.

All farms benefit from nutrient management planning, and some farms are already required to develop and implement NMPs. Medium Farm Operations (MFOs), Large Farm Operations (LFOs), and those small farms that have received NRCS cost-share assistance for waste management are required to have NMPs that follow the “590 NMP Practice Standard” contained in the NRCS Field Office Technical Guide. Other small farms have developed their own NMPs through University of Vermont Extension educational programs or the AAFM Nutrient Management Incentive Grant Program. However, many small farms need additional technical assistance in conducting nutrient management planning.

Revisions to the AAPs will increase the number of producers that are developing and implementing 590 standard NMPs, by creating a screening process for evaluating plan needs based on criteria such as animal numbers, density and location.

Adjustments in nutrient management planning in the areas of livestock exclusion, buffers, and winter spreading may be allowed in site-specific instances, where producers have demonstrated adherence to all state and federal regulations, and have situations where these practices will in no way cause

negative impacts to water quality. These adjustments may positively affect water quality by allowing more targeted, appropriate nutrient application and would allow for more cost- effective use of limited resources:

(a) Livestock exclusion grazing management plans

A universal livestock exclusion policy, compared to a targeted livestock exclusion policy, is extremely costly, and may not be cost-effective or environmentally beneficial in all circumstances. A farm prioritizes the environmental impacts of their operation, targeting the highest ranking concerns. In some instances, livestock exclusion of a few animals on a large number of acres may not be the most beneficial practice to implement from a cost and long-term operation and maintenance perspective. Furthermore, there are farms that have demonstrated that they can effectively use intensive grazing strategies to manage the environmental impacts of grazing a pasture adjacent to a stream. In order to allow flexibility, the AAFM is proposing that farms that are fully compliant with the AAPs and, if applicable, the MFO and/or LFO rules, may utilize a third-party certified livestock grazing management plan. This plan allows for prescribed streambank grazing where there is a demonstrated need to utilize this management strategy.

(b) Winter spreading ban

The current winter spreading ban poses the unintended consequence of increasing the risk of soil compaction as well as spreading during the wetter times of the year. The ban forces farmers to spread manure at very high rates using heavy tractors and tanks in the spring -- the time of year when the soils are often wet and the risk of increases in runoff and concurrent bankfull flows are the greatest. For AAP and state permit-compliant farms, a third party Technical Service Provider (TSP) can develop a NMP that identifies fields that: (a) are not adjacent to surface waters or contains setbacks greater than 150 feet; and, (b) have slopes of 3 percent or less and ensure manure application rates are no greater than 3,000 gallons per acre.

(c) Field-Specific Buffers

Site specific buffers that seek to minimize runoff potential make better use of the productive land while enhancing environmental goals. Buffers may be greater than 25’ in high risk areas, and a minimum of 10’ where water does not leave the field. Field specific buffers would only be allowed with a certified NMP.

<u>Implementation Mechanism</u>

AAFM will revise the AAPs

AAFM will redesign and implement a nutrient management planning assistance program. Actions include: (a) revising the AAPs to include NMP requirements; (b) developing a NMP matrix which

will determine which farms are required to complete a 590 standard NMP. (the goal of the matrix is to ensure that only farms that have resource concerns and potential for water quality issues are required to develop and implement NMPs); (c) revising the MFO and LFO programs to include site specific NMP requirements; (d) developing and implementing educational materials; (d) working with NRCS to implement the NMP TSP training and certification program; (e) creating site-specific NMP TSP program standards; (f) enhancing the current level of courses offered for farms to develop their own NMPs under the supervision of a certified TSP; and (g) achieving substantial compliance with NMPs by all livestock farms in agriculturally impaired watersheds within the Lake Champlain basin.

Implementation Steps

1. Develop a small farm NMP matrix;
2. Expand the availability of small farm NMP development course;
3. Develop and offer a NMP training program for TSPs;
4. Develop and offer a training program for contractors (e.g., manure applicators);
5. Contract with organizations to develop and implement annual nutrient management planning workshops; and,
6. Conduct assessments of all livestock farms in agriculturally impaired watersheds for compliance with regulations.

2.5. Small Farm Certification Program

Description

Owners or operators of small farms, as defined in the revised AAPs, will need to certify every five years that they comply with the Accepted Agricultural Practices (6 V.S.A. Chapter 215). The certification will document the number and type of animals and acreages in agriculture. The certification will also specify that the farm does not directly discharge wastes into surface waters from a discrete conveyance such as a pipe or ditch.

Implementation Mechanism

AAFM will complete the AAP update that will include a small farm AAP certification program and enable increased sharing of agricultural data within state government.
Implementation Steps
1. Create a certification form for all small farms that would document animal units, acreage, and certify compliance with AAP's. Document would provide information and assistance where producer is unsure or unable to self-certify;
2. Update agricultural water quality statutes, which will include enforcement provisions to prevent false certification or failure to certify compliance;
3. Amend legislation to allow AAFM access to information about farm locations known by other agencies of state government;
4. Work with partners and contracted staff to provide targeted outreach to areas in agriculturally impaired watersheds within the Lake Champlain basin; and,
5. Conduct outreach to other agriculturally impaired watersheds outside of the Lake Champlain basin.

3.0. Stormwater Management

Stormwater runoff from roads, and existing developed lands will be addressed in a staged and prioritized manner through a system of watershed-based stormwater permitting using a combination of state law and NPDES-based regulatory authority.

3.1. Stormwater from Roads: State Highways

Description

The first stage of implementation will include permitting all state and municipal roads to achieve the necessary level of pollutant reduction to meet TMDL targets. Permitting will generally involve requirements to develop management plans, followed by an implementation scheduled informed by the relative significance of the source, on a watershed basis.

The State highway system may be addressed via a TS4 Stormwater General Permit. The TS4 is a NPDES-based Transportation Separate Storm Sewer System (TS4 GP) General Permit designed to regulate stormwater discharges from the entire state-operated transportation system. The TS4 would regulate all stormwater discharges from the transportation network by consolidating the permit requirements from the existing Municipal Separate Storm Sewer System (MS4), Multi-sector General Permit (MSGP) and Post-construction stormwater permits. Implementation of comprehensive TS4 GP approach could allow for the prioritization of maintenance, upgrade of stormwater infrastructure, and implementation of remediation activities based on environmental benefit.

Implementation Mechanism
The State will establish a TS4 Stormwater General Permit. \

Implementation Steps
1. Issue a Letter of Intent;
2. Issue draft permit; and,
3. Establish TS4 General Permit.

3.2. Stormwater from Roads: Municipal Roads

Description

The first stage of implementation will include permitting all state and municipal roads to achieve the necessary level of pollutant reduction to meet TMDL targets. Permitting will generally involve requirements to develop management plans, followed by an implementation schedule informed by the relative significance of the source, on a watershed basis.

Vermont municipalities maintain approximately 11,000 miles of road; 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. Road structures, particularly along gravel roads, can cause erosion and sedimentation into adjoining streams. A recent study published by the Lake Champlain basin Program indicates that Vermont's unpaved roads contribute up to 30 percent of the annual suspended sediment load and up to 11 percent of the annual total phosphorus load to the Vermont portion of Lake Champlain (LCBP, 2013; UVM, 2013). Stormwater runoff from paved roads can accumulate and deliver debris, oils, salts, and other chemicals, sediment, nutrients, and other pollutants to surface waters. Paved roads can also affect the volume of stormwater runoff being generated, which in turn, can alter the hydrology and ecological health of receiving waters.

The Department will issue a stormwater general permit covering municipal roads. The permit will require development of management plans based on local road conditions including road slope, connectivity to receiving waters, and other factors, that identify the type and scope of BMPs necessary for the municipality. The management plan will include an implementation schedule informed by sub-watershed phosphorus-reduction priorities. At a minimum, BMPs shall be as protective as those identified in the Town Road and Bridge Standards.

Implementation Mechanism

DEC will use existing authorities to develop a permit program for issuing a municipal road stormwater permit and reporting requirements. The program will emphasize the use of road-related best management practices. The State will first issue a letter of intent prior to the issuance of the new permit.

Implementation Steps

1. Issue a Letter of Intent;
2. Establish a state stormwater permit pertaining to road-related best management practices; and,
3. Complete road erosion needs inventories to identify and prioritize implementation.

3.3. Existing Developed Lands

Description

Stormwater runoff from existing developed land will be addressed in a staged and prioritized manner through a system of watershed-based stormwater permitting using a combination of state law and NPDES-based regulatory authority.

The first stage of implementation will require permit coverage for all stormwater discharges on sites where impervious surfaces exceed (3) acres. Additionally, impervious surfaces discharging to municipal stormwater systems where such impervious surfaces exceed 15 acres, in aggregate, and the density of impervious surface is greater than 7%, shall be addressed by a stormwater permit, issued to the municipality and requiring implementation of a stormwater management and phosphorus control plan.

Implementation Mechanism

The State will establish a general permit program to address stormwater from existing developed land.

Implementation Steps

The State will develop a program to expand the regulation of stormwater discharges within the Lake Champlain basin:
1. Identify affected parcels and municipalities;
2. Develop regulatory/treatment standards;
3. Implement education and outreach program;
4. Issue a Letter of Intent;
5. Issue draft permit;
6. Issue general permit;
7. Receive Notices of Intent; and,
8. Issuance of Permit Authorizations.

3.4. Non-Regulatory Stormwater Management for Non-MS4 Municipalities

Description

About three percent of the land area in the Lake Champlain basin is impervious surface (such as driveways, sidewalks, streets, and parking lots), but these areas generate a disproportionate amount of the phosphorus loading to Lake Champlain. Only six percent of this impervious surface area in the Basin is currently subject to regulation under a state operational stormwater permit, and only 12 percent of the impervious area is covered by the Municipal Separate Storm Sewer System (MS4) permit.

Stormwater master planning is an analytical process designed to prevent and reduce stormwater runoff from the impervious area that is currently not regulated by the DEC. The process serves as the basis for targeting management actions at areas in the developed landscape thought to be critical sources of phosphorus. The process also directs actions using Green Infrastructure and Low Impact Development approaches and promotes municipal adoption of the Vermont League of Cities and Town's model stormwater ordinance to protect water quality and save municipalities money by avoiding the increasing costs of collecting and treating stormwater runoff. Recommended actions identified by a stormwater master planning process are then integrated into Tactical Basin Plans.

Implementation Mechanism

DEC is using existing authorities to manage the program. DEC will develop, employ, and offer trainings for municipalities and other partners on the stormwater master planning protocol as a tool to identify and prioritize stormwater remediation actions.

Implementation Steps

1. Establish a DEC Green Stormwater Infrastructure program to provide technical assistance to municipalities;
2. Develop and finalize a standardized Stormwater Master Planning protocol;
3. Provide technical assistance to municipalities on stormwater master planning and integrate project priorities into tactical basin planning process;
4. Provide technical and financial assistance to municipalities on stormwater project implementation; and,
5. Enhance outreach and technical assistance to support municipal adoption of model stormwater ordinances to prevent or minimize stormwater impacts from future development.

3.6. Green Infrastructure Initiative

Description

Since 2009, the Vermont Agency of Natural Resources (VANR) has supported a Green Infrastructure (GI) Coordinator position within DEC through various funding mechanisms. This position plays 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 GSI 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 and lists major objectives for each:

1. Design Professionals: Design professionals (Engineers, Landscape Architects, Architects, Design/Build Contractors) statewide are trained in, promoting and utilizing LID principles and GSI practices;
2. Municipalities: Help municipalities recognize the impacts from stormwater runoff and work to mitigate the effects;
3. Property Owners: Property owners voluntarily implement GSI practices on their property(s); and,
4. State Agencies: State Agencies secure and commit funding to develop policies and programs to support GSI.

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.

Finding ways to incorporate LID and GSI into the framework of the Vermont Stormwater Management Manual is an identified task in ANR's Implementation Work Plan. The existing manual has been seen as a barrier to GSI implementation for some time. In response to this, the Stormwater Program is currently undergoing a process to revise the manual. The purpose of this

is two-fold: to incorporate and incentivize LID and GSI concepts and to enhance nutrient removal. The revised Stormwater Manual will be adopted via rulemaking.

Implementation Mechanism

DEC will continue to support the Green Infrastructure Initiative to implement the GSI Strategic Plan and the ANR Implementation Work Plan.
DEC will revise the Vermont Stormwater Management Manual to include a wider array of LID and GSI practices. DEC will require greater pollutant removal requirements. Those changes will be formally adopted via rulemaking.

Implementation Steps

1. Support the Green Infrastructure Initiative:
    a. Review existing state processes and programs and develop a plan for incorporating GSI concepts;
    b. Provide training opportunities to ANR staff and external partners to increase knowledge of GSI;
    c. Provide technical assistance and financial support for GSI projects;
    d. Develop process for auditing GSI on state properties and explore opportunities to enhance or utilize additional practices;
    e. Work with partners to enhance and disseminate model LID Bylaws;
    f. Revise and redistribute Vermont Low Impact Development Guide for Residential and Small Sites;
    g. Develop GSI design standards for downtowns, subdivisions, and state owned properties; and,
    h. Continue to administer the Green Infrastructure Roundtable and Green Infrastructure Council.
2. Revise the Vermont Stormwater Management Manual
    a. Convene a stakeholder process; and,
    b. Commence adoption of revised Stormwater Management Manual via rulemaking.

4.0. River Channel Stability

4.1. Minimizing River Corridor and Flood Plain Encroachments

Description

Managing rivers to attain and maintain equilibrium (or natural vertical stability) conditions provide for greater flood resilience and public safety while reducing sediment and nutrient pollution. Avoiding new buildings or public infrastructure in river corridors and floodplains and maintaining native plant-vegetated buffers are essential to attaining and maintaining equilibrium conditions. Avoiding new encroachments increases the capacity to store floodwaters and decreases phosphorus and sediment loading. Floodplains and meanders with vegetated buffers: (a) dampen the erosive energy and soil erosion by moderating stream flow velocities when floodwaters spill onto them during storm events; (b) allow for sediment deposition on floodplains during floods, which account for the greatest volumes of sediment over time; and, (c) moderate streambank failures due to the root strength, root depth, and root density of the vegetated buffer.

Implementation Mechanism

DEC will: (a) undertake a formal rulemaking process to enhance the floodplain protection and restoration through the state regulation of activities currently exempt from municipal regulation; (b) establish a regional certified floodplain technician program; (c) expand its river corridor planning and mapping program with statewide maps and River Corridor Procedures that establish river corridor best management practices; (d) establish the Flood Resilient Communities Program with funding and technical assistance incentives for municipalities to adopt regulations in floodplains and river corridors (e.g., the Emergency Relief and Assistance Fund (ERAF), effective in October, 2014, will increase the state cost share recovery in municipalities where enhanced bylaws have been adopted); and, (e) establish Memoranda of Understandings (MOUs) with sister agencies and departments that they will regulate floodplain activities and developments within their respective jurisdictions.

Implementation Steps

1. Establish the State floodplain rule that addresses all developments exempt from municipal regulation and establish Memoranda of Understanding (MOUs) with other state agencies to regulate developments within their purview to be consistent with the new state floodplain rule;
2. Prepare river corridor procedures for maintaining a statewide river corridor map layer, regulating Act 250 developments, and establishing river corridor BMPs;

3. Establish a regional Certified Floodplain Technician Program to increase the regulatory and technical assistance capacity for floodplain protection;
4. Provide technical assistance to a minimum number of communities each year on the importance of active floodplain protection and promote enhanced model bylaws that exceed the NFIP minimum requirements;
5. Develop better floodplain mapping for municipal and state agency use by seeking to obtain Light Detection and Ranging (LiDAR) data to modernize inundation mapping for streams and lakeshores;
6. Complete river corridor mapping for the State;
7. Update and complete River Corridor Planning to include "local flood hazard analyses" (LFHA), targeting floodplain restoration and large-scale flood hazard mitigation in the most sensitive streams;
8. Increase the role of land conservation in river corridor protection; secure river corridor easements;
9. Establish the "Flood Resilient Communities Program to increase Vermont municipal adoption of enhanced floodplain and river corridor protection bylaws through an incentives-based program; and,
10. Modify the Emergency Relief and Assistance Fund (ERAF) rule to contain added incentives for towns to adopt river corridor or enhanced floodplain bylaws.

4.2. Preventing Adverse River Channel Modifications

Description

Widespread and historic stream channelization (i.e., dredging, berming, straightening, and armoring) has resulted in increasing sediment and nutrient loading. Structural controls such as riprap or concrete may prevent erosion at one site, but increase erosion downstream and contribute to destabilizing the stream system. These activities increase the power of floods thereby increasing stream bed and bank erosion, property damages, and risks to public safety. Stream alteration activities that result in conditions that depart from, further depart from, or impede the attainment of an equilibrium condition (i.e., an equilibrium standard) should be limited.

Implementation Mechanism

DEC will: (a) develop standard river management practices (SRMP) for disaster response; (b) undertake rulemaking and complete the update to the stream alteration general permit to establish equilibrium-based performance standards (i.e., as stated above) and regulate emergency actions; (c) promote the municipal adoption of the new Vermont Transportation Agency's (VTrans) Road and Bridge Standards which require stream crossings to meet the state's technical standard established in the VANR stream alteration general permit; (d) develop 3 tiered outreach and training program by offering instream training courses to VTrans Operations Technicians, municipal roads workers, contractors, and other river technicians; and (e) as opportunities arise, implement projects to remove river, river corridor, and floodplain encroachments (e.g., floodplain fills, undersized stream crossings, flood-damaged structures, or dams).

Implementation Steps

1. Develop a set of Standard River Management Procedures for state disaster response efforts;
2. Adopt new rule and update general permits to address stream alterations and emergency in-stream work;
3. Develop and implement a set of training programs to meet SRMPs and Emergency River Management rules;
4. Adopt codes and standards to achieve FEMA recognition of state-adopted technical standards for conducting emergency protective measures, replacing infrastructure, such as culverts with adequately sized structures;
5. Establish a network of river scientists, engineers, and habitat restoration specialists, to assist VTrans and municipalities as resident experts on larger disaster recovery sites; and,
6. Continue to target restoration and protection funds to high priority critical source areas identified in tactical basin plans or river corridor plans, recognizing that restoration measures will vary from passive to active interventions, depending on site characteristics and plan recommendations.

5.0. Forest Management

5.1. Forestry Accepted Management Practices

Description

Vermont adopted rules in 1987 for Acceptable Management Practices (AMPs) for Maintaining Water Quality on Logging Jobs in Vermont. The AMPs are intended and designed to prevent any mud, petroleum products and woody debris (logging slash) from entering the waters of the state and to otherwise minimize the risks to water quality. The AMPs are scientifically proven methods for loggers and landowners to follow for maintaining water quality and minimizing erosion.

Vermont Department of Forests, Parks, and Recreation (FPR) has begun the process of updating the AMPs. Key modifications include:

- Require compliance with standards set forth in the state stream alteration general permit, described above in Section 3.2. Preventing Adverse River Channel Modifications and pursuant to 10 V.S.A. § 7501.
- Strengthen standards pertaining to stream crossing practices. The proposed standards include:
    - Better management of ditch water in approaches to stream crossings. The proposal is to prohibit drainage ditches along truck roads from terminating directly into streams and to specify a minimum distance for installing turn-outs. Drainage ditches approaching stream crossings must be turned out into the buffer strip a minimum of 25 feet away from the stream channel, as measured from the top of the bank.
    - Better management of surface water runoff from skid trails and truck roads on downhill approaches to stream crossings. The proposal is to prevent surface runoff from entering the stream at stream crossings from skid trails and truck roads and to specify a minimum distance for installing surface water diversion practices, such as drainage dips. Surface runoff is to be diverted into the buffer strip at a minimum distance of 25 feet from the stream channel, as measured from the top of the bank.
    - Better management of stream crossings after logging. The proposal is to prevent erosion and to specify a minimum distance from the stream for diverting runoff. Upon removal of the temporary stream crossing structures, the site is to contain water bars 25 feet from the stream channel on downhill approaches to the stream crossing to divert runoff into the buffer to capture sediment before entering the stream. Additionally, all exposed soil, at a minimum of 25 feet on each side of the crossing, must be stabilized with seed and mulch according to existing application rates.

- Include a new AMP to address the management of petroleum products and other hazardous materials on logging operations. Such materials must be stored in leak-proof containers, place outside of buffer strips, and must be removed when logging is completed.

Sediment and other pollution discharges on logging jobs are subject to enforcement under the state's water pollution control statute (10 V.S.A. 1259(a)). The DEC Compliance and Enforcement Division conducts necessary enforcement actions under a Memorandum of Understanding with FPR. The circumstances and outcomes of field inspections are documented and summarized in annual reports.

Vermont's Use Value Appraisal Program, also known as the "Current Use Program," provides property tax benefits to forest land owners enrolled in the program. To maintain eligibility in the Use Value Appraisal program, all timber harvesting operations on enrolled land must comply with the AMPs. Harvesting operations on forest land owned or controlled by the VANR and land enrolled in the Forest Legacy Program must also adhere to the AMPs. Similar water quality protection requirements apply to logging operations on Green Mountain National Forest land.

As shown in the table below, AMPs or equivalent requirements are mandatory on nearly 60 percent of the 4.6 million acres of forest land in the state, and a similar percentage applies to forest land within the Lake Champlain basin in Vermont. This percentage is expected to increase over time as: (a) the U.S. Forest Service conducts new land acquisitions within the Green Mountain National Forest proclamation boundary; (b) the VANR acquires land and enrolls forest land into the Forest Legacy Program; and, (c) landowners enroll in the Current Use Program. Between 2007 and 2012, acreage enrolled in the Current Use Program within the Lake Champlain basin increased from 600,207 acres to 679,207 acres, showing an approximate 12 percent increase.

Table: Amount of State and Lake Champlain basin Forestlands Subject to Water Quality Management Practices

Forest Land Category	State Acres (Approximate)	Lake Champlain basin Acres (Approximate)
Use Value Appraisal	1,780,000	710 ,670
Agency of Natural Resources	475,650	186,570
Forest Legacy Program	50,630	11,570
Green Mountain National Forest	400,000	265,490
Sub-Total	2,706,280	1,174,300
Total forest in state	4,591,000	1,953,420

Implementation Mechanism
VFPR is undertaking a rulemaking process to update of the AMP Rule and manual.

Implementation Steps

1. Form a Technical Steering Committee (TSC);
2. Complete initial draft revision;
3. Hold public stakeholder meetings;
4. Submit final recommendations of the TSC to Director of Forests; and,
5. Initiate State Rulemaking.

6.0. Watershed Protection and Restoration Programs

6.1. Ecosystem Restoration Program

Description
The DEC's Ecosystem Restoration Program (ERP), first established in 2005, manages a competitive grant program to reduce nutrient and sediment pollution into the Lake Champlain basin and other surface waters of the state from nonpoint sources. The grant program has received sustained funding over time. The program awards approximately 50grants each year, totaling $2 million of state capital construction funds. Grant recipients include municipalities, watershed and lake organizations, regional planning commissions, and other local and regional partners. Two-thirds of the grants are for projects within the Lake Champlain basin.

Objectives of the ERP grant program are to:

- Reduce unmanaged stormwater runoff from developed areas;
- Reduce runoff from farms and timberlands;
- Upgrade road networks with best road-related stormwater management practices; and,
- Restore and protect floodplains, river corridors, wetlands, and riparian areas along rivers, streams, lakes, ponds, and wetlands.

Implementation Mechanism
The Program continues to seek annual state capital bill appropriations and dispensing funds for implementation of priority actions, as described in the Tactical Basin Plans and other state-sanction prioritization plans.

Implementation Steps

1. Develop an annual capital budget for clean water funding and addresses both point and nonpoint source needs;
2. Continue to manage the process for the awarding, monitoring, and reporting of grants and contracts; and,
3. Conduct technical assistance on stormwater management using green infrastructure and road best management practices.

6.2. Vermont Clean Water Improvement Fund

Description

The Vermont Clean Water Improvement Fund is a concept to establish a dedicated source of funding that targets priority water quality improvement projects to help the State meet its' anticipated obligations under the Lake Champlain phosphorus TMDL. The fund can be created using existing resources and programs, and lays the foundation should additional resources become available. The fund would make strategic investments using existing programs to enable the State to effectively implement stormwater runoff control measures and river corridor protection strategies pertaining to TMDL implementation:

1. Manage direct loans and grants under the State Revolving Loan Fund (SRF), the fund supported by an annual EPA capitalization grant, state matching funds, and principal and interest repayments on past SRF loans. In addition to continuing to fund repair, replacement and operation of existing wastewater treatment systems, the fund could provide low interest loans, forgivable principal loans, or grant funding for:
    a. Stormwater runoff pollution control projects, including green infrastructure projects;
    b. Match for state grant-funded stormwater control projects;
    c. Projects required by for stormwater permit or TMDL compliance;
    d. Decentralized sewage treatment systems or onsite septic repair and replacement;
    e. Agricultural runoff control projects, such as equipment purchase for direct seed/no till conservation practices;
    f. Capital projects to improve municipal road networks; and,
    g. Infrastructure planning and asset management for all water system infrastructure;
2. Support grant-making as part of the DEC Ecosystem Restoration Program (ERP). The program offers municipalities, landowners, state agencies, and other partners increased access to funds for project implementation;
3. Support VTrans' Vermont Better Back Roads Program, a grant program to help municipalities implement best management practices pertaining to runoff from roads;
4. Bolster technical and educational assistance to municipalities, farmers, loggers and foresters, developers, businesses, and landowners in practices to reduce nonpoint source pollution runoff and improve flood resilience. The objective is to support:
    a. Priority technical assistance initiatives, such as at the Vermont Agency of Natural Resources' (VANR) Green Infrastructure Initiative and tactical basin planning that targets highest priority capital projects;
    b. Priority agricultural programs, such as an emerging small farm assistance program at the AAFM, the University of Vermont (UVM) Extension/Poultney-Mettowee Conservation District's Agronomy and Conservation Assistance Program (ACAP), and ongoing technical assistance from the state Conservation Districts that make up the Vermont Association of Conservation Districts;

c. Watershed protection work of key partners including the regional planning commissions, the water resources coordinator at the Vermont League of Cities and Towns Municipal Assistance Program, the natural resources conservation districts, watershed-based groups, and lake associations;

d. Technical assistance to loggers, landowners, and foresters about best management practices, such as the use of portable skidder bridges, for controlling runoff from timber harvesting operations; and,

e. Educational assistance from organizations such as the Vermont Youth Conservation Corps, the Student Conservation Association, and the North Woods Stewardship Center.

Implementation Mechanism

DEC will continue to work with the Administration and the Vermont General Assembly to investigate ways to support a Clean Water Improvement Fund.

Implementation Steps

1. Develop a concept paper on the elements of a Clean Water Improvement Fund;
2. Create a Clean Water Improvement Fund Advisory Committee; and,
3. Develop an administrative framework for managing the Fund.

6.3. Tactical Basin Planning and Critical Source Area Targeting

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 surface waters. Tactical Basin Planning uses monitoring and assessment results, combined with sector-specific planning processes, to identify and prioritize implementation projects. DEC relies on tactical basin plans to ensure that limited funds are directed to the highest-merit 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 plans are developed on a five-year recurring cycle and reviewed biennially with public input to monitor progress or add emerging priority actions. The plan's implementation table outlines the priorities of DEC, VANR, and partner organizations, for protection or restoration of specific stream or lake/pond segments affected by discrete and specific pollution sources. Tactical basin planning is DEC's approach to implement actions for TMDL compliance.
The phosphorus reduction potential attributable tactical basin planning is a function of the specific projects identified within the supporting processes, which are found in other Sections of this document.

Implementation Mechanism

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.vtwaterquality.org/wqd_mgtplan/swms_ch4.htm. Municipalities and other local and regional partners can seek Ecosystem Restoration Program grants to help pay for priority actions, specified in the plans, to reduce nutrient and sediment loading from nonpoint sources.

Implementation Steps

The implementation timetable for tactical basin plans is also found in Chapter 4 of the Vermont Surface Water Management Strategy:

1. Complete or modify implementation tables of existing basin plans that are specific to Lake Champlain basin, namely, South Lake Champlain, North Lake Direct, Missisquoi, Winooski, Otter Creek, and Lamoille; and,
2. Managing implementation of Tactical Basin Plans.

6.4. Phosphorus Detergent and Fertilizer Usage

Description

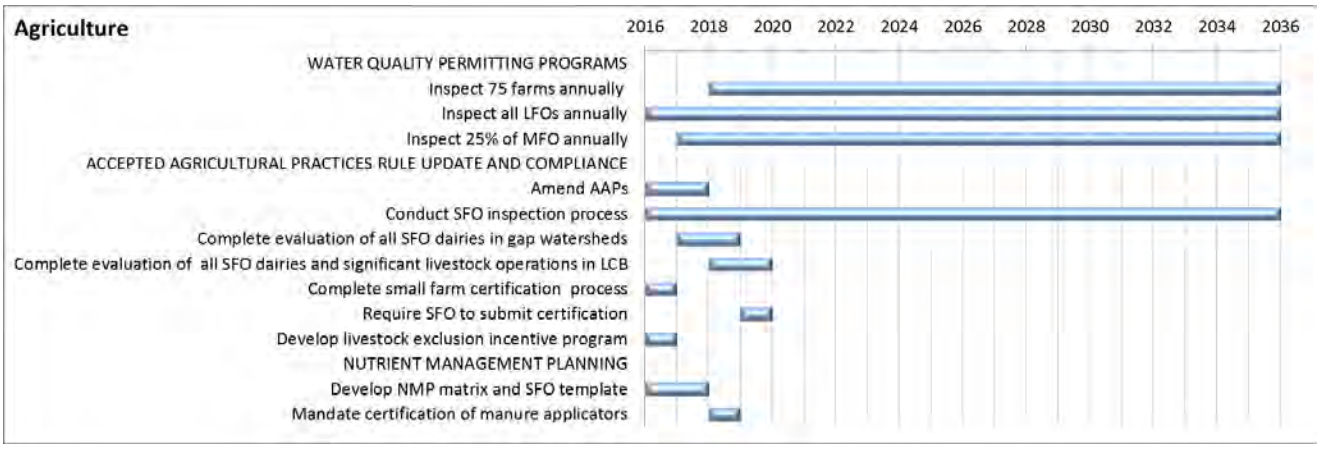
Vermont has had a law in effect since 1978 prohibiting the sale of household cleaning agents (e.g., laundry detergents) containing more than a trace amount of phosphorus (10 V.S.A §1382). Effective in 2010, the exemption given to automatic dishwasher detergents was removed from the statute. This change was estimated to reduce wastewater phosphorus loading to Lake Champlain by 0.8 - 3.2 metric tons per year.

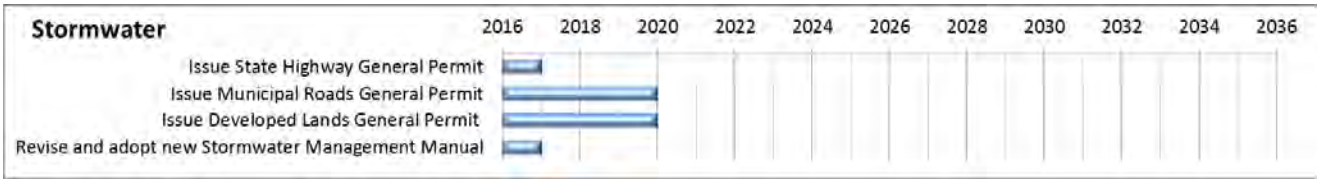
Vermont adopted legislation effective in 2012 (10 V.S.A §1266b) that prohibits the application of phosphorus fertilizer to turf unless the grass is being established during the first growing season, or a soil test indicates the need for phosphorus. Fertilizer applications to impervious surfaces or within 25 feet of surface waters are prohibited.

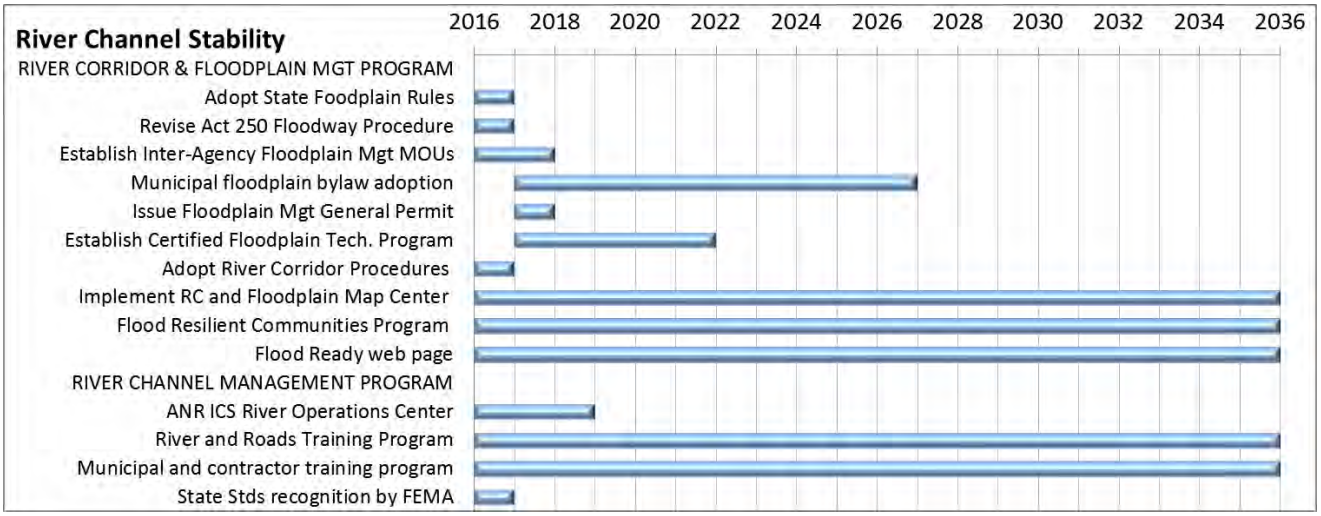
Implementation Mechanism and Steps.

Vermont passed legislation. No additional action is necessary.

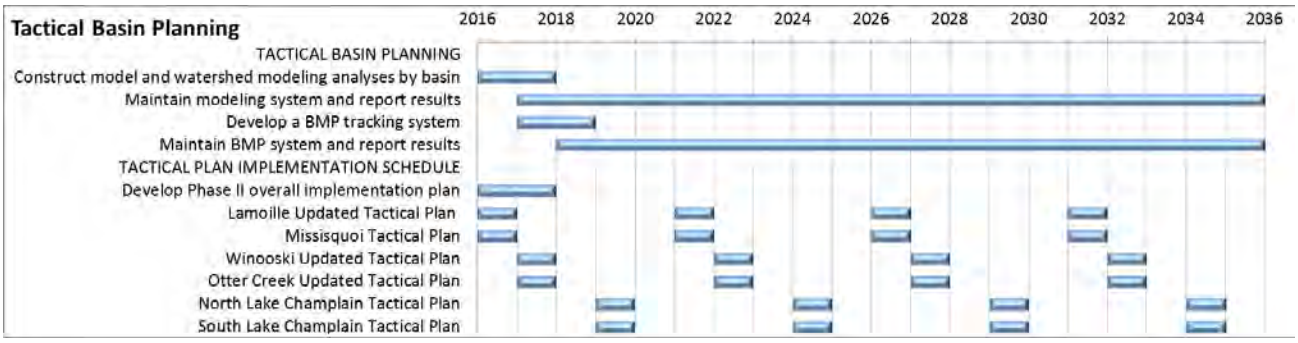
APPENDIX E – *GANTT CHART OF POLICY COMMITMENT MILESTONES*

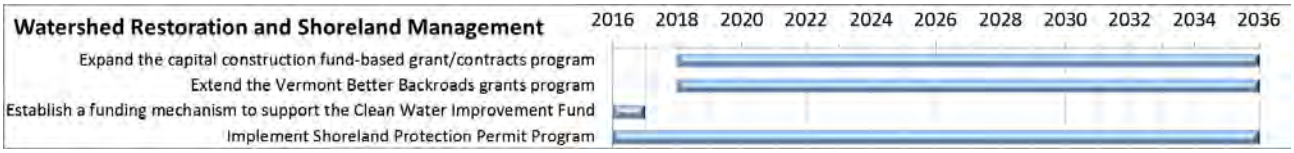


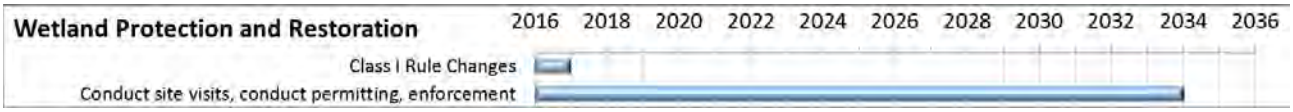


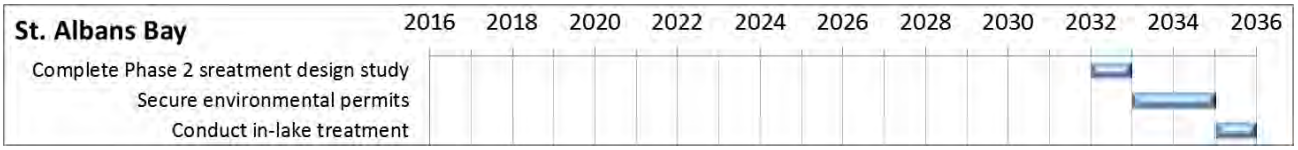



Forest Management
2016 2018 2020 2022 2024 2026 2028 2030 2032 2034 2036
Revise and publish AMP manual


Tactical Basin Planning
2016 2018 2020 2022 2024 2026 2028 2030 2032 2034 2036
TACTICAL BASIN PLANNING
Construct model and watershed modeling analyses by basin
Maintain modeling system and report results
Develop a BMP tracking system
Maintain BMP system and report results
TACTICAL PLAN IMPLEMENTATION SCHEDULE
Develop Phase II overall implementation plan
Lamoille Updated Tactical Plan
Missisquoi Tactical Plan
Winooski Updated Tactical Plan
Otter Creek Updated Tactical Plan
North Lake Champlain Tactical Plan
South Lake Champlain Tactical Plan


Watershed Restoration and Shoreland Management
2016 2018 2020 2022 2024 2026 2028 2030 2032 2034 2036
Expand the capital construction fund-based grant/contracts program
Extend the Vermont Better Backroads grants program
Establish a funding mechanism to support the Clean Water Improvement Fund
Implement Shoreland Protection Permit Program


Wetland Protection and Restoration
2016 2018 2020 2022 2024 2026 2028 2030 2032 2034 2036
Class I Rule Changes
Conduct site visits, conduct permitting, enforcement


St. Albans Bay
2016 2018 2020 2022 2024 2026 2028 2030 2032 2034 2036
Complete Phase 2 sreatment design study
Secure environmental permits
Conduct in-lake treatment

APPENDIX F – *SUMMARY OF PUBLIC COMMENT*

The VDEC and VAAFM released in November of 2013 a draft *Proposal for a Clean Lake Champlain* – the State's proposal for reducing phosphorus pollution that is degrading Lake Champlain and its tributaries. The State solicited public comments of that draft from November 26, 2013 to January 17, 2014. Table 12 summarizes the public comments, organized by sector and topic.

TABLE 12 - PUBLIC COMMENTS -THE DRAFT PROPOSAL FOR A CLEAN LAKE CHAMPLAIN, RELEASED 11/20/2013

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical Assistance	Involves Research/Development	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
General Comments										
Support the restoration of Lake Champlain.		X								
Support the restoration of all Vermont waters and steps to prevent waters from becoming impaired.										X
Should identify clear roles for non-profit organizations; important for delivering technical assistance, education, and project implementation.	X			X						
Should be comprehensive, involving primary sources of pollution, with control efforts designed at the right scope and scale.	X									
Need to monitor progress.	X									
Uncertain that TMDL and policy commitments are necessary.						X				
Need to target phosphorus controls at Missisquoi Bay and South Lake.		X								
Acknowledge that restoration will take decades, but we must continue the work.		X								
Need greater educational assistance to reduce impacts caused by our activities.				X						

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
General Comments - Continued										
Current laws and volunteer actions are not working.	X									
The Lake's condition is a public health issue, in addition to an environmental and economic concern.	X									
Restoring Lake Champlain will likely create new jobs.	X									
Public should we warned about public health concerns caused by algae blooms.				X						
Support innovation and alternative implementation strategies.					X					
Consider anaerobic digestion, aeration and manure injection systems and weed harvesting as an energy source.					X					
Support a business enterprise that can extract phosphorus from the Lake and export nutrients to areas of need.					X					
Consider actively harvesting weed blooms.	X									
Consider use of algaecide or other actions to address toxic outbreaks.	X									
Find ways to deal with infestations of Eurasian Milfoil and water chestnut.										X
Plan needs to include the expected amount of phosphorus reductions from each strategy in order to see if the actions will meet water quality standards.	X									
Before EPA can issue a final TMDL, the plan must enhance existing programs, establish new programs with legislative approval, and complete appropriations.	X									
Support legislation and enforcement to reduce or eliminate direct discharges from private lands adjacent to the Lake and tributaries.							X			
Support load reductions from unregulated sources where significant improvements have not been made to date.	X									

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
General Comments - Continued										
Education of municipalities, developers, farms, and the public is important for changing behavior and achieving the plan's long-term success.				X						
Look for ways to improve existing programs and processes.	X									
Everyone needs to be involved. Public engagement is critical.				X						
Citizens need education in order to encourage towns to use best management practices to improve water quality.				X						
Involve schools and college students.				X						
Need success stories and demonstration projects for each sector.				X						
Engage the public and businesses about actions that cause impacts, investments that make a difference, and what they can do.				X						
Rely on ECHO to demonstrate how to take care of local waters.				X						
Plan should also evaluate deficiencies and bottlenecks in existing programs.	X									
The State should make available evidence to support the attainment of water quality standards by implementing the draft proposal.	X									
Plan should address impacts the State is experiencing from increased precipitation that is causing more runoff and flooding.	X									

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
General Comments – Cross-Sector Issues –Offsets and Nutrient Trading										
Support offsets if cost-effective in achieving targets.								X		
Do not support offsets because they shift the cost of nonpoint source controls to point sources, creating an unfair burden on a sector that has already made improvements to become the smallest contributor of phosphorus.								X		
Recommend evaluating the benefits and costs of an offset program prior to establishing one.	X							X		
An offset program with fees that are similar to impact fees could be costly without financial support.								X		
Any offset payment and fees should be retained for use in the watershed in which they are generated to prevent degradation.	X									
Any offset program must not result in cleaner waters becoming more degraded.	X									
Recommend an offset program to reduce loading from other pollutant source categories to offset the increased pollutant loads associated with the "hands-off" approach to achieve stream channel equilibrium conditions.	X									
Consider a credit system for cities, farms and other sources for practices in place and proactive actions taken.								X		
Support a verifiable nutrient trading program.	X									

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
General Comments – Cross-Sector Issues – Trading and Offsets - Continued										
Consider allowing trading to occur outside of specific watershed where attainment is harder to reach and benefits are to reduce phosphorus in the broader Lake Champlain.	X									
Consider a trading program as a means of capping nutrient loads from farms to prevent an increase in phosphorus loads, even when the farm converts from hay to corn.	X									
General Comments – Cross-Sector Issues - Buffers										
Buffers are effective and relatively inexpensive, compared to other actions.								X		
Different buffer standards exist, depending on the land use and agency. Buffers must be large enough to be effective, composed of appropriate vegetation, and exist to reduce pollution. Support one buffer standard, managed by one agency, with assistance from third parties to ease implementation.	X									
Support installation of riparian buffers.	X									
Use non-profit organizations to assist with installation of riparian buffers.				X						
Riparian buffers are among the best tools for protecting water quality, and provide other benefits including bank stability and flood attenuation.	X									
Install nitrogen-absorbing plants within 50 feet of waters to reduce runoff.	X									
Buffers are important to prevent streambanks from eroding.	X									
Support well-vegetated riparian buffers along lakes, streams and ditches to protect water quality, habitat function, and flood resilience.	X									

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
General Comments – Compliance and Enforcement										
Greater inspection leads to better compliance.							X			
Expand compliance monitoring and enforcement.							X			
Inspection and enforcement should be timely and consistent. Penalties for noncompliance should be meaningful and greater than the cost of compliance.							X			
Commit to maintaining adequate staffing to implement existing and new regulatory programs.	X									
Recommend assigning VANR the sole regulatory authority; more cost-effective.							X			
Consider performance-based regulations to replace a specification-based system.	X									
Adopt the IRS or OSHA model of enforcement; chances of inspection are low but penalties are significant; could change behavior.							X			
Consider "effluent limitations" or "Best Available Technology" standards to limit discharges; current program still allows discharges to occur.	X									
Consider ways to improve enforcement and compliance with existing programs.							X			

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
General Comments – Future Pollution Loads										
Need to account for increases in pollution loading from increases in development, increases in agricultural practices, and increases in population.	X									
Concern that new development could mask progress; consider incentives for redevelopment and disincentives for new development.	X									
Support actions and technical assistance to towns to minimize impacts from future development.	X			X						
Consider incentives or regulations to minimize or mitigate effect of converting from pasture to row crops.	X									
Consider incentives to convert dairy to other types of farming.	X									
Programs that prevent future loading are more cost-effective than efforts to restore degraded waters, although they do not help with reducing current loads.								X		

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
General Comments – Costs and Targeting										
Concerned about the cost to implement the plan.								X		
Consider prioritizing actions in all sectors to achieve greater reductions in a cost-effective manner.		X						X		
Consider evaluating costs per pound or ton of phosphorus removed for actions in the plan.								X		
To achieve reductions in the most effective means possible, the State should identify and target the dominant sources of pollution such as farm runoff, and then see if more reduction is necessary.	X									
Municipalities are struggling with the need to replace failing structures first and concerned about the affordability of the plan and taxpayers' ability to pay.								X		
Existing program staffing and funding sources are inadequate.	X								X	
Plan should target cropland, streambanks, and development before addressing the lessor sources.	X									
Consider a tiered approach, targeting the largest sources, then the larger towns.	X									
An equitable strategy is to include smaller community in the regulatory requirements on stormwater discharges.	X									
Support actions that are affordable and strategic.	X									
Focus effort on where we can make the greatest reductions in the most cost-effective manner.								X		

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
General Comments – Costs and Targeting - Continued										
Need detailed costs in terms of phosphorus reductions.								X		
Costs need to be discussed transparently and in consideration of costs to implement other state requirements. "Saving the Lake" is not a good enough reason to require taxpayers to shoulder much of the financial burden of cleaning up the Lake.								X		
Consider adequately focusing on one watershed before moving to other areas.	X									
Plan shifts the costs of the State's failure to regulate the toxic effects of conventional dairy farming onto taxpayers.								X		
Support river corridor plans, stormwater master plans, and road assessments to identify and target implementation.		X								
Support linking basin plans with local and regional plans, which should help integrate basin plan actions into local decision-making.	X									
Tactical Basin Planning has no authority. There is no assurance that the actions identified will be implemented. Measurable reductions are impossible to estimate.	X									

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
General Comments - Funding										
Support for a shared responsibility with everyone contributing.							X			
The plan needs adequate staffing, resources, and project funding.	X									
Support a publicly funded grant program to help farmers reduce pollution.									X	
Need to provide financial and technical assistance, particularly for small farmers and municipalities.				X					X	
Need a new, broad-based, stable and dedicated funding mechanism that will focus on projects to reduce nonpoint source pollution. Improved targeting and leveraging existing funds will not be adequate.									X	
Support new resources to fill the gap in funding needs. One-time installation of funds will not provide the Clean Water Act's Reasonable Assurances in securing reductions over the long-term.									X	
Support funding from many sources including federal government and private donations.									X	
Concerned that the plan will not be fully funded.									X	
Municipalities need financial assistance to implement requirements.									X	
Municipalities face many current funding needs associated with aging infrastructure. The plan should include a cost/benefit analysis and prioritization.								X		
Need to determine the scope and cost required to implement the plan prior to establishing a new clean water fund.								X		

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
General Comments – Funding - Continued										
Each nonpoint source pollutant source sector should contribute in proportion to its level of phosphorus loading in order to equitably assign costs to sources.								X	X	
A fee-based system should give credit for or offer incentives for voluntary implementation of BMPs.									X	
Scope of activities supported by a fund should be limited to measures required to implement the TMDL.									X	
Concern that there are no federal or state funding commitments for implementing the set of initiatives.									X	
Support an "environmental tax" on manufactured products that contain phosphorus.									X	
Support broad-based funding that distributes the burden of phosphorus reduction to a wider cross-section of Vermont than those who live in communities with Clean Water Act (NPDES) permits.									X	
Simply restating the existence of the Ecosystem Restoration Program does not meet the Clean Water Act's Reasonable Assurances provision.									X	
Evaluate whether existing funding sources are being spent efficiently and effectively. Successful programs should be given priority to receive additional funds.									X	
Support the restoration of the Clean Water Act Section 319 grant program.									X	
Consider boat registrations as a source of new revenue, scaled to size or value.									X	

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
General Comments – Funding - Continued										
Consider tax incentives, awards, and discounts from garden centers, landscapers, and developers.									X	
Consider North Carolina's State Clean Water Management Trust Fund, which supports similar clean water projects.									X	
Consider Colorado Springs, Colorado's stormwater fee that is part of the annual property tax bill.									X	
Consider Minnesota's Clean Water Legacy fund as a model.									X	

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
Stormwater Management										
Stormwater Runoff from State Roads										
Support a Clean Water Act (NPDES)-based permit for state roads.		X								
Effectiveness of this permit depends on the terms, compliance, and enforcement.							X			
Runoff from the state highway network is a point source, and should be assigned a "wasteload allocation."	X									
Success involves maintaining adequate staffing to implement the program.	X									
Under the Vermont Water Quality Standards, compliance schedules are appropriate only for attainment of new or newly interpreted standards. All discharges from state road network are not eligible for compliance schedules. Discharges from these sources must comply immediately with water quality-based effluent limits.	X									
Municipal garages, previously exempt from permitting under the Vermont Multi-Sector General Permit (MSGP) should be included in this program.	X									
A state road permit program will be a good model for municipalities and lead to delivery of technical assistance to towns.				X						

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
Stormwater Runoff from Municipal Roads										
Support improved management of gravel roads. Road sediment in runoff can discharge directly into streams, acting like a point source.		X								
Support reducing or eliminating direct discharges from roads. Actions will result in cost savings for municipalities and Vermonters due to lower maintenance costs.		X						X		
Not all water in town ditches comes from roads. Adjacent landuses discharge water to road ditches. Should seek runoff reductions from adjacent landuses.	X	X								
Accept the municipal road standards if they are similar to VTrans Road and Bridge Standards.	X									
Do not support municipal road standards if they are similar to VTrans Road and Bridge Standards because of visual impacts on rural roads and cost.								X		
Support a municipal road standard, using the VTrans Road and Bridge Standards as minimum standards, but support making them more protective and increasing the potential to save money over the long term.	X									
Support targeting problem area, such as locations where transportation infrastructure is incompatible with river channel stability or where there are direct discharges, rather than a state permitting program.	X									
Concerned that the plan imposes a disproportional cost onto municipalities.								X		
Support minimum standards based on the Vermont Better Back Roads Manual.	X									
Municipalities need guidance on road best management practices.				X						

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
Stormwater Runoff from Municipal Roads - Continued										
Identifying affordable Best Management Practices, taking into account maintenance costs, is critical.								X		
Undersized stream crossings are responsible for a great deal of flood damage. The permit system should require towns to establish capital plans for replacing and upgrading stream crossings.	X								X	
The process, including the management of grant programs, should include ranking and targeting to address priority road erosion impacts.		X								
Concern about accuracy regarding the amount of phosphorus coming from roads.						X				
Municipalities cannot afford the high cost of upgrading all town roads at once.								X		
Support education and training for municipal road crews.				X						
The program requires adequate staffing to implement the program.	X									
Concern that there has been no evaluation to demonstrate that it will work.		X								
The Vermont Better Back Roads Grant Program's small grants are insufficient to address undersized culverts that could be a significant source of runoff.								X		
Road erosion problems can be created or exacerbated by runoff from private roads and driveways. Approach needs to engage landowners and homeowner associations to address erosion and be part of the solution.	X									
Consider including Class 4 roads under the permit program. Class 4 roads are often a significant source of erosion, but considered lower priorities for repair because of low vehicle miles traveled.	X									

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
Stormwater Runoff from Municipal Roads - Continued										
The permit program should be accompanied by adequate enforcement							X			
Consider incentives, rather than regulation, to implement practices that reduce impacts from road runoff.	X									
Consider changes to state law to facilitate installation of cutouts along roads.			X							
Consider vegetated swales along flatter roads.	X									
Support programs like the Vermont Better Back Roads Grant Program.									X	
Municipalities need guidance but hold them accountable so as to discontinue damaging practices.				X			X			
Include treatment requirements of road runoff, before discharging into streams.	X									
Any general permit should contain flexibility, since landscape features in certain locations may prevent the application of standards.	X									

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
Stormwater Runoff from Existing Developed Lands										
Support this element of the plan.	X									
Based on the amount of impervious surfaces that are directly connected to waterways, even small impervious surfaces below the proposed thresholds can have a disproportionate impact on water quality. Consider targeting directly connected imperious cover.	X									
Consider incentives for property owners that allow for the siting of stormwater retrofits on their land that will provide treatment for a number of properties.	X									
Support updating the state 2010 MS4 Designation Procedure to acknowledge the contributions of phosphorus loading from current MS4 municipalities and to expand	X									
Support using the Clean Water Act's Residual Designation Authority (NPDES) discharge permit and managed as part of the TMDL Wasteload Allocation.	X									
Support adequate staffing to implement program.	X									
Support greater compliance and enforcement.							X			
A 3-acre threshold to trigger permit coverage seems excessively high when compared to the one-acre threshold for new construction stormwater permits.	X									
Managing stormwater runoff from private land via a municipal stormwater permit is not practical. Not all towns have or want to use zoning as a tool to direct development. The State should augment its own stormwater regulations to prevent water quality degradation or develop statewide zoning.	X									

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
Stormwater Runoff from New Development										
Support updating Vermont Stormwater Manual to reduce pollutant loads associated with new development.		X								
Update to the Manual should focus on Increased pollutant removal.	X									
Require conservation design and Low Impact Development (LID) practices for all stormwater permits and quantify pollutant reductions.	X									
Changes to the Vermont Stormwater Manual should include changes in design standards to improve resilience towards greater intensity precipitation events associated with climate change.	X									
Support lowering the default threshold for stormwater permitting.	X									
Provide assistance to municipalities in adopting local ordinances that include conservation design and Low Impact Development.				X						
Strategies to prevent future loading important but will not offset pollutant loads that are already occurring.	X									
Create incentives that include availability of grant funding or eligibility of Tax Increment Financing (TIF) to encourage municipalities to adopt local standards that include best practices for compact development.	X								X	
Changes to the Vermont Stormwater Manual should include changes in design standards to improve resilience to greater intensity precipitation events associated with climate change.	X									

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
Non-regulatory Stormwater Management for Non-MS4 Municipalities										
Stormwater Master Planning										
Support stormwater master planning to encourage towns to voluntarily reduce runoff from new and existing developments.		X								
Provide greater technical assistance to municipalities in reducing runoff.				X						
Support a publicly accessible central clearinghouse for stormwater master plans and reports.				X						
Include these actions in a plan for meeting Clean Water Act's "Reasonable Assurances" provision only if they are to be implemented, required, and quantified.	X									
Define stormwater master planning.	X									
Green Infrastructure Initiative										
Support establishing "Urban Tree Canopy" goals for all downtowns and village centers.	X									
Support the Green Stormwater Infrastructure Strategic Plan, including technical assistance to municipalities on how to implement actions at the local level.				X						
Support green roofs as a stormwater management solution.	X									

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
Agricultural Programs - General										
It is unfair and impractical that municipalities are being asked to shoulder the costs when the largest source is agricultural and forest runoff.								X		
Address drainage ditches that are "straight pipes," discharging and damaging the Lake.	X									
Involve Booth Brothers and Cabot for greater publicity.				X						
Strengthen penalties for non-compliance.							X			
Majority of pollution to be curbed is the result of agricultural runoff. Need stricter requirements to reduce agricultural runoff, with technical and financial assistance for farmers.	X			X						
Removing existing exemptions from water quality protections in statute for agriculture will go farther in improving water quality, than relying on voluntary measures, self-certification, and flexibility that will not lead to improvements in water quality.			X							
Replanting pastures that involve leaving soil bare in the spring before grasses have sprouted, particularly on sloping fields, can lead to erosion. Require actions, such as terracing, to reduce erosion.	X									
Large corporate farms have taken advantage of laws intended to protect small farms from going out of business.	X									
Chart showing pollutant loads overstates loads from streambanks and understate loads from cropland. Much of the streambank erosion is associated with cropland activities.	X									

Public Comments	General or Program-Specific	Included in the Plan	Requires Legislative Changes	Focuses on Education/ outreach or Technical	Involves	Concerns Data Quality,	Focuses on Enforcement	Includes cost considerations	Focuses on Funding	Is not Related to the Plan's Focus
Agricultural Programs – General - Continued										
Fields treated with herbicides for corn production also ends up in the Lake.										X
Evaluate the possible contribution of the herbicide, glyphosate, to phosphorus loading and increase monitoring.					X					
Consider incentives to support less polluting agricultural uses of land to encourage transition away from conventional dairy.	X									
Achieving water quality compliance involves care in the management of herd size, attention to prevent overproduction, prevention of row crops in or near the annual floodplain, and greater management in the application of phosphorus-containing manure, fertilizer, and feed.	X									
Need more regulation of agricultural runoff, poor farm practices, and inadequate vegetative buffer zones. Regulation should be the preferred alternative to ineffective incentives.							X			
Some farms have overflowing manure pits, plow close to streams and ditches, and spread manure in pouring rain. There is erosion and runoff from bare farm fields.	X									
Need stronger enforcement. Farmers will have to be held accountable.							X			
Increase funding for crop and soil management practices of the VAAFM Farm Agronomic Practices Program, new technologies, and management practices.									X	

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Agricultural Programs – General - Continued										
Farm roads near ditches can cause erosion hazards. Consider a program that offers improvements to farm roads near ditches.	X									
Farm roads that service manure storage areas can become rutted and concentrate water. These roads have the potential to discharge to streams. Consider a program to help farmers prevent these problems from occurring.	X									
Roads that access sugar maple stands are at risk of contributing high pollutant loads because the lands are steeper, access roads may not have any erosion controls, and maple sugar makers are accessing these lands in the spring when soils are saturated.	X									
Stop criticizing farms which produce local foods.	X									
Consider supporting the implementation of a phosphorus export program, such as Vermont Organics Reclamation that purchase excess manure and nutrients and uses them to make an organic line of soil amendments.	X				X					
Promote nutrient export in milk, cheese, vegetables, potting soil, and other products out of the Basin.	X				X					
Consider a tax on grain to minimize the import of phosphorus from feed.									X	

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Agricultural Programs – General – Flood Resilience										
Plan should address strategies to improve the resilience of agricultural lands from the impacts of flooding by prevent crop loss due to flooding and protecting floodplains.	X									
Encourage wetland and floodplain restoration to slow down the velocity of the streamflow during storm events. Consider paying farms for the loss of cropland from these restoration projects.	X							X		
AAPs should reduce nonpoint source pollution that is occurring during high flows.	X									
Should reduce or eliminate tilling in high risk flood zones or permanently take flood-prone land out of production.	X									
Encourage buying flood-prone land or using land swaps to reduce farmers' vulnerability to flooding.	X									
Consider incentives or subsidies to convert corn crop to a perennial crop in floodplains.								X		
Floodplains are almost always defined as not being highly erodible, even though the farm field may be vulnerable to damages from fluvial erosion. Consider actions to protect these areas.	X									
Consider an evaluation to ensure that payments to farms for crop loss or damage do not result in continuing to plant the field crop in the vulnerable area.	X									

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Agricultural Programs										
Water Quality Permitting Programs										
Reduce the MFO threshold from 200 to 150 cows.	X									
Do not support meeting the Clean Water Act's Reasonable Assurances provision with the State's LFO and MFO programs. VAAFM maintains that a majority of LFOs and MFOs are in full compliance. Therefore, the plan cannot credit continued implementation with no enhancement of requirements. Reasonable Assurances require reductions in nonpoint sources.	X									
Compliance with LFO and MFO programs is not universal. Support steps to enhance existing enforcement.							X			
Recommend addressing the state rule that is inconsistent with statute, whereby numerous MFOs in common ownership evade the LFO requirements, including requirements aimed at regulating additional animals. If a farmer owns multiple MFOs in Lake Champlain Basin or other watersheds impaired by agricultural runoff, the regulatory program should treat those as a single LFO.	X									
Support a Clean Water Act (NPDES) permit for CAFOs.	X									
CAFO permits govern point source discharges assigned to the TMDL's Waste Load Allocation. They cannot be counted towards meeting Reasonable Assurances.	X									
A CAFO's manure lagoons should not be open to the rain, but should be covered.	X									
Withstanding a 25-yer, 24-hour storm event means that lagoons would overflow on average every 25 years. Noting the many lagoons in the Basin and the variable rainfall, there likely will be an overflow somewhere in the Basin every year.	X									

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Accepted Agricultural Practice Rule Update and Compliance										
Enhance AAPs to meet the TMDL's Reasonable Assurances provision by appropriately sizing buffers, restricting haying and pesticide application in buffers, improving soil testing and record-keeping, and extending winter spreading ban to days which conditions result in frozen ground or snow cover prior to or after specified dates.	X									
Enhance AAPs by improving enforcement with adequate staffing.							X			
Support expanding regulatory oversight to small farms.							X			
Support technical, educational, and financial assistance to small farms.				X						
Inspections should occur in areas where waters are not yet impaired. Should not focus on watersheds are only agriculturally impaired.							X			
Proposed changes to AAPs will put many small dairy farms out of business.								X		
AAPs are not about protecting waters of the State. AAPs shield dairy farmers from environmental regulation.							X			
Support gully erosion. Specify practices to accomplish this objective.	X									
Important to address gully erosion early before they become major sources. It can be expensive to address if left unattended.		X								
Consider stabilizing ditches that are actively eroding.	X									
Ditches discharge sediment and phosphorus. Plan needs to address this source.	X									
Support third-party certification. Self-certification has the potential to be abused.							X			
If farmers are unaware of the AAPs, it raises the question regarding the reliability of a self-certification process.							X			

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Accepted Agricultural Practice Rule Update and Compliance - Continued										
Self-certification may be a way to avoid inspection and compliance. Following outreach, certification should involve 3 options: yes; no; or not entirely compliant but working with NRCS and have a plan for compliance.							X			
The State does not appear to be serious about certifying and inspecting 850 small farms with only one employee.							X			
Support a licensing program, similar to Wisconsin, for contract manure applicators.	X									
Plan should address concern about liquid manure being applied very close to waterways, such as brooks and marshes in Addison County.	X									
Consider reductions of phosphorus loading from tile drains, a source of soluble phosphorus. This is a particular concern if the tile drain is in close proximity to the Lake.	X									
Require at a minimum the registration of all tile drain installations.							X			
Conduct paired monitoring study to investigate impact of tile drainage.					X					
Consider actions to prevent farmers from bringing manure onto roads that then runs off into road ditches or streams.	X									
Address the pollution risk of older manure pits located on floodplains or permeable soils. The pose a risk of nutrient leaching into groundwater and streams.	X									

Public Comments

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Accepted Agricultural Practice Rule Update and Compliance - Buffers										
Do not support the 10-foot buffer. A little bank erosion will eliminate a 10-foot buffer in no time.		X								
Calling a 10-foot grass strip a buffer is misleading and enables credit for providing benefits without actually providing any.		X								
Easier to monitor a standard buffer width using aerial photography. Variable widths are more difficult to monitor for compliance.		X					X			
Support sliding buffers if site-specific conditions such as slope indicate this need.	X									
Grass buffers have little effect on protecting streams or helping to improve stream stability, and are inconsistent with the State's Act 250 Guidance, which calls for undisturbed and naturally vegetated buffers.	X									
Minimum buffer widths of 25 feet for streams and 10 feet for ditches may be insufficient to provide pollutant removal and stream channel protection.	X									
The proposed widths are inconsistent with the State's technical guidance for the Conservation Reserve Enhancement Program (CREP). That guidance calls for 25 feet under the best circumstances – low slope, permeable soils, and small contributing area.	X									
Buffers should apply to intermittent streams.	X									
Buffers should apply to all "blue-line" streams on USGS maps.		X								

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Accepted Agricultural Practice Rule Update and Compliance – Buffers - Continued										
Ditches should have larger buffers in order to maximize pollutant filtering, slow velocity of runoff, and alleviate situations where ditching in buffers allow runoff to bypass the buffer.	X									
Increase buffer widths to at least 35 feet if pesticides are being used.	X									
Consider having buffers on tile inlets.	X									
Consider strategies to overcome barriers to achieve vegetated buffers on farmlands.	X									

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Accepted Agricultural Practice Rule Update and Compliance – Livestock Exclusion										
Support adoption of mandatory livestock exclusion, not just in areas where streambanks are eroding, due to presence of nutrients, bacteria, antibiotics, and other pollutants in public trust waters. Support phasing in the practice, focusing on areas of greatest concern.	X									
Support livestock erosion from streams and not limit exclusion where there is erosion. AAPs need to prevent areas of new erosion.	X									
Could be a very cost-effective practice, especially when compared to stormwater retrofits in urban areas or wastewater treatment facility upgrades.								X		
Livestock exclusion can be cost-prohibitive at some farms.								X		
Support incentives to exclude livestock from streams.	X									
Support livestock exclusion for land that is not currently used to pasture animals.	X									
Support livestock exclusion grazing management plans.	X									
Could support very limited grazing along streambanks, only a few days per year or per month.	X									
Dairy farmers are already at the brink of insolvency. A declining share of the costs of fencing cannot be an incentive.								X		

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Accepted Agricultural Practice Rule Update and Compliance – Winter Spreading Ban										
Do not support lifting the existing winter spreading ban.	X									
Agencies across the country recognize that spreading manure on ice and frozen ground is unpredictable at best. It is known to result in major pollution events.	X									
If a farmer is forced to spread at high rates during a time of year that is for flooding, the farmer has not scaled the number of animals to available storage. The farmer may be using land to dispose of waste rather than for taking up nutrients. The farmer may not be operating under useful nutrient management plan, is not following the existing plan, or there is a need for greater enforcement.	X						X			
VAAFM's use of the winter spreading ban waiver yearly reflects the problem associated with not enough storage. They need to scale operations to meet capacity to dispose of wastes without using the waters of the State.	X									
A farm should not be allowed to have more animals that it has manure storage capacity to properly handle and contain manure and leachate.	X									
Winter spreading ban waivers pose immense enforcement challenges.							X			
If farmers are following nutrient management plans, they should not be applying manure at very high rates anywhere. Farmers should be manure to soils that need it, not just to the nearest field.	X									

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Accepted Agricultural Practice Rule Update and Compliance – Winter Spreading Ban - Continued										
Eliminating or loosening the winter spreading ban contradicts the proposal's stated goal of cleaning up Lake Champlain. It does not provide the Clean Water Act's Reasonable Assurances that nonpoint source reductions will occur.	X									
A waiver request should automatically require a reduction in the number of animals until the farmer can demonstrate proof of adequate storage capacity.	X									
Define, "not adjacent to surface water." Consider a minimum 150-foot setback if the winter spreading ban is lifted.	X									

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Nutrient Management Planning										
Plan should specify the threshold to determine when farmers would need to develop and implement nutrient management plans.	X									
Supports nutrient management planning.	X									
Nutrient management planning should include actions that address erosion and sediment control.	X									
Do not support the use of the soil loss factor, "T," in the Universal Soil Loss Equation, since "T" is an agronomic standard and not a water quality standard.										
Some NRCS offices allow for greater than "T" in nutrient management plans.	X									
Consider a more stringent target for soil loss, expressed as a fraction of T, such as ½T or a more protective "P" standard. Consider ½T for areas that are known to be discharging, critical source areas, or erosion areas.	X									
Need to explain the basis for determining waters that are "agriculturally impaired," and provide a list of these waters.	X									
See little value unless the state develops a better system of monitoring and enforcing compliance related to soil testing, timing and rate of nutrient application.							X			
Support technical exchanges and educational opportunities among farmers.				X						
Need more clarification as to how to ensure compliance with nutrient management plans. Support meaningful enforcement for cases of non-compliance.							X			
Need accountability and assurances against abuse and capacity for enforcement.							X			

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Nutrient Management Planning - Continued										
The State needs to change agricultural land management to involve constant cover 100% of the time. Farmers in North Dakota, Ohio, and Missouri all use cocktail cover cropping in their crop systems. The biodiversity of plants and roots build healthy soils.	X									
Farmers need technical assistance in nutrient management plan development and implementation.				X						
Farmers that manage grazing effectively with adequate buffers should not require technical service providers to develop a grazing plan.	X									
Gap Watersheds Missisquoi Bay, St. Albans Bay, South Lake										
Actions must help the South Lake meet water quality standards.	X									
Consider having corn fields along the Lake in St. Albans use cover crops after the corn is harvested. No cover crops are planted there year after year.	X									

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River Channel Instability										
Minimizing River Corridor and Floodplain Encroachments										
Support regulation of floodplain developments that are exempt from municipal regulations.		X								
Support floodplain protection.	X									
Unstable streams are a product of poor landuse practices that from agricultural areas and development.	X									
Allowing rivers to establish stable equilibrium conditions by limiting actions that impede this objective is critical to achieving a healthy Lake Champlain.		X								
Support river corridor protection using easements and land conservation. This approach increases resilience to storm events, improves habitat connectivity, and maintains water quality.		X								
River corridor protection via land conservation and easements are expensive. The plan does not identify any new sources of funding to increase use of this strategy.									X	
Support a state program to acquire flooded properties to prevent rebuilding in vulnerable areas.	X									
A less expensive approach to achieving floodplain and river corridor protection is to encourage municipalities to develop better zoning bylaws.				X				X		
Support stormwater utilities to implement floodplain restoration projects.									X	
Support targeted, rather than ad hoc, floodplain restoration.	X									
FEMA flood maps are inadequate for determining flood risk.										X

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Preventing Adverse River Channel Modifications										
Support actions to prevent pollutant loads from stream channel modifications.		X								
Support bank stabilization strategies to address rate of bank erosion that is consistent with the pollutant load the Lake can assimilate, without compromising the ultimate goal of achieving channel stability.	X									
Support repairing eroding streambanks.	X									
Concerned that streambank erosion control is used to protect infrastructure at the expense of increasing erosion of agricultural land.	X									
Dry eroded waterways, exposed to poor agricultural and forestry operations, can contribute pollutant loading.	X									
The plan should address streambank erosion as a source of phosphorus. Allowing streams to erode will continue to generate pollutant loads.		X								

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Forest Management										
Water quality impacts occur when forest cover goes below 65% on a watershed scale and 70% for riparian buffers. Should develop a statewide strategy to protect, conserve, and enhance forest cover for water quality.		X								
Improve the rate of compliance with AMPs.							X			
The draft Timber Harvest Assessment shows some degree on noncompliance with AMPs. Either strengthen enforcement, increase implementation of existing requirements, or add stronger provisions.							X			
AMPs should prevent, not just reduce, mud, petroleum products and woody debris from entering streams, wetlands, and ponds.	X									
Need quantifiable reductions if the plan seeks to claim pollutant reductions from existing programs.	X									
Recommend taking action other than promoting skidder bridges. Most states with strong forestry industries have licensing programs that include water quality. If farmers must become certified to comply with AAPs, foresters and loggers should become certified.	X									
Support program that identifies abandoned logging roads and skid trails and incentives to correct them.		X								

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Internal P Loading in St. Albans Bay										
Consider addressing phosphorus-laden sediments in the Lakes polluted bays	X	X								
Phosphorus Detergent and Fertilizer Use										
Consider having retailers post signage in accordance with the law to help make customers aware of the general restrictions on the use of phosphorus-containing fertilizers.				X						
Support an assessment whether the ban of phosphorus in laundry and dishwasher detergents and the limit on phosphorus in lawn fertilizer are working, and whether wholesalers and retailers are complying with these state statute.					X		X			
State law does not outright ban the use of fertilizers. It requires signs at point of sale, and that homeowners not apply fertilizer without a soil test. Consider a ban on the sale and use of lawn fertilizers, with the possible exception of golf courses.			X							

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Wastewater Treatment										
Point sources are a very small source; additional requirements are costly with diminishing return and limited improvement, and may not be cost-effective.								X		
Additional reductions from point source will need broad-based funding.									X	
Wastewater plants that do not meet permit limits should be a priority.	X									
Encourage optimization of wastewater treatment plant performance using incentives to award good performance.	X									
Support integrated stormwater and wastewater planning and permitting to more cost-effectively manage multiple clean water permits, allow for a greater prioritization of actions, and a logical timeline that reflects compliance costs.								X		
Need to address failing, inefficient, or insufficient septic systems with better technologies before they fail and become a problem.	X									
Need to address spills of partly and untreated sewage from wastewater treatment plants.	X									

Restoring Lake Champlain: Frequently Asked Questions

General Topics

- **Why do we need a clean Lake Champlain?**
  A clean Lake Champlain supports the health of our communities, adds to the vibrancy of our economy, bolsters our businesses that depend on clean water, keeps drinking water safe for people and treatment costs down, and safeguards the recreational and ecological values that we treasure.

- **What is a TMDL and why do we need one?**
  TMDL means "Total Maximum Daily Load", which is a cap on the amount of a pollutant (in this case phosphorus) that a waterbody can safely absorb and still meet the State's water quality standards. The cap, or the maximum amount of that pollutant, is then allocated among the various pollutant sources and locations.

- **Was there not already an existing TMDL?**
  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 a cap on the amount of phosphorus allowed to enter Lake Champlain, and allocated that maximum amount among the various sources within each major watershed draining to the Lake. In 2011, in response to concerns about the adequacy of the 2002 TMDL, EPA revoked its prior approval of the Vermont portion of the Lake Champlain TMDL and is in the process of developing a new TMDL.

- **What is meant by "point" source water pollution?**
  There are two general source categories of water pollution – "point" and "nonpoint" source pollution. Since the passage of the federal Clean Water Act in the 1970s, Vermont and the rest of the nation have made significant gains in controlling water pollution through permit requirements that manage discharges from "point sources." The federal Clean Water Act defines point sources are, "any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture." 33 U.S.C. § 1362(14).

- **What is meant by "nonpoint" source pollution?**
  Nonpoint sources of water pollution from our land use activities have grown in significance in Vermont and nationally. Nonpoint sources of pollution are sources that do not meet the Clean Water Act's legal definition of point source. A common definition is the kinds of water pollution emanating from diffuse sources, rather than a pipe or discrete conveyance.

Examples include runoff from developed areas, construction sites, and agricultural operations, and erosion from unstable and incised streams. Nationally, nonpoint source pollution is the leading cause of water quality degradation.

- **Why specifically did EPA revoke its approval of the 2002 TMDL?**
  For TMDLs that require pollution reductions from nonpoint sources to meet water quality standards, EPA must have "reasonable assurances" from the State that the necessary nonpoint source phosphorus reductions will actually occur. Insufficient reasonable assurance was the primary reason given by EPA for reversing its approval of the 2002 TMDL.

- **Will there be one TMDL for the Basin, or multiple TMDLs, one for each tributary?**
  Total loading capacities will be established for each major lake watershed. These watershed-level total loading capacities will be subdivided into a "wasteload allocation" for point sources of pollution and a "load allocation" for nonpoint sources of pollution.

- **What are the main problems affecting the health of Lake Champlain?**
  Phosphorus pollution is a significant threat to clean water in Lake Champlain, which is important for recreational and drinking water uses, as well as aquatic life and aquatic habitat function. Phosphorus is a nutrient that stimulates excessive growth of algae in the Lake, turning the water green and making it unsuitable at times for swimming, and increasing the costs for drinking water treatment.

- **Where is the phosphorus pollution coming from?**
  Excessive levels of phosphorus are entering the Lake from many sources including stormwater runoff from roads, parking lots, and lawns, agricultural and logging operations, unstable and incised streams, and discharges from sewage treatment plants.

- **Why is the phosphorus trend line going up over the past 20 years? How do we get the trend line to go down?**
  There are several reasons why phosphorus levels in the Lake have been increasing in spite of our efforts to reduce phosphorus loading to the Lake. There is a tremendous amount of phosphorus stored in soils, unstable streambanks, and lake sediments that has built up over a period of many decades. Even with better management, it takes time for these soils and sediments to purge themselves of excess phosphorus and for river channels to stabilize. The wetter weather and more intense floods we have experienced in recent decades have increased the rates of phosphorus loading to the Lake, offsetting some of the progress that has been made in watershed management. However, the major reason for the increasing phosphorus trend line is that we have not taken strong enough actions to reduce phosphorus from all the major sources. We need to do more.

- **What do we need to do to clean- up the Lake?**
  We need to address all major sources of phosphorus to Lake Champlain and its tributaries and involve new and increased efforts from nearly every sector of society, including homeowners, developers, farmers, municipalities, and state government. All of us contribute to phosphorus problems, and we must commit to act together. Fundamentally, we must work together as a Vermont community to view nonpoint sources of phosphorus as a shared problem with a shared solution. Vermont must aggressively address or avoid every situation that results in water quality degradation.

- **What funding will be provided to support the clean-up, and where will those funds come from?**
  Our first step is to develop a set of policy commitments to reduce phosphorus loading and an estimation of the costs of implementation. We also need to promote a process for establishing funding priorities – a process that strategically directs resources towards projects that will yield the greatest long-term benefit. We will then explore ways to fund implementation, recognizing that progress in reducing phosphorus loading will require a long-term commitment of adequate resources. A greater state investment will also enable the State to leverage greater benefit from federal, local, and private funds.

- **What kind of benefits will the restoration of Lake Champlain provide?**
  Investments in a clean Lake Champlain and its tributaries will support local and regional economies, enhance tourism and recreation-based businesses, support property values, help our communities reduce future flood damage risk, support the viability of our public infrastructure, and improve the ecological functions within the watershed.

- **Are you looking at the cost-effectiveness of actions, including the cost of upgrading wastewater treatment facilities, when evaluating alternatives?**
  Yes, EPA is developing "costs per kilogram of phosphorus removed" for a variety of practices, including upgrades to wastewater treatment facilities. For the wastewater treatment plants, EPA intends to consider both generalized estimates developed by EPA's consultant, Tetra Tech and some site specific cost estimates being developed by VTDEC that take into account higher costs at some plants due to specific plant characteristics.

- **Is Lake Champlain recoverable**?
  Yes, but it will require a collaborative and deliberate effort involving everyone – towns, homeowners, farmers, citizens, and loggers. It will also take time.

- **How long will it take to restore Lake Champlain?**
  We need to accept that the restoration of Lake Champlain could take decades in some areas. Accomplishing all the necessary phosphorus reduction steps in the watershed will require a phased implementation process with achievable programmatic and budgetary milestones along the way. The watershed soils, river channels, and lake sediments will take

considerable time to stabilize and purge themselves of stored phosphorus. The sooner we accelerate this work, the sooner the Lake will recover.

- **What are the consequences of inaction?**
  Vermont's restoration plan will likely adopt an "adaptive management" approach to the restoration of the Lake. This plan will include the development of two-year milestones to help the State monitor its progress and assure that it does not fall short in meeting expectations. If nonpoint source reduction goals are not met, EPA has the authority to drive wastewater treatment facilities to install the best available technology available for phosphorus removal, a move that will provide minimal reduction in phosphorus inputs to the Lake at an excessive cost.

- **What are the State of New York and the Canadian Province of Quebec doing about cleaning up Lake Champlain?**
  The New York portion of the 2002 Lake Champlain TMDL remains in effect. The New York State Department of Environmental Conservation is in the process of revising its implementation plan for the TMDL. The Province of Quebec committed in a 2002 Water Quality Agreement with Vermont to achieving 40% of the phosphorus reduction needed in the Missisquoi Bay watershed. Vermont committed to achieving the other 60% of the necessary reduction.

- **How large is Lake Champlain basin? How many people live in the Basin?**
  Lake Champlain basin is 8,234 square miles, spanning two states (Vermont and New York), and two countries (the United States and Canada's province of Quebec). Fifty-six percent of the land mass in the Basin is in Vermont, 37% is in New York, and 7% is in Quebec. The Lake is 120 miles long, flowing northerly from Whitehall, NY to Quebec's Richelieu River, which drains into the St. Lawrence River. Approximately 388,000 people live in the Vermont portion of the Basin, representing about 68 percent of the overall population in the Basin. The Lake is the drinking water source for nearly 200,000 people.

- **Do ski areas put fertilizer on snow in race courses? If it does occur, are there any studies into the impacts of this practice?**
  The so-called, "salting" of racecourses is not known to be a common practice in Vermont. A comprehensive study was conducted recently by the University of Vermont that examined the possibility that additives in snowmaking may result in water quality impacts to receiving waters. For those skis areas in the Lake Champlain basin, they found no evidence that snowmaking additives or race course management resulted in phosphorus impacts. However, this is an area that deserves additional inquiry with resort operators.

- **Will the plan include treatment of the internal phosphorus loads that have accumulated in the lake sediments?**
  Research on St. Albans Bay has shown that internal phosphorus loading from the Bay's sediments is likely to delay the recovery of the bay for a long time, even after all necessary watershed load reductions are achieved. Vermont's TMDL implementation plan will likely include additional feasibility studies for an in-lake treatment to control internal phosphorus loading in St. Albans Bay, with such a treatment being the final step after all watershed controls are fully implemented.

- **How can the public participate in the Lake Champlain restoration process?**
  There will be many opportunities for the public and interested parties to stay involved in the process to restore Lake Champlain. The State is committed to an open and transparent process to engage the public in the restoration of all of Vermont's waters. The Vermont Department of Environmental Conservation (VTDEC) and the Agency of Agriculture, Food and Markets (AAFM), in conjunction with EPA, held six public meetings and took public comments on the draft State Proposal for a Clean Lake Champlain, over 500 people attended those meetings. The VTDEC, in partnership with the Vermont Transportation Agency (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 and is using those comments to inform the development of the TMDL's Phase 1 Implementation Plan, required by EPA in the spring of 2014. Upon the release of the draft TMDL later this spring, EPA will hold a formal public comment period. After the TMDL is completed and approved by EPA, the State will establish a public process pertaining to the implementation steps that will be described in the TMDL's Phase 1 Implementation Plan. Moreover, the State expects to use the Tactical Basin Planning process to oversee the implementation of the TMDL.

- **What technical assistance, sample policies or projects, and education programs will be available to help town leaders, who are not professionals in water quality?**
  We acknowledge that all sectors – municipalities, farmers, loggers, developers, businesses, and homeowners – need technical, educational, and financial assistance to reduce nutrient and sediment pollution loading. We also recognize that our successes depend on an informed and engaged citizenry. The State anticipates using existing resources and programs to support this need. Statewide, regional, and local organizations play an important role in delivering technical and educational assistance. These existing programs will become the foundation for an expansion of existing grant and loan programs, should additional resources become available.

Stormwater Management

- **Can work to reduce combined sewer overflow (CSO) problems count towards stormwater pollution reductions?**
  It will depend on how the CSO problem is being addressed. EPA anticipates establishing specific CSO wasteload allocations. Thus, CSO improvements will count, at a minimum, towards achieving any specific CSO reduction targets in the TMDL.

- **Does the plan call for improving compliance with stormwater permits?**
  The Department anticipates both expanding the scope of stormwater programs as well as increasing the effectiveness of existing permit programs. Continued implementation of the Compliance Monitoring Strategy, as approved by EPA, has resulted in robust inspection rates and increased compliance actions. These efforts are expected to continue.

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River Management

- **Should there be more focus on streambank erosion?**
  The State should develop the capacity, both in terms of technical assistance and funding, to address erosion from unstable streams, where doing so is consistent with the State's river corridor and tactical basin plans. Stabilization methods need to be consistent with the state equilibrium and connectivity standards for stream alterations. This consistency will ensure that stopping bed and bank erosion in one location does not lead to or cause erosion in another location.

- **What are some examples of the kinds of developments exempt from municipal regulations that can be addressed with new state floodplain rules?**
  Power facilities regulated under Section 248, telecommunications facilities regulated under Section 248a, accepted agricultural practices, and state facilities and infrastructure (including state roads) are the types of development exempt from municipal regulation that will be subject to the State Floodplain Rule.

- **How will actions to improve resilience to future flooding help?**
  Increasing the storage of floodwaters in meandering river channels and land features that may function as floodplains lower both flood levels and velocities. These actions make downstream residents safer, reduces property damage, and increases the storage of fine sediments and phosphorus.

- **Are there phosphorus standards for streams?**
  The Vermont Water Quality Standards currently include numeric criteria for total phosphorus in Lake Champlain, Lake Memphremagog, and in high-elevation streams. VTDEC has been working for several years to develop more comprehensive nutrient criteria for inland lakes and three types of streams (small high gradient; medium high-gradient; warmwater medium gradient). VTDEC expects to initiate rulemaking to amend the Water Quality Standards during spring of 2014 that will include in-stream total phosphorus criteria.

Lakes Management

- **There are lakes in the basin that might benefit from pollution management. Are these waters included in the TMDL?**
  Lakes located in the Champlain basin are not directly included in the TMDL, however they can benefit from additional program resources available through the TMDL implementation process. Lake Carmi, in the Town of Franklin, also has a phosphorus TMDL that calls for specific work in that lake's watershed. Work in this watershed will be aided by increased funding and technical assistance that the Champlain TMDL is identifying. Other lake residents concerned about phosphorus runoff to their lake can access technical and funding assistance by contacting either the Lakes and Ponds Section or the regional basin planner of the Watershed Management Division. The State intends to continue assisting lake residents to both address existing water quality problems as well as prevent problems from emerging, both in the Champlain basin as well as in the rest of the State.

- **Why is the State supporting a shoreland regulation when this is not included in the State's draft proposal to clean up Lake Champlain?**
  There is no information to quantify the phosphorus load from erosion and runoff derived specifically from the Lake Champlain shoreline. However, developed sites along the lakeshore are likely to be greater than average phosphorus contributors per acre because of their direct proximity to the Lake. Shoreland protection, as proposed in H.526, would help address these shoreline critical source areas within the broader developed landscape in the basin, and if enacted would become part of Vermont's overall commitment to EPA to implement the Lake Champlain Phosphorus TMDL. The shoreland source of phosphorus runoff is likely to be a larger percent of a lake's phosphorus budget on Vermont's smaller, more rural lakes. In addition, the protection of shoreland vegetation seeks to achieve the objective of protecting important wildlife habitat and fish and aquatic habitat.

Wastewater Treatment

- **What is the State doing about sources from septic systems?**
  Decentralized wastewater treatment systems (including septic systems and small, shared systems that discharge to a leach field) are typically small scale, gravity based wastewater treatment systems with little or no management oversight after the system is permitted and installed. Failed or failing septic systems are more of a public health concern from pathogens than a major source of phosphorus loading to Vermont lakes. Failing lakeshore septic systems could, however, contribute to localized health hazards from pathogens, and all such systems should be properly constructed and maintained. The property owner has the responsibility to maintain the system including bearing the costs for upgrades and replacement. There are few funding sources available for property owners if a system needs to be replaced. The Vermont Wastewater and Potable Water Revolving Loan Fund was recently established to provide low interest loans to moderate and low income households for the purpose of repairing or replacing a home's failed septic system or water supply. The NeighborWorks® HomeOwnership Centers of Vermont offers a low-interest revolving loan program to single-family homeowners below an income threshold.

- **This year, there were a number of instances of accidental discharges of partially and untreated effluent from wastewater treatment facilities. Will the TMDL work to reduce these discharges?**
  The TMDL does not directly address accidental discharges, as they are transitory unplanned events. However, the actions established in the TMDL to address stormwater runoff have the potential to result in a significant reduction in the volume of stormwater entering sewage collection systems, the primary cause of most releases seen in the last few years, and should eventually lead to a substantial reduction in the number of these events. The remaining portion of the releases are generally caused by equipment failures and even more rarely by operator error.

Management of Agriculture Runoff

- **How are the Accepted Agricultural Practices (AAPs) enforced?**
  The Agency of Agriculture, Food and Markets (AAFM) inspects all complaints. However, there are limited resources to perform systematic whole farm inspections. AAFM recently hired a small farm inspector, who is conducting inspections in the agriculturally impaired watersheds in Northern Lake Champlain.

- **Will stream-side or lake-side buffers at farms be increased to 25 feet?**
  One of the proposals in the restoration plan is that all perennial streams have a 25 foot buffer. Science shows that there are substantial water quality benefits with larger buffer sizes. If this becomes a new regulation, there will be timelines for implementation.

- **What is the timeframe for implementing a small farm certification program?**
  AAFM is proposing a certification program for small farms and increasing inspections of small farms. Ideally, AAFM will incorporate the small farm certification concept into the AAP rulemaking process planned for next year. Implementation will depend on resource availability and will be phased in over time.

- **If you own land, but lease it to a farmer, who is responsible for making corrective changes, such as livestock exclusion, erosion control, and establishing buffers?**
  Either can make any changes. Ultimately, the landowner is responsible for the land and compliance with all regulations. If a farmer who is leasing requests financial assistance, he or she would need to demonstrate that there is a long-term lease on the land.

- **What can a resident do if a neighboring farm does not employ practices to reduce runoff?**
  Any time an individual believes that there is a violation of the AAPs or any type of water quality violation, that person should contact the AAFM, who will send out an inspector to evaluate the situation. If there is a discharge, there may be a violation of the Vermont Water Quality Standards and will be addressed with the appropriate enforcement procedures of either AAFM or ANR. If the farmer is not choosing to do some voluntary practices, there are non-regulatory organizations, such as the UVM Extension System or the natural resources conservation districts, which can visit the farm and provide assistance and resources to install additional runoff prevention practices.

- **Is the Army Corps helping Vermont farmers convert wetlands to agricultural uses? If so, it appears counter-productive to restoration efforts.**
  No one is helping farmers convert wetlands. Any wetland conversion must be approved by ANR. Conversions which compromise the effectiveness of wetlands to prevent excess nutrients from entering waterways are not approved. ANR strongly encourages wetland restoration through grants and by identifying priority restoration sites.

- **The agencies cannot regulate the laws they have now. Why make more regulation that could put small farmers out of business?**
  Our primary goal is to implement the current rules that exist (i.e., the AAPs, Medium Farm Operations (MFO), Large Farm Operations (LFO), and Concentrated Animal Feeding Operation (CAFO) permit rules). The State intends to add new rules and requirements, where they will make a measureable water quality difference, and where the State can provide educational, technical, and financial assistance to help meet the rules. Of the proposed rules, many are simply enhancements of the regulations that AAFM is already enforcing, and therefore, do not require a substantial increase in resources.

- **Does it make sense to make all farms that have to meet the Accepted Agricultural Practices (AAPs) do a self-certification program, including someone with 3 chickens in their backyard?**
  The State continues its policy of making the most serious water quality problems a high priority for treatment. All farms are required to meet AAPs. There are times when very small operations can cause significant water quality impacts, and they are still required to meet Accepted Agricultural Practices. The small farm certification is a way to find and correct the smaller operations that may be causing water quality problems. It will also help raise awareness about the AAPs with the non-traditional agricultural community.

- **Many landowners do not know about the AAPs, and their responsibility to comply with them. How can you locate those that own a few animals?**
  Education is critical for farmers and landowners to understand how their actions can make a difference and reduce water quality impacts. We will need to rely on local, regional, and statewide partners, such as UVM Extension, Conservation Districts, watershed groups, agriculture service providers, and municipalities, for assistance, and we will need to find ways to support their involvement.

- **Agricultural runoff seems to be a major source. Why are you not regulating more farmers?**
  The state's farm inspection effort is based on current resources. Between AAFM and ANR, the State visits hundreds of farms every year, and responds to all direct complaints and concerns. We cannot see every violation that occurs, and appreciate the information we receive from the public and neighbors to help us identify potential problems areas.

- **Most of the problems are from manure on fields. Why don't you regulate manure application?**
  We do. Dairy farms with more than 200 cows must have a certified nutrient management plan that details how much manure can go on individual fields. All other farms are required to apply manure and other nutrients based on soil tests and crop needs. We acknowledge that these requirements, which involve more farmer education opportunities and more field checks of records, are resource-intensive.

- **Manure in the road is getting into road ditches and into streams. What is being done about this?**
  If manure has simply spilled on the road, this problem is usually left to the local law enforcement due to safety concerns. However, manure running off into ditches and streams is a violation of the AAPs and permits. Those cases should be referred to the AAFM or ANR for inspection.

- **Why are farmers allowed to plant corn along the edges of rivers and streams where the runoff would be a big problem?**
  Pursuant to the AAPs and farm water quality permits, farms are required to install a minimum buffer between crop lands and surface waters, and AAFM enforces those buffer requirements. The AAPs require a minimum buffer width of at least 10 feet. The State's proposal is to increase the AAP minimum buffer width and to require buffers on ditches.

- **If you want to inspect small farms, why did the Agency of Agriculture, Food and Markets (AAFM) only hire one employee?**
  AAFM was authorized to hire one new position to inspect small farms.

- **AAFM proposes working on small farm compliance in agriculturally impaired watersheds. What happens if someone reports soil or manure washing onto a public road or into a waterway outside of an agriculturally impaired watershed? Can the State conduct enforcement as a follow up to a compliant?**
  The AAPs will remain in place as the statewide set of agricultural water quality regulations, and AAFM will continue to follow up on all complaints. If an inspector sees a violation of any regulation, whether it is the result of a complaint or any other notification, that inspector has the authority to pursue enforcement