PART SEVEN: CONCERNS & RECOMMENDATIONS

There are several concerns and recommendations which relate to the management and improvement of Vermont's water quality and water resources. Concerns and recommendations have been prepared for the following topics:

Lakes & Ponds

Atmospheric Deposition of Pollutants

Deposition of pollutants to the Vermont landscape from the atmosphere is principally responsible for the impairment of fish consumption uses on 8,115 inland lake acres, all of Lake Champlain and all river and stream miles, and aquatic life uses on 4,420 acres. Atmospheric deposition is the principal source of two major causes of use loss in Vermont: mercury and low pH. The two causes are linked, since in many instances, lakes that are vulnerable to acidification are also those which transfer atmospherically deposited mercury to the aquatic food web in the toxic methyl- form. However, many lakes that are not at risk of acidification exhibit elevated mercury levels in fish and wildlife.

Atmospheric deposition of mercury has resulted in the issuance of fish consumption advisories for many Vermont lakes and rivers, particularly those containing walleye. Specific advisories are in place for the five Deerfield River reservoirs, and for Moore and Comerford Reservoirs within the Fifteen Mile Falls Project (Connecticut River). The impacts of mercury deposition are not, however, limited to loss of fish consumption uses. Reproductive and behavioral impacts to wildlife that feed on fish are common to a subset of New England lakes, including the reservoirs along the Deerfield River and Connecticut River (Fifteen Mile Falls). Potential impacts to upper trophic level biota continue to be monitored by the Vermont Institute of Natural Sciences, in collaboration with the Biodiversity Research Institute.

The mercury that affects Vermont's watersheds is largely derived from mid-Atlantic or mid-Western sources: principally coal-fired electric generating units; non-regulated waste combustors; and smelters. In the past several years, mercury emissions from within New England have declined by 71%, largely due to regulation of waste incinerators within New England. Regional and long-range emissions of acid-forming precursors cause acidification of Vermont waterbodies. The atmospheric deposition of nitrous oxide (NO_x) and sulfate (SO_4) from Midwestern sources (and NOx from regional and mid-Atlantic mobile sources) has resulted in acidification of 34 lakes and eight streams within Vermont. In Vermont, the potential for acidification is measured by direct measurement of pH as well as corollary measures such as acid neutralizing capacity, NO_x, SO_4 and others. Deposition of SO_4 and in-lake SO_4 concentrations are presently decreasing, although evidence of alkalinity increases and de-acidification is very limited in Vermont. All of the acid-impaired lakes are subject to an approved TMDL addressing sources of the acid-forming precursors.

Vermont continues to work at the local, regional, and national scale to research the environmental effects associated with atmospherically deposited pollutants, reduce Vermont's locally-generated emissions, and influence the development of Federal legislation aimed at reducing atmospherically-derived pollution. Specifically, DEC has recently completed a revised mercury emissions inventory, and participated in the publication of an important volume of the scientific journal *Ecotoxicology*, which describes in detail the overall impact of the mercury problem in the northeast. DEC continues to

participate in several regional mercury monitoring, research, and assessment projects including a mass-balance modeling effort for mercury in Lake Champlain; participation in a regional modeling and TMDL analysis of mercury fate and transport in New England; and a regional study to ascertain the covarying influence of water level fluctuation and trophic state on mercury bioaccumulation in fluctuated reservoirs. With significant assistance and support from DEC, the Vermont Advisory Committee on Mercury Pollution continues to identify areas in Vermont where mercury use and emissions can be reduced, and is active in advising the Vermont General Assembly on the efficacy of newly-passed mercury-related legislation for Vermont. Finally, DEC staff continue to interact with Vermont's congressional delegation to address this issue from a national perspective.

Despite these many efforts, there remains a significant need to properly assess inland Vermont waters for mercury contamination. During the reporting period, and in response to a legislative directive, the Vermont Fish Contaminant Monitoring Committee prepared a comprehensive fish mercury monitoring plan which, if adopted by the Agency of Natural Resources and Department of Health, will significantly increase the availability of fish-tissue mercury measurements statewide. Funding is needed to implement this program, which has been designed based on findings from the many regional projects, to better estimate mercury levels in fish tissue in particular lakes and to estimate overall statewide levels of contamination for indicator species. Under the newly described fish-tissue monitoring plan, Vermont would implement a six-year rotating tissue assessment program that would yield a stream of new fish tissue data on a biennial basis. In order to enable this project, there exists the need to add a new direct mercury analyzer to the LaRosa Laboratory, or to develop a regional mechanism whereby fish tissue sampled can be processed by the EPA Regional Laboratory using their direct analyzer.

Hydrologic Modifications in Lakes

Water level manipulations are another important source of use impact to lakes. There are 24 lakes and ponds (about 9,000 acres) in Vermont for which one or more uses are altered due to water level manipulations. Flow alteration affects aquatic life uses due to littoral habitat loss. In some instances, flow alteration can also affect aesthetic, swimming, and even boating uses, depending on the severity and/or timing of the drawdown.

During 2004 and 2005, DEC's Lake Bioassessment Program sampled several reservoirs in order to obtain more precise and quantitative estimates of aquatic life use impairments in flow-altered lakes and reservoirs. These data have not been comprehensively evaluated as of this writing, but will provide the information necessary to develop bioassessment guidelines for reservoir systems. This analysis is planned for early 2006. Presently, the Assessment and Listing Methodology contains a decision-making tree to make preliminary assessments of use support in fluctuated lakes and reservoirs in a uniform fashion.

Exotic Aquatic Species as Pollutants

Non-native aquatic plants and animals are established in Vermont - at least 48 non-native aquatic species are known – and many Vermont waters, especially lakes, have a history of impacts related to these invasions. While the number of new introductions of species already known into Vermont lakes continues to increase, no new aquatic invasive species were identified in Vermont waters during the 2006 reporting period.

During the 2006 305b reporting period, Eurasian watermilfoil (*Myriophyllum spicatum*) was discovered in one new lake, Gale Meadows Pond in Londonderry. Water chestnut (*Trapa natans*) was discovered in two private waterbodies (one in Benson and one in Bennington) and at the mouth of the

Missisquoi River. Management efforts (physical removal by hand) were implemented on all four of these waters. The Missisquoi River water chestnut occurrence is of particular concern. The river flows into Missisquoi Bay of Lake Champlain, which is suitable habitat for water chestnut and at significant risk of invasion. At the present time, zebra mussels are pervasive in Lake Champlain and Lake Bomoseen, but have not emerged elsewhere. The mussels also threaten aquatic life and swimming uses in a small set of inland lakes. Most alarming is the positive identification of the nuisance alewife (*Alosa pseudoharaengus*) in Lake Champlain, which has the potential to seriously alter trophic conditions and food chain dynamics, as it has in the Great Lakes and in New York's Finger Lakes.

On a more positive note, sustained hand pulling efforts appear to have eliminated the water chestnut populations in Rood Pond (Williamstown/Brookfield) and Lake Bomoseen (Castleton). Continued surveillance efforts, however, are critical to future success. Other water chestnut sites are continually held in check by a management partnership between the DEC and The Nature Conservancy, which is funded by State, Federal, and Lake Champlain Basin Program sources. It is essential that DEC receive continued funding for water chestnut control at or above existing levels in order to maintain the ground gained in the battle over the last eight years against water chestnut in Lake Champlain and associated waters, and in inland waters.

During the 2006 reporting period, the Permittees/Co-Permittees for the three waterbody systems treated with the aquatic herbicide Sonar A.S. in 2004 (the Lake St. Catherine, Little Pond and Lily Pond system in Wells and Poultney; Star Lake in Mt. Holly; and the Burr Pond/Lake Hortonia system in Hubbardton and Sudbury) have provided year two information regarding the level of Eurasian watermilfoil control achieved/maintained, impacts to non-target species, and the most effective strategy to be implemented in the next phase of their five-year integrated management plans (IMP). While treatments in all systems were deemed successful, Eurasian watermilfoil levels post-treatment were higher than anticipated in Burr Pond and Permittees for two of the three treated waterbody systems have submitted applications for the use of the aquatic herbicide, Renovate 3 in spot/partial-lake treatments in 2006.

This is the first time that the DEC has received a proposal for a second chemical treatment in the five year IMP. Previously, only non-chemical control methods were proposed for the duration of a five year IMP. Requests for follow-up treatments may be a developing trend in aquatic invasive species control in Vermont (and elsewhere). DEC has concerns regarding the effectiveness and longevity of control from the chemical treatments, the effects of cyclical chemical treatments on the non-target environment and the ability of the volunteer groups (lake associations) to sustain the funding and manpower needs associated with this type of regime. In addition, DEC has received numerous inquires from the lake associations and affected citizens regarding these concerns with the main issue focusing on the need for adequate funding. Currently, state dollars available to fund herbicide treatments and other non-chemical controls are inadequate to meet demand. The burden of funding management programs, primarily Eurasian watermilfoil, is on affected shoreline property owners and municipalities. In addition, there is minimal funding for other aspects of invasive species management (monitoring and education and outreach efforts) and for preventing the spread of existing as well as new introductions statewide.

Developing and implementing a Rapid Response Plan is crucial to prevent the introduction of new invasive species populations. Efforts to develop such a plan were initiated during the reporting period for the Lake Champlain Basin and are expected to follow for the non-Basin portion of the state in the future.

Eutrophication of Lakes

DEC commits significant resources to the management of cultural eutrophication that affects Vermont lakes. Vermont has relatively unproductive lakes as compared to other parts of the country. Indeed, only four lakes appear on Vermont's draft 2006 303d list as impaired due to excessive eutrophic conditions (Lake Carmi, Franklin; Shelburne Pond, Shelburne; Ticklenaked Pond, Ryegate; and, Lake Memphremagog, Newport). Of these lakes, the first three are actively subject to TMDL or pre-TMDL analyses. Lake Memphremagog is subject to a two-year comprehensive trophic re-characterization; a joint project with the Province of Quebec. The purpose of this sampling is, in part, to determine if the lake is no longer impaired due to elevated phosphorus levels. A number of years ago the Newport WWTF was upgraded, although the lake was never properly re-assessed following the upgrade in locations that are relevant to the existing numeric nutrient criteria for that lake.

Eutrophication can simultaneously affect aesthetics, aquatic life, swimming, and in some instances even boating uses. The major causes related to eutrophication for inland Vermont lakes are nutrients, siltation, and organic enrichment. The major sources of these pollutants are construction, urban and suburban runoff, road maintenance and runoff, agriculture, silviculture and other nonpoint sources.

Implementing protective actions to reduce human impacts on lake trophic state before impairments develop is more efficient and effective than waiting until restoration is needed. Toward this end, several lake protection projects have been carried out in Vermont, with successes in some waters. For example, even though the Lake Carmi TMDL is remains in preparation, there have already been notable improvements in the summer nutrient concentrations, transparency, and algal populations in the lake owing to significant watershed restoration efforts already underway there (see Figure 7.1). Another important lake protection and monitoring project is described in the following.

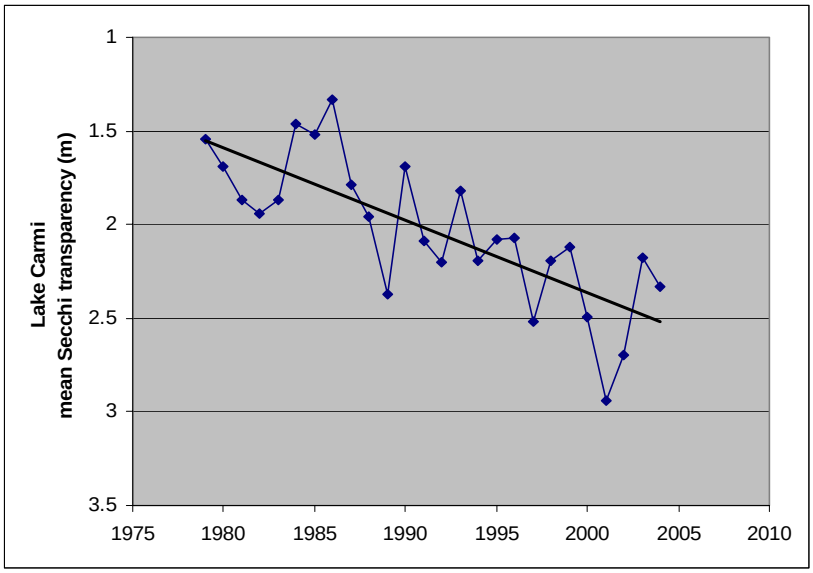

Figure 7.1. Lake Carmi water transparency measured by the Vermont Lay Lakes Monitoring Program.

Nutrient Criteria

During the reporting period, DEC implemented the field phase of its nutrient criteria development plan, having received two EPA grants under the national nutrient criteria program. Vermont's nutrient criteria development plan focuses on developing quantitative relationships between nutrient parameters and designated uses such as recreation, aesthetics, aquatic habitat, and public water supply, in lakes and rivers. At present, all data necessary to carry out the analyses articulated in the Nutrient Criteria plan are catalogued, quality assured, and ready for further analysis.

While DEC is uncertain whether strict numeric nutrient criteria can stand alone as assessment or listing tools, the preliminary signals from the Vermont project dataset do suggest there are threshold nutrient limits for rivers and lakes beyond which impacts to biological communities and water uses are evident. DEC has presented the initial results of this project at several regional meetings, most recently at the

national EPA-States nutrient criteria meeting in Dallas, Texas. A comprehensive analysis of all nutrient criteria analyses will be completed during 2006. The results of these analyses will be provided in a technical document to EPA and the Vermont Water Resources Panel near the end of 2006.

Lake Champlain and Lake Memphremagog and all Class A(1) waters are already subject to segment-specific numeric nutrient criteria for phosphorus. All waters are also subject to numeric criteria for nitrate.

Alteration of Littoral Habitat and Effects of Shoreline Development on Inland Lakes

A well vegetated lakeshore protects the soil from erosion, filters runoff keeping nutrients from overfertilizing the lake, and provides essential wildlife habitat to both terrestrial and aquatic organisms. A developed lakeshore lot with lawn contributes seven times more phosphorus per year to the lake than a forested site. Recent data collected in Vermont show that developed shores have an average of 96% less trees and greater than 10 fold increase in grass than undeveloped shores. In addition, developed lots had 61%, 87% and 69% less of fine, medium and coarse littoral woody debris, respectively, than undeveloped lots. Woody debris provides important habitat for fish, turtles, amphibians and other wildlife. In addition, fish nests tend to be found along undeveloped shores.

Twenty-four percent of all the species identified in Vermont as "Species of Greatest Conservation Need" by Vermont Fish and Wildlife in 2005 rely on inland lakes (< 1% of the Vermont lake area) for most of their habitat needs; habitats that co-occur with vermont's areas of greatest population densities. Of the 304 lakes in the Lakes Inventory database with land use calculations completed for their watersheds, 85% of them have undeveloped land use percentages of 90 % or greater. Many times in Vermont, there is little development in a watershed, but concentrated development along the lakeshore.

Alteration of lakeshore habitat is not simply a Vermont phenomenon. Between 70% to 90% of natural riparian vegetation nationwide has already been lost or is degraded due to human activities. A 2002 recreation survey of Vermont residents revealed that more than 84 percent were concerned with the destruction of fish habitat and indicated that this was a problem.

Under Section 3-01(D) of Vermont's Water Quality Standards relating to Numeric Biological Indices, DEC is authorized to determine full support of aquatic biota and aquatic habitat uses through other appropriate methods of evaluation. In 2005, DEC undertook a study to examine different possible littoral habitat parameters that may be measured and form the basis of a quantitative assessment of littoral habitat condition.

Questions addressed by this study were whether certain parameters can be used to assess littoral condition and whether differences in these parameters occur between developed and undeveloped sites. Ultimately, DEC hopes to determine what level of alteration of littoral habitat a lake can sustain and develop strategies to protect and maintain lakes within the sustained level and remediate lakes with unsustainable levels of littoral habitat alteration. This assessment is intended to dovetail with the lake bioassessment indices that have been developed as part of the Lake Bioassessment Project.

DEC plans to continue its efforts to develop a scientifically based and Vermont-specific evaluation methodology to aid in the determination of full support of aquatic biota and aquatic habitat uses in the littoral zone of inland lakes.

Rivers & Streams

Emerging Contaminants

A host of new generation contaminants are being measured and described from waters throughout the United States. During the reporting period, DEC, in partnership with EPA, was able to obtain measurements of several of these wastewater-derived contaminants. The project confirmed that six pharmaceuticals and personal care product (PPCP) target analytes are present in Vermont wastewater treatment facilities (WWTFs) at detectable concentrations. For the most part, concentrations were in the low part-per-trillion range. The treatment facilities represent a range of potential inputs and treatment technology. It can be concluded that some analytes, particularly 4-nonylphenol and triclosan, are relatively ubiquitous in the environment around WWTF discharges. 4-Nonylphenol was detected most frequently and at the highest concentrations (up to 3 ppb). These findings constitute an initial screening of PPCP occurrence in WWTF effluents and receiving waters in Vermont. Concentrations were low and below known adverse effect thresholds. However, given the uncertainty about the potential environmental effects of long-term exposure to individual PPCPs and combinations of PPCPs, these findings indicate that additional characterization of the occurrence of PPCPs in Vermont's surface waters would be appropriate.

Beginning in 2006, the Lake Champlain Basin Program is sponsoring a more comprehensive screening of PPCPs in surface waters to be implemented in 2006 by the United States Geological Survey. The design of this project is such that effluents, receiving waters, ambient lake and river waters, sediments, and control sites will be tested. While a complete analyte list is beyond the scope of this summary, the project will assess the presence and ranges of several classes of contaminants, including: endcrine disruptors; persistent organics; new organic pesticides; antibiotics and pharmaceuticals; personal care products; and, other industrial-chemical solvents.

New generation contaminants are not limited to waters and wastewater effluent. DEC remains interested in developing the capability to analyze fish tissue for residues of the flame-retardant poly-brominated diphenyl-ethers, and would be pleased to work with the EPA New England should these analyses become available at the New England Regional Laboratory.

E.coli Contamination and Microbial Source Tracking

Vermont is entering a triennial Water Quality Standards (WQS) review process with EPA. Vermont's current criterion for *E.coli* in Class B waters (all Water Management Types) is 77 *E. coli* /100ml. This is the most stringent criterion in the nation and equates to a 75% likelihood illness rate of 3.4 swimmers in 1000 over the course of a season. This level of risk assumes swimmers are exposed to waters subject to heavy use and to wastewater treatment facility discharge. Few beaches in Vermont come close to this kind of situation. Vermont's Class A(1) criterion is 33 *E. coli* /100ml or 18 *E.coli*/100ml expressed as a geometric mean. DEC expects that existing *E. coli* criteria, particularly the one associated with Class B waters, will be re-evaluated as part of the triennial review process.

Research from Vermont watersheds indicates that the Class B criterion is exceeded 34% of the time in completely forested and undisturbed watersheds during wet weather. As such, exceedences of the Class B criterion are very common and can as easily be attributed to natural sources during wet weather conditions. When strictly interpreted, Vermont's criterion results in numerous cases where waters may be identified as unsuitable for swimming. This presents a very difficult situation for water resource management. Waters may be incorrectly identified as potentially unsuitable for swimming, and there may be unwarranted public stigma cast upon the waters in question. For this reason, there

exists the need to modify the Vermont standard to be compliant with the currently accepted, scientifically defensible criteria options now being promoted by EPA.

The development of the LaRosa Laboratory Services Partnership Program has significantly augmented the quantity of swimming water quality assessment data based on *E. coli* bacteria. Certain waters, when assessed using Vermont's Assessment and listing Methodology, become identified as either impaired or in need of further assessment. There are about 280 stream miles and 1030 lake acres identified as stressed due to elevated *E. coli* levels and about 120 miles and 19 acres identified as impaired due to repeatedly high levels of *E.coli*. These measures, and the enhanced attention accorded to swimming water quality monitoring by LaRosa Partnership participants, elevates the need for microbial source tracking (MST) tools in Vermont to determine the extent to which sources are or are not of a natural origin. At present, MST technology remains largely a research-level activity, although a growing number of MST projects in New Hampshire, Maine, and Massachusetts have made this technology more common and precise. There are several waters in Vermont where MST would be highly-relevant, including segments of the Huntington and West Rivers, as well as other Section 303d listed segments impaired by *E. coli*. In Vermont, as with other States, the need exists for regionally-available microbial source tracking facilities at an accessible cost. Vermont recommends that EPA's New England Regional Laboratory strongly consider developing this technology as a service to Vermont and the other New England states.

Lack of Strategic Statewide Vegetated Buffer Requirements

Undisturbed vegetation along rivers and streams (as well as along lake shorelines) is effective at reducing pollutants from reaching surface water. Other than Act 250 development constraints and a few regulations adopted by a small number of municipalities, there are no strategic statewide requirements that riparian landowners maintain a minimum width of vegetation along bodies of water as there are in other states. As a result, many miles and acres of Vermont's surface waters are negatively influenced by urban runoff, sediment, increased temperature, fertilizers, manure, and other pollutants which can be reduced or eliminated by properly maintained vegetated buffers.

As the result of the recognized importance of riparian buffers to water quality in certain strategic locations, a Buffer Procedure Action Team was created in October 1999. The Team was charged with developing a revised Agency buffer policy and procedure, including general and site specific standards. The Buffer Procedure, finalized in 2005, will be used by the Agency in the Act 250 and Act 248 processes and as guidance to riparian landowners, including public and quasi-public agencies.

DEC continues to make some strides in the educational effort to inform the public and municipal planning commissions about the environmental benefits of riparian vegetation. DEC and Regional Planning Commissions (and in some cases local watershed groups) have been working with municipalities to strengthen their municipal plans and zoning regulations to maintain streamside vegetation. Workshops for town officials and the general public have been conducted regarding strategies to encourage the maintenance of existing riparian vegetation as well as promoting the planting of riparian areas lacking vegetative buffers. DEC, the Vermont Youth Conservation Corps, the various Natural Resources Conservation Districts, watershed groups and other volunteer groups have worked on many streamside planting projects around the state. However, there is still need for additional public education about the need to maintain riparian buffers for water quality protection and wildlife habitat.

A new position, supported by Clean and Clear funding and hosted by the Vermont League of Cities and Towns, has been created and will focus on municipal zoning. The position will be able to provide

planning assistance on local water quality protection strategies one of which will include vegetated buffers.

It is recommended that the Agency continue to make more use of the print media, TV and radio to draw the public's attention to the benefits of maintaining riparian vegetation.

Road Salt and Water Quality

Sodium chloride (also known as table salt) is the de-icing agent of choice in much of the Northeast. It is applied in large amounts to most paved roads throughout Vermont by the Vermont Agency of Transportation, by the 250 municipalities and by an unknown number of private contractors. Application rates are typically measured in tons per lane mile. Exposure to high concentrations of road salt has been shown to have detrimental effects on terrestrial and aquatic ecosystems. In the past, research found that impacts are greatest directly adjacent to roadways and uncovered salt storage piles. The general conclusion was that salt concentrations were unlikely to reach levels of concern in other locations because of dilution or that exposure to high concentrations (1000 mg/L chloride or higher) would be brief and therefore not of concern.

Recent data may be challenging these conclusions. In 2001, Environment Canada completed an assessment of road salt and the potential for harmful effects on the environment. They concluded that, based on available data, road salt was toxic as defined by the Canadian Environmental Protection Act and entering the environment in potentially harmful amounts. In the fall of 2005, Kauschal et al (Proc. Nat. Acad. Sci. 102:13517) documented chloride concentrations reaching 25% of seawater (up to 5 gr/L) in some streams in New York, Maryland and New Hampshire. In Vermont, data from the Lake Champlain Long-term Monitoring Program indicates that chloride concentrations in the main lake, though well below levels of concern, have been rising steadily since 1998. Several of the major tributaries in both Vermont and New York show similar trends. Data collected from areas of high density development throughout Vermont indicate that summer base flow chloride concentrations are elevated in some streams, which may, in turn, point to elevated groundwater concentrations.

These new data suggest that current assumptions of the movement and concentrations of road salt in the environment may need revision. There is limited recent data on chloride in aquatic systems in Vermont and little information on the chronic effects on biota of exposure to sub-lethal levels. Because de-icing is an integral part of maintaining safe winter roads and sodium chloride is the current de-icer of choice, it is presumed that road salt is the culprit and that large amounts of chloride will continue to enter the environment. DEC is assessing available data to identify aquatic environments at the greatest risk from elevated chloride in Vermont and the implications this may have for resident biota. There is also an investigation underway to determine whether conductivity can serve as a useful surrogate for chloride measurements. In the Northeast region, it would be beneficial to add chloride to existing routine groundwater and surface water monitoring to gain a better understanding of current concentrations, loading, and sources. Additionally, investigations into effects of chronic sublethal exposure to chloride on aquatic communities are needed to better understand the environmental response to these concentrations.

Polluting Discharges from Large Farms

From a water quality perspective, concerns continue to exist regarding shifts in agricultural production from a large number of smaller farms to increasing numbers of larger farms. The water pollution potential from such large farming operations is equivalent to the waste generated by a small to medium sized city. It is recommended and essential that waste management and pollution prevention efforts are well coordinated between farm operators and state and federal agencies. The Large Farm

Operation Rules, regulating about 20 farms in Vermont with greater than 950 animals and administered by the Vermont Agency of Agriculture, Food and Markets, will help ensure animal wastes on these larger facilities are managed effectively.

Changes at the federal level are soon to affect the Concentrated Animal Feeding Operation permit program, currently administered by DEC under the National Pollutant Discharge Elimination System. Farms that have between 200 and 700 dairy animals, known as Medium-sized Farm Operations or MFO, will soon need a General Permit and will need to demonstrate compliance with nutrient management requirements. There are close to 200 MFO dairy farms in Vermont. Farms with greater than 700 animals will soon need an Individual Permit.

Improvements and changes to the Accepted Agricultural Practice (AAP) rules are recommended to keep pace with the changing nature of Vermont agriculture. Revisions to the AAPs have been prepared by the Vermont Agency of Agriculture and, once promulgated, will provide an important set of requirements which all farms throughout the state will adhere to.

In order to achieve the greatest possible environmental protection benefit while supporting an important ingredient of Vermont's landscape and way of life, it is recommended these permit programs be developed or modified in a coordinated manner with various technical and financial assistance programs to address waste and nutrient management.

Groundwater

Groundwater is fundamental to the ecosystem and as a drinking water resource. Groundwater recharges wetlands, streams, rivers, lakes, and ponds, which is critical to wildlife. It is a source of drinking water for most of the State's population. While groundwater is addressed through the Safe Drinking Water Act, this Act's prime focus has been on monitoring, treatment, operation, and infrastructure needs of public water systems. Additional regulations that address groundwater are often in reaction to contamination. Yet, the quantity and quality of groundwater which define its use in Vermont remain largely unknown. Characterizing the groundwater resources is overdue relative to the continuing threats of contamination, the pressures and pace of economic development, and the importance of this resource. Specifically, the Vermont Groundwater Coordinating Committee (GWCC) recommends the following:

A) the GWCC should review and comment on proposed legislation to provide technical review of its implications by a broad range of Agency representatives;

B) institute water conservation incentives to proactively prepare for the next drought cycle along with expanding the drought monitoring capabilities of ANR; and,

C) fully implement the Groundwater Protection Statute, Chapter 48, with adequate resources for a comprehensive groundwater program that identifies and funds groundwater research.

To appropriately address groundwater and elevate its standing to a level that other natural resources enjoy will require a continuous commitment. Requisite in this commitment is a groundwater program with personnel that would define the State's groundwater resources. Central to this mission is a proactive approach to aquifer mapping. This mapping would identify potential future aquifers and also

update existing Source Protection Areas that were insufficiently delineated. This approach would establish the connection between surface water and groundwater that is so often ignored. In addition, there is a need for education and technical assistance at the state level and, most importantly, at the local level.

The above approach is based on the policy, as stated in Chapter 48, Groundwater Protection, that comprehensive groundwater management is needed to provide effective preventative strategies to protect the resource. Without this basic understanding of the resource, assumptions regarding groundwater will remain ill conceived and the resource will be under-appreciated. Such an approach results in inadequate groundwater protection efforts. Conversely, a groundwater program based on data that describes the resource can appropriately protect the resource for present and future needs.