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REFERENCES

- Castleton Area River Projects*, Annual Report, Fair Haven Grade School, 2001-2003.
- Field, John, Jim Graves, and Kathy Doyle, July 2001. *A Wetland and Riparian Habitat Assessment of the Poultney River Watershed in NY and VT, Final Report*. The Nature Conservancy, Southern Lake Champlain Valley Office, NY and VT.
- Field, John, 2001. *Geomorphic Studies at the Harrison Site (Lower Poultney River) and Hubbardton River Tributaries, NY and VT*. The Nature Conservancy, Southern Lake Champlain Valley Office, NY and VT.
- Graves, Jim, August 2001. *Clayplain Forests on the Middle Hubbardton River: Assessment of Mature and Successional Vegetation on Clay Soils*. The Nature Conservancy, Southern Lake Champlain Valley Office, NY and VT.
- Hegman, W., D. Wang and C. Borer, 1999. *Estimation of Lake Champlain Basinwide Nonpoint Source Phosphorus Export*. Lake Champlain Basin Program, Technical Report No. 31. USEPA, Boston, MA.
- Lake Champlain Basin Program. 2000. Preliminary Evaluation of Progress toward Lake Champlain Basin Program Phosphorus Reduction Goals.
- Lake Champlain Management Conference. 1996. *Opportunities for Action, An Evolving Plan for the Future of the Lake Champlain Basin*. Lake Champlain Basin Program (Draft Update 2001).
- Packer, M.J., (2002). *Public attitudes and landowner resource use: A study of residents of the Poultney Mettowee Watershed, Vermont and New York*. Unpublished manuscript (Syracuse University Masters Thesis).
- Parsons, Jeffrey, 1988, A Characterization of Vermont's More Important Wetlands, Vermont Department of Forests, Parks and Recreation. Waterbury, Vermont.
- Rutland Regional Plan, Adopted November 16, 1999*. Rutland Regional Planning Commission.
- Schumm, S.A., *The Fluvial System*. John Wiley and Sons, New York, 1977.
- Thompson, Elizabeth H. and Sorenson, Eric, 2000. *Wetland, Woodland, Wildland, A Guide to the Natural Communities of Vermont*. University Press, Hanover, NH
- Thompson, Elizabeth H. 2002. *Vermont's Natural Heritage, Conserving Biological Diversity in the Green Mountain State*. A Report from the Vermont Biodiversity Project. 48 pp.

- Vermont Agency of Agriculture, Farms, and Markets, 2002. Agricultural Plan for the Poultney Mettowee Basin. Montpelier, Vermont.
- Vermont Agency of Natural Resources, 2003. *Vermont Stream Geomorphic Assessment Phase 1 Watershed Assessment, Phase 2 Rapid Assessment, Phase 3 Survey Assessment, and Handbook Appendices*. Waterbury, VT.
- Vermont Better Backroads Manual*, March 2002. George D. Aiken & Northern Vermont Resource Conservation and Development Councils.
- Vermont Department of Water Resources, April 1975. *Poultney-Mettowee Water Quality Management Plan*. Vermont Agency of Environmental Conservation, Waterbury, VT.
- Vermont Department of Environmental Conservation, 1988. *The Waterfalls, Cascades and Gorges of Vermont*. Jerry Jenkins and Peter Zika for the Vermont Agency of Natural Resources, Waterbury, VT.
- Vermont Department of Environmental Conservation, January 1989. *Vermont's Whitewater Rivers: their Geology, Biology, and Recreational Use*. Jerry Jenkins and Peter Zika for the Vermont Agency of Natural Resources, Waterbury, VT.
- Vermont Department of Environmental Conservation, 1990. *Planning for Lake Water Quality Protection, a Manual for Vermont Communities*. Vermont Agency of Natural Resources, Waterbury, VT.
- Vermont Department of Environmental Conservation, 1992. *The Lower Poultney River, A Vermont Outstanding Resource Water*. Vermont Agency of Natural Resources Management Plan, Waterbury, VT.
- Vermont Department of Environmental Conservation, 1992. *Vermont Swimming Hole Study*. Vermont Agency of Natural Resources, Waterbury, VT.
- Vermont Department of Environmental Conservation, 1994. *A Threat to Vermont's Lakes: Eurasian Watermilfoil an Invasive Non-native Aquatic Plant*. Vermont Agency of Natural Resources, Waterbury, VT.
- Vermont Department of Environmental Conservation, 1998. *A Classification of the Aquatic Communities of Vermont*. Vermont Agency of Natural Resources, Waterbury, VT.
- Vermont Department of Environmental Conservation, February 1999. *Options for State Flood Control Policies and a Flood Control Program*, Prepared for the Vermont General Assembly Pursuant to Act 137 Section 2, Vermont Agency of Natural Resources, Waterbury, VT.

- Vermont Department of Environmental Conservation, 1999. *Poultney Mettawee Watersheds Water Quality & Aquatic Habitat Assessment Report*. Vermont Agency of Natural Resources, Waterbury, VT.
- Vermont Local Roads Program, May 1999. *Road Design and Maintenance Handbook*. Colchester, VT.
- Vermont Water Resources Board, 2000. *Vermont Water Quality Standards*. Montpelier, VT.
- Vermont Department of Environmental Conservation, 2001. *Fluvial Morphology: a Foundation for Watershed Protection, Management, and Restoration*. Vermont Agency of Natural Resources, Waterbury, VT.
- Vermont Department of Environmental Conservation, October 2002. *Mettawee River Temperature TMDL Study*, ENSR International Consulting. Waterbury, VT.
- Vermont Department of Environmental Conservation, November 2002. *White River Basin Plan, A Water Quality Management Plan*. Vermont Agency of Natural Resources, Waterbury, VT.
- Vermont Department of Environmental Conservation, 2002. *State of Vermont 2002 Water Quality Assessment – 305(b) Report*. Vermont Agency of Natural Resources, Waterbury, VT.
- Vermont Department of Environmental Conservation, 2002. *State of Vermont Year 2002, 303(d) List of Waters*. Vermont Agency of Natural Resources, Waterbury, VT.
- Vermont Department of Environmental Conservation and New York State Department of Environmental Conservation, 2002. *Lake Champlain Phosphorus TMDL*. Waterbury, VT and Albany, NY.
- Vermont Department of Environmental Conservation, 2002. *Citizen's Guide to Bacteria Monitoring in Vermont Waters*. Vermont Agency of Natural Resources, Waterbury, VT.
- Vermont Department of Environmental Conservation, 2003. *Alternatives for River Corridor Management*. Vermont Agency of Natural Resources, Waterbury, VT.
- Vermont Department of Environmental Conservation, 2003. *Vermont Watershed Initiative, Guidelines for Watershed Planning*. Vermont Agency of Natural Resources, Waterbury, VT.

Vermont Department of Fish and Wildlife, June 1998. *A Plan for the Management of Walleye Fisheries in Lake Champlain*. Vermont Agency of Natural Resources, Waterbury, VT.

Vermont Department of Fish and Wildlife, 2000. Fishery Surveys in the Mettowee River.

Vermont Department of Fish and Wildlife, Fall 2001. *Batten Kill News*, Volume 2, Issue 2, Vermont Agency of Natural Resources, Waterbury, VT.

Vermont Department of Fish and Wildlife, Winter/Spring 2003. *Batten Kill News*, Volume 4, Issue 1, Vermont Agency of Natural Resources, Waterbury, VT.

Vermont Water Resources Board, 2002. *Vermont Wetland Rules*. Montpelier, VT.

Wadeable Stream Biocriteria Development for Fish and Macroinvertebrate Assemblages in Vermont Rivers and Streams, VTDEC, 2001.

GLOSSARY

10 V.S.A., Chapter 47 - Title 10 of the Vermont Statutes Annotated, Chapter 47, Water Pollution Control, which is Vermont's basic water pollution control legislation.

Accepted Agricultural Practices (AAP) - land management practices adopted by the Secretary of the Agency of Agriculture, Food and Markets in accordance with applicable State law.

Accepted Management Practices (AMP) - methods of silvicultural activity generally approved by regulatory authorities and practitioners as acceptable and common to that type of operation.

Aquatic biota - all organisms that, as part of their natural life cycle, live in or on waters.

Basin - one of seventeen planning units in Vermont. Some basins include only one major watershed after which it is named such as the White River Basin. Other Basins include two or more major watersheds such as the Poultney Mettowee.

Best Management Practices (BMP) - means a practice or combination of practices that may be necessary, in addition to any applicable Accepted Agricultural or Silvicultural Practices (examples of AMPs), to prevent or reduce pollution from non-point source pollution to a level consistent with State regulations and statutes. Regulatory authorities and practitioners generally establish these methods as the best manner of operation. BMPs may not be established for all industries or in agency regulations, but are often listed by professional associations and regulatory agencies as the best manner of operation for a particular industry practice.

Classification - a method of designating the waters of the State into categories suitable for different uses in accordance with the provisions of 10 V.S.A §1253.

Designated use - any value or use, whether presently occurring or not, that is specified in the management objectives for each class of water as set forth in §§ 3-02 (A), 3-03(A), and 3-04(A) of these rules.

EPA - The U.S. Environmental Protection Agency.

Existing use - a use that has actually occurred on or after November 28, 1975, in or on waters, whether or not the use is included in the standard for classification of the waters, and whether or not the use is presently occurring

Fluvial geomorphology - a science that seeks to explain the physical interrelationships of flowing water and sediment in varying land forms

Natural condition - the condition representing chemical, physical, and biological characters that occur naturally with only minimal effects from human influences.

Nonpoint source pollution - waste that reaches waters in a diffuse manner from any source other than a point source including, but not limited to, overland runoff from construction sites, or as a result of agricultural or silvicultural activities.

pH - a measure of the hydrogen ion concentration in water on an inverse logarithmic scale ranging from 0 to 14. A pH under 7 indicates more hydrogen ions and therefore more acidic solutions. A pH greater than 7 indicates a more alkaline solution. A pH of 7.0 is considered neutral, neither acidic nor alkaline.

Point source - any discernable, confined and discrete conveyance including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which either a pollutant or waste is or may be discharged.

Reference condition - the range of chemical, physical, and biological characteristics of waters minimally affected by human influences. In the context of an evaluation of biological indices, or where necessary to perform other evaluations of water quality, the reference condition establishes attainable chemical, physical, and biological conditions for specific water body types against which the condition of waters of similar water body type is evaluated.

Riparian vegetation - the vegetation growing adjacent to rivers or streams.

Sedimentation - the sinking of soil, sand, silt, algae, and other particles and their deposition frequently on the bottom of rivers, streams, lakes, ponds, or wetlands.

Thermal modification - the change in water temperature

Turbidity - the capacity of materials suspended in water to scatter light usually measured in Jackson Turbidity Units (JTU). Highly turbid waters appear dark and “muddy.”

Water Quality Standards - the minimum or maximum limits specified for certain water quality parameters at specific locations for the purpose of managing waters to realize their most beneficial uses. In Vermont, Water Quality Standards include both Water Classification Orders and the Regulations Governing Water Classification and Control of Quality.

Waters - all rivers, streams, creeks, brooks, reservoirs, ponds, lakes, springs and all bodies of surface waters, artificial or natural, which are contained within, flow through or border upon the State or any portion of it.

Watershed - all the land within which water drains to a common area (waterbody).

LIST OF ACRONYMS USED IN THIS DOCUMENT.....

AAP	Accepted Agricultural Practice
Agency	Vermont Agency of Natural Resources
AMP	Acceptable Management Practice
ANCF	Aquatic Nuisance Control Fund
ANR	Vermont Agency of Natural Resources
B1	Class B Water Management Type 1
B2	Class B Water Management Type 2
B3	Class B Water Management Type 3
BASS	Biomonitoring and Aquatic Studies Section, Vermont Water Quality Division
BMP	Best Management Practice
CAV	Composting Association of Vermont
CWA	Federal Clean Water Act
AAFM	Vermont Agency of Agriculture, Food & Markets
DEC	Vermont Department of Environmental Conservation (WC= watershed coordinator, RM= River Management Section, WS=Wetlands Section, LS=Lakes Section, SMS=Stormwater Management Section, HS=Hydrology Section, PS= Planning Section)
Department	Vermont Department of Environmental Conservation
DFPR	Vermont Department of Forest, Parks and Recreation
EPA	United States Environmental Protection Agency
FWD	Vermont Department of Fish and Wildlife
GIS	Geographic Information System
NPDES	National Pollution Discharge Elimination System
NPS	Nonpoint Source Pollution
NRCD	Natural Resource Conservation District
NRCS	Natural Resource & Conservation Service (Formerly SCS)
ORW	Outstanding Resource Water
RPC	Regional Planning Commission
TMDL	Total Maximum Daily Load
ACOE	United States Army Corp of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
VTDOH	Vermont Department of Health
VTrans	Vermont Agency of Transportation
VYCC	Vermont Youth Conservation Corp
WWTF	Wastewater Treatment Facility

STATUTORY INDEX – (Including MOU’s, Collaborative Programs used in the Basin Planning Process)

Statutory Index

Federal and State law and regulation call for the review of specific topics in each basin plan. The following is a listing of basin planning requirements that have been extracted from the Vermont Water Quality Standards (WQS), the Federal Register and the Agency of Agriculture, Food and Markets’ (AAF&M) Accepted Agricultural Practice Regulations (Effective June 29, 1995), their Best Management Practice Regulation (Effective January 27, 1996), and the Memorandum of Understanding between the ANR and the DAF&M. The requirements below are addressed in this basin plan in the section noted in bold adjacent to each requirement.

The Vermont Water Quality Standards (2000)

1. Basin plans inventory the existing and potential causes and sources of pollution that may impair the waters. **Chapters 3, 4, and 5**
2. Basin plans establish a strategy to improve or restore waters. **Chapter 4 and Chapter 5**
3.shall seek public participation to identify and inventory problems, solutions, high quality waters, existing uses, other water uses, and significant resources of high public interest. **Chapters 4 and 5**
4.shall consider approved municipal and regional plans adopted under 24 V.S.A. Chapter 117. **Appendix I**
5.shall coordinate and cooperate with the Commissioner of AAF&M, as provided for in 6 V.S.A. Chapter 215. **Sections 2.2, 4.1, 4.3, and Appendix K**
6.shall identify strategies, where necessary, by which to allocate levels of pollution between various sources as well as between individual discharges. **Chapter 4**
- 7.....should, to extent possible, contain specific recommendations by the secretary that include, but are not limited to the identification of all known:
 - a. existing uses **Section 5.3**
 - b. salmonid spawning or nursery areas important to the establishment or maintenance of such fisheries **Section 2.2**
 - c. reference conditions appropriate for specific waters **See – “A Classification of the Aquatic Communities of Vermont (VTDEC – Biomonitoring and Aquatic Studies Section, 1998)”**
 - d. any recommended changes in classification and designation of waters **Chapter 5 and Appendix C**

- e. schedules and funding for remediation **Chapter 4 and Chapter 5**
- f. stormwater management **Section 2.2, 4.1, and 4.3**
- g. riparian zone management **Section 4.1 and 4.2**
- h. other measures or strategies pertaining to the enhancement and maintenance of the quality of waters within the basin. **Strategies in Chapter 4 and 5**

8. In basins that include class B waters which have not been allocated into one or more Water Management Type or Types pursuant to Section 3-06 of the WQS, the basin planshall propose the appropriate Water Management Type or Types based on both the existing water quality and reasonably attainable and desired water quality management goals. **Section 5.1 and Appendix C**

40 CFR, Section 130.6

9. Water Quality Management (WQM) plans....consist of initial plans produced in accordance with sections 208 and 303e of the Clean Water Act (CWA) and certified and approved updates of those plans.

10. State water quality planning should focus annually on priority issues and geographic areas and on the development of water quality controls leading to implementation measures. **Chapter 3, Chapter 4, and Chapter 5**

11. WQM plans are used to direct implementation. **Chapter 4 and Chapter 5**

12. WQM plans draw upon the water quality assessments to identify priority point and non-point water quality problems, consider alternative solutions and recommend control measures, including the financial and institutional measures necessary for implementing recommended solutions. **Chapter 3, Chapter 4, and Chapter 5**

13. State annual work programs shall be based upon the priority issues identified in the State WQM plan. **Strategies in Chapter 4**

14. The following plan elements shall be included in the WQM plan or referenced as part of the WQM plan if contained in separate documents when they are needed to address water quality problems:

- (1) Total maximum daily loads. **Chapter 3 and Section 4.2 and 4.5**
- (2) Effluent limitations - including water quality based effluent limitations and schedules of compliance. **Chapter 3 (Lake Champlain Phosphorus TMDL) and Appendix J**
- (3) Identification of anticipated municipal and industrial waste treatment works, including
 - (a) facilities for treatment of stormwater-induced combined sewer outfalls;
 - (b) programs to provide necessary financial arrangements for such works;
 - (c) establishment of construction priorities and schedules for initiation and completion of such treatment works. **Appendix J**

(4) Nonpoint source management and control

(a) describe the regulatory and non-regulatory programs, activities and best management practices (BMPs). (Economic, institutional and technical factors shall be considered....)..... BMPs shall be identified for the nonpoint sources identified in Section 208(b)(2)(F)-(K) of the CWA and other nonpoint sources as follows: **Chapter 2, Section 4.1, and Appendix B and K**

- (i) Residual waste
- (ii) Land disposal
- (iii) Agricultural and silvicultural
- (iv) Mines
- (v) Construction **Section 4.1**
- (vi) Urban stormwater **Section 4.1 and 4.3**

The nonpoint source plan elements outlined in #14 above shall be the basis of water quality activities implemented through agreements or memoranda of understanding between EPA and other departments, agencies or instrumentalities of the United States in accordance with section 304(k) of the CWA.

(5) Identification of management agencies necessary to carry out the plan and provisions for adequate authority for intergovernmental cooperation.....

Strategies in Chapter 4 and Chapter 5

(6) Identification of implementation measures necessary to carry out the plan, including financing, time needed to carry out the plan, and the social, economic and environmental impact of carrying out the plan in accordance with 208(b)(2)(E). **Strategies in Chapter 4 and Chapter 5**

(7) Identification and development of programs for the control of dredge or fill material in accordance with section 208(b)(4)(B) of the CWA. **Appendix B**

(8) Identification of any relationship to applicable basin plans developed under section 209 of the CWA. **This is the basin plan**

(9) Identification and development of programs for control of groundwater pollution including the provisions of section 208(b)(2)(K) of the CWA. States are not required to develop groundwater WQM plan elements beyond the requirements of section 208(b)(2)(K) of the CWA, but may develop a groundwater plan element if they determine it is necessary to address a groundwater (water) quality problem [see section 130.6(c)(9) for specifics of the groundwater plan element]. **Appendix B**

Title 6, Ch. 215, Agricultural Nonpoint Sources Pollution Reduction Program and Memorandum of Understanding Between the ANR and AAF&M

15. The Secretary of AAF&M shall cooperate with the Secretary of ANR in the basin planning process with regard to the agricultural nonpoint source waste components of each basin plan. **Section 2.2.2, Strategies in Chapter 4, Section 4.1 and 4.3, and Appendix K**

16. Any person with an interest in the agricultural nonpoint source component of the basin planning process may petition the Secretary (AAF&M) to require, and the Commissioner may require, BMPs in the individual basin beyond accepted agricultural practices (AAPs) adopted by rule, in order to achieve compliance with the water quality goals in section 1250 of Title 10 and any duly adopted basin plan. **The Basin Planning Process**

17. The Secretary shall retain State and federally mandated responsibilities related to basin planning, water quality management planning and the wasteload allocation process except that the Secretary shall coordinate with the Secretary AAF&M about those aspects of basin planning and water quality management planning which relate to the agricultural NPS component of each plan. **Strategies in Chapter 4 (4.1 and 4.3) and Appendix K**

18. The Secretary shall be responsible for determining the extent to which designated water uses and water quality standards are supported or impaired and for determining the causes and sources of water quality problems. The Secretary AAF&M may assist the Secretary with these determinations. **Chapters 2, 3, 4, and 5**

19. The Secretary AAF&M shall cooperate with the Secretary in basin/water quality management planning processes by preparing appropriate sections of each plan that relate to the implementation of controls and programs affecting agricultural NPS wastes and runoff. **Appendix B and K, Strategies in Chapter 4**

20. The wasteload allocation process results in the allocation of a river's limited assimilative capacity to receive discharges from point and nonpoint sources. The Commissioner DEC shall be responsible for the designation of wasteload allocations within specific river basins or watersheds. The Commissioner DEC shall coordinate with the Secretary AAF&M when making determinations regarding the magnitude of any wasteload allocation dedicated to pollution from agriculture nonpoint sources. **Strategies in Section 4.1 and 4.3**

21. The Secretary AAF&M shall follow the priorities identified in the most recent version of the Vermont State Clean Water Strategy, which describes the nature, location and extent of agricultural NPS pollution and the prioritization of river basins or waterbodies for further action. **The Vermont State Clean Water Strategy was developed in 1993. This Basin Plan supercedes the Vermont State Clean Water Strategy for the Poultney Mettowee River Basin.**

22. The Secretary AAF&M, in collaboration with the Commissioner DEC, shall conduct evaluations to determine to what extent and which land treatment measures, including BMPs, are necessary in each basin to achieve water quality standards. **Strategies in Chapter 5 and 6, Appendix K**

23. The Secretary AAF&M shall cooperate with the Commissioner DEC and shall be responsible for preparing descriptions of agricultural NPS programs and practices for the

biennial water quality assessment report required by Section 305(b) of the federal Clean Water Act (and for the report required under Title 10 V.S.A. Chapter 47). **Appendix K**

24. The Commissioner DEC shall retain the responsibility for evaluating the effectiveness of agricultural NPS control programs in attaining water quality standards. Such evaluations will be based on all available information with an emphasis on water quality monitoring data. The Secretary AAF&M shall be responsible for determining the effectiveness of land use practices to reduce the release of agricultural pollutants and for compatibility with sound agricultural practices. **Strategies in Chapter 4 (4.1 and 4.3)**

APPENDIX A: PUBLIC PARTICIPATION PROCESS USED IN DEVELOPMENT OF THE PLAN

This plan is developed under the premise of Principle # 4 of the *Guidelines for Watershed Planning – Draft November, 2001* which states, **“The process should be inclusive – maximize public participation and involvement in the local decision-making and action.”**

In general, the planning process follows the steps of issue identification, issue prioritization, development of strategies and solutions, allocation of resources and funding, and implementation. The planning process will occur for each watershed on a cyclical basis with the interim years designated for implementation, monitoring, and evaluation. In reality, the latter three activities will occur concurrently with the planning process, with the basin plan steering a continually evolving course of watershed improvement activities for the watershed.

Watershed Council – The *Basin Planning Guidelines* propose that local “Watershed Council” be formed in each basin to assist in the creation of a basin plan. In some basins an existing local organization may serve this role without having to create a new planning entity. The Poultney Mettowee Watershed Partnership is serving as the Watershed Council for the Poultney Mettowee Watershed, and is helping to facilitate the basin planning process. The Partnership is providing recommendations and strategies for implementing goals and objectives of the Basin Plan.

In order for public participation to be meaningful, an ongoing and evolving collaborative process should be emphasized throughout the planning process. While difficult to arrive at a consensus on all decisions, efforts made to promote a shared learning environment on most issues will help to ensure ownership of the problem-solving approach and its outcomes by Watershed Council members and residents of the watershed. Perhaps the most effective means by which to accomplish this is to engage the public early on and often throughout the decision-making process. In addition, by ensuring that the Council is inclusive and representative of constituents in the watershed, a meaningful planning process can take place.

Public Meetings – All meetings convened by the Watershed Partnership and/or the Vermont Department of Environmental Conservation are open to the public. Any issue defined through these meetings will be advisory to the Commissioner of the Department of Environmental Conservation, the Secretary of the Agency of Natural Resources and the Secretary of the Agency of Agriculture, Food, and Markets.

A series of public forums have been conducted throughout the watershed to generate basin plan strategies and project ideas. Ongoing input is sought from all interested community members during the planning and basin plan implementation process. Focus group meetings and kitchen meetings continue to be held throughout the watershed on an informal basis. A draft plan was made available for public comment in May, 2004.

Website – The Poultney Mettowee Watershed Partnership website, located at <http://www.vacd.org/pmnrcd/index.html> disseminates information about the Partnership and associated projects and other on-going efforts. Public meetings and meeting summaries are posted on the web. The issue ranking process is also accessible at this site. Articles that have appeared in local and regional newspapers are also included here. An index of these articles appears at <http://www.vacd.org/pmnrcd/press.html>. This website provides dates, times, and locations of Partnership meetings, as well as projects associated with the Partnership in which the public can participate. The Rutland Regional Planning Commission's website has additional minutes of meetings convened by the Regional Issues Committee regarding basin planning accessible at: <http://www.rutlandrpc.org>

The Agency of Natural Resources website provides several different means to locate information. Particularly helpful is the Natural Resource monthly page, available at: <http://www.anr.state.vt.us/NRMonthly.htm>, which provides information on public meetings in each watershed. Also helpful is Department of Environmental Conservation - Water Quality Division website that lists public meetings and meeting summaries at: <http://www.vtwaterquality.org/cfm/notices/alllist.cfm>. There are links about other related programs within the Water Quality Division including information about the Basin Planning Initiative, located at: <http://www.vtwaterquality.org/planning.htm>. Finally, the Lake Champlain Basin Program serves as a clearinghouse for most watershed associations and partnerships in the Lake Champlain Basin. To learn more information about the Program in general, or to find links to a specific watershed organization, go to: <http://www.lcbp.org/watersheds/assoc.htm>.

Newspaper – All public forums held in the Poultney Mettowee Watershed are publicly noticed in both *The Rutland Herald* and *The Lakes Region Free Press*. *The Lakes Region Free Press* ran fifteen weekly articles throughout the summer of 2001 to promote water quality efforts and opportunities underway in the basin. An excerpt from the September 7th, 2001 issue sums up the purpose of the articles:

“This is the tenth in a fifteen part series of weekly articles about the work of the Poultney Mettowee Watershed Partnership. The Partnership is a joint initiative of the Poultney-Mettowee Natural Resources Conservation District in Vermont, and New York's Washington County Soil and Water Conservation District, with funding for coordination by the Lake Champlain Basin Program. The mission of the Partnership is to bring together the efforts of citizens and organizations that share the common vision of conserving, protecting, and enhancing the natural and cultural resources of the watershed. To get involved, come to the **1st Annual Watershed Festival September 8**, attend the next meeting of the **Partnership Steering Committee September 19**, or contact the Partnership office 802-287-4284 - email pmwater@gwriters.com. Learn more on the Partnership website: www.vacd.org/pmnrcd.”

Television and Radio – Both television and radio are an additional resource for disseminating information to residents in the watershed. Two television programs

that have been particularly useful in promoting watershed planning have been the *Champlain 2000* Program (WPTZ) and the *Across the Fence* Program (WCAX). The *Champlain 2000* segment focused on the thermal impairment issue on the Mettowiee River and the project underway to identify sources and possible solutions to this problem. *Across the Fence* ran a segment on the formation of the Poultney Mettowiee Watershed partnership and a recent progress report on the activities and projects of the Partnership, specifically the Poultney Education Trail. The radio program, "Coffee Break" (WVNR, Poultney) has provided the opportunity for on-air discussions regarding basin planning.

Newsletters and Mailings – The primary method of contact with residents in the watershed who have expressed interest in the Watershed Partnership and water quality issues in general has been through newsletters and direct mailings. Approximately two hundred families and individuals received regular correspondence and updates through this medium. In addition, quarterly newsletters from the Watershed Partnership, the Poultney Mettowiee Natural Resource Conservation District, and the Rutland Regional Planning Commission reach thousands more in the Poultney Mettowiee Basin, as well as other parts of Rutland County. Recent issues of all three listed have focused on watershed planning.

Public Attitudes Survey – The Watershed Partnership conducted a public attitudes survey with assistance from Green Mountain College students. According to the Partnership's coordinator, Mary Jeanne Packer, "Green Mountain College students called nearly 1200 households in a five week period." About 300 residents "from all seventeen towns within the watershed in Vermont and New York participated," Packer said. Funding for the research came from the Vermont Community Fund and the Lake Champlain Basin Program with in-kind contributions from UVM Sea Grant Program and Syracuse University.

Issue Prioritization Process – All issues and concerns, visions and priorities were prioritized from the numerous focus group and public forums held in the watershed. Following compilation, the list of issues was sent out to all attendees, watershed council (steering committee) members, and PMNRCD Board members to review and rank. These were also sent out in survey format to mailing list of 400 households maintained by the Partnership. The survey was also available as a download from the PMWP website. A press release was sent out informing watershed residents of this effort. A meeting was convened in February to review responses and rank the issues. The goals of the Partnership have been revisited in anticipation of ranking priorities in the basin plan. The ranking table can be viewed at: http://www.vacd.org/pmnrpd/project_ranking.html

Public Meetings in the Poultney Mettowee Watershed

2001 Meetings

- **March 28th**, a **TMDL public meeting** was held at the Mettowee Community School.
- **April 11th** – **PM Watershed Partnership** steering committee/watershed council.
- **June 6th** - **issue-specific Partnership Steering Committee**. This meeting provided an overview of the impaired waters in the basin as well as a brief discussion of TMDLs and the thermal impairment on the Mettowee River.
- **June 26th** – Focus group meeting focused on **Lake Associations'** perception of lake issues and developing project areas on 6/26 in Castleton from 3 to 5 on a steamy afternoon. Other focus group meetings included:
- **July 23rd** – **Working Landscapes**; with representatives invited from the following stakeholders – Slate Quarry Association, VT Forest Products Association, Mettowee Lumber Mill, Poultney Snowmobilers Club, Merck Forest, Smokeyhouse, The Nature Conservancy, and the following “technical” rep’s – Nate Fice (County Forester), George Tucker (Conservation Forester), and Chris Olson (Consulting Forester).
- **July 25th** – **Water-Based Recreation**; with representatives invited from Woodard Marine on Bomoseen, Southwest Chapter of Trout Unlimited, The Audubon Society, Vermont Rivers Conservancy (Rebecca Purdhum), Lake St. Catherine Canoe & Kayak Rentals, Lake Association members (one from each invited), and the following “technical” rep’s – Bruce Brown (State Parks), Chris Alexopoulos (US Forest Service re: fisheries), Chet McKenzie (VT Fish & Wildlife), and Scott MacLachlan (Wildlife Biologist, Friends of the Poultney River).
- **September 8th** – **Watershed Festival** – To focus on and celebrate the watershed with highlights from the work of the Poultney Mettowee Watershed Partnership (PMWP) and other groups as well. Geared towards the community.
- **September 5th** – **Poultney Mettowee Watershed Council Meeting (open to the public)** – Overview of the PM Watershed Partnership and ANR Basin Planning Initiative – Who we are, what we’ve done so far since the original public forums. Are we still on track? Focus on breakout sessions to revisit priorities and developing project areas. This will be an opportunity to further develop strategies into basin plan.
- **Sept 10th** – Basin Planning Presentation **PMNRCD Board Meeting**
- **Sept. 18th** – Basin Planning Presentation at **Rutland RPC Board Meeting**
- **Sept. 19th** – **Poultney Mettowee Watershed Council meeting (core)**
- **October 4th** - **Watershed Planning Public Forum** - Watershed Coordinator and collaborators (The Nature Conservancy, The Poultney Mettowee Watershed Partnership, Poultney Mettowee Natural Resource Conservation District, Friends of the Poultney River, The Poultney Garden Club, Green Mountain College, and others) conducted joint public forum on water quality issues in the Poultney and Mettowee Rivers. Attendance numbered approximately 50 for the event, including State Senator Hull Maynard and Poultney Representative Fred Maslack.

- **October 9th – Agricultural Focus Group Meetings** for Basin Planning - Conducted focus group for agricultural producers in the watershed. An overview of the basin planning process provided discussion on agriculture in the basin with legal implication of Classification and Typing as well as (remedial work) the impaired waters in the basin, such as the thermal impairment of the Mettowee River.
- **October 25th – Agricultural tour of the Poultney Mettowee Watershed** with Leon Graves, Phil Benedict, Jon Anderson, and District managers of the Rutland and Poultney Mettowee NRCs and other members of both boards and the invited public. The Stone Brook Farm (along the mainstem of the Mettowee) was visited and Eileen Greber, the Nutrient Management Consultant for the PMNRC, presented the Nutrient Management Plan. Afterwards a good discussion regarding the agricultural component of the Basin Plan took place over lunch.
- **November 2nd – Basin planning presentation to the annual Farm Bureau** gathering. The emphasis of this meeting is the agricultural component of the Poultney Mettowee Basin Plan.
- **December 5th Public Forum in Poultney.** The emphasis for this meeting was to review the past and ongoing work of the Watershed Partnership and to re-prioritize the direction that the Partnership is headed. Specific areas addressed by the attendees continue to be areas of concern, areas for restoration and protection, and the management vision for the future in the watershed. Efforts to include more people in this process are an ongoing priority of the basin planning process.

2002 Meetings

- **January 15th – Rutland – Regional Issues Committee** – Review Regional Plan.
- **February 19th - The Regional Issues Committee** (acting water quality issues group to inform the Poultney Mettowee Basin Plan) has approved changes to the Water Resources Section of the Rutland Regional Plan that incorporates basin planning and water quality protection language into the Plan.
- **March 9th – Castleton Town Fair** – A municipal event to showcase town plan/resources and to hear feedback and input on the draft town plan. This all day event provided the opportunity to interact with town planning officials and residents on the content of the proposed town plan.
- **March 11th - West Rutland Selectboard Meeting** – Opportunity to meet with the selectboard to discuss the West Rutland Marsh project.
- **March 18th – Poultney Mettowee Watershed Partnership** meeting included a panel discussion on the value of using geomorphic assessments for planning purposes. As a result of the public presentation (3/26) of last year's thermal monitoring on the Mettowee River (by ENSR, project contractor), an additional meeting is planned for the evening of the March 18th.
- **March 18th - Public presentation regarding the thermal monitoring project on the Mettowee River** (by ENSR, project contractor), an additional meeting was held the evening of the 18th for the many of the riparian landowners (farmers). Barry Cahoon (DEC Rivers Management Program), Nate Fice (Rutland County

Forester), and George Tucker (Rutland County Conservation Forester) were on hand to discuss river dynamics and the value of buffers. Other participants included representatives from VT Fish & Wildlife, VTDEC, Poultney Mettowee Watershed Partnership, Orvis, and the PMNRCD. Seven farmers along the Mettowee and five landowners were in attendance.

- **May 13th – PMNRCD Board Meeting** – Update and discussion with USDA-NRCS District Conservationist on status of farms engaging in CREP and EQIP.
- **May 21st – Regional Issues Committee (RRPC)** – to review chapters 4, 5, and 6 and to schedule additional meetings with municipal selectboards. We received considerable input from regional commissioners (municipal officials), and expect to begin meeting more closely with individual towns this summer.
- **June 5th – Poultney Mettowee Watershed Partnership – Agricultural tour of projects and practices in the watershed.** The purpose of this tour was to get like-minded folks together to talk about issues that we see here locally, and listen to other ideas, suggestions, concerns and input. The day allowed for open dialogue, and out-of-the-box thinking, with a healthy respect for all opinions and suggestions.
- **September 10th – Poultney Mettowee Watershed Partnership meeting** – attended by representatives from the Burr Pond Association, Lake St. Catherine Association, Vtrans, The Nature Conservancy, The Intervale Foundation, The Rutland Regional Planning Commission, the Lake Champlain/ Lake George Regional Planning Board, PM NRCD, Wash. Cty NY SWCD, The Batten Kill Alliance, The George Aiken RC&D, Lake Champlain Sea Grant/ UVM, and others. Topics included current and upcoming grant projects, the Mettowee TMDL, the native plant nursery, and publicity and outreach efforts. A pilot project has been proposed for members of a local lake association to track their impacts on water quality through personal land management practices.
- **September 17th - Lake Bomoseen wetlands re-classification WRB Public Hearing**
- **October 18th – Gully Brook Restoration meeting** with concerned landowners (farmers), USDA-NRCS, USFW, VTDF&W, VTDEC, PMNRCD, PMWP, EPA-Lake Champlain Coordinator, and UVM students to discuss ongoing flooding and erosion issues associated with the confluence of the Gully and Castleton River.
- **Poultney Mettowee NRCD board meeting** – Discussion of upcoming Legislative Luncheon on Thursday, December 19th at Green Mountain College. The theme of this luncheon will be how “multiple partners have been able to achieve multiple objectives through the basin planning process”. Topics will include an overview of the Basin Plan, with focus on the partnership between ANR and the Poultney Mettowee Watershed Partnership - Poultney Mettowee NRCD. An executive summary is being prepared to share with legislators. We will have the Mettowee TMDL newsletter, a grant deliverable under the PMNRCD Mettowee River TMDL and Watershed Education Project (DEC grant)
- **December 19th – Legislative Luncheon in Poultney** - Discuss partnership with ANR and its successes and accomplishments including collaboration on basin planning. Other issues discussed include the native plant nursery and clayplain

restoration, the nutrient management program and the TMDL/ buffer outreach and education project.

2003 Meetings

- **PMNRCD Board Meeting** – Discussion focus on finalizing grant deliverables for the TMDL and Basin Planning Outreach and Education project. Final report forthcoming. Discussion of upcoming field season and several potential projects dependent on grant funding including:
 - Mettowee Buffer Outreach Campaign, Streambank stabilization project, and riparian restoration – plantings (**CWA 319 proposal**).
 - Poultney – Mettowee water quality monitoring project – to monitor and assess river reaches where documented existing uses occur – swimming (**LaRosa Laboratory**).
 - Rutland RPC – Phase 1 geomorphic assessment of the Castleton River (**CWA 604(b)**).

- **April 20th - GPS/GIS workshop** held at Castleton State College for natural resource inventories. . Good turnout from the hunting, fishing, birding, and boating communities in the basin.
- **May 14th – Poultney Mettowee NRC Board Meeting**
- **May 15th – Castleton Water Protection Committee** to discuss stormwater issues as they pertain to the Source Protection Plan – geographic area.
- **May 19th and 20th - Phase 1 Geomorphic Assessment Workshop** - Completed two-day workshop to initiate a geomorphic assessment training program and SGAT tutorial in conducting a phase 1 geomorphic assessment of the Castleton River watershed. This was a training on the ANR River Management Program’s Geomorphic Assessment Protocols and SGAT software in completing Phase 1 of the Assessment Protocol. The workshop was jointly hosted by the Rutland Regional Planning Commission, VT Department of Environmental Conservation, VT Fish & Wildlife, and Castleton State College. The workshop was well attended and represented by state agencies, 2 conservation districts, local and regional watershed groups, and academics from 2 area colleges.
- **June 3rd – Poultney Mettowee Watershed Partnership – steering committee meeting** - The PMWP met to discuss the evolution of the organization, from a newly started consortium of concerned citizens, to a fully functioning and productive entity. Accompanying this shift in identity is a need to re-assess the mission and priorities of the Partnership, search out different funding sources, and market the “projects and services” they offer to area communities. Several ideas were discussed of how to better to promote the work and services of the Partnership.
- **June 19th – Castleton Water Protection Committee** – The Castleton Source Water Protection Committee with the Rural Community Assistance Program and Vermont Department of Environmental Conservation staff conducted a field

assessment of the stormwater situation in Castleton, and its potential impacts to surface and ground water. Suggestions were made that will be incorporated as strategies in revisions to the town's Source Water Protection Plan.

- **July 24th – Poultney Mettowee NRCD Board Meeting** – This month's Board meeting focused on long-term workplan, grants and related projects, Farm Bill, 104(b) funding, basin plan, and organizing an October tour of agricultural projects and practices in the basin.
- **September 10th – Poultney Mettowee NRCD Board Meeting** - Discussed annual priorities with USDA-NRCS representatives. Discussed annual workplan for the Conservation District with respect to ongoing implementation of strategies. Discussed current and ongoing project updates.
- **September 15th - Lower Poultney – Hubbardton River Project Area - Clayplain and Floodplain Forest Restoration Plan Meeting** organized by The Nature Conservancy to discuss the process for implementing goals and objectives contained in the EPA Freshwater Project, "The Wetland and Riparian Habitat Assessment of the Poultney River" (including geomorphic assessment of the Poultney and Hubbardton Rivers). Partners in this project include USDA-NRCS, USFW, Green Mountain College, The Poultney Mettowee Watershed Partnership, and VTDEC-Water Quality Division. Some of these objectives and corresponding strategies appear in the Poultney Mettowee Basin Plan.
- **October 7th Agricultural tour of the Poultney Mettowee Basin** - Annual agricultural tour of farms and innovative practices implemented this season in the watershed. The tour included a visit to riparian restoration projects, a greenhouse project ("living machine") to treat milkhouse waste, and a whole animal composting and organic slaughterhouse operation.
- **December 18th – Annual Legislative Luncheon hosted by the Poultney Mettowee Watershed Partnership.**

2004 Meetings

- **March 16th – PMWP Quarterly Meeting with Partners**

APPENDIX B: REGULATORY AND NON-REGULATORY PROGRAMS THAT CONTAIN BMPs APPLICABLE TO PROTECTING AND RESTORING WATERS WITHIN THE BASIN INCLUDING RECENT AND ANTICIPATED DEC ACTIONS.

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RESIDUAL WASTES PROGRAM

State of Vermont
Agency of Natural Resources
Department of Environmental Conservation
Wastewater Management Division
Watershed Improvement Project
DEC Programs

POULTNEY, METTOWEE RIVER BASIN

1. Program Description:

Residuals Management

This section oversees the management of the state's residuals, such as septage and wastewater sludge. Permits are required for treatment, storage, or disposal of these residuals and for the operation or construction of such facilities. Environmental Analysts: Ernest Kelley, Patrick Lowkes

1. **Statutory Reference:** 10 VSA Chapter 159

2. **Contact: Section Chief: Catherine Jamieson**

3. Program Accomplishments in the past five years:

A. General info (with respect to surface and groundwater):

There are several regulatory requirements for the land application of sludge (biosolids) and septage that assist in protecting surface waters and groundwater, such as required set backs and separation distances, maximum allowed slope of site, nutrient management for site, etc. In 1998, the Solid Waste Management Rules were revised to include, along with other items, the prohibition of land application of solid waste in the area of the 100-year floodway as another measure to assist in protecting surface water quality.

B. Poultney, Mettowee River Basin:

The Town of Castleton has the only certification that authorizes the land application of biosolids or septage on sites in the Poultney, Mettowee River Basin, and is currently going through re-certification (February, 2001).

4. **Program activities planned in the basin in the next five years:**

We are not aware of any new proposed land application activities proposed for this area. The current certifications are required to be recertified once every five years.

<u>Permittee</u>	First Full Cert <u>Issued</u>	Recertification <u>Issued</u>	Next Recertification <u>Anticipated</u>
Castleton	1996	Pending	2006

LAND DISPOSAL [OF WASTES] PROGRAM

1) Indirect Discharge Permits - Program Description

The Indirect Discharge Permit Section within DEC issues permits for large land-based sewage treatment systems, such as septic tanks and leachfields and also treatment plants and spray disposal systems, all of which use soil as part of the waste treatment process. Following primary and/or secondary treatment, the soil provides final effluent renovation and polishing before it reaches groundwater and, eventually, surface water. This is in contrast to direct discharge systems, which may discharge through a pipe directly to surface waters. Permits are issued for a maximum of five years and the permittee must apply for renewal to continue authorization of the indirect discharge.

Statutory Reference: 10 VSA, Chapter 47

Program accomplishments in the Poultney-Mettowee basin in the past five years:

There is one identified indirect discharging system (with design sewage flows of greater than 6,499 gallons per day) in the Poultney/ Mettowee Basin. The system serves the Bomoseen State Park, has a design capacity of 9,000 gallons per day, and is located in the Town of Castleton. The indirect discharge is to the outlet of Glen Lake, which is also a tributary to Lake Bomoseen.

During a routine annual inspection of the system in 1999, a septic tank at the beach house was found to be malfunctioning. As a result of the comments from the Indirect Discharge Section, the tank was investigated further and found to be leaking sewage to groundwater. The tank has been replaced.

Program activities planned in the Poultney-Mettowee basin in the next five years:

The permit for Bomoseen State Park was renewed in January 2001 and will be subject to renewal again in 2006. The lat/ long coordinates for the disposal field for this system will be determined by use of a GPS unit prior to the next renewal of the permit. As part of on-going compliance activities, the Section will continue to review the annual engineer's report on the condition of this treatment and disposal system.

Rulemaking for a complete revision of the Indirect Discharge Rules is currently underway. These rules apply statewide and will affect all indirect discharging systems in the basin.

2) Regional Office Permits - Program Description

This section issues water supply and subsurface wastewater disposal permits required for all buildings other than single family homes and all permits for subdivisions, sewer line extensions, mobile home parks and campgrounds which have flows less than 6,500 gallons per day. If the subdivision involves 10 or more lots, Act 250 may take jurisdiction. Engineers in five regional offices examine applications and approve permits. The regional office that covers the basin is the Rutland Regional Office.

Statutory Reference:

10 VSA Chapter 61

18 VSA Section 1218

Program accomplishments in the Poultney-Mettowee basin in the past five years:

While the basin boundaries do not follow town boundaries the following towns are representative of the work done in the basin. The towns of Roxbury, Granville, Brookfield, Chelsea, Braintree, Randolph, Tunbridge, Hancock, Rochester, Bethel, Pittsfield, Royalton, Sharon, Stockbridge, Barnard, and Pomfret were reviewed and a combined total of 130 new lots were created and a total of 140 actions were taken under the Water Supply - Wastewater Disposal Permit Program. The WW permits included new projects, conversion of use, and replacement of failed water and wastewater systems.

Each of these actions resulted in protection of the watershed by ensuring that new and replacement systems were constructed in accord with the applicable rules and that any conversion of use did not overload existing systems, thereby causing pollution.

Program activities planned in the Poultney-Mettowee basin in the next five years:

It is expected that the existing activities will continue during the next five years. The number of projects will likely increase a small amount, based on the general trend in growth in these areas, however the economy has a strong linkage to the number of projects. The Department is seeking additional jurisdiction over water and wastewater systems, which if granted in the next legislative sessions, will significantly increase the number of systems reviewed and will greatly increase the percentage of the total number of systems constructed that must be permitted under the state rules.

AGRICULTURAL RUNOFF CONTROL PROGRAMS

1) State of Vermont Agricultural Programs

1.A. Accepted Agricultural Practices (AAP) are statewide regulations designed to reduce nonpoint pollutant discharges through implementation of improved farming techniques rather than investments in structures and equipment. The law requires that these practices must be technically feasible as well as cost effective for farmers to implement without governmental financial assistance.

AAPs are intended to reduce, not eliminate, pollutants associated with nonpoint sources such as sediments, nutrients and agricultural chemicals that can enter surface water and groundwater that would degrade water quality. AAPs are a group of basic farmland management activities, which will help conserve and protect natural resources. These practices will maintain the health and long-term productivity of the soils, water, and related plant and animal resources and reduce the potential for water pollution from agricultural nonpoint sources. Accepted Agricultural Practices include these practices among others: erosion and sediment control, animal waste management, fertilizer management, and pesticide management. AAPs are basic practices that all farm operators must follow as a part of their normal operations.

Implementation of AAPs by Vermont agricultural operators creates a reputable presumption of compliance with Vermont Water Quality Standards. The presumption that the use of Accepted Agricultural Practices complies with Vermont Water Quality Standards may be overcome by water quality data or results from a water quality study deemed conclusive by the Secretary. These rules, however, do not exempt farmers from the obligation to comply fully with the Vermont Water Quality Standards and the provisions of the Clean Water Act.

1.B. Best Management Practices (BMP) are more restrictive than Accepted Agricultural Practices and are site-specific practices to correct a problem on a specific farm. BMPs typically require installation of structures, such as manure storage systems, to reduce agricultural nonpoint source pollution. While farmers may realize an economic benefit from BMPs, it is unlikely that they will be affordable without governmental cost sharing.

The Vermont BMP program was created to provide state financial assistance to Vermont farmers in support of their voluntary construction of on-farm improvements designed to abate non-point source agricultural waste discharges. The program makes maximum use of federal financial assistance and seeks to use the least costly methods available to accomplish the abatement required.

The Vermont Agency of Agriculture, Food, and Markets (DAF&M) grants are limited to a cap of 35 percent of the total actual costs of the system in cases where either the federal government or other entities cost share the system, or 50 percent on projects with no other source of cost share assistance. Combined federal, state and other cost share participation may not exceed 85 percent of the eligible costs, ensuring grant recipients pay at least 15 percent of the total cost of each BMP. Awards of funding for BMP implementation shall require that the BMP be operated and maintained under contract or agreement for the design life of the practice under contract or agreement, but not to exceed 10 years.

It is a policy of the State of Vermont to assist farmers with the implementation of BMPs that will protect and maintain water quality by reducing agricultural nonpoint source pollution. The implementation of Best Management Practices is subsequent to the implementation of Accepted Agricultural Practices.

1.C. Large Farm Operations The purpose of the Large Farm Operations (LFO) program is to require farms with more than 950 animal units to be pro-actively managed in accordance with the accepted agricultural practices and to prohibit a direct discharge from their barnyard and environments commonly known as the facility. Farms that are following the regulations for LFOs should adhere to a technical standard to assure that they will not discharge to waters of the state. If farms chose to ignore the LFO rule or to create a discharge, they are required to obtain a National Pollution Discharge Elimination Systems permit (issued by DEC). There are at present no farms in the Poultney Mettowee watershed that require an LFO permit.

1.D. Conservation District Technical Assistance Program & “Farm*A*Syst” Free technical assistance and information is provided to help farmers meet the requirements of Vermont’s AAP regulations. Technical assistance for manure and nutrient management, runoff potential, floodway determinations, streambank stabilization, vegetative buffer strips and soil erosion potential are all addressed by the program. Agricultural Resource Specialists (ARS) work with landowners on strategies specific to their farms and provide information and referrals for State and Federal cost-share programs. “Farm*A*Syst” is a free drinking water protection program for farms based on voluntary assessments to determine how current practices and structures may pose a risk to drinking water. Voluntary farm assessments provide information that help ARS staff offer farm-specific suggestions for protecting the farm’s drinking water. Crop Consultants are available to assist farmers in developing nutrient management plans and record-keeping systems in order to maximize the benefit from fertilizer and manure applications while minimizing the impact of excess nutrients on water quality. The Crop Consultant program is available in part of the Poultney Mettowee watershed and is being reviewed for expansion into the remaining areas.

2) Federal Programs (US Department of Agriculture & US Fish & Wildlife Service)

2.A. Environmental Quality Incentives Program (EQIP) provides technical, educational, and financial assistance to eligible farmers working to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. This USDA program provides assistance to landowners in complying with Federal and State laws, and encourages environmental enhancement. Protection of surface and groundwater resources is the major focus of EQIP.

The program offers cost-share payments of up to 75% of costs up to \$50,000, to implement one or more eligible practices. Five- to ten-year contracts are made with producers to use and maintain cost-shared practices and require a conservation plan be created and carried out for the length of the contract. Priority is given to livestock

operations and targeted locations within the State. Applications are ranked on a point system and awarded by rank.

2.B. Conservation Reserve Enhancement Program (CREP) is a State-federal USDA conservation partnership program targeted to address specific State and nationally significant water quality, soil erosion and wildlife habitat issues related to agricultural use. The program uses financial incentives to encourage farmers and ranchers to voluntarily enroll in contracts of 10 to 15 years in duration to remove lands from agricultural production. This community-based conservation program provides a flexible design of conservation practices and financial incentives to address environmental issues. The state is considering enhancing the program to include 30-year easements on marginal pastureland where forested buffers would be required.

2.C. Conservation Reserve Program (CRP) is a voluntary program of USDA that offers long-term rental payments and cost-share assistance to establish long-term, resource-conserving cover on environmentally sensitive cropland or, in some cases, marginal pastureland. Converting highly erodible and/or environmentally sensitive cropland to permanent vegetative cover reduces soil erosion, improves water quality, and enhances or establishes wildlife habitat. CRP contracts are for a term of 10 years. However, for land devoted to certain practices such as hardwood trees, wildlife corridors, or restoration of cropped wetlands or rare and declining habitat, participants may choose contracts of up to 15 years. Incentives include annual rental payments of up to \$50,000 per year, cost-share payments of up to 50% of the cost for establishing cover, plus special incentive payments for wetland restoration.

2.D. Wildlife Habitat Incentives Program (WHIP) is a voluntary program that provides financial incentives to develop habitat for fish and wildlife on private lands. The USDA program provides both technical assistance and cost sharing help to participants who agree to implement a wildlife habitat development plan. Participants work with USDA's Natural Resources Conservation Service to prepare a wildlife habitat development plan in consultation with a local conservation district. The plan describes the landowner's goals for improving wildlife habitat, includes a list of practices, a schedule for installing them, and details the steps necessary to maintain the habitat for the life of the agreement.

USDA pays up to 75% (usually no more than \$10,000) of the cost of installing wildlife practices. USDA and program participants enter into a cost-share agreement that generally lasts a minimum of 10 years from the date the contract is signed.

2.E. Forestry Incentives Program (FIP) of USDA provides cost-share monies to help support good forest management practices on privately owned, non-industrial forestlands nationwide. FIP is designed to benefit the environment while meeting future demands for saw timber, pulpwood, and quality hardwoods. FIP's forest maintenance and reforestation projects also provide numerous natural resource benefits, including reduced soil and wind erosion and enhanced water quality and wildlife habitat.

FIP provides up to 65% of the total costs, with a maximum of \$10,000 per person per year, to assist with the establishment of eligible practices. Private landowners of at least 10 acres and no more than 1,000 acres of suitable land are eligible for funding. Normally the length of the program is from one to 10 years. There may be certain restrictions on time limits and on certain practices to be performed. Financial assistance ranges from \$50 to \$10,000 per year, with an average of \$1,600. Funding is limited, and priority areas for participation in the program are established at the local level.

2.F. Wetlands Reserve Program (WRP) of USDA is a voluntary program offering landowners a chance to receive payments for restoring and protecting wetlands. Marginal agricultural land that is too wet to produce, previously drained wetlands or land damaged by flooding are typical sites for WRP funding. Landowners retain control over access to their property and compatible uses such as haying, grazing, timber harvest, fee hunting, and trapping may be permitted upon request. Land can be resold. The program offers landowners three options:

1) Permanent Easement. USDA will pay up to the agricultural value of the land and 100% of the costs of restoring the wetlands and uplands.

2) 30-Year Easement. USDA will pay 75% of what would be paid for a permanent easement and 75% of the restoration costs.

3) Restoration Cost-Share Agreement. USDA will pay 75% of the cost of restoring a wetland in exchange for a minimum 10-year agreement to maintain the restoration. No land use payment is provided.

Easements and restoration cost-share agreements establish wetland protection and restoration as the primary land use for the duration of the easement or agreement. Restored wetlands improve water quality, filter sediment, reduce soil erosion, provide habitat for wildlife and endangered species, reduce flooding and provide outdoor recreation and education opportunities.

2.G. Farmland Protection Program (FPP) of USDA provides funds to help purchase development rights to keep productive farmland in agricultural uses. Since 1960, an average of 1.0 million acres of farmland have been converted to other uses each year, often resulting in permanent loss of valuable topsoil and agricultural land. The FPP was designed to help protect quality farmland with prime, unique, or other productive soil, from urban growth.

USDA provides up to 50 percent of the costs of purchasing easements. For the FPP, a conservation easement is an assigned right prohibiting any development, subdivision or practice that would damage the agricultural value or productivity of the farmland. To be selected for participation in the FPP, a pending offer must provide for the acquisition of an easement or other interests in land for a minimum duration of 30 years, with priority given to those offers providing permanent protection.

2.H. Watershed and River Basin Planning and Installation - Public Law 83-566 (PL-566) Technical and financial assistance is provided in cooperation with local sponsoring organizations, state, and other public agencies to voluntarily plan and install watershed-based projects on private lands. The program empowers local people or

decision makers, builds partnerships and requires local and state funding contributions. The purposes of watershed projects include watershed protection, flood prevention, water quality improvements, soil erosion reduction, rural, municipal and industrial water supply, irrigation water management, sedimentation control, fish and wildlife habitat enhancement and create and restore wetlands and wetland functions.

Watershed plans involving an estimated Federal contribution in excess of \$5,000,000 for construction, or construction of any single structure having a capacity in excess of 2,500 acre feet, require Congressional committee approval. Other plans are approved administratively. After approval, technical and financial assistance can be provided for installation of works of improvement specified in the plans.

Project sponsors are provided assistance in installing planned land treatment measures when plans are approved. Surveys and investigations are made and detailed designs, specifications, and engineering cost estimates are prepared for construction of structural measures. Areas where sponsors need to obtain land rights, easements, and rights-of-way are delineated. Technical assistance is also furnished to landowners and operators to accelerated planning and application of needed conservation on their individual units. There are presently over 1600 projects in operation. The Poultney-Mettowee basin is awaiting designation as a PL-566 project area.

2.I. Partners for Fish and Wildlife Habitat Restoration Program provides technical and financial assistance to private landowners interested in voluntarily restoring or otherwise improving native habitats for fish and wildlife on their lands. This USF&WS program focuses on restoring former and degraded wetlands, native grasslands, stream and riparian areas, and other habitats to conditions as natural as feasible. The program emphasizes the reestablishment of native vegetation and ecological communities for the benefit of fish and wildlife in concert with the needs and desires of private landowners.

The assistance that the US Fish and Wildlife Service offers to private landowners may take the form of informal advice on the design and location of potential restoration projects, or it may consist of designing and funding restoration projects under a voluntary cooperative agreement with the landowner. Under the cooperative agreements, the landowner agrees to maintain the restoration project as specified in the agreement for a minimum of 10 years. While not a program requirement, a dollar-for-dollar cost share is usually sought on a project-by-project basis.

SILVICULTURAL (LOGGING) RUNOFF CONTROL PROGRAM

1) Vermont Acceptable Management Practices (AMP) - Program

Description

Acceptable Management Practices (AMPs) for maintaining water quality on logging jobs in Vermont became effective on August 15, 1987. Since adoption of the AMPs, the Department of Forest Parks and Recreation (DFPR) has worked with the Vermont forest industry to support ANR Enforcement Division in an effort to eliminate discharges resulting from logging operations.

In 1990 a Memorandum of Understanding between the Agency of Natural Resources, Department of Environmental Conservation Enforcement Division and the Agency of Natural Resources Department of Forests, Parks and Recreation was developed which establishes a process that the DFPR and the forest industry may use to assist loggers or landowners when there is a discharge while maintaining the legal enforcement responsibilities assigned the Enforcement Division.

According to the agreement, five AMP Technical Advisory Teams were created to directly assist any logger or landowner when there is a potential discharge, complaint or request for assistance. Enforcement would be pursued in instances where:

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

Statutory Reference

10 VSA Section 1259

2) Vermont Heavy Cutting Law (Act 15) - Program Description

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

Statutory Reference

10 VSA Section 2625

Program accomplishments in the Poultney-Mettowee basin during the last five years

The heavy cutting program is now in its third year. Statistics are not kept on a river basin basis. There have been limited numbers of authorized heavy cuts within the basin. Most of them are associated with the 1998 Ice Storm. Some owners are salvaging severely damaged stands. It is expected that heavy cutting in the Basin will be a very small part of the heavy cutting that occurs across Vermont, both in numbers of cuts and numbers of

involved acres. Through December 2000 and on a statewide basis, 234 “Notice of Intent to Cut” applications were filed. Most of these fell under one of the exempt categories. They were covered in an approved forest management plan, agricultural clearing, a chip harvester operation approved by Vermont Fish and Wildlife Department or approved by Act 250. Thirty-five applications required an issuance of a “Notice of Intent to Cut.” All of the applications were reviewed by Department foresters for adherence to the appropriate silvicultural guidelines.

Future program activities in the Poultney-Mettowee basin in the next five years

It is expected that the small number of heavy cut applications within the watershed will decline even more as the ice storm fades into the past. The program of assisting landowners and reviewing applications for heavy cuts will continue. The impact of heavy cutting on the Poultney Mettowee River watershed will be minimal.

MINE RUNOFF CONTROL PROGRAM

Refer to Hazardous Waste Management Program.

CONSTRUCTION RUNOFF CONTROL PROGRAM

Sediment discharges to waterbodies is a critical stormwater issue. The Department, through the Vermont Geological Survey, developed a guidance document for erosion and sediment control related to construction activities (Vermont Handbook for Soil Erosion and Sediment Control on Construction Sites, Vermont Geological Survey, 1982, rev. 1987). This document is frequently used by developers and their consultants for project planning and responses to Criterion 4 of the Act 250.

DEC routinely reviews Act 250 applications for adequacy of the erosion control plans and stream buffer protection.

General Permit for Stormwater Runoff from Construction Sites

Why: Sediment runoff rates from construction sites are typically 1,000 to 2,000 times greater than those from forested areas. During a short period of time, construction activity can contribute more sediment to our streams than can be deposited naturally over several decades, causing physical, chemical, and biological harm to our waters. The development of an erosion control plan helps to protect water quality by preventing the discharge of sediment from construction sites, minimizing the extent and duration of soil disturbance, maintaining existing drainage ways and vegetation, and protecting riparian buffer areas from disturbance.

Who: Any construction project that disturbs one or more acres of soil, including any disturbance of less than one acre which is part of a larger common plan that will result in a total of one or more acres of disturbance.

- What:* A General Permit to permit discharge of stormwater from construction sites; requires the development and submittal of an erosion and sediment control plan.
- When:* At least 30 days prior to the commencement of construction activity.
- Where:* An application can be obtained from:
Vermont Agency of Natural Resources
Department of Environmental Conservation
Division of Water Quality, Stormwater Section
103 South Main Street, Building 10 North
Waterbury, VT 05671-0408
Stormwater Hotline 241-4320
http://www.anr.state.vt.us/dec/waterq/stormwater/htm/sw_cgp.htm
- How:* Complete the application, enclose a copy of the erosion and sediment control plan and a fee of \$100 and send to the address listed above.
- What's next:* One or more but less than five acres of disturbance over time: Develop the Plan in accordance with the draft permit; send a letter of notification of construction commencement to the address listed above. The Department will contact you with further instructions.
- Five or more acres of disturbance over time: Complete the application form, enclose a copy of the erosion and sediment control plan and a fee of \$250 and send to the address listed above.

HAZARDOUS WASTE MANAGEMENT PROGRAM

1) Hazardous Waste Management - Program Description

The Hazardous Waste Management Program within DEC establishes the regulatory framework for all hazardous waste generated in Vermont and provides a "cradle-to-grave" tracking system for these wastes. The program establishes the standards for proper management of hazardous waste while also addressing the environmental and human health problems that arise from the mismanagement of hazardous waste. Improper management of hazardous waste can pollute vast areas of land, rivers, streams and lakes, and can lead to unacceptable human exposure to these materials. The program is a prevention program -- when it is successful, these impacts occur less frequently and with less severity.

Statutory Reference

Title 10 VSA Chapter 159, the Waste Management Act.

Specific sections include 10 VSA 6601, 6602, 6604, 6605f, 6606, 6606a, 6606b, 6607, 6607a, 6608, 6608a, 6608b, 6609, 6610a, 6612, 6615, 6616, 6617, 6618.

Program accomplishments in the Poultney-Mettowee basin in the past five years:

Over the last five years the program has succeeded in keeping to a schedule that has every Large Quantity Generator (LQG) of hazardous waste inspected every four years. LQGs generate more than 2,200 pounds of hazardous waste per month. Small Quantity Generators (SQGs) have been inspected approximately every 6-10 years. SQGs generate between 220 and 2,200 pounds of hazardous waste per month. The last category of generators, Conditionally Exempt Generators (CEGs) generate less than 220 pounds per month. The program visits 40 to 80 of these generators per year, often in a complaint response or assistance mode. The program now has virtually all LQGs, and approximately 70% of SQGs, in a computerized overlay mapping system or GIS. The program has settled over 25 formal enforcement actions since 1995. The program has also provided assistance in the field and from the office on a regular basis. The program has approximately 8 sites in RCRA corrective action, for which all but one have met the EPA's GPRA goals for corrective action codes of CA725 (human exposures controlled) and CA750 (migration of contaminated groundwater controlled).

Future program activities planned in the Poultney-Mettowee basin in the next five years:

Although the program's activities are not currently broken down by watershed and since the program inspects all LQGs in the state every four years, the program must get to every LQG in the basin in that same timeframe. The program intends to keep GIS as current as possible, maintaining a near 100% rate for LQGs and 80-90% for SQGs (who are a more dynamic population). The program plans to do cooperative work with the DEC Environmental Assistance Division with the metalworking sector. This would impact some generators in the Poultney Mettowee River Basin. Although the program is interested in having more direct connections to the resources (media) it is designed to protect, the small number of program staff will likely limit such connections to sub-basin efforts.

2) Underground Storage Tanks - Program Description

All Vermonters depend on clean water. Leaking underground storage tanks (USTs) pose a substantial threat to both human health and the environment, because substances leaked from these tanks are one of the most significant contaminants polluting ground and surface water supplies. In densely developed areas, releases from underground tanks pose an additional risk, since gasoline vapors can accumulate in basements and crawl spaces, posing health hazards as well as fire dangers.

The goal of the UST Program within DEC is to protect human health and the environment by eliminating releases of hazardous materials from underground storage tanks, and fostering proper management of underground tanks in Vermont. By regulating the installation, operation, and closure of USTs, the Underground Storage Program protects the state's water resources and prevents vapor impacts to buildings.

Statutory Reference

10 VSA Chapters 59 and 159

SOLID WASTE MANAGEMENT PROGRAM

Program Description

The Solid Waste Management Program regulates the treatment, storage and disposal of solid waste, with the exception of the land management (diffuse disposal) of biosolids and septage, which is regulated by the Wastewater Management Division. In order to receive a certification, a facility must demonstrate that it complies with applicable siting, design, operation, closure and post closure requirements and standards included in the Vermont Solid Waste Management Rules. The Solid Waste Management Program also assists the Enforcement Division in illegal dumping/disposal cases.

The protection of water related resources are specifically addressed in the Vermont Solid Waste Management Rules (“SWMR”), Vermont Groundwater Protection Rule and Strategy, and Agency Procedures applicable to solid waste management facilities (with the exception of biosolids or septage diffuse disposal). These requirements are to be addressed in a solid waste facility application for certification and may be specifically addressed in the requirements of a certification issued by the Agency.

- Solid Waste Disposal Facilities must be in compliance with the Vermont Ground Water Protection Rule and Strategy and the Vermont Water Quality Standards to receive certification - §6-303(d) of the SWMR, Vermont Groundwater Protection Rule and Strategy, 2/8/99 Procedure Addressing Requirements For Municipal Solid Waste Landfills To Demonstrate Compliance Of The Landfill Design With Water Quality Standards, and 2/8/99 Procedure For A Combined Solid Waste Certification and Indirect Discharge Permit.

- The SWMR identifies various types of water related resources as prohibited areas for the siting of solid waste management facilities - §6-309(c)(6), §6-502(a) and §6-1104(b)3(b)(3) of the SWMR.

- Facilities must meet performance standards in order to assure that siting of the facility will have the least possible reasonable impact on the environment, including groundwater, surface water or waters of the state. §6-503 of the SWMR. and 9/12/95 Procedure Addressing the Numerical Criteria For The Distance To Drinking Water Sources From Discrete Disposal Facilities.

- Site characterization on which a facility is to be located must address groundwater and surface water - §6-603 of the SWMR.

- Facilities must be designed and operated to protect the environment, including ground water and surface water - §6-604(a)(4), §6-606(a)(3), §6-701, §6-1104(c)(2)(E) and §6-1203&1204 of the SWMR. Most landfills must be lined with leachate collection and off-site treatment and must control run-on and run-off - §6-606(b)(2) of the SWMR and 6/9/94 Procedure Addressing Requirements For Run On/Run Off Control System for Municipal Solid Waste Landfills.

- Facilities are to be monitored as deemed appropriate to detect the discharge of contaminants to groundwater and surface water. For landfills, monitoring continues through the operational life of the landfill and the post closure period (20 years for unlined landfills that closed since 1989, 30 years for lined landfills which operated since 1994) - §6-604(a)(4) and §6-606(a)(3) of the SWMR. 2/8/99 Procedure Addressing Ground Water Quality Monitoring and Ground Water. 2/8/99 Remedial Action at Municipal Solid Waste Landfills. Procedure Addressing Post-Closure Care and Post Closure Certification At Solid Waste Landfills.

- A response involving corrective action for ground water impacts by a solid waste landfill can be required - VT Groundwater Protection Rule and Strategy and 2/8/99 Procedure Addressing Corrective Action & Financial Responsibility For Corrective Action At Solid Waste Landfills.

- Any discharge that poses a threat to the environment must be reported within 24 hours to the DEC.- §6-703(c) of the SWMR.

- Facilities must be closed in a manner that prevents discharges to surface water during and after closure -§6-1001 of the SWMR.

Statutory Reference

10 VSA Chapter 159 (Waste Management)

10 VSA Chapter 48 (Groundwater Protection).

Contact

Julie Hackbarth, Chief, Technical Assistance Section.. 241-3446

Program accomplishment in the past five years in the Poultney-Mettowee basin:

- Closure of the unlined Town of Pawlet Landfill.

Future program activities planned in the Poultney-Mettowee basin in the next five years:

- Continued regulatory oversight of the Pawlet Landfill, including review of ground water and surface water data.

- Cleanup of illegal dump sites as they become known.

DAM SAFETY PROGRAM

Program Description

The Dam Safety Section administers the State Dam Safety program, operates and maintains the Winooski Valley Flood Control Reservoirs, and periodically inspects the 85 state-owned dams and plants found throughout Vermont for their repair/improvement needs. The section operates a permit program for construction and alteration of non-hydroelectric dams (the Public Service Board regulates hydroelectric dams) to serve the public good and provide adequately for the public safety. The section inspects privately

owned dams on a resources-available basis, maintains an inventory of dams, and provides technical assistance to dam owners.

Permit Program: A permit is required to alter any dam, pond or impoundment not related to generation of electric energy for public use or part of a public utility system which is or will be capable of impounding more than 500,000 cubic feet of water or other liquid, as measured to the top of the dam. Requires submittal of completed application form, fee, plans and specifications and design data. May require public information meeting.

Statutory Reference

Permit program: 10 VSA Chapter 43 (Dams).

Program accomplishments in the Poultney-Mettowee Basin the past five years:

Dam safety inspections take place on a cyclical basis, and recently include the Lake St. Catherine outlet dam and historic slate mill dams on the Castleton River in Fair Haven.

Program activities planned in the Poultney-Mettowee Basin in the next five years:

No specific activities are planned. The program will address issues and problems that may arise including the conduct of dam inspections as appropriate.

LAKES AND PONDS MANAGEMENT AND PROTECTION PROGRAM

Lakes and Ponds Management and Protection Program

Program Description: The Lakes and Ponds Management and Protection Program monitors the water quality, aquatic biota, and aquatic habitat of Vermont lakes; seeks to prevent water quality problems or habitat degradation; determines the causes of problems that arise; and in collaboration with others, develops management or restoration plans to address problems. Technical and financial assistance is provided to municipalities, lake associations, and individuals to help them implement lake management and protection activities. The Program also administers permits for aquatic nuisance control activities and encroachments into lakes, and assists other state programs with lake-related issues such as water level management, Act 250 review, point source discharge permitting, Use of Public Waters rulemaking by the Water Resources Board, and near-shore waterski course regulation by the Vermont State Police. Public information and education is an important part of the Lakes and Ponds Management and Protection Program, and educational materials for all ages on a wide variety of lake and watershed-related topics are available from the Program. Elements of the Program of particular relevance to the Poultney-Mettowee River Basin include the Lay Monitoring Program, the Lake Champlain Long-Term Water Quality and Biological Monitoring Program, the Lake Assessment Program, the Aquatic Nuisance Control Program, the Lake and Watershed Protection Program, and the Information/Education Program (Project WET).

Through the *Lay Monitoring Program*, volunteers are equipped and trained to monitor lake water quality on a weekly basis during the summer months. The program enables the VTDEC to obtain detailed water quality information on a larger number of lakes than

would otherwise be possible, while educating volunteers about lake ecology and lake protection. Participation ensures the VTDEC has long-term seasonal data on lakes in the Basin, and accordingly, emerging water quality problems can be caught more quickly.

The ***Lake Champlain Long-Term Water Quality and Biological Monitoring Program*** includes sampling stations near the mouths of the Poultney and Mettowee Rivers. Regular sampling has been conducted at these stations since 1990 for total phosphorus concentration and a variety of other water quality parameters. The purpose of the monitoring program is to document expected reductions in phosphorus loading to Lake Champlain, and to detect other long-term changes in water quality.

The ***Lake Assessment Program*** consists of a variety of monitoring projects that range from simple one-day site visits to long-term diagnostic studies. The results of these monitoring projects help the VTDEC characterize current water quality conditions, detect trends, and determine which lakes are supporting their designated uses. Ongoing special projects of basin-wide significance include a project to determine lakes most likely to exhibit mercury contamination in fish, and an effort designed to characterize expected biological communities in lakes of differing types, under varying degrees of human disturbance.

The goal of the ***Aquatic Nuisance Control Program*** is to prevent or reduce the environmental and socio-economic impacts of nuisance (primarily non-native) aquatic plant and animal species. Many species are included in the Program; however the priority species at this time are Eurasian watermilfoil, water chestnut, zebra mussels, and purple loosestrife. The Program's components include control technology research, environmental monitoring, control and spread prevention projects and technical assistance, a permit program, a grant-in-aid program for municipalities, and public information/education.

Control technology research efforts assure that Vermont biologists stay informed about currently available or potential new control technologies nationwide or worldwide, and when appropriate, participate in research or demonstration projects to evaluate the effectiveness of control techniques in Vermont. *Environmental monitoring* is conducted to monitor the populations of priority aquatic nuisance species in Vermont lakes, detect new infestations as quickly as possible, and monitor the effectiveness and environmental impact of various control programs.

Considerable technical assistance is provided to municipalities and local organizations to help them design and implement long-term *control and spread prevention projects* on lakes with existing populations of nuisance aquatic species, and to help them prevent the spread of nuisance species into uninfested lakes. In certain circumstances, such as the management of water chestnut on Lake Champlain or the development of legislation or rules to control the spread of nuisance species, biologists in the Aquatic Nuisance Control Program directly initiate control or spread prevention projects. The Program also administers a *permit program* under 10 V.S.A. §1263a to authorize aquatic nuisance control activities in state waters, and a *grant-in-aid program* to assist municipalities by

providing grants for up to 75% of the cost of aquatic nuisance control and spread prevention projects.

Public information and education is an essential part of the Aquatic Nuisance Control Program. It is critical that lake users understand the serious impacts that nuisance aquatic species can have on the state's aquatic resources and on people's use of those resources, and are aware of what can be done to prevent the spread of nuisance species to uninfested waterbodies. In the case of nuisance aquatic species, an ounce of prevention is truly worth a pound of cure.

The ***Lake and Watershed Protection Program*** provides technical and financial assistance to local governments and volunteer groups for a wide variety of lake protection activities. Groups are provided information and guidance to enable them to conduct lake and watershed surveys to identify pollution sources and develop plans to correct problems found during surveys. Assistance grants are available through the state's Conservation License Plate Watershed Grants Program for conducting these surveys and developing and implementing remediation plans. The VT Better Backroads Program provides more targeted assistance to enable municipalities to reduce erosion and sediment-laden runoff from gravel roads. Information and technical assistance is also available regarding local planning and zoning options to enhance water quality protection.

Information/Education: The Lakes and Ponds Management and Protection Program understands that educating Vermont's citizenry about water quality issues is critical to engendering long-term water quality protection. The Program handles countless information requests annually, on issues ranging in scale from small pond management to providing information for national-level environmental policy decisions. Moreover, educating today's youth is crucial to protecting lake water quality in the future. The Water Quality Division is the Vermont sponsor of the national Project WET (Water Education for Teachers) Program. Project WET is an interdisciplinary water education program for kindergarten through twelfth graders to promote awareness, appreciation, knowledge and stewardship of Vermont's water resources. Project WET workshops are conducted throughout Vermont during the year to introduce and train formal and informal educators in the use of the Project WET Curriculum and Activity Guide. There is a per-person cost for the workshop and Activity Guide. Interested schools, districts, and other organizations can request on-site Project WET workshops with a minimum of ten participants.

Statutory References: 10 V.S.A. §921-923; 10 V.S.A. §1263a; 10 V.S.A. Chapters 37, 47 and 49; 29 V.S.A. Chapter 11; Act 250; Clean Water Act § 314, 319, 401 and 404; Vermont Water Quality Standards.

Contacts: The primary contact person varies, depending on which program element is involved. Contact the Lakes and Ponds Section at 241-3777. Primary contacts most pertinent to the Poultney-Mettowee River Basin are: Lay Monitoring Program - Amy Picotte; Lake Assessment Program - Neil Kamman; Aquatic Nuisance Species Spread Prevention Program - Michael Hauser; Lake and Watershed Protection Program - Susan

Warren; and Project WET - Amy Picotte. Also see the Water Quality Division's web page at www.vtwaterquality.org for more information on these programs.

Program accomplishments in the past five years in the Poultney Mettowee Basin:

Lake Monitoring Program:

- Volunteers on six lakes participated in the Lay Monitoring Program during this time, providing 24 annual estimates of lake trophic state.

Lake Champlain Long-Term Water Quality and Biological Monitoring Program:

- A consistent annual monitoring program has been sustained on Lake Champlain since 1990, with funding support from the Lake Champlain Basin Program.

Lake Assessment Program:

- Two lakes were surveyed for mercury contamination; biological characterizations were performed on two lakes; 13 lakes were visited for general assessment purposes; and 37 spring nutrient measurements were made on 22 individual lakes.

Aquatic Nuisance Control Program:

- Aquatic Nuisance Control grants were awarded for Eurasian watermilfoil management projects (control, spread prevention, or both) on Beebe (Hubbardton); Burr (Sudbury); Hortonia (Hubbardton); St. Catherine, Little and Lily (Wells, Poultney); Sunrise (Benson); and Sunset (Benson).
- Weevil populations were augmented in Black Pond (Hubbardton).
- A water chestnut partnership was established with The Nature Conservancy and water chestnut was handpulled in Cogman and Mill Ponds (Benson).
- Eurasian watermilfoil was handpulled in Sunset Lake (Benson) and Burr Pond (Sudbury).
- The aquatic herbicide "Sonar™" has been applied to Beebe Lake, Burr Pond, Lake Hortonia, and Sunrise Lake to control Eurasian watermilfoil infestations.

Lake and Watershed Protection Program:

- Assisted the town of Benson with the design and funding for a road bank erosion control/stabilization project on Sunset Lake.
- Filled requests for information or recommendations regarding Lake St Catherine and Beebe Pond.
- Awarded Vermont Better Backroads grants to approximately five towns in the basin.
- Awarded Conservation License Plate Watershed Fund grants to four local watershed projects in the basin.

Information/Education:

- Hundreds of information requests were filled (the exact number of information requests is not tracked).
- New lake and pond information was made available over the Internet and existing information on the Water Quality Division's web page was redesigned.

Future program activities planned in the Poultney Mettowee River Basin in the next five years:

- Continue to offer volunteers the opportunity to participate in the Lay Monitoring, including accommodating new citizen monitors where possible.
- Continue to conduct the Lake Champlain Long-Term Water Quality and Biological Monitoring Program.
- Continue lake assessment activities.
- Continue to provide technical and financial assistance for the management of aquatic nuisances.
- Continue to carry out water chestnut control on Coggman and Mill (Benson) Ponds.
- Continue to offer technical and financial assistance on lake watershed management issues and projects through the Lake and Watershed Protection Program.

Other Lake Issues in the Basin:

- **Lake St. Catherine** – Supports a coldwater trout fishery (Rainbow, Brown and Lake Trout) and an excellent warm water fishery. In July of 1997, Vermont State Fisheries Biologists discovered alewives in Lake St. Catherine, Rutland County. State Biologists are concerned that the establishment of this exotic fish species in Vermont waters could prove to be a major threat to native forage and game fish populations. The threats posed by the alewives are not limited to Lake St. Catherine. Water from Lake St. Catherine flows into Little Pond and over a dam into Mill Brook. Mill Brook enters the Mettowee River, which empties into the Barge Canal and then southern Lake Champlain. The implications of alewives becoming established in Lake Champlain are serious. The multi-million dollar Salmonid Restoration Program run by Vermont, New York, and the U.S. Fish & Wildlife Service could be in jeopardy. Direct competition from alewives could have a negative impact on native fish communities including smelt, yellow perch, and other important forage fish that game fish populations such as trout, salmon, and bass depend on. The use of chemical piscicide (Rotenone) has been mentioned as one management option for control of the alewife. A follow-up with VTF&W fisheries biologists may yield a more comprehensive management plan regarding this issue. (Shawn Good, VTF&W fisheries biologist is developing this management plan.)

The Aquatic Nuisance Species Program of VTDEC (2002) indicates that Eurasian watermilfoil densities in the Lake St. Catherine chain is as follows: Lake St. Catherine – heavy infestation, Little Pond – heavy infestation, Lily Pond – moderate infestation. The Lake St. Catherine Association has submitted a permit application for use of Sonar A.S. to control Eurasian watermilfoil in Lake St. Catherine as well as the adjoining ponds (Lily and Little). This application is currently under review.

Recently, investigation into the condition of the dam at the outlet of Little Pond has led to an updated dam assessment report. It has been determined that the dam undergo re-conditioning in the near future to repair the deteriorating slate face, as well as replacing the 1960's era sluice (stop) boards.

- **Burr Pond** – At the September 10th, 2002 Poultney Mettowee Watershed Partnership meeting, Nance McShane from the Burr Pond Association asked the Partnership if there was financial and/or technical assistance available for their Association to combat milfoil. The Partnership agreed to pursue education and outreach opportunities for the Burr Pond Association. Specifically, the Partnership will look into additional signage regarding invasive species that could be erected at the F&W access, as part of the Lake Champlain Byways project. The Aquatic Nuisance Species Program of VTDEC (2002) indicates that Eurasian watermilfoil density in Burr Pond as “moderate”. The Associated has indicated they plan to join with the Lake Hortonia Association to submit a permit application to re-treat Eurasian watermilfoil with Sonar A.S.
- **Sunset Lake** – At the September 3rd, 2002 meeting with the Benson selectboard, to discuss Classification and Typing candidates, the Board expressed the desire to improve public access to Sunset Lake. The Watershed Planning Process could advocate the need for improved access to the lake if (1) it was confirmed to be in the public interest and had local public support and (2) property came available for a suitable access area. As Sunset Lake is a public waterbody of the state, and the current access area is unsuitable for public health and safety reasons, there appears to be the need to improve access at this time. A Better Backroads grant was awarded to the town of Benson (fy2001) to alleviate road erosion along the lake.

Non-chemical control of a light Eurasian watermilfoil population has been successfully implemented for the last few years.

- **Sunrise Lake** – This Lake supports the Southern naiad *Najas guadalupensis*. This plant was last observed in 1993, and may be threatened by Eurasian watermilfoil present in the lake. Sunrise Lake has been treated with the herbicide “Sonar™” applied to control an Eurasian watermilfoil infestation.
- **Lake Bomoseen** (wetlands) – The Water Resource Board members recently voted unanimously to reclassify the 450-acre wetland to Class One. The Water

Resources Board also reopened a comment period on whether to vary the buffer zone accompanying it, normally 100 feet. Because of the testimony on that issue, a flexible buffer zone was allowed for Ledgemere Point that remains as a 50-foot setback to the mean watermark. The Aquatic Nuisance Species Program of VTDEC (2002) indicates that Eurasian watermilfoil densities in Lake Bomoseen as “heavy”

- Several lake and pond associations have applied to use the herbicide SONAR to reduce populations of Eurasian watermilfoil. Thousands of lakes and ponds in the U.S. have been treated with SONAR, but 2000 marked the first time that it was approved for use in the Vermont portion of the watershed. SONAR has also been used in several New York water bodies. SONAR, which is expensive, and must be applied according to state permit requirements, was used in Lake Hortonia, Burr Pond and Sunrise Lake in Vermont. The concentration used for treatment in these water bodies was considerably less than has typically been used in other states. A three-year aquatic plant monitoring program is underway on Burr Pond and Lake Hortonia to determine the treatment’s effectiveness on controlling Eurasian watermilfoil and assess impacts to non-target aquatic plants. The Lake George Association is currently hosting hearings to support a SONAR demonstration project to control milfoil on Lake George.

HYDROLOGY PROGRAM

Program Description

This program within DEC reviews all projects that may alter the natural flow of rivers and streams, such as hydroelectric projects and all manner of water withdrawals. These reviews may take place under a number of regulatory programs, including Act 250, Agency dam orders and stream alteration permits, and projects subject to federal licenses or permits (under Section 401 of the Clean Water Act). In addition, the Hydrology program evaluates projects subject to Act 250 for riparian protection provisions, erosion control measures, and general consistency with Vermont Water Quality Standards.

Statutory References

10 V.S.A. Chapter 41 (Regulation of Stream Flow)

10 V.S.A. Chapter 43 (Dams)

10 V.S.A. Chapter 151 (Act 250)

Section 401 of the Federal Clean Water Act (33 U.S.C. §1341)

Program accomplishments in the Poultney-Mettowee Basin during the past five years:

Participation in Act 250 hearings and related proceedings.

Program activities planned in the Poultney-Mettowee Basin in the next five years:

Working with a wide range of stakeholders, staff is identifying dams that are obsolete and are good candidates for removal. The program will continue its routine evaluation of projects seeking land use permits.

WETLANDS, DREDGE AND FILL MATERIAL CONTROL PROGRAMS

1) Vermont Wetlands Protection - Program Description

The overall goal of the program is to achieve no net loss of wetland functions and values. The program consists of three components: a regulatory component, a scientific component, and an education and outreach component. The regulatory aspects of the program include administering the Vermont Wetland Rules, making determinations of Water Quality Certification under the Clean Water Act and the Vermont Water Quality Standards, providing project review concerning wetlands in Act 250 land use permitting, and assisting in compliance and enforcement. Inventories and scientific investigations are carried out as special grant projects and include both the biomonitoring section of the division, and biologists in the Department of Fish and Wildlife, Nongame and Natural Heritage program. Education and outreach is provided through technical assistance, workshops and presentations to towns, stakeholder groups, conservation commissions, schools, and other Agency programs.

Statutory references:

Sections 404 and 401 of the Clean Water Act
Section 104(b) 3 of the Clean Water Act
Act 250
Title 10 VSA Chapter 37, Sec. 905 (7-9).

Program accomplishments in the Poultney-Mettowee Basin during the past five years:

Site visits to projects involving wetlands in the watershed, with resulting no net loss of or undue adverse impacts to wetland functions and values of Class Two wetlands. Support to the Heritage Program for inventory work in the basin for significant natural communities. Education programs for schools, workshops for real estate agents, loggers, and towns in the watershed.

Future program activities planned in the Poultney-Mettowee Basin in the next five years:

Emphasis on including wetlands in the basin assessment and the plan. Continuation of the above activities, with addition of wetland assessment for status and trends in the basin. Seek opportunities for wetland restoration and enhancement.

2) Federal Wetlands Protection - Program Description

A Corps of Engineers permit is required for all work beyond ordinary highwater in or above navigable waters of the United States under Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403). In New England, for the purpose of Section 10, navigable

waters of the United States are those subject to the ebb and flow of the tide and a few major waterways used to transport interstate or foreign commerce. Permits are required under Section 404 of the Clean Water Act for those activities involving the discharge of dredged or fill material in all waters of the United States, including not only navigable waters of the United States but also inland rivers, lakes, streams and wetlands. In inland waters Corps jurisdiction under the Clean Water Act extends landward to the ordinary high water mark or the landward limit of any wetlands. The term "discharge" in this context may include the re-depositing of wetlands soils such as occurs during mechanized land clearing activities, including grubbing, grading and excavation.

The term "wetlands," used above, is defined by Federal regulations to mean "...those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions..." (33 C.F.R. Part 328.3 (b), as published in the November 13, 1986 Federal Register).

Wetlands generally include swamps, marshes, bogs and similar areas.

The term "fill material," used above, is defined by Federal regulations to mean "...any material used for the primary purpose of replacing an aquatic area with dry land or of changing the bottom elevation of a waterbody. The term does not include any pollutant discharged into the water primarily to dispose of waste..." (33 C.F.R. Part 323.2 (b), as published in the November 13, 1986 Federal Register).

GROUNDWATER POLLUTION CONTROL PROGRAMS

1) Groundwater Protection - Program Description

The Groundwater Protection Rule and Strategy is the groundwater management and protection strategy for the State of Vermont. The Rule outlines the principles, directives and goals relating to groundwater protection. The Rule also contains groundwater quality enforcement standards and outlines the four classes of groundwater. The Groundwater Coordinating Committee, an interagency committee, oversees the groundwater reclassification efforts and provides a forum for interagency coordination on groundwater issues. The DEC Water Supply Division provides administrative and technical support to the Committee. The program reviews weekly Act 250 applications for potential water supply and groundwater impacts. The Water Supply Division also serves as a clearinghouse on groundwater protection information. Through their regulatory and outreach programs, other divisions also protect groundwater and provide information on groundwater protection issues.

Statutory Reference

10 VSA Chapter 48

Program accomplishments in the Poultney-Mettowee Basin during the past five years:

All of the groundwater in the Poultney Mettowee Basin is currently classified as Class III. This means the groundwater is "Suitable as a source of water for individual domestic

water supply, irrigation, agricultural use and general industrial and commercial use.” Using the Groundwater Quality Enforcement Standards as standards in various permit programs, groundwater quality has been protected in the watershed. Act 250 permit applications have been reviewed for potential groundwater and water supply impacts.

Program accomplishments in the Poultney-Mettowee Basin in the next five years:

In addition to continuing the activities discussed above, the Groundwater Coordinating Committee will review any groundwater reclassification petitions submitted for the Poultney Mettowee Basin.

2) Underground Injection Control - Program Description

This program within DEC regulates all non-sanitary sewage discharges to the groundwater. It is a federally delegated program. If the discharge receives a permit from another DEC program, the UIC permit is not required.

Statutory Reference

10 VSA Chapter 47

Section 1422 of the Federal Safe Drinking Water Act.

Program accomplishments in the Poultney-Mettowee Basin in the past five years:

There are no UIC permits issued for projects in the Poultney Mettowee Basin.

Program activities planned in the Poultney-Mettowee Basin in the next five years:

The Department intends to review existing floor drains and close out or permit them within the next five years. The UIC program will be reaffirming primacy and revising its rules. A specific rule revision will be to prohibit cesspools as a method of disposal.

3) Public Water Supply (program also influences surface water) -

Program Description

The DEC Water Supply Division is responsible for the regulation of all public water systems in the state of Vermont. A public water system has fifteen connections or serves an average of twenty-five people at least sixty days a year. Examples of public water systems include municipalities, mobile home parks, schools, restaurants, motels. The major program functions involve permitting construction and operation, approving new sources of drinking water, review of monitoring data, technical and financial assistance, enforcement, source water protection, operator certification, enforcement, and inspections.

Statutory Reference

Federal Safe Drinking Water Act Amendments of 1996

10 VSA Chapter 56 Public Water Supply

10 VSA Chapter 55 Aid to Municipalities for Water Supply, Pollution Abatement, and Sewer Separation

24 VSA Chapter 120 Special Environmental Revolving Fund.

Program accomplishments in the Poultney-Mettowee Basin during the past five years:

The Poultney Mettowee Basin has 18 Public Community Water Systems, 13 Non-transient, Non-community Public Water Systems, 20 Transient Non-Community Public Water Systems, and 2 Bottled Water Systems. Through sanitary surveys (inspections), on-site visits of all public community and non-transient, non-community water systems were completed in the watershed.

The program investigated contaminant incidents occurring in public water systems, both chemical and bacteriological in nature, and provided technical expertise to assist in alleviating associated public health risks

New public water sources and source protection areas were developed which included opportunities for public comment. Source Protection Plans were developed by 26 water systems for review and approval by the program.

Drinking Water State Revolving Fund provided monies for water system improvements.

Water system operators were certified and provided with training opportunities. The program has helped new public water systems acquire the technical, financial, and managerial ability or capacity to provide safe drinking water.

Future program activities planned in the Poultney-Mettowee Basin during the next five years:

Sanitary surveys will be conducted for all public water systems on a cyclical three to five year basis, including transient, non-community water systems for the first time. Program staff will increase its educational efforts with the transient water systems. Loan funding will continue to be available, with small community water systems given preference. Source Water Assessments of all Transient, Non-community Systems will be conducted and all other water systems will develop a Source Protection Plan. Operator training opportunities will increase. Existing systems will have assistance to develop the technical, financial and managerial ability to provide safe drinking water.

4) Well Driller Program - Program Description

Any person who intends to engage in the business of drilling wells must obtain a license to do so. This includes both water well drillers and monitoring well drillers. Licensing is intended to protect public health and prevent degradation of groundwater quality through competent drillers appropriately applying industry standard well construction and abandonment procedures in their work. A license may be renewed if appropriate continuing education is demonstrated on a three-year basis.

Statutory Reference
10 VSA Chapter 48

Program accomplishments in the Poultney-Mettowee Basin during the last five years:

The program streamlined data entry by digitizing the well locations into a GIS format and by entering the well completion records into a computer database (around 81,000 records statewide). To preserve the non-alphanumeric information on the reports for easy access after they have been sent to public records, the paper files have been scanned to a CD-ROM. Additionally, GPS locations for new wells drilled are being accepted along with the use of the E-911 addresses. This has greatly improved the well location accuracy.

Future program activities planned in the Poultney-Mettowee Basin for the next five years:

The Well Driller Licensing Rule and the Well Construction Standards within the Water Supply Rule, Title 10 VSA Chapter 21, are planned to be revised within this time frame. The GIS maps which are cross-indexed to the well log database will be accessible on the internet where the general public can view them without needing to reserve a viewing time and physically visit the Water Supply Division in Waterbury office where the paper copies were filed.

TOTAL MAXIMUM DAILY LOAD PROGRAM

(Vermont's Wasteload Allocation Process & Federal Requirements for TMDLs)

Program Description

The primary goal of the Total Maximum Daily Load (TMDL) program is to develop solutions to restore those waters which do not meet Vermont Water Quality Standards and will not meet those standards even after all minimum required Best Practicable Treatment (BPT) alternatives are applied. In order to fulfill the requirements of the Clean Water Act, the program works in two phases and is dependent on several other programs within the Agency of Natural Resources to fulfill its goal. First, water quality monitoring data is gathered and analyzed to identify the condition of the State's waters. Those waterbodies that show a clear and documented violation of the Water Quality Standards substantiated by data collected through chemical, biological or physical monitoring are placed on the State's List of Impaired Surface Waters. The second phase is to develop TMDL plans for those waters that are Water Quality Limited Segments, defined as waters that will not achieve water quality standards even after BPTs are applied to all discharges. These plans essentially are a budget for the pollutant causing the impairment. Following investigations, all pollutant sources are identified that contribute to the impairment and each receives an allocation as to how much it can contribute to the total pollutant load. This is usually accomplished by determining from what sources reductions are necessary. The TMDL plans are structured in accordance with Clean Water Act regulations and EPA guidance. These plans involve public participation and ultimately need approval from EPA to verify their satisfaction of Clean Water Act requirements. The third phase is to implement the TMDL plan and conduct water quality monitoring in order to evaluate the effectiveness of implementation and document achievement of Water Quality Standards.

Statutory reference

Section 303(d) of the Clean Water Act
40 CFR §130.7

Program accomplishments in the Poultney-Mettowee Basin in the past 5 years:

As a result of the continuing Monitoring and Assessment programs, data has been gathered that resulted in the inclusion five waterbodies on the List of Impaired Waters (refer to the 2002 list). Inclusion on this list focuses attention on developing solutions to restore the waters. TMDLs are currently being developed for the Mettowee River considered to be thermally impaired

Future program activities in the Poultney-Mettowee Basin in the next 5 years:

The TMDL program will continue to identify and list waters that are not meeting the Vermont Water Quality Standards by working closely with State and Federal Agencies and with citizen based monitoring activities. Restoration plan development for these impaired waters will continue and will look to take advantage of local water quality planning opportunities.

EFFLUENT LIMITATIONS & POINT SOURCE CONTROL PROGRAMS

1) Design/Engineering Program - Program Description

Vermont municipalities need various wastewater treatment facility and conveyance system construction and improvement projects including: original treatment facility and collection line construction; enlargement and/or refurbishment of existing facilities; implementation of nutrient removal or sludge & septage treatment improvements at existing facilities; combined sewer overflow abatement; or collection line extensions. These projects enable the municipalities to meet the effluent limits in their NPDES permit in order to meet Vermont Water Quality Standards and comply with statute; provide for centralized treatment to replace problem individual on-site systems; and provide desired wastewater treatment capacity to enable municipal growth and development.

The municipalities desire to take advantage of the state and federal capital funds appropriated for municipal pollution control projects, which we administer. We assist grant and loan recipients in developing capital planning and financing plans; assist in defining project scopes to meet the technical, regulatory, and funding requirements; assure the design of appropriate facilities; oversee facility construction; and monitor the first year's operation.

Statutory Reference

State: Title 10 VSA Chapter 55 Aid to Municipalities for Water Supply, Pollution Abatement and Sewer Separation. Title 24 VSA Chapter 120 Special Environmental Revolving Fund. Federal: Clean Water Act Title VI - State Water Pollution Control Revolving Funds.

Contacts

Nopadon Sundarabhaya, P.E. - Design Section Supervisor, 241-3750.

Thomas Joslin, P.E. - Design Section, 241-3740

Eric Blatt, P.E. - Financial Management Section Supervisor, 241-3734.

Program accomplishments in the past five years in the Poultney-Mettowee basin:

- Castleton, wastewater treatment plant expansion and upgrade, with addition of phosphorus removal.
- Fair Haven, wastewater treatment plant upgrade, with addition of phosphorus removal.
- Fair Haven, wastewater collection system rehabilitation, including abatement of Adams Street pump station overflow.
- Poultney, wastewater treatment plant expansion and upgrade, with addition of phosphorus removal.

Program activities planned in the Poultney-Mettowee Basin in the next five years:

- No projects currently anticipated, but projects may arise within this time period.

2) Discharge Program (Discharging Facilities and Stormwater Management) - Program Description

2.A. Permits:

A discharge permit is required whenever an individual, municipality or company wants to discharge waste directly to waters of the state. Some industries are also required to treat waste before sending it to a municipal wastewater treatment facility. This section issues discharge permits and pretreatment permits. The permitting process involves a system evaluation and design being prepared by a consultant.

2.B. Operations and Management (O&M):

This group performs oversight functions of municipally owned wastewater treatment facilities, and of privately owned treatment and pretreatment facilities. In addition to performing certification and training programs, periodic discharge sampling for permit compliance checks, and laboratory evaluations. Assistance is also provided to operators and municipal officials in the proper operation, maintenance and budgeting of their wastewater facilities.

Statutory Reference

10 VSA Chapter 47

Program accomplishments in the Poultney-Mettowee basin in the past five years:

The O&M section has conducted its ongoing oversight inspection program of municipal wastewater treatment facilities (WWTF) during the last five years (there are four municipal WWTFs in the Poultney Mettowee River Basin which discharge directly to the Poultney Mettowee River or its tributaries, Castleton, Fair Haven, Pawlet, and Poultney). A number of technical assistance projects have been completed at municipal WWTFs in the basin, including a project in Castleton designed to improve treatment/clarification at that facility.

During the last five years the Permits Section worked with the Town of Poultney and the DEC Facilities Engineering Division to eliminate combined sewer overflows from the Town's sewage collection system to the Poultney River. To date, overflows have been eliminated or substantially reduced from the majority of overflow points within the Town's collection system.

Program activities planned in the Poultney-Mettowee basin in the next five years:

The O&M Section will continue oversight inspections of municipal WWTFs a minimum of once every three years and more frequently where operational and compliance records indicate ongoing problems.

The stormwater management section has been transferred to the Water Quality Division. In conjunction with this transfer, new and more comprehensive rules are being developed for the control of stormwater runoff. The new rules have gone into effect in early 2002. It is anticipated that these new rules will increase the scope of the program, lower the threshold for when a permit is needed, encourage innovative site design to reduce the volume of runoff, and require greater treatment for stormwater runoff.

**OTHER IMPORTANT NON-POINT SOURCE CONTROL PROGRAMS
(Monitoring & Assessment, Geologic Surveys, Pollution Prevention, etc)**

1) Surface Water Monitoring & Assessment - Program Description

The overall goal of the environmental monitoring and assessment program is to ensure that good science is used to develop an understanding of the attributes of, and the forces which affect, the physical, chemical, and biological characteristics of Vermont's aquatic ecosystems, and ensure that this information is available to be used as the basis for making, and evaluating the consequences of, environmental management decisions made or influenced by DEC. The specific objectives of this program include the following:

- Determine the present and future health of aquatic ecosystems in Vermont;
- Establish empirical limits of natural variation in aquatic ecosystems in Vermont;
- Diagnose abnormal conditions to identify issues in time to develop effective mitigation;
- Identify potential agents of abnormal change;
- Assess ecological changes resulting from the implementation of environmental management activities; and
- Identify risks to human health associated with the use of aquatic resources.

In order to accomplish these objectives, this program conducts activities to monitor and assess the chemical, physical, and biological components of aquatic ecosystems. Findings relate to both ecological and human health. Activities are conducted both in response to identified issues, activities, and potential problems; and in the framework of long-term environmental status and trends monitoring.

Statutory Reference
10 V.S.A. Chapter 47
Federal Clean Water Act

Program accomplishments in the Poultney-Mettowee basin in the past five years:

Site visits and sampling were conducted to assess aquatic resources in the Basin. Primary activities have included biological evaluations of surface water sites throughout the basin. The Biomonitoring and Aquatic Studies Section (BASS) has evaluated 16 sites in various locations within the last five years.

Future program activities in the Poultney-Mettowee Basin for the next five years:

Continued site assessments in accordance with need and DEC plans (eg rotational watershed assessments) over the next five years.

2) Geologic Surveys & Information - Program Description

The Geology program conducts surveys and research related to Vermont geology, topography, and mineral resources; provides information to the public, government, industry, and other institutions which request assistance; and maintains and publishes Vermont geological information. Geologic research can illuminate the nature of ground water and the interaction of ground and surface waters that maintains stream discharge and temperature during low flow periods. Erosion studies that focus on slope stability and the sources of sediment released to rivers have direct bearing on water quality

Statutory references

3 VSA, Chapter 53, Section 2879
10 VSA, Chapter 7, Sections 101-105

Program accomplishments in the Poultney-Mettowee Basin during the past five years:

The division maintains a database of quarry locations that covers the basin. The Division of Geology in cooperation with USGS is now compiling the bedrock geology for the basin that will be available in print during the next five-year period (as of December 2003).

Future program activities planned in the Poultney-Mettowee Basin in the next five years:

HAZUS-MH (stands for FEMA's Mitigation Division powerful risk assessment software program for analyzing potential losses from floods, hurricane winds and earthquakes) will be used to not only to predict the potential damage from earthquake events but from flood events and the effects of riverine erosion.

3) Pollution Prevention Program - Program Description

The focus of this program within DEC is to help businesses research and identify opportunities to reduce the amount of waste generated and the amount and toxicity of

chemicals used in their operations. Technical assistance may be provided on-site at the facility's request. The program is also responsible for administering Vermont's Pollution Prevention Planning Requirement affecting over 100 businesses that generate hazardous waste and/or use certain listed toxic chemicals. The Program is located in the Environmental Assistance Division and shares a toll-free number with the Small Business Compliance Assistance Program that businesses and others can use to get answers to their environmental questions.

Statutory reference:

10 V.S.A. Chapter 159 Subchapter 2. Sections 6623-6632.

Program accomplishments in the Poultney-Mettowee Basin in the past five years:

The program conducted on-site visits to 35-40 facilities per year for the purpose of providing waste reduction technical assistance and/or review of pollution prevention plans. It planned, promoted and participated in sector-specific educational workshops for vehicle service, municipal garages and lithographic printers among others. It co-developed environmental guides and fact sheets for many business sectors on applicable waste reduction strategies and compliance with environmental regulations.

More information about the Pollution Prevention Program is found on the Program's website:<http://www.anr.state.vt.us/dec/ead/eadhome/p2.htm>

Future program activities in the Poultney-Mettowee Basin in the next five years:

The Pollution Prevention Program will continue to offer the above services to all Vermont businesses.

4) Section 319 Nonpoint Source Management - Program Description

Water pollution control in Vermont, as well as in other states across the nation, has tended to focus on the larger, more obvious discharges referred to as point sources of pollution. Recently, much greater attention has been directed at the more diffuse, harder to quantify, more difficult to control pollution sources known as nonpoint sources of pollution. Pollution from nonpoint sources (NPS) is the major source of water use impairment to Vermont surface and ground water resources. NPS pollution is apparent in each of Vermont's seventeen river basins. The types and extent of water quality problems associated with these sources of pollution, however, exhibit a considerable degree of variation between and within basins. To a large extent, NPS pollution control and NPS pollution prevention centers about the watershed approach, land use and land management.

NPS implementation through Section 319 has been available to Vermont since federal fiscal year 1990, the first year funding was appropriated. Over twelve years of annual funding (FFY1990-2001), Vermont has been awarded about \$11 million, which has assisted over 100 NPS projects. Projects have been completed or are underway by a variety of interests including several towns, watershed associations and state departments, the University of Vermont and many Natural Resources Conservation Districts (refer to attached project listing). The Vermont NPS Program is involved in the following areas of concentration:

- coordination, oversight & administration of Section 319;

- influence the direction & level of NPS planning and implementation arising from other programs or funding sources (e.g. US Department of Agriculture, Lake Champlain Basin Program, Connecticut River Joint Commissions);
- assist Vermont Department of Agriculture, Food & Markets with new agricultural NPS responsibilities (as per Act 261 of 1992);
- distribution of Clean Water Act Section 604(b) pass-through planning funds to the 12 Vermont regional planning commissions; and,
- advocate the widespread adoption of certain land management practices (especially erosion/sediment control, phosphorus management and vegetated buffer strips).

Statutory reference:

Title 10 VSA, Chapter 47, the Vermont Water Pollution Control Law
 Section 319, 1987 Amendments, Federal Water Pollution Control Act (also known as Clean Water Act)

Program accomplishments in the Poultney-Mettowee River basin in the past five years:

Provided funding to the Poultney-Mettowee NRCO for the establishment of nutrient management planning services to particular farm operations (on-going).
 Installation of water quality protection measures on certain municipal unpaved back roads. Data collection and development of temperature TMDL for the Mettowee River will continue through 2004. Streambank stabilization and habitat restoration will take place on the Gully Brook during 2004.

Future program activities in the Poultney-Mettowee River basin in the next five years:

The major future needs and goals of the Vermont NPS Program are the result of greater understanding arising from NPS implementation from two watershed projects (LaPlatte River and St. Albans Bay), from diagnostic monitoring of Lake Champlain and as a result of some 10 years of 319 NPS program history. These needs and goals are as follows:

- continue, to the fullest extent possible, voluntary implementation of NPS controls;
- improve the water quality effectiveness knowledge base on certain management practices found in agricultural settings and in areas undergoing developments;
- improve the content and delivery system of information and education materials associated with NPS control and NPS management; and,
- provide to the public on-going effective demonstrations of NPS projects and control/restoration measures.

5) River Corridor Management Program - Program Description

The River Corridor Management Program provides regulatory review and technical assistance to landowners, municipalities, non-governmental organizations and other agencies to help determine the appropriate stream channel and flood plain management practices necessary to resolve and avoid conflicts with river systems. The practices

selected will be designed to recognize and accommodate, to the extent feasible, the stream's natural stable tendencies. The recommended conflict resolution will recognize the stream's long-term physical response to past and proposed management practices. The resulting work will provide increased property and infrastructure protection and will maintain or enhance the ecological functions and economic values of the river system. Geomorphic assessment of the Castleton River watershed is underway and additional geomorphic assessments are planned for the Mettowee River and tributaries.

Statutory Reference

10 VSA Chapter 41
10 V.S.A., Chapter 32
Section 401 of the Clean Water Act

Contact

For stream alteration regulatory and technical assistance and flood damage issues:

Fred Nicholson, Stream Alteration Engineer
Water Quality Division
450 Asa Bloomer Office Building
Rutland, VT 05701
802-786-5906
fred.nicholson@anrmail.anr.state.vt.us

For flood plain technical assistance:

Karl Jurentkuff, Flood Plains Management Engineer
Water Quality Division
10 North, 103 South Main St.
Waterbury, VT 05676
802-241-3759
karl.jurentkuff@anr.state.vt.us

For stream stability assessment technical assistance:

Mike Kline, River Restoration Ecologist
Water Quality Division
10 North, 103 South Main St.
Waterbury, VT 05676 802-241-3774
mike.kline@anr.state.vt.us

Program accomplishments in the Poultney-Mettowee basin during the last five years:

- Assisted in the recovery from and mitigation of damages from a significant flood in December 2000.

- Supported the appropriation of several tens of thousands of dollars in flood hazard mitigation funding toward infrastructure upgrade projects in the watershed. This included assisting in the design and implementation of many of these projects.
- Participated in a stream stability assessment of the main stem of the Poultney River with Green Mountain College.

Future program activities planned in the Poultney-Mettowee basin in the next five years:

- Implement a river corridor protection and restoration plan in cooperation with Green Mountain College on the Poultney River.
- Implement a river corridor protection and restoration plan in cooperation with the P-M NRCD on the Mettowee River.

6) Sand & Gravel Pits

Non-point source pollution is a concern associated with the operation, maintenance, and closure of sand and gravel pits in Vermont. Surface runoff and erosion contribute to the sedimentation of waterbodies adjacent to sand and gravel pits. Vegetative cover can reduce erosion and sedimentation problems, enhancing aesthetic values, and improve nesting and cover areas for wildlife. Practices for the control of erosion can be found in: USDA Natural Resources Conservation Service Technical References:

A. Vegetating Vermont Sand and Gravel Pits- VT Technical Guide, Conservation Planning Application Technical Reference #10

B. Critical Area Planting-Conservation Practice Standards code 342: Technical Guide Chapter IV (www.vt.nrcs.usda.gov/standards/342vt.html)

7) Act 250

Act 250 provides a public, quasi-judicial process for reviewing and managing the environmental, social and fiscal consequences of major subdivisions and development in Vermont through the issuance of land use permits. Activities include review of land use permit applications for conformance with the Act's ten environmental criteria, issuance of opinions concerning the applicability of Act 250 to developments and subdivisions, monitoring for compliance with the Act and with land use permit conditions, and public education.

In an Act 250 application, applicants need to supply sufficient information for the District Commission to make findings on the ten environmental criteria. In so doing, certifications and/or approvals from other agencies and departments, utilities, regional planning commissions and local government may be necessary.

With regard to water pollution, Criterion 1 states that the project will not result in undue water or air pollution. This criterion deals with water and air pollution potential generally and such specific matters relating to water pollution as: (A) Headwaters; (B) Waste disposal; (C) Water Conservation; (D) Floodways; (E) Streams; (F) Shorelines; and (G) Wetlands.

FISHERIES PROTECTION REGULATIONS

Statutory references

Title 10, Chapters 101 through 123, and Appendix

This is where all the laws relating directly to fish and wildlife conservation are found. It also gives the authority to the Fish and Wildlife Board to set seasons, creel limits and size limits. Most of the laws pertaining to fish are found in Chapter 111 and primarily deal with the "taking of fish." One of these laws, section 4605 (placing fish in waters) allows for the control of introductions of exotic or competing fish species as well as diseases. Section 4607 (obstructing streams) prohibits the installation of a structure that prevents fish movement, such as a rack, weir or other obstruction, unless an approval has been granted by the Commissioner of Fish and Wildlife. This statute generally is applied to small streams with a drainage area less than 10 square miles; on larger streams Title 10, Chapters 41 or 43 is applied.

Title 10, Chapter 43 Dams

A certificate of public good is required before constructing any dam impounding more than 500,000 cu. ft. This law is administered by the Department of Environmental Conservation excepting projects involving the generation of hydroelectric energy. The Public Service Board assumes jurisdiction in those cases. Regarding public hydroelectric and flood control projects, the final authority lies with the Federal Energy Regulatory Commission.

Section 1084 requires the Fish and Wildlife Department to investigate the effect of any proposed project on fish and wildlife resources and to certify its findings to the Department of Natural Resources or the Public Service Board, prior to any hearing.

Section 1086 enumerates the several issue areas that must be explored before a determination of public good is made. Specifically included are recreational values; fish and wildlife; existing uses such as fishing; and the need for minimum stream flows.

Title 10, Chapter 47 Vermont Water Pollution Control Act

This law administered by the Agency of Natural Resources under auspices of the Federal Water Pollution Control Act (PL 92-500). Within the Water Pollution Control Act are sections 1252 and 1258 which, respectively, set up a classification system for state waters and authorize the Agency to manage waters to attain or maintain their classification, including the regulation of discharges to state waters. Under Section 1252, Water Quality Standards are promulgated by the Water Resources Board to establish numeric and narrative standards for the management of waters. The Standards also designate all waters as to their fish habitat type - either cold water or warm water. The Standards have the force of law and set up an important framework for management of physical water quality, such as dissolved oxygen, temperature, turbidity, and toxics and for protection of other important habitat and life-stage considerations, such as nutrient control, substrate integrity, and propagation. The authority to regulate stormwater discharges is included in Section 1264. Section 1263(a) regulates activities pertaining to control of aquatic nuisances (Aquatic Nuisance Control).

Title 10, Chapter 41 Regulation of Stream Flow; Subchapter 1, Section 1003

This section of the statute dealing with the regulation of stream flow empowers the Department of Environmental Conservation to call to conference any dam owner that regulates natural stream flow and to require the passage of adequate flows to support the stream fishery.

Title 10, Chapter 41 Regulation of Stream Flow; Subchapter 1, Section 1004

Section 1004 makes the Secretary the state agent with respect to the Federal Energy Regulatory Commission (FERC) dam licensing process and with respect to the Federal Clean Water Act Section 401 administration. Under Section 401, federal agencies cannot issue licenses or permits for activities that may affect water quality until such activities have been certified as meeting state water quality standards. This Section 401 process has proved to be a powerful tool in the review of projects subject to FERC and Corps of Engineers jurisdiction.

Title 10, Chapter 41 Regulation of Stream Flow; Subchapter 2 Alteration of Streams

A person may not change the cross-section of a stream or modify or alter it in any way by moving more than 10 cu. yd. of material without a permit from the Department of Environmental Conservation. This subchapter does not apply to dams subject to Chapter 43 or highways and bridges subject to section 5 of Title 19. Exemptions include personal use of 50 cu. yd. of gravel/year by riparian landowners (this gravel exemption also includes streams having drainage area of less than 10 mi²) and accepted agricultural and silvicultural practices. A permit will be granted if, among other criteria, it appears the project will not significantly damage fish life. There are also special provisions for protecting outstanding resource waters.

Title 10, Chapter 151 Vermont's Land Use and Development Law (Act 250)

This law provides for broad protection of streams, shorelines, and water quality through criteria related to erosion control, effect on public investments, necessary wildlife habitat, and retention of the natural condition of streams and shorelines. Protection of fisheries resources has been primarily protecting stream habitat by imposing buffer strips, minimum stream flows, and stream crossings which provide unrestricted fish passage. The development must meet all the criteria of the Act (6086(a)1-10), but District Commissions have considerable latitude in the decision since the criteria are loosely worded (e.g. "undue water pollution").

Title 29, Chapter 11 Management of Lakes and Ponds

This statute addresses encroachment onto lands lying under public waters such as from docks, marinas, boathouses, etc. Exceptions include water pipes <2 inches (inside diameter), buoys and duck blinds, docks of certain size, rafts, etc. Criteria for granting or denying a project include determination of public good (Section 405), which addresses impacts on fish habitat and recreation. In 1989 interim procedures for issuance or denial of encroachment included whether or not the project meets the requirements of the public

trust doctrine. In a recent case the Vermont Superior Court ruled that the Department of Environmental Conservation overstepped its authority by including the public trust doctrine criteria in its interim procedures for permit denial. The interim procedures also addressed the potential cumulative effect of encroachment. In 1984, the Water Resources Board overturned the Department's denial of a permit by concluding "... the consideration of the potential cumulative effect of possible future encroachments is neither contemplated nor authorized by 29 V.S.A. 405(6)." (LaFleur Appeal).

Although there are a number of other state laws that indirectly protect fisheries resources, such as T24 Flood Plain Development and T10 Chapter 159 Solid Waste Disposal, the above are most applicable.

In addition to fisheries considerations addressed in the Federal Energy Regulatory Commission's rules, there are several other Federal regulations that can afford resource protection. Two of the most notable are:

1. Section 404 of the Federal Water Pollution Control Act amendments of 1972 give the U.S. Army Corps of Engineers the authority to regulate discharges of dredged or fill material into all waters of the U.S. including wetlands.
2. Section 10 of the Rivers and Harbors Act requires a Corps of Engineers permit for construction of any structure in or over any navigable water of the U.S. This includes dredging or disposal of dredged material, excavation, channelization or other modification. Projects can range in size from small docks to large breakwaters.

APPENDIX C: PROPOSED CLASSIFICATION AND TYPING MAPS OF POULTNEY METTOWEE RIVER BASIN

Click [here](#) (pdf, 2.6 MB) to download a full color map of the basin.

APPENDIX D: DESCRIPTION OF PROPOSED WATER MANAGEMENT TYPE (WMT) B1 WATERS IN THE BASIN

Proposed Water Management Typing for the Poultney Mettowee Watershed

- The standing waters within all wetlands that are adjacent to lakes, streams and rivers proposed as WMT B1 are also proposed for WMT B1 designation. The waters of wetlands adjacent to waters proposed for WMT B2 designation are also proposed for WMT B2 designation.
- Most waters located within public lands (state and federal) are proposed for WMT B1 designation. Waters at elevations greater than 2,500 feet are classified A1. Surface waters used as public water supplies are classified A2. Waters that are fluctuated by impoundments or by other means may be typed as WMT B3. No waters are proposed for this Water Management Type (B3) in this plan.

Waters Proposed for B1 Type Designation

Waterbody Name	Town	Location
Mettowee River Watershed		
Unnamed tributary to the Mettowee River	Dorset	All unnamed tributaries in the Dorset Hollow area in Dorset below 2500 feet flowing into the Mettowee River from the north from “ <i>The Mettawee</i> ” mountain located in the Green Mountain National Forest.
Sykes Hollow and Mountain Brook headwaters	Danby	The upper elevation reaches of Sykes Hollow Brook (tributary to the Mettowee River) from its headwaters (or below 2500 feet) to 2000 foot elevation. The upper elevation reaches of Mountain Brook (tributary to Flower Brook) on Woodlawn Mountain and “ <i>The Oxbow</i> ” from its headwaters to 2000 feet.
Flower Brook headwaters	Danby, Pawlet	Unnamed tributaries to Flower Brook southeast of the Danby-Pawlet Road from their headwaters to the down hill edge of land conserved by the Vermont Land Trust.
Unnamed tributary to the Mettowee River	Pawlet	The west branch of Sykes Hollow Brook from its headwaters to 1500 foot elevation.
Unnamed tributary to the Mettowee River	Pawlet	Unnamed tributary flowing southeastward to the Mettowee River.

		This segment ends north of the Rupert town line and the boundary of land conserved by the Vermont Land Trust, approximately one third of a mile west of Route 30.
Unnamed tributary to the Mettowee River	Pawlet	Unnamed tributaries to the Mettowee River flowing from their headwaters south towards Waite Hill Rd from Middle and Haystack Mountains through the North Pawlet Hills Conservation Area (TNC) and terminating at the southernmost boundary of the conservation area.
Unnamed tributary to Wells Brook	Wells	Unnamed tributary to an unnamed tributary flowing along Butts Hill Road to Wells Brook. The unnamed tributary is approximately one half mile long and flows in a southeasterly direction from Pine Hill.
Unnamed tributary to Snow Brook	Wells	Unnamed tributary to Snow Brook from its headwaters to an elevation of 750 feet.
Unnamed tributary to Endless Brook	Wells	Unnamed tributary to its confluence with Endless Brook that flows south-southwest from its headwaters on Coy Mountain.
Unnamed tributary to Little Lake	Wells	Unnamed tributary to Little Lake that flows westerly from its headwaters north of Pond Mountain to an elevation of 750 feet.
Headwater Branches of Purchase Brook	Tinmouth	Two headwater branches of Purchase Brook from their headwaters to the Tinmouth/ Danby town line.
Wells Brook headwaters	Tinmouth	All Wells Brook headwater tributaries that flow westerly from Tinmouth Purchase Recreation Area and VLT easement parcels to an elevation of 1300 feet.
-Unnamed tributary to Endless Brook	Middletown Springs	An unnamed tributary to Endless Brook from its headwaters flowing westerly to an elevation of 1000'.
Poultney River Watershed		
Unnamed tributary to the Poultney River	Tinmouth	Unnamed tributary to the Poultney River from its headwaters flowing south-southwest to an elevation of 1300'.

Unnamed tributary to Doughty Pond	Orwell	Unnamed tributary to Doughty Pond flowing southerly and entering the Pond from the east.
Unnamed tributaries to Wells Brook	Tinmouth	Two unnamed tributaries to Wells Brook in Tinmouth flowing west-northwest from their headwaters to an elevation of 1300 feet.
Unnamed tributary to the Poultney River	Ira	Unnamed tributary from its headwaters to the Poultney River. It flows southwesterly from Susie Peak (AKA Edmunds Peak) to the Ira/ Tinmouth town line.
Unnamed tributaries to Gully Brook	Ira	Unnamed tributaries to Gully brook from their headwaters the Ira – Poultney town line.
Unnamed Tributaries to Gully Brook	Ira, Poultney, Castleton	Unnamed tributaries to Gully Brook within and bordering Bird Mountain Wildlife Management Area
	Middletown Springs	Train Brook, tributary of the Poultney River, north of Route 133/140, from its headwaters to the elevation of 1000 feet.
Unnamed tributaries to North Brook	Middletown Springs	Unnamed tributaries from 1100 feet that flow westerly towards North Brook to an elevation of 1000 feet.
Unnamed tributary to the Poultney River	Middletown Springs	Unnamed tributary that flows northerly to the Poultney River from its headwaters west of Barker Mountain to an elevation of 1000 feet.
Unnamed tributary to the Poultney River	Middletown Springs, Poultney	Unnamed tributary that flows southwesterly to the Poultney River on the Poultney/ Middletown Springs town line from its headwaters to an elevation of 1000 feet.
Unnamed tributary to Coggman Pond and Billings Marsh	West Haven	Unnamed tributaries from their headwaters flowing from Bald Mountain easterly to Coggman Pond, Billings Marsh, including adjacent reed marshes. These tributaries are mostly located within the Helen W. Buckner Memorial Preserve on Bald Mountain and is owned by The Nature Conservancy.
Big Hollow Brook	West Haven	Big Hollow Brook from its headwaters on Bald Mountain flowing southeasterly to the Schoolhouse

		Marsh on the Poultney River.
Bumps Brook	West Haven	Bumps Brook from its headwaters on Bald Mountain flowing southeasterly into the East Bay/ Ward Marsh at the mouth of the Poultney River.
Unnamed tributaries to the Castleton River	Ira	Unnamed tributaries that flow northward toward the Castleton River from their headwaters east of Bird Mountain to an elevation of 1000 feet.
Unnamed tributaries to the Castleton River	Ira	All tributaries from their headwaters that flow southerly within Blueberry Hill WMA to the Castleton River upstream of Route 4 West.
Unnamed tributaries to the Castleton River	Ira, West Rutland	Unnamed tributaries to the Castleton river originating in West Rutland and flowing southerly to the east of Blueberry Hill Wildlife Management Area
Unnamed tributaries to the Castleton River	West Rutland	Unnamed tributaries from their headwaters north of Clark Hill flowing northerly toward the Castleton River to an elevation of 1000 feet.
Castleton River mainstem and the West Rutland Marsh	West Rutland	Castleton River mainstem from the Pittsford/West Rutland town line through the West Rutland Marsh to Whipple Hollow Road, including all surface waters within the West Rutland Marsh.
Unnamed tributaries to the Castleton River	West Rutland	Unnamed tributaries from their headwaters that flow easterly from Grandpa's Knob (mountain) down to the elevation of 1000 feet.
Unnamed tributaries to North Breton Brook	Castleton	Unnamed tributaries to North Breton Brook from their headwaters on the western slopes of Grandpa's Knob flowing westerly to the westernmost boundary of the 5-acre rural residential zoning district.
Unnamed tributary to Gully Brook	Castleton, Poultney	Unnamed tributary to Gully Brook originating in Poultney and joining the mainstem of Gully Brook at the northwest corner of the Bird Mountain Wildlife Management Area
Unnamed tributaries to Glen Lake, Lake Bomoseen and	Castleton, Hubbardton, Fair	Unnamed tributaries within Bomoseen State Park, including unnamed

Loves Marsh	Haven	tributaries from their headwaters, that flow southwesterly to Glen Lake and tributaries from their headwaters flowing southeasterly through Half Moon Pond to Loves Marsh. Also, two unnamed tributaries from their headwaters flowing directly into Lake Bomoseen, one to the south and one north of Bomoseen State Park.
Sucker Creek to Inman Pond and unnamed tributaries to Old Marsh Pond	Fair Haven	Sucker Creek from its headwaters through Howard Dam and Sheldon Dam flowing southerly to Inman Pond. Unnamed tributaries from their headwaters flowing southerly into Old Marsh Pond.
Lakes & Ponds and Associated Wetlands		
Root Pond	Benson	Entire pond
Doughty Pond	Benson	Entire pond
Glen Lake	Castleton/ Fair Haven	Entire lake
Half Moon Pond	Hubbardton	Entire pond
Hinkum Pond	Sudbury	Entire pond
Spruce Pond	Orwell	Entire pond
Buczek Marsh	Poultney	Buczek Marsh

Sources (the following information was taken into account in making the WMT – B1 recommendations):

BASS sources- Poultney Mettowee Watershed macroinvertebrate monitoring scores in the Excellent and Very Good categories.

Lakes and Ponds sources- Poultney Mettowee Watershed Assessment Report, 1999, Special Uses and Values of Poultney Mettowee Watershed Lakes and Ponds (Lake Protection Classification System) and B1 proposal list from Neil Kamman, Vermont Water Quality Division.

Wetlands sources- Significant Wetlands in the Poultney Mettowee River Watershed, “A Characterization of Vermont’s More Important Wetlands” Parsons, 1988, and “List of Potential Class One Wetlands,” Quackenbush.

Vermont Department of Fish and Wildlife- B1 proposal list from Christa Alexander, Vermont Department of Fish and Wildlife (District covers the Poultney Mettowee Watershed) and VTF&W Fisheries Biologists Chet MacKenzie and Shawn Good.

Nongame and Natural Heritage Program- “Wetlands of Outstanding Ecological Significance in Western Rutland County, Vermont 1992”; “Vermont Advanced Wetlands Planning and Protection Project Report Lake Champlain Basin, 1997”; “Calcareous Open Fens and Riverside Seeps of Vermont: Some Sites of Ecological Importance, 1995”; “Northern White Cedar Swamps and Red Maple-Northern White

Cedar Swamps of Vermont, 1998.” *Wetland, Woodland, Wildland*, Thompson and Sorenson, 2000. These sources appear in the references section as well.

Municipal Zoning and Planning - the following meetings with municipal selectboards, planning commissions, and conservation commissions were held to ensure that local goals and management objectives were complementary to the Water Management Typing process for consideration of candidate B1 surface waters:

- Benson – 09/03/02 - Selectboard and Planning Commission members
- Castleton – 12/18/02 – Planning Commission
- Danby – 10/21/02 – Planning Commission
- Dorset – 03/04/03 – Planning Commission and Selectboard members
- Fair Haven – 11/19/02 – Planning Commission
- Hubbardton – 07/15/02 - Planning Commission
- Ira – Sent letter, spoke with Tim Martin, Chair of Planning Commission
- Middleton Springs – 10/07/02 – Planning and Conservation Commission
- Orwell – Only a sliver in PM Basin, nothing proposed.
- Pawlet – 09/23/02 – Pawlet Planning Commission, again on 01/26/04.
- Pittsford – Only a sliver in PM Basin, nothing proposed.
- Poultney – Spoke with Jonas Rosenthal, Poultney Town Manager
- Rupert – Spoke with Julien Dixon, Planning Commission, nothing proposed.
- Sudbury – 02/03/04 – Planning Commission
- Tinmouth – 07/25/02 – Planning Commission
- Wells – 8/26/02 – Planning Commission
- West Haven – 12/05/02 – Planning Commission
- West Rutland – 08/28/02 – Planning Commission and Selectboard

Lakes and Ponds Proposed Typing:

The following lakes and ponds are proposed for WMT B1 based on existing water quality criteria and continued expectation of the attainment of these criteria. The next step in this process were to review town and regional plans as well as municipal zoning regulations and meet with towns to discuss how the proposals for typing meet with their expectations. Lakes and ponds not noted below will default to the WMT B2 unless otherwise noted:

- **Doughty Pond** (Benson/ Orwell)(3) – “This small 17 acre pond is partially contained within the Pine (sic) Woods Wildlife Management area (Pond Woods WMA). It is noteworthy that the lake is completely undisturbed, and is accessible only by foot (and ATV (5)). The lake itself is surrounded by a perimeter of *Sphagnum*, on which can be found numerous sundew and pitcher plants. This lake is highly tannic, which is anomalous for this region of Vermont” (1).
- **Glen Lake** (Castleton/ Fair Haven)(3) – *Potamogeton friesii* – S2 (4). “This lake supports a population of *Potamogeton friesii*, which was last observed in 2002. In addition, the northwest shore of the lake is quite scenic, with a small cliff band that overlooks the lake. The majority of the Glen Lake shoreline is in state

ownership, as a component of the Lake Bomoseen State park. Eurasian watermilfoil has been a threat to this lake (1).” There is a moderate milfoil infestation in Glen Lake. There are potential water level management issues as well. Given that there are a handful of private camps on the lake, efforts will be made to contact these landowners and describe the process used for typing. The towns of Fair Haven and Castleton have approved of the Water Management Typing of Glen Lake as B1, as per selectboard and planning commission meetings.

- **High Pond** (Hubbardton) – No structures on shore, entirely contained within Bomoseen State Park (3)(5).
- **Hinkum Pond** (Sudbury)(3) – Wilderness-like rating (2). 2WD road to Pond (2). No structures on shore or in watershed (2). Extremely rare ledge and scenic lake bottom (2). “Hinkum Pond is a spectacular wilderness-like pond located in the center of a privately owned, 2,000 acre undeveloped forest. These 2,000 acres are themselves adjacent to another 1,500-acre block, the ownership of which is presently split between the Audubon Society and the Nature Conservancy. The entire Hinkum Pond watershed is presently protected (1).” Very clear water, and an extremely scenic lake bottom characterize Hinkum Pond. The lake supports 32 species of macrophytes, and is free of Eurasian watermilfoil, water chestnut, or zebra mussels at this time. It does, however, support the non-native (but non-nuisance) chestnut banded snail *Viviparus georgiensis*. The lake supports a very healthy bass fishery, which is unmanaged and self-sustaining. Hinkum Pond is considered a biological reference lake for Vermont’s Lake Biocriteria System. Public access to Hinkum Pond is restricted, and is allowed only by permission from the owners of the property that surrounds the lake (1).” Contact with The Nature Conservancy, Audubon, and the Hinkum Property Owners Association will be made to gauge the interest in typing this waterbody as a B1.
- **Spruce Pond** (Orwell)(3) – Wholly contained in the Pond Woods WMA, undisturbed shoreline (5). “This small, undeveloped, wilderness pond is completely surrounded by forestland. The setting is remarkably beautiful. The land surrounding the pond is in state ownership, as part of the Pine Woods Wildlife Management Area. A small dirt road approaches the pond from the northwest, and this appears to recently have been improved, but is limited to four-wheel drive traffic at best. Spruce Pond has a fine diversity of aquatic macrophytes. In addition, the lake is highly tannic, which is anomalous for this part of the state (1).”
- **Root Pond** – (5)-Determined to be privately conserved. Both TNC and Camp E-Wen-Akee are supportive of provided greater protection for Root Pond as it pertains to local management goals and objectives.

Source:

1. Poultney Mettowee Assessment Report, 1999
2. Vermont Lake Protection Classification System, 1994
3. Basin 2 Water Management Typing Proposal, 2002 (Kamman)
4. Natural Heritage and Non-Game Program
5. Personal observations of Watershed Coordinator Ethan Swift

Biological Reference Sites in the Poultney Mettowee Watershed Basin: Biological monitoring data for fish and or macroinvertebrate communities from the sites listed in the following table have been included in statewide initiatives to develop biocriteria for streams and lakes. For more detailed information regarding stream biocriteria development and selection of reference sites see *Wadeable Stream Biocriteria Development for Fish and Macroinvertebrate Assemblages in Vermont Rivers and Streams*, VTDEC, 2001. There is no implication that conditions upstream or downstream of these sites demonstrate comparable condition. Additionally many other stream reaches within the Poultney Mettowee Watersheds are likely to be in or close to reference condition.

Location	Station	Community	D.A.Km ²	Elev Ft	Town	WBID	Description
Hubbardton River	1.8	MF	115	160	West Haven	VT02-02	Located 1200m below first bridge.
Hubbardton River	10.7	MF	44	255	Hubbardton	VT02-02	Located about 500m west of Sunset Lake Road.
Hinkum Pond	1.1	M	1.4	719	Sudbury	VT02-02L08	Identifies Lake Only
Castleton River	8.7	MF	128	401	Castleton	VT02-03	Located upstream of South North Rd 100m.
Flower Brook	4.8	MF	21.4	1045	Danby	VT02-05	Located 100m below bridge off Danby-Pawlet Rd.
Bump School Brook	0.8	MF	2.8	310	Benson	VT02-02	Located above/below East road crossing.
Giddings Brook	0.4	F	13.3	440	Hubbardton	VT02-03	Located above Rt 30 bridge about 150 m.
Giddings Brook	1.1	M		535	Hubbardton	VT02-03	Located above Monument Rd crossing.
Breese Pond Outlet	4.7	MF	2.87	460	Hubbardton	VT02-02	Located above Baker Road.

APPENDIX E: RIVER PROGRAM ALTERNATIVES ANALYSIS

Alternatives for River Corridor Management Vermont DEC River Management Program Position Paper

Vermont has found itself in an unending and escalating cycle of spending millions of dollars to maintain river channels, repair and rebuild flood damaged roads and bridges, and protect adjacent land uses from destruction by erosion or flooding, only to see these river management investments: a) fail during the next flood; or b) result in increased damage elsewhere. Riparian landowners are increasingly strident about real and perceived failures of state river management policies to address their concerns as they lose valued property with every significant runoff event. At the same time, stream channel erosion is increasingly cited as one of the most significant statewide water resource concerns, as evidenced by physical and biological indicators of aquatic ecosystem health.

Recognize that:

- A significant percentage of Vermont rivers have undergone channelization. Typically, channelized streams are straighter, steeper, wider, and largely devoid of the instream and riparian features that maintain natural channel stability and provide a diversity of aquatic and riparian habitats.
- Channelization practices that were started over 100 years ago to accommodate early settlement, roads, railroads, logging, farms, mills, and other “human investments” have been periodically maintained through gravel removal, realignment, channel armoring, and post flood remediation projects.
- Many channels have incised, eroding downward, losing access to floodplains which are essential to maintaining natural channel stability over time. Many miles of rivers have lost access to their floodplains during frequent run-off events (1-10 year floods) and in some cases even rare events involving very large discharges (50-100 year floods) resulting in a tremendous increase in channel adjustment and erosion.
- Adjacent to incised and adjusting channels, land uses, including agriculture, residential and commercial development, and transportation infrastructure, have encroached into the lands previously used by river meanders and flood water.
- While some channelization continues today, many straightened, incised reaches are now widening and aggrading (building up with sediment transported from upstream). Recent major storm events have energized these channelized stream systems with inputs of water and sediment and, in so doing, have accelerated

these physical adjustment processes (widening and aggradation), as new flood plains develop along the rivers.

- The physical adjustment processes (most commonly observed as stream bank erosion) lead to the planform or meander changes that are imperative for the river system to attain a natural balance within its watershed. These adjustments cause property damage that, in many cases, have become increasingly intolerable for current landowners.

Managing Conflict, the Options:

Managing the conflict between people's land use expectations and river dynamics should be based on an examination of alternatives and cost-benefit analyses, in both the short and long-term, to both private and public interests. To avoid the growing conflict between the changing course of Vermont rivers and our land use expectations, the DEC and in collaboration with its partners must:

- 1) acknowledge these on-going physical processes and the circumstances leading to their existence today;
- 2) understand and be able to articulate the implications and consequences of different conflict management options; and
- 3) develop the ability to effectively address conflicts with riverine systems through the application of one or a combination of the following alternatives.

River corridor management alternatives for resolving historic and ongoing conflicts between river dynamics and land use expectations:

- Channelization: Maintain rivers in a channelized state through dredging and bank armoring applications. Active revegetation and long-term protection of a wooded riparian buffer is important to this alternative.
- Active Geomorphic: Restore or manage rivers to a geomorphic state of dynamic equilibrium through an **active** approach that may include human-constructed meanders, floodplains, and bank stabilization techniques. Typically, the active approach involves the design and construction of a management application or river channel restoration such that dynamic equilibrium is achieved in a relatively short period of time. Active riparian buffer revegetation and long-term protection of a river corridor is essential to this alternative.
- Passive Geomorphic: Allow rivers to return to a state of dynamic equilibrium through a **passive** approach that involves the removal of constraints from a river corridor thereby allowing the river, utilizing its own energy and watershed inputs to re-establish its meanders, floodplains, and self maintaining, sustainable equilibrium condition over an extended time period. Active riparian buffer revegetation and long-term protection of a river corridor is essential to this alternative.
- Combinations of the Above Alternatives: Use a combination of alternative approaches to accommodate the varying constraints that typically occur along a project reach.

The Physical Imperatives of River Systems

Changes to the shape of a river channel or changes in the inputs of water and sediment often lead to imbalance, and cause adjustments in river and floodplain geometry until balance is re-established. Natural adjustments to the river channel occur continually, but often dramatically manifest themselves during large flood events. These adjustments, however, have been overshadowed or largely magnified during the past two centuries by those resulting from human-imposed changes to the depth and slope of rivers related to intensive watershed and riparian land uses. Nearly every Vermont watershed has streams “in adjustment” from the following sequence of events:

Deforestation – led to dramatic increases in the volume of water and sediment runoff;

Snagging & ditching – clearing boulders and woody debris for logging and flood control, and ditching poorly drained land for agricultural improvements increased the rate of water and sediment runoff;

Villages, roads, and railroads – early settlements led to the first attempts to straighten rivers and streams which resulted in increases in channel slope, stream bed degradation, and floodplain encroachments;

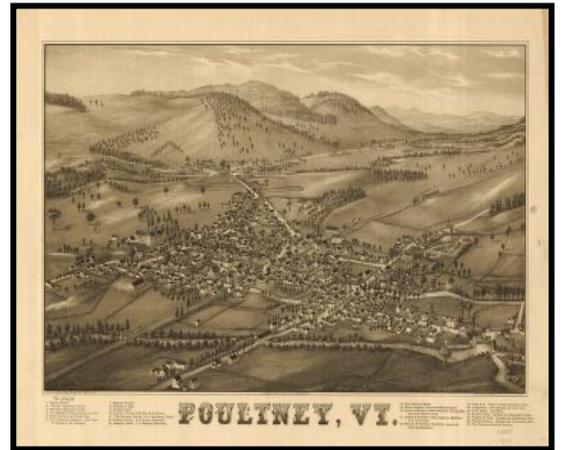
Mills, dams, and diversions – led to alterations in the amount and rate of water and sediment runoff. While dozens of dams are in place in each Vermont watershed today, historically there were hundreds;

Floods and flood works – each major flood event brought enormous loads of sediment into channels that were already aggrading or degrading, causing damage to human infrastructure which in turn led to new efforts to straighten and deepen the rivers;

Gravel removal – advocated as a way to maintain straighter, deeper channels; large-scale commercial gravel mining resulted in bed degradation, head cutting, channel over-widening, and severe bank erosion;

Encroachment – investments on lands previously occupied by river meanders or inundated during floods created unrealistic and unsustainable human expectations in the absence of continuous or periodic channel management activities; and

Stormwater and urbanization – increases in impervious surface and ditching to support economic development and land use conversion increased the rate and volume of water and sediment runoff entering stream systems.



Rivers are in a constant balancing act between the energy they produce and the work that must be done to convey the runoff of sediment and debris produced in their watersheds. The slope and depth of a river dictate how much transporting energy it contains. For example, a wide and shallow river will have less energy than one that is narrow and deep, resulting in a lower capacity to move sediment. During large runoff events, the shallow

river channel may aggrade, filling with gravel. On the other hand, a steep or high gradient river will have more energy than one of lower gradient, resulting in a greater capacity to move sediment. River channels that have become steeper will often degrade, eroding bed and banks, then widening and aggrading until the meanders and floodplains necessary to expend the excess energy have been established. It is a physical imperative within river systems that over time an energy balance with watershed inputs is achieved and maintained. This balance is achieved through adjustment of channel dimensions and longitudinal slope, and its elevation relative to the floodplain.

When a natural stream achieves a depth and slope in balance with its water and sediment loads, the channel and flood plain geometry are primarily maintained by the boundary conditions established by coarse sediment on the bed and/or the soil cohesiveness and soil binding attributes of vegetative root systems on the banks. When these stabilizing influences are disturbed, the resistance of the bed and bank to erosion is largely diminished. Grade control structures and rip-rap have been used on streams to replace boulder steps, cobble riffles and the deep, soil binding roots of trees and shrubs. These structures work but are not self-maintaining or replenishing like the boundary materials of naturally stable streams, and thus, must be periodically maintained. Human-placed boundary conditions may work for many years where the channel and floodplain geometry are in equilibrium, but typically initiate other channel adjustments or fail with the next flood when placed on channels that are in adjustment through stages of aggradation, degradation or seeking balance through longitudinal slope adjustment and plan form change.

The Conflict: Today's Accounting

Conflict between river corridor land uses and riverine flooding and erosion is as old as our imprint on the landscape. Traditional floodplain and channel management practices implemented to reduce or manage these conflicts have largely worsened the problem, or transferred it to an adjacent landowner, out of a lack of respect for or understanding of the physical imperatives of river systems.



Each time a river has been straightened, dredged, bermed, and armored to mitigate flood damage without respect for the physical form and function of its channel and floodplain, adjustments were set in motion that, more often than not, led to further erosion. The decades that often intervene between major floods have given people the misperception that their channelization projects actually worked. Generations have passed and people have forgotten that the rivers have been altered multiple times to “protect” human investments.

In Vermont, there are many rivers and streams that were channelized with little thought to how river systems work. As rivers adjust to regain a balance between their form and function, they are likely to undergo a period of significant bank erosion. This period will

be particularly painful for people to watch or experience. Especially as our population and global economy grow, the conflict between what is a physical imperative of the river system and our land use expectations becomes more and more intractable.

The floods of the 1990's in Vermont resulted in over \$60 million in mostly erosion-related damages (VTDEC Act 137 Report). Some severely aggraded channels were dredged, others were armored with rip-rap. But unlike the damaging floods of the 1970's, when commercial gravel mining was in its heyday, the rivers were not dredged and bermed as extensively during the 1990's. This has caused great concern for some interests, because, although the rivers have begun the adjustments necessary to reach equilibrium, the erosion and changes in planform are threatening current day investments in lands adjacent to the rivers.

Today's accounting shows a significant amount of the Vermont land base to be threatened by flood-related erosion due to historic channel management, changes in watershed hydrology and sediment regime, and riparian land use practices and encroachments. The expenditure of millions of dollars will be necessary to restore or manage rivers and property after future floods. The high cost of restoration or management may be mitigated over time at a watershed scale where an understanding of the physical processes of rivers (fluvial geomorphic science) is used to restore both channel and floodplain function and protect riparian corridors from future ill-advised developments. Where there is neither the will nor the means to compensate people for their current investments, the cost of post-flood remediation and property protection will remain high in perpetuity.



On another part of the ledger, the cumulative impact of human actions have degraded physical habitat necessary to support healthy populations of some fish species and other aquatic life. Repeated channelization reduces the river bed and riparian structures upon which aquatic biota rely for shelter, food, and reproduction. Worldwatch Institute research (Abramovitz, 1996) cited dams and channelization as the two most pervasive threats to freshwater ecosystems today, with dramatic effects on species abundance and diversity.

Unfortunately the growing conflict with river dynamics can not be treated as a one-dimensional economic problem to be solved for short term gain. The social, economic, and ecological return for implementing river corridor management practices that work toward equilibrium at the watershed scale will be largely enjoyed by generations to come. The long term challenge is to have more predictable investments with less erosion and healthier aquatic ecosystems, while minimizing short term economic losses along the way.

Short vs. Long Term Solutions: A Choice of Management Scenarios

For the straightened river, it is only a matter of time before a flood drops a very large load of sediment at some point along its course. The wedge of sediment that builds in the channel during the recession of the flood may cause the river to avulse, or leave the channel, and head cut back through the landscape from the point where it returns to the channel further downstream. These events can erode riverbanks tens of feet and sometimes create whole new channels through adjacent lands, often someone's farm field.

A common, understandable response from landowners is to get the gravel out, return the river to where it was, and repair the eroded riverbank with rock. This **“dredge and armor”** response should be used with great caution. We can all agree and recognize that the current pattern of land use investment and expectation along river corridors is not sustainable without some level of intervention or channel maintenance. The key is to assure that the maintenance is done in an informed way through acknowledgment of past mistakes and moves us all toward a more economically and ecologically sustainable relationship with the river.

Success, in the long term, will primarily be measured by our ability to solve problems at the watershed and river corridor scale; and secondarily, by how we resolve conflicts at individual erosion sites. From a geomorphic standpoint, this means recognizing that rivers transport and deposit sediment; and that natural stability and balance in the river system will depend on the river's opportunity to build and access a floodplain and create depositional features such as point bars, steps, and riffles to evenly distribute its energy and sediment load in a sustainable manner.

Gravel removal could continue to be an acceptable alternative to deal with erosion and flooding conflicts where the result is consistent with the natural form and function of the river and influences the physical adjustment processes in a way that reduces the long term conflicts rather than just pushing the problem into the future to be dealt with by our children and grandchildren.

As with the “dredge and armor” response, the **“do-nothing”** response has limited application, and should be used with caution and consensus. Projects that would restore and enhance aquatic habitat, aesthetics, and/or river recreation as primary objectives, **in the absence of river and land use conflicts**, should strongly consider the do nothing alternative. Where river and land use conflicts exist, the do-nothing response is rarely a viable alternative. Watersheds and river corridors freed of human encroachment would heal themselves in time, but unresolved conflict at one location may create more conflict and unintended consequences for both the river and adjacent landowners. Sometimes, the river management practices that must be implemented after a period of doing nothing (as

the conflicts have worsened) may, in the end, be worse than those avoided in the first place.

Understanding that river and riparian habitats are formed and maintained by fluvial processes at the watershed scale is essential to resolving conflicts and carrying out river corridor management activities that, while seemingly detrimental to an existing habitat feature, nevertheless represent meaningful long-term solutions that support the river's ecological potential. In the end, the riparian corridor and floodplain functions provide the basis for instream habitat-forming processes. Opportunities to establish long-term buffer agreements that minimize future corridor encroachments and support riparian woodlands should be supported even where site-specific habitat features may be compromised in the short-term. The major exception to such a policy would be that a long term solution should not compromise habitat that is critically limited in geographical extent, especially rare, threatened or endangered species habitats.



In some situations, the “dredge and armor” and “do nothing” approaches may support positive land use and/or habitat-related outcomes for a certain period of time. When the alternatives are not well known, articulated or understood, it is human nature to seek out or repeat solutions that protect the status quo, even if that same solution just failed. It would be wrong though, to pursue a short term approach that is doomed to failure and/or did not resolve the conflict at the expense of long-term solutions. A guide to both the short and long term costs and benefits associated with the four different management alternative and examples of how each alternative might be pursued as a river management project are offered in an appendix to this paper.

Informing the Alternatives Selection Process

The decision to armor an eroding bank or dredge a river to protect investments in the land becomes easy if you focus only on the short term costs and benefits. While one armoring or gravel removal project to stop erosion may be relatively benign, the problem arises from the cumulative effects of dredging and armoring up and down a river valley. At some threshold, bank armoring, post flood channelization, and changes in stormwater runoff combine to move a river out of equilibrium. In Vermont over the past century, a high percentage of riparian landowners, with government assistance, have considered and applied the dredge and armor approach. Meanwhile, commercial and residential development, transportation infrastructure, logging, and agricultural practices have altered the quantity and rate of water and sediment runoff. The resulting watershed-level instability places the viability of individual, seemingly benign, bank protection projects in

jeopardy where significant channel adjustments are now underway. Even so, gravel removal and bank armoring may be the necessary short-term “band-aid” solutions that are applied in areas of irresolvable conflict until significant watershed problems can be documented through geomorphic assessment and addressed through the application of best management practices.

The DEC River Management Program is working with its partners to focus on the long term benefits of a geomorphic management approach to both property owners and riparian ecosystems. The largest challenge will not be in applying the science to understand the river’s slope and planform requirements, but rather how to redefine the relationship of public and private investments with fluvial dynamics in an equitable manner over time within a valley. The larger short term costs associated with using a geomorphic-based approach, where land conversion is necessary, become more acceptable and economically justifiable where channelization projects have failed repeatedly or in post flood remediation where major erosion, property damage, and channel avulsions have occurred. A passive geomorphic approach may be the most desirable alternative due to its lower maintenance costs but is highly dependent upon landowners willing to accept what may be significant changes in land use expectations. It is extremely important that State and Federal agencies involved with river resource management work together to provide economic incentives and technical assistance to towns and landowners to make decisions that resolve immediate conflicts with the long term watershed solutions in mind.

Watershed planning and the year-to-year implementation of management / restoration projects will require information about the geomorphic condition of the watershed. Using the Vermont ANR Stream Geomorphic Assessment Protocols, the River Management Program and its partners will gain critically important information on:

- **stream condition** or the current degree of departure of the channel, floodplain, and valley conditions from the reference (natural or equilibrium) condition for parameters such as channel dimension, pattern, profile, sediment regime, and vegetation;
- **sensitivity** or the likelihood that a stream will respond to a watershed or local disturbance caused by natural event and/or anticipated human activity; and
- **adjustment process** or type of change that may be underway due to natural causes or human activity that has or may result in a change to the valley, floodplain, and/or channel condition (e.g., vertical, lateral, or channel plan form adjustment processes).

The assessment of stream condition, sensitivity, and adjustment process is an ideal tool for problem solving in a watershed context because it will not only show the proximity of river reaches undergoing channel adjustment, but will explain how one



reach may be affecting the geomorphic condition of another. The physical stream condition is largely a function of the type and magnitude of channel adjustments that are happening in response to changes in runoff patterns and the channel and floodplain modifications that have occurred in a watershed.

Ideally, watershed plans involving all stakeholders would articulate how public and private land use and infrastructure investments would be balanced with the goal of achieving an equilibrium condition in the river. In addition to that, an incentives-based, multi-agency river management program that seeks incremental progress with each landowner toward protecting, managing, and restoring the river corridor should be established. Either way, real progress will be measured over decades.

Glossary of Terms as used in this paper

Aggradation: Raising or building up of the channel bed or flood plain through the deposition of sediment transported from upstream.

Armoring: Increasing the erosion resistance of the channel bed and banks through structural treatments such as rock rip rap or gabions.

Avulsion: Catastrophic relocation of the channel, typically across a peninsula-shaped flood plain or through a flood chute usually during a major flood event.

Belt Width: The meander belt width is the horizontal distance between the opposite outside banks of fully developed meanders. The belt width is an area critical to unconfined streams as they adjust their slope consistent with their sediment regime.

Channelization: Channel and flood plain alterations that typically straighten and increase the longitudinal slope, raise the elevation of the banks or lower the elevation of the bed and often includes bank armoring.

Degradation: Lowering of the streambed typically due to an imbalance between a) sediment supply and transport capacity or b) resistance of the bed materials and the energy of flowing water.

Dynamic Equilibrium: A state of balance whereby a stream, over time and in the present climate, transports the flow, sediment, and debris of its watershed in such a manner that it maintains its dimension, pattern, and profile without aggrading or degrading.

Fluvial: Related to the river system

Geomorphic: 1) Refers to a condition within which a fluvial system is in dynamic equilibrium or 2) refers to the complex interaction of physical landscape parameters that influence river form and function.

Incise: See Degradation.

Longitudinal Slope: The profile of the river or the rate at which it drops in elevation in relation to the horizontal length it travels.

Physical Adjustment Process: If a stream reach is forced out of a state of dynamic equilibrium (generally as a result of channel, floodplain or watershed disturbances), it will adjust its dimension, plan form and profile until balance between the watershed inputs and its ability to transport those inputs is re-established.

Plan Form: Channel geometry in plan view; meander pattern.

Riparian: Relating to the river or in geographic proximity to river.

Sediment: Soil materials ranging from boulders to clay particles that may be transported or deposited in the channel or flood plain.

Structure: Natural or human-introduced materials, typically wood or rock, that create physical features along the bank or bed.

Appendix to the Alternatives for River Corridor Management Vermont DEC River Management Program Position Paper

Example Projects

The following project considerations are offered as a way to begin distinguishing between the four alternatives described in this paper. Prior to the selection of **any** management alternative:

- the economic and ecological consequences to both on and off-site areas, properties, and infrastructure should be understood through the completion of stream geomorphic assessments of the project reach as well as upstream and downstream reaches; and
- essential riparian values should be protected, maintained, and/or restored by establishing long-term agreements with landowners to establish and maintain a wooded buffer between the channel and adjacent land uses.

Channelization Projects involve the design and implementation of practices intended to resolve conflicts and meet the goal of protecting property and certain other social values. New channel straightening efforts are rarely permitted today, but many dredge, berm, and armor practices are carried out on channels that were historically straightened. They are

essentially maintenance projects to re-establish the flow capacity of the altered channel and/or rip rap banks that have begun to fail. All stream channels in equilibrium will move over time, and therefore any project that attempts to lock in the planform or meander geometry of a stream is, in part, a channelization project. An armored or fixed channel that has or is constructed to have the dimension, pattern, profile, and median sediment size of its regime or equilibrium condition will perform more ecological functions (see list below) than one that is armored as a straightened channel.

Active Geomorphic Projects involve the design and implementation of practices intended to resolve conflicts and meet the goals of protecting and/or restoring property, social values and ecological functions. Primary ecological functions as defined by the U.S. Army Corps of Engineers (Fischenich, 2003) include:

Stream Dynamics involving stream evolution processes, energy management, and riparian succession

Hydrologic Balance involving water storage processes, surface/subsurface water exchange, seasonal flow condition (hydrodynamic character)

Sediment processes involving sediment continuity, substrate and structural processes, and quantity and quality of sediment

Biological Support involving biological communities and processes, necessary habitats for all life cycles, and trophic structures and processes

Chemical Processes and Pathways involving water and soil quality, chemical processes and nutrient cycles and landscape pathways

Active geomorphic projects would include designs supported by survey-level stream geomorphic assessments and involve the long-term protection of a river corridor necessary to accommodate the channel slope and planform adjustments that support the functions of stream dynamics and sediment processes. These corridors could support land uses (e.g. agriculture and silviculture) but would limit investments that could lead to further conflict and channelization practices. Active geomorphic project designs would typically involve the human construction of channel and floodplain segments with dimension, plan form, and/or slope requirements similar to a reference equilibrium condition. Structures used to treat exposed bank soils and encourage the establishment of woody vegetation are selected to avoid future conflict (where it can be reasonably anticipated), in consideration of other social values, and with respect to the long-term restoration of ecological functions. In the appropriate settings, bank treatments would be temporary in nature until root systems have a chance to take hold and re-enforce the boundary conditions of the channel.

Passive Geomorphic Projects involve all the assessment and design elements of an active geomorphic project with the exception of human constructed channel and floodplain geometry. The stream bed and banks are not treated, and the channel evolution process is allowed to proceed unimpeded. Passive geomorphic projects may involve the removal of constraints from a geomorphically designed river corridor; thereby allowing the river, utilizing its own energy and watershed inputs to re-establish its meanders, floodplains, and equilibrium condition, over an extended time period.

In most cases, to balance social values and ecological functions, project designs will combine elements of the four alternatives based on the nature of the conflicts and the time and resources available for project implementation. Geomorphic assessment, basin planning, and alternatives analysis at the watershed scale will support strategic restoration that is both economically and

The Do Nothing Alternative literally involves doing nothing. This alternative does not involve the resolution of existing conflict. Doing nothing may support other social values and other ecological functions until conflict resolution becomes imperative.

Preferred Alternatives

The Vermont DEC River Management Program offers the following situations where each alternative for river corridor management may be preferred.

The **Passive Geomorphic Approach** may be the most preferred alternative due to the lower risk and maintenance costs associated with its implementation and the long term economic and ecological sustainability that is accrued. But, due to the potentially higher costs associated with changes in land use and/or buyouts, the passive geomorphic approach may be preferred more often where conflicts are in the minor to moderate range. There are also risks to upstream and downstream reaches and adjacent landowners (associated with active adjustment processes) that should be factored.

The **Active Geomorphic Approach** is also a highly preferred alternative due to the benefits associated with long term economic and ecological sustainability. The active geomorphic approach may be applied where conflicts are high, but is tempered by the fact that short-term costs and risks are also high due construction and maintenance, as well as the land use changes that may be engendered. The construction of a river channel and its floodplain may be the most cost effective and preferred alternative in a post-flood situation where avulsions and property damage are severe and remediation costs are already high. Pre-Disaster Mitigation plans may also identify the active geomorphic approach as a viable alternative.

The **Channelization Approach**, exclusively involving dredge and armor practices and the maintenance of straightened channels, is not generally the preferred alternative due to high construction costs, long-term maintenance costs and greater impacts to ecological functions. The channelization approach may be preferred and offer the only viable alternative where conflicts are high to extreme and land use conversions are not possible.

The **Do-Nothing Approach**, may be preferred where land use conflicts are low to non-existent. The do-nothing approach is not a preferred alternative where conflicts are in the moderate to high range and its selection only postpones the implementation of a different alternative and/or adversely affects fluvial processes in upstream and downstream reaches. Delays in resolving conflicts typically result in higher costs and fewer management options.

Matrix of Alternative Constraints, Cost, and Benefits

A matrix for evaluating the short and long term costs and benefits associated with river management alternatives is presented on the following pages.

The first page looks at whether certain design constraints affect the successful implementation of projects that attempt to follow one of the alternatives. These constraints include the inability of the project design to 1) establish and maintain channel boundary conditions with a wooded buffer; 2) establish and maintain channel equilibrium through floodplain access and a belt width to accommodate slope adjustments; and 3) deal with sediment regime problems related to changes in the water and sediment inputs of the watershed.

The second page of the matrix looks at the short and long term costs/risks and benefits to the property owners and other project proponents. Construction and maintenance costs are discussed as well as the risks associated with project failure. The cost of land use conversion is also factored. The third page begins to look at the costs and risks to the ecological functions of the river system, including habitat features and habitat forming processes.

References

1. Abramovitz, J. 1996. Imperiled Waters, Impoverished Future: The Decline of Freshwater Ecosystems. Worldwatch Institute, Worldwatch Paper 128. Washington DC.
2. Fischenich, J.C. 2003. Technical Considerations for Evaluating Riverine/Riparian restoration Projects. ERDC/EL TR-WRAP-03-XX, April 2003, U.S. Army Engineer Research and Development Center Environmental Laboratory, Vicksburg, MS.
3. Vermont Department of Environmental Conservation. 1999. Act 137 Report: Options for State Flood Control Policies and a Flood Control Program. Waterbury, VT.

Alternatives Analysis of Management/Restoration Approaches – Vermont DEC River Management Program

	Channelization	Active Geomorphic	Passive Geomorphic
<p>General Description – Each approach is described as a stand-alone alternative. The chosen alternative for a management / restoration project may be a combination or blending of approaches which may share the strengths and weaknesses of the approaches used.</p>	<p>Maintain rivers in a channelized state through dredging and bank armoring applications. Includes maintenance of sites where the dimension, pattern, and profile are not consistent with the fluvial processes and geomorphic condition. Active revegetation and long-term protection of a wooded riparian buffer is important to this option.</p>	<p>Maintain or restore rivers to a geomorphic state through an active approach that may include human-constructed meanders, floodplains, and temporary bank stabilization practices. Active revegetation and long-term protection of a wooded riparian corridor is imperative to this option.</p>	<p>Restore rivers to a geomorphic state through a passive approach. This involves river meanders and temporary bank activities may be used to achieve the geomorphic condition. Active revegetation and long-term protection of a wooded riparian corridor is imperative to this option.</p>
Management constraints that may limit the success of the approach			
<p>Buffers - Lack of long term agreement for the conservation of an appropriately sized and managed wooded buffer.</p>	<p>Minor influence on channel stability depending on bank armoring application. Limits buffer functions (e.g., formation or restoration of aquatic and riparian habitats).</p>	<p>Is a constraint. A wooded buffer is imperative for bank resistance to erosion. The width necessary to perform buffer functions is dependent on the bank stabilization techniques that are used and maintained.</p>	<p>Is a constraint. A wooded buffer is imperative for bank resistance to erosion. The width necessary to perform buffer functions is dependent on whether bank stabilization techniques are used and maintained.</p>
<p>Flood plain and Meanders - Inability or unacceptability to create access to floodplain and/or limitations to provide adequate belt width (meander amplitude) and longitudinal slope.</p>	<p>Is a constraint where channel has become incised due to human activities and the bed is comprised of fine grained sediments; will cause project failure during flood due to structural undermining. Limits natural habitat-forming processes.</p>	<p>Is a constraint where the management approach is for a geomorphic channel form based on a geomorphic reference condition and depends on adequate flood plain, meander width and balance between stream power and bed/bank resistance. May limit natural habitat-forming processes.</p>	<p>Is a constraint where the management approach is for a geomorphic channel form based on a geomorphic reference condition and depends on adequate flood plain and meander width. May limit natural habitat-forming processes.</p>
<p>Watershed Inputs and Fluvial Processes - Watershed and reach level instability from hydrologic modifications and/or sediment regime imbalances (between sediment load, transport and deposition).</p>	<p>May become a constraint where accelerated erosion is due to increased discharge of water and aggradation of sediment from upstream; project may transfer impacts associated with increased velocity and sediment to downstream reaches.</p>	<p>May be a constraint where the management approach is for a channel form based on a geomorphic reference condition; especially where energy dissipation and sediment storage is limited elsewhere in the reach and/or watershed.</p>	<p>May become a constraint where the management approach is for a channel form based on a geomorphic reference condition; especially where energy dissipation and sediment storage is limited elsewhere in the reach and/or watershed.</p>
Costs/Risks and Benefits to Property			
Short term	<p>Moderate construction costs depending on the amount and</p>	<p>Low construction and maintenance costs where</p>	<p>Minor construction costs where project involves</p>

	Channelization	Active Geomorphic	Passive Geomorphic
General Description – Each approach is described as a stand-alone alternative. The chosen alternative for a management / restoration project may be a combination or blending of approaches which may share the strengths and weaknesses of the approaches used.	Maintain rivers in a channelized state through dredging and bank armoring applications. Includes maintenance of sites where the dimension, pattern, and profile are not consistent with the fluvial processes and geomorphic condition. Active revegetation and long-term protection of a wooded riparian buffer is important to this option.	Maintain or restore rivers to a geomorphic state through an active approach that may include human-constructed meanders, floodplains, and temporary bank stabilization practices. Active revegetation and long-term protection of a wooded riparian corridor is imperative to this option.	Restore rivers to a geomorphic state through a passive approach. This approach involves river meanders and temporary bank stabilization activities may be used to achieve the geomorphic condition. Active revegetation and long-term protection of a wooded riparian corridor is imperative to this option.
	availability of rock armor; lower costs associated with land conversion and buffer creation; lower failure risk, unless degradation and/or aggradation existed prior to treatment then failure risks may be high; increased risks to upstream and downstream channel instability; benefits accrued from resolving erosion-related conflicts at the treated site.	channel alignment is at or near the geomorphic reference, high costs where planform construction is necessary; higher costs associated with land conversion and buffer creation; failure risk lowers after root structures of vegetation are established; reduced risks to upstream and downstream instability; benefits accrued from resolving erosion-related conflicts along the restored reach.	stabilization approaches that are not at the geomorphic reference; high costs associated with land conversion and buffer creation; minimal investment in riparian corridor; related sedimentation risks to downstream; benefits accrued from resolving erosion-related conflicts at the treated site.
Long Term	High risk of repeated failure where 1) watershed is producing high loads of sediment, 2) the river bed is comprised of fine grain sediments, 3) upstream and downstream reaches are in adjustment or have also been channelized; high structural maintenance costs associated with repeated failures; potentially high loss of land and other investments when structures fail during floods.	Low risk of repeated failure where wooded corridor has been protected; moderate risks where upstream and downstream reaches are in adjustment or have been channelized; low structural maintenance costs as river is moderated by natural vegetation and bed form controls; little or no loss of additional land or other investments during flood; long term conflict resolution.	Low risk of repeated failure where wooded corridor has been protected; moderate risks where upstream and downstream reaches are in adjustment or have been channelized; low structural maintenance costs as river is moderated by natural vegetation and bed form controls; little or no loss of additional land or other investments during flood; long term conflict resolution.
Costs/Risks and Benefits to Ecological Function			
Short Term	Fair to good quality runs and pools may form along rip-rap depending on the bank line curvature; increased sediment transport through straightened reaches reduces deposition-formed bed features including riffles/ steps, runs and pools	Good to reference quality riffles/ steps, runs and pools will form where the pre-existing or constructed channel and flood plain morphology is consistent with the fluvial processes	Poor quality riffles/ steps, runs and pools may persist for some time. Good to reference quality riffles/ steps, runs and pools that pre-exist the channel and flood plain morphology

	Channelization	Active Geomorphic	Passive Geomorphic
General Description – Each approach is described as a stand-alone alternative. The chosen alternative for a management / restoration project may be a combination or blending of approaches which may share the strengths and weaknesses of the approaches used.	Maintain rivers in a channelized state through dredging and bank armoring applications. Includes maintenance of sites where the dimension, pattern, and profile are not consistent with the fluvial processes and geomorphic condition. Active revegetation and long-term protection of a wooded riparian buffer is important to this option.	Maintain or restore rivers to a geomorphic state through an active approach that may include human-constructed meanders, floodplains, and temporary bank stabilization practices. Active revegetation and long-term protection of a wooded riparian corridor is imperative to this option.	Restore rivers to a geomorphic state through a passive approach. This involves river meanders and floodplains. Temporary bank stabilization activities may be used to protect the geomorphic state until a permanent state is achieved. Active revegetation and long-term protection of a wooded riparian corridor is imperative to this option.
	steps and riffles; risks to aquatic biota from temperature increases; increased velocity and bed load transport may impact downstream reaches; aquatic habitat benefits of riparian buffer accrued where bank vegetation is established and wood recruitment occurs; less erosion of sand/silt may decrease embeddedness downstream.	(deposition/scour of sediment and debris into the different scaled bed forms) occurring in the reach or watershed; temporary bank stabilization may result in reduced pool quality; aquatic and riparian habitat benefits accrued with establishment of corridor vegetation and wood recruitment; less erosion of sand/silt may decrease embeddedness.	become consistent with fluvial processes; the reach or watershed; temporary bank stabilization may result in reduced pool quality; aquatic and riparian habitat benefits accrued with establishment of corridor vegetation and wood recruitment; erosion from adjustment may lead to increased and/or embeddedness impacts in the reach.
Long Term	Habitat quality is fair at best; very limited structure and complexity at micro, meso, and macro habitat scales; where the channelization approach (dredging and armoring) has become the prevailing and repeated post-flood practice in a watershed, biological productivity is far less than its potential.	Physical habitat is near its potential. Depth and cover within pools are restored as bank vegetation and bed features control the boundary conditions of the channel and large wood recruitment continues. Water temperature lowers as channel narrows and canopy is restored.	Physical habitat is near its potential. Depth and cover within pools are restored as bank vegetation and bed features control the boundary conditions of the channel and large wood recruitment continues. Water temperature lowers as channel narrows and canopy is restored.

APPENDIX F: LIST OF RARE, THREATENED AND ENDANGERED SPECIES IN THE POULTNEY METTOWEE BASIN

The biophysical regions of Vermont are characterizations of the landscape based on factors such as climate, geology, topography, soils, natural communities, and human history (Thompson and Sorenson, 2000). The Poultney and Mettowee watersheds are primarily located in the Taconic Mountain biophysical region of Vermont, with a small portion of the northwest basin located in the Champlain Valley biophysical region. Within these biophysical regions, there are many types of natural communities that contain numerous rare, threatened, and endangered species of flora and fauna. Examples of these natural communities and associated rare and uncommon plants species are included here.

Upland Natural Communities

Montane Yellow Birch – Red Spruce Forest

Wood Millet – *Millium effusum*
Lesser pyrola – *Pyrola minor*
Showy Mountain Ash – *Sorbus decors*
Mountain sweet-cicely – *Osmorhiza chilensis*
Northern Sweet-cicely - *Osmorhiza depauperata*

Red Spruce – Northern Hardwood Forest

Wood Millet – *Millium effusum*

Boreal Talus Woodland

Moss – *grimmia apocarpa*
Rock Tripe – *Umbilicaria* spp.

Northern Hardwood Forest

Broad beech fern – *Thelypteris hexagonoptera*
Male fern – *Dryopteris filix-mas*
Three-birds orchid – *Triphora trianthophora*

Mesic Red Oak – Northern Hardwood Forest

Squawroot – *Conopholis americana*
Minnesota sedge – *Carex albursina*
Ginseng – *Panax quinquefolius*
Broad beech fern – *Thelypteris hexagonoptera*

Summer sedge – *Carex aestivalis*
Virginia spring beauty – *Claytonia virginica*
Flowering dogwood – *Cornus florida*
Large whorled pagonia – *Isotria verticillata*

Hemlock-Northern Hardwood Forest

Pinedrops – *Pterospora andromedea*

Northern Hardwood Talus Woodland

Northern stickweed – *Hackelia deflexa*
Goldie's wood fern – *Dryopteris goldiana*

Red Pine Forest or Woodland

Douglas' knotweed – *Polygonum douglasii*

Limestone Bluff Cedar-Pine Forest

Rams head lady's slipper – *Cypripedium arietinum*
Purple clematis – *Clematis occidentalis*
Four-leaved milkweed – *Asclepias quadrifolia*
Yellow oak – *Quercus muehlenbergii*
Buffalo-berry – *Sherpherdia Canadensis*
Walking fern – *Asplenium rhizophyllum*

Red Cedar Woodland

Longleaf bluet – *Hedyotis longifolia*
Downy arrowwood – *Viburnum rafinesquianum*
Hay sedge – *Carex foenea*

Best place to visit – Helen W. Buckner memorial Preserve at Bald Mountain,
West Haven, The Nature Conservancy

Dry Oak Forest

Rattlesnake-weed – *Hieracium venosum*
Slender wheatgrass – *Elymus trachycaulus*
Downy arrowwood – *Viburnum rafinesquianum*
Panicked tick trefoil – *Desmodium paniculatum*
Four-leaved milkweed – *Asclepias quadrifolia*
Squawroot – *Conopholis Americana*

Best place to visit – North Pawlet Hills Natural Area – The Nature Conservancy

Dry Oak-Hickory-Hophornbeam Forest

Yellow oak – *Quercus muehlenbergii*
Four-leaved milkweed – *Asclepias quadrifolia*
Wood lily – *Lilium philadelphicum*
Hitchcock's sedge – *Carex hitchcockiana*
Forked chickweed – *Paronychia Canadensis*
Allegheny crowfoot – *Ranunculus allegheniensis*
Early blue violet – *Viola palmate*
Deerberry – *Vaccinium stamineum*
Hound's tongue – *Cynoglossum boreale*
Hairy honeysuckle – *Lonicera hirsute*
Rue anemone – *Anemonella thalictroides*
Back's sedge – *Carex hackii*
Sprout bearing muhlenbergia - *Muhlenbergia soholifera*
Slender-flowered muhlenbergia - *Muhlenbergia tenuiflora*

Best place to visit - Shaw Mountain Natural Area, Benson, The Nature Conservancy

Mesic Maple-Ash-Hickory-Oak Forest

Pignut Hickory – *Carya glabra*
Flowering dogwood – *Cornus florida*
Round-leaved tick trefoil – *Desmodium rotundifolium*
Minnesota sedge – *Carex albursina*
Four-leaved milkweed – *Asclepias quadrifolia*
Squawroot – *Conopholis Americana*
Handsome sedge – *Carex Formosa*
Yellow oak – *Quercus muehlenbergii*
Broad beech fern – *Thelypteris hexagonoptera*
Hitchcock's sedge – *Carex hitchcockiana*
Spicebush – *Lindera benzoin*
Perfoliate bellwort – *Uvularia perfoliata*
Short-style snakeroot – *Sanicula Canadensis*

Best place to visit – Bomoseen State Park, Castleton, Department of Forests, Parks, and Recreation

Valley Clayplain Forest

Short-style snakeroot – *Sanicula Canadensis*
Harsh sunflower – *Helianthus strumosus*
Buxbaum's sedge – *Carex buxbaumii*

Leafy bulrush – *Scirpus polyphyllus*
Grove sandwort – *Arenaria lateriflora*
Loose sedge – *Carex laxiculmis*
Yellow bartonia – *Bartonia virginica*
American hazelnut – *Corylus Americana*
Drooping bluegrass – *Poa saltuensis*
Umbellate sedge – *Carex umbellate*
Rough avens – *Geum laciniatum*
Broad beech fern – *Thelypteris hexagonoptera*
Minnesota sedge – *Carex albursina*
Gray's sedge – *Carex grayi*
Folliculate sedge – *Carex folliculata*
Handsome sedge – *Carex Formosa*
Stout woodreed – *Cinna arundinacea*
Fragrant sumac – *Rhus aromatica*
Spicebush – *Lindera henzoin*

Best place to visit – Hubbardton River Valley, West Haven, Benson

White Pine – Red Oak – Black Oak Forest

Scarlet oak – *Quercus coccinea*
Slender mountain rice – *Oryzopsis pungens*
Yellow panic grass – *Panicum xanthophysum*
Mountain Laurel – *Kalmia latifolia*
Spotted wintergreen – *Chimaphila maculata*

Transition Hardwood Talus Woodland

White-flowered leafcup – *Polymnia Canadensis*
Upland Boneset – *Eupatorium sessilifolium*
Goldie's wood fern – *Dryopteris goldiana*
Black maple – *Acer nigrum*
Climbing fumitory – *Adlumia fungosa*
Hairy wild rye – *Elymus villosus*
Northern stickseed – *Hackelia deflexa* var. *Americana*
Back's sedge – *Carex backii*
Sprout bearing muhlenbergia - *Muhlenbergia soholifera*
Slender-flowered muhlenbergia - *Muhlenbergia tenuiflora*

Best place to visit - Shaw Mountain Natural Area, Benson, The Nature Conservancy

Riverside Outcrop

Cut-leaved anemone – *Anemone multifida*

Rand's goldenrod – *Solidago simplex*
Smooth cliff brake – *Pellaea glabella*
Hyssop-leaved fleabane – *Erigeron hyssopifolius*
Tradescant's aster – *Aster tradescantii*
Spiked oatgrass – *Trisetum spicatum*
Dwarf bilberry – *Vaccinium cespitosum*
Stout goldenrod – *Solidago squarrosa*
Canada burnet – *Sanguisorba Canadensis*
Jessup's milkvetch – *Astragalus robbinsii*
Wild chives – *Allium schoenoprasum*
Shining ladies tresses – *Spiranthes lucida*
Great St. Johnswort – *Hypericum pyramidatum*
Snowy aster – *Solidago ptarmicoides*
Whorled milkworm – *Polygala verticillata*

Erosional River Bluff

Wild lupine – *Lupinus perennis*
Plains frostweed – *Helianthemum bicknellii*
Canada frostweed - *Helianthemum canadense*
Molested sedge – *Carex molesta*
Short-headed sedge – *Carex brevoir*
Silver-flowered sedge – *Carex argyrantha*

Boreal Outcrop

Bigelow's sedge – *Carex bigelowii*
Alpine bilberry – *Vaccinium uliginosum*
Mountain fir clubmoss – *Lycopodium appalachianum*

Temperate Acidic Outcrop

Douglas' knotweed – *Polygonum douglasii*
Dwarf chinquapin oak – *Quercus prinoides*
Prickly rose – *Rosa acicularis*

Temperate Calcareous Outcrop

Richardson's sedge – *Carex richardsonii*
Hairy honeysuckle – *Lonicera hirsute*
Lyre-leaved rock cress – *Arabis lyrata*
Creeping juniper – *Juniperus horizontalis*
Purple clematis – *Clematis occidentalis*
Snowy aster – *Solidago ptarmicoides*
Hay sedge – *Carex foenea*
Smooth false-foxglove – *Aureolaria flava*

Harsh sunflower – *Helianthus strumosus*
Downy arrowwood – *Viburnum rafinesquianum*
Four-leaved milkweed – *Asclepias quadrifolia*
Silver-flowered sedge – *Carex argyrantha*
Hairy beardtongue – *Penstemon hirsutus*
Yellow oak – *Quercus muehlenbergii*
Fragrant sumac – *Rhus aromatica*

Best place to visit - Shaw Mountain Natural Area, Benson, The Nature Conservancy

Boreal Acidic Cliff

Fragrant fern – *Dryopteris fragrans*
Scripus-like sedge – *Carex scirpoidea*
Deer-hair sedge – *Scirpus caespitosus*

Boreal Calcareous Cliff

Roseroot – *Sedum rosea*
Lyre-leaved rock cress – *Arabis lyrata*
Purple mountain saxifrage – *Saxifraga oppositifolia*
White mountain saxifrage – *Saxifraga aizoon*
Yellow mountain saxifrage – *Saxifraga aizoides*
Tall wormwood – *Artemisia campestris*
Fragrant fern – *Dryopteris fragrans*
Smooth woodsia – *Woodsia glabella*
Birdseye primrose – *Primula mistassinica*
Scripus-like sedge – *Carex scirpoidea*
Butterwort – *Pinguicula vulgaris*
Blake's milk-vetch – *Astragalus robbinsii*
Hyssop-leaved bane – *Erigeron hyssopifolius*
Braya – *Braya humulis*
Few-flowered spikerush – *Eleocharis pauciflora*
Capitate beak-rush – *Rhynchospora capitellata*
Mountain fir-clubmoss – *Lycopodium appalachianum*
Alpine sweet-broom – *Hedysarum alpinum*

Temperate Acidic Cliff

Best Places to visit – North Pawlet Hills Natural Area, Pawlet, The Nature Conservancy

Temperate Calcareous Cliff

Wall-rue – *Asplenium rutamuraria*

Stellar's cliff brake – *Cryptogramma stelleri*
Smooth cliff brake – *Pellaea glabella*
Purple cliff brake – *Pellaea atropurpurea*
Missouri rock cress – *Arabis missouriensis*
Spiral whitlow-grass – *Draba arabisans*
Walking fern – *Asplenium rhizophyllum*
Purple clematis – *Clematis occidentalis*
Maple-leaved goosefoot – *Chenopodium gigantosperum*
Strawberry-blite – *Chenopodium capitatum*
American stickweed – *Hackelia deflexa*
Drummond's rock cress – *Arabis drummondii*
Supple panic grass – *Panicum flexile*

Open Talus

Best places to visit – White Rocks, Wallingford, White Rocks National
Recreational Area, GMNF

Wetland Natural Communities

Silver Maple-Ostrich Fern Riverine Floodplain Forest

Wiegand's wild-rye – *Polygonum cuspidatum*
Hairy wild-rye – *Elymus villosus*
Stout woodreed – *Cinna arundinacea*
Meadow horsetail – *Equisetum pretense*

Silver Maple-Sensitive Fern Riverine Floodplain Forest

Green dragon – *Arisaema dracontium*
Gray's sedge – *Carex grayi*
Stout woodreed – *Cinna arundinacea*

Sugar Maple-Ostrich Fern Riverine Floodplain Forest

American hazelnut – *Corylus americana*
Hairy honeysuckle – *Lonicera hirsute*
Wiegand's wild-rye – *Polygonum cuspidatum*
Goldie's wood fern – *Dryopteris goldiana*

Red Maple-Black ash Swamp

Yellow water-crowfoot – *Ranunculus flabellaris*
Yellow bartonia – *Bartonia virginica*
Short-awn foxtail – *Alopecurus aequalis*
Cyperus-like sedge – *Carex psuedocyperus*

Green adder's mouth – *Malaxis unifolia*
White adder's mouth – *Malaxis monomphyllos*
Nodding trillium – *Trillium cernuum*
Black gum – *Nyssa sylvatica*
Massachusetts fern – *Thelypteris simulate*

Red or Silver Maple-Green Ash Swamp

Yellow water-crowfoot – *Ranunculus flabellaris*
Nodding trillium – *Trillium cernuum*
Gray's sedge – *Carex grayi*
False hop sedge – *Carex lupiformis*
Cyperus-like sedge – *Carex psuedocyperus*
Loesel's twayblade – *Liparis loeselii*
Stout woodreed – *Cinna arundinacea*
Drooping bulrush – *Scirpus pendulus*

Calcareous Red Maple-Tamarack Swamp

Showy lady's slipper – *Cypripedium reginae*
Pink pyrola – *Pyrola asarifolia*
Rough-leaved goldenrod – *Solidago patula*
Green adder's mouth – *Malaxis unifolia*
Moss – *Meesia triquetra*

Red Maple-Northern White Cedar Swamp

Lily-leaved twayblade – *Liparis lilifolia*
White adder's mouth – *Malaxis monomphyllos*
Ram's head lady-slipper – *Cypripedium arietinum*
Wild Jacob's ladder – *Polemonium van-bruntiae*
Nodding trillium – *Trillium cernuum*
Swamp fly honeysuckle – *Lonicera oblongifolia*
Hairy honeysuckle – *Lonicera hirsute*
Thin-flowered sedge – *Carex tenuiflora*
Green adder's mouth – *Malaxis unifolia*
Yellow bartonia – *Bartonia virginica*
Small yellow lady's slipper – *Cypripedium calceolus*
Showy lady's slipper – *Cypripedium reginae*
Loesel's twayblade – *Liparis loeselii*
Yellow water-crowfoot – *Ranunculus flabellaris*

Northern White Cedar Swamp

Sheathed sedge – *Carex virginata*
Swamp valerian – *Valeriana uliginosa*

Fairy-slipper- *Calypso bulbosa*
White adder's mouth – *Malaxis monophyllos*
Ram's head lady-slipper – *Cypripedium arietinum*
Sweet coltsfoot – *Petasites frigidus*
Pink pyrola – *Pyrola asarifolia*
Bog aster – *Aster nemoralis*
Drooping bluegrass – *Poa saltuensis*
Small yellow lady's slipper – *Cypripedium calceolus*
Showy lady's slipper – *Cypripedium reginae*
Swamp thistle – *Cirsium multicum*
Swamp fly honeysuckle – *Lonicera oblongifolia*
Mountain fly honeysuckle – *Lonicera caerulea*
Moss – *Calliergon richardsonii*
Moss – *Calliergon obtusifolium*
Moss – *Meesia triquetra*

Dwarf Shrub Bog

White fringed orchid – *Habenaria blephariglottis*
Bog sedge – *Carex exilis*
Bog aster – *Aster nemoralis*
Dragon's mouth – *Arethusa bulbosa*
Southern Twayblade – *Listera australis*

Poor Fen

Pod-grass – *Scheuchzeria palustris*
Bog sedge – *Carex exilis*
Water sedge – *Carex aquatilis*
Creeping sedge – *Carex chordorrhiza*
Swamp birch – *Betula pumila*
Dragon's mouth – *Arethusa bulbosa*
Grass pink – *Calopogon tuberosus*
Rose pogonia – *Pogonia ophioglossoides*
Labrador bedstraw – *Galium labradorium*
Bog willow – *Salix pedicellaris*
Northern yellow-eyed grass – *Xyris Montana*
Bog aster – *Aster nemoralis*

Intermediate Fen

Dragon's mouth – *Arethusa bulbosa*
Showy lady's slipper – *Cypripedium reginae*
Pink pyrola – *Pyrola asarifolia*
Swamp thistle – *Cirsium multicum*
Livid sedge – *Carex livida*

Creeping sedge – *Carex chordorrhiza*
Water sedge – *Carex aquatilis*
Greenish sedge – *Carex viridula*
Few-flowered spikerush – *Eleocharis pauciflora*
Twig rush – *Cladium mariscoides*
Common arrow-grass – *Triglochin maritime*
Moss – *Paludella squarrosa*
Moss – *Scorpidium scorpiodes*

Rich Fen

Schweinitz's sedge – *Carex schweinitzii*
Bog willow – *Salix pedicellaris*
Showy lady's slipper – *Cypripedium reginae*
Few-flowered spikerush – *Eleocharis pauciflora*
Slender cottongrass – *Eriophorum gracile*
Swamp thistle – *Cirsium multicum*
Moss – *Scorpidium scorpiodes*
Moss – *Paludella squarrosa*
Moss – *Meesia triquetra*
Moss – *Calliergon trifarium*
Moss – *Cynclidium stygium*

Shallow Emergent Marsh

Barbed-bristle bulrush – *Scirpus ancistrochaetus*
Mild water-pepper – *Polygonum hydropiperoides*
Tapering rush – *Juncus acuminatus*
Grass rush – *Juncus marginatus*
Pursh's bulrush – *Scirpus purshianus*
Shore sedge – *Carex lenticularis*
False hop sedge – *Carex lupiformis*
Bristly crowfoot – *Ranunculus pensylvanicus*

Best Place to visit – Root Pond and Marshes, Benson, Shaw Mountain Preserve of
The Nature Conservancy

Sedge Meadow

Water sedge – *Carex aquatilis*
Barbed-bristle bulrush – *Scirpus ancistrochaetus*
Pursh's bulrush – *Scirpus purshianus*
Shore sedge – *Carex lenticularis*
Contracted sedge – *Carex arcta*
Buxbaum's sedge – *Carex buxbaumii*
Vasey rush – *Juncus vaseyi*

Cattail Marsh

Torrey's rush – *Juncus torreyi*

Best Place to visit – Drowned Lands, West Haven, Helen W. Buckner Memorial Preserve, Bald Mountain, The Nature Conservancy

Deep Broadleaf Marsh

Arrow arum – *Peltandra virginica*

Lake-cress – *Armoracia lacustris*

Least bur-reed – *Sparganium minimum*

False hop sedge – *Carex lupiformis*

Best place to visit – Lake Bomoseen Marsh, Hubbardton

Deep Bulrush Marsh

Slender bulrush – *Scirpus heterochaetus*

Lake-cress – *Armoracia lacustris*

River Mud Shore

Matted spikerush – *Eleocharis intermedia*

Creeping lovegrass – *Eragrostis hypnoides*

Shore quillwort – *Isoetes riparia*

River Sand or Gravel Shore

Hare figwort – *Scrophularia lanceolata*

Obedience – *Physostegia virginiana*

Frank's lovegrass – *Eragrostis frankii*

Creeping lovegrass – *Eragrostis hypnoides*

Canada burnet – *Sanguisorba Canadensis*

Great St. John's Wort – *Hypericum pyramidatum*

Musk flower – *Mimulus moschatus*

River Cobble Shore

Tuberled orchid – *Habenaria flava*

Obedience – *Physostegia virginiana*

Sand cherry – *Prunus pumila*

Shore sedge – *Carex lenticularis*

Canada burnet – *Sanguisorba Canadensis*

Calcareous River Seep

Capitate beak-rush – *Rhynchospora capitellata*
Garber's sedge – *Carex garberii*
Sticky false asphodel – *Tofieldia glutinosa*
Few-flowered spikerush – *Eleocharis pauciflora*
Fringed gentian – *Gentianopsis crinita*
Shining lady's tresses – *Spiranthes lucida*
Greenish sedge – *Carex viridula*
Atlantic sedge – *Carex atlantica*

Rivershore Grassland

Obedience – *Physostegia virginiana*
Great St. John's Wort – *Hypericum pyramidatum*
Canada burnet – *Sanguisorba Canadensis*
Wild chives – *Allium schoenoprasum*

Alluvium Shrub Swamp

Auricled twayblade – *Listera auriculata*
Wild garlic – *Allium canadense*

Alder Swamp

Auricled twayblade – *Listera auriculata*

Sweet Gale Shoreline Swamp

Creeping sedge – *Carex chordorrhiza*
Marsh mermaid-weed – *Proserpinaca palustris*

Buttonbush Swamp

Marsh mermaid-weed – *Proserpinaca palustris*
Yellow water-crowfoot – *Ranunculus flabellaris*

Best Place to visit – West Haven, Helen W. Buckner Memorial Preserve, Bald Mountain, The Nature Conservancy

APPENDIX G: PARTNERS IN THE POULTNEY METTOWEE RIVER BASIN PLANNING PROCESS

PMWP

The Poultney-Mettowee Watershed Partnership is a project of the Poultney-Mettowee Natural Resources Conservation District in Vermont and the Washington County Soil and Water Conservation District in New York with funding provided by the Lake Champlain Basin Program. It is coordinated by Ghostwriters Communications in Poultney, Vermont. A steering committee, made up of individuals and representatives of many different stakeholder groups in the watershed, will make recommendations to the Conservation Districts for management priorities and on-the-ground project activities.

The mission of the Poultney-Mettowee Watershed Partnership is to bring together the efforts of citizens and organizations that share the common vision of conserving, protecting, and enhancing the natural and cultural resources of the watershed.

The Poultney-Mettowee Watershed Partnership has five primary goals:

- To improve water quality.
- To enhance and interpret wildlife populations and habitats and other natural resources.
- Maintain a healthy agricultural based economy while protecting, restoring, and conserving the soil and water resources of agricultural land.
- To educate youth, educators, adults, residents, and visitors about conservation practices and the environment around them.
- To maintain and enhance agriculture-related and nature-based recreation opportunities.

Poultney-Mettowee Natural Resources Conservation District

The Poultney-Mettowee Natural Resources Conservation District was formed in 1940 to become the first conservation district in New England. What began as primarily an interest in soil erosion prevention now encompasses all natural resources, but especially water quality. The function of the District is to take available technical, financial and education resources, and to focus or coordinate them so that they meet the needs of the land users. The District encourages voluntary cooperation of landowners and the general public through information and education. They also inform local, state and federal legislators about the implications of conservation issues that they address.

The PMNRCD is governed by a board of five locally elected supervisors who serve a five year term. Supervisors prioritize conservation needs and projects, and work in close partnership with USDA Natural Resources Conservation Service, which provides the technical assistance to these programs.

THE NATURE CONSERVANCY

The Nature Conservancy is a non-profit organization working to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. Since 1951, TNC has been working with communities, businesses and individuals to protect more than 92 million acres around the world.

Locally, TNC has a field office in West Haven, VT, and has been a major partner in watershed planning, both physically and financially.

Lower Poultney River Restoration Project (TNC – GMC)

The lower Poultney River was designated a Vermont Outstanding Resource Water in 1991 because of its exceptional natural, cultural, and scenic values. Given its special natural resource value and the need to reduce pollutants to the southern end of Lake Champlain, TNC has made the Poultney River watershed a national-level priority. To identify riparian and wetland sites in need of restoration in the Poultney River watershed, TNC and its project partners sought to use a broad watershed-level ecological assessment. Three professors from Green Mountain College in Poultney (John Field, Jim Graves and Kathy Doyle) combined their backgrounds in geomorphology, hydrology, plant ecology, and restoration to assess the range and diversity of wetland and riparian communities and river conditions in the study area and recommend restoration priorities in the study area.

The results of this study are an invaluable source of information and prioritization for the overall watershed. For example, the study clearly showed areas along the Hubbardton River (a major tributary of the Poultney) where streambank conditions, and erosion due to cattle access are creating serious water quality issues. With this direction, the PMWP pursued funding from the National Fish and Wildlife Foundation, and received \$80,000 that will be spent on streambank work and landowner education to help address this concern.

NATURAL RESOURCES CONSERVATION SERVICE

The Natural Resources Conservation Service provides leadership with partners to help conserve, maintain, and improve our natural resources and the environment.

The purpose of the NRCS conservation programs is to assist land-users, communities, units of state and local government, and other Federal agencies in planning and implementing conservation systems. The purpose of the conservation systems is to reduce erosion, improve soil and water quality, improve and conserve wetlands, enhance fish and wildlife habitat, improve air quality, improve pasture and range condition, reduce upstream flooding, and improve woodlands.

Objectives of the conservation programs are to:

- Assist individual land users, communities, conservation districts, and other units of State and local government and Federal agencies to meet their goals for resource stewardship and assist individuals to comply with State and local requirements. NRCS assistance to individuals is provided through conservation districts in accordance with the memorandum of understanding signed by the Secretary of Agriculture, the governor of the state, and the conservation district. Assistance is provided to land users voluntarily applying conservation and to those who must comply with local or State laws and regulations.
- Provide technical assistance to participants in USDA cost-share and conservation incentive programs. (Assistance is funded on a reimbursable basis from the CCC.)
- Collect, analyze, interpret, display, and disseminate information about the condition and trends of the Nation's soil and other natural resources so that people can make good decisions about resource use and about public policies for resource conservation.
- Develop effective science-based technologies for natural resource assessment, management, and conservation.

Local USDA-NRCS Project

Paul and Kerry Lussier, farmers in Benson, VT, participated in the NRCS EQIP program last year, and installed a manure storage pit. This project was cost-shared and as a result the expense to the Lussiers was manageable. This year, NRCS field staff as well as the PMNRCD have been working again with the Lussiers, to address the concern about cattle access to the Hubbardton River. The District is concerned because of the erosion that is occurring as a result. The Lussiers however, need a source of feed for their cattle. A program was developed through NRCS, US Fish and Wildlife Partners for Wildlife, and the District that will pay the Lussiers to set aside this riparian land through a long-term contract. This payment will provide an alternative source of feed for these animals. At the same time, the streambank will be allowed to redevelop a forested buffer that will stabilize the streambank and decrease the sedimentation into the river.

At the same time, several old dumps from previous owners were found along the river. With the volunteer coordination of the District, as well as some funding from the PMWP and PFW, the dumps are being removed with a Youth Conservation Corps group and a major pollution source is being eliminated. This proactive, partnering opportunity has resulted in multiple benefits to the water quality while maintaining the farm sustainability.

LAKE CHAMPLAIN BASIN PROGRAM

The Lake Champlain Basin Program (LCBP) is a federal, state and local initiative to restore and protect Lake Champlain and its surrounding watershed for future generations.

The LCBP works in partnership with government agencies from New York, Vermont, and Quebec, private organizations, local communities, and individuals to coordinate and fund efforts that benefit the Lake Champlain Basin's water quality, fisheries, wetlands, wildlife, recreation, and cultural resources. These efforts are guided by the plan Opportunities for Action. The LCBP is currently working with its partners, committees, and local communities to implement this plan.

Opportunities for Action: An Evolving Plan for the Lake Champlain Basin (the Plan) is a pollution prevention, control, and restoration plan. The governors of New York and Vermont and the regional administrators of the USEPA endorsed the Plan in October 1996. The 1996 Plan called for periodic updates and 2001 marks the first revision of the Plan.

Three priorities were identified to protect and restore ecological and cultural resources of the Basin while maintaining a vital economy for the region:

- Reduce phosphorus in priority sub basins of the Lake
- Prevent and control persistent toxic contaminants
- Develop and implement a comprehensive program to manage nuisance nonnative aquatic species

Several themes emerged from the public involvement process in the development of the Plan. These themes include:

- A partnership approach that relies on existing agencies, organizations and individuals to implement the Plan while forming innovative partnerships;
- An ecosystem approach that stresses management decisions which recognize the inter-relationships among the physical, biological and chemical components of the Lake Champlain Basin;
- Watershed approach that recognizes that Lake Champlain is affected by activities throughout its Basin. Water quality protection and ecosystem restoration efforts should be focused along watershed boundaries;
- Integration of environmental and economic goals in the decision-making process and in selecting the most cost-effective actions to protect and enhance the resources of the Basin;
- Pollution prevention as a cost-effective means to protect the environment by eliminating pollution before it is generated;
- A consensus-based, collaborative approach that strengthens the outcomes of decisions by facilitating a dialogue among multiple interested parties; and
- Flexibility built into programs and organizations so that they can adapt according to emerging issues, resources and technology.

Progress 2000 is the LCBP's annual report on the progress made in the past year by the LCBP partners in addressing the priorities of the plan Opportunities for Action. In 1999, the LCBP continued many on-the-ground projects and cooperative management programs around the lake basin and initiated several new projects to address emerging issues.

The LCBP is firmly committed to helping small watershed organizations continue their local efforts. Two years ago, when these organizations were struggling to find funding to maintain their administrative structure, LCBP stepped in. While there are many sources of funding for programs and on-the-ground projects, revenues are less for simply administrative costs, which continue to be a financial concern for most of these non-profit organizations. LCBP began the Organizational Support Grant Program, which is designed to support increased organizational capacity and long-term effectiveness of Lake Champlain Basin watershed organizations working to implement elements of *Opportunities for Action*.

In addition to the Organizational Support Grant Program, LCBP also makes funds available through two additional programs; the Partnership Grant Program which provides funding for small projects emphasizing community partnerships, and the Annual Priorities Program which supports larger projects such as enhancement of riparian areas, promotion of pollution prevention, and reduction of nonpoint source inputs of phosphorus and toxic substances.

Approximately \$75,000 has been received by the PMWP alone in the past 3 years through funding from the LCBP. In addition, local groups, TNC and other organizations in the watershed have also received funding.

GREEN MOUNTAIN COLLEGE

Founded in 1834, Green Mountain College is a 4-year, coeducational, private college, accredited by the New England Association of Schools and Colleges, Inc. As an environmental liberal arts college, Green Mountain offers students a special opportunity to integrate modern environmental thought into a traditional liberal arts or pre-professional course of study, regardless of major.

Green Mountain faculty and staff have been critical partners in watershed planning through their research (see above with TNC), their educational programs (see sidebar) and their on-the-ground efforts. Professors John Field, Kathy Doyle and Jim Graves participated in a large assessment of the Poultney and Mettowee rivers; Professor Rebecca Purdom has used watershed planning for the basis of one of her integrated courses; Dr. Meriel Brooks has used class time to evaluate pros and cons of biological influences on agriculture and our environment; and Professor Jon Jensen's courses look at each person's place as an individual and part of an ecosystem. The value of this educational facility from a research, student, and hands-on application point of view is invaluable to the watershed as a whole.

In the fall of 2000, Dr. Rebecca Purdom began a course entitled *Watershed Planning* for 30 students at GMC. As a major requirement of the course, students were required to evaluate one watershed issue in depth, interview experts and local residents on the subject, and present an overview of the issue along with possible solutions. Topics ranged from wetlands to wildlife to invasive species. The resulting papers were

presented at a local public forum, and selected papers are attached as appendices to this watershed plan.

APPENDIX H: 10 V.S.A. § 1424A OUTSTANDING RESOURCE WATERS

In 1991, the Lower Poultney River Committee successfully petitioned the Water Resources Board to designate the Lower Poultney River as an Outstanding Resource Water due to its exceptional natural, cultural and scenic values. Based on this designation, the VT Agency of Natural resources developed a management plan for the lower Poultney River that established the following goal: “For that portion of the Lower Poultney River within Vermont borders, the State will seek to manage certain activities affecting the water quality, flows, course, current, and cross-section of the Lower Poultney River to preserve and enhance the exceptional natural, cultural, scenic, and recreational values of the river and river corridor (refer to uses and values included in Section III of the *VANR Management Plan for The Lower Poultney River, A Vermont Outstanding Resource*)”

APPENDIX I: REVIEW OF MUNICIPAL AND REGIONAL PLANS

Summary of Water Quality Reporting in the Rutland Region

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Model Water Quality Plan Section

Prepared by:
Rutland Regional Planning Commission

as outlined in
FFY 99 Section 604(b) funds

September 2001

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References

Introduction

Environmental planning is increasingly important in local and regional planning initiatives, but it is often difficult to know where to turn for information or how information should be presented. In creating a local water quality plan, it is essential to not only address the needs of the community at the micro level, but it is also to consider the larger impact on watersheds at the more macro level.

Section A of this document provides an outline of what information is available to local planners including the statutes, rules and regulations that should be considered in local development as they pertain to the watersheds in the Rutland Region. **Section B** summarizes and compares water quality sections of each town plans in the Rutland Region with the corresponding zoning and subdivision ordinances where applicable. **Section C** is a model Town Plan element.

Section A – Information Sources

What is a Watershed?

A watershed is the land and water systems around a body of water that drains into that body of water. The Water Quality Division of the Vermont Department of Environmental Conservation has divided the state into different basin areas, determined by the watersheds of major rivers and lakes.

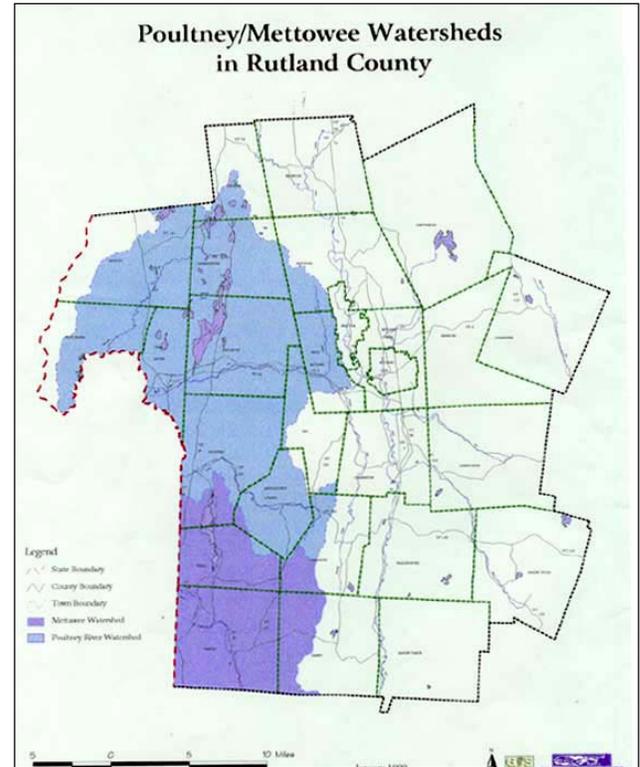
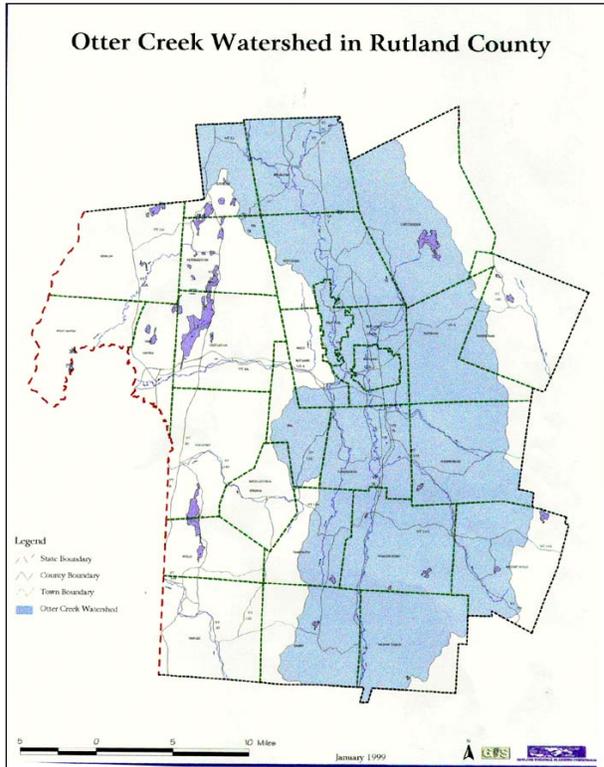
The State is required by federal law to adopt basin plans, and each of these plans must be updated by the year 2000. Vermont has moved to a rotational watershed assessment strategy for the purposes of assessing and reporting water quality information. The State has been divided into seventeen major drainage basins that have from four to twenty-two river sub-basins, and mainstream segments within them (Appendix A). The surface waters within these sub-basins are referred to as “waterbodies”; there are 210 river and 556 lake waterbodies in Vermont.

The waters of all seventeen major basins in the state will be assessed at least once every five years. By focusing annual evaluations on selected watershed each year, more systematic and intensive efforts can be made to collect and evaluate point and nonpoint sources of pollution. Detailed assessment reports have been created for the three major watersheds in Rutland County—Otter Creek, Black & Ottauquechee and Poultney-Mettowee. These documents provide valuable information about the waterbodies that make up each watershed and the quality of the water resources.¹

¹ Additional information about the rotational watershed assessment program can be found in **State of Vermont 2000 Water Quality Assessment 305(b) Report**, Appendix D.

Watersheds in Rutland County

There are six watersheds within the Rutland Region: Lake Champlain, Poultney-Mettowee, Otter Creek, Black-Ottaquechee, West, and White. The two largest, Poultney-Mettowee and Otter Creek, are shown below.



General reports and studies specific to Rutland Watersheds

There are many reports and studies that examine watersheds, watershed management, and water quality at the national, state level and regional level. While national and state documents can be overwhelming in the amount of information they provide, they do explain where local initiatives stem from and what are the relevant topics surrounding water quality management. This section briefly describes the documents and policies that discuss the rules and regulations of water quality management. The end of this section will narrow its focus on documents that are relevant to local water quality management and that will assist planners in the creation of town plans.

A. Federal Documents

The Environmental Protection Agency (EPA) has an extensive list of publications that address watershed planning issues. The following documents would be a valuable resource in creating a water quality plan at the local level.

Community-Based Environmental Protection: A Resource Book for Protecting Ecosystems and Communities*

This document is a “how-to” guide that identifies practical tools and draws on the experiences of many different communities in the creation of local protection efforts.

Watershed Protection: A Statewide Approach* focuses on state resource management programs for water quality managers around major basins and describes why and how watersheds should be managed.

Watershed Protection: A Project Focus* provides a blueprint for implementing watershed projects for individual watersheds including references and case studies.

Environmental Planning for Small Communities: A Guide for Local Decision Makers* helps small communities manage local environmental issues. It provides ideas and strategies for developing and implementing a community environmental plan.

EPA Watershed Tools Directory comprehensively describes several hundred methods, models, data sources and other approaches that states and communities can use to improve or maintain water quality for human health and ecological purposes.

The EPA’s **Watershed Website** at www.epa.gov/owow is very informative and includes features such as the *Watershed Academy*, *National Estuary Program*, *Surf Your Watershed*, and *Adopt a Watershed* as well as many links to other related sites. *Surf Your Watershed* is an effective interactive site that offers detailed information on each watershed and what activities, studies, and reports are available for each watershed. This feature of the EPA website is an essential tool in learning about and preparing a local water quality plan.

B. State documents

The **Clean Water Act** is a national policy aimed at restoring and maintaining the chemical, physical and biological integrity of the nation’s water surfaces. Section 305 (b) of this Act requires that each state provide a water quality assessment report that evaluates surface water quality in one-fifth of the state each year resulting in a complete state-wide assessment every five years. The State of Vermont Agency of Natural Resources **2000 Water Quality Assessment 305(B) Report**² summarizes the programs designed to assess, reduce and eliminate water quality problems and provides

* Indicates the document is available in the RRPC Library.

² See Appendix B for a map of the Five Year Watershed Rotation and the Year of Assessment.

comprehensive information on Vermont's water quality conditions through January 1998 to December 1999.

The State of Vermont Agency of Natural Resources, Department of Environmental Conservation, Water Quality Division has created *Water Quality & Aquatic Habitat Assessment Reports* for each watershed as required by the Vermont Water Quality Standards Section 1-02D (Appendix B). These basin plans analyze ways to improve or restore waters and act as a guide to watershed management according to state and federal legislation.

These assessment reports also provide a description of basin waters, watersheds, wetland communities, population growth, threats to open surface waters (rivers, lakes and streams) as well as specific projects and water quality protection work in the basin. There are also helpful discussions, recommendations, as well as detailed appendices which provide information on land use and land cover of the basin; causes and sources of impairments; stream macroinvertebrate sites, dams and individual river waterbody reports. Copies are available through the State of Vermont Agency of Natural Resources, and the RRPC also maintains a water quality library.

In preparing a watershed or water quality section of a town plan, it is recommended that each town examine those reports that pertain to the watersheds that are present in their area to gain full understanding of the issues surrounding their watershed(s). The Agency of Natural Resources has assigned each basin in Vermont with a specific number. Table 1 lists each watershed and the basin number associated with it (see also Appendix A).

Table 1—Basins in the Rutland Region

Basin Number	Name	Year of Assessment
2	Poultney—Mettowee*	1997/98
3	Otter Creek*	1996/97
4	Lower Lake Champlain	1996/97
9	White River	1996/97
10	Black-Ottawquechee*	1997/98
11	West—Williams	1998/99

*The RRPC has copies of the **Assessment Reports** for, Poultney-Mettowee Watersheds (Basin 2), Otter Creek Watershed (Basin 3) and Black & Ottawquechee Watersheds (Basin 10).

C. Regional/Local Documents

Rutland Region Natural Environment Technical Report*, created by the RRPC in March 1994, profiles selected aspects of the natural environment of the Rutland Region that pertain to water quality including *Groundwater Resources* and *Surface Water Resources*. It also examines *Land Resources*, *Air Resources*, *Aesthetics*, *Wildlife Habitat*, *Natural and Fragile Areas*, and *Outdoor Recreation*. This document provides a comprehensive assessment of the natural environment of the Region, with numerous maps provided.

The following documents have been designed for local planners and provide guidelines that can be used to develop a local water quality plan.

Perhaps the most invaluable document for local planners is the **Local Planning and Zoning Options for Water Quality Protection** produced by the Agency of Natural Resources Department of Environmental Conservation Water Quality Division. This document outlines some important elements of watershed and shoreland protection and suggests some general guidelines to be included in a town plan and bylaw contents.

Community Planning for Flood Hazards (August 1998)*

This document was created to assist communities in formulating preventative strategies for flood-prone areas to protect water quality and to make responsible land use decisions. By understanding how flooding relates to the watersheds, communities can make appropriate land use and development decisions to prevent hazards and to find local solutions.

Wetlands Fact Sheets* The Vermont Wetland Office produces a series of fact sheets to answer frequently asked questions about wetlands (see Appendix C for index). **Sheet 4** provides a summary of Vermont Wetland Rules and **Sheet 16** lists the Town Wetland Responsibilities that are necessary to consider in local development.

The **Planning for Lake Water Quality Protection*** manual is designed to assist planning commissions, lake associations and citizens in preparing lake protection plans. This manual would be very useful for towns wishing to take a comprehensive, watershed approach to lake water quality protection as well as addressing specific local problems in and around local lakes.

Local drinking water is also an important consideration in local planning initiatives and is directly linked to watershed management. **Tapping Your Own Resources: A Decision-Maker's Guide for Small Town Drinking Water** offers a valuable resource for communities faced with the responsibility of managing their own municipal water systems. The implementation of new federal standards can be cumbersome, and this document can assist in simplifying the rules and regulations and offers information that can be used in the development of local plans.

What needs to be considered in developing a town plan?

A. Watershed Inventory

Early in the planning process it is necessary to identify the watersheds that overlap your local area and perform an inventory of the surface and ground water bodies in your community.

The following outline suggests a list of information to gather when designing town plan statements, regulations and development as it appears in the document ***Local Planning and Zoning Options for Water Quality Protection***.³

- a) Extent of watershed (acreage and boundaries): *DEC Water Quality Division*
- b) Locations of industrial and municipal discharges: *DEC Wetlands Program and NWI maps*
- c) Land uses and activities including residential development, logging, farming, miles of dirt roads: *Town Records, Field observation, Regional Planning Commission*
- d) Percent impervious area of watershed: *Field Observation, Regional Planning Commission*
- e) Area of undisturbed land: *Town Records, Regional Planning Commission*
- f) Locations of industrial and municipal discharges: *DEC Wastewater Management Division, DEC Water Quality Division*
- g) Underground storage tank locations: *DEC Water Quality Division, Town Records, DEC Hazardous Materials Division*
- h) Project population growth and development trends: *Town Records, Regional Planning Commission, Census data or Vermont Dept. of Health data*
- i) Gather public input: *surveys, public meetings/round table discussions*

The sources below will aid in creating an accurate inventory:

- The **Rutland Regional Planning Commission** maintains GIS maps that illustrate watersheds, ground and surface waters within them and inventory landfill, sewage, hazardous waste and junkyard facilities. In addition, information can be obtained on river basins, wetlands and well protection sites and National Wetland Inventory (NWI) maps are also available at the commission office.
- The **EPA's Center for Environmental Information and Statistics (CEIS)** maintains a website that illustrates each watershed and how it overlaps each county in Vermont as well as providing comprehensive information on each watershed at <http://www.epa.gov/surf2/states/VT>

³ This outline is extracted from: "Local Planning and Zoning Options for Water Quality Protection," Agency of Natural Resources, Department of Environmental Conservation, Water Quality Division, October 1999.

- The **Vermont Department of Environmental Conservation Water Quality Division** manages the State’s surface waters through planning, engineering, monitoring as well as technical analysis, technical assistance, information and education. There is a **Watershed Management** division that can provide assistance.

Using this data, you should be able to construct a thorough inventory of the watersheds in your community. This will allow you to determine what information is required to create a watershed plan.

B. Rules, regulations, statutes and monitoring programs

What needs to be considered in local development?

At the local level, there are issues that must be considered in local development, and it is the responsibility of the town to ensure that rules and regulations are followed, and when necessary, the State is informed about certain issues that are presented to the Town. Some elements that need to be considered include:

Wetlands—Towns need to give the state 30 days notice prior to giving a permit in a wetland area. Sheet 16 of the Wetlands Fact Sheet Index lists the Town Wetland Responsibilities that are necessary to consider in local development and Sheet 4 Lists a summary of the Vermont Wetland Rules (see Appendix C). There is also A Planners Guide to Wetland Protection in Vermont that provides a step-by-step process for protecting wetlands and avoiding wetland conflicts due to local development. This document will also be invaluable in the creation of local town plans or reviewing specific development projects.

Ponds—Ponds can create numerous problems within a watershed system, so it is critical that guidelines are followed to mitigate unintentional damage. Vermont Pond Construction Guidelines lists laws, regulations and permits required in the construction of any local ponds.

C. Compliance with Rutland Regional Plan

Before local development occurs or before a local plan is created, it is important to examine the **Rutland Regional Plan** (adopted November 16, 1999) to determine the water quality goals, policies and implementation strategies that have been set out for the Rutland Region. The elements listed in the Plan address issues that are considered to be important to the entire county, and compliance with these recommendations is important to the health and well being of citizens and their environment. Appendix D provides a summary of the goals, policies and strategies listed in the **Rutland Regional Plan**.

D. Statutes

Vermont's Statutes as they pertain to Conservation and Development can be viewed on-line. The following web pages are directly linked to **VERMONT STATUTES ONLINE**, TITLE 10: Conservation and Development, PART II: Soil and Water Conservation; Flood Control, and additional statutes can also be viewed at this site:

- a) CHAPTER 039: WATERSHED PROTECTION AND FLOOD PREVENTION

<http://www.leg.state.vt.us/statutes/title10/chap039.htm>

- b) CHAPTER 037: WATER RESOURCES MANAGEMENT

<http://www.leg.state.vt.us/statutes/title10/chap037.htm>

Monitoring programs

The US Environmental Protection Agency (EPA) and other federal, state and local agencies use a watershed-oriented approach to meet water quality goals. This is known as **the Watershed Protection Approach (WPA)**, and it encourages integration of traditional regulatory and non-regulatory programs to support natural resource management. There are four main features to the WPA approach: targeting priority problems, a high level of stakeholder involvement, integrated solutions that make use of the expertise and authority of multiple agencies, and measuring success through monitoring and other data gathering.

The EPA Office of Water prepared ***Watershed Protection: A Project Focus*** (EPA 1995) that examines this topic further. It offers information on how watershed management and protection programs can be implemented and how to promote watershed-level planning as envisioned under the Watershed Protection Approach. The document helps to target watersheds requiring action as well as pooling resources and expertise with government agencies and citizen groups.

As part of a new collaborative watershed planning process, the **Vermont Department of Environmental Conservation** promotes and supports partnerships to work on water quality planning within watersheds to propose surface water management goals and restore waters as outlined in section 303 (e) of the Clean Water Act. These partnerships consist of landowners, towns, regional planning commissions, watershed associations, conservation districts, businesses and state and federal agencies interested in water quality management. Partnerships work together to identify local and state needs to protect watersheds. Known as ***The Watershed Improvement Project*** the partnerships are expected to shape the content of plans and seek financial and technical support for remedial activities.⁴

⁴ See Appendix B of Agency of Natural Resources, Department of Environmental Conservation. State of Vermont 2000 Water Quality Assessment 305 (b) Report. Waterbury, Vermont: Water Quality Division, June 2000.

The **River Watch Network** is another organization committed to bringing people together to monitor, restore, and protect their rivers. They work with concerned community members to: define the issues which are most critical to their rivers; design and execute scientifically credible studies which assess the condition of the river ecosystem; and create strategies for conserving rivers through community action. Website is <http://www.riverwatch.org/> or contact River Network at (802) 223-3840.

There are a number of watershed associations involved in watershed protection and monitoring within the Rutland Region. A list of the water associations that pertain to watersheds in Rutland County is provided in Appendix E.

The Center for Watershed Protection

Founded in 1992, the Center for Watershed Protection, non-membership, nonprofit 501(c) 3 corporation, works to provide objective and scientifically sound information on effective techniques to protect and restore urban watersheds and develop watershed protection programs. They have created a Watershed Leadership Kit designed to provide community leaders, watershed managers, educators and activists with materials to craft their own watershed protection seminars. Contact via <http://www.cwp.org/> or 8391 Main Street, Ellicott City, MD 21043-4605, Phone: (410) 461-8323.

Water Education Resource

This is a valuable tool for Internet research because it lists many different organizations involved in watershed protection and also provides information on how to work towards watershed management in within a community. Web address: <http://www.igc.apc.org/green/resources.html>

Funding Sources for Watershed Protection

A. EPA Funding

The EPA publishes a **Catalog of Federal Funding Sources for Watershed Protection (1999 edition)**, and is available from the EPA Office of Water, via the website at <http://www.epa.gov/owow/watershed/funding.html> or RRPC office. The following is a sampling of the funding sources available, but there are other funding sources also available through the EPA website.

- **Watershed Assistance Grants:** Aimed at nonprofits, tribes and local governments, this grant provides funds to establish a cooperative agreement with the EPA and one or more nonprofit organization(s) to other eligible entities to support watershed partnership organizational development and long-term effectiveness. Funding supports organizational development and capacity building for watershed partnerships with diverse membership.

Contact: EPA
Office of Wetlands, Oceans and Watersheds
Ariel Rios Bldg., 1200 Pennsylvania Ave., NW
Washington, DC 20460
(202) 260-4538
email: cole.james@epa.gov
website: <http://www.epa.gov/owow/wag.html>

- **Watershed Protection and Flood Prevention Program:** Also known as the “Small Watershed Program” or the “PL 566 Program”, this program provides technical and financial assistance to address resource and related economic problems on a watershed basis. Projects related to watershed protection, flood prevention, water supply, water quality, erosion and sediment control, wetland creation and restoration, fish and wildlife habitat enhancement, and public recreation are eligible for assistance. Technical and financial assistance is also available for planning and installation of works to improve, to protect, to develop land and water resources in small watersheds. Eligibility: local or state agency, county, municipality, town or township, soil and water conservation district, flood prevention/flood control district, tribe or other subunit of state government with the authority and capacity to carry out, operate, and maintain installed works of improvement. Projects are limited to watershed containing \leq 250,000 acres.

Contact: State NRCS office
Headquarters: Department of Agriculture
Natural Resources Conservation Service
P.O. Box 2890
Washington, DC 20013-9770
(202) 720-3534
email: rcollett@usda.gov
website: <http://www.ftw.nrcs.usda.gov/programs.html>
<http://www.aspe.os.dhhs.gov/cfda/p10904.htm>

Other funding opportunities are listed in the EPA’s Catalog of Federal Funding Sources for Watershed Protection (Second Edition, 1999).

B. Vermont Municipal Planning Grants

Since watersheds often overlap multiple towns, municipalities can form a consortia to create joint applications for watershed protection. The conditions for consortia are:

All the municipalities must be involved with the same project.

A consortium represents a shared effort and a sharing of resources; there must, however, be a lead applicant/grantee who will take the responsibility for fulfilling the provisions of the contract.

Further information on Vermont's Municipal Planning Grant Program can be obtained from the Rutland Regional Planning Commission or the Department of Community Affairs (DCA).

C. Northeast Watershed Round Table and River Network

The Northeast Watershed Round Table and River Network have combined forces to create the **Directory of Funding Sources for Grassroots River and Watershed Conservation Groups in New England and New York 1999-2000***. This document provides a comprehensive list of funding sources and other resources along with tips on grant proposal writing, web resources, national research tools and national, state and local directories. A copy of the guide is available for consultation at the RRPC, or copies of the guide can be obtained from River Network at (202) 364-2550.

D. Grassroots Environmental Fund

The purpose of the New England Grassroots Environment Fund is “to increase engagement and participation in grassroots environmental initiatives and to build and connect healthy, sustainable communities in New England”. The Fund is designed to help increase the number of citizens involved in concrete actions where success is most likely and where new, broader environmental constituencies will arise. The Fund's priority objectives are building networks, increasing community involvement, and fostering environmental stewardship within the citizenry of the region: urban, suburban and rural. To meet these objectives, the Fund interprets the word "environment" broadly and supports a wide range of activities. The organization can be reached at <http://www.grassrootsfund.org> or:

Contact: New England Grassroots Environment Fund
PO Box 1057
Montpelier, VT 05601
(802) 223-4622 Voice; (802) 229-1734 Fax

E. State sponsored programs

a. Lake Champlain Basin Program Local Implementation Grants

Eligible projects are those addressing the major issues outlined in the LCBP Opportunities for Action: An Evolving Plan for the Future of the Lake Champlain Basin. For instance, watershed groups and municipalities have received grants to implement practices that reduce nonpoint source pollution in the basin and pay for the project coordinator's time.

Contact: Barry Gruessner, Lake Champlain Basin Program (800) 468-5227

b. Clean Water Act Section 319—Nonpoint Source Project Proposals

Eligible types of nonpoint source (NPS) management/implementation activities fall into five general categories and include:

Demonstration – projects that accelerate the adoption of new or innovative NPS controls or technology;

Watershed resource restoration – projects that protect and restore wetlands, rivers and streams, lakes and ponds, riparian areas and related aquatic habitats;

Enforcement – regulatory or non-regulatory programs for enforcement of NPS controls;

Technical/financial assistance – projects that provide assistance (e.g. education, training, technology transfer) with the implementation of NPS controls; and,

Monitoring – projects that assess the affects of specific NPS implementation projects on surface or ground water.

Contact: Rick Hopkins, VT DEC, Water Quality Division, Waterbury, VT 241-3770

c. Conservation License Plate Watershed Projects

Provides funding for projects that address watershed resource protection and restoration including: protect or restore fish and wildlife habitats; protect or restore water quality and shorelines; enhance recreational use and enjoyment; identify and protect historic and cultural resources; educate people about watershed resources; or monitor fish and wildlife populations and/or water quality. (Funded through the sale of the Conservation License Plate.)

Contact: Crystal French, VT DEC, Water Quality Division, Waterbury, 241-3777

d. Vermont Better Backroads Small Grants Program

Town or private road projects in two categories: projects to repair an erosion site (ditch, culvert, etc.) OR Town Road Inventory and Capital Budget Planning project to identify and rank problem sites and adopt a capital budget plan to fix sites on a schedule.

Contact: Beth Ann Finlay, Northern Vermont Resource Conservation and Development Council, Berlin VT, 828-4595.

e. The Sustainable Future Fund

The Fund supports projects that help people and communities to think creatively and critically about the challenges of building a sustainable society. It also encourages the development of models of sound ecological practice and the design of methods to increase community awareness of ecological issues. While innovative ideas and solutions are of interest, the advisors of the fund may also support more traditional community efforts to build public awareness such as town or regional meetings and discussions.

Contact: Judy Dunning, The Vermont Community Foundation, (802) 388-3355.

Section B — Water Quality Report

Zoning and subdivision regulations are often the body through which the goals and policies of a town plan are implemented, so this section will compare water quality statements made in each town plan (within the Rutland Region) with the corresponding zoning and subdivision regulations (where applicable). Each town's water quality agenda is summarized so that it is possible to examine how each town in the Region anticipates addressing water quality issues.

Current legislation:

There is considerable opportunity for water quality protection, particularly with respect to lakes and rivers, within Chapter 117. Below is a listing of applicable legislation that every town can implement in preparing a water quality plan.

Chapter 117, Section 4401 (b) (1), contains the basic authorization for zoning regulations and allows for a wide range of protection provisions for shorelands and watersheds in a municipality's zoning bylaw. As outlined in this statute, a municipality may:

“Adopt zoning regulations to permit, prohibit, restrict, regulate, and determine land development, including specifically, without limitation, the following:

- (A) Specific uses of land, watercourses and other bodies of water;*
- (B) Dimensions, location, erection, construction, repair, maintenance, alteration, razing, removal and use of structures;*
- (C) Areas and dimensions of land and bodies of water to be occupied by uses and structures, as well as areas, courts, yards and other open spaces and distances to be left unoccupied by uses and structures;*
- (D) Density of population and intensity of use.”*

Communities may also adopt zoning authorization that deals specifically with shoreland regulations. Shoreland zoning is contained in **Chapter 117, Section 4411** which states that town shoreland regulations may:

“Regulate the design of sanitary facilities; regulate filling of and other adverse alterations to wetlands and other wildlife habitat areas; control building location; require the provision and maintenance of vegetation; require provisions for access to public waters for all residents and owners of the development and impose other requirements authorized by [Chapter 117].”

These statutes allow each municipality diverse opportunities and broad authorization to actively protect the water quality and habitat value of their lakes, rivers and shorelands

that are considered valuable elements of each watershed. Protection options are outlined further in **Local Planning and Zoning Options for Water Quality Protection**.

Below is a summary of the water quality section of each town plan in the Rutland Region and the zoning/subdivision regulations (where applicable) that directly apply to water quality issues.

Town of Benson

Water Quality Elements of Town Plan

Town Plan: Adopted June 1998.

The Plan does not directly address water quality; however, it does include a recommendation to protect wetlands from development. There is one statement that specifically states that groundwater, lakes, natural ponds, streams and rivers are to be protected.

Zoning/subdivision regulations

Zoning Regulations: Adopted February 1992.

Regulations relating to shoreline districts are outlined in *Section 304* of the town's zoning regulations. A five hundred foot (500') buffer is stipulated from "the normal mean water mark of rivers, streams and those lakes and ponds greater than one acre in size".

Town of Castleton

Water Quality Elements of Town Plan

Town Plan: October 1995 (currently under revision)

The plan identifies Surface Waters and Groundwater areas in the community and outlines goals and objectives to: maintain and protect groundwater supplies; protect well-head protection and recharge areas from pollution; ensure adequacy of groundwater supplies (page 36-39).

The plan also contains a map outlining all wetlands, and the goals and objectives section discusses: the maintenance of wetlands by requiring buffer strips for development, the preservation of surface waters and shorelands of lakes (which specifically stipulates the development of a shoreland zoning district for Glen Lake and Lake Bomoseen to carefully regulate land development).

Zoning/subdivision regulations

Zoning Regulations: Adopted July 1987.

While Castleton's Town Plan specifically addresses the development of a shoreland zoning district, it is not outlined in the zoning ordinance. However, as of August 2000 the zoning ordinance was in the process of being updated, and these recommendations may be reflected in the new version.

The only section of the 1987 Zoning Ordinance that specifically addresses water quality is *Section 713: Waterfront Lots*, but it only discusses boathouse regulations. There are no other references to water quality planning in the zoning ordinance.

Subdivision Regulations: Adopted May 1986.

Water quality issues are not specifically addressed, with the exception of standard drinking water and sewage disposal statements.

Town of Danby

Water Quality Elements of Town Plan

Town Plan: 1995 (currently under revision)

The *Water Conservation* section of the plan discusses State laws that govern development along navigable streams, lakes and ponds, as well as wetland areas. The plan suggests extending this protection to non-navigable streams, small bodies of water and marshlands, but there is no indication of how this action will be taken.

Zoning/subdivision regulations: none

Town of Fair Haven

Water Quality Elements of Town Plan

Town Plan: June 1998

Water quantity and quality are identified as part of Fair Haven's most valuable resources (pg 4) in *Section I—Natural Resources*. The *Recommendations* in the Plan outline objectives that are designed to achieve the Town's goal "to protect the natural resources of Fair Haven" (pg 4).

These recommendations include:

- Related growth to the capacity of these resources and encourage development that will protect them.

- Protect wildlife habitats, woodlands, conservation areas, water resources...aquifers and natural areas through private and/pr public property actions.
- Identify and protect existing aquifers by limiting unsuitable development, on, or over, these areas.
- Create a municipal conservation commission

Section II—Natural Areas describes the numerous rivers, streams, lakes and wetlands in the Fair Haven area, and the water quality goals of the plan aim to protect Fair Haven’s natural areas by protecting “waterways against unreasonable incursions” and “define, identify and protect natural areas”. The Town has also indicated that in the event that the State of Vermont ever decides to sell its woodland near Glen Lake, the Town should request the right of first refusal if possible. The *Recommendations* made in *Section II* call for “the establishment of natural buffer strips and green belts along the shores of most ponds, lakes and waterways” (pg 7). The Plan also identifies a “Watershed Zone” in *Section VIII—Land Use* which includes specific waterbodies within Fair Haven.

Zoning/subdivision regulations

Zoning Regulations: October 1997.

In *Section 215: Zoning District Descriptions*, Lake Shore and Watershed areas are included as zoning districts with the Town’s zoning ordinance.

- The Lake Shore district is “the area around the shoreline of Glen Lake that lies within the Town of Fair Haven. This area is zoned to prevent the erecting of any building within 75 feet of the shoreline” (pg 9).
- The Watershed district is “the area around Inman Pond, Sheldon Dam and the Howard Dam. The boundaries of the watershed are determined by the topography of the area that forms the drainage basin to these water sources” (pg 9). According to the zoning bylaw, *Section 417*, trespassing is not permitted in the watershed area.

Both the Lake Shore and Watershed districts are subjected to *Conditional Uses* as listed in *Article III* of the Town Plan.

Subdivision Regulations: None

Town of Hubbardton

Water Quality Elements of Town Plan

Town Plan: Adopted August 1999 (currently under revision)

Hubbardton has numerous lakes and ponds, and, accordingly, the current plan addresses these precious natural resources more comprehensively than many other towns in the

Rutland Region. However, this is often limited to definitions of water resources (such as watersheds, wetlands, groundwater, etc). The Plan does not indicate what the town's goals and priorities are in regards to water quality issues in the future even though the plan clearly states that water quality issues should be viewed as one of the town's most significant planning issues.

The *Water Resources* section of the plan identifies the watershed in which Hubbardton waters are located, and outlines all "public" lakes and ponds over 20 acres in size. Wetlands are discussed in the plan, and, while the plan references the National Wetlands Inventory to determine the acreage of Hubbardton wetlands, it also highlights the fact that the National Inventory may not include all wetlands. Hubbardton's plan also includes a section on *Ground Water* and names it as a critical water resource. However, according to the plan, the precise location of aquifers and recharge areas have not been mapped, and this has been identified as an element that should be addressed in future plans.

Zoning/subdivision regulation

Zoning regulations: Adopted—March 1991

The Shoreland District designation includes all lands within 500 feet of the normal mean watermark of those lakes and ponds listed in the ordinance. Section 409B, 410, 411, and 412 directly address Shoreland District issues.

Subdivision regulations: Do not address water quality issues beyond sewer and municipal water supply systems.

Town of Ira

Water Quality Elements of Town Plan

Town Plan: Adopted March 1998

Water Quality issues in this plan provide an overview of the town's potable water supply which includes a brief discussion on the three methods of water extraction: surface (or groundwater) wells, artesian wells (subterranean aquifer), and ground springs. Watershed discussion is limited to a brief description of the rivers and wetlands in the district.

The *Environmental and Natural Resources Goals* section includes a statement on protecting "fragile areas or resources including wetlands, floodways, deer yards, mountainous areas or steep slopes, [and] aquifer recharge areas" (pg 22), and the *Objectives* section outlines the need to establish zoning/subdivision "regulations to ensure land uses or development will not adversely impact fragile areas and/or species" (pg 22). A Water Resources Map is provided in the plan, but it is difficult to read and to identify specific areas of interest.

Zoning/subdivision regulations: Have only septic system regulations, no formal zoning or subdivision regulations have been adopted

Town of Middletown Springs

Water Quality Elements of Town Plan

Town Plan: Adopted December 1997.

Proposed Land Use section provides a statement that discourages development of activities that affect water quality; preservation and protection of Mineral Springs are listed as a priorities. A basic statement concerning water supply is provided, and it states that natural springs, dug springs and drilled wells need to be protected.

Zoning/subdivision regulations

Middletown Springs has neither zoning nor subdivision regulations.

Town of Pawlet

Water Quality Elements of Town Plan

Town Plan: Adopted September 1999

In the *Resources* section of the plan, the town states that it will continually seek to protect its water resources by federal and state laws, and that the Mettowee and Indian Rivers and streams, marshes, and wetlands should be clearly designated as such.

Future planning goals for domestic water supply issues are also discussed. The plan encourages the identification and protection of potable water resources including ground water.

Zoning/subdivision regulations

Zoning Regulations—Adopted October 14, 1997

Does not directly address water quality issues.

Town of Pittsford

Water Quality Elements of Town Plan

Town Plan: Adopted 1995 (revision of new plan in process as of August 2000)

The plan discusses the preservation of stream quality in *Policies on Preservation of Resources: Stream Quality*. The Plan states “as part of the zoning and subdivision ordinances, the town will develop land use standards which will protect stream quality.” The public water supply is also addressed, and the town proposes to “write a well head protection plan, establish the well head protection area, and negotiate acquisition of said area.” In the *Statement of Preservation Policies*, the plan indicates that the need to maintain and improve water quality in the town’s ponds and streams is of vital concern; however, implementation policies are not listed.

Zoning/subdivision regulations

Zoning Regulations: (currently under review)

Development is restricted in areas that fall within the Conservation District and must conform to the regulations stipulated in the town’s zoning codes. Water quality issues are not directly addressed.

Town of Poultney

Water Quality Elements of Town Plan

Town Plan: Adopted 1996

Water quality issues are addressed in this plan through a description of surface waters and ground water; future goals are limited to a statement that calls for the establishment of a continual maintenance and inspection program to assure the proper operation of existing septic systems along Lake St. Catherine.

Policy statements in the *Fragile Area Conservation* section indicate actions that should be taken considered in future development. The policy statement concerning wetlands stipulates that development should avoid these areas so that they can be retained in their natural condition. Shorelines are addressed in two areas. The *Stream Headwaters and Stream Banks* policy statements call for shoreline buffers and setbacks of 50 feet where applicable. The *Proposed Land Use* section suggests the adoption of a special lakeshore district for Lake St. Catherine within 1000 feet of the mean high water level.

Zoning/subdivision regulations

Zoning regulations: Adopted December 1993

Section 808—Locating Home sites prohibits construction on wetlands, or areas of unique or endangered habitat and areas with slopes in excess of twenty-five (25%) percent which reflects the policies outlined in the plan.

Section 1218: Calls for pond permits to be issued by the Administrative Officer as long as it meets the setback requirements of the District in which it is located. However, this

regulation does not take into consideration State recommendations that are outlined in *Pond Construction Guidelines* document (see reference section). In order to seriously consider water quality issues as they relate to ponds, it is recommended that elements of this document should appear as part of the zoning regulations.

The Zoning Map indicates Lake Shore designation around Lake St. Catherine which is called for in the Town Plan.

Subdivision regulations: Adopted March 1985

Regulations do not directly address water quality issues.

Town of Sudbury

Water Quality Elements of Town Plan

Town Plan: Adopted August 2000

The *Environment and Natural Resources* section is limited to a brief inventory and description of major water bodies within the Town. This also includes a statement about Sudbury's wetlands that indicates wetlands are protected from disturbance by state law.

Zoning/subdivision regulations

Zoning regulations: Adopted March 1997

Water quality issues in Sudbury's zoning regulations are limited to *Section 4.11 Referral to State Agency* which stipulates that development on marinas, public beaches, floodplains or wetlands will only be granted once a report is submitted to applicable State Agencies and after a thirty (30) day period is granted for state agencies to respond. This type of regulation requires the input of state agencies where applicable and required by state law within the zoning regulations.

Town of Tinmouth

Water Quality Elements of Town Plan

Plan Adopted: Spring 2000 (being revised in conjunction with the RRPC as of August 2000)

The Town's current policy on Wetlands stipulates "wetland areas shall be retained in their natural state for the provision of wildlife habitats, retention areas for surface runoff, recreation and scientific value" (pg 14). The Shorelines and Streambanks policy calls for the shores of Tinmouth Pond to be designated as a Shoreland Zoning District, and that

shorelines and streambanks are to be retained in their natural state and protected from erosion.

Ground and surface waters in Tinmouth are described in the plan, and specific reference is made to Chipman Lake, a significant water body in the Town which is characterized by intensive development and the frequent occurrence of water pollution due to infiltration of effluent from septic systems.

Zoning/subdivision regulations

Zoning regulations: Adopted 1994 (currently under review)

Section 2.6 District #6 Lake Shore of the zoning regulations calls for the protection of Tinmouth Pond (Chipman Lake) “from uses and settlement which would cause erosion, prohibit public access, and reduce scenic qualities of the water” (pg 7). This district applies to all land within a 500 foot buffer from the mean water mark.

Article III Conditional Uses: Section 3.5 Lake Shore indicates the necessary requirements to obtain conditional use permits within a designated Lake Shore district to protect overall ground water quality or aquifer recharge areas.

Subdivision regulations: Adopted February 1988

These regulations do not address water quality issues beyond sewer and municipal water supply systems, soil erosion and run-off.

Town of Wells

Wells currently has neither a town plan, zoning nor subdivision regulations (as of 1999).

Town of West Haven

Water Quality Elements of Town Plan

The Goals of the plan call for improvement or maintenance of water quality including ground water protection areas. Wetland goals present guidelines that aim to retain and protect the current amount of significant wetlands

The plan’s *Policies* indicate that the Town wants to ensure new development near streams will not affect the ecological functions of the stream. The protection of surface water quality aims to establish buffer zones from new development to mitigate erosion and bank disruption and to prohibit or to control the removal of gravel from streambeds and banks.

To ensure groundwater protection, new development and land use activities must not impair the quality of the water or exceed the capacity to supply adequate water supply to users. The section on *Wetlands Objectives* also provides several statements outlining the Town's desire to prohibit wetland destruction through the protection of designated wetlands using State standards, rules and guidelines.

Appendix D—Technical Report on the Natural Environment, Fragile Areas and Historic and Cultural Resources contains detailed information on watersheds, surface waters, wetlands and ground water in West Haven.

Zoning/subdivision regulations

Zoning regulations: Adopted 1999

Although the removal of gravel from streambeds and banks is listed as a priority in the town plan, this is not clearly reflected in the zoning ordinance. There is no definitive regulation that deals specifically with water quality issues.

Section 715: Referral to State Agency stipulates that development affecting wetland, ground or surface water resources will only be approved once a report is submitted to applicable State Agencies and after a thirty (30) day period is granted for state agencies to respond. This type of regulation requires the input of state agencies where applicable and required by state law within the zoning regulations. Overall, the zoning regulations do not appear to directly address the town plan's Land Use Implementation Strategies

Town of West Rutland

Water Quality Elements of Town Plan

Town Plan—Adopted June 1994 (being revised in conjunction with the RRPC as of August 2000)

As part of the *Community Profile* section, the *Physical Features* element of the Plan indicates the Town's desire "to protect and retain the present amount of significant wetlands and enhance the opportunities for recreation, education and natural beauty" (pg 30). The Plan includes the following *Implementation Strategies*:

- Assure protection of wetland areas through local zoning laws and Act 250
- Add wetland to the town's priority list for acquisition of land and easements for recreational and conservation purposes
- Improve points of access to wetland areas through trails, vantage points, and boat access.
- Organize a volunteer committee to follow through in this direction.

Land Use Plan--Item #2 states that "waterbodies, streams, brooks and marsh lands should be protected and preserved. The town will continue to pursue improved drainage and reclamation of marshlands to the greatest extent feasible under existing

law. The creation of overlay zones will ensure protection of sensitive areas and resources. Stream buffers should be established to conserve water quality, natural habitats, wildlife movements and other ecological processes within the marshlands and streams. A program should be established to gather detailed information about the town's wetlands and evaluate their importance to the town" (pg 103).

Also within the *Land Use Plan* is a section dedicated to *Recommend Areas of Limited Development*. Within this category, forestry and watersheds are grouped together, and these are considered to be lands above 1,000 feet and/or upland areas with steep slopes, shallow soils or other limitations on agriculture and development. This section also calls for the purity of watershed headwaters to be incorporated into any Town bylaw (pg 105).

Zoning/subdivision regulations In update process

Section C – Model Town Plan Element

Introduction

Town Plan sections and zoning ordinances related to water quality are thin in the Rutland region. While most of the towns do address the subject, they do so to only a limited extent. The accompanying documents – water quality resource agencies and a review of each town in the region's plans and regulations – address this subject.

This document is intended to be models for towns throughout the region to use in creating their own plan sections. Each town should examine the proposed goals, policies, and descriptions and decide which elements are applicable and which are not.

This model plan section looks at water quality from four perspectives:

- A. Surface Water
- B. Groundwater
- C. Wetlands
- D. Fisheries & Aquatic Resources

While the four are related, the point of approach differs for each. For ground water, the driving issue is ensuring that water drawn from wells is safe for consumption. For surface water, the question is how to maintain a healthy ecosystem. Wetlands and fisheries are subsets of the first two. Well-managed watersheds minimize soil erosion, loss of wildlife habitat, and sedimentation of water bodies.

There are three basic parts to each of the four sections:

1. Local Water Resources
2. Goals / Policies
3. Implementation Strategy

Each is discussed in detail in the sections that follow.

A variety of factors influence water quality at the local level. Development, however, is a common link between the elements. Careful planning for development can minimize water quality impacts throughout a community and, at a larger scale, a watershed.

A good resource for examining water quality and its components (watershed, wetlands, etc.) has been produced by the Rutland Regional Planning Commission as an accompaniment to this model plan. This report highlights a variety of planning documents and public agencies, available to towns, as well as providing background information on water quality, watersheds, and existing plans and regulations in the Rutland Region.

Model Plan Section

Introduction

This section introduces the community's water system. It should include a general outline of the town's water system including major lakes, rivers, and watersheds, as well as a short statement about the importance of maintaining the highest possible water quality level.

Note: Most of this and other data for these sections are available from the Rutland Regional Planning Commission in an electronic format. The Regional Planning Commission can produce maps showing most of the data.

I. Surface Waters

A) Background and local water resources

1. Catalogue the major bodies of water and describe their physical relationship to the community.
 - a. *Size and length*
 - b. *Depth and contours*
 - c. *Water quality information (current and past)*
 - d. *Evidence of nutrient / sediment input (erosion from banks, etc.)*
 - e. *Locations of municipal and industrial discharges*
 - f. *Rare plants or animals*
 - g. *Presence of special features (waterfalls, swimming holes, etc.)*
 - h. *Are they significant parts of the town?*
 - i. *Who has access?*
 - j. *Are they rocky, sandy, fast flowing?*

2. Examine how development has been and is associated with these bodies.
Seasonal cottages, for example, may surround one lake, with lawns stretching straight to the water, while another is largely undeveloped. By the same token, rivers may be in a relatively natural state or may have been dammed for electricity or flood protection.
3. Map community's watersheds
Five watersheds run through the Rutland Region, the most significant being the Otter Creek and Poultney. See the accompanying Report for details regarding inventoring local watersheds.
4. Identify topography and soil types surrounding bodies of water
5. Map existing structures, roads, and general land uses within 1,000 feet of any major water body.
Awareness of land uses will help to determine what regulations are necessary to ensure good water quality.
6. Map existing vegetation cover
7. Identify pristine waters
Pristine waters are waters that are a) generally pure in nature with significant ecological value or b) are of high quality and used for public water supply.
8. Identify fragile areas
Outline areas where development should be carefully monitored or prohibited. These areas may include steep slopes, poor soils, or shallow depths to bedrock, among others.

B. Plan Components

Note: Model language has been typed in a normal font; comments and suggestions from this report are italicized.

Specific issues of concern

1. Problem areas
Determine where 'problem spots' currently exist in the community. Past development in some areas may be causing poor water quality through construction too close to lakes or streams
2. Erosion
Erosion is soil loss into a body of water. Soil may be either carried down along 'channels' from higher ground or taken away along the bank of a river. It is a natural phenomenon but is often greatly

exacerbated by development and/or the removal of vegetation along stream banks and lake shores.

3. Steep slopes

A leading cause of erosion is the loss of vegetation on steep slopes. Surface runoff is highest where trees and shrubs have been removed from a landscape because nothing exists to slow the course of rainfall down a slope. The lack of vegetation, in turn, leaves little to protect topsoil from being carried away the faster-moving water. A similar, if not greater, problem exists with septic discharge on steep slopes.

4. Buffer strips

Buffer strips are bands of protected vegetation along the side of a body of water. They are a natural solution to many of the problems associated with water-side development, capturing and dissolving water and pollutants drawn from run-off. Buffer strips act as filters for water running towards the stream or lake.

“Plant roots in the buffer hold the banks of the river in place, stabilizing the soil. Roots also absorb the water and some of the contaminants in it. The bodies of plants (tree trunks, bushy shrubs, and tall grass) slow the rush of polluted runoff, allowing the water to seep into the ground, where it is filtered and cleaned. Plants and leaf litter catch eroded soil before it reaches the waterway .”

Recommended widths of these buffer strips vary. In general, 65-100 feet is considered standard for providing effective filtering. Where streams are narrow, that width may be reduced. By contrast, where wildlife habitat is involved, the optimal width increases to 200 or 600 feet. Buffer widths may also vary as a function of the slope and soil types found in the area.

5. Non-point source pollution

Non-point source pollution off is a significant contributor to erosion, sedimentation, and water quality. Water run off from agriculture, silviculture, and roads can force nutrient-enriched particles and soil to enter a foreign water system. Efforts should be taken to minimize non-point pollution.

6. Gravel road maintenance

Graveled back roads, by nature of their topography and design, if not properly maintained, can contribute heavily to water pollution. The Vermont Better Backroads Manual (1995) describes a number of cost-effective techniques and actions that can be used to improve maintenance of gravelled backroads in a manner that also protects and enhances local water quality.

Goals (examples)

- (1) Maintain or improve surface water quality to protect drinking water, aquatic habitat, and recreation.
- (2) Protect from risk and preserve in their natural state high quality waters including fragile high-altitude waters, and the ecosystems they sustain.

Policies (examples)

- (1) Encourage pollution abatement in the town's rivers, streams, lakes and ponds.

Existing water pollution problems, as identified in State of Vermont - Agency of Natural Resources Basin Plans, Water Quality Assessment (305(b) report), and the Clean Water Strategy should be considered high priority for abatement. These problems include:

- (a) agricultural runoff;
 - (b) erosion, sedimentation, and water crossings from construction sites and other land disturbance, road and ditch runoff, stream bank destabilization, impoundments, and logging;
 - (c) infestation of nuisance weeds such as Eurasian water milfoil and animals such as zebra mussels;
 - (d) failing or inadequate community and individual on-site wastewater disposal systems;
 - (e) elevated temperatures, low dissolved oxygen, and physical habitat degradation from poor flow regimes.
- (2) Vegetated buffer strips should be maintained in shoreland and riverside areas surrounding streams, lakes and ponds according to the following schedule:
 - (a) where there are slight to moderate slopes and soils that are only slightly to moderately erodible, buffer widths of 50-100 feet are needed to protect and maintain water quality and aquatic habitat.
 - (b) Where slopes are moderate to high and soils are moderately to highly erodible, buffer widths of 200 to 300 feet are recommended.
 - (c) Wider vegetated areas should be established where large mammal or bird habitat preserves are intended.

Land use policy and decisions should encourage structures to be erected away from vegetated buffers through proper site planning and design. For stream bank and lakeshore stabilization projects, methods employing the use of native shrubs, trees, and grasses should be used on as much of the vertical profile as possible.

(3) Construction should be limited where slopes exceed 12 percent and should be prohibited where slopes exceed 20 percent.

(4) Pristine waters should be protected from development and other activities that diminish their purity, natural flow or condition.

(5) Off-stream disposal of treated effluents in “spray fields” or other alternative systems are encouraged over on-stream discharge where soil and site conditions permit. Those conditions include: permeability, and distances from surface water or underground wells.

(6) Upland watersheds should be maintained predominantly in forest and recreation use to ensure high quality of valley streams and their tributaries.

(7) Withdrawal or contamination of ground water which affects the quality or quantity of surface water should be discouraged.

(8) Activities that are potential sources of non-point pollution, including but not limited to agriculture and silviculture, should be conducted as follows:

- (a) Logging practices should follow Acceptable Management Practices (AMPs) developed by the Vermont Agency of Natural Resources or other practices recognized by public agencies or professional associations.
- (b) Agricultural activities should follow Best Management Practices (BMPs) for Agriculture. BMPs are site-specific practices for farm management developed by the Natural Resource Conservation Service (formerly the Soil Conservation Service).
- (c) The location and characteristics of non-point sources should be consistent with the strategy for managing non-point source wastes within any applicable basin plan.

(9) Wastewater and storm water run-off discharges into surface waters shall meet water quality standards as administered by the Vermont Agency of Natural Resources. (24 V.S.A. Chapter 47 and related Rules)

(10) The town should employ gravel road maintenance techniques to prevent soil erosion and road surface deterioration.

II. Groundwater

A) Background and Local Water Resources

The section should describe existing water sources for drinking water. This would include a discussion of the effects different types of soils, slopes, and geological formations in the community and should make reference to the Natural Resources section of the Town Plan where these materials are presented.

Map areas of public water supply and sewers

1. Map existing aquifers, recharge areas, and well-head protection areas
2. Map slopes, soil types, and bedrock depths in the community
Often done as part of the basic Natural Resource mapping
3. Identify household septic systems / other information

B. Plan Components

Note: Model language has been typed in a normal font; comments and suggestions from this report are italicized.

Specific issues of concern to the community

1. Problem areas
Determine where ‘problem spots’ currently exist in the community. Past development in some areas may be causing poor water quality through failing or poorly placed septic systems.
2. Maintenance
Safe drinking water is the most important consideration in this section. Efforts must be taken to ensure its continuance throughout the community.
3. Constraints to development
Among the most significant constraints to development in Vermont is the suitability of land to handle subsurface water sewage disposal. Slope, soil type, depth to bedrock, and water table levels are determining factors for construction in the state.
 - i. Slope – development is inadvisable where slopes exceed 12 percent and severely constrained where steepness is greater than 20 percent.
 - ii. Soil type – Soils that are too porous (sand) or not permeable enough (clay) are constraints to development.
 - iii. Depth to bedrock – Areas where the depth to bedrock is less than four feet present constraints to development. Where these conditions exist, the use of on-site sewage disposal is extremely limited. Sewage has a stronger likelihood of reaching the surface and, where water recharge areas overlap dispersal fields, ground water may be contaminated. Soil erosion and the potential for frozen sewage lines are also a concern.
 - iv. High water table – Areas where the seasonal or year-round high water table is within four feet of the surface pose a serious

constraint to development. Cellars may receive excessive groundwater seepage. Septic fields are also a serious problem, and may result in pollutants reaching the surface.

- v. Elevations above 2,500 feet – Precipitation is greater and soil is generally thinner at elevations above 2,500 feet, lending those areas to having a greater fragility than elsewhere. Those factors, combined with steep slopes and a lesser variety of plant species, creates an environment intolerant to intensive uses. Erosion is more likely at high altitudes. Moreover, because these areas generally receive more precipitation than elsewhere, they are often vital sources of groundwater recharge.

Goals (examples)

(1) Maintain and enhance the quality of ground water resources and their resource protection areas from adverse development.

Policies (examples)

(1) Water withdrawal from underground sources should be carefully monitored to ensure that aquifers and surface waters are not significantly depleted and that water is properly allocated.

(2) The location, size and density of on-site sewage disposal facilities should be determined by the capacity of the soil and by the natural limitations of the site and underlying substrata conditions, and should be limited where,

- (a) depth to bedrock is less than four feet
- (b) soil does not drain well or drain too well
- (c) the slope is greater than 12 percent
- (d) depth to the high water table is less than four feet

(3) Further to (2), on-site sewage disposal and development should be prohibited where,

- (a) the slope is greater than 20 percent
- (b) elevation is greater than 2,500 feet (in accordance with state regulations)

(4) Land use activities which potentially threaten ground water quality should be carefully reviewed and monitored to prevent undue loss of groundwater quality. Potentially harmful activities include the following:

- (a) Underground storage tanks for petroleum or other hazardous substances. *Permits are required from the State for most underground storage tanks containing gasoline or heating oil; however, exceptions include are made for fuel oil storage tanks used for on-premises heating purposes and residential tanks storing motor fuel. These should be identified and mapped;*

- (b) Pesticide and herbicide applications on agricultural land, golf courses, resorts, residential properties, and railroad and utility rights-of-way. Such activities may require permits from the State.

These should be identified and mapped;

- (c) Failing septic systems, old industrial and town solid waste disposal sites, industrial floor drains, poor agricultural practices, road salt, and landfill leachate.

These should be identified and mapped.

(5) Groundwater contamination should be remedied by parties causing the contamination.

(6) Class 1 groundwaters should be protected.

These are high quality resource areas mapped by the Agency of Natural Resources and so classified by the Secretary as currently being used or suitable for a public water supply source. Human activities in these areas to the extent that they pose unacceptable risks to groundwater contamination should be limited. Acceptable uses within such Class 1 areas may include winter outdoor recreational activities, low density pasturing of livestock, and tree harvesting.

III. Wetlands

A) Background and local water resources

(1) Map of Class I and Class II wetlands

B. Plan Components

Note: Model language has been typed in a normal font; comments and suggestions from this report are italicized.

Specific issues of concern to the community

1. Wetland description and uses

Wetlands are land areas that are saturated with water at least part of the year and include marshes, swamps, soughs, fens, mud flats, and bogs. They provide important wildlife habitat, but also play a critical role in local water management. They serve as an additional filter for stormwater runoff and limit erosion by slowing the progress of water into a lake or river system. They are also storage basins for chemicals such as phosphorous and help minimize algae blooms and nuisance aquatic growth during the summer.

Some wetlands are currently protected by the state through various jurisdictions (among them, the Vermont Wetland Rules, the Lakes and Ponds Permit Program,

and the Act 250 permit process). Towns, however, are empowered and encouraged to provide additional protection for wetlands under Chapter 117.

2. Classes of Wetlands

Wetlands are identified by three parameters: hydrology, soils, and vegetation. Class I and II wetlands are considered significant and are protected by the Vermont Wetland Rules.

Class 1: Class One wetlands are those which the Vermont Water Resources Board determines are exceptional or irreplaceable. A 100-foot protected buffer zone is designated adjacent to Class One wetlands.

Class 2: The rules designate most wetlands shown on the National Wetland Inventory (NWI) maps and those wetlands contiguous to mapped wetlands as Class Two wetlands. A 50-foot protected buffer zone is designated adjacent to all Class Two wetlands.

Class 3: Class Three wetlands are those which either considered not significant for producing any wetland functions when last evaluated or that have not been mapped on the NWI maps. Class Three wetlands are not protected under the Vermont Wetland Rules. They may, however, be protected by other federal, state, or local regulations.

3. Local Wetlands

Not all relevant wetlands in a town are mapped by the state. Important local phenomena should be identified and evaluated for what level of protection is necessary and beneficial to the community.

Goals (examples)

(1) Identify and protect all wetlands which provide significant functions and values in such a manner as to achieve no net loss of such wetlands and their functions. In the long term, restoration and enhancement of wetlands should be pursued in order to improve the town's wetland resource.

(2) Identify and protect critical natural communities through petitioning the State Wetlands Board or through zoning regulations.

Policies (examples)

(1) Significant wetlands and other critical natural communities should be protected from development by maintaining an undisturbed buffer strip of naturally vegetated upland, at least 50–100 feet in width (or wider according to the type of development and the

wildlife species to be protected), around the edge and by preventing runoff and direct discharge into wetlands.

IV. Fisheries and Aquatic Resources

A. Background and Local Resources

1. Inventory types and habitats of fish / animals

This is done primarily by the State's Department of Environment and Conservation. They provide digital data that can be mapped by the Regional Planning Commission

2. Map dams and stream / river crossings

3. Map warm water infusions

Warm water infusions are specific discharge points into a body of water which produce above-average temperatures.

B. Plan Components

Note: Model language has been typed in a normal font; comments and suggestions from this report are italicized.

Specific issues of concern to the community

1. Fish / animals

Identify which fish / animal habitats are in danger using information available from the State determine what sized buffer zones may be needed to protect their habitats. The State plays a significant role in determining these habitats and their required buffers. Towns are encouraged, however, to extend these minimums where necessary or valued.

2. Dams

Dams along streams and rivers can seriously alter their flow and habitability. A permitting process exists through the Vermont Public Service Board.

3. Stream crossings

Stream crossings, like dams, are impediments to water flow and can create significant ramifications to wildlife. Bridges and bottomless plate arches cause the least harm and are encouraged. Box, squashed, and round culverts are more practical in many instances, but create greater problems for fish movement.

Goals (examples)

- (1) Assure the maintenance of water quality and quantity necessary to sustain existing aquatic communities.
- (2) Maintain or improve the natural diversity, population and migratory routes of fish.

Policies (examples)

- (1) Give due consideration to the effects of interruptions to the natural flow of water.
Intermittent and diverted flows should be permitted only upon finding that these actions assure the downstream protection of water quality and quantity of aquatic communities and stream functions.
- (2) Obstructing streams or ponds preventing the passage of fish for construction purposes is discouraged unless it is found by the State to have little or no impact.
- (3) The design and construction of dams on rivers and streams is encouraged only when the public interest is clearly benefited and meets with the following criteria:
 - (a) Run-of-the-river projects are preferred over projects which require impoundments with low or minimum flows;
 - (b) Maintenance or enhancement of recreation and fisheries are priorities and should not be significantly diminished by impoundments. Provisions should be made for fish passage and canoe portages.
 - (c) Water quality and minimum flows should be maintained.
- (4) The construction of ponds is discouraged unless fed by groundwater and/or overland drainage.
- (5) Discourage activities that will kill or injure bank vegetation. It is advisable to limit activities such as the following adjacent to waters: housing and commercial development, road construction, cultivation, livestock grazing, dumping, filling, mowing, and herbicide application.

A 100'-plus buffer policy may be appropriate in lieu of this general policy on development limitations.

Section D

The following provides a summary of the goals, policies and strategies listed in the Water Resources section of the **Rutland Regional Plan** adopted November 1999. These elements should be encouraged in any local development and in the creation of a water resources plan.

Goal 1: Protect, preserve and improve the quality and quantity of existing and potential ground water resources.

Policy 1: Encourage identification and elimination of point and non-point pollution sources.

Policy 2: Current and *alternate drinking water supplies* shall be protected.

Implementation Statement 1: Support efforts to identify and protect aquifers.

Policy 3: Support existing and prospective land uses if they are compatible with *well head protection areas*. Discourage the use, storage, and transportation of hazardous wastes in well head protection areas.

Implementation Statement 1: Encourage and assist communities in identifying and protecting supplies of water for community systems.

Goal 2: Protect, preserve, and improve the quality and quantity of surface waters for a variety of uses.

Policy 1: Encourage reduction of non-point source pollution.

Implementation Statement 1: Define and identify the origins of non-point source pollution and support their reduction through public education.

Implementation Statement 2: Encourage erosion management practices such as those specified in Erosion Control: Vermont Handbook for Soil Erosion and Sediment Control on Construction Sites.

Implementation Statement 3: Encourage creation and maintenance of buffer zones of a width adequate to reduce loading of sediments and nutrients into lakes and ponds.

Policy 2: Encourage protection of pristine waters, including all streams above 2500 feet. Discourage water reclassification to lower classes.

Implementation Statement 1: Encourage greater awareness of the need for and benefits of using best land management practices in areas adjacent to water resources.

Policy 3: Encourage upgrading in classification of unique water resources.

Implementation Statement 1: Support extending *Outstanding Resource Waters* designation to other waters.

Policy 4: Encourage maintenance of stream flows at levels necessary to support biodiversity and a full range of activities and values such as fishing, boating and water withdrawal.

Implementation Statement 1: Encourage re-licensing of dams when they provide for multiple uses of rivers, fish bypasses, and power generation by run of the river operation.

Policy 5: Encourage maintenance of lake elevations at levels necessary to support biodiversity and a full range of activities and values such as fishing, boating and water withdrawal.

Implementation Statement 1: Promote ecologically sound methods to reduce the impact of aquatic nuisances such as Eurasian milfoil, water chestnut, zebra mussels and purple loosestrife on water resources.

Policy 6: Encourage the protection of scenic and recreational water resources such as waterfalls, cascades, and gorges.

Implementation Statement 1: Encourage greater awareness of the need for and benefits of using best land management practices in areas adjacent to water resources.

Policy 7: Encourage the provision and maintenance of public access to public water, where appropriate.

Policy 8: Support protection of wetlands and encourage upgrading of wetland classification where appropriate. There shall be no loss of *Class I Wetland* or *Class II Wetland* quality or extent.⁵

Implementation Statement 1: Encourage reduction of development in *flood hazard areas* and *floodways* and support compatible land uses such as riverside parks and greenways.

Implementation Statement 2: Encourage continuing inventory and *delineation* of wetlands.

Policy 9: Encourage communities to plan for and adopt measures to safeguard water resources.

- Implementation Statement 1: Encourage communities to play an active role in monitoring the health of their water resources (e.g. Riverwatch Network, Lay Monitoring Program, etc.)
- Implementation Statement 2: Encourage the use of multi-stage (i.e. secondary or tertiary level) sewage treatment.
- Implementation Statement 3: Encourage municipalities to adopt sewage control policies and to use methods yielding effluent of the highest purity.
- Implementation Statement 4: Encourage programs to educate the public about the impacts of premature aging (*eutrophication*) of waters in the region. Encourage schools to adopt education programs addressing water resources.
- Implementation Statement 5: Encourage greater awareness of the need for and benefits of using best land management practices in areas adjacent to water resources.

Section E

This is a list of Vermont Water Associations as of July 1999 (for watersheds that overlap Rutland County)

Basin 3 Otter Creek	<u>Addison County River Watch Collaborative</u> <u>Otter Creek Audubon River Watch</u> Heidi Willis PO box 433 E. Middlebury, VT 05740 388-9207
	<u>New Haven River Anglers Association</u> Pete Diminico 1311 Meehan Road Bristol, VT 05443 453-3899 email: diminico@sover.net
	<u>Lewis Creek Association</u> Linda Henzel (Coordinator of the Collaborative) 725 Economou Road Huntington, VT 05462 434-4113
	<u>The Watershed Center at Little Otter Creek</u> PO Box 96 Bristol, VT 05443
	<u>LaPlatte River Group</u> Kate Bortz c/o Shelburne Natural Resources Committee Planning & Zoning Department Town of Shelburne Shelburne, VT 05482 985-5118
	<u>Green Mountain Fly Tyers Club</u> c/o Charles A. Whitehair 205 North Church Street Rutland, VT 05701
<u>Otter Creek Natural Resource Conservation District</u> Route 7 South RD 4 Box 1302 Middlebury, VT 05753 388-6746	

Basin 2 Poultney--Metawee	<u>Friends of the Poultney River</u> Joanne & David Calvi 62 Inman Pond Road Fair Haven, VT 05743 773-5811
	<u>Poultney River Watch</u> Mary Jeanne Packer 82 River Street Poultney, VT 05764 287-4284 email: mjpacker@gwriters.com
	<u>Poultney-Mettawee Natural Resource Conservation District</u> Marli Rupe PO Box 209 Poultney VT 05764 287-5841
	<u>The Nature Conservancy</u> Mary Droege RR1 Box 266 Castleton, VT 05735 273-3676

Basin 4 Lower Lake Champlain	<u>Lake Champlain Basin Program</u> Michaela Stickney PO Box 204 54 West Shore Road Grand Isle, VT 05458 372-3213
Basin 9 White River	<u>White River Partnership</u> Patrick Dakin HC 67 Box 17A Randolph, VT 05060 763-3018
Basin 10 Black- Ottauquechee	<u>South Windsor County Regional Commission</u> Becky Basch The Ascutney Building, PO Box 320 Ascutney, VT 05030 674-9201 email: rbasch@sover.net
Basin 11 West--Williams	<u>Stratton Area Citizens Committee</u> Bill & Betsy Uptegrove PO Box 351 West Townshend, VT 05359 874-4374
	<u>Saxtons and West River Watch, Whetstone Monitor</u> Francis Doyle Bonnyvale Environmental Education Center PO Box 2318 Brattleboro, VT 05303 257-5785 email: beec@together.net <u>West River Watershed Association</u> c/o Melissa Reichart Windham Regional Planning Commission 139 Main Street Brattleboro, VT 05301 257-4547

Section F —Internet Sites related to Water Quality Planning

Adopt-A-Watershed

<http://www.tcoe.trinity.k12.ca.us/aaw/>

American Rivers

<http://www.amrivers.org/>

Center for Excellence for Sustainable Development

<http://www.sustainable.doe.gov/index.html>

Center for Watershed Protection

<http://pipeline.com/~mrrunoff/>

Environmental Protection Agency (EPA)

<http://www.epa.gov/owow>

Freshwater Imperative

<http://www.islandpress.com/books/bookdata/Fwimp.html>

GREEN

<http://www.econet.apc.org/green/>

Groundwater Foundation

www.groundwater.org

Know Your Watershed

<http://ctic.purdue.edu/KYW/KYW.html>

National Fish and Wildlife Organization

<http://www.nfwf.org>

National Water Quality Criteria and Standards/Clean Water Network

<http://www.cwn.org>

The Nature Conservancy:

<http://www.tnc.org>

Planners Web

<http://planning.org/>

Rutland Regional Planning Commission

<http://www.rutlandregionplanning.org/>

River Network

<http://www.teleport.com/~rivernet/rivernet/leader2.htm>

Surf Your Watershed

www.epa.gov/surf

US Geological Survey—National Water Summary on Wetland Resources

<http://www.water.usgs.gov/nwsum/WSP2425/index.html>

Vermont Water Quality Standards—Effective April 2000

<http://www.state.vt.us/wtrboard/rules/vwqs.htm>

Vermont Water Resources and Lake Studies Center

www.nature.snr.uvm.edu/vtwater

Water Environment Federation

<http://www.wef.org/wwwboard/watershed/wwwboard.html>

Wildlife Habitat Council

<http://www.wildlifehc.org/index.html>

References for Rutland RPC Assessment of Town Plans and Zoning

Agency of Commerce and Community Development. 2000. **Vermont Municipal Planning Grant Program**. Montpelier, Vermont: Department of Housing and Community Affairs.

Jeer, Sandy, Megan Lewis, Stuart Meck, Jon Witten and Michelle Zimet. 1997. **Nonpoint Source Pollution: A Handbook for Local Governments**. Planning Advisory Service, Report Number 476, American Planning Association (APA).

Rutland Regional Planning Commission. 1994. **Rutland Region Natural Environment Technical Report**. Rutland, Vermont: Rutland Regional Planning Commission.

National Association of Towns and Townships. 1993. **Tapping Your Own Resources: A Decision-Makers Guide for Small Town Drinking Water**. Washington, DC: National Center for Small Communities.

US Environmental Protection Agency (EPA). 1994. **Environmental Planning for Small Communities: A Guide for Local Decision-Makers**. Washington, DC: Office of Research and Development.

US Environmental Protection Agency (EPA). 1995. **Watershed Protection: A Statewide Approach**. Washington, DC: Office of Wetlands, Oceans and Watersheds.

US Environmental Protection Agency (EPA). 1995. **Watershed Protection: A Project Focus**. Washington, DC: Office of Wetlands, Oceans and Watersheds.

US Environmental Protection Agency (EPA). 1999. **Catalog of Federal Funding Sources for Watershed Protection (Second Edition)**. Washington, DC: Office of Wetlands, Oceans and Watersheds.

US Environmental Protection Agency (EPA). 1997. **Community-Based Environmental Protection: A Resource Book for Protecting Ecosystems and Communities**. Washington, DC: Office of Policy, Planning and Evaluation.

US Environmental Planning Agency (EPA). 1997. **Top 10 Watershed Lessons Learned**. Washington, DC: Office of Wetlands, Oceans, and Watersheds.

Vermont Agency of Natural Resources. Department of Environmental Conservation. 2000. **State of Vermont 2000 Water Quality Assessment 305(b) Report**. Waterbury, Vermont: Water Quality Division.

Vermont Agency of Natural Resources. Department of Environmental Conservation. 1999. **Local Planning and Zoning Options for Water Quality Protection**. Waterbury, Vermont: Water Quality Division.

Vermont Agency of Natural Resources. Department of Environmental Conservation. 1999. **Vermont Pond Construction Guidelines**. Waterbury, Vermont: Water Quality Division.

Vermont Agency of Natural Resources, Department of Environmental Conservation. 1990. **Planning for Lake Water Quality Protection: A Manual for Vermont Communities**. Waterbury, Vermont: Water Quality Division.

Vermont Agency of Natural Resources. Department of Environmental Conservation. 1994. **A Planner's Guide to Wetland Protection in Vermont: A Manual for Vermont Communities**. Waterbury, Vermont: Water Quality Division.

Vermont Department of Housing and Community Affairs. 1998. **Community Planning for Flood Hazards.**

APPENDIX J: EXPANDED MUNICIPAL AND INDUSTRIAL WASTE TREATMENT WORKS INCLUDING FACILITIES TO TREAT COMBINED SEWER OVERFLOWS

Municipal Wastewater Treatment Facilities

Vermont municipalities need various wastewater treatment facility and conveyance system construction and improvement projects including: original treatment facility and collection line construction; enlargement and/or refurbishment of existing facilities; implementation of nutrient removal or sludge and septage treatment improvements at existing facilities; combined sewer overflow abatement; or collection line extensions. These projects enable the municipalities to meet the effluent limits in their NPDES permit in order to meet Vermont Water Quality Standards and comply with statute; provide for centralized treatment to replace problem individual on-site systems; and provide desired wastewater treatment capacity to enable municipal growth and development. (VTDEC - Facilities Engineering Division, Municipal Pollution Control Project Implementation, Poultney River and Mettowee River Basins, 2001).

Wastewater Plant accomplishments in the past five years (Basin 2):

- **Castleton**, wastewater treatment plant expansion and upgrade, with addition of phosphorus removal.
- **Fair Haven**, wastewater treatment plant upgrade, with addition of phosphorus removal.
- **Fair Haven**, wastewater collection system rehabilitation, including abatement of Adams Street pump station overflow.
- **Poultney**, wastewater treatment plant expansion and upgrade, with addition of phosphorus removal.

APPENDIX K: AGRICULTURE IN THE POULTNEY METTOWEE BASIN

Poultney-Mettowee Watershed Plan - Agricultural Aspects

Prepared by Marie Levesque Caduto for the Agency of Agriculture, Food, and Markets

Introduction

When one thinks of the Poultney-Mettowee watershed, one invariably thinks of broad green valleys rimmed with forested hillsides. This image is reality and the reality is based on agriculture.

Agriculture gives the watershed its character. It also gives it an economic base, a cultural identity and an environment that combines field, forest, pasture and village. Only 5% of the basin has been developed into roads, homes and businesses.

Of the 235,760 acres that make up the Vermont portion of the Poultney-Mettowee watershed, 16% or 38,533 acres, is in agricultural uses. This is the second largest land use type in the watershed but is far below the 69% of the land that is forested. Farms are producing milk and meat as well as apples, eggplant, wool and zucchini. Farm-owned forestland extends farm production into maple syrup and forest products. *

Agriculture has a large impact on the economy. Agricultural products produced in Rutland County have a market value of over \$28 million dollars. Farms spend over \$24 million a year, much of it locally, on production costs and property taxes. †

Agriculture also has an impact on the environment in both positive and negative ways. It is estimated that almost 60 miles of rivers and 80 acres of lake water are adversely affected by agricultural runoff. * Excess nutrients, pathogens and sediments all can leave the farm when erosion control methods fail or heavy rains and floods inundate fields. In the recent past farmers were supported through government programs for increasing production and land base, which encouraged removing vegetation along rivers to access, more land. A greater awareness of the impact of farming on water quality and a better understanding of the long-term impacts of stream

* Basin 2 Poultney-Mettowee Watersheds Water Quality & Aquatic Habitat Assessment Report, December 1999

† USDA 1997 Census of Agriculture, Vermont State and County Data

channel alterations has changed the focus of these programs. However many of the practices are still in place. Streambank destabilization on agricultural land is often associated with past cropping practices that removed riparian vegetation and left the banks susceptible to erosion leading to sedimentation.

However, agriculture also provides many benefits to the environment. Fields, pastures and forestland maintain large tracks of open space. Fewer pollutants are released from an acre of agricultural land than from an acre of developed land. Field and forest soils absorb water allowing it to permeate into the ground rather than quickly running off into rivers as paved surfaces do. Farms recycle farm- produced wastes as fertilizer, and work to prevent runoff of soil, nutrients and pathogens.

Agriculture has been an active force in the valley for over 200 years. It is only within the past 15 years that non-point source pollution has begun to be addressed. It will take a great deal of time, work and investment on the part of Federal, State and local organizations, as well as farmers, to control the cumulative effects of over two centuries of impact.

Agriculture in the Watershed

The most recent data available from 1997 shows a diversity of farm types ranging from dairy and horse to bees, cut flowers and raspberries.

Types of Farms - 1997†

	Number of Farms	Acres or AU*
Hay-Total	358	33,477
Other hay	233	13,850
Haylage	118	9,681
Alfalfa	128	5,840
Wild hay	73	3,330
Small grain	13	776
Beef	179	1,796
Corn silage	151	7,353

* AU = Animal Units

† USDA 1997 Census of Agriculture, Vermont State and County Data

Horse	124	1,593
Dairy	116	10,261
Maple Sugar	100	2,542
Poultry-All	53	2,015
Sheep	50	1,160
Vegetables	45	314
Nursery	31	31
Bees	21	1,080
Hog	19	238
Christmas Trees	17	NR
Orchards	15	149
Goat	14	105
Berries	13	NR
Corn grain	12	701
Rabbits	4	15
Trout	1	NR

NR = Not Reported

Dairy operations and their associated crops are the predominant agricultural use in the Poultney-Mettowee basin. Year 2001 Vermont Department of Agriculture, Food & Markets data shows 153 dairy farms in the watershed, with 81 of these currently in operation.

There are eight certified organic farms in the watershed. These farms have a total of 160 acres in hay, 227 acres in pasture, 34 acres in various crops and another 128 acres in other uses.‡

Agricultural Water Uses In the Poultney-Mettowee Watershed

1997 USDA Census of Agriculture – Rutland County

Irrigated land - No. Farms	26
Irrigated land - Total acres	113

‡ NOFA Vermont, Personal communication from John Cleary

Water from the Poultney and Mettowee River systems is an important resource for agriculture in the watershed. Potatoes, vegetables, orchards, berries, and nursery stock are all being supported by irrigation. Yet, combined surface-water withdrawals for animal watering and irrigation account for only 3.7% of the total surface water withdrawals by all uses.

Water Withdrawals – in gallons per day

	Surface-water	% of Total	Ground-water	% of Total	Acres Irrigated
All Uses	12,570,000		100%	3,470,000	100%
Irrigation	290,000		2.3%	60,000	1.7%
Livestock Watering	180,000		1.4%	630,000	18.2%

(Lake George watershed area, including Poultney-Mettowee watershed - USGS 1990 Water Use for 0201000-Lake George)

From 1992 to 1997 the number of acres under irrigation and the number of farms using irrigation has remained near constant. While the acreage covered is small, the availability of irrigation is crucial to the produces using it.

Conservation Practices In Place In The Watershed

Of the 81 dairy farms currently in operation in the Poultney-Mettowee watershed, 23 have completed or are presently implementing 73 Best Management Practices (BMPs). Each year between 2 and 8 farms are provided with cost-share funds for BMP implementation. Contributions of Federal and State dollars combine to decrease the cost for the farmer/landowner to as little as 15%.

Before 1996, prior to the State providing additional cost share funds, farmers on their own or with only Federal assistance implemented many improvements. Since 1996, over \$964,000 have been invested in non-point source pollution control on farms in the Poultney-Mettowee basin. This investment will reduce agriculture’s contribution to phosphorus in the watershed by 1560 lbs. per year once fully implemented. (See following charts.) Additionally, these practices will reduce pathogen loading of waterways and assist farmers in better managing nutrients on their farms.

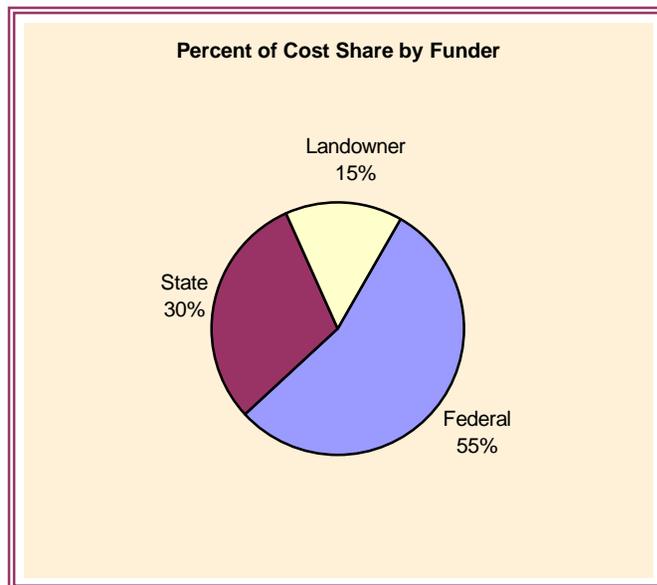
Some of the BMPs installed include: waste storage facilities, improved barnyards, roof runoff management systems, fencing animals out of waterways and providing them with stream crossings and alternative watering systems.

Best Management Projects COMPLETED

Fiscal Year	Farms Funded	Completed Practices	Phosphorus Reduced (lbs)	Actual Total Cost	Actual Federal Cost	Actual State Cost	Actual Landowner Cost
1996	3	3	93.5	\$28,347.00	\$21,240.00	\$2,832.00	\$4,275.00
1997	2	2	158.1	\$185,535.00	\$101,111.00	\$48,532.40	\$35,891.60
1998	0	0	0.0	\$0.00	\$0.00	\$0.00	\$0.00
1999	6	11	284.5	\$109,950.53	\$56,242.00	\$24,156.10	\$29,552.43
2000	2	1	0.0	\$291.43	\$145.72	\$102.00	\$43.71
2001	2	4	162.8	\$52,275.50	\$23,624.50	\$16,537.15	\$12,113.85
2002	8	2	0.0	\$34,079.00	\$17,040.00	\$11,927.15	\$5,111.85
Totals	23	23	698.9	\$410,478.46	\$219,403.22	\$104,086.80	\$86,988.44

Best Management Projects IN-PROGRESS

Fiscal Year	Farms Funded	Remaining Practices	Phosphorus Reduced (lbs)	Estimated Total Cost	Estimated Federal Cost	Estimated State Cost	Estimated Landowner Cost
1996	3	0	0.0	\$0.00	\$0.00	\$0.00	\$0.00
1997	2	0	0.0	\$0.00	\$0.00	\$0.00	\$0.00
1998	0	0	0.0	\$0.00	\$0.00	\$0.00	\$0.00
1999	6	11	200.4	\$155,448.00	\$99,287.00	\$32,201.50	\$23,959.50
2000	2	11	180.6	\$112,023.57	\$56,012.78	\$39,206.75	\$16,804.04
2001	2	11	356.4	\$158,476.64	\$83,904.17	\$50,800.98	\$23,771.49
2002	8	17	123.0	\$128,299.00	\$64,052.50	\$44,904.65	\$19,341.85
Totals	23	50	860.4	\$554,247.21	\$303,256.45	\$167,113.88	\$83,876.88



Percent of Animal Units in Dairy Operations Treated

	Farms	Animal Units	% Treated
Total Farms	81	10,142	
Farms with Improved Barnyards	42	6,282	62%
Farms with Manure Storage	18	3,620	36%

Current Status of Agriculture in the Watershed

Rutland County Data	1982	1987	1992	1997
Total # Farms	561	516	493	530
Acres in Farms	166,855	140,177	132,674	125,770
Acres in Cropland	71,090	61,167	57,342	52,797
In # Farms	521	487	459	465
Acres in Pasture	22,501	17,535	15,040	13,041

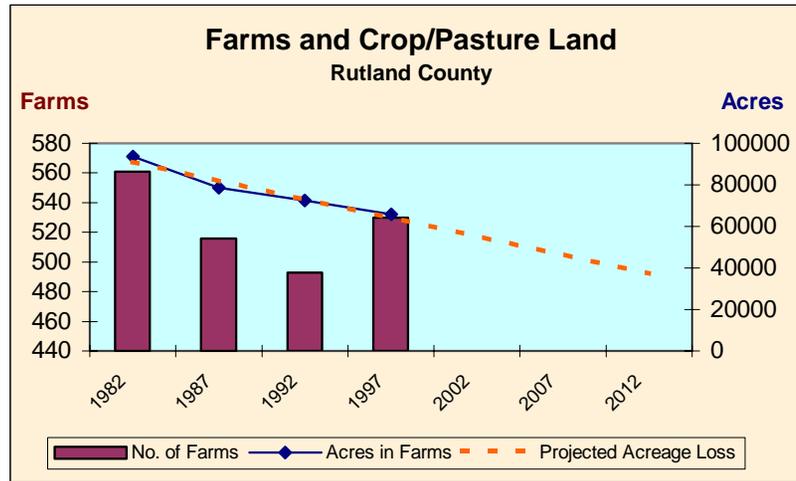
In # Farms	290	301	272	274
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* Data source: 1997 & 1987 Census of Agriculture, USDA

While the total number of farms has decreased by 31 (5.5%) between 1982 and 1997, the number of farmed acres in either crops or pasture has decreased by 27,753 acres. This is almost a 30% decrease in the agricultural land of the county in only fifteen years. This loss of agricultural land has many implications. Loss of open space to development is evident along many of the major roads in the watershed. Development has been shown to have a greater adverse impact on water quality than does agricultural land. The increase in pavement and other impervious areas can increase runoff and carry toxic pollutants into waterways.

Increased development means greater disturbance to soils, greater impact on natural resources and greater stress on existing farmland to both produce more on less land and to maintain the pastoral nature of the landscape. This becomes increasingly difficult with the concurrent increase in the cost of farming due to higher land costs and higher tax rates. Loss of Vermont's pastoral aesthetic may ultimately impact the State's tourism revenue.

Projecting out another 15 years at the present rate of loss, there will be fewer than 40,000 acres in agriculture by the year 2012 in all of Rutland County. This is only 6.7% of the land base of the county. This would dramatically change the cultural and environmental qualities of the area.



The current economic impact of agriculture in the watershed is striking. Despite the dramatic decrease in farm acreage, the value of the agricultural products that are sold continues to increase, reaching \$28.3 million in 1997. Dairy products make up 74% of the total value for the County. With total production expenses of \$22,350,000, including \$1,707,000 in property taxes, agriculture puts a significant amount of money into the local economy.

Trends for the Future

There are currently 81 operating dairy farms in the Poultney-Mettowee watershed. Of these farms, 63 do not have waste management systems. At the current rate of 3 waste management systems per year it will take approximately 21 years and \$2,087,040 to complete implementation. The cost is based on a treatment cost of \$320 per animal unit for waste management systems and a need to treat 6,522 animal units on dairy farms. Thirty-nine farms have not yet installed improved barnyards. In order to treat the remaining 3,860 animal units needing this practice, at an average cost of \$90 per animal unit, it will cost \$347,400.

Participation in these programs is voluntary and not all producers are willing or financially able to invest in BMPs so we may never have full participation. Manure will never be 100% contained. Storage systems contain wastes produced during the winter spreading ban or when animals are confined. Pasture wastes and spread wastes will always be susceptible to runoff.

If funding for BMP installation continues at the current levels, it will take over 20 years to treat all the remaining dairy farms with appropriate practices. In that time, systems now in use will need upgrading as well. Water quality should gradually improve over time as more farms have systems in place however, without increased funding the end of installing and upgrading is far off. Levels of phosphorus and nitrogen in surface waters should decrease but will not be eliminated. Even greater improvement should come now that nutrient management is a requirement of participation in Federal programs. Further improvement could take place if the cost share funding programs are refocused on other types of farms and on annual practice implementation such as riparian treatments and buffer installation. An increase in support for these programs would decrease the amount of time it will take to reach full nutrient containment.

Despite these constraints the Poultney-Mettowee watershed remains very rural, rich in excellent agricultural land and maintains a vital agricultural industry. While development pressure is a concern of local towns they are committed to maintaining the rural, agricultural nature of the area. It is the economics of agriculture however that will likely determine the future character of the valley.

Unfortunately, examining the past fifteen years of data and looking ahead another ten years, at the current rate of farm loss, there may be 100 fewer farms in Rutland County 2012 than there were in 1987.

Successes - What has been done so far?

To date three Federal programs have been used to protect a total of 396 acres in the Poultney-Mettowee watershed. Two are USDA programs. The Wetland Reserve Program has protected 137 acres, and the Conservation Reserve Program, 5 acres. The US Fish & Wildlife Service's Partners for Fish & Wildlife Program has protected 254 acres with fencing to prevent livestock from damaging streambanks.

The **Poultney-Mettowee Watershed Partnership** is a project of the Poultney-Mettowee Natural Resources Conservation District in Vermont and the Washington County Soil and Water Conservation District in New York with funding provided by the Lake Champlain Basin Program and other grant programs. The mission of the Partnership is to bring together the efforts of citizens and organizations that share the common vision of conserving, protecting, and enhancing the natural and cultural resources of the watershed.

Partnership Goals:

- To improve water quality.
- To enhance and interpret wildlife populations and habitats and other natural resources.
- Maintain a healthy agricultural based economy while protecting, restoring, and conserving the soil and water resources of agricultural land.
- To educate youth, educators, adults, residents, and visitors about conservation practices and the environment around them.
- To maintain and enhance agriculture-related and nature-based recreation opportunities.

Agriculture Related Projects:

The Poultney Mettowee Natural Resources Conservation District,

Agriculture Related Projects:

The Southern Vermont Nutrient Management Program provides on-farm consultation; with the primary goal of working on individual nutrient management plan development. Nutrient management plans are required in Vermont on larger farms and on farms participating in Federal and State cost-share programs. A detailed plan involves field and crop histories, soil tests and sampling results, and a detailed plan for use of all on-farm nutrients so as to maximize environmental and financial sustainability.

Programs To Address Issues

State Government Programs

Accepted Agricultural Practices are statewide restrictions designed to reduce nonpoint pollutant discharges through implementation of improved farming techniques rather than investments in structures and equipment. The law requires that these practices must be technically feasible as well as cost effective for farmers to implement without governmental financial assistance.

Accepted Agricultural Practices (AAPs) are intended to reduce, not eliminate, pollutants associated with nonpoint sources such as sediments, nutrients and agricultural chemicals that can enter surface water and groundwater that would degrade water quality. Accepted Agricultural Practices are a group of farmland management activities, which will conserve and protect natural resources. These practices will maintain the health and long-term productivity of the soils, water, and related plant and animal resources and reduce the potential for water pollution from agricultural nonpoint sources. Accepted Agricultural Practices include these practices among others: erosion and sediment control, animal waste management, fertilizer management, and pesticide management. Accepted Agricultural Practices are basic practices that all farm operators must follow as a part of their normal operations.

Implementation of Accepted Agricultural Practices by Vermont agricultural operators creates a reputable presumption of compliance with Vermont Water Quality Standards. The presumption that the use of Accepted Agricultural Practices complies with Vermont Water Quality Standards may be overcome by water quality data or results from a water quality study deemed conclusive by the Secretary. These rules, however, do not exempt farmers from the obligation to comply fully with the Vermont Water Quality Standards and the provisions of the Clean Water Act.

Best Management Practices are more restrictive than Accepted Agricultural Practices and are site-specific practices to correct a problem on a specific farm. Best Management Practices (BMPs) typically require installation of structures, such as manure storage systems, to reduce agricultural nonpoint source pollution. While farmers may realize an economic benefit from Best Management Practices, it is unlikely that they will be affordable without governmental cost sharing.

The Best Management Practice program was created to provide state financial assistance to Vermont farmers in support of their voluntary construction of on-farm improvements designed to abate non-point source agricultural waste discharges. The program makes maximum use of federal financial assistance and seeks to use the least costly methods available to accomplish the abatement required.

The Vermont Agency of Agriculture, Food, and Markets (AAF&M) grants are limited to a cap of 35 percent of the total actual costs of the system in cases where either the federal government or other entities cost share the system, or 50 percent on projects with no other source of cost share assistance. Combined federal, state and other cost share participation may not exceed 85 percent of the eligible costs, ensuring grant recipients pay at least 15 percent of the total cost of each BMP. Awards of funding for BMP implementation shall require that the BMP be operated and maintained under contract or agreement for the design life of the practice under contract or agreement, but not to exceed 10 years.

It is a policy of the State of Vermont to assist farmers with the implementation of Best Management Practices that will protect and maintain water quality by reducing agricultural nonpoint source pollution. The implementation of Best Management Practices is subsequent to the implementation of Accepted Agricultural Practices.

All options on the Vermont NRCS practice list are available for use in the watershed. NRCS staff does final determination of which practices to implement on a specific farm.

The purpose of the **Large Farm Operations** (LFO) program is to require farms with more than 950 animal units to be pro actively managed in accordance with the accepted agricultural practices and to prohibit a direct discharge from their barnyard and environments commonly known as the facility. Farms that are following the regulations for LFOs should adhere to a technical standard to assure that they will not discharge to waters of the state. If farms chose to ignore the LFO rule or to create a discharge they are required to attain a National Pollution Discharge Elimination Systems permit. There are currently no farms in the Poultney-Mettowee watershed, which require an LFO permit.

Local Government Programs

Conservation District Technical Assistance Program and Farm*A*Syst

Free technical assistance and information is provided to help farmers meet the requirements of Vermont's AAP regulations.

Technical assistance for manure and nutrient management, runoff potential, floodway determinations, streambank stabilization, vegetative buffer strips and soil erosion potential are all addressed by the program. Agricultural Resource Specialists (ARS) work with landowners on strategies specific to their farms and provide information and referrals for State and Federal cost-share programs.

Farm*A*Syst is a free drinking water protection program for farms based on voluntary assessments to determine how current practices and structures may pose a risk to drinking water. Voluntary Farm Assessments provide information that help ARS staff offer farm-specific suggestions for protecting the farm's drinking water. **Nutrient Management Planners** are available to assist farmers in developing nutrient management plans and record-keeping systems in order to maximize the benefit from fertilizer and manure applications while minimizing the impact of excess nutrients on water quality.

Federal Programs

The **Environmental Quality Incentives Program** (EQIP) provides technical, educational, and financial assistance to eligible farmers and non-industrial private forestland owners working to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The program provides assistance to landowners in complying with Federal and State laws, and encourages environmental enhancement. Protection of surface and groundwater resources is the major focus of EQIP.

The program offers cost-share payments of up to 75% of costs up to \$450,000, to implement one or more eligible practices. Five- to ten-year contracts are made with producers to use and maintain cost-shared practices and require a conservation plan be created and carried out for the length of the contract. Priority is given to livestock operations and targeted locations within the State.

The **Agricultural Management Assistance** (AMA) program provides cost share assistance to agricultural producers to voluntarily address issues such as water management, water quality, and erosion control by incorporating conservation into their farming operations. Producers may construct or improve water management structures or irrigation structures; plant trees for windbreaks or to improve water quality; and mitigate risk through production diversification or resource conservation practices, including soil erosion control, integrated pest management, or transition to organic farming. Vermont's AMA program priorities are waste storage facility construction and streambank stabilization.

The **Conservation Reserve Enhancement Program (CREP)** is a State-federal conservation partnership program targeted to address specific State and nationally significant water quality, soil erosion and wildlife habitat issues related to agricultural use. The program uses financial incentives to encourage farmers and ranchers to voluntarily enroll in contracts of 10 to 15 years in duration to remove lands from agricultural production. This community-based conservation program provides a flexible design of conservation practices and financial incentives to address environmental issues. The state is considering enhancing the program to include 30-year easements on marginal pastureland where forested buffers would be required. Currently CREP is only available in the Lake Champlain watershed.

The **Conservation Reserve Program (CRP)** is a voluntary program that offers long-term rental payments and cost-share assistance to establish long-term, resource-conserving cover on environmentally sensitive cropland or, in some cases, marginal pastureland. Converting highly erodible and/or environmentally sensitive cropland to permanent vegetative cover reduces soil erosion, improves water quality, and enhances or establishes wildlife habitat.

CRP contracts are for a term of 10 to 15 years. However, for land devoted to certain practices such as hardwood trees, wildlife corridors, or restoration of cropped wetlands or rare and declining habitat, participants may choose contracts of up to 15 years. Incentives include annual rental payments of up to \$50,000 per year, cost-share payments of up to 50% of the cost for establishing cover, plus special incentive payments for wetland restoration.

The **Wildlife Habitat Incentives Program (WHIP)** is a voluntary program that provides financial incentives to develop habitat for fish and wildlife on private lands. It provides both technical assistance and cost sharing help to participants who agree to implement a wildlife habitat development plan. Participants work with USDA's Natural Resources Conservation Service to prepare a wildlife habitat development plan in consultation with a local conservation district. The plan describes the landowner's goals for improving wildlife habitat, includes a list of practices, a schedule for installing them, and details the steps necessary to maintain the habitat for the life of the agreement.

USDA pays up to 75% (usually no more than \$10,000) of the cost of installing wildlife practices. USDA and program participants enter into a cost-share agreement that generally lasts a minimum of 10 years from the date the contract is signed.

The **Forest Land Enhancement Program (FLEP)**, is a new cost-share program to be carried out through state foresters. The initiative will provide financial, technical, educational and related assistance to state foresters to help non-industrial private forest

landowners address a variety of multiple, watershed-based forestry resource objectives.

The **Conservation Security Program (CSP)** is a voluntary program to assist agricultural producers implementing and maintaining new or maintaining existing conservation practices on working lands. All producers and all private agricultural lands including cropland, improved pastureland, rangeland, and forested land that is an incidental part of an agricultural operation are eligible for enrollment.

The purpose of the CSP is to provide incentive payments to producers who adopt and/or maintain conservation practices on private working lands. Producers may choose from one of three tiers of conservation practices and systems, with the more complex and comprehensive tiers receiving higher incentive payments. CSP contracts are from five to 10 years. Contract payments are based on five, 10 and 15 percent of a national land rental rate per acre for Tiers I, II and III, respectively. In addition to incentive payments, producers will receive cost-share assistance to install practices, annual practice maintenance fees and potentially a bonus to encourage participation in the program. Maximum annual payments are \$20,000, \$35,000 and \$45,000.

Tier I contracts must include conservation practices that, at a minimum, address at least one significant resource of concern for the land enrolled.

Tier II contracts must include conservation practices that, at a minimum, address at least one significant resource of concern for the entire agricultural operation.

Tier III contracts must include conservation practices that, at a minimum, apply a resource management system that meets appropriate nondegradation standard for all resources of concern of the entire agricultural operation.

The **Grassland Reserve Program (GRP)** establishes a grassland reserve program for the purpose of restoring and conserving two million acres of grassland, rangeland, and pastureland. GRP uses up to 30-year rental agreements and 30-year or permanent easements. GRP lands may be used for haying and grazing under a conservation plan.

Rental and easement payments are based on a percentage of the fair market value of the land less the grazing value of the land for the period during the contract or easement period. Restoration costs are cost shared at up to 75 percent.

The **Wetlands Reserve Program (WRP)** is a voluntary program offering landowners a chance to receive payments for restoring and protecting wetlands. Marginal agricultural land that is too wet to produce, previously drained wetlands or land damaged by flooding

are typical sites for WRP funding. Landowners retain control over access to their property and compatible uses such as haying, grazing, timber harvest, fee hunting, and trapping may be permitted upon request. Land can be resold.

The program offers landowners three options:

- 1) Permanent Easement. USDA will pay up to the agricultural value of the land and 100% of the costs of restoring the wetlands and uplands.
- 2) 30-Year Easement. USDA will pay 75% of what would be paid for a permanent easement and 75% of the restoration costs.
- 3) Restoration Cost-Share Agreement. USDA will pay 75% of the cost of restoring a wetland in exchange for a minimum 10-year agreement to maintain the restoration. No land use payment is provided.

Easements and restoration cost-share agreements establish wetland protection and restoration as the primary land use for the duration of the easement or agreement. Re-stored wetlands improve water quality, filter sediment, reduce soil erosion, provide habitat for wildlife and endangered species, reduce flooding and provide outdoor recreation and education opportunities.

The **Farmland Protection Program (FPP)** provides funds to help purchase development rights to keep productive farmland in agricultural uses. Since 1960, an average of 1.0 million acres of farmland have been converted to other uses each year, often resulting in permanent loss of valuable topsoil and agricultural land. The FPP was designed to help protect quality farmland with prime, unique, or other productive soil, from urban growth.

USDA provides up to 50 percent of the costs of purchasing easements. For the FPP, a conservation easement is an assigned right prohibiting any development, subdivision or practice that would damage the agricultural value or productivity of the farmland. To be selected for participation in the FPP, a pending offer must provide for the acquisition of an easement or other interests in land for a minimum duration of 30 years, with priority given to those offers providing permanent protection.

The **Partners for Fish and Wildlife Habitat Restoration Program** provides technical and financial assistance to private landowners interested in voluntarily restoring or otherwise improving native habitats for fish and wildlife on their lands. This program focuses on restoring former and degraded wetlands, native grasslands, stream and riparian areas, and other habitats to conditions as natural as feasible. The program emphasizes the reestablishment of native vegetation and ecological communities for the benefit of fish and wildlife in concert with the needs and desires of private landowners.

The assistance that the U.S. Fish and Wildlife Service offers to private landowners may take the form of informal advice on the design and location of potential restoration projects, or it may consist of designing and funding restoration projects under a voluntary

cooperative agreement with the landowner. Under the cooperative agreements, the landowner agrees to maintain the restoration project as specified in the agreement for a minimum of 10 years. While not a program requirement, a dollar-for-dollar cost share is usually sought on a project-by-project basis.

Watershed and River Basin Planning and Installation - Public Law 83-566 (PL566)

Technical and financial assistance is provided in cooperation with local sponsoring organizations, state, and other public agencies to voluntarily plan and install watershed-based projects on private lands. The program empowers local people or decision makers, builds partnerships and requires local and state funding contributions. The purposes of watershed projects include watershed protection, flood prevention, water quality improvements, soil erosion reduction, rural, municipal and industrial water supply, irrigation water management, sedimentation control, fish and wildlife habitat enhancement and create and restore wetlands and wetland functions.

Watershed plans involving an estimated Federal contribution in excess of \$5,000,000 for construction, or construction of any single structure having a capacity in excess of 2,500 acre feet, require Congressional committee approval. Other plans are approved administratively. After approval, technical and financial assistance can be provided for installation of works of improvement specified in the plans.

Project sponsors are provided assistance in installing planned land treatment measures when plans are approved. Surveys and investigations are made and detailed designs, specifications, and engineering cost estimates are prepared for construction of structural measures. Areas where sponsors need to obtain land rights, easements, and rights-of-way are delineated. Technical assistance is also furnished to landowners and operators to accelerated planning and application of needed conservation on their individual units. There are presently over 1600 projects in operation.

The Poultney-Mettowee basin is awaiting designation as a PL-566 project area.

Federal Water Pollution Control Act - CWA 104(b)(3)

In cooperation with Federal, State, and local agencies, public or private institutions, organizations, and individuals, EPA provides grant funding to conduct and promote a comprehensive program of research, investigations, experiments, surveys, and studies relating to the causes, sources, effects, extent, prevention, detection, and correction of water pollution.

EPA provides technical services in conducting activities that establish national programs for the prevention, reduction, and elimination of pollution. This program provides funding for the nutrient management program.

The Poultney-Mettowee watershed has received \$250,000 in fiscal 2002 to assist farmers with BMP implementation.

Non-Governmental Programs

The **National Fish and Wildlife Foundation** conserves healthy populations of fish, wildlife and plants, on land and in the sea, through creative and respectful partnerships, sustainable solutions, and better education.

The Foundation meets these goals by awarding challenge grants to projects benefiting conservation education, habitat protection and restoration, and natural resource management. The National Fish and Wildlife Foundation supports the conservation of native fish, wildlife, plants and their habitats by attracting diverse investments to conservation and encouraging locally supported stewardship on private and public lands. Congress created the Foundation in 1984 to benefit the conservation of fish, wildlife, and plants, and the habitat on which they depend. Federal and private funds contributed to the Foundation are awarded as challenge grants to on-the-ground conservation projects. The Foundation does not support lobbying, political advocacy, or litigation.

The Foundation fosters partnerships among federal, tribal, state, and local governments, corporations, private foundations, individuals, and non-profit organizations. Funds have been awarded to more than 1,100 grantees, including government agencies, educational institutions, and domestic and international conservation organizations. Challenge grants require that the funds awarded are matched with non-federal contributions, maximizing the total investment delivered to conservation projects. For every dollar that Congress provides to the Foundation, an average of \$3 in on-the-ground conservation takes place. The Foundation has made more than 4,400 grants, committing over \$165 million in federal funds, matched with non-federal dollars, delivering more than \$500 million for conservation.

Land Trust Programs The Vermont Land Trust, the Nature Conservancy and other local trusts often provide avenues for preserving farmland through either the donation or purchase of development rights or the donation or purchase of land and the reselling or leasing of farmland to producers who agree to continue active agriculture on the property.

Cooperating Partners

State, Federal and private partners working in cooperation with the Department of Agriculture, Food and Markets to provide these programs include:

- ⊗ Natural Resource Conservation Districts (VT & NY)
- ⊗ Vermont Department of Environmental Conservation
- ⊗ USDA Natural Resource Conservation Service
- ⊗ USDA Farm Service Agency
- ⊗ USDA Forest Service
- ⊗ US Fish And Wildlife Service
- ⊗ Army Corps of Engineers
- ⊗ National Fish and Wildlife Foundation
- ⊗ Lake Champlain Basin Program
- ⊗ Green Mountain College
- ⊗ The Nature Conservancy of Vermont
- ⊗ Rutland Regional Planning Commission
- ⊗ Lake Champlain By-Ways Program
- ⊗ Local Town Selectboards and Planning Commissions

Areas in need of attention due to agricultural impacts

Poultney River

Current Condition:

– VT02-01, Lower Main Stem (2.8 miles) – Agriculture is a moderate source of impairment from Carvers Falls to the confluence with Castleton River possibly associated nutrient enrichment and streambank erosion from agricultural runoff.

Agricultural Needs:

Irrigation

Animal watering

Remediation Options:

The major farms along this stretch are on the New York side of the river with much of the land in corn. New York State does not prevent manure spreading in winter, therefore pathogens, nutrients and sediments may be entering the water from these operations at times when the ground is frozen or during spring runoff and heavy rains.

There is however a 100 – 150 foot buffer along both sides of the river.

On the Vermont side of the river one major farm is currently participating in EQIP and is implementing several Best Management Practices. Funding for this project is from USDA, VT DAF&M, the 104(b) program and the farmer's cost-share match.

Nutrient management is still needed.

Wider vegetated buffers along a short stretch of the Poultney River and a quarter mile of the Castleton River would also help.

Current Condition:

- VT02-04, above & below mouth of Castleton River (1.0 miles) – Agriculture is a moderate source of impairment 0.5 miles above & below the confluence with the Castleton River possibly associated with nutrient enrichment from agricultural runoff.

Remediation Options:

This covers the same reach and the same farm that is described above. 0.5 miles below the confluence of the Castleton the agricultural operation on the Vermont side has ceased and fields are growing back up. There is also a wide buffer surrounding these fields.

Other sections of the Poultney watershed could be improved with additional practices including:

- fencing along streams to exclude animals with alternative watering systems
- buffers along waterways
- stream crossings for animals, walkways and access lanes
- streambank stabilization
- improved barnyards and heavy use area protection
- control of invasive species

Mettowee River

Current Condition:

– Main Stem (8.2 miles) – Agriculture is a moderate source of impairment due to temperature problems from agricultural land uses (especially crop and hay production and pasturing), loss and removal of riparian vegetation.

Remediation Options:

The Mettowee River corridor has very little vegetative buffer coverage. Many long stretches are worked up to the edge of the riverbank with pasture, hay or corn.

Conditions might be improved with the planting of trees and shrubs along the banks and herbaceous vegetation strips as a filter along the edge of fields. Pasture management and nutrient management would also decrease agricultural runoff, which can also contribute to temperature gains.

Other sections of the Mettowee watershed could be improved with additional practices including:

- waste storage facilities
- fencing along streams to exclude animals with alternative watering systems
- stream crossings for animals, walkways and access lanes
- roof runoff management
- silage leachate management
- improved barnyards and heavy use area protection
- milkhouse waste management
- surface and subsurface water diversions
- buffers along waterways
- streambank stabilization
- stream channel stabilization
- grade stabilization structures along the river channel
- control of invasive species

Future Needs in the Basin

Unmet needs

- Increased funding for implementing agricultural best management practices
- Funding to assist farmers in diversifying their operations or transitioning to alternative systems
- Creation of a local youth conservation corps that can serve as a workforce on projects beyond what volunteers can provide
- A dairy program that better serves farmers

APPENDIX L: IMPAIRED WATERS (2002)

Under federal regulations and the most recent EPA guidance, impaired waters must be identified by the State and may need to be reported under §303(d) of the Clean Water Act. If the waterbody is identified as impaired (meaning these waters consistently do not meet Vermont Water Quality Standards) but there are specific regulatory measures in place that, when executed, will bring it into compliance with Vermont Water Quality Standards, it is not required to be reported under §303(d). All other impaired waters where no such legal remedies exist must be reported under §303(d) and scheduled for TMDL development. All impaired waters identified in the Poultney Mettowee Basin are reported on the 303(d) List.

Waterbody Completion ID State Lead	Segment Name/ Description		Use(s)	Surface Water	Current Status/ Situation	Year
		Pollutant(s)	Impaired	Quality Problem(s)		
VT02-01	POULTNEY RIVER, FROM CARVERS FALLS UP TO CASTLETON RIVER (2.8 MILES)	NUTRIENT ENRICHMENT	ALS	NUTRIENT ENRICHMENT FROM AGRICULTURAL RUNOFF, EROSION	FAIR BIOLOGICAL CONDITION (97 & 98); PRELIMINARY 566 PLANNING (ON-GOING); NEED ADDITIONAL FARM TREATMENT & MANAGEMENT	2010
	POULTNEY RIVER, DEC-AP/WQ MOUTH UPSTRM TO CARVERS FALLS (10.4 MILES)	MERCURY	FC	ELEVATED LEVELS OF Hg IN WALLEYE	CONSUMPTION ADVISORY IN EFFECT; FISH TISSUE DATA COLLECTION POINT AT MOUTH	2008
VT02-02	UNNAMED TRIB TO HUBBARDTON RIVER, BELOW WWTF DISCHARGE	E. COLI, NUTRIENT ENRICHMENT, TEMPERATURE	ALS, CR, 2CR	BENSON WWTF DISCHARGE POSSIBLE SOURCE; SITUATION NEEDS MORE MONITORING & ASSESSMENT ESP UPSTREAM OF WWTF DISCHARGE (LAND USES & WETLAND)	POOR BIOLOGICAL CONDITION (97); DISCHARGE HAD ELEVATED TOTAL RESIDUAL CHLORINE, AMMONIA & TEMPERATURE; ALSO HIGH E.COLI LEVELS MEASURED IN DISCHARGE OCCASIONALLY; EFFECTS POSSIBLE FROM UPSTREAM ACTIVITIES	2008
VT02-03	CASTLETON RIVER, FAIR HAVEN	E. COLI	CR	WWTF PUMP STATION OVERFLOWS	INITIAL 1272 ORDER ISSUED; PRELIMINARY ENGINEERING DONE; BOND VOTE PASSED (FALL 98); REVISED ORDER ISSUED WITH SCHEDULE; FINAL DESIGN DONE (9/99); CONSTRUCTION DONE CY2001	2000
VT02-04	POULTNEY RIVER, 0.5 MI ABOVE TO 0.5 MI BELOW CASTLETON RIVER CONFL	NUTRIENT ENRICHMENT	ALS	AGRICULTURAL RUNOFF	FAIR BIOLOGICAL CONDITION (91, 97, 98); PRELIMINARY 566 PLANNING (ON-GOING); NEED ADDITIONAL FARM TREATMENT & MANAGEMENT	2010

VT02-05	METTAWEE RIVER, UPSTREAM OF NY/VT BORDER (8.2 MILES)	TEMPERATURE	ALS, 2CR	LOSS OF RIPARIAN VEGETATION; CLOSE PROXIMITY OF AGRICULTURAL USES	HOT SUMMERS CAUSE OCCASIONAL FISH KILLS, FISH MOVE OUT; BIOLOGICAL MONITORING @ PAWLET (FISH '86, MACROINVERT '97); RIVER DISTANCE REVISED FROM 6 MILES TO 8.2 MILES; TEMPERATURE DATA COLLECTION & MODELING SUMMER 2000	2002
	UNNAMED TRIB TO DEC-SW METTAWEE RIVER	METALS (IRON, ZINC)		PAWLET LANDFILL LEACHATE	ALSO ELEVATED LEVELS OF Mn; NEEDS FURTHER ASSESSMENT; CLOSURE (99) & CAPPING (01)	2010

APPENDIX M: WATERS IN NEED OF FURTHER ASSESSMENT

The waters listed below fall outside the scope of the State List of Impaired Waters (the EPA approved 303(d) List of Waters that consistently do not meet Vermont Water Quality Standards). This list is also known as part “C” of the Section 303(d) List and referred to as “waters in need of further assessment”. This list reflects waters listed as of 2002.

Part C. Waters appearing below are waters in need of further assessment. If future assessment results indicate impairment, the waterbody will be included in the next 303(d) list (Part A).

Waterbody Assessment ID Lead	Segment Name/ Description	Possible Pollutant(s)	Possible Use(s) Impaired	Possible Surface Water Quality Problem Needing Assessment	Assessment	Year
VT02-01	POULTNEY RIVER, AT MOUTH	NUTRIENTS	AES	CONTRIBUTES PHOSPHORUS LOADING TO LAKE CHAMPLAIN SOUTH LAKE B SEGMENT; TOTAL LOAD 17 MT/YR (91)	C.1	
VT02-04	POULTNEY RIVER, RT 30 BRIDGE DOWNSTREAM TO POULTNEY WWTF (2.2 MILES)	SEDIMENT, TEMPERATURE	ALS, 2CR	LOSS OF RIPARIAN VEGETATION; "GOOD" BIOLOGICAL CONDITIONS (98); ENRICHED CONDITIONS OBSERVED (98 & 99); SOURCE(S) NEED FURTHER ASSESSMENT	C.1	
VT02-05	INDIAN RIVER BELOW WEST PAWLET WWTF	LOW D.O.	ALS	D.O. LEVELS OF DISCHARGE & DOWNSTREAM	C.1	