Executive Summary

The Vermont Clean and Clear Action Plan was initiated in 2003 with the goal of accelerating the reduction of phosphorus pollution in Lake Champlain and reducing related pollutants in waters statewide. The state has appropriated more than $42 million for Clean and Clear over the first five years of this effort, and Vermont's commitment to Clean and Clear has leveraged an additional $42 million in federal funds for supporting programs. As a result, the Agencies of Natural Resources, Agriculture, and Transportation have been able to greatly expand their programs to implement the phosphorus loading reductions required by the Lake Champlain Phosphorus Total Maximum Daily Load (TMDL) plan, and to address similar water quality needs statewide.

Each year since the initiation of Clear and Clear, these agencies have jointly prepared an annual report describing the broad scope of the Clean and Clear effort and the accomplishments to date. Act 130 of the 2008 legislative session established a requirement that the Agency of Natural Resources continue to submit to the Legislature an annual *"Clean and Clear program summary reporting on activities and measures of progress for each program supported by funding under the Clean and Clear Action Plan."* This report is submitted in accordance with this requirement of Act 130.

Center for Clean and Clear

The Center for Clean and Clear was established in May 2007 to enhance Vermont's commitment to improve water quality in Lake Champlain by placing the resources dedicated to improving water quality in Lake Champlain under a single director. The Center for Clean and Clear has established both a functional structure and a physical location that have resulted in strong lines of communication across programs, departments, agencies, and organizations. The Center produced a workplan in May 2008 that laid out its approach for addressing phosphorus pollution in the northern Lake Champlain watershed. Also in May 2008, the Agencies of Natural Resources and Agriculture opened a Clean and Clear office in St. Albans, giving the Center an enhanced presence in the northern lake. The Agency has also initiated a process involving a number of partners in the South Lake area to determine priorities and strategies for controlling phosphorus pollution in the southern-most segments of Lake Champlain.

The Center for Clean and Clear has a core group of dedicated staff that have emphasized project development and implementation in the northern Lake Champlain watershed. Over the past 18 months Center staff have sponsored, supported, and managed a variety of projects targeting phosphorus pollution in the northern Lake Champlain watershed.

Agency of Agriculture, Food and Markets Programs

The Vermont Agency of Agriculture, Food, and Markets (VAAFM) 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 farms meet, or exceed, the standards established by federal water quality regulations while providing the financial and technical tools needed to do so. In 2008, VAAFM staff made more than 2,000 visits to farms to provide technical assistance and enforce regulatory requirements.

Regulatory Programs

The water quality regulatory programs are set up in a three-tiered structure that is designed to provide a logical progression in regulatory oversight as a farm grows from a small farm to a large farm operation.

Accepted Agricultural Practices (AAPs)

Originally implemented in 1995, the AAPs were revised in the current 2006 rule in order to meet evolving water quality needs. The AAPs are the base-level of management required of all farms. Under these rules, farms are prohibited from having a production area discharge of wastes to surface waters and are required to implement erosion, sediment, and nutrient control measures for their farmland. The AAPs are intended to be low-cost, low-tech solutions to improving water quality and are not intended to require a significant capital investment.

Medium Farm Operations (MFO) Program

In response to federal CAFO rulemaking in 2003, VAAFM developed the Medium and Small Farm Rules for Issuance of General and Individual Permits (MFO Rules) in April 2006, and issued the General Permit for Medium Farm Operations (MFO GP) in February 2007. The MFO Rules require all medium-sized farms, for instance those dairies with 200-699 mature animals, to seek coverage under, and meet the conditions of, the MFO GP. Like the AAPs, the MFO GP prohibits production area discharges to surface waters. In addition, the MFO GP requires that manure, compost, and other wastes be applied according to a Nutrient Management Plan that meets the USDA Natural Resource Conservation Service standard for nutrient management ("590 Standard"). A total of 157 farms have sought coverage under the MFO Rule and Initial Facility Evaluations are underway to ensure these farms are complying with the permit.

Large Farm Operations (LFO) Program

Environmental regulation of Vermont's largest farms began in 1997 and underwent a substantial revision in November 2007 with the adoption of new rules. There are 18 permitted LFOs statewide and the majority of them are dairy operations with greater than 1,000 animals. Like the MFO General Permit, the LFO Rules prohibit production area discharges to surface waters and require farms to operate according to a "590 Standard" Nutrient Management Plan. However, LFOs are each required to operate under an individual permit and are regulated for odor, noise, traffic, flies, insects, and other pests. The 2007 LFO Rule revision addresses new statutory requirements for advisory groups, siting and setbacks for new barns, groundwater investigation procedures, updated operation and maintenance requirements, and updated engineering and design requirements.

Financial and Technical Assistance Programs

In addition to implementing regulatory programs to protect Vermont's waters, VAAFM offers several financial and technical assistance programs in order to help the agricultural community meet these responsibilities. Farmers can receive assistance for structural production area improvements, groundwater testing, buffer installation along streams, and Nutrient Management Plan development and implementation.

Best Management Practices (BMP)/Alternative Manure Management (AMM) Program

The BMP program provides financial cost-share assistance for the implementation of practices that allow for more efficient use of manure nutrients and proper handling of agricultural wastes in order to improve water quality and help farmers comply with regulations. Typically these practices require a substantial capital investment and otherwise would not be affordable without the state's assistance. Common practices include manure storage facilities, silage leachate collection and treatment systems, and fencing animals out of waters. Through the BMP program, farmers who are not receiving other financial assistance can receive 50%-75% of the cost of implementing a single practice up to a $50,000 cap, and multiple practices up to $75,000. When partnered with other programs such as the USDA Natural Resources Conservation Service's Environmental Quality Incentives Program, participants are eligible for 35% cost-share up to $50,000 for a single practice and $75,000 for multiple practices.

Similar to the BMP program, the AMM program provides financial assistance to more efficiently use manure nutrients on farms and to help improve the handling of agricultural wastes to reduce the overall risks associated with water quality. However, AMM projects are demonstrations that help to develop new waste management technologies.

Approximately $1,300,000 was awarded between both programs in fiscal year 2008, with funds obligated towards 292 practices statewide. Of this, approximately $263,000 was committed for alternative manure management. Among the AMM practices contracted, there were two anaerobic digesters, one custom manure injection unit, one GPS injection technology system, and one algae photo-bioreactor system.

Nutrient Management Plan Incentive Grant (NMPIG) Program

Established in 2005, the NMPIG program was developed to help farmers meet the demand for nutrient management created by the new MFO Rules and the anticipated LFO Rule revision. NMPIG grants span four years and include a payment for the development of a Nutrient Management Plan (NMP) and an additional three years of plan updates. Grants in fiscal year 2008 provided $7/acre, $10/soil test, and $30/manure test for plan development, and $5,000 for three years of plan updating, up to a maximum of $13,000 per farm.

Since the program's inception through the end of fiscal year 2008, 236 contracts have been awarded to develop and maintain NMPs on more than 128,000 acres statewide, representing a financial commitment greater than $2,000,000. Although enrollment declined in fiscal year 2008, 60 contracts were awarded and nearly $600,000 were committed for NMP development and three years of updates. This lull in enrollment was expected as many of the now regulated medium and large farms have used the program to develop an NMP for the farm. The sense is that the small livestock farms and the non-livestock farm communities have not yet taken full advantage of this program, and enrollment will continue.

Farm Agronomic Practices (FAP) Program

The FAP program was first made available in 2006 to help farmers implement those practices typically required when implementing a NMP. These soil-based practices improve soil quality, increase crop production, and reduce erosion and agricultural waste discharges from cropland. In 2008, farmers could have received $20/acre for cover cropping, $25/acre for strip cropping,

$25/acre for conservation crop rotation, $2/acre to update an existing NMP, and $10/acre for cross-slope tillage through the FAP program. Funding for NMP maintenance and updates will continue to be increasingly important as farmers' NMP Incentive Grants expire and continued assistance is needed to keep the plans current.

Fiscal year 2008 totals exceeded 2,700 acres of cover cropping and nearly 180 acres of conservation crop rotation. Fiscal year 2009 is already proving to be a record year for the program. To date, enrollment has increased 78% over fiscal year 2008.

Conservation Reserve Enhancement Program (CREP) and Vermont Agricultural Buffer Program (VABP)

By establishing perennially vegetated buffers between agricultural land and surface waters, sediment-bound phosphorus in runoff can be intercepted before it reaches water. The Conservation Reserve Enhancement Program, a partnership with the U.S. Department of Agriculture and the U.S. Fish and Wildlife Service, provides financial compensation in order to encourage farmers to install these buffers and maintain them for 15 or 30 years. The compensation attempts to cover the replacement costs of the lost agricultural production, and is paid in the form of rental and incentive payments.

There has been a positive reception to the 2006 increase in soil rental rates with 2008 having an enrollment increase of 10% over the increase seen in 2007. Total enrollment (2002 through the end of fiscal year 2008) has reached 1,829 acres statewide, and already in 2009 it has reached a milestone of 2,000 acres.

VABP is similar to CREP as it provides financial compensation for the installation and maintenance of vegetated buffers along surface waters. Unlike CREP, VABP allows farmers to harvest the buffer at certain times of the year. Because of greater payments, CREP remains the dominant of the two programs.

Pesticide and Groundwater Monitoring Program

The Pesticide and Groundwater Monitoring Program provides drinking water testing and technical assistance at no cost to farmers and their neighbors. The program was founded to investigate the quality of drinking water on Vermont farms because of concerns for the potential contamination by pesticides. The program was expanded to test for nitrates and has found this to be a more common drinking water contaminant. Since its beginning in 1986, the program has sampled nearly 1,600 private drinking water supplies in 184 towns representing each of Vermont's 14 counties. The number of nitrate violations above the 10 parts per million standard has been decreasing according to the five-year rolling averages since the 2002-2006 period.

Agencies of Natural Resources and Transportation Programs

The Agency of Natural Resources administers a broad variety of Clean and Clear programs within the Departments of Environmental Conservation, Forests, Parks, and Recreation, and Fish and Wildlife. The Agency of Transportation administers the Vermont Better Backroads Program in cooperation with the Agency of Natural Resources and other program partners. These programs are aimed primarily at reducing nonpoint source nutrient and sediment pollution, but most have other environmental and economic benefits, as well.

Wastewater Discharges

Vermont's long-term commitment to upgrade wastewater treatment facilities for phosphorus removal has resulted in an 83% decrease in wastewater phosphorus loading to Lake Champlain from Vermont facilities since 1991. The total wastewater phosphorus load to Lake Champlain from Vermont's 60 treatment facilities reached a new low of 21.0 metric tons per year during 2007, well below the aggregate limit of 55.8 metric tons per year specified in the Lake Champlain Phosphorus TMDL There are only two municipal facilities still needing upgrades in order to meet their wasteload allocations under the TMDL, and both are in the planning and/or design process.

River Management

Investments made in river geomorphic assessment, project identification, and project development during the early years of Clean and Clear are paying off now with river corridor protection and restoration projects being implemented in watersheds throughout the state. Removal of six miles of flood plain encroachments along the Lamoille Valley Railroad embankment reconnected river access to over 200 acres of historic flood plain. Subsequent monitoring on 21 acres of the restored flood plain found that over 1,100 cubic yards of sediment and one metric ton of phosphorus were deposited at the monitored sites alone, less than one year after project completion. In 2008, the Floodplain Management Section took a major step toward enhanced floodplain and river corridor protection by releasing a suite of model flood hazard bylaws with the goal of encouraging National Floodplain Insurance Program (NFIP) communities to shift away from federal minimum standards. Communities adopting one of the enhanced model bylaws will better protect the sediment and nutrient attenuation capacity of floodplains in their communities and decrease their exposure to inundation and erosion related flood hazards. The River Management Program, in collaboration with most of the state's Regional Planning Commissions, leveraged Clean and Clear funding to attract over $1.0 million in FEMA Pre-Disaster Mitigation Program planning grants to support river corridor protection. Draft Fluvial Erosion Hazard Maps have been developed in 29 Vermont towns and incorporated into local ordinances in three towns.

Better Backroads

A total of $382,000 in Better Backroads Program grant funds was awarded to Vermont towns and other organizations in 2008 for inventories, capital budget planning, and erosion correction projects, including the stabilization of ditches, culverts, and roadside banks. To date, about two thirds of the towns in the Lake Champlain Basin have participated in the Better Backroads program by conducting at least one grant-funded project.

Stormwater Management

The original backlog of 1,757 expired stormwater permits has been reduced to fewer than 100 outstanding permits out of over 2,000 permitted facilities. The Stormwater Management Program issued 273 operational permits for new developments or redevelopment projects during 2008 (250 of which were general permits), most of which required stormwater treatment systems consistent with the standards in the 2002 Vermont Stormwater Management Manual. Staff of the Stormwater Program conducted 398 site visits during 2008, inspecting for compliance with operational or construction permits. As of November 2008, nine of the twelve lowland (non-

mountain) watershed TMDLs have been approved by EPA. The remaining three were submitted to EPA in October of 2008 and are awaiting approval. Additionally, the Vermont DEC is pursuing alternative approaches to the five mountainous stormwater-impaired watersheds.

Erosion Control at Construction Sites

An increased field presence by Stormwater Management Program staff in 2007 and 2008 has allowed for the most thorough assessment of program compliance to date. Compliance rates, though not yet at a satisfactory level, have improved substantially. Historically, projects permitted under Individual Permits tended to be the only ones in general compliance with the terms of their permits. In 2008, projects authorized under the new Construction General Permit had significant non-compliance observed in less than 17% of inspections. Projects receiving Individual Permits were found to be in substantial compliance at 68% of the sites inspected during 2008, while 41% of inspected projects authorized under the General Permit were in substantial compliance.

Local Municipal Actions

The Vermont League of Cities and Towns Water Quality Coordinator has continued to work with towns primarily in the Lake Champlain Basin providing technical assistance to support water quality enhancements to town zoning regulations and other municipal ordinances. This year, the program produced a Model Low Impact Development Stormwater Management Bylaw and a technical paper titled "*Managing Stormwater through Low Impact Development (LID) Techniques*" which were mailed to over 1,000 municipal officials, including selectboard and city council members, planning commission chairs, and zoning administrators across the state. The number of towns in the Lake Champlain Basin with good water quality protection provisions in their zoning ordinances is growing slowly. Currently, 26 out of 136 towns in the basin have adopted such provisions.

Wetland Protection and Restoration

Capital funds appropriated under Clean and Clear are being combined with funding from other partner organizations to support wetland restoration projects in the Lake Champlain Basin. To date, a total of 819 acres have funds committed for projects, and 100 acres of wetland have been protected or restored. An important new development is that the U.S. Natural Resources Conservation Service is using the Lake Champlain Basin Wetland Restoration Plan developed through Clean and Clear as guidance for proactively seeking new sign-ups for the historically underutilized Wetland Reserve Program (WRP). The NRCS received a dramatic increase in its federal fiscal year 2009 budget for WRP from previous levels of $200,000-300,000 per year to $6.6 million in 2009.

Forest Watershed Management

Department of Forests, Parks, and Recreation staff continue to work with the Vermont forest industry to support compliance with Forestry Acceptable Management Practices (AMP's) for maintaining water quality. Technical assistance is provided to forest landowners and loggers during investigations of possible violations. The Portable Skidder Bridge Initiative provides opportunities for loggers to loan or rent bridges for temporary stream crossings on log jobs to

protect water quality. Department staff conduct and participate in AMP and Forest Water Quality workshops for loggers and landowners each year.

St. Albans Bay Studies

The Vermont ANR worked with the U.S. Army Corps of Engineers and the Lake Champlain Basin Program to secure technical approval and funding for Phase 2 of the Feasibility Study for Control of Internal Phosphorus Loading in St. Albans Bay. A Project Management Plan is currently in preparation by the Corps of Engineers under Section 542 of the U.S. Water Resources Development Act of 2000. The specific treatment alternatives that will be the focus of the Phase 2 analysis are (1) phosphorus inactivation of the sediments within the Black Creek Wetland and inner St. Albans Bay using aluminum compounds (alum and sodium aluminate), and (2) hydraulic dredging of an area limited to the open-water portion of the Black Creek Wetland. By proceeding with feasibility studies for the control of internal loading concurrently with renewed efforts to reduce nonpoint source loads from the bay's watershed, a future in-lake treatment could be closer to realization once a judgment is made that watershed loads are sufficiently reduced to justify such a treatment.

Monitoring and Research

Much of the monitoring and research work related to the Clean and Clear program is being done in close cooperation with the Lake Champlain Basin Program. Data collected as part of the Lake Champlain Long-Term Water Quality and Biological Monitoring Program were presented in the Lake Champlain Basin Program's 2008 State of the Lake Report to show the current status and long-term trends in phosphorus levels in Lake Champlain and its tributary rivers. In 2008, the Vermont Lay Monitoring Program celebrated 30 consecutive years of this unique partnership with citizen volunteers collecting nutrient enrichment data on Lake Champlain and many other lakes throughout Vermont.

The Vermont ANR River Management Program and the University of Vermont Water Resources and Lake Studies Center have pooled resources in recent years in order to jointly support a Watershed and Water Quality Research Program. Several research projects are underway to advance scientific understanding of the dynamics, management, and contribution of sediment and nutrients derived from fluvial processes in Vermont's rivers.

DEC Watershed Initiative

Consistent with legislation enacted in 2007, water quality management plans for the West/Williams/Saxtons river basin and the Waits/Wells/Ompompanoosuc/Stevens river basin were finalized and then adopted by the ANR Secretary in June 2008. Work was begun with the Province of Quebec to begin planning to address pollution problems in the waters that drain to Lake Memphremagog. Basin planning has also been initiated in the Southern Lake Champlain Direct, Winooski, and Ottauquechee/Black basins. Interim final basin plans for the Northern Lake Champlain and Lamoille basin areas are being prepared as well. Basin planning efforts to the revise the 2002 White River Plan will begin in 2009.

In addition to conducting the statutorily-required basin planning activities, DEC Watershed Coordinators are actively working with watershed councils, stream teams, watershed groups, other state and federal agencies, landowners, and other stakeholders to address water quality problems and threats throughout the state. In 2008, the DEC Watershed Coordinators engaged

close to 3,000 persons across Vermont in forums and meetings designed to generate participation in projects, and developed or substantially assisted with dozens of watershed projects.

Accounting for Phosphorus Reductions and Identifying Critical Source Areas

Act 130 requires the Agency of Natural Resources to develop a method of accounting for changes in phosphorus loading to Lake Champlain due to implementation of the TMDL and other factors, and to develop a process for identifying critical source areas for nonpoint source pollution in each subwatershed of the basin. The ANR is actively participating in several research projects aimed at addressing these needs.

Clean and Clear funds are being combined with additional funding from the Lake Champlain Basin Program to support a research project underway at the University of Vermont to develop a phosphorus reduction accounting system for the Lake Champlain Basin. An interim report submitted during 2008 presented the modeling framework that will be used. The final report due in December 2009 will cover findings on the potential for phosphorus reduction from agricultural sources in the Rock River watershed, and include a discussion of how the model can be extrapolated to urban, suburban, and fluvial sources of phosphorus in other similar watersheds.

The interim report also included a scientific literature review and compilation of results from multiple published studies comparing the phosphorus reduction effectiveness of eight common agricultural best management practices. These practices typically reduced phosphorus loads by 40-60%, although there were large variations from site to site depending on factors such as slope, soil type, and location within the U.S. The findings from this literature review were encouraging because they demonstrated that substantial phosphorus reductions can be expected from some of the management practices being pursued in the Lake Champlain Basin.

The Vermont Department of Environmental Conservation and the Quebec Ministry of Sustainable Development, Environment, and Parks (MDDEP) issued a joint report in 2008 on the results of phosphorus load monitoring in the Missisquoi Bay watershed over the period of 2002-2005. The report compared phosphorus loading rates among ten Vermont and Quebec sub-basins within the Missisquoi Bay watershed, identifying the highest-contributing areas. A statistical analysis found that if hydrologic conditions had remained comparable to what they were during the 1991 base year, phosphorus loads would have actually declined in the Missisquoi and Pike Rivers. These findings suggest a possible beneficial effect of the wastewater treatment plant upgrades and nonpoint source management efforts that have taken place since 1991, especially in the Pike River watershed.

The Agencies of Natural Resources and Agriculture are also participating in a study to identify critical source areas of phosphorus in the Missisquoi Bay watershed in Vermont. This study is being conducted by the Lake Champlain Basin Program. Appropriations from the U.S. Congress to the International Joint Commission totaling $800,000 will support this work, to be completed by December 2011. The work will be accomplished through a combination of geophysical data acquisition, watershed modeling, and tributary monitoring.