



## Non-Erosion Nutrient and Organics Loading

### What is Non-Erosion Nutrient and Organics Loading?

Three stressors discussed in this Strategy comprise the vast majority of the nutrient load delivered to Vermont's surface waters: channel erosion; land erosion; and, the subject of this stressor evaluation, non-erosion nutrient and organics loading. Non-erosion based nutrient and organics loading results from direct application of nutrients to lands (e.g., fertilizer application on farm fields or gardens) that may be subsequently washed into surface waters without any attendant land erosion, leaching of nutrients embedded in soil or organic matter or from direct or indirect discharges (e.g., wastewater treatment facilities). Phosphorus and nitrogen are the two major nutrients of concern for Vermont's surface waters.

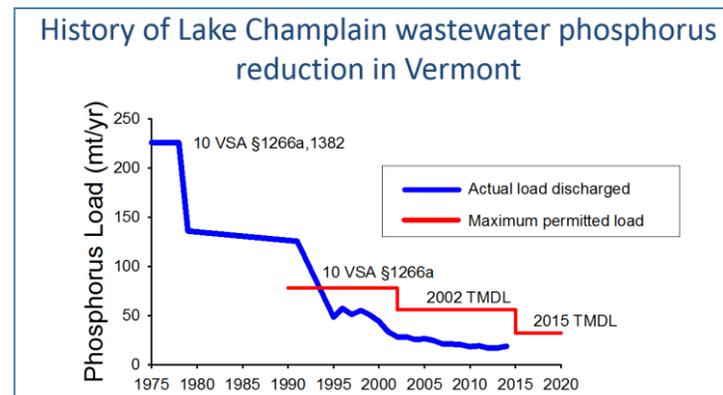
Eutrophication is a natural process of nutrient accumulation in surface waters over long time periods (hundreds to thousands of years). When human activities enhance phosphorus and nitrogen loading to surface waters, accelerated "cultural" eutrophication typically results. Signs of accelerated cultural eutrophication may include an increased incidence of algae, plants or cyanobacteria (formerly called blue-green algae) blooms and reduced water clarity, which can affect the biological communities in lakes, wetlands and rivers, and also significantly impact recreational uses. In most of Vermont's surface waters, as in most fresh water systems, phosphorus is considered the limiting nutrient; nitrogen tends to be the limiting nutrient in salt water or brackish systems.

Nutrients that are directly delivered to surface waters from non-erosional sources are typically in a chemical form that is more biologically available and therefore readily assimilated by algae and cyanobacteria. These nutrients are not bound to sediment particles at the time of discharge or application. Phosphates and ammonium, respectively, are examples of bioavailable phosphorus and nitrogen. Non-erosional nutrient loading tends to have more immediate and localized impacts when excess quantities of nutrients are discharged. For these reasons, direct discharges of phosphorus are regulated to low levels in most wastewater treatment plant and permitted indirect discharges. Limits are also imposed on nitrogen from permitted discharges to comply with current water quality criteria for nitrogen.

### How important is Non-Erosion Nutrient and Organics Loading?

Since the passage of the federal Clean Water Act, considerable efforts have been made to control nutrient discharges from wastewater treatment facilities, and to impose regulations upon septic discharges. Villages that once discharged collected untreated septage directly to streams now treat this waste in well-functioning wastewater treatment facilities, the majority of which are subject to advanced phosphorus removal systems. Through the use of the Surface Water Revolving Fund and Vermont's implementation of National Pollution Discharge Elimination System and Indirect Discharge permits, the loads of nutrients to streams and lakes from direct discharges has been vastly reduced. Since passage of the Clean Water Act, \$750M has been spent to construct, upgrade, and improve wastewater treatment infrastructure in Vermont, including \$8M during the 2015-2016 funding cycle.

Vermont is presently involved in two major multi-State nutrient control planning efforts; the Lake Champlain Phosphorus TMDL and the Long Island Sound Nitrogen TMDL. Through implementation of the Lake Champlain TMDL, as well as through prior legislative efforts, current point source discharges of phosphorus from treated wastewater comprised only 3% of the phosphorus load to Lake Champlain, while in Lake Memphremagog, the total phosphorus load to the lake from Vermont wastewater treatment facilities has been estimated at 1.2%. A phosphorus load allocation study for Lake Carmi identified just over 1% of the total phosphorus load from septic and indirect discharge sources.





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In rivers, nutrients resulting from municipal wastewater and associated combined sewer overflows affect under 2% of assessed river miles. Further, phosphorus loads to Lake Champlain are far below allowable levels based on the Lake Champlain total maximum daily load (see figure adjacent). Owing to the major success of point source controls in Vermont, non-erosion phosphorus is viewed as a lower-ranked stressor to Vermont waters. However, no empirical studies are available to assess the extensiveness of other non-erosion nutrient sources such as application of fertilizers or agricultural leachate in Vermont. There are only a few streams reaches, and no lakes, where impairments exist as a result of nitrogen loading.

### **What objectives are achieved by managing Non-Erosion Nutrient and Organics Loading?**

Successful control of excessive nutrient loss meets Objectives A, B, D of this Strategy.

**Objective A.**                    *Minimize Anthropogenic Nutrient and Organic Pollution*

Nutrient loads from any anthropogenic source can enhance the rate of eutrophication in surface waters.

**Objective B.**                    *Protect and Restore Aquatic, and Riparian Habitat*

In some circumstances, nutrient loads and the associated decomposing organic debris can accumulate over the long-term in the deep waters of lakes. One result of this is the depletion of oxygen, and the development of so-called “hypoxic” deep water areas that are unsuitable as fish and invertebrate habitat.

**Objective D.**                    *Minimize Toxic and Pathogenic Pollution, and Chemicals of Emerging Concern*

Excessive levels of phosphorus and imbalances in the ratio of nitrogen to phosphorus are known to promote blooms of cyanobacteria. These organisms can produce toxins that have significant health effects on humans and other animal species (see Chapter 2, Stressor Document on Toxic Substances for more information).



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### **What are the causes and sources of Non-Erosion Nutrient and Organic Loading?**

There are five principal causes of non-erosional nutrient and organic loading to Vermont's surface waters. They are:

#### **Domestic and industrial wastewater**

Direct discharges from industrial facilities and municipal wastewater treatment facilities are operated under NPDES and State permits which are crafted to limit the release of pollutants, including nutrients and organics. The limits are derived from existing TMDLs, the ability of the receiving waterbody to assimilate pollutants, available technology as well as some cost benefit calculations. In addition, releases of excess nutrients and organics can occur in these facilities due to seasonal factors or process upsets, combined sewer overflows during wet weather, and underperformance of infrastructure.



In addition, nutrients can be released due to poor maintenance of septic systems and underperforming indirect discharges.



#### **Poorly-managed animal wastes and silage leachate**

Inadequate farm production area management (including undersized manure storage or barnyard and feed storage area concerns) may in some circumstances result in direct runoff of manure or leachate to surface waters. Ongoing operation and maintenance of infrastructure to address these nutrient sources is critical to the practice success. Some infrastructure, such as silage leachate systems require ongoing maintenance to ensure

containment of the runoff.

#### **Over-application of fertilizer on residential lawns and croplands, and improper spreading practices**

Overfertilization can lead to excess levels of soil phosphorus and elevated levels of nitrogen in surface and groundwater. The potential for overfertilization of Vermont lawns is high as local studies indicate that the soils already contain sufficient phosphorus for turf growth. Supporting studies include the [Northeast Voluntary Turf Fertilizer Initiative](#), a [St. Albans City](#) study by Erica Gaddis, PhD, and a Lake Champlain Committee review of 2000-2002 UVM extension soil test of residential lawns throughout the state (pers. comm. Mike Winslow). Over fertilization does not promote better turf growth, but rather results in excess phosphorus runoff into surface water drainages, and ultimately into streams and lakes.



As of 2012, Vermont prohibits the application of phosphorus fertilizers to turf except in certain circumstances. Fertilizer with phosphorus may be applied to new lawns or if a soil test indicates a phosphorus deficiency.

Over-application of nutrients on agricultural croplands can also be a potential source of phosphorus and nitrogen to surface waters. Stormwater can carry leached nutrients to subsurface perforated pipes that are installed to drain fields. The discharge from the tile drains is often directed towards streams or other waterbodies. While the practice can reduce overland flow and therefore the erosion of soil, it can also lead to increased discharge of soluble phosphorus and nitrogen.



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All farms in Vermont must conduct soil tests for phosphorus and adjust application rates accordingly as required by the state Required Agricultural Practice regulations. In addition, large, medium, and certified small farms are required to have a detailed nutrient management plans that is developed by a certified planner.

### **Legacy phosphorus loading from sediments**

Internal phosphorus loading in lakes results from historic accumulation in deep lake sediments. Under the right environmental conditions, they may be released from the sediments to the overlying waters, resulting in algae and cyanobacteria blooms. This phenomenon is one factor contributing to the excessive phosphorus levels found in St. Albans and Missisquoi Bay of Lake Champlain. In Lake Morey (Fairlee, Vt.), an internal phosphorus loading problem was successfully controlled in the late 1980's, resulting in restoration of that lake that has been sustained to the present day. A second lake, Ticklenaked Pond in Ryegate, was treated in 2014. These two small lakes were selected for application of chemical treatments due to the likelihood of success and relatively low cost of treatment. However, the costs associated with similar treatments large embayments, coupled with uncertainty about the likelihood of treatment success, reduces the attractiveness of implementing this type of solution for St. Albans and Missisquoi Bay.

### **Leaching of nutrients from organic material (e.g., leaves and yard/garden waste) from urbanized areas and soil**

Phosphorus is part of the matrix of molecules that make up organic material and is released to waterways through the decomposition process. In a natural system, the nutrients would be adsorbed to soil particles or taken up by plants; but where leaves collect at the edge of roads, stormwater can carry the leached nutrients to storm drains. Research from the Midwestern United States indicates that as much as 25% of the phosphorus in stormwater runoff is attributable to leaf debris and other yard wastes ([Lehman et al, 2009](#)). Where stormwater saturates soils, phosphorus can also be leached out as the stormwater percolates downslope through soils and eventually carried to storm drains.

### **Organic Pollution and Biochemical Oxygen Demand (BOD)**

The presence of discharged organic materials, coupled with the organic matter from algae that proliferate as a result of nutrient discharges, contribute to accelerated bacterial growth in surface waters. These bacteria effectively decompose organic materials while consuming dissolved oxygen (DO), thus reducing the available DO for fish and other aquatic organisms. Biochemical Oxygen Demand (BOD) is a measure of the oxygen needed by microorganisms to decompose discharged organic matter and nutrients. The more organic waste present, the more bacteria are needed to decompose this waste. BOD is regulated in all Vermont direct waste discharges.



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### **About the Long Island Sound Nitrogen TMDL**

Low dissolved oxygen (DO), or hypoxia, has been identified as a major concern in Long Island Sound and is caused by excess nitrogen loading. To address the excess nitrogen, and resulting DO problems, US EPA – Region 1 developed a Total Maximum Daily Load for nitrogen.

With respect to the Vermont's nitrogen contribution, modeling studies indicate:

- The estimated nitrogen contribution from Vermont is 7%. When inputs of nitrogen from direct precipitation on the Sound are accounted for, Vermont's contribution falls to about 4% of total loading to LIS.
- The estimated Vermont contribution from wastewater treatment facilities is 1% of the total point source load to the LIS.
- The estimated Vermont contribution from nonpoint sources is 18% of the total nonpoint source load to the LIS, but over half of this is due to nitrogen in precipitation which may or may not originate in Vermont.

Various nitrogen reduction scenarios have been analyzed to estimate the improvement in DO response in the Sound, and results indicate that if the entire load from Vermont was eliminated (all point and nonpoint), the average DO improvement would be 1%. Despite Vermont's small contribution to water quality problems in LIS, the Department of Environmental Conservation continues to work collaboratively with LIS states and US EPA to ensure Vermont's participation in the LIS TMDL.

During 2013, the Department worked with EPA to develop a plan to allocate an interim total wasteload of 1,727 lbs nitrogen per day across all municipal wastewater treatment facilities in Vermont's portion of the Connecticut River Basin. Reductions will be achieved through a mix of low-cost retrofits and operational adjustments, and in some instances, upgrades with wastewater treatment facilities.

### ***Monitoring and assessment activities to assess effects of Non-Erosion Nutrient and Organics Loading***

Monitoring and assessment of non-erosion nutrients and organics is coordinated by VTDEC and partner organizations under the following:

#### ***Department of Environmental Conservation***

WSMD's Ambient Biomonitoring Network Program: The "ABN" monitors approximately 125 sites per year for water quality measurements and biological condition. The ABN ensures that nutrients are monitored in waters up and downstream of wastewater treatment facilities, for all facilities within the current-year monitoring rotation.

In concert with ABN, a study was conducted in 2012 within the Connecticut River Basin to develop facility-specific loading information for nitrogen. This supported development of a Vermont-specific nitrogen wasteload allocation for the Long Island Sound TMDL.

The Wastewater Management Program processes discharge monitoring reports submitted by permittees subject to NPDES and State discharge permits for wastewater facilities. As permits are re-issued, additional monitoring requirements are commonly inserted to assess the degree to which discharges will influence receiving water nutrient, dissolved oxygen, and other pollutant concentrations, and related biological integrity.



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Lake Champlain Long-term Monitoring Program: This program tracks long-term trends in nutrients in Lake Champlain tributaries and also summarizes annual wastewater treatment facility phosphorus loads for facilities in the Lake Champlain Basin based upon the discharge monitoring reporting.

LaRosa Environmental Partnership Program: The LaRosa Program enables Vermonters to test water quality conditions in waters of mutual interest to VTDEC and watershed organizations.

Stormwater Multi-sector General Permit Monitoring Requirements: This permit program carries monitoring requirements that are carried out by regulated permittees that include hydrologic and chemical measurements.

Stormwater Mapping and Illicit Discharge Detection and Elimination (IDDE) Project: This VTDEC program maps stormwater infrastructure to identify potential cross connections to municipal sewer systems, and identify deficiencies for repair.

Lake Champlain Basin Program: The Lake Champlain Basin Program supports phosphorus and nitrogen cycling studies through its technical program, and funds the Long-term Monitoring Program. Numerous studies have been conducted relating to nutrient concentrations and effects in the Lake Champlain Basin.

### *Key Monitoring and Assessment Strategies to Address Non-Erosion Nutrients*

The monitoring programs listed above should be continued. In addition, the following strategies have been identified.

#### **Wastewater Discharges**

As practical, the Department should provide annual estimates of nutrient loads from wastewater treatment facilities.

LaRosa Partnership participants should be encouraged to partner with municipalities to obtain relevant monitoring information at reduced expense to municipalities.

#### **Agricultural and Developed Land Nutrient Sources**

Current river-mouth monitoring may not fully capture non-erosional nutrients from agricultural and developed areas. Watershed-based monitoring designs that test both nitrogen and phosphorus at a range of flow conditions should be targeted in a rotational basis as part of the Tactical Planning Process, leveraging LaRosa Partnership resources as available. Resulting data can be used to support targeting of best management practices as necessary, and to support effectiveness monitoring.

The Monitoring, Assessment and Planning Program may assist AAFM where practical in conducting water quality monitoring as determined to be necessary as a result of farms inventories conducted under the Required Agricultural Practices rule.

The precise geographic locations of pipes discharging to surface waters from all sources should be integrated from the IDDE and geomorphic assessment programs.

Tile draining, the installation of subsurface drainage pipes, is an agricultural practice that can reduce land erosion and its related potential phosphorus contribution by increasing infiltration rates of soils to reduce surface flows. The practice is popular because it increases field productivity and decreases gully erosion in fields; however, the practice may enhance non-erosional nutrient loading to surface waters through the



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mobilization of soil nutrients to the tiles and increased channel erosion. The Lake Champlain Basin Program has funded a literature review in 2016 that provides a better understanding of both the advantages and disadvantages of the practice when used throughout the Lake Champlain Basin. The VAAFMM will be providing a full report on tile drainage and water quality impacts to the Legislature in 2017.

### **Technical assistance programs to address Non-Erosion Nutrient and Organics Loading**

Technical assistance to address non-erosion nutrients is coordinated by VTDEC and partner organizations under the following:

#### ***Department of Environmental Conservation***

Watershed Management Division

- Stormwater Mapping and Illicit Discharge Detection and Elimination Project
- Concentrated Animal Feeding Operation Permit Program – staff support
- Wastewater Management Program – Operations and Management Section

Facilities Engineering Division

- Design, Construction, and Financial Management Sections

Drinking Water and Groundwater Protection Division

Innovative and Alternative Systems

#### ***Agency of Agriculture, Food and Markets***

*(although these are permit programs, staff support provide significant technical assistance):*

- Required Agricultural Practice regulations
- Medium Farm Operations Permit Program
- Large Farm Operations Permit Program

#### ***Agency of Agriculture, Food and Markets/USDA Natural Resources Conservation Service – Vermont Association of Conservation Districts***

- Conservation District Technical Assistance Program
- Required Agricultural Practices Assistance
- Farm\*A\*Syst
- Land Treatment Planners

#### ***New England Interstate Water Pollution Control Commission***

- Wastewater Treatment Facility Nitrogen Removal Optimization Study – 2013

#### ***Vermont Rural Water Association***

- Training programs for wastewater and source water protection

### ***Key Technical Assistance Strategies to Address Non-Erosion Nutrients and Organics***

The technical assistance programs listed above do a good job at supporting control of non-erosion nutrients and organics, but are not extensive enough to cover the number of farms in Vermont. As appropriate, WSMD staff should continue to cooperate with AAFM and VACD/NRCD programs to target education and technical assistance to areas where monitoring and assessment data suggest it is most highly needed (Critical Source Areas).

One full-time Technical Assistance position in the Wastewater Management Program – Operations and Management Section needs to be restored. This position provided invaluable assistance to wastewater treatment facilities on improving process control to maintain compliance with permit limits for nutrients and organics. This position was eliminated in 2009 and the program does not have the staff resources to



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provide technical assistance. With the implementation of the new Long Island Sound TMDL for nitrogen, 34 municipal wastewater treatment facilities are required to optimize their processes to achieve nitrogen removal. When the revised Lake Champlain TMDL for phosphorus is implemented, many wastewater treatment facilities may need to increase phosphorus removal. A full-time Technical Assistance person will provide critical support to these facilities in meeting the new regulatory requirements.

Additional technical assistance has been available to farms in the Lake Champlain Basin since 2011 due to short-term federal funds. These included four agronomists (through UVM Extension and the Poultney Mettowee Conservation District), engineering, grazing, and mapping specialists. These 12 positions have provided assistance in farm structural design, and field practice education and change, mostly focused on smaller farms that are not subject to the medium or large farm permit programs. Technical assistance and nutrient management implementation have been provided to hundreds of farms in the Basin and involved many thousands of acres of land. These positions are all scheduled to expire by the end of 2014. Funding for the continuation of the short-term agronomists and other technical service providers is critical to the ongoing agricultural management improvements in the Lake Champlain Basin and additional resources are needed outside the Basin for water quality improvement in other watersheds.

Stormwater mapping and IDDE efforts are coordinated as appropriate within the tactical planning process to further target municipalities where infrastructure mapping has not yet been carried out. Staff from this program work in collaboration with municipalities to design remediation steps that address the deficiencies identified, as well as pursue strategic stormwater treatment retrofits identified through the mapping effort. An analysis between traditional and Green Infrastructure (GI) approaches is typically completed as part of this process. Targeted municipalities are identified in the implementation tables of all new and forthcoming [Tactical Basin Plans](#).

## **Regulatory programs to address Non-Erosion Nutrient and Organics Loading**

Regulation of non-erosion nutrients and organics is coordinated by VTDEC and partner organizations under the following:

### ***Department of Environmental Conservation***

Watershed Management Division:

- National Pollutant Discharge Elimination System (NPDES), Pretreatment, and State wastewater permits
- NPDES Concentrated Animal Feeding Operation (CAFO) permit program
- Stormwater permits including Multi-Sector General Permit Program
- Reasonable Potential Analyses for wastewater permits
- Wastewater treatment facility inspections, permitting, compliance, and Wastewater Operator Certification Program

Drinking Water and Groundwater Protection Division:

- Indirect Discharge Permits, including Sewage General Permit for Septic Systems
- State's Universal Jurisdiction over onsite wastewater systems, less than 6,500 gallons per day
- [Groundwater Protection Rule](#)

### ***Agency of Agriculture, Food and Markets***

- Large Farm Operations Rule
- Medium Farm Operations Rule
- Required Agricultural Practices Rule
- Act 37 - Vermont Turf Fertilizer Law



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### ***Key Regulatory Strategies to Address Non-Erosion Nutrients and Organics***

The VTDEC and AAFM regulatory programs listed above address the vast majority of directly and indirectly discharged non-erosion nutrients and organics from farms, however additional resources are needed to monitor and ensure compliance with these regulations. One new small farm operations inspector position has been added to VAAFAM, but there are about 850 small dairy farms, and unknown hundreds of small non-dairy livestock farms in VT. Additional staff resources are needed to ensure compliance with the AAPs by all small livestock farms.

Revisions to the AAPs are currently being considered that would require a small farm certification program and changes in livestock exclusion, buffers and soil erosion tolerance on farms. A template for a small farm Nutrient Management Plan is also being developed.

In the past year, the Watershed Management Division has developed a revised approach to ensuring that where possible, NPDES permit limits do not have a reasonable potential to cause or contribute to impairment, by implementing a “Reasonable Potential Analysis” procedure. (This does not apply to the Concentrated Animal Feeding Operations (CAFO) permit as outlined in Clean Water Act requirements.)

In addition, the issuance schedule for NPDES direct discharge permits now follows the rotating monitoring, assessment, and tactical planning schedule described in Chapter 4 of this Strategy and the Lake Champlain TMDL. This ensures that reasonable potential analyses benefit from up-to-date monitoring information.

## **Funding programs to address Non-Erosion Nutrient and Organics Loading**

### ***Department of Environmental Conservation:***

[Clean Water State Revolving Fund](#), and the [Intended Use Plans](#)

[Link to currently available funding](#) including

- Vermont Watershed Grant Program
- Ecosystem Restoration Grant Program
- EPA 319 Funding Program (pass through funds are currently not available)

### ***Agency of Agriculture, Food, and Markets:***

[Links to financial programs](#)

### ***Natural Resources Conservation Service:***

[Links](#) to:

Environmental Quality Incentive Program (EQIP)

Conservation easement (Farm and Ranchland Protection Program)

Wetland Protection programs (WRP)

Cooperative agreements for technical assistance positions

### ***Lake Champlain Basin Program***

[Links](#) to:

Pollution Prevention Grants

Education and Outreach Grants

Watershed Environmental Assistance Program



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### *Key Funding Strategies and Next Steps to Address Non-Erosion Nutrients and Organics*

The Clean Water State Revolving Fund (CWSRF) is a major funding source for wastewater infrastructure. It is designed with a priority system to ensure that the most important remaining point-sources are addressed earliest, and the technical assistance provided by the Wastewater Management Division programs listed identify facilities in need of upgrading. The priority system established within the SRF may earmark up to 20% of funding for Green Infrastructure/Low Impact Development funding. In order to maximize the nutrient reductions achievable through the SRF, funding algorithms may need to be modified in order to give more weight to stormwater management projects, which currently tend not to score well when compared to wastewater projects. Incentives could be provided in the form of lower interest charges on loans to promote increased use of SRF for stormwater infrastructure improvement.

Funding for improved farm production area design, manure storage and nutrient management are critical. Primary sources of funding are the federal NRCS' EQIP program and the state VAAFMs' Best Management Practice (BMP), Farm Agronomic Practice (FAP) and Capital Equipment Assistance (CEAP) programs. These programs offer cost-share assistance (generally 75-90%) to producers to support infrastructure construction as well as cost-share and technical assistance for changes in field based practices. Participation in these programs is voluntary, however all agricultural technical support staff work with farmers to direct them to these resources when water quality issues are found. To maximize the environmental gains through these programs, outreach and education is being focused on critical source areas ([Identification of Critical Source Areas of Phosphorus Within the Vermont Sector of the Missisquoi Bay Basin. Technical Report # 63B](#)) as determined by extensive mapping and assessment work. Additional LIDAR data that is being gathered currently will extend our ability to map these critical source areas throughout the Champlain Basin, with the hope of statewide mapping within the next two years. The Clean Water Roadmap presents the results of the Lake Champlain phosphorus model used to develop the phosphorus TMDL for all areas of the Lake Champlain Basin.

An Agricultural Workgroup (AWG) of farmers and technical service providers was created to help DEC and VAAFMs evaluate potential changes in regulatory programs as well as new incentive programs that will focus on additional improvements in agricultural water quality. Also, the agronomists and other field staff have been instrumental in educating about current and potential opportunities and providing valuable technical feedback to the agencies. DEC is using this input to address the needs of the upcoming TMDL as well as other future TMDLs and water quality needs statewide.

## **Information and education programs to address Non-Erosion Nutrient and Organics Loading**

### *Department of Environmental Conservation*

Watershed Management Division, Lakes and Ponds Section

### *Other*

UVM Lake Champlain Sea Grant Programs

Lake Champlain Basin Program's "Lawn to Lake" group and associated "Don't P on your Lawn" campaign

Chittenden County's Regional Stormwater Educational Program (RSEP) and associated Stream Team project.

Various short term programs through NGOs and watershed groups



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### *Key Education and Outreach Strategies to Address Non-Erosion Nutrients and Organics*

The Agency of Natural Resources leaves much of the education of non-erosion nutrient and organics issues and interventions in the hands of other entities. The Vermont Association of Conservation Districts, in partnership AAFM and NRCS carry out the majority of educational efforts for agricultural lands.

In urban settings, the 2012 law restricting use of lawn fertilizer does require all retailers to post information about the law. Otherwise, education to help residential home owners reduce stormwater volume as well as fertilizer application is limited geographically and varies in effectiveness. A small-scale effort is provided by a loose partnership of non-governmental entities and DEC with limited funding from the Lake Champlain Basin Program, and educational efforts by watershed groups and others are funded through various grants. The “Lawn to Lake” effort is a collaboration of WSMD, AAFM, and LCBP to provide education about the new fertilizer restrictions on lawns. Additional support of the effort through all agency publications is needed. The Lawn to Lake organization distributes “Don’t P on the Lawn” brochure as well as signs for retailers that highlight the fertilizer ban on lawns for customers. The current approach would benefit from adequate resource support for developing and implementing a social marketing campaign to encourage adoption of residential BMPs; a current expertise of the Lake Champlain Sea Grant. Campaigns that are effective and far reaching require more funds than are available through current grant programs.

Towns and other entities subject to MS4 stormwater permitting develop and distribute education about the source of stormwater and residential BMPs for protecting surface waters from stormwater. To meet permit criteria, they provide information on websites, displays, commercials, and factsheets. Most recently towns have encouraged residents to reduce P fertilizer use by offering free soil test kits.

In municipalities subject to mandatory stormwater pollution control efforts at the individual parcel level (e.g., where total maximum daily loads and residual designation authority has been imposed), considerable education and outreach effort is provided to residents on how to comply with the stormwater control requirements. Materials developed for that purpose should be made available to residents and officials in other municipalities, coincident with a coordinated outreach effort.

Wastewater Treatment Facilities provide vital nutrient removal from the water environment. Many host tours to help communities understand the integral role the community wastewater facility provides in public health and environmental protection. The community supports these actions through user fees and capital improvements.

WSMD staff may assist DEC’s Environmental Assistance Program in encouraging businesses to implement water quality protection BMPs or meet municipal compliance in MS4 communities.