FINAL

PROGRAMMATIC ENVIRONMENTAL ASSESSMENT FOR THE IMPLEMENTATION OF THE CONSERVATION RESERVE ENHANCEMENT PROGRAM FOR VERMONT

US Department of Agriculture
Farm Service Agency

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EXECUTIVE SUMMARY

This Programmatic Environmental Assessment (PEA) describes the potential environmental consequences resulting from the proposed implementation of Vermont's Conservation Reserve Enhancement Program (CREP) Agreement (Vt CREP, 2005). The environmental analysis process is designed: to ensure the public is involved in the process and informed about the potential environmental effects of the proposed action; and to help decision makers take environmental factors into consideration when making decisions related to the proposed action.

This PEA has been prepared by the United States Department of Agriculture (USDA), Farm Service Agency (FSA) in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality regulations implementing NEPA, and 7 CFR 799 *Environmental Quality and Related Environmental Concerns – Compliance with the National Environmental Policy Act.*

Purpose and Need for the Proposed Action

The purpose of the proposed action is to implement Vermont's CREP agreement. Under the agreement, eligible farmland in the State that drains into Lake Champlain and the Connecticut River would be voluntarily removed from production and approved conservation practices, such as installation of filter strips, riparian buffers, grassed waterways, and wetland restoration, would be implemented. Landowners would receive annual rental payments and would be eligible for one-time payments to support the implementation of approved conservation practices. The Vermont CREP agreement is needed to assist the State in meeting the following conservation goals:

- Improve water quality,
- Protect drinking water,
- Protect threatened and endangered species
- Improve wildlife habitat, and
- Assist the State in complying with environmental regulations that are related to agriculture.

Proposed Action and Alternatives

The proposed action would implement Vermont's CREP agreement. Under this agreement, 7,500 acres of eligible farmland within the all of the counties in Vermont would be enrolled in CREP: Addison, Bennington, Caledonia, Chittenden, Essex, Franklin, Grand Isle, Lamoille, Orange, Orleans, Rutland, Washington, Windham, and Windsor. The State has identified the watersheds in the Lake Champlain Basin, the Connecticut River Basin, Lake Memphremagog Basin, and the Hudson River Basin for treatment under this CREP agreement. The tributaries of Lake Champlain are the Lamoille, LaPlatte, Mettawee, Missisquoi, Poultney and Winooski Rivers, and Otter Creek. The main tributaries of the Connecticut River Basin are the Black, Connecticut, Deerfield, Ompompanoosuc, Ottaquechee, Passumpsic, Saxtons, Stevens, Waits, Wells, West, White and Williams Rivers.

Landowners would enroll eligible farmland by entering into 10-year minimum contracts with FSA, not to exceed 15 years. Approved conservation practices would be established and maintained on enrolled lands for the contract duration. Landowners would receive annual rental payments for the duration of the contracts as well as financial and technical support for implementing and maintaining the practices. For lands enrolled in CREP, annual rental payments would be the sum of the base soil rental rate, an incentive payment, and an annual maintenance rate. This PEA documents the analysis of the Proposed Action and the No Action Alternative. Under the No Action Alternative, no lands would be enrolled in CREP. None of the conservation practices or rental payments described above would be implemented.

Summary of Environmental Consequences

Below in Table ES-1 is a summary of the potential impacts identified in this PEA.

Table ES-1: Executive Summary Impacts Table

Resource	Proposed Action	No Action Alternative
Biological Resources	The proposed action is expected to contribute to vegetation and wildlife diversity. Positive impacts to threatened and endangered species, species of concern, and their habitats are expected.	Continued degradation of terrestrial and aquatic habitats; potential for invasion by exotic species.
Cultural Resources	There is high potential for encountering archaeological resources. Site specific archaeological and historic architectural surveys and coordination with SHPO are recommended prior to the installation of approved conservation practices. Consultation with several tribes that have traditional ties to the Vermont areas affected may be required once sites are selected and could delay program enrollment.	No major impacts are expected, though negative impacts to cultural resources could result from changes in existing farming practices or the disturbance of previously undisturbed land.
Water Resources	Significant long-term positive impacts to surface and groundwater quality are expected. Wetlands acreages are expected to increase as a result of the proposed conservation practices. Temporary minor adverse impacts to existing wetlands and localized surface water quality may result from runoff during activities associated with the installation of	Continued degradation of surface and groundwater and wetlands is expected to result if the proposed action is not implemented. The surface drainage systems would continue to receive sediment from eroded soils and potential contaminants from agricultural wastes.
Earth Resources	Positive impacts to localized topography and soils are expected to result from implementation of the proposed action.	Continued erosion is expected to result in susceptible areas that are not vegetated, have unrestricted surface flow, or have unimproved channels if the proposed action is not implemented.
Air Quality	No impacts to attainment status or violations of State Implementation Plan standards would result from the proposed action. However, localized temporary adverse minor impacts to air quality may result from ground disturbing activities and the use of heavy equipment during the installation of approved conservation practices.	No change from current conditions is expected.

Table ES-1: Executive Summary Impacts Table(continued)

Resource	Proposed Action	No Action Alternative
Recreational Resources	Positive long term effects on recreational resources where proposed approved conservation practices are expected to increase habitat for game and non-game species. Water quality improvements would result in better recreation fishing and other water-related recreation.	No change from current land-based recreational opportunities is expected; however, continued water quality degradation may affect game fish or other water related recreation.
Socioeconomics and Environmental Justice	Increased land values and a loss of farm labor jobs and expenditures are expected to result from the implementation of the proposed action. The project area is not considered an area of concentrated minority population, no significant impacts to Environmental Justice is expected.	No changes in current trends in socioeconomic conditions are expected.

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ACRONYMS

Term/Acronym	Definition
(V)ANR	Agency of Natural Resources (Vermont)
AQI	Air Quality Index
APCD	Air Pollution Control Division (Vermont)
AREI	Agricultural Resources and Environmental Indicators
BEA	Bureau of Economic Analysis
BLS	Bureau of Labor Statistics
CAA	Clean Air Act
CAFO	Concentrated animal feeding operations
CCC	Commodity Credit Corporation
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
COE	(US Army) Corps of Engineers
CP	Conservation practice
CPA	Conservation priority area
CPC	Center for Plant Conservation
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CRP-SIP	CRP-signing incentive payment
CWA	Clean Water Act
DEC	Department of Environmental Conservation (Vermont)
EA	Environmental assessment
EBI	Environmental Benefits Index
EI	Erodibility Index
EO	Executive Orders
EPA	(U.S.) Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ERS	Economic Research Service
ES	Executive Summary (of the CREP PEA)
ESA	Endangered Species Act
EWP	Emergency Watershed Protection Program
EWRP	Emergency Wetlands Reserve Program
FEMA	Federal Emergency Management Agency
FOTG	Field Office Technical Guide
FPR	Department of Forests, Parks, and Recreation (Vermont)
FSA	Farm Service Agency
FWD	Department of Fish and Wildlife (Vermont)
FWP	Farmable wetlands pilot program
FWS	(U.S.) Fish and Wildlife Service
GIS	Geographic information system
HEL	Highly erodible land.
HUC	Hydrologic unit code

ACRONYMS (continued)

LCBP	Lake Champlain Basin Program
LTA	Long-term agreement
MG/L	milligrams per liter (same as parts per million)
NAAQS	National Ambient Air Quality Standards
NEIWPCC	New England Interstate Water Pollution Control Commission
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NPS	Non-point sources
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
O_3	Ozone
Pb	the heavy metal element lead
PCB	polychlorinated biphenyls
PEA	Programmatic Environmental Assessment
PEIS	Programmatic Environmental Impact Statement
PIP	Practice Incentive Payment
PM_{10}	Respirable particulate matter, 10 micron diameter
ROI	Region of influence
RUSLE	Revised universal soil loss equation
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan for CAA regulatory compliance
SMC	Saint Michaels College
SO_2	Sulfur dioxide
SRC	State resource conservationist
SRR	Soil rental rate
SSA	Sole Source Aquifer
SWAP	Source Water Assessment and Protection
TCP	Traditional cultural properties
THPO	Tribal Historic Preservation Officer
TMDL	Total Maximum Daily Load
TSP	Technical service provider
USACE	US Army Corps of Engineers
USCB	US Census Bureau
USDA	US Department of Agriculture
USDOL	US Department of Labor
USFWS	US Fish and Wildlife Service
USGS	U.S. Geological Survey
USLE	Universal soil loss equation
UVM	University of Vermont
UVM-SNR	University of Vermont - School of Natural Resources
VDEC	Vermont Department of Environmental Control
VMC	Vermont Monitoring Cooperative

ACRONYMS (continued)

VT or V	Vermont
WBP	Water Bank Program
WEQ	Wind erosion equation
WESL	Wind erosion soils list
WHIP	Wildlife Habitat Incentive Program
WMA	Wildlife management area
WQD	Water Quality Division (Vermont)

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION

The United States Department of Agriculture (USDA) Farm Service Agency (FSA) proposes to implement the Conservation Reserve Enhancement Program (CREP) agreement for the State of Vermont. This Programmatic Environmental Assessment (PEA) has been prepared to analyze the potential environmental consequences associated with the Proposed Action and No Action Alternative in accordance with the requirements of the National Environmental Policy Act (NEPA); the Council on Environmental Quality (CEQ) regulations; and 7 Code of Federal Regulations (CFR) 799 Environmental Quality and Related Environmental Concerns – Compliance with the National Environmental Policy Act. (Vt CREP, 2005)

1.2 BACKGROUND

The Farm Service Agency and Conservation Reserve Program

FSA was established during the reorganization of USDA in 1994. The mission of FSA is to "ensure the well being of American agriculture, the environment and the American public through efficient and equitable administration of farm commodity programs; farm ownership, operating and emergency loans; conservation and environmental programs; emergency and disaster assistance; domestic and international food assistance and international export credit programs."

FSA's Conservation Reserve Program (CRP) is the Federal government's largest private land environmental improvement program. CRP is a voluntary program that supports the implementation of long-term conservation measures designed to improve the quality of ground and surface waters, control soil erosion, and enhance wildlife habitat on environmentally sensitive agricultural land.

Conservation Reserve Enhancement Program

CREP was established in 1997 under the authority of the CRP. The purpose of CREP is to address agriculture related environmental issues by establishing approved conservation practices (CPs) on farmlands using funding from State, tribal, and Federal governments as well as nongovernment sources. Federal funds for the CREP are provided by the Commodity Credit Corporation (CCC). CREP addresses high priority conservation issues in specific geographic areas such as watersheds. Owners of lands eligible for inclusion in CREP receive annual rental payments in exchange for implementing approved CPs. In addition, landowners may receive monetary and technical support for establishing these practices. (USDA 2005a)

Statewide CREP agreement proposals are developed by teams that generally consist of State, tribal, Federal and local government agency representatives, producers and other stakeholders. CREP proposals are submitted to FSA by the State's Office of the Governor. An interagency panel then reviews the agreement. A final CREP agreement is set into practice through a Memorandum of Agreement between USDA and the Governor. CREP programs are limited to 100,000 acres per State. (USDA 2005a)

In 2003, a final Programmatic Environmental Impact Statement (PEIS) was prepared for the proposed nationwide CRP, authorized under the Farm Security and Rural Investment Act of 2002 (2002 Farm Bill, FSA 2003). The PEIS contained the results of a general analysis of the impacts of implementing CRP nationwide including the CREP component (USDA 2005a). Vermont's CREP Agreement would enroll up to 7,500 acres of eligible farmland to establish approved conservation practices (CPs) within targeted watersheds (Vt CREP, 2005). Specific lands that

would be enrolled in the program will be evaluated and qualified for participation prior to implementation of the selected CPs. Once offers are received, FSA will complete a site-specific environmental evaluation to determine what potential environmental impacts may result from implementation of the selected CPs.

Vermont CREP Goals

Implementation of the Vermont CREP Agreement would support goals to achieve non-point source pollutant reduction, enhance fish and wildlife habitat, and to attain specific conservation goals established by the State of Vermont. Specific areas for this action are Vermont watersheds draining into Lake Champlain and the Connecticut River. Figure 1.2-1 shows the proposed Vermont CREP watersheds. (Vt CREP, 2005)

Vermont Watersheds

This CREP agreement encompasses all watersheds within the State of Vermont. (Table 1.2-1)

Table 1.2-1 Vermont Watersheds

Watershed Name	HUC[1]	Area, Square Miles¤	Area, Acres¤	Primary Drainage Basin[2]
Black-Ottauquechee	01080106	684.15	437,856	Connecticut River
Deerfield	01080203	318.95	204,128	Connecticut River
Hudson-Hoosic	02020003	453.18	290,035	Hudson River
Lake George	02010001	369.07	236,205	Lake Champlain
Lamoille	02010005	721.9	462,016	Lake Champlain
Middle Connecticut	01080201	26.19	16,762	Connecticut River
Missisquoi	02010007	606.74	388,314	Lake Champlain
Otter	02010002	943.04	603,546	Lake Champlain
Passumpsic	01080102	503.99	322,554	Connecticut River
St. Francois	01110000	588.43	376,595	Lake Memphremagog
Upper Connecticut	01080101	399.91	255,942	Connecticut River
Upper Connecticut-Mascoma	01080104	364.31	233,158	Connecticut River
Waits	01080103	310.91	198,982	Connecticut River
West	01080107	634.46	406,054	Connecticut River
White	01080105	711.71	455,494	Connecticut River
Winooski	02010003	1,063.19	680,442	Lake Champlain
Lake Champlain	02010008	902.36	577,510	Lake Champlain

[1]*Source: EPA 2004;* [2]*Source: Vt CREP 2005; Watershed areas calculated by JMWA*

The State of Vermont lies mainly within the New England physiographic province including the New England Uplands (also known locally as the Vermont Piedmont) in the eastern portion of the State, the Green Mountains in central Vermont, and the Taconic Mountains area in the southwest part of the State. The northwest portion of Vermont is in the Champlain section (known locally as the Vermont Lowlands) of the St. Lawrence Valley physiographic province. (USGS 2003)

1.3 PURPOSE AND NEED FOR THE ACTION

The purpose and need for this CREP Agreement is to address the following objectives (Vt CREP, 2005):

1. Supplement existing efforts to achieve phosphorus reductions attributable to non-point sources (NPS) described in the Lake Champlain Basin Program (LCBP). The LCBP identifies a NPS phosphorus reduction target of 48.3 tons per year.
2. Assist existing efforts to achieve nitrogen reductions attributable to NPS required by the Long Island Sound Total Maximum Daily Load (TMDL). The Connecticut River Basin drains into Long Island Sound. The TMDL identifies a nitrogen reduction target of 1,173 tons per year

for Massachusetts, New Hampshire and Vermont. Point sources and NPS must show 25 and 10 percent reductions, respectively. Vermont's CREP efforts in the Connecticut River Basin will account for a majority of Vermont's nitrogen reduction for the Long Island Sound TMDL.

3. Provide secondary benefits to wildlife and aquatic habitat.

1.4 REGULATORY COMPLIANCE

This PEA is prepared to satisfy the requirements of the NEPA (Public Law 91-190, 42 United States Code 4321 et seq.); its implementing regulations (40 CFR 1500-1508); and FSA implementing regulation, Environmental Quality and Related Environmental Concerns – Compliance with the National Environmental Policy Act, Code of Federal Regulations Title 7, Part 799 (7 CFR 799). The intent of NEPA is to protect, restore, and enhance the human environment through well-informed Federal decisions.

A variety of laws, regulations, and Executive Orders (EO) apply to actions undertaken by Federal agencies and form the basis of the analysis presented in this PEA. These include but are not limited to:

- Endangered Species Act (ESA)
- National Historic Preservation Act (NHPA)
- Clean Air Act (CAA)
- Clean Water Act (CWA)
- EO 11514, Protection and Enhancement of Environmental Quality
- EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations.

Implementation of the Proposed Action would be authorized by the following authorities:

A. Federal.

The CCC has the authority under provisions of the Food Security Act of 1985 (1985 Act), as amended (16 U.S.C. 3830 et seq.), and the regulations at 7 CFR Part 1410 to perform all its activities contemplated by this Agreement. In accordance with the 1985 Act, CCC is authorized to enroll land in CRP through December 31, 2007. Amended 04/23/2003. Sections 1230, 1234, and 1242 of the 1985 Act authorize the CCC to enter into agreements with States to use the CRP in a cost-effective manner to further specific conservation and environmental objectives of a State and the nation. Other authorities may also apply.

B. State.

The Vermont Department of Agriculture, Food and Markets is provided the statutory authority to perform all activities contemplated by this Agreement by the provisions of Vermont Statutes Annotated 6 V.S.A. §4821(a) and §4810(b).

1.5 ORGANIZATION OF THE PEA

This PEA assesses the potential impacts of the proposed action and the No Action Alternative on potentially affected environmental and economic resources. Chapter 1.0 provides background information relevant to the proposed action and discusses its purpose and need. Chapter 2.0 describes the proposed action. Chapter 3.0 describes the baseline conditions (i.e., the conditions against which potential impacts of the proposed action and alternatives are measured) for each of the resource areas while Chapter 4.0 describes potential environmental impacts on these resources. Chapter 5.0 includes analysis of cumulative impacts and irreversible and irretrievable resource commitments. Chapter 6.0 is a list of the preparers of this document and Chapter 7.0 contains a list of persons and agencies contacted during the preparation of this document. Chapter 8.0 contains references and Chapter 9.0 is a glossary of terms used in this PEA.

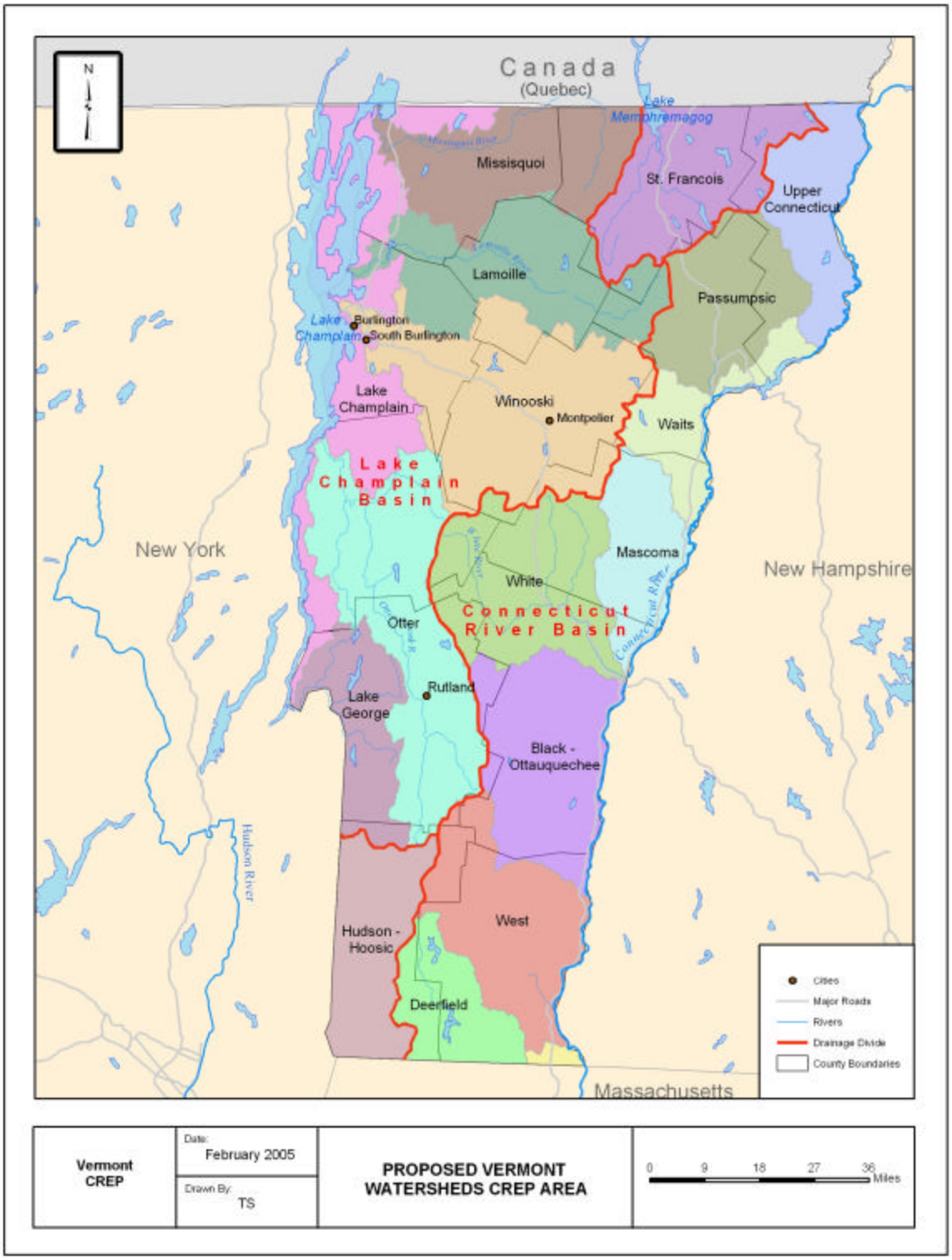

Figure 1.2-1 Proposed Vermont Watersheds CREP Area

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

FSA proposes to implement the Vermont CREP Agreement. This agreement would enroll lands under CREP by establishing contracts with participants in eligible targeted watersheds. Producers would receive support for the costs of installing and maintaining such practices in addition to annual rental payments for enrolled lands. The entire text of the Vermont CREP Agreement and the Addendum Agreement are attached to this PEA in Appendix A.

2.1.1 Eligible Lands

The Vermont CREP will seek to enroll eligible crop land or marginal pasture land located within the watersheds of the project area. Cropland and marginal pasture land located within the watersheds are both considered to be eligible for enrollment in the CREP. The goal of the Vermont CREP Agreement is to enroll up to 7,500 acres of environmentally sensitive agriculture land throughout the State of Vermont. Once the CREP Agreement is approved, producers would enroll eligible lands in the program on a voluntary basis. Table 2.1-1 lists the acreage of agriculture lands potentially eligible for the program. (Vermont CREP 2004, 2005)

2.1-1 Acreage of Agricultural Land Eligible for Enrollment in CREP

County	Total Acres	Estimated Acres of Cropland	Estimated Number of Farms
Addison	492,800	124,099	676
Bennington	432,640	13,379	228
Caledonia	416,640	35,622	505
Chittenden	344,960	34,612	473
Essex	425,600	8,040	98
Franklin	407,680	97,853	770
Grand Isle	53,120	12,032	99
Lamoille	295,040	18,359	317
Orange	440,960	44,285	680
Orleans	446,720	65,963	583
Rutland	597,120	45,705	623
Washington	440,960	20,851	425
Windham	504,960	18,042	397
Windsor	621,440	28,667	697
Vermont State Total	5,920,640	567,509	6571

Estimated Farmland & Estimated Number of Farms USDA; National Agricultural Statistics Service 2002

2.1.2 Established Conservation Practices

CPs proposed for implementation under the Vermont CREP are Grassed Waterways (8A), Filter strips (CP21), Riparian buffers (CP22), and Wetland Restoration (CP23). Appendix B contains the expanded list of these conservation practices and the corresponding USDA Natural Resources Conservation Service (NRCS) conservation practice standards as they apply to CRP and the State CREP agreements.

All installed practices must be consistent with applicable USDA Natural Resources Conservation Service (NRCS) field office technical guides (FOTG) and the *Agricultural Resource Handbook 2-CRP.* All approved conservation plans shall be consistent with applicable CRP statutes and regulations.

2.1.3 Provide Financial Support to Producers

Commitments by FSA, CCC, and Vermont are subject to the availability of funds. All CRP contracts under the Vermont CREP are subject to limitations set forth in the regulations at 7 CFR part 1410. Neither Vermont nor FSA may assign or transfer any rights or obligations under the Vermont CREP without the prior written approval of the other parties and amendments. Table 2.1-2 summarizes the Vermont CREP Agreement payments and government commitments (Vermont CREP 2004, 2005).

Table 2.1-2 Vermont CREP Payments and Commitments

Terms	Conservation Practices	Federal & State Commitments	Maximum Length of Contract
Cropland in Production for 3 of the Past 6 Years	CP8A, CP21, & CP23	$117/Acre	15 Years
Cropland in Production for 3 of the Past 6 Years	CP22	$127/Acre	15 Years
Cropland in Production for 3 of the Past 6 Years	CP21	$127/Acre	30 Years*
Cropland in Production for 3 of the Past 6 Years	CP22	$137/Acre	30 Years*
Cropland in Production for 1 or 2 of the Past 6 Years	CP8A, CP21, & CP23	$53/Acre	15 Years
Cropland in Production for 1 or 2 of the Past 6 Years	CP22	$63/Acre	15 Years
Cropland in Production for 1 or 2 of the Past 6 Years	CP21	$63/Acre	30 Years*
Cropland in Production for 1 or 2 of the Past 6 Years	CP22	$73/Acre	30 Years*
Cropland in Production for 0 of the Past 6 Years	CP22	$53/Acre	15 Years
Cropland in Production for 0 of the Past 6 Years	CP22	$63/Acre	30 Years*
Marginal Pasture Land	CP8A, CP21, CP22 & CP23	One time signing incentive. $21/acre multiplied by years of contract	15 Years
Marginal Pasture Land	CP8A, CP21, CP22 & CP23	One time signing incentive. $21/acre multiplied by years of contract	30 Years*
Signing Incentive Payment (SIP)	CP8A, CP21, & CP23	One Time SIP	
Practice Incentive Payment (PIP)	CP8A, CP21, CP22 & CP23	One Time PIP	

Source: Vermont CREP Agreement and Addendum. *With State Incentives

2.2 ADDITIONAL ENVIRONMENTAL EVALUATION REQUIREMENTS

A site specific NEPA environmental evaluation would be completed by FSA for each offer prior to approval of a contract as provided for in Part 10 of *Handbook 2-CRP* and other applicable guidance. The USDA Vermont Field Office uses the NRCS Environmental Evaluation Worksheet form NRCS-CPA52, attached to this PEA in Appendix G.

2.3 ALTERNATIVES

Alternative A – Preferred

Under Alternative A, Vermont's CREP Agreement would be implemented as descrived in Section 2.0. Up to 7,500 acres of eligible farmland in Vermont would be removed from production. CPs would be established on those lands, and producers would receive annual payments and incentive awards in accordance with the provisions of the Agreement.

Alternative B – No Action

The no action alternative would not implement the Vermont CREP Agreement. No land in the targeted watersheds would be enrolled under CREP and the CREP program's goals would not be achieved. Though eligible lands could be enrolled under CRP or other conservation programs, the benefits inherent to CREP would not be realized. This alternative will be carried forward in the analyses to serve as a baseline against which to assess the impacts of the Preferred Alternative.

3.0 AFFECTED ENVIRONMENT

This chapter describes relevant existing conditions for the resources potentially affected by the proposed action. In compliance with guidelines contained in NEPA (43 US Code 4321 and CFR Title 40, Part 1500) and CEQ regulations, the description of the affected environment focuses on those resources potentially subject to impacts (CEQ 2005).

3.1 BIOLOGICAL RESOURCES

3.1.1 Definition of Resource

Biological resources include living plant and animal species and the habitats within which they occur. These resources are divided into four categories: vegetation; wildlife; aquatic species; and threatened, endangered, and sensitive species and their defined critical habitat. Vegetation and wildlife refer to the plant and animal species, both native and introduced, which characterize a region. Threatened, endangered, and sensitive species refer to those species which are protected by the Endangered Species Act (ESA) or similar State laws. Critical habitat is designated by the U.S. Fish and Wildlife Service (USFWS) as essential for the recovery of threatened and endangered species and like those species, is also protected under the ESA.

3.1.2 Region of Influence

The Region of Influence (ROI) for biological resources is the area encompassed by the proposed Vermont CREP agreement and includes all watersheds within the State that drain into Lake Champlain and the Connecticut River.

3.1.3 Affected Environment

Vermont lies within two natural regions, or physiographic provinces, of the northeastern United States and Canada. The New England province in Vermont contains the Green Mountain Section, the New England Upland, the Taconic Section, and the White Mountain Section. The St. Lawrence Valley province extends into Vermont in the Champlain Valley. The heavily forested Green Mountains cover much of the State extending from the Massachusetts border to Canada. The White Mountains extend into northeastern Vermont from New Hampshire. They are heavily forested granite formations that have resisted erosion.

Biophysical Regions of Vermont

Climate, bedrock geology, surficial geology and topography combine to form the biophysical regions of Vermont. Eight distinct biophysical regions have been identified in Vermont (VMC 1998 and SMC 2004):

- Champlain Valley (Vermont Lowlands of the St. Lawrence Valley)
- Taconic Mountains
- Vermont Valley
- Northern Green Mountains
- Southern Green Mountains
- Northern Vermont Piedmont
- Southern Vermont Piedmont
- Northeastern Highlands

The regions with the State are shown in Figure 3.1.3-1 but extend beyond Vermont's borders and have characteristic topography. The Champlain Valley extends northward and westward, joining the St. Lawrence Valley. The Green Mountain region extends north to Quebec and

south into Massachusetts and Connecticut. The Taconic Mountains reach south and west into New York, Massachusetts and Connecticut. The Northern Vermont Piedmont extends into Quebec and the Southern Vermont Piedmont extends down into the Connecticut River Valley. The Northeastern Highlands area is a small part of a much larger boreal region that stretches to the north and east.

Champlain Valley

The uplands are dominated by calcareous rock with clay and sand in the low-lying areas. Topography is flat to rolling. Climate is warm with the lowest precipitation in the State. Vegetational communities include oaks and northern hardwoods, limestone communities, large lakeside wetlands, clayplain and sandplain forests. Approximately nine percent of this community is preserved.

Taconic Mountains

The Taconics form a mountainous highland where the borders of New York, Massachusetts and Connecticut meet. The geology of the region is composed of mainly metamorphic minerals like slate, schist and phylitte with some marble and limestone. The climate is warm with low rainfall. Natural vegetation includes oaks and northern hardwoods with spruce and fir at the highest elevations. Ten percent of the region is conserved.

Vermont Valley

Geology consists of marble and limestone with karst features; also significant postglacial features are present on valley walls. Topography is flat to rolling with streams, wetlands, and dry terraces. Climate is warm with average rainfall. Vegetation includes red maple swamps, seeps, fens, oak-pine-northern hardwood forests. About ten percent of this region is conserved.

Northern Green Mountains

Geology is dominated by acidic to neutral rocks with small amounts of surface deposits in valleys. Mountains and foothills dominate the landscape. Climate is cool with high precipitation at high elevations due to "lake effects" that bring moisture east from the Great Lakes. Communities include northern hardwoods, spruce and fir, and small alpine meadows. Twenty-six percent of this region is conserved.

Southern Green Mountains

Geology consists of acidic ancient rocks with topography that is characterized by broad plateaus with a few dominant peaks. The climate is cool with a high amount of rainfall. Communities include northern hardwoods, with spruce and fir at higher elevations and in cooler valleys. Thirty-eight percent of the region is conserved.

Northern Vermont Piedmont

The geology of this area consists of calcareous rocks in the uplands with sand and gravel in river valleys. The climate is cool with average rainfall. Vegetation consists of northern hardwoods, rich in many areas with small wetlands, lakes, and ponds. There are also boreal outcrops, dwarf shrub bogs, rich fens, northern white cedar communities and other communities. Eight percent of this region is conserved.

Southern Vermont Piedmont

This region is composed of a combination of calcareous and non-calcareous geologic formations with sand and gravel deposits in the valleys. Rolling foothills and the Connecticut River Valley are the dominant features of the landscape. The climate is warm and dry in the southeast and average in the north and west. Vegetation consists of oak and northern hardwoods with some pine in the Connecticut River Valley. Seven percent of this region is conserved.

Northeastern Highlands

This area is dominated by acidic granite with some areas of calcareous rock and is hilly with large lowland areas. The climate is cold with high rainfall. Vegetation consists of northern hardwoods, spruce and fir, and large softwood swamps and bogs. Rare plant communities include dwarf shrub bogs and dystrophic ponds (water bodies that are highly acidic from tannic acids).

Vegetation

Vermont, with 4.6 million acres of forestland, is 78.2 percent forested. Forestland has increased 93,000 acres since the 1983 forest inventory. Vermont's forests consist of a mixture of different species with poorly defined boundaries between seven recognized groups:

- White pine/red pine
- Spruce-fir
- Aspen-birch
- Oak-hickory
- Elm-ash-red maple
- Oak-pine

Most of the trees are deciduous, principally the maple, elm, birch, beech, oak, hickory, ash, cherry, and butternut. The State tree is the sugar maple, which provides Vermont's famous maple syrup. Conifers are common in some mountain areas and include mainly the white pine, red spruce, hemlock, and cedar. Northern hardwoods consist primarily of sugar maple, beech, and yellow birch. Table 3.1-1 is a list of trees commonly found in Vermont forests.

Table 3.1-1 Common Tree species in Vermont Species Associations

Common Name	Scientific Name
Sugar maple	*Acer saccharum*
Red maple	*A. rubrum*
American beech	*Fagus grandifolia*
Yellow birch	*Betula alleghaniensis*
Eastern white pine	*Pinus strobus*
Red pine	*P. resinosa*
Red spruce	*Picea rubens*
Balsam fir	*Abies balsamea*
Quaking aspen	*Populus tremuloides*
Paper birch	*Betula papyrifera*
Gray birch	*Betula populifolia*
Northern red oak	*Quercus rubra*
White oak	*Q. alba*
Shagbark hickory	*Carya ovata*
Eastern hemlock	*Tsuga canadensis*
Black cherry	*Prunus serotina*
Pin cherry	*P. pensylvanica*
American elm	*Ulmus americana*

In addition, a great variety of ferns have been found within the State. Among the more common wildflowers that grow in Vermont are anemones, arbutuses, violets, lilacs, daisies, buttercups, goldenrods, and gentians.

Figure 3.1.3-1 Physiographic Regions of the Proposed CREP Area

Wildlife

White-tailed deer are common in the wooded areas of the State, and bears, moose, and bobcats are present in some of the higher mountain areas. Smaller animals include the muskrat, skunk, raccoon, and mink, which are hunted for their pelts, and the rabbit, squirrel, and woodchuck. Table 3.1-2 is a list of common mammals found in Vermont. Common birds include the robin, redwing blackbird, sparrow, blue jay, chickadee, junco, and nuthatch. The principal game birds are the ruffed grouse, ring-necked pheasant, woodcock, Canada goose, wild turkey, and various ducks.

Vermont contains a wealth of different habitats, from low-lying wetlands near Lake Champlain to bogs and fens to dry oak woodlands and boreal forests. All of these habitat types are very important to resident and migrating birds. Important areas for nesting and foraging birds in the Lake Champlain area include Mud Creek Wildlife Management Area (WMA), Common Tern Islands, Sandbar WMA, and Little Otter Creek. These areas provide feeding and nesting habitat for many types of shorebirds, waders and waterfowl. Nulhegan Basin and Victory Bog in northeast Vermont contain boreal habitat (spruce-fir association) and harbor State-rare species such as the black-backed woodpecker, grey jay, boreal chickadee, spruce grouse and common loon. Boreal areas also provide critical breeding habitat for neotropical migrants like warblers. In addition, there are sites all across the State to reestablish the peregrine falcon (30 sites), common loon (45 sites), and Bicknell's thrush (24 sites).

During spring and fall migration, waterfowl, shorebirds and songbirds also use wetlands, woodlands and riparian areas throughout the Lake Champlain Region for critical stopovers as they travel along the Atlantic Flyway.

Table 3.1-2 Common Mammal Species in Vermont

Common Name	Scientific Name
White-tailed deer	*Odocoileus virginianus*
Moose	*Alces alces*
Beaver	*Castor canadensis*
Muskrat	*Ondatra zibethicus*
Woodchuck	*Marmota monax*
Grey squirrel	*Sciurus carolinensis*
Red squirrel	*Tamiasciurus hudsonicus*
Fox squirrel	*Sciurus niger*
Cotton-tail rabbit	*Silvilagus floridanus*
Snowshoe hare	*Lepus amaericanus*
Bobcat	*Lynx rufus*
River otter	*Lutra canadensis*
Skunk	*Mephites mephites*
Marten	*Martes americana*
Mink	*Mustela vision*
Fisher	*Martes pennati*
Coyote	*Canis latrans*
Red fox	*Vulpes vulpes*
Gray fox	*Urocyon cinereoargenteus*
Raccoon	*Procyon lotor*

Source: VANR 2004a

Aquatic Species

Landlocked salmon and several kinds of trout are found in many rivers and small lakes. Other State of Vermont sports fish include large and smallmouth bass, northern pike, chain pickerel, walleye, yellow perch, and rainbow smelt (VANR 2004b). See Table 3.1-3 for sports fish species in Vermont. Other fish include bass, northern pike, walleyed pike, perch, pickerel, and smelt. Table 3.1-3 is a list of the common sports fish species in Vermont.

Table 3.1-3 Common Sports Fish Species in Vermont

Common Name	Scientific Name
Brook trout	*Salvelinus fontinalis*
Brown Trout	*Salmo trutta*
Lake Trout	*Salvelinus namaycush*
Largemouth Bass	*Micropterus salmoides*
Smallmouth Bass	*Micropterus dolomieui*
Rock Bass	*Ambloplites rupestris*
Black Crappie	*Pomoxis nigromaculatus*
Bluegill	*Lepomis macrochirus*
Smelt	*Osmerus mordax*
Chain Pickerel	*Esox niger*
Northern Pike	*Esox lucius*
Muskellunge	*Esox masquinongy*
Sauger	*Stizostedion canadense*
Walleye	*Stizostedion vitreum*
Yellow Perch	*Perca flavescens*
Bullhead	*Ameiurus nebulosus*
Channel Cat	*Ictalurus punctatus*

Source: VANR 2004b

Threatened, Endangered, and Sensitive Species

Birds

Thirteen bird species in the Lake Champlain Basin are listed by New York, Vermont and/or the federal government as endangered or threatened including the bald eagle and peregrine falcon (USFWS, 2001). Bald eagles prefer open water for hunting and large mature trees for nesting. Vermont has a Bald Eagle Restoration Initiative, a collaborative effort to create a breeding bald eagle population in Vermont by raising and releasing eagle chicks in the Lake Champlain Valley (FWD, 2004). Ospreys are fish-eating birds, like the bald eagle, with open water habitat requirements. Peregrine falcons hunt over open water, marshes, valleys, fields and tundras. Peregrines nest mainly on high cliffs, although some birds have accepted man-made structures including ledges of skyscrapers in large cities (FWD, 2005a). The common loon is also a state endangered species. Loons are divers that need lakes and deep ponds for breeding and feeding. Much of their habitat is threatened by development, and artificial modifications of water levels (FWD, 2005b).

Mammals

Indiana Bats are medium–sized members of the genus Myotis. They hibernate in the winter in only seven cool limestone caves located in Missouri, Indiana, and Kentucky. During summer they require closed canopy, riparian forests for foraging and hardwood stands with open to partially closed canopies for roosting (USACE, 1998). The wolf and the cougar were once found all over the United States but are now primarily restricted to mountainous areas of the West.

Insects

The Puritan tiger beetle is another federally threatened species that occurs only in Vermont and New Hampshire. Common habitats are sandy areas along rivers, shorelines, and beaches in the north east. This is a summer species with either a 1 or 2-year lifecycle. Adults are common from June to August (USGS, 2005).

Mussels

Historically, the dwarf wedge mussel occurred in 11 States and one Canadian province. In Vermont, the only known populations are in Windsor County. This mussel prefers creek and river areas with a slow to moderate current and a sand, gravel, or muddy bottom. These areas must be nearly silt free. Water pollution and the construction of impoundments are the primary threats to this mussel's survival. Increased acidity, caused by the mobilization of toxic metals by acid rain, is thought to be one of the chief causes of the species' extirpation. Another reason for the species' decline may be due to the fact that its anadromous fish host has been blocked by dams or other manmade structures from important habitat areas (USFWS 1990).

Plants

Jesup's milk vetch is a federally endangered plant that occurs only in Vermont and New Hampshire (USFWS, 2005). Northeastern or barbed bulrush is found only in the Northeast (USDA 2005). *Scirpus ancistrochaetus* occurs in a variety of wetlands. In the northeast, the species is found most commonly on the edge of shallow beaver ponds. It is found more commonly along the edges of larger ponds. Threats to the bulrush include: contaminated run-off from upland sources, logging, road construction that impacts wetlands directly or changes hydrology and other habitat destruction or alteration (CPC, 2005).

Table 3.1-4 is a list of the Federal and State listed threatened and endangered species that occur in Vermont. A complete list of Vermont's endangered, threatened and special concern species is attached to this PEA in Appendix C.

Table 3.1-4 Federal and State Listed Threatened and Endangered Species

Common Name	Scientific Name	State Status	Federal Status
Mammals			
Indiana bat	*Myotis sodalis*	Endangered (E)	E
Puma	*Felis concolor*	E	E
Grey wolf	*Canis lupus*	Unknown	Threatened (T)
Birds			
Bald eagle	*Haliaeetus leucocephalus*	E	T
Common loon	*Gavia immer*	E	None
Osprey	*Pandion haliaetus*	E	None
Peregrine falcon	*Falco peregrinus*	E	None
Insects			
Puritan tiger beetle	*Cicindela puritana*	T	T
Mussels			
Dwarf wedgemussel	*Alasimidonta heterodon*	E	E
Plants			
Jesup's Milk-vetch	*Astragalus robbinsi* var. *jesupi*	S1*	E
Northeastern bulrush	*Scirpus ancistrochaetus*	S2**	E

*S1: Very rare, 1 to 5 occurrences believed to be extant and/or some factor(s), especially vulnerable to extirpation from the State
*S2: Rare, 6 to 20 occurrences believed to be extant and/or some factor(s) making it vulnerable to extirpation in the State

Critical Habitat

Bear and Neotropical Migratory Birds
The Vermont Trust for Public Land is launching a campaign to raise $230,000 in private contributions to help permanently protect the 2,700-acre White's Hill property in Wardsboro (Southern Green Mountain biophysical region). The land lies adjacent to more than 4,000 acres of existing conservation land, provides critical habitat for black bear and other wildlife, and includes waterfalls, beaver ponds, and White's Hill. In addition, to the south, the Lamb Brook Wilderness area near the towns of Readsboro and Searsburg is breeding habitat for bear and interior forest-dependent neo-tropical birds like the scarlet tanager, veery, and black-throated blue warbler, who winter in Central and South America but fly north to Vermont in the spring to raise their young. Lamb Brook is a rare large block of unbroken forest cover, the type of habitat required by these birds to reproduce successfully in the region.

Lynx
The range of the lynx includes parts of Vermont that contain boreal forest that are important lynx habitat; however, no critical habitat has been designated for the lynx in Vermont. Although the USFWS determined that the lynx population in the contiguous U.S. does not require listing as endangered throughout a significant portion of its range, the March 2000 final rule lists the lynx as threatened.

Other Species
The National Fish and Wildlife Foundation has identified 335 acres of critical habitat on South Hero Island in Lake Champlain that includes 1,900 feet of shoreline, two rare plants, emergent wetland areas, abundant waterfowl, and native mussel beds.

3.2 CULTURAL RESOURCES

3.2.1 Definition of Resource

Cultural resources consist of prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activities considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Cultural resources can be divided into three major categories: archaeological resources (prehistoric and historic), architectural resources, and traditional cultural properties (TCP). Archaeological resources are locations and objects from past human activities.

Architectural resources are those standing structures that are usually over 50 years of age and are of significant historic or aesthetic importance to be considered for inclusion in the National Register of Historic Places (NRHP). Traditional cultural resources hold importance or significance to American Indians or other ethnic groups in the persistence of traditional culture.

The significance of such resources relative to the American Indian Religious Freedom Act, the Archaeological Resources Protection Act, Native America Graves Protection and Repatriation Act, EO 13007, and/or eligibility for inclusion in the NRHP is considered a part of the EA process. The regulations and procedures in 36 CFR 800, which implements Section 106 of the National Historic Preservation Act, requires Federal agencies to consider the effects on properties listed in or eligible for inclusion in the NRHP. Prior to approval of the proposed action, Section 106 requires that the Advisory Council on Historic Preservation be afforded the opportunity to comment.

3.2.2 Region of Influence

The ROI for cultural resources is the area encompassed by the proposed Vermont CREP agreement and includes all watersheds within the State that drain into Lake Champlain and the Connecticut River.

3.2.3 Affected Environment

Vermont has a rich heritage of historic resources: 10,000-year-old Native American sites, 19th century farm complexes, railroad-spawned villages of the 1870s, and streamlined diners built to serve auto-borne patrons of the 1930s.

3.2.3.1 Archaeological Resources

Prehistoric Period and Archaeological Sites

The prehistory of Vermont is divided into three periods – Paleo-Indian, Archaic, and Woodland. The Paleo-Indians began to move into Vermont by about 9,000 B.C., at the end of the last ice age. The environment was similar to what occurs today in the Arctic regions: barren tundra which gradually gives way to a park tundra of spruce, fir and birch that sustained mastodons, wooly mammoths and large herds of caribou. The Paleo-Indians hunted large and small game using type of spear point unique to this period of prehistory, the fluted point (UVN 2005).

Previous glacial activity depressed the land, once the glaciers receded sufficiently northward; the Atlantic Ocean flooded the St. Lawrence Valley and filled up an enormous basin with marine water. This inland ocean, called the Champlain Sea, supported an assortment of marine animals including various species of whales and seals. The former beaches of the Champlain Sea are now well above the present shorelines of Lake Champlain (UVN 2005).

By 7,000 B.C., hardwood trees such as beech, oak, ash and maple, began to appear in the Champlain Valley, but the uplands remained dominated by conifers. The newly developing lake, pond, and wetland environments provided improved habit for the region's plants and animals. During this period (Early Archaic), small communities settled into favorable areas (UVN 2005).

Approximately 30 sites have been discovered in Vermont from the 1,500-year period between 7,000 B.C. and 5,500 B.C, and they have been identified primarily on the basis of small, bifurcated base or side-notched spear points used for hunting. It appears that small groups of people lived over a broad territory throughout the fertile lowlands of the Champlain Valley and along the Walloomsac River in southwestern Vermont. Little evidence has been found regarding native peoples of Vermont during the subsequent Middle Archaic period dating between 5500 and 4000 B.C. It is believed that the old ways of life such as hunting, fishing, and the gathering of plant foods according to seasons continued during this period (UVN 2005).

By the beginning of the Late Archaic period around 4000 B.C., the generally warm regional climate fostered an increase in human settlements. Groups exploited the increased food resources in the rich valleys, bottomlands, and the upland regions of Vermont, especially areas adjacent to lakes and ponds. Animal and plant communities flourished during this time period that supported human habitation. Evidence left by these people has been found that they returned to many sites seasonally in all parts of Vermont. The extensive array of woodworking tools and artifacts found in sites provides evidence that the dugout canoe was an important method of transportation on Vermont's waterways. Vermont's Late Archaic sites contain an unprecedented, and never again to be repeated in later times, use of highly

specialized ground slate tools. During this period there is evidence of wide-ranging exchange networks. Although most of the stone used for tools was derived from local sources, Late Archaic sites in Vermont have been found to contain such objects as a walrus tooth from Arctic Canada, copper tools and beads from the upper Great Lakes, and shells from the Gulf of Mexico. (UVN 2005)

The Early Woodland period that began around 900 B.C. saw several major changes, although the basic way of life did not alter much. Although living patterns were still prescribed by the seasons, pottery first appeared in Vermont during this period; and it is believed that the bow and arrow also came into use for the first time. Knowledge about the Early Woodland period that lasted approximately 800 years, has been learned from four exceptional cemetery sites. Cemetery sites are sacred places to the native Abenakis people and the excavation of those cemeteries prior to 1972 was not agreeable to them. Nonetheless, this study found that the trade networks of these people during this period were extraordinary. Shell, copper, and stone artifacts were acquired by the Abenakis as far away as northern Quebec, Ohio, Michigan, Indiana, western New York and the Carolina coast. The spiritual and ceremonial life of Vermont's early people was complex and an important part of their culture (UVN 2005).

By the start of the Middle Woodland period around 100 B.C., a long-term growth trend in the region's human population began. This population increase required that increasing numbers of environmental habitats, from mountains to valleys, be fully used to ensure that no single habitat or food resource was overtaxed. Diversification was apparently the best strategy for success. By the beginning of the Late Woodland period in A.D. 1050, extensive settlements were established in all of Vermont's river valleys. There were ebbs and flows of trading networks; and many stylistic changes in pottery occurred during this 500-year period. It was also during this time that the millennia-old seasonal cycle of hunting, fishing, and gathering of wild plant foods was now supplemented by the planting and harvesting of crops. Corn-bean-squash cultivation, introduced into southern New England and New York by about A.D. 1000, quickly became an important component of these early Vermonters' diversified strategy of success. (Vermont Heritage Network). Table 3.2-1 is a table of Archaeological Sites formally listed on the National Register of Historic Places within the Vermont CREP area. Many other sites have been identified that have not been formally listed on the Register (UVN 2005).

Table 3.2-1 NRHP Archaeological Sites Located in CREP Area

County	NRHP Listed Archaeological Sites	County	NRHP Listed Archaeological Sites
Addison	1	Lamoille	0
Bennington	0	Orange	0
Caledonia	0	Orleans	0
Chittenden	0	Rutland	1 Archaeological District
Essex	0	Washington	0
Franklin	0	Windham	1 Petroglyph Site
Grand Isle	0	Windsor	0

Total: 3 Archaeological Sites

Source: National Register of Historic Places

3.2.3.2 Historic and Architectural Resources

Proto-Historic and Historic Period

During the Proto-historic period (ca. A.D. 1600 – 1750) the lives of Native Americans were drastically altered with the arrival of the Europeans. Up to this point, Vermont was held largely by the western Abenaki, an Algonquian-speaking people, although some portions of the Lake Champlain basin were occupied by the Iroquois Confederacy. The Iroquois had pushed several smaller Algonquian-speaking groups out of the region before 1600, and the Iroquois and Abenaki continued to struggle for control of the area. (VDHP 2004)

In 1609, French explorer Samuel de Champlain was the first European to set foot in Vermont. Upon his arrival he sided with the Montagnais and Algonquian peoples against the Mohawk, defeating them with firearms. With the French as allies, the Abenaki were able to reestablish control over their lost territories, including Vermont. However, Champlain claimed the region for France. During the 17th century a few French military settlements were established and abandoned, and the area became primarily a thoroughfare between French and Native American settlements to the north and English settlements to the south. As the English slowly pushed north, the first white settlements were made at Fort St. Anne, on the Isle La Motte, in the middle of Lake Champlain near Canada. Fort Dummer, near the present Brattleboro, was established in 1724 by Massachusetts colonists, and became the first permanent European settlement in Vermont. By the time of the American Revolution, many more English colonists had migrated to Vermont's lands. They came from Massachusetts, Connecticut, New Hampshire and New York, as those English colonies extended their boundaries into the Vermont territory (VDHP 2004).

By the end of the 17th century, interactions between Europeans and native peoples resulted in changes in Native American economies, technologies, settlement patterns and demographics. European contact resulted in severe native population losses due to European introduced diseases for which native peoples had no immunity. The archaeological record indicates that native peoples began to use many European items including iron tools, copper kettles and glass beads. At some sites a blending of traditional and European manufactures reflecting adaptations made by Native Americans to their changing world can be observed (VDHP 2004).

With New Hampshire and New York colonists laying claim to Vermont, there was a period of confusion in the 18th century as their land grants and titles overlapped. In the turbulent years leading to the American Revolution, several acts of rebellion took place in Vermont that were not against the British Crown, but against the province of New York. Vermont's famous "Green Mountain Boys," a group of colonists from New Hampshire organized by Ethan Allen in 1770-71, were among those harassing and attacking Vermont settlers with land titles issued from New York. These skirmishes ceased when news of the Revolution reached the territory. In 1775, Allen and other Vermonters captured important British forts in the north, including Forts Ticonderoga and Crown Point on Lake Champlain. The spreading news of their victories was significant, as it indicated to other colonists that the Revolution truly was a united American cause. Amidst the battles, debates and congresses of the Revolution, Vermont organized itself as an independent republic and was admitted to the Union as the 14th State in 1791. The State's population nearly doubled in the following decade and small self-sufficient communities developed slowly that were populated primarily by people from New York and other New England States. The connection of rail lines to Vermont in the mid-19th century expanded the possibilities for export and import of goods, information, and people. With this economic expansion came rapid growth for many of Vermont's towns. While a majority of Vermont's immigrants during this period

were of English descent, for the first time a large influx of non-English speaking peoples arrived as well. The immigration of thousands of skilled stone workers from Italy, seeking chances to utilize their skill, made the growth of Barre's granite industry possible (VDHP 2004).

The prosperity fostered by the railroad lasted well into the late 19th and early 20th centuries. The State's industries, businesses, agriculture, and population thrived. Two Vermont natives, Chester A. Arthur and Calvin Coolidge, served as US Presidents during this period. Changes that began early in the 20th-century affected the economic viability of Vermont within an increasingly competitive and global market. The State's natural beauty, ski slopes, and small town character has caused tourism in Vermont to increase whereas other aspects of Vermont's economy, such as farming, milling and quarrying have experienced a decline (VDHP 2004).

Among the most popular places to visit in Vermont are its State monuments. The Old Constitution House in Windsor was the site of the framing and adoption of the State's first constitution on July 8, 1777. The Hubbardton Battlefield and the Bennington Battle Monument commemorate battles of the American Revolution. In the small community of Plymouth, Notch is the President Coolidge Homestead where Calvin Coolidge lived and was sworn in as president in 1923. The replica of the birthplace of President Chester A. Arthur is a State monument located in Fairfield, in northern Vermont, near the Canadian border. The State Capitol, in Montpelier, dates from the mid-19th century. The Old First Church in Bennington dates from 1805. The interior of the church has been restored to its original 19th-century appearance. Old Round Church in Richmond, dating from 1813, is an unusual 16-sided building topped by a cupola. Joseph Smith Birthplace Memorial, on the town line between Sharon and Royalton, marks the site of the farm where the Mormon leader was born. In the Barre area, quarrying, finishing, and polishing of Vermont granite is of historic and cultural interest. The Vermont Marble Exhibit in Proctor has displays of numerous varieties of native and foreign marble in addition to marble sculptures. The Maple Grove Maple Museum near Saint Johnsbury illustrates the process and history of the local maple sugaring (VDHP 2004).

Table 3.2-2 is a summary of the number of historic districts and NRHP listed or eligible properties located within the CREP area.

Table 3.2-2 Historic Districts and NRHP Eligible or Listed Historic Properties in CREP Area

County	Historic Districts	Number of Properties
Addison	3	71
Bennington	9	46
Caledonia	8	48
Chittenden	23	88
Essex	3	8
Franklin	2	48
Grand Isle	0	9
Lamoille	3	26
Orange	16	56
Orleans	2	21
Rutland	15	64
Washington	11	55
Windham	18	73
Windsor	20	105
Total	**133**	**718**

Sources: Vermont Division for Historic Preservation (2002), NRIS National Register Information System

3.2.3.3 Traditional Cultural Properties

Traditional Cultural Property (TCP) is defined as a property that is eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community. In most cases, TCPs are associated with Native Americans but may also be associated with other sociocultural or ethnic groups. Traditional cultural properties may be difficult to recognize and may include a location of a traditional ceremonial location, a mountaintop, a lake, or a stretch of river, or culturally important neighborhood.

3.3 WATER RESOURCES

3.3.1 Definition of Resource

The Clean Water Act is the primary Federal law that protects the nation's waters including lakes, rivers, aquifers, wetlands, and coastal areas. For this analysis, water resources include surface water, impaired waters, groundwater, wetlands, and floodplains. Surface water includes streams and rivers. Impaired waters are defined by the Environmental Protection Agency (EPA) those surface waters with levels of pollutants that exceed State water quality standards. Every two years, States must publish lists of impaired rivers: those streams and lakes that do not meet their designated uses because of excess pollutants (EPA 2004a).

Groundwater refers to subsurface hydrologic resources, such as aquifers, that are used for domestic, agricultural, and industrial purposes. Wetlands are defined by the US Army Corps of Engineers (USACE) as areas that are characterized by a prevalence of vegetation adapted to saturated soil conditions. Wetlands can be associated with groundwater or surface water and are identified based on specific soil, hydrology, and vegetation criteria defined by USACE (USACE 1987). For this analysis, floodplains will be defined as 100-year floodplains, designated by the Federal Emergency Management Agency (FEMA) as those low-lying areas that are subject to inundation by a 100-year flood, a flood that has a 1 percent chance of being equaled or exceeded in any given year (CFR Title 44).

3.3.2 Region of Influence

Most of the rivers in Vermont drain the eastern slopes of the Green Mountains and flow into the Connecticut River Basin or drain the western slopes of the these mountains into the Lake Champlain Basin. Rivers in southwestern Vermont that drain into the Hudson/Hoosic River watershed and the St. Francois watershed that flows north into Canada, ultimately into the St. Lawrence River, are excluded from the Vermont CREP agreement assessed in this PEA. The longest river in the State is Otter Creek, about 100 miles long. Other major rivers within the State include the Mettawee, Batten Kill, Winooski, Lamoille, Missisquoi, the Passumpsic, White, Ottauquechee, and West Rivers. Vermont contains more than 60 percent of Lake Champlain, which is shared with New York and the province of Québec in Canada. There are approximately 300 smaller lakes scattered throughout the State. The largest lake entirely within the State is Lake Bomoseen. The Chittenden and Somerset Reservoirs are the principal man-made water bodies that provide surface water to public distribution systems in the State.

3.3.3 Affected Environment

Surface Water

The ROI for the surface water environment are the watersheds and portions of watersheds within the State boundaries of Vermont listed in Chapter 1 of this PEA that are part of the Lake Champlain or the Connecticut River drainage basins. Figure 3.3-1 is a map of water resources in Vermont and the proposed CREP areas (EPA, 2004).

Impaired Waters

(From EPA, NEIWPCC, and VDEC 2004b)
Under Section 303(d) of the Federal Clean Water Act, all States are required to develop lists of impaired waters. The list includes impaired lakes, ponds, rivers and streams that do not meet Water Quality Standards. For Vermont, impairment is substantiated by chemical, physical or biological data collected through monitoring. These waters are noted on the State's 2004 updated List of Impaired Waters report that follows the impairment data and watershed fact sheets published in 2000 by the USEPA, both attached as Appendix D in this PEA. A summary of watersheds and their impairments is also provided in Table 3.3-1.

Sources of Stream Pollution

The sources of pollution identified as having the greatest impacts or causing the greatest stresses on miles of river and stream are: flow alteration from hydroelectric facilities; snowmaking water withdrawals and other sources; stream bank erosion; agricultural land uses and activities; and removal of riparian vegetation. In some situations, all three latter sources could be interrelated and affecting one given stretch of river and stream at the same time. Pollution from non-point sources (NPS) continues to be the major source of water use impairment to Vermont surface and groundwater resources. It is estimated that close to 90percent of the miles and acres of the State's impaired surface water bodies are the result of NPS pollution. Water quality impacts due to NPS and the threat of impact from NPS are apparent in each of Vermont's 17 drainage basins.

Inland lakes & ponds

Of the 55,342 inland lake/pond acres that were assessed for the most recent CWA Section 305 report, 35,908 inland lake acres support uses and 19,434 inland lake acres do not support uses. Although all inland lake/pond waters are impacted by mercury pollution and are subject to fish consumption advisories, Vermont's assessment methodology indicates the need for waterbody-specific tissue data to indicate non-support of fish consumption. Accordingly, when assessed following the methodology, 85 percent of inland lake acres support fish consumption use. This proportion reflects that there are only a relatively small number of Vermont lakes from which actual fish tissue data are available.

Lake Champlain

In Lake Champlain and due to the combined effects of trace metal contamination, nutrient accumulation and non-native species, none of Lake Champlain's 174,175 acres found in Vermont fully support designated uses. No acres in the Vermont portion of Lake Champlain support fish consumption use due to elevated levels of mercury and polychlorinated biphenyls (PCB) in fish tissue. Mercury originating from industrial activities is the greatest cause of impairment to Lake Champlain, precluding consumption of fish from the entire lake. Priority organics (specifically PCBs from industrial sites) also impair fish consumption on the majority of Lake Champlain. Atmospheric deposition is the most important source of mercury to Vermont's landscape and is listed as the greatest source of mercury to Lake Champlain. The source of PCBs in lake trout was identified in 1994 as a residual "dump" of PCBs in the vicinity of the Wilcox Dock in Plattsburg Bay, New York. The PCB source and contaminated sediments were cleaned up in the late 1990s by the New York State Department of Environmental Conservation. Nutrients, phosphorus, and associated algal growth impair 132,053 acres of Lake Champlain, and related siltation contributes to that impairment, by stressing uses on 5,388 acres. Unspecified NPS of nutrients are the largest source of the nutrient pollution, although a suite of sources also contribute nutrients to Lake Champlain, as discussed above. Urban runoff, including storm water, is also an important nutrient and sediment source in certain segments of Lake Champlain.

Table 3.3.3 - 1: Vermont CREP Agreement Watersheds and Listed Impairments

		General Impairment Name																					
Watershed	**HUC**	**Total Number of Impairments**	Other Habitat Alterations And Algal Blooms	Organic Enrichment/ Low DO	Sediment/ Siltation	Nutrients	Cause Unknown	Fish Consumption Advis. (Hg, PCB, Cd)	Pathogens	Metals	Unknown Toxicity	Priority Organics**	Oil And Grease	Thermal Modifications	Total Toxics	Chlorine	Turbidity/ TDS/Conductivity***	Taste And Odor	Noxious Aquatic Plants	Non-priority Organics & Raw Sewage	pH	PCBs	Phosphorus	Iron
Black-Ottauquechee	1080106	2	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Deerfield	1080203	31	-	-	1	-	2	6	5	3	1	-	-	-	-	1	-	1	1	-	9	1	-	-
Hudson-Hoosic	202003	39		2	2	3	4	2	6			2					2		1		8	7		
Lake George	2010001	4	-	-	-	1	-	-	1	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-
Lamoille	2010005	43	-	5	7	4	2	7	5	-	-	-	1	-	1	-	-	-	-	1	2	4	3	1
Middle Connecticut	1080201	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Missisquoi	2010007	9	-	2	1	2	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Otter	2010002	23	-	1	-	-	3	4	6	-	-	-	-	-	-	-	-	-	-	-	6	1	1	1
Passumpsic	1080102	4	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
St. Francois	1110000	8		1	1																4		2	
Upper Connecticut	1080101	8	-	-	-	-	-	1	2	2	-	-	-	-	-	-	-	-	-	-	1	-	2	
Upper Connecticut-Mascoma	1080104	19	-	-	1	1	1	2	11	-	-	1	1	-	-	-	-	-	-	-	1	-	-	-
Waits	1080103	10	-	-	-	-	-	-	2	4				-	-	-	-	-	-	-	4	-	-	-
West	1080107	7	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	1	-	-
White	1080105	4	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
Winooski	2010003	41	1	4	8	2	5	-	9	2	1	-	-	1	3	-	1	-	-	-	-	-	1	3

Source: EPA 2004 TMDL Watershed Fact Sheet

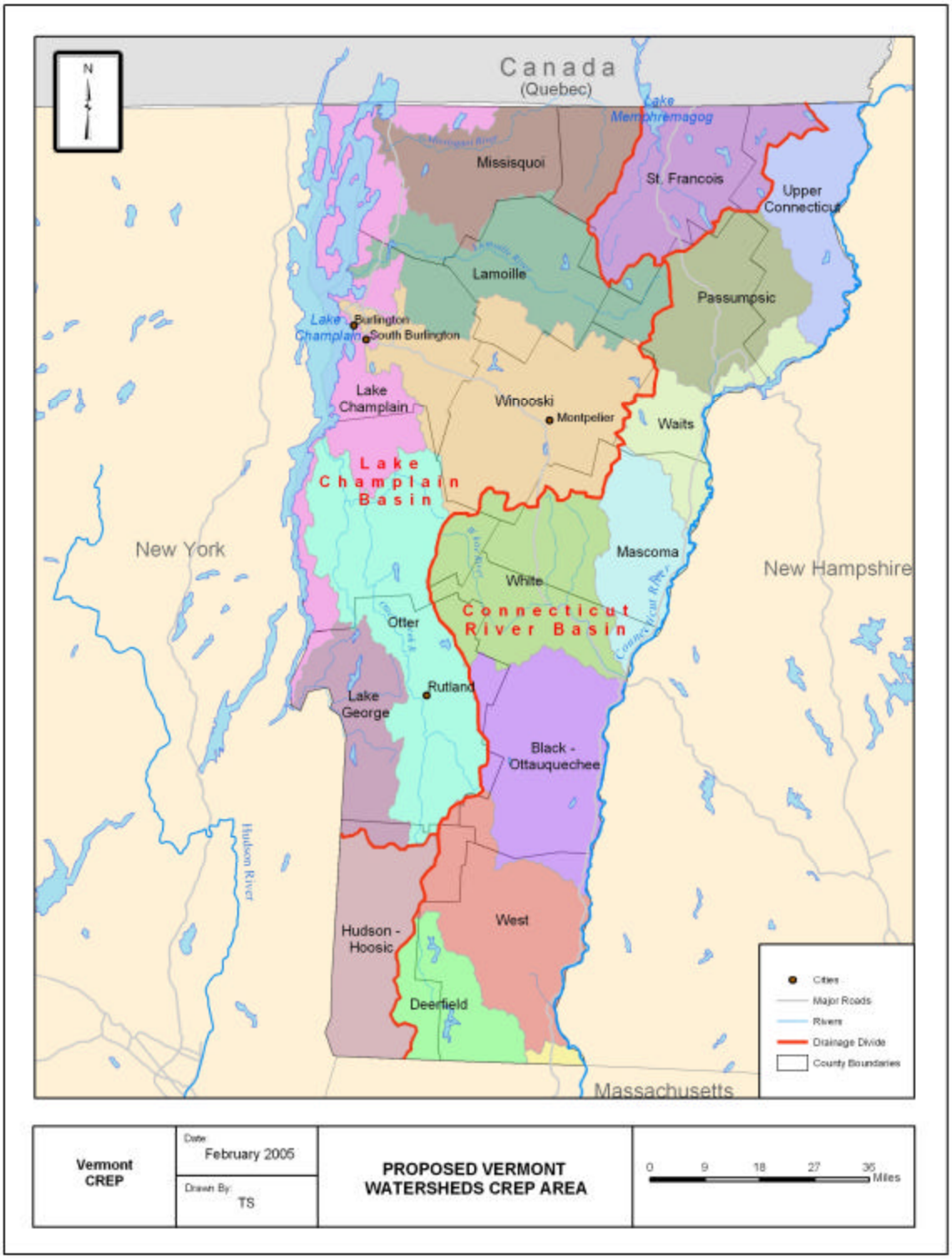

Figure 3.3-1 Water Resources in the Proposed CREP Area

Groundwater

Aquifers are in three principal hydrogeologic environments in the New England region: unconsolidated glacial deposits, unconsolidated Coastal Plain sediments, and consolidated bedrock (USGS 2002).

Surficial Aquifers

The most productive and widely used aquifers in New England are part of the surficial aquifer system. These aquifers primarily consist of deposits of sand and gravel which, for the most part, are individual valley-fill deposits of outwash and ice-contact materials laid down in numerous bedrock valleys by glacial meltwater. After all the glacial ice in the valleys had melted, the land rebounded, base level was lowered, and streams began to erode the glacial deposits, which resulted in present-day conditions. The streams are now depositing alluvium that consists primarily of reworked glacial material. Where the valley-fill glacial aquifers consist primarily of ice-contact deposits, well yields commonly range from 10 to 1,000 gallons per minute and might be as much as about 3,000 gallons per minute. Where these aquifers consist primarily of outwash deposits, well yields commonly range from 10 to 400 gallons per minute and might be as much as 2,000 gallons per minute.

Consolidated Bedrock Aquifers

Consolidated bedrock aquifers in the New England Physiographic Provinces are in consolidated rocks of sedimentary, igneous, and metamorphic origin. Some of these aquifers, mainly in the western portion of Vermont, consist of carbonate rocks (primarily limestone, dolomite, and marble). These consolidated rocks yield water primarily from bedding planes, fractures, joints, and faults, rather than from intergranular pores. Carbonate rocks generally yield more water than other types of consolidated rocks because carbonate rocks are subject to dissolution by slightly acidic groundwater. Dissolution along openings, such as bedding planes, fractures, and joints, has enlarged these openings and increased the permeability of the formation. Caves formed by the dissolution of carbonate rocks are located in the western portion of Vermont. Carbonate-rock aquifers in New England generally yield 10 to 30 gallons per minute to wells depending on the degree of fracturing and the number and size of dissolution features in the rock. Yields of as much as 1,000 gallons per minute have been reported in some wells in carbonate-rock aquifers in the region.

Consolidated bedrock aquifers in the New England Physiographic Provinces also consist of crystalline rocks. Although these aquifers are the least productive of the major aquifers, they are important sources of domestic water supplies in Vermont. The eastern three-quarters of Vermont contains these types of aquifers.

Groundwater Quality

The chemical quality of the water in each of the major aquifers and aquifer systems of New England generally is suitable for most uses, including human consumption. Water quality, however, differs among the aquifers as a result of natural conditions and human activities that may prevent potable uses or require treatment of the water. Groundwater quality is primarily related to the (1) mineral composition and solubility of the rocks that make up the aquifer, (2) time that the water is in contact with the rock, (3) surface area of rock exposed to the water, (4) chemistry of water moving into the aquifer from other aquifers, and (5) introduction or induced movement of contaminants. The concentration of naturally-occurring dissolved solids in groundwater generally increases with depth, and some aquifers contain saltwater or brine in their deeper parts. The median dissolved-solids concentrations in water from the surficial aquifer systems in Vermont range from 75 to 200 milligrams per liter, substantially less than the 500-milligram-per-liter limit for public supply recommended by the USEPA. The widespread use of deicing chemicals on roads in New England may introduce salts into the aquifer system. Other common sources of local contamination throughout New England are effluent from septic systems and leaching of agricultural chemicals.

Carbonate-rock aquifers that consist of limestone, dolomite, and marble are generally the most soluble of the aquifers in New England. For this reason, median dissolved-solids concentrations in water from carbonate-rock aquifers are among the highest - 220 to 700 milligrams per liter - in the region. Water from carbonate-rock aquifers is characteristically very hard and slightly alkaline. Where carbonate-rock aquifers are exposed at the land surface, they are susceptible to contamination from the land surface because of their solution-enhanced permeability.

Crystalline-rock aquifers that exist in the eastern three-quarters of Vermont consist of almost insoluble igneous and metamorphic rock. These aquifers are characterized by shallow fracture systems that store and transmit water. The shallow fracture systems that have small surface areas and rapid water movement along short flow paths only allow minimal dissolution of the rocks. Water in crystalline-rock aquifers is similar in quality to water in aquifers of the surficial aquifer system. Locally, excessive concentrations of iron, manganese, and sulfate are present. The susceptibility of the crystalline-rock aquifers to contamination from the land surface is greatest where they are exposed at the land surface.

Fresh Groundwater Withdrawals

Crystalline-rock aquifers in the New England States and the Adirondack Mountains of New York provide about 12 percent of total withdrawals. Carbonate-rock aquifers, primarily in western Vermont produced about seven percent of total withdrawals. Shallow dug wells in till throughout the region are estimated to supply less than one percent of total fresh water withdrawals. In the sparsely populated areas of New England, which include much of rural New York, Vermont, New Hampshire, and Maine, water demand is small, and withdrawals are about 5 million gallons per day per county.

Sole Source Aquifers and Groundwater Protection Areas (USGS 2002, EPA 2001)

No "sole source" aquifers have been designated in the State of Vermont. However, groundwater is a significant portion of the drinking water resource for the State of Vermont and continues to be vulnerable to numerous man-made and natural risks. The contribution groundwater makes to surface waters - wetlands, streams, rivers, ponds and lakes - has not been fully evaluated in Vermont. Appendix E contains maps and additional information regarding groundwater resources.

Vermont's groundwater classification systems defines Class I groundwater as suitable for a public water supply with character that is uniformly excellent and is not exposed to any activities that pose a risk to its use. Class II groundwater is suitable for public water supply with character that is uniformly excellent but exposed to activities that may pose a risk to its use. Currently, there are no Class I or Class II groundwater areas designated in Vermont although one area, Brandon, has been proposed as a Class II groundwater area.

Class III groundwater is defined as suitable as a source of water for non-public water supply, irrigation, agricultural use, and general industrial and commercial use.

Vermont's groundwater classification system defines Class IV groundwater as not suitable as a source of potable water but suitable for some agricultural, industrial, and commercial uses. There are 8 areas classified as Class IV groundwater areas in Vermont, including the Burgess Brothers Landfill in Bennington, Parker Landfill in Lyndon, Transitor Electronics in Bennington, UniFirst Sites in Williamstown, Brookfield, and Randolph, Pine Street Barge Canal in Burlington, Maska Inc. in Bradford, Windham Solid Waste District Unlined Landfill in Brattleboro, and the Bennington Landfill (NEIWPCC).

Wetlands

The 1987 USACE Wetland Delineation Manual (USACE 1987) specifies three criteria for the identification of wetlands: hydrophytic vegetation, hydric soil, and positive indicators of wetland hydrology. Wetlands are defined by the EPA (Federal Register 1980) and the USACE (Federal Register 1982) as

"Those areas that are inundated or saturated by surface or ground water 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. Wetlands generally include swamps, marshes, bogs and similar areas" (33 CFR 3283 (b) 1984).

According to the National Wetland Inventory, there are approximately 258,382 acres of wetlands in the counties in the proposed CREP area. Table 3.3-3 shows acreages of wetlands in each county based on the National Wetland Inventory. Wetlands provide habitat for fish and wildlife including threatened and endangered species, recreational and educational opportunities, temporary storage of flood waters, and they aid in the maintenance of water supply and quality. Wetlands in Vermont have been significantly affected by human, land, and water use activities.

The Vermont Wetlands Program within DEC administers the Vermont Wetland Rules which regulate most palustrine wetlands that have been mapped on the Vermont Significant Wetland Inventory Maps. Mapped wetlands have a higher level of protection than unmapped wetlands. Some years ago, the Vermont Agency of Natural Resources digitized all the National Wetland Inventory (NWI) Maps for the State. This effort identified a State wide total of 232,000 acres of palustrine wetlands. These wetland areas are considered significant and are designated as Class Two wetlands under the Vermont Wetland Rules. Wetland inventories conducted in selected towns around Vermont indicate there is considerably more acres of wetland than identified by the NWI project. The wetlands that do not appear on the NWI maps are considered Class Three by the Vermont Wetland Rules. The area of Class Three wetlands is estimated as 90,000 acres. A recent analysis of all completed projects reviewed by DEC showed there has been a total of 330 acres of documented wetland loss and 491 acres of documented wetland impairment during the period between 1990 and 2002. The analysis also showed there were about 590 acres of wetlands saved during the same period.

Floodplains

Floodplains are areas of low-lying land that are subject to inundation by the lateral overflow of waters from rivers or lakes with which they are associated. EO 11988, Floodplain Management, requires that Federal agencies "take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains." (CFR Title 44 and EO 11988)

Table 3.3.3-2 Acreages of Wetlands Base on NWI

County Name	Wetland Acreage
Addison	38,849
Bennington	12,702
Caledonia	12,665
Chittenden	18,073
Essex	35,582
Franklin	30,610
Grand Isle	9,640
Lamoille	8,996
Orange	8,231
Orleans	28,969
Rutland	28,374
Washington	8,291
Windam	10,824
Windsor	6,576
Total:	258,382

Source: Dudley, J.B. NWI, USF&W

3.4 EARTH RESOURCES

3.4.1 Definition of Resource

In this analysis, earth resources are defined as topography and soils. Geography describes the elevation and slope of the terrain, as well as other visible land features. Soils are assigned to taxonomic groups and can be further classified into associations.

3.4.2 Region of Influence

The ROI for earth resources is the area encompassed by the proposed Vermont CREP Agreement includes all watersheds within the State that drain into Lake Champlain, the Connecticut River, the Hudson-Hoosic rivers, and Lake Memphremagog. (VDEC, 2003)

3.4.3 Affected Environment

Geography

Vermont has a total area of 9,614 square miles (sq mi), including 366 sq mi of inland water. Vermont has a maximum length, from north to south, of 156 miles and varies in width from 37 miles in the south to 89 miles along the northern border. The State's average elevation is 1,000 feet above mean sea level (MSL).

Soils

Thin stony soils that are generally infertile and difficult to farm cover most of Vermont. They are deficient in mineral plant nutrients and require heavy applications of lime and fertilizer when they are used for growing crops. Grass, however, thrives in this soil, and Vermont has excellent pastureland. Deeper and more productive soils occur in the Champlain Valley. (See Appendix F, Cite USDA/NRCS Farmland Classification Systems for Vermont Soils, April 2003)

3.5 AIR QUALITY

3.5.1 Definition of Resource

The CAA requires the maintenance of National Ambient Air Quality Standards (NAAQS). NAAQS, developed by EPA to protect public health, establish limits for six criteria pollutants: ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), lead (Pb), and respirable particulates [particulate matter less than 10 microns in diameter] (PM_{10}). The CAA requires States to achieve and maintain the NAAQS within their borders. Each State may adopt requirements stricter than those of the national standard. Each State is required by EPA to develop a State Implementation Plan (SIP) that contains strategies to achieve and maintain the national standard of air quality within the State. Areas that violate air quality standards are designated as nonattainment areas for the relevant pollutants. Areas that comply with air quality standards are designated as attainment areas for relevant pollutants (EPA 2003).

3.5.2 Region of Influence

With regard to the Vermont CREP, the ROI is the State of Vermont.

3.5.3 Affected Environment

The State of Vermont DEC Air Pollution Control Division (APCD) monitors, implements and regulates toxic air reduction programs throughout the State. These programs focus on preventative measures for pollutants that pose the greatest risk to public health and the environment. (VDEC 2004a)

Ozone

Vermont operated two ozone (O_3) monitoring sites in 2003: one at the Proctor Maple Research Facility in Underhill and the other in Bennington. The 8-hour average ozone National Ambient Air Quality Standard (NAAQS) is 0.08 parts per million (ppm) and is assessed relative to the running 3-year average of the annual 4th maximum daily maximum 8-hour average. Based on these criteria, both

Underhill and Bennington were near the NAAQS 0.08 ppm limit for 2003. The highest 8-hour concentration of ozone in 2003, 0.082 ppm, was recorded at the Bennington site. The highest recorded 8-hour concentration of ozone at the Proctor Maple Research site was 0.077 ppm. The highest 1-hour concentration of ozone in 2003, 0.093 ppm, was recorded at the Bennington site while the highest recorded 1-hour concentration of ozone at the Proctor Maple Research Facility was 0.085 ppm.

PM2.5

Vermont maintained four monitoring sites that sampled for particulate matter with aerodynamic diameter < 2.5 microns ($PM_{2.5}$). $PM_{2.5}$ sampling in 2003 was conducted at Rutland, Bennington Airport Road, Burlington Zampieri Building and Burlington Main Street. $PM_{2.5}$ sampling was discontinued in 2003 at both the Bennington Bradford Street site and at the Proctor Maple Research Facility in Underhill. $PM_{2.5}$ sampling continues in Underhill through the USEPA's Interagency Monitoring of Protected Visual Environments Program (IMPROVE) program and the Bennington Bradford Street site was moved to the Bennington Airport Road site. Vermont began $PM_{2.5}$ sampling in 1999. The annual average $PM_{2.5}$ standard is assessed relative to the three-year average of the respective annual averages. The $PM_{2.5}$ annual average NAAQS is 15 micrograms per cubic meter ($\mu g/m^3$). Compliance was assessed at only the Burlington Zampieri site having recorded three consecutive years of annual averages. Both the Bennington Airport Road site and the Burlington Main Street site were established in 2003. Rutland's annual average was not used for compliance assessment because of intermittent interruptions of monitoring due to local construction. The three-year average at the Burlington Zampieri site ranged from 9.6 $\mu g/m^3$ (64percent of NAAQS). The $PM_{2.5}$ 24-hour average standard is assessed relative to the three-year average of the annual 98th percentile sample concentration. Given Vermont's 1-in-3 day sampling schedule, the annual 98th percentile concentration is the annual third 24-hour maximum concentration. The $PM_{2.5}$ 24-hour standard is 65 $\mu g/m^3$. Compliance was assessed at the Burlington Zampieri site and the three-year 98th percentile average was 31 $\mu g/m^3$.

PM10

In 2003, Vermont maintained only one monitoring site at the Burlingon Main Street location that sampled for particulate matter with aerodynamic diameter < 10 microns (PM_{10}) for the entire year. The highest 24-hour concentration recorded in Burlington for 2003 was 51 $\mu g/m^3$. The annual PM_{10} average (weighted) concentration in Burlington was 19 $\mu g/m^3$. These concentrations are well below the former PM_{10} annual maximum 24-hour average NAAQS of 150 $\mu g/m^3$ and the PM_{10} annual average NAAQS of 50 $\mu g/m^3$. Yearly variability in the data is common, in part determined by meteorology, transport of particulate matter from distant sources, and changes in the emission volumes from local sources.

Carbon Monoxide

During 2003, Vermont operated two carbon monoxide (CO) monitoring sites in Rutland and at the Burlington Main Street site. No exceeding of the NAAQS for CO was recorded. The highest 1st and 2nd maximum 8-hour concentrations of CO recorded at Rutland were 2.2 ppm and 1.9 ppm. The highest 1st and 2nd maximum 8-hour concentrations of CO recorded at Burlington were 1.9 ppm and 1.7 ppm. The five-year trend line of data from the Rutland site shows a slight downward trend with the second highs at levels between 21percent and 28percent of the 8-hour NAAQS of 9 ppm. The Burlington CO monitoring site was not in operation in 2002 but was put back in operation during 2003 and continues to operate. CO measured in Burlington from 1995 through 1999 resulted in second 8-hour maximums ranging between 24percent and 37percent of the standard. The second 8-hour maximum in Burlington was 1.7 ppm in 2003. In 2003, the maximum one-hour concentration of CO recorded at Burlington and Rutland was 2.9 ppm and 3.1 ppm, respectively.

Nitrogen Dioxide

According to the Vermont DEC Air Pollution Control Division, the State operated two nitrogen dioxide (NO_2) monitoring sites in Rutland and at the Burlington Main Street location in 2003. No

exceeding of the NAAQS for NO_2 was recorded. In 2003, the annual average for NO_2 at Burlington and Rutland was 0.015 ppm and 0.012 ppm, respectively. Historical data for the most recent five years (1999-2003) of record indicate that the annual average concentrations of NO_2 have remained relatively stable. During this time period, the annual averages for the Rutland site ranged from 0.011 ppm to 0.013 ppm NO_2. The Burlington NO_2 monitoring site was not in operation in 2002 but was back in operation during 2003 where it continues to operate. During the period of 1996 to 2000, the annual average NO_2 concentrations ranged from 0.017 ppm to 0.018 ppm in Burlington. The five-year annual NO_2 average trend in Burlington and Rutland ranged between 21percent to 34percent of the NAAQS. In 2003, the maximum one-hour concentration of NO_2 recorded at Burlington and Rutland was 0.060 ppm and 0.075 ppm, respectively.

Sulfur Dioxide

In 2003, Vermont maintained one sulfur dioxide (SO_2) monitoring site in Rutland. No exceeding NAAQS for sulfur dioxide was recorded. The Burlington SO_2 site was not in operation in 2003 but was put back in operation during 2004. The highest 24-hour average concentration of SO_2 in Rutland in 2003 was 0.029 ppm. The highest 3-hour and 1-hour average SO_2 concentrations were 0.062 and 0.073 ppm, respectively. The annual average of 0.004 ppm in Rutland for 2003 is 13percent of the NAAQS. For compliance purposes, the annual second maximum 24-hour average of 0.026 ppm is 19percent of the NAAQS. The annual second maximum 3-hour average of 0.050 ppm is 10percent of the NAAQS. Five years (1999-2003) of historical SO_2 data indicate little variability in SO_2 concentrations in Rutland.

Lead

Vermont is not required to measure the concentration of lead in ambient air. No measurement data are available. [Note: The Vermont Air Pollution Control Division discontinued monitoring lead concentrations in Vermont in 1989.]

3.6 RECREATIONAL RESOURCES

3.6.1 Definition of Resource

Recreational resources are those activities or settings either natural or manmade that are designated or available for recreational use by the public. Recreational resources include lands and waters utilized by the public for hunting, fishing, hiking, birding, canoeing and other water sports, and water-related activities. Figure 3.6-1 shows State and Federal recreational lands in the CREP area

3.6.2 Region of Influence

The ROI for recreational resources includes the entire State of Vermont.

3.6.3 Affected Environment

An analysis of the 1996 and 2001 National Surveys of Fishing, Hunting, and Wildlife Associated Recreation (USFWS 1997, 2002) for Vermont indicated that total participants in wildlife related recreation increased from approximately 242,000 in 1996 to 319,000 in 2001, an increase of 23 percent. Total expenditures for wildlife-related recreation activities were approximately $380 million in 2001, an 11.5 percent increase over 1996 (USFWS 1997, 2002). Total expenditures for hunting related activities in Vermont decreased 121 percent to from 116 million in 1997 to 52 million in 2001, and sport fishing expenditures declined 11.8 percent to $92.5 million (USFWS 1997, 2002). Wildlife viewing expenditures increased 120.1 percent to $203.7 million in 2001 (USFWS 1997, 2002).

National Forests

The Green Mountain National Forest covers an area of 345,000 acres in two sections along the crest of the Green Mountains in central Vermont. The forest contains winter sports areas and a wide variety of recreational facilities and is traversed by about 80 miles of the Appalachian National Scenic Trail, a 2,174-mile footpath along the ridge crests and across the major valleys of the Appalachian Mountains from Katahdin in Maine to Springer Mountain in northern Georgia. Short-term hikers as

well as "thru-hikers" that travel the entire length of the Trail in one season use the Appalachian Trail. The Trail was developed by volunteers, opened as a continuous trail in 1937, and was designated as the first National Scenic Trail by the National Trails System Act of 1968. The Trail is currently protected along more than 99 percent of its course by Federal or State ownership of the land or by rights-of-way.

State Forests and Parks

The Vermont Departments of Forests, Parks, and Recreation operate about 90,000 acres of public land. The largest of Vermont's six State forests is the Mount Mansfield area. Located in the north central part of the State, the forest contains a well-known skiing area and Smugglers Notch, a scenic gorge through which contraband goods were smuggled from Canada to New England during the War of 1812. Within the State forests are recreation areas that have facilities for picnicking, camping, hiking, and horseback riding. Some of the State parks, including Crystal Lake, Bomoseen, and Branbury, are located along the shorelines of small lakes and have facilities for water recreation. Others, such as Grand Isle, Sand Bar, North Hero, and Button Bay, lie on the shore of Lake Champlain.

National Natural Landmarks

The National Natural Landmarks Program of the National Park Service (NPS) includes 587 sites in 48 states, 3 territories, and the Commonwealth of Puerto Rico nurturing a partnership ethic with various state, federal, and private landowners. However, a moratorium was placed on the program in 1989 that has postponed the nomination, evaluation, and designation of new sites for landmark status. The dissolution of this moratorium hinges on approval of final revised program regulations by the Department of the Interior and Office of Management and Budget. The program provides NPS landmark coordinators with opportunities to make improvements including revising regulations, contacting landmark owners, updating the national landmarks database, and establishing management controls (NPS 2002). The State of Vermont contains eleven National Natural Landmarks as shown in Table 3.6.3-1 and the associated location map below:

Table 3.6.3-1 National Natural Landmarks in Vermont (Location Map)

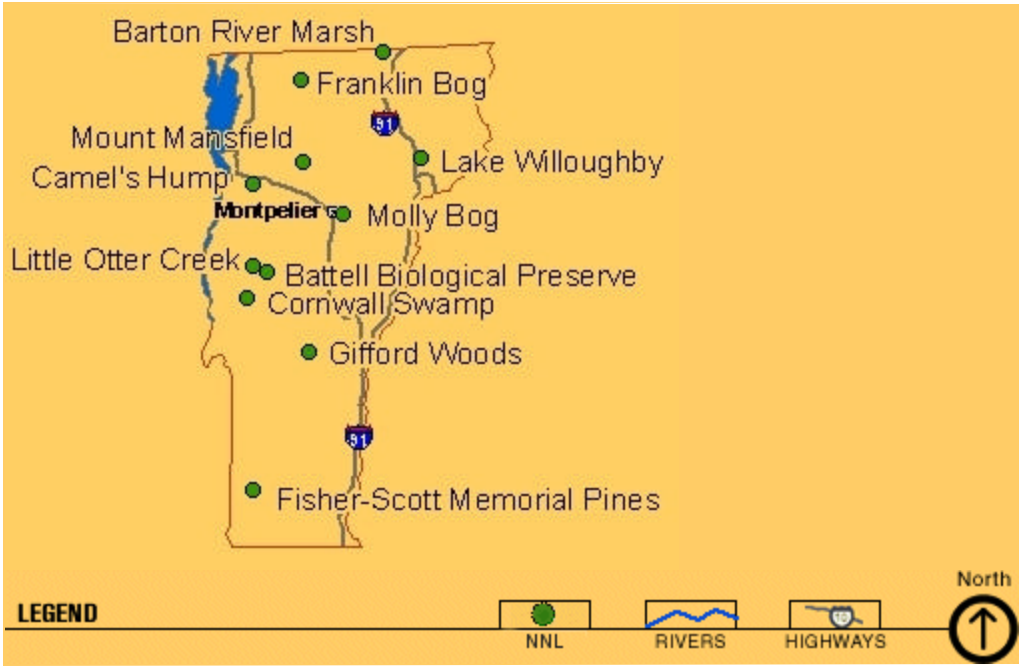

Table 3.6.3-1 National Natural Landmarks in Vermont (continued)

Name - Description	Location	Date Designated	Ownership
Battell Biological Preserve - rare, undisturbed, virgin hemlock-northern hardwoods climax forest	Addison Co.	May 1976	Private
Barton River Marsh - large, shallow, freshwater marshes	Three miles south of Newport in Orleans Co.	May 1973	State
Camel's Hump – anticlinal geologic deformation in the Green Mountains, and altitude-related zonation of biota, contains the second largest extent of alpine-tundra vegetation in Vermont	Chittenden Co. and extending into Washington Co.	April 1968	State
Cornwall Swamp - largest, unbroken red maple swamp in Vermont	Addison Co.	November 1973	State, Private
Franklin Bog - unspoiled, large, cold northern sphagnum-heath bog	Franklin Co.	May 1973	Private
Fisher-Scott Memorial Pines - unique stand of old-growth white pine representing the culmination of the white pine subclimax forest in New England, and containing the largest pines in Vermont	2 miles north of Arlington, Bennington Co.	May 1976	State
Gifford Woods - prime example of undisturbed, old-growth northern hardwood climax forest	Nine miles northeast of Rutland in Rutland Co	April 1980	State
Little Otter Creek Marsh - unspoiled example of a shallow water marsh maintaining itself under prevailing natural conditions	Addison Co.	May 1973	State, Private
Lake Willoughby Natural Area - deepest lake in Vermont, and an exceptionally fine example of a trough cut by glacial scouring, containing multiple examples of the work of glaciers	Town of Westmore in Orleans Co.	November 1967	State
Molly Bog - example of a small, early successional, absolutely unspoiled cold northern bog	Lamoille Co.	May 1973	State, Private
Mount Mansfield Natural Area - isolated, little-disturbed site with virgin spruce-fir forest on its upper slopes and an exceptional alpine tundra area on the summit ridge	Chittenden Co. and extends into Lamoille Co	April 1980	State, Private

Source: NPS 2005

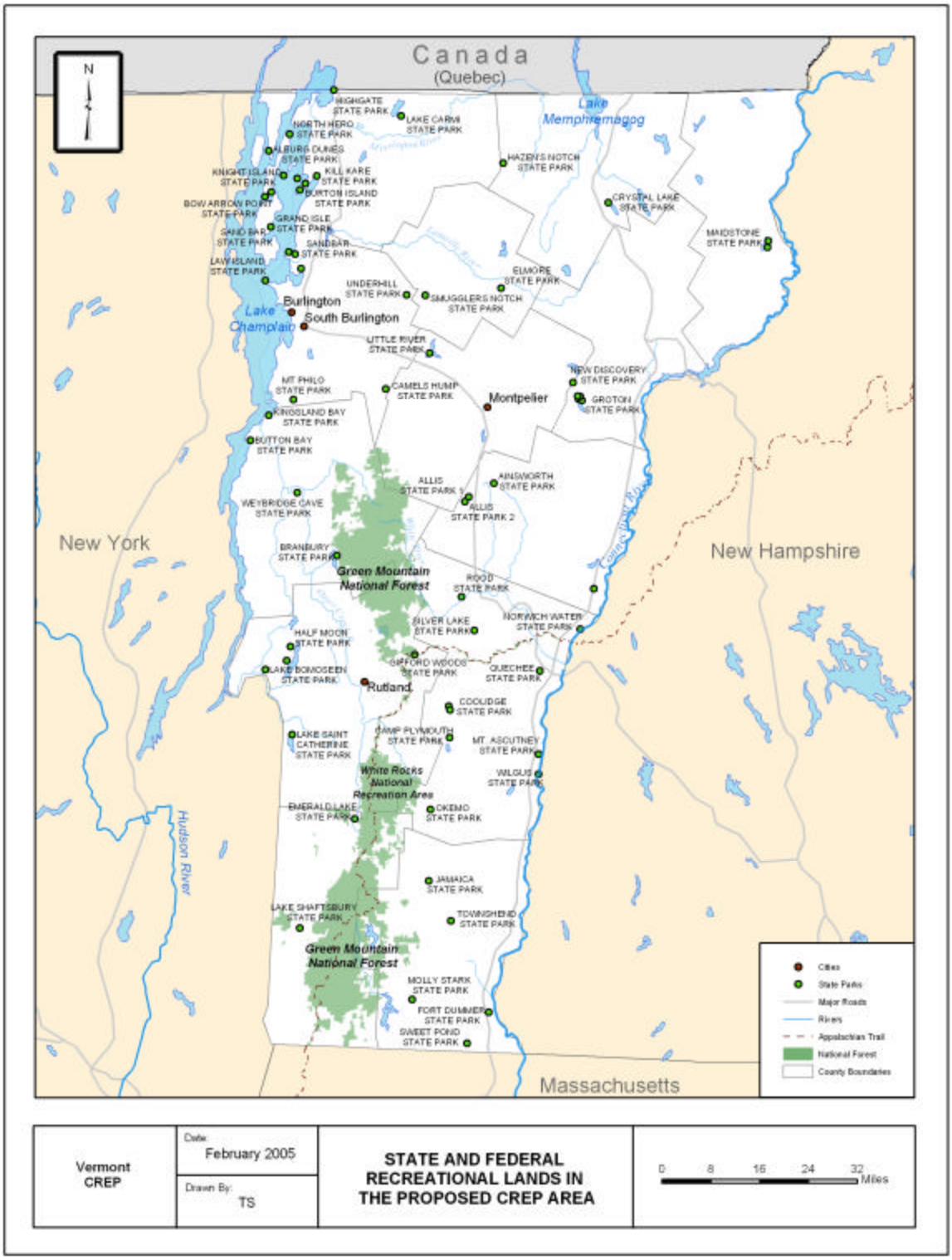

Figure 3.6-1 State and Federal Recreational Lands in the Proposed CREP Area

3.7 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

3.7.1 Definition of Resource

For this analysis, socioeconomics includes investigations of farm and non-farm employment and income, farm production expenses and returns, agricultural land use, and recreation spending.

EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires a Federal agency to "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high human health or environmental effects of its programs, policies, and activities on minority populations and low income populations." A minority population can be defined by race, by ethnicity, or by a combination of the two classifications.

According to CEQ, a minority population can be described as being composed of the following groups: American Indian or Alaska Native, Asian or Pacific Islander, Black, not of Hispanic origin, or Hispanic, and exceeding 50 percent of the population in an area or the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population (CEQ 1997). The U.S. Census Bureau (USCB) defines ethnicity as either being of Hispanic origin or not being of Hispanic origin. Hispanic origin is further defined as "a person of Cuban, Mexican, Puerto Rican, South or Central America, or other Spanish culture or origin regardless of race" (USCB 2001a).

Each year the USCB defines the national poverty thresholds, which are measured in terms of household income and are dependent upon the number of persons within the household. Individuals falling below the poverty threshold are considered low-income individuals. USCB census tracts where at least 20 percent of the residents are considered poor are known as poverty areas (USCB 1995b). When the percentage of residents considered poor is greater than 40 percent, the census tract is considered an extreme poverty area.

3.7.2 Region of Influence

The ROI for socioeconomics and environmental justice is the entire State of Vermont.

3.7.3 Affected Environment

Farming was the main economic activity in Vermont until the 20th century, when manufacturing took the lead. Then, by the mid-1990s, the service sector, led by tourism, was the fastest growing segment of the State's economy. Vermont's labor force in 2003 was 352,600 people: 39 percent had jobs in the service industries, 23 percent worked in wholesale or retail trade, 16 percent in manufacturing, 5 percent in government and the military, 5 percent in construction, 4 percent in finance, insurance, and real estate, 1 percent in farming (including agricultural services, forestry, or fishing), 5 percent in transportation or public utilities, and about 0.2 percent in mining. Table 3.7.3-1 lists the employment status of Vermontians by industry. In 2003 about 10 percent of Vermont's workers were unionized.

Agriculture

There were approximately 6,500 farms in Vermont in 2003. Of those, 39 percent had annual sales of more than $10,000. Many farms are managed by operators who have secondary employment. Farmland in Vermont occupies about 1.3 million acres, or approximately one-quarter of the State's land area. Crops were grown on 46 percent of the farmland; much of the rest is pasture or woodland. Dairying is still the dominant agricultural activity in Vermont with the sale of dairy products and of cattle and calves accounting for about 80 percent of total farm income. The State's other principal crops include apples, Christmas trees, and vegetables, including sweet corn. Poultry and eggs are

locally important, as are greenhouse and nursery items. Vermont leads the nation in the production of maple sugar and syrup.

Forestry

More than three-fourths of Vermont land is forested. Much of the forestland is contained on relatively small woodlots and is not operated as a regular source of income. The principal hardwoods are the sugar maple, beech, and yellow birch; the principal softwoods are spruce, fir, and white pine. Lumber-processing and wood-processing plants employ about 3,200 workers in the State.

Mining

Granite, marble, limestone, and slate account for much of the total value of mineral production in Vermont, noted for its fine granite and marble products. Granite production is centered chiefly near Barre and also occurs in many areas east of the Green Mountains. Marble is quarried in Rutland County in western Vermont that also produces slate. The Champlain Valley is a source of limestone. Asbestos is mined in the Belvidere Mountain area in the northern part of the State. Talc is produced principally in the Green Mountains.

Manufacturing

Nearly one-third of the income generated by industrial activity in Vermont through the mid-1990s was the manufacture of electrical equipment, especially electronic components in the Burlington area of northwestern Vermont. The manufactures of semiconductors and related devices are the leading employers in the electronics sector of Vermont. Other manufacturing industries in Vermont include printing and publishing; food and dairy processing, machinery manufacturing concentrated in the Springfield-Windsor area of the Connecticut Valley, metal products fabrication, and paper products. Other Vermont employers include firm's aircraft engine and parts manufacturers and furniture makers.

Electricity

Vermont's sole nuclear power plant opened in Vernon in 1972 and in 2002 it produced 73 percent of the State's electricity. Another 20 percent came from hydroelectric facilities. Wood fueled plants operate in Burlington and Ryegate.

Tourist Industry

Tourism has become an important source of income for Vermont. The expansion of winter sports activities in the State has made tourism a year-round industry. Tourism has been partially responsible for improvements to roads and has encouraged an increase in the migration of permanent residents to Vermont. Skiing recreation has become Vermont's single most important tourist industry.

Transportation

Vermont's inland location along an international border, its variable topography, and its severe winters have historically hindered the development of transportation systems within the State. Improved and expanded interstate highways have provided better commercial truck and automobile transportation routes. The cities of White River Junction, Montpelier, Saint Johnsbury, Rutland, and Burlington are major transportation hubs in the State. By 2002 the State had 14,289 miles of highways, of which 320 miles are part of the interstate highway system. Vermont contains 456 miles of railroad tracks and the transportation of stone products is approximately 52 percent of the tonnage of goods shipped originated in the State. About half the railroad mileage is State-owned. Three main airports in Vermont are located in Burlington, Rutland, and in the Barre-Montpelier area and operate most of the State's commercial air traffic. Lake Champlain is a major link in an international waterway system extending from the St. Lawrence River/Seaway in Canada to the Hudson and New York City on the Atlantic Coast. Vermont has long-standing trade ties with Canada. Saint Albans,

near the Canadian border, is a port of entry for international rail-freight traffic through which Canadian lumber and animal feed products for New England farms enter. Burlington, on Lake Champlain, is the State's principal business center and is also a port of entry for waterborne freight, particularly fuel oil. Table 3.7.3-1 shows Vermont employment status by industry based on 1990 and 2000 census data.

Table 3.7.3-1 Vermont Employment Status by Industry.

Industry	Persons Employed 2000	Percent Employed 2000	Persons Employed 1990	Percent Employed 1990	Percent Change
Agriculture, forestry, fishing, hunting, and mining	9,643	3.0	12,813.0	4.4	-1.4
Construction	21,155	6.7	21,952.0	7.6	-0.9
Manufacturing	47,767	15.1	44,018.0	15.1	0
Wholesale Trade	9,901	3.1	14,071.0	4.8	-1.7
Retail Trade	38,027	12.0	48,114.0	16.6	-4.2
Transportation, Warehousing and Utilities	11,783	3.7	14,768.0	5.1	-1.4
Information	8,425	2.7	0.0		N/A
Finance, Insurance, Real Estate	14,819	4.7	15,971.0	5.5	-0.8
Professional	22,437	7.1	18,102.0	6.2	0.9
Educational, Health and Social Services	76,381	24.1	55,694.0	19.2	4.9
Art, Entertainment, Service	27,237	8.6	14,887.0	5.1	3.5
Other Services	14,963	4.7	18,102.0	6.2	-1.5
Public Administration	14,596	4.6	12,187.0	4.2	-0.4

Source: U.S. Census Bureau 2000 and 1990

3.7.3.1 Demographic Profile

Population Patterns

In 2003 Vermont ranked 49th among the States, with a total population of 619,107. This figure represented an increase of 8.2 percent over the 1990 census figure of 562,758. The average population density was 26 persons per sq km (67 per sq. mi.) in 2003. Vermont's population is, proportionately, more rural than that of any other U.S. State; only 38 percent of Vermont residents lived in areas defined as urban in 2000. All Vermont urban centers are small. The largest, Burlington, accounts for less than one-tenth of the population, although Burlington and its surrounding Chittenden County region contain one-fourth of the people in the State. The fastest-growing areas are in the Champlain Valley and southern Vermont. The Green Mountains and northern Vermont had less growth, and some communities, notably Rutland and Barre, lost population.

Principal Cities

The dominant city by far is Burlington, which had a 2002 population of 39,466. This 200-year-old port on Lake Champlain is a trade and transportation center, the seat of the State's oldest university, and a summer resort. It also has a diversity of industries. Rutland (17,098), in eastern Vermont, is the center of the State's marble-quarrying belt. Barre (9,245), in north central Vermont, is the center of what are believed to be the world's largest granite quarries. Montpelier, with 8,026 inhabitants, is the smallest State capital in the nation.

Ethnicity

The largest immigrant group in Vermont is French Canadian. Whites constitute 96.8 percent of the population, Asians 0.9 percent, blacks 0.5 percent, and Native Americans 0.4 percent. Those of

mixed heritage or not reporting race are 1.4 percent. Native Hawaiians and other Pacific Islanders number 141. Hispanics, who may be of any race, make up 0.9 percent of Vermont's people.

3.7.3.2 Non-Farm Employment and Income

Between 1990 and 2002 the non-farm labor force within the ROI ranged from 1.38 million in 1992 to 1.56 million in 2002 (Bureau of Labor Statistics [BLS] 2003). Non-farm employment also ranged during this period from a low of 1.27 million positions in 1990 to a high of 1.54 in 1998 (BLS 2003). The unemployment rate within the ROI varied from a high of 6.56 percent in 1992 to a low of 3.48 in 2000 (BLS 2003). Within the ROI, Adams County has experienced the highest average non-farm unemployment rate for the period (11.80 percent), with the highest rate occurring in 1993 (14.8 percent) (BLS 2003).

Median household income in 1999 ranged within the ROI, the highest median household income occurring in Delaware County ($67,258) and the lowest median household income occurring in Scioto County ($28,008) (USCB 2003). The average poverty rate for the ROI in 2000 was 10.5 percent, a decrease of approximately 2.5 percent from the 1990 poverty rate (USCB 1993, 2003). The 2000 poverty rate varied from a high of 20.0 percent in Vinton County to a low of 3.85 percent in Delaware County (USCB 2003). Vinton County would be considered a poverty area, while other counties within the ROI would not be considered poverty areas.

Table 3.7.3-2 lists agricultural land uses within the ROI for 1997 and 2002 and the percent change over that time period.

Table 3.7.3-2 Agricultural Land Use Acreage within the ROI

Land Use	2002	1997	Percent Change
Cropland [1]	567,509	632,339	11.4
Hay land [2]	190,716	167,976	11.9
Pastureland [3]	89,095	86,835	2.5
Woodland [4]	468,955	448,078	4.5
House lots, ponds, roads, wasteland, etc.	65,101	79,113	-21.5
CRP & WRP [5]	1,376	8,024	-483.1
Active Agriculture [6]	847,320	887,150	-4.7
Total Land in Farms [7]	1,381,376	1,414,341	-2.4

1 Cropland excludes all harvested hayland and cropland used for pasture or grazing

2 Hay land includes all harvested cropland used for alfalfa, other tame, small grain, wild, grass silage, green chop, etc.

3 Pastureland includes all pasture, including cropland, grazed woodland, and rangeland not considered cropland or woodland

4 Woodland excludes all wooded pasture lands

5 CRP & WRP acreages are included as active agricultural lands

6 Active agricultural lands include the sum of cropland, hay land, and pastureland

7 Total land in farms include the sum of cropland, hay land, pastureland, woodland, and house lots, etc.

Source: USDA, National Agricultural Statistics Service (2002)

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 BIOLOGICAL RESOURCES

4.1.1 Alternative A – Preferred

Implementation of Alternative A would result in beneficial impacts to biological resources in the proposed CREP area and the waters downstream from the area. The agricultural land eligible for enrollment in the proposed CREP area were generally previously disturbed and managed for production purposes. Vegetation; wildlife; aquatic species; and threatened, endangered, and sensitive species have been typically been displaced from these lands. The project objectives to reduce sediment, nitrogen and phosphorus loading would be anticipated to improve habitat conditions for wildlife, especially aquatic and other predominantly water-dependent species.

Vegetation

Every CP that is proposed for implementation under the Vermont watersheds CREP would be anticipated to contribute to vegetation diversity in the proposed CREP area. In particular, establishment of riparian buffers (CP22) would benefit vegetation resources in the CREP area. The native forest types are generally associated with riparian areas and the adjacent uplands. Establishment of native plant communities in wetlands (CP23) would help to reduce occurrences of exotic plant species. Vegetation restoration would increase biodiversity and improve water quality throughout the 7,500 acres proposed for enrollment.

Wildlife

Associated with improved habitat conditions, wildlife diversity in the proposed CREP area would increase from implementation of conservation practices. In comparison to the existing conditions on most of the eligible cropland, wildlife habitat and wildlife diversity would thrive after establishment of each CP. Establishment of filter strips (CP21) and riparian buffers (CP22) would enhance stream corridor quality and important habitat for neo-tropical and other migratory and nesting birds.

Aquatic Species

Aquatic biodiversity in the proposed CREP area would benefit from reduced levels of nutrient and sediment loading to surface waters from agricultural activity. Lower nutrient concentrations in the streams would improve the health of fish and invertebrate communities, as well as stream corridor quality. In particular, establishment of filter strips (CP21), riparian buffers (CP22), wetland restoration (CP23), and grassed waterways (CP8A) would enhance aquatic biodiversity in the CREP area and downstream. Aquatic species would benefit from the targeting of conservation practices to alluvial floodplain soils, hydric, and hydric-included soils. These practices would provide filter strips, riparian buffers, and wetland restoration areas in the 100-year floodplain for protection and enhancement of water quality, which would increase aquatic biodiversity in the proposed CREP area.

Threatened, Endangered, and Sensitive Species

Implementation of the proposed CREP would be expected to have positive impacts on threatened, endangered, and sensitive species that occur downstream of these areas. Benefits to aquatic species in this category would be realized shortly after implementation of CPs and would increase in the long term. Benefits to threatened, endangered, and sensitive species in terrestrial environments would be minimal in the short term as vegetative communities developed. However, the greatest benefits to terrestrial species and habitats in this category would be expected in the long term following implementation of the proposed CREP.

Implementation of the Preferred Alternative would not have adverse impacts on biological resources providing that appropriate guidelines for their implementation are practiced. For example, wetland

restoration may require precautions to limit disturbances to existing vegetation and habitat by using specially designed equipment and their construction would be coordinated during non-breeding times.

Two species of particular concern in the Connecticut River basin are the dwarf-wedge mussel (*Alasmidonta heterondon*) and Jesup's milk-vetch (*Astragalus robbinsii var. Jesupi*) that would be reported to the FWS if they are identified during the site-specific Environmental Evaluation process. In addition, any CP involving tree cutting or timber harvesting in Addison or Rutland Counties in the Chaplain Valley should be coordinated with the FWS to ensure that disturbance of the endangered Indiana bat (*Myotis sodalist*) does not occur.

4.1.2 Alternative B – No Action

Under the No Action Alternative the proposed CREP would not be implemented and there would be no change to existing biological resources in the Vermont CREP area.

4.2 CULTURAL RESOURCES

4.2.1 Alternative A – Preferred

Archaeological Resources

Due to the rich cultural and archaeological history of the CREP agreement area, the potential for encountering archaeological resources during implementation of CREP contracts is considered high. CPs that have the potential to disturb the subsurface beyond what is normally disturbed from agricultural plowing have the potential to impact known and, as yet, unknown archaeological resources. Such practices include earthmoving for installation of filter strips and grassed waterways, as well as construction of dams, levees, and dikes in wetland restoration areas and excavation of potholes or other structures to regulate water flow.

In order to determine whether proposed ground disturbing practices would impact archaeological resources listed in or eligible for listing in the NRHP, an appropriate archeological review will be completed prior to implementation of the contract as part of the environmental evaluation as provided for in Part 10 the USDA/FSA *Agriculture Resource Conservation Program (Handbook 2-CRP).* Results and recommendations from the review should receive concurrence for the Vermont SHPO prior to project implementation.

Architectural Resources

The CREP agreement area contains a rich architectural history related to early settlement and agricultural themes of Vermont's history. Should proposed conservation practices include the removal or modification of historic architectural resources included in or eligible for the NRHP, a historic architectural resources survey (Vermont Historic Inventory) would be required in order to determine whether such resources are present.

Traditional Cultural Properties

Because the areas of potential effect of CREP actions are not yet defined, no Native American sacred sites or TCPs are identified. Once these areas are defined, consultation with Native American tribes that have traditional ties to the lands may be needed to determine whether such properties exist on affected lands.

4.2.2. Alternative B – No Action

Under the No Action Alternative, farming practices in the CREP area would continue. Though the continuation of farming in previously disturbed areas is not expected to impact cultural resources, a change in farming practices that would disturb previously undisturbed areas or plowing in areas not previously plowed, could result in impacts to known or unknown archeological, architectural, or traditional cultural resources.

4.3 WATER RESOURCES

4.3.1 Alternative A – Preferred

Implementation of the proposed conservation practices listed in Section 2.1 would improve surface water quality within the proposed CREP area by reducing agriculture sources of nutrient and sediment loading within the region's streams and rivers. Activities such as vegetation clearing and soil disturbance may occur during the installation of the CPs. These activities could result in temporary and minor impacts to surface water quality resulting from runoff associated with these activities. Use of filter fencing or similar practices would reduce these impacts.

Implementing the proposed conservation practices is expected to have positive impacts on groundwater quality in the proposed CREP area. Agricultural acreages would be reduced which would decrease the amount of nutrients leaching into groundwater sources.

Implementation of the proposed conservation CP22 (Riparian Buffer) and CP23 (Wetland Restoration) is expected to increase the acreages of wetlands and riparian habitat in the proposed CREP area. As with surface water, temporary and minor increases in runoff could occur during the installation of the proposed conservation practices.

4.3.2 Alternative B – No Action

Under Alternative B, the No Action Alternative, the CPs described in Section 2.1 would not be implemented and no change to existing surface water, groundwater or wetland acreage would occur. Continued runoff of agricultural chemicals, erosion of soils, and the impacts of these to surface and groundwater quality would be expected if the preferred alternative were implemented.

4.4 EARTH RESOURCES

4.4.1 Alternative A – Preferred

Under Alternative A, potential long-term positive impacts to earth resources are expected to occur. Implementation of the proposed CPs would result in localized stabilization of soils and control of nutrients as a result of reduced erosion and runoff. In pasturelands, exclusion of livestock from streams and riparian areas bordering streams would increase stream bank stabilization, resulting in reduced rates of sedimentation and subsequent improvements to water quality. Establishing permanent native vegetation on former croplands would reduce erosion by wind and water. Short-term disturbance to soils could include tilling, or installation of various structures such as fences, breakwaters and roads that may be necessary in association with the implementation of CPs. These activities may result in temporary minor increases in soil erosion, particularly prior to the establishment of new vegetation and during heavy rainfall or flooding events. The potential impacts to soil associated with specific tracts of agriculture land and their suitability for implementation of the conservation practices included in the Vermont CREP would be evaluated as provided for in Part 10 the *USDA/FSA Agriculture Resource Conservation Program* (Handbook 2-CRP).

4.4.2 Alternative B – No Action

Under Alternative B, the No Action Alternative, the CPs described in Section 2.1 would not be implemented and continued erosion would be expected to occur, causing further alteration of topography and loss of soils.

4.5 AIR QUALITY

Any impacts to air quality in attainment areas would be considered significant if pollutant emissions associated with the proposed action: caused, or contributed to a violation of any national, State, or local ambient air quality standard; exposed sensitive receptors to substantially increased pollutant concentrations; or exceeded any significance criteria established by the SIP.

4.5.1 Alternative A – Preferred

Implementation of Alternative A would result in establishment of CPs as described on up to 7,500 acres of farmland in 14 counties in Vermont. Preparing the lands for CPs could include activities such as tilling, burning, and installation of various structures in water or on land. These activities would have a temporary minor impact to the local air quality. It is not expected that any of these practices would change the current attainment status or violate standards in the SIP.

4.5.2 Alternative B – No Action

Implementation of Alternative B, the No Action Alternative, would not change existing air quality conditions. The CPs described in Section 2.1 would not be implemented.

4.6 RECREATIONAL RESOURCES

4.6.1 Alternative A – Preferred

Implementation of Alternative A would have a positive long term impact on recreational resources by facilitating potential increases in game species of birds, fish and mammals. Installation of the proposed CPs would increase habitat for game bird and mammal species. An increase in water quality would allow for the replenishment of game fish species. The CPs listed in Section 2.1 would potentially increase the desirability of land to be used for hiking, boating or camping by improving aesthetics. A short term negative impact to recreational activities may occur during the installation of the proposed conservation practices due to unsightly construction activities or potential displacement of game species.

4.6.2 Alternative B – No Action

Under Alternative B, the No Action Alternative, the conservation practices described in Section 2.1 would not be implemented and no change to existing recreational activities would occur. Continued degradation of water quality would be expected, affecting water related recreational opportunities.

4.7 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

4.7.1 Alternative A – Preferred

Implementing the proposed action would be anticipated to result in positive net present values for land rentals into the Vermont CREP program within the ROI. Enrollment in the CREP would improve wildlife habitat for game species and nongame species. This improved and expanded wildlife habitat would be likely to increase wildlife-related recreation opportunities within the ROI. This increased/improved habitat would be likely to improve wildlife-recreation generated economic activity within the ROI.

Since the ROI would not be considered an area of concentrated minority population or a poverty area and there would be no adverse impacts from selecting the proposed action there would be no ROI-wide impacts due to environmental justice.

4.7.2 Alternative B – No Action

Under the no action alternative, the Vermont CREP would not be implemented. Socioeconomic conditions would be expected to continue to follow the trends associated with the ROI and larger northeastern US region. The continued loss of wildlife habitat could result in wildlife enthusiasts to spend more of their activity dollars in adjacent States with similar opportunities and forego the remaining available wildlife-related recreation opportunities. There would be no impacts from selecting the no action alternative as there would be no ROI-wide impacts due to environmental justice.

5.0 CUMULATIVE IMPACTS, COMMITMENT OF RESOURCES

5.1 CUMULATIVE EFFECTS

5.1.1 Definition of Cumulative Effects

CEQ regulations stipulate that the cumulative effects analysis within an EA should consider the potential environmental impacts resulting from "the incremental impacts of the action when added to other past, present and reasonably foreseeable actions regardless of what agency or person undertakes such other actions." CEQ guidance in Considering Cumulative Effects affirms this requirement, stating that the first steps in assessing cumulative effects involve defining the scope of the other actions and their interrelationship with the proposed action. The scope must consider geographic and temporal overlaps among the proposed action and other actions. It must also evaluate the nature of interactions among these actions.

Cumulative effects most likely arise when a relationship exists between a proposed action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with or in proximity to the proposed action would be expected to have more potential for a relationship than those more geographically separated. Similarly, actions that coincide, even partially, in time tend to have potential for cumulative effects.

In this PEA, the ROI for cumulative impacts is the State of Vermont. For the purposes of this analysis, the goals and plans of Federal programs designed to mitigate the risks of degradation of natural resources are the primary sources of information used in identifying past, present, and reasonably foreseeable actions.

5.1.2 Past, Present, and Reasonably Foreseeable Actions

In addition to CREP, the Vermont NRCS maintains and implements numerous programs authorized under the 2002 Farm Bill to conserve and enhance the natural resources of the area. These programs include, but are not limited to, the Wildlife Habitat Incentives Program (WHIP), Grassland Reserve Program (GRP), Environmental Quality Incentives Program (EQIP), Farm and Ranchlands Protection Program (FRPP), Grazing Lands Conservation Initiative (GLCI), and the Wetlands Reserve Program (WRP). Although these programs are required to be implemented on separate lands (i.e. a particular tract of land cannot be used for acquiring funding on more than one government program), the cumulative impacts from their implementation would provide an overall beneficial cumulative impact on water, soil, biological, and other natural resources.

5.1.3 Analysis of Cumulative Impacts

The incremental contribution of impacts of the proposed action, when considered in combination with other past, present, and reasonably foreseeable actions, is expected to result in positive impacts to water, earth, biological, and recreational resources both in the proposed CREP area and in waters downstream.

5.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

NEPA requires that environmental analysis include identification of any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented. Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources has on future generations. Irreversible effects primarily result from the use or destruction of a specific resource that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action.

Participation in the Vermont CREP may result in some permanent changes in land uses, particularly with regard to the restoration, enhancement, or establishment of wetlands. Under current Federal policies, particularly the National Wetlands Mitigation Plan, no net loss of wetlands is a primary goal. Wetlands that become established as a result of implementation of CREP conservation practices would be subject to these policies. Additionally, land that has been restored to provide habitat for wildlife, particularly endangered and threatened species, may be subject to provisions of the ESA. Although regarded as beneficial consequences, it should be recognized that such permanent changes in land uses would be regarded as irretrievable commitments of agricultural production resources.

6.0 LIST OF PREPARERS

Robert F. Moyer, EIT, REM
Project Manager
M.S. University of Texas at San Antonio, Civil Engineering, 1997
M.S. University of Texas at San Antonio, Natural Resources Management, 1987
B.S. University of Texas at San Antonio, Applied Sciences, 1980
Years of Experience: 25

Herbert Moss
Environmental Scientist/Researcher
B.S. Texas State University, Geography, 2002
Years of Experience: 3

Julie Jeter
Wildlife Biologist
M.S. Texas A&M University, Wildlife and Fisheries Science, 1989
B.S. University of Texas at San Antonio, Biology, 1983
Years of Experience: 17

Michael R. Schneider
GIS/Graphics
B.A. University of Texas at San Antonio, Geography, 2002
A.A. San Antonio College, GIS, 2000
Years of Experience: 6

Ellen M. Stutsman
Technical Editor
B.S. Midwestern State University, 1978
Years of Experience: 15

Patricia V. Moses
Cultural Resources Specialist
M.S., Environmental Science, University of Texas at San Antonio, 2004
B.S., Composite Science, University of Texas at San Antonio, 1999
Natural Resource Compliance Certification (Department of Defense)
Cultural Resource Compliance Certification (Department of Defense)
Prescribed Burn Management Certification (Texas Prescribed Burn School)
Wildland Firefighter Type I Certification
Years of Experience: 8

7.0 PERSONS AND AGENCIES CONTACTED

Roger Allbee
State Executive Director
Farm Service Agency, USDA
356 Mountain View Drive, Suite 104
Colchester, Vt. 05446

Craig Miner
USDA/FSA
68 Catamount Park
Middlebury, VT 05753

Michael P. Toussaint
USDA/FSA Agricultural Program Specialist
356 Mountainview Drive
Colchester, VT 05446

Fletcher (Kip) Potter
Resource Conservationist, USDA-NRCS
356 Mountain View Drive, Suite 105
Colchester, VT 05446

Phil Benedict, Vermont's Agency of Agriculture, Food & Markets
Director, Plant Industry & Laboratories
116 State Street, Drawer 20
Montpelier, VT 05620-2901

Barry Cahoon, Agency of Natural Resources, State of Vermont
Dept. of Environmental Conservation, DEC Commissioner's Office
One South Building
103 South Main Street
Waterbury, Vermont 05671-0401

Christopher E. Smith USFWS, Partners for Wildlife
Fish and Wildlife Biologist
Lake Champlain Fish and Wildlife Resources Office
11 Lincoln Street
Essex Junction, VT 05452

Michael J. Amaral, Endangered Species Specialist
New England Field Office
70 Commercial Street, Suite 300
Concord, New Hampshire 03301-5087

Rick Hopkins*
VT Water Quality Division
Bldg 10 North
103 South Main Street
Waterbury, VT 05671

David Sausville
State of Vermont Agency of Natural Resources, Fish & Wildlife Dept.
Dead Creek WMA
966 Rte. 17 West
Addison, VT 05491

Giovanna Peebles, Archeology Education and
Scott Dillon, Survey Archeologist
Vermont Division for Historic Preservation
National Life Bldg., Drawer 20
Montpelier, VT 05620-0501

Tim Buskey
VT Farm Bureau
2083 East Main Street
Richmond, Vermont 05477

Jeff Reardon, New England Conservation Director
Trout Unlimited
8 Crosby Street
Augusta, ME 04330

Jim MacCartney, TU/NPS Restoration Specialist
Trout Unlimited / NPS Rivers & Trails
18 Low Street
Concord, NH 03301-4902

Miranda Lescaze
Technical Coordinator, Lake Champlain Basin Program
54 West Shore Road
Grand Isle, Vermont 05458

Kari Dolan
National Wildlife Federation
58 State Street
Montpelier, VT 05602

Richard Nelson
Ducks Unlimited Vermont State Chairman
145 Briere Patch Lane, Newport, VT 05855

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9.0 GLOSSARY

Term/Acronym	Definition
2002 Farm Bill	Farm Security and Rural Investment Act of 2002
2-CRP	United States Department of Agriculture, Farm Service Agency (FSA) Handbook, *Agricultural Resource Conservation (Revision 4)*
Agricultural Pollution	Wastes, emissions, and discharges arising from farming activities. Causes include runoff and leaching of pesticides and fertilizers; pesticide drift and volatilization; erosion and dust from cultivation; and improper disposal of animal manure and carcasses. Some agricultural pollution is point source (e.g., large feedlots), but much is nonpoint source, meaning that it derives from dispersed origins.
Agricultural Services	Includes establishments primarily engaged in supplying soil preparation services, crop services, landscape and horticultural services, veterinary and other animal services, and farm labor and management services.
Algal Bloom	Rapid and flourishing growth of algae in and on a body of water.
Alkaline	Having a ph of 7.0 or above.
Alluvium	Material transported and deposited on land by flowing water, such as clay, silt, and sand.
Anaerobic	Devoid of gaseous or dissolved molecular oxygen; organisms that are able to live without oxygen.
Approved Conservation Plan	A plan that covers approved cover, other required practices necessary for establishing and maintaining cover, and a schedule for installing conservation practices to provide adequate environmental benefits on eligible cropland.
Aquifer	An underground formation or layer of earth, gravel, or porous stone capable of storing and yielding significant quantities of water;
Beneficial Use	The role that the government decides a water body will fulfill. Examples of these uses include healthy fish and wildlife populations, fish consumption, aesthetic value, safe drinking water sources, and healthy phytoplankton and zooplankton communities.
Benthic Organisms	Bottom-dwelling aquatic organisms.
Bioaccumulation	The uptake and retention of nonfood substances by a living organism from its environment, resulting in a build-up of the substances in the organism.
Biomass	Any biological material. In reference to alternative energy sources, mainly plants or parts of plants, such as harvested trees, leaves, limbs, etc. In ecological studies, the dry mass of living organisms in a specified area.
Biosphere	The entire planetary ecosystem, including all living organisms and the parts of the earth in which they live or that support them. The term is also used to refer to only the living organisms on earth and not to their physical and chemical environments.
Carbon Sequestration	The net removal or fixation of carbon dioxide (CO2) from the atmosphere or in a carbon sink into long-lived pools of carbon through biological or physical processes. These pools can be living, aboveground biomass (e.g., trees), products with a long, useful life created from biomass (e.g., lumber), living biomass in soils (e.g., roots and microorganisms), or recalcitrant organic and inorganic carbon in soils and deeper subsurface environments.
Carbon Sink	A process or an activity that absorbs or takes up released carbon (greenhouse gases) from another part of the carbon cycle. The four sinks, which are ecosystem-based, within which carbon behaves in a systematic manner are the atmosphere, terrestrial biosphere (including freshwater systems), oceans, and sediments (including fossil fuels).
Coliform	Bacteria common to the intestinal tract of warm-blooded animals, including humans.

Glossary (continued)

Term/Acronym	Definition
Conservation	The management of human and natural resources to provide maximum benefits over a sustained period of time. In farming, conservation entails matching cropping patterns and the productive potential and physical limitations of agricultural lands to ensure long-term sustainability of profitable production. Conservation practices focus on conserving soil, water, energy, and biological resources.
Conservation Easement	Acquisition of rights and interest to a property to protect identified conservation or resource values, using a reserved interest deed.
Conservation Plan	A combination of land uses and farming practices to protect and improve soil productivity and water quality, and to prevent deterioration of natural resources on all or part of a farm. Plans must meet technical standards.
Conservation Practice	A technique or measure used to protect soil and water resources, air, plants, and animals for which standards and specifications for installation, operation, or maintenance have been developed.
Cost-Sharing	Payments to producers to cover a specified portion of the cost of installing, implementing, or maintaining a conservation practices .
Critical Habitat	The specific areas within the geographical area occupied by the species on which are found those physical or biological features that are both essential to the conservation of the species and may require special management considerations or protection.
Crop failure	Consists mainly of the acreage on which crops failed because of weather, insects, and diseases, but includes some land not harvested due to lack of labor, low market prices, or other factors.
Cropland harvested	Includes row crops and closely sown crops; tree fruits, small fruits, and tree nuts; vegetables; other minor crops and hay.
Cropland used only for pasture	Generally is considered in the long-term crop rotation, as being tilled, planted in field crops, and then re-seeded to pasture at varying intervals. However, some cropland pasture is marginal for crop uses and may remain in pasture indefinitely. This category also includes land that was used for pasture before crops reach maturity and some land used for pasture that could have been cropped without additional improvement.
Cultivated summer fallow	Refers to cropland in sub-humid regions of the Western United States cultivated for a season or more to control weeds and accumulate moisture before small grains are planted.
Deposition	The washout or settling of material from the atmosphere to the ground or to surface waters.
Dissolved Oxygen (DO)	Amount of free oxygen found in water; most commonly used measurement of water quality.
Drainage basin	The geographical area draining into a river or reservoir.
Easement	A landowner sells or surrenders the right to develop a portion of the property, usually in return for a payment or some other benefit.
Ecosystem	A level of organization within the living world that includes both the total array of biological organisms present in a defined area and the chemical-physical factors that influence the plants and animals in it; all biological and non-biological variables within a defined area.
Ecotone	A zone of transition between two well-defined vegetated areas.

Glossary (continued)

Term/Acronym	Definition
Erodibility Index	Erodibility Index: A numerical value that expresses the potential erodibility of soil in relation to its soil loss tolerance value without consideration of applied conservation practices or management. (Defined at 7 CFR 12.2). Derived by dividing potential erosion (from all sources except gully erosion) by the T value, which is the rate of soil erosion above which long term productivity may be adversely affected. The erodibility index is used in conservation compliance and CRP. One of the eligibility requirements for the CRP is that land have an EI greater than 8
Emergent Plant	A plant that grows in shallow water with the root system submerged under the water and the upper vegetation rising about the water.
Endangered Species	A species that is threatened with extinction throughout all or a significant portion of its range.
Erosion	The removal and loss of soil by the action of water, ice, gravity, or wind.
Estuary	Regions of interaction between rivers and near-shore ocean waters, where tidal action and river flow mix fresh and salt water. Such areas include bays, mouths of rivers, salt marshes, and lagoons. These brackish water ecosystems shelter and feed marine life, birds, and wildlife.
Eutrophication	A process where more organic matter is produced than existing biological oxidization processes can consume.
Farm Income	The earnings of a farming operation over a given period of time, measured by several factors
Farmed Wetland	Wetlands that have been partially drained or are naturally dry enough to allow crop production in some years, but otherwise meet the soil, hydrological, and vegetative criteria defining a wetland.
Fauna	All animals associated with a given habitat, area, or period.
Filter Strip	An area of vegetation, generally narrow and long, that slows the rate of runoff, allowing sediments, organic matter, and other pollutants that are being conveyed by the water to be removed. Filter strips reduce erosion and the accompanying stream pollution, and can be a best management practice.
Floodplain	The lowland that borders a stream or river and is found outside of the floodway. It is usually dry, but subject to flooding.
Flora	All plant life associated with a given habitat, country, or period, including bacteria.
Flyways	A general term used to describe common migrating patterns among different bird species, based on definite geographic regions.
Forestland	A land cover/land use category that is at least 10 percent stocked by single-stemmed woody species of any size that will be at least 13 feet tall at maturity. Also included, for the NRI, is land bearing evidence of natural regeneration of tree cover and not currently developed for nonforest use.
Forest-use land	Forest-use land excludes special-use areas in forest cover, such as parks, wilderness, and wildlife areas, to avoid double counting. To eliminate overlap with other uses that exist is not feasible, but this reduced area is a more realistic approximation of the land that they may be expected to serve normal forest uses.
Fossil Fuel	Crude oil, natural gas, peat, coal, or other hydrocarbons that are derived from the remains of plants and/or animals that were converted to other forms by biological, chemical, or physical forces of nature.
Gleaning	The placing of livestock on fields after harvesting to use the excess crop residue and grains that remain in the field.
Gross cash income	Is the sum of all receipts from the sale of crops, livestock, and farm related goods and services as well as all forms of direct payments from the government.

Glossary (continued)

Term/Acronym	Definition
Gross farm income	Is the same as gross cash income with the addition of nonmoney income, such as the value of home consumption of self-produced food and the imputed gross rental value of farm dwellings.
Groundwater	Water in the porous rocks and soils of the earth's crust; a large proportion of the total supply of fresh water.
Harvested Acres	The cropland actually harvested for a particular crop, usually somewhat smaller at the national level than planted acres due to weather damage or abandonment because of low market prices.
Harvested cropland	This category includes land from which crops were harvested, hay was cut, and land was used to grow short-rotation woody crops, land in orchards, citrus groves, Christmas trees, vineyards, nurseries, and greenhouses. Land from which two or more crops were harvested was counted only once. Land in tapped maple trees is included in woodland not pastured.
Hay	All hay including alfalfa,
Highly Erodible Land	Land that has an erodibility index of 8 or more. (Defined at 7 CFR 12.2)
Hydric	Containing an abundance of water.
Hydrology	The study of the distribution, movement, and chemical makeup of surface and ground waters.
Hydrophyte	Plants that live in water or that have adapted to hydric conditions.
Hypoxia	A low oxygen condition in the water that may occur where a nutrient-laden free-flowing body of water (like a river) enters a lake or ocean. The high nutrient content promotes rapid growth of plankton/phytoplankton that subsequently die and, in the process, consume large amounts of oxygen.
Infiltration	The flow of a liquid into a substance through small openings.
Introduced Species	Species that have evolved elsewhere and have been transported and purposely or accidentally disseminated by humans. Many terms describe these species including: alien, exotic, non-native, and nonindigenous
Invasive Species	A species that is 1) non-native (or alien) to the ecosystem under consideration, and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112). Invasive species generally tend to progress into communities that posses a few general communal characteristics, including, but not limited to climatically similar to original habitat of invader; low diversity of native species present; recently disturbed (early successional); absence of predators on invading species; and previously disturbed by humans.
Lacustrine	Pertaining to lakes.
Land Capability (Classification)	The quality of soil resources for agricultural use is commonly expressed as land capability classes and subclasses, which show, in a general way, the suitability of soils for most kinds of field crops. Soils are grouped according to their limitations when they are used to grow field crops, the risk of damage when they are used, and the way they respond to treatment. Capability classes, the broadest groups, are designated by Roman numerals I through VIII, with I being the best soils and VIII being the poorest.
Mangrove Swamp	A tidal swamp forest populated by plant species capable of growth and reproduction in areas that experience periodic tidal submergence in seawater with a resulting increase in saline conditions. They develop along coastal regions in tropical climates.
Market Price	The price per bushel (or pound or hundredweight) of an agricultural commodity paid in the private sector. It can sometimes refer to the price paid at domestic seaports or large inland terminal markets (such as daily cash prices listed in newspapers).
Marsh	A coastal region where the soil has high moisture content because of periodic flooding caused by the tides. The vegetation is normally dominated by grasses.

Glossary (continued)

Term/Acronym	Definition
Median Household Income	The income level which divides the income distribution of all of the households in a given area into two equal groups, half of the households having incomes above the median, half having incomes below the median.
Migrational Homing	Term used to describe the behavior of birds that return to the same nesting grounds year after year.
Mitigation	A method or action to reduce or eliminate adverse program impacts.
Native Grasses	Various regional and national grasses that were original to particular areas of the United States; they are regional with regards to soils, acidity or alkalinity, climate, diseases, and symbiotic coexistence with other plants in the surrounding area.
Neotropical Migrants	Bird species that annually migrate to the tropics during the northern winter months.
Net cash income	Is gross cash income less all cash expenses such as for feed, seed, fertilizer, property taxes, interest on debt, wages to hired labor, contract labor and rent to nonoperator landlords.
Net farm income	Is gross farm income less cash expenses and noncash expenses, such as capital consumption, perquisites to hired labor, and farm household expenses. Net farm income is a longer-term measure of the ability of the farm to survive as a viable income-earning business, while net cash income is a shorter-term measure of cash flow.
Nitrate	The nitrogen ion, NO3-, is derived from nitric acid and is an important source of nitrogen in fertilizers. Nitrate pollution of drinking water, shallow wells being particularly vulnerable, is of concern because infants are especially sensitive.
Nitrogen	An element found in the air and in all plant and animal tissues. For many crops, nitrogen fertilizer is essential for economic yields. However, nitrogen can also be a pollutant when nitrogen compounds are mobilized in the environment (e.g., leach from fertilized or manured fields), are discharged from septic tanks or feedlots, volatilize to the air, or are emitted from combustion engines. As pollutants, nitrogen compounds can have adverse health effects (see nitrate) and contribute to degradation of waters.
No Net Loss	A federal and state policy to achieve no overall net loss of the nation's remaining wetlands base as defined by acreage and function and to restore and create wetlands where feasible, to increase the quality and quantity of the nation's wetland resource base. Related program: Wetland Conservation Act, Section 404.
Non-Indigenous Species	Those species found beyond their natural ranges or natural zone of potential dispersal. Also referred to as exotic species.
Non-Indigenous Aquatic Nuisance Prevention and Control Act of 1990	A federal law to prevent the unintentional introduction and dispersal of non-indigenous species into the waters of the U.S. The act mandates the establishment of: a national ballast water control program; the Aquatic Nuisance Species Task Force; initial research funding; technical assistance and education for federal and state agencies; state management plans; and grant programs to prevent, monitor, and control the spread of zebra mussels and other exotic species. It also provides for the establishment of regulations that control the introduction of and dispersal of these organisms. See also aquatic nuisance species.
Nonpoint Source	A pollution source, which comes from diffuse sources (the origin of the pollutant cannot be easily defined), such as land runoff, precipitation, atmospheric deposition, or percolation. Nonpoint source pollution occurs when moving water, either from precipitation or irrigation, runs over the land or through the ground, picks up pollutants, and deposits them into a body of water or into the groundwater.
Nutrients	Elements or compounds essential as raw materials for organism growth and development, such as carbon, nitrogen, and phosphorus.

Glossary (continued)

Term/Acronym	Definition
Nutrient Pollution	Contamination by excessive inputs of nutrient a primary cause of eutrophication of surface waters, in which excess nutrients, usually nitrogen or phosphorus, stimulate algal growth. Sources of nutrient pollution include runoff from fields and pastures, discharges from septic tanks and feedlots, and emissions from combustion.
Ozone (O_3)	A highly reactive molecule composed of three oxygen atoms. Environmentally, ozone is important in two completely separate contexts—one, as a naturally occurring screen of harmful radiation in the outer atmosphere (i.e., stratospheric ozone), and two, as a component of polluting smog formed from emissions resulting from human activities (i.e., urban smog). In the stratosphere 7 to 10 miles above the Earth, naturally occurring ozone acts to shield the Earth from harmful radiation.
Organic	Chemically, a compound or molecule containing carbon bound to hydrogen. Organic compounds make up all living matter. The term organic frequently is used to distinguish "natural" products or processes from man-made "synthetic" ones. Thus, natural fertilizers include manures or rock phosphate, as opposed to fertilizers synthesized from chemical feedstocks.
Other Rural Land	A land cover/land use category that includes farmsteads and other farm structures, field windbreaks, barren land, and marshland.
Outfall	The location or structure where wastewater or drainage empties into the surface water from a sewer, drain, or other conduit.
Palustrine	Describing marsh or wetlands.
Particulate Matter (see also PM_{10})	Air pollutants, including dust, soot, dirt, smoke, and liquid droplets directly emitted into the air by sources such as factories, power plants, cars, construction activity, fires, and natural windblown dust.
Pastureland	A land use/land cover category of land managed primarily for the production of introduced forage plants for livestock grazing. For the NRI, includes land that has a vegetative cover of grasses, legumes, and/or forbs, regardless of whether or not it is being grazed by livestock.
Pastureland and rangeland, other than cropland and woodland pastured	This land use category is very inclusive and encompasses all grazable land that does not qualify as cropland pasture. It may be irrigated or dry land. In some areas, it can be a high quality pasture but could not be cropped without improvements. In other areas, it is barely able to be grazed and is only marginally better than waste land.
Pb	the heavy metal element lead
PEA	Programmatic Environmental Assessment
Peat	The residue of partly decomposed plant material in which various plant parts, such as stems, can easily be discerned.
Per Capita Income	The average income computed for every person in a given area, excluding patients or inmates in institutional quarters. Per capita income is derived by dividing the total income of every person in a given area by the total population within that area.
Permanent Vegetative Cover	Trees, or perennial grasses, legumes, or shrubs with an expected life span of at least 5 years. Permanent cover is required on cropland entered into the CRP.
pH	A numerical indicator of the acidity or alkalinity of a substance; ranges from 0.0 (acidic) to 14.0 (basic or alkaline); pure water is neutral, with a ph of 7.0.
Photosynthesis	Process occurring in the cells of green plants that converts carbon dioxide and water into food and oxygen in the presence of sunlight.
Point Source Pollution	Pollutants that are discharged or emitted from discrete "point" sources, such as pipes and smokestacks. While much agricultural pollution is nonpoint source, some agricultural activities are affected (e.g., feedlots of over 1,000 animal units).

Glossary (continued)

Term/Acronym	Definition
Porosity	A description of the total volume of soil, rock, or other material that is occupied by pore spaces. A high porosity does not equate to a high permeability, in that the pore spaces may be poorly interconnected.
Poverty Thresholds	For statistical purposes (e.g., counting the poor population), the U.S. Census Bureau uses a set of annual income levels (poverty thresholds) that represent a Federal Government estimate of the point below which a household of a given size has cash income insufficient to meet minimal food and other basic needs. They were developed in the 1960s, based largely on estimates of the minimal cost of food needs, to measure changes in the poor population. The thresholds differ by household size and are adjusted annually for overall inflation.
Priority Pollutants	Pollutants identified in certain federal and state regulations. Priority pollutants have different definitions in air, water, and waste programs.
Rangeland	A land cover/land use category on which the climax or potential plant cover is composed principally of native grasses, grass-like plants, forbs, or shrubs suitable for grazing and browsing, and introduced forage species that are managed like rangeland. For the NRI, grasslands, savannas, many wetlands, some deserts, and tundra were considered to be rangeland.
Regional Permit	A type of general permit that may be issued by a division or district engineer (USACE), after compliance with other procedures, for activities in navigable waters of the U.S. or wetlands. Related program: Section 404, 33 CFR.
Riparian	Of, on, or relating to the banks of a natural course of water.
Riparian Areas	Lands adjacent to rivers and streams that are influenced by flooding. They are considered transition zones between the aquatic and terrestrial ecosystem that are connected by direct land-water interaction.
Runoff	Non-infiltrating water entering a stream or other conveyance channel shortly after a rainfall.
Section 404	A term used to refer to Section 404 of the federal Clean Water Act that outlines permit requirements for dredging and other filling activities in waters of the U.S.. This is the primary federal law that regulates activities affecting wetlands. The Section 404 program is administered by the USACE in accordance with the EPA. Related program: Clean Water Act.
Sediment	Any finely divided organic and/or mineral matter derived from rock or biological sources that have been transported and deposited by water or air.
Sedimentation	The process of depositing sediment from suspension in water.
Sign-Up Period	A USDA-prescribed time period, usually lasting several months, when farmers can enroll in a crop price support or other farm program.
Slippage	Occurs when the amount of land an owner enrolls in the CRP is partially or wholly offset by additional land that is brought into production.
Sodbuster	A program created by Title 12 of the Food Security Act of 1985 designed to discourage the plowing up of erosion-prone grasslands for use as cropland. If such highly erodible land is used for crop production without proper conservation measures as laid out in a conservation plan, a producer may lose eligibility to participate in farm programs. Sodbuster provisions remain in effect under the FAIR Act of 1996.
Soil Quality	The capacity of a specific kind of soil to function, within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation.
Soil and Water Conservation District (SWCD)	Local county units of government within states that assist landowners with implementation of soil and water conservation measures and practices. Related program: Board of Water and Soil Resources.
Surface Water	All water above the surface of the ground including, but not limited to lakes, ponds, reservoirs, artificial impoundments, streams, rivers, springs, seeps, and wetlands.

Glossary (continued)

Term/Acronym	Definition
Swampbuster	A provision of the Food Security Act of 1985 that discourages the conversion of wetlands to cropland use. Producers converting a wetland area to cropland lose eligibility for several federal farm program benefits. Benefits are lost from when water levels are lowered to facilitate agricultural production until they have been restored. Several types of wetlands and wetlands in specified situations are exempt. Exceptions include conversions that began before December 23, 1985, conversions of wetlands that had been created artificially, crop production on wetlands that became dry through drought, and conversions that USDA has determined have minimal effect on wetland values. Swampbuster provisions were amended in the FAIR Act of 1996 to provide greater flexibility for producers and landowners.
Threatened Species	Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
Threatened Species	A species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
Topsoil	The topmost layer of soil, usually containing organic matter.
Total cropland	This category includes cropland harvested; cropland used only for pasture or grazing; cropland idle or used for cover crops or soil improvement but not harvested and not pastured; cropland on which all crops failed; and cropland in cultivated summer fallow.
Total Cropland	Includes five components: cropland harvested, crop failure, cultivated summer fallow, cropland used only for pasture, and idle cropland.
Total Maximum Daily Load (TMDL)	A TMDL identifies the amount of a specific pollutant or property of a pollutant, from a point source ("end of the pipe"), a nonpoint source (from runoff), and natural background sources, including a margin of safety, that may be discharged to a water body and still ensure that the water body attains water quality standards.
Toxic Pollutant	A substance or combination of substances, including disease-causing agents, which may cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including reproductive malfunctions), or physical deformation in organisms or their offspring.
Toxicity	The inherent potential of a substance to cause adverse effects in a living organism.
Vegetative Cover	Is planted vegetation that has an expected lifespan to sufficiently protect the land for the life of CRP-1 and includes trees, perennial grasses, legumes, and forbs or shrubs.
Velocity	The distance moved in a given direction per unit time (such as meters per second).
Vistas	An overlook or narrow break in vegetation that allows a wide or distant view of the landscape.
Water Table	The uppermost level of the belowground, geological formation that is saturated with water.
Waters of the United States	A term used in federal regulations that defines all water bodies regulated as waters of the U.S. It includes: (1) all waters which may be susceptible to use in interstate or foreign commerce; (2) all interstate waters, including interstate wetlands; (3) all other waters, such as intrastate lakes, rivers, streams (including intermittent streams), mud flats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce including any such waters; (4) all impoundments of waters otherwise defined as waters of the United States; (5) tributaries of waters identified in this section; (6) the territorial seas; (7) wetlands adjacent to waters (other than waters that are themselves wetlands). Related programs: Clean Water Act, 33 CFRs.
Watershed	The land across and under which water flows on its way to a stream, river, lake, or other water body; the surface drainage area above a specified point on a stream.

Glossary (continued)

Term/Acronym	Definition
Wellhead Protection Area	A surface and subsurface land area regulated to prevent contamination of a well or well-field supplying a public water system. This program, established under the Safe Drinking Water Act, is implemented through state governments.
Wetland	Areas that are 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. Wetlands generally include swamps, marshes, bogs, and similar areas. (Defined at 33 CFR 320-328.3)
Wildlife Corridor	Is a strip of land, 1 to 3 chains in width, which includes woody vegetation as determined by STC, in consultation with the State Technical Committee, that connects existing wildlife cover and provides travel lanes for wildlife through a nonprotective cover area.
Woodland pastured	This category includes all woodland used for pasture or grazing during the census year. Woodland or forest land pastured under a per-head grazing permit was not counted as land in farms and, therefore, was not included in woodland pastured.

Appendix A

Agreement Between the State of Vermont
and
The U.S. Department of Agriculture Commodity Credit Corporation
Concerning the Implementation of the Vermont
Conservation Reserve Enhancement Program

AGREEMENT

BETWEEN

THE U.S. DEPARTMENT OF AGRICULTURE
COMMODITY CREDIT CORPORATION

AND

THE STATE OF VERMONT
CONCERNING THE IMPLEMENTATION OF A
CONSERVATION RESERVE ENHANCEMENT PROGRAM

I. PURPOSE

This Agreement is between the Commodity Credit Corporation (CCC) of the United States Department of Agriculture (USDA) and the State of Vermont to implement a Conservation Reserve Enhancement Program (CREP) to achieve non-point source pollutant reduction, enhance fish and wildlife habitat and to attain conservation goals established by the State of Vermont (State).

II. GENERAL PROVISIONS

The State has identified the watersheds in the Lake Champlain Basin and Connecticut River Basin for treatment. The tributaries of Lake Champlain are the Lamoille, LaPlatte, Mettawee, Missisquoi, Poultney and Winooski Rivers, and Otter Creek. The main tributaries of the Connecticut River Basin are the Black, Connecticut, Deerfield, Ompompanoosuc, Ottaquechee, Passumpsic, Saxtons, Stevens, Waits, Wells, West, White and Williams Rivers. (See Exhibit 1) (Amended 12/04/2003)

The CREP described within this Agreement (Agreement) is designed to reduce pollutant loading to Lake Champlain and the Connecticut River and enhance wildlife habitat. This Agreement is intended to enhance the ability of agriculture producers to enroll certain acreage under the Conservation Reserve Program (CRP), where deemed desirable by USDA, CCC, and the State. This Agreement is not intended, and does not, supersede any rules or regulations which have been, or may be, promulgated by either USDA, CCC, or the State. (Amended 12/04/2003)

It is the intent of USDA, CCC, and the State of Vermont that this Agreement will address the following objectives:

1. Supplement existing efforts to achieve phosphorus reductions attributable to non-point sources (NPS) described in the Lake Champlain Basin Program (LCBP). The LCBP

identifies a NPS phosphorus reduction target of 48.3 tons per year.

2. Assist existing efforts to achieve nitrogen reductions attributable to NPS required by the Long Island Sound Total Maximum Daily Load (TMDL). The Connecticut River Basin drains into Long Island Sound. The TMDL identifies a nitrogen reduction target of 1,173 tons per year for Massachusetts, New Hampshire and Vermont. Point sources and NPS must show 25 and 10 percent reductions, respectively. Vermont's CREP efforts in the Connecticut River Basin will account for a majority of Vermont's nitrogen reduction for the Long Island Sound TMDL.

3. Provide secondary benefits to wildlife and aquatic habitat. (Amended 12/04/2003)

III. AUTHORITY

A. Federal.

The CCC has the authority under provisions of the Food Security Act of 1985 (1985 Act), as amended (16 U.S.C. 3830 et seq.), and the regulations at 7 CFR Part 1410 to perform all its activities contemplated by this Agreement. In accordance with the 1985 Act, CCC is authorized to enroll land in CRP through December 31, 2007. (Amended 12/04/2003)

Sections 1230, 1234, and 1242 of the 1985 Act authorize the CCC to enter into agreements with States to use the CRP in a cost-effective manner to further specific conservation and environmental objectives of a State and the nation. Other authorities may also apply.

B. State.

The Vermont Department of Agriculture, Food and Markets of the State of Vermont is provided the statutory authority to perform all activities contemplated by this Agreement by the provisions of Vermont Statutes Annotated 6 V.S.A §4821(a) and §4810(b).

IV. PROGRAM ELEMENTS

USDA, CCC, and the State agree that:

A. This Vermont CREP will consist of a special continuous sign-up CRP component and a State of Vermont incentive program. The Vermont CREP will seek to enroll up to 1,331 acres of eligible crop land or marginal pasture land located within the watersheds located in the project area. State payments under this CREP will not exceed $847,191 as set forth in Table 1 unless the State shall agree, by a subsequent declaration, to a higher amount. (Amended 12/04/2003)

B. The following CRP practices are approved for inclusion in this program:

Filter strips (CP21)
Riparian buffer (CP22)
Wetland restoration (CP23)
Grassed Waterways (CP8A)

All installed practices must be consistent with applicable USDA Natural Resources Conservation Service NRCS field office technical guides and FSA manual 2-CRP.

In determining CCC=s share of the cost of practice establishment, CCC shall use appropriate CRP procedures. All approved conservation plans shall be consistent with applicable CRP statutes and regulations.

C. Enrollments in this CRP will be by continuous sign-up. The CRP contract must be for a minimum of 10 years but may not exceed a maximum of 15 years; however, the State will endeavor to enroll 322 of the 1,331 acres using CP22 in contracts which shall run for a total of 30 years, encompassing the term of the CRP contract itself, and for which the State shall pay to the producer an incentive. In this Agreement, such contracts shall be designed to extend the benefits of the CRP enrollment for such additional period as needed to complete the 30-year period. (Amended 12/04/2003)

D. Eligible producers will not be denied the opportunity to offer eligible acreage for enrollment during normal, general, or continuous CRP enrollment periods.

E. CRP contracts executed under this Agreement will be administered in accordance with, and subject to, the CRP regulations at 7 CFR Part 1410, and the provisions of this Agreement. In the event of a conflict, the CRP regulations will be controlling.

F. No lands may be enrolled under this program until the USDA=s Deputy Administrator for Farm Programs, in consultation with NRCS, concurs with a detailed Vermont Amendment to Handbook 2-CRP which will provide a thorough description of this program and applicable practices.

V. FEDERAL COMMITMENTS

Subject to the availability of funds, USDA and CCC agree to:

A. Determine applicant eligibility for participation in the CRP portion of the CREP consistent with the regulations at 7 CFR Part 1410, and administer those CRP contracts that are executed.

B. Pay up to 50 percent of the reimbursable costs of the CRP conservation practices. Reimbursements to CREP participants from all sources may not exceed 100 percent of the cost of such practices.

C. Make rental payments under the CRP contract at normal CRP county cropland soil rental rates, subject to such further payments as are provided for in paragraphs D, E, F, and G of this section.

D. Make incentive payments, as an addition to the annual rental payment equal to 100

percent of the base CRP maximum annual rental rate otherwise applicable to the land under the normal CRP.

E As a further incentive, make a one-time Signing Incentive Payment (SIP) for land enrolled using CP8A, CP21 and CP22 in accordance with Handbook 2-CRP to the extent and in the amount that a SIP would normally be paid for such enrollments.

F. As a further incentive, make a one-time Practice Incentive Payment (PIP) in accordance with Handbook 2-CRP to the extent and in the amount that a PIP would normally be paid for such enrollments.

G. As a further incentive, make maintenance payments in accordance with Handbook 2-CRP to the extent and in the amount that would normally be paid for such enrollments. Such payments and those under paragraphs E and F will be considered additional rental payments for payment limit purposes and other purposes.

H. Conduct normal annual compliance reviews in accordance with Farm Service Agency Handbook 2-CRP to ensure compliance with the CRP contract.

I. Provide information to landowners concerning Vermont=s CREP program and technical assistance for the CREP in general.

J. Provide, in a manner consistent with the existing CRP program, assistance to producers whose practices are destroyed by circumstances beyond the producer=s control.

K. Permit successors-in-interest to enroll in CRP agreements under this CREP in the same manner as allowed for under any other CRP contract.

L. Share appropriate data, in accordance with procedures and restrictions and exemptions established under the Federal Freedom of Information Act, Federal privacy laws, and other applicable laws, with the State of Vermont to facilitate State monitoring efforts.

VI. STATE COMMITMENTS

Subject to the availability of funds, the State agrees to:

A. Contribute not less than 20 percent of the overall annual in-kind and direct program costs. However, incentive payments paid under this Agreement by the State shall not, unless separately agreed, exceed $847,191. (Amended 12/04/2003)

B. Be responsible for:

1) With respect to all crop land qualifying for this CREP as “cropland” under CRP, paying an up-front, one-time signing incentive equal to the product of multiplying $117 per acre by the number equal to the number of years of the CRP contract period for land producing an annual crop for at least three (3) out of the past six

(6) years and $53 per acre by the number equal to the number of years of the CRP contract period for land producing an annual crop for less than three (3) out of the past six (6) years. (Amended 12/04/2003)

(2) With respect to all land qualifying for this CREP as Amarginal pasture land@, paying an up-front, one-time signing incentive equal to the product of multiplying $21 per acre by the number equal to the number of years of the contract period, except that this calculation shall be $28 per acre, rather than $21, for marginal pasture land enrolled in 30 year contracts under this program.

(3) Paying all costs associated with its annual monitoring program;

(4) Reviewing proposed CRP contract offers to determine whether the proposed project meets Vermont's goals. Prepare and sign Vermont State CREP contracts prior to county committee approval on CRP contracts. Provide for additional technical assistance in the development of conservation plans and in the design of needed structural soil conservation and sediment retention practices in each watershed as resources become available. (Amended 12/04/2003)

C. Seek applicants willing to offer eligible and appropriate land for enrollment in the CREP.

D. Facilitate the provision of technical assistance from the local conservation districts and other conservation cooperators to develop conservation plans for applicants offering to enroll eligible acreage in the CREP.

E. Implement a broad campaign for continuous public information and education regarding the CREP.

F. Ensure that the CREP is coordinated with other agricultural and natural resource conservation programs at the State and Federal level.

G. By January 1 of each year, beginning in 2002, provide a report to CCC summarizing the status of enrollments under this CREP and progress on fulfilling the other commitments of this program. The annual report to CCC shall include: level of program participation; the results of the annual monitoring program in terms of accomplishing program objectives; a summary of non-Federal CREP program expenditures; and, recommendations to improve the program.

H. By January 1 of each year, beginning in 2002, submit information summarizing its overall costs for the program. In the event that the State has not obligated 20 percent of the overall costs for a relevant Federal fiscal year, the State will fulfill its obligations within 90 days by paying the shortfall to CCC, or by providing some other mutually agreed-upon remedy.

I. Temporarily release participants from any contractual restriction on crop production during the CRP contract period if such release is determined necessary by the Secretary

of Agriculture in order to address a national emergency.

VII. MISCELLANEOUS PROVISIONS

A. All commitments by USDA and the State are subject to the availability of funds. In the event either party is subject to a funding limitation, it will notify the other party expeditiously and make any necessary modifications to this Agreement.

B. All CRP contracts under this CREP shall be subject to all limitations set forth in the regulations at 7 CFR Part 1410, including, but not limited to, such matters as economic use, transferability, violations, and contract modifications. Agreements between owners or operators and the State may impose additional conditions not in conflict with those under the CRP regulations, but only if approved by CCC.

C. Neither the State nor USDA shall assign or transfer any rights or obligations under this Agreement without the prior written approval of the other party.

D. The State and USDA agree that each party will be responsible for its own acts and results only to the extent authorized by law and shall not be responsible for the acts of each other, third parties, or the results thereof.

E. The Deputy Administrator for Farm Programs, Farm Service Agency, is delegated authority to carry out this Agreement, and with the concurrence of the Governor of Vermont or his designee, may further amend this Agreement consistent with the provisions of the 1985 Act and the regulations at 7 CFR Part 1410.

F. This Agreement shall remain in force and effect until terminated by USDA, CCC, or the State. Either party upon written notice may terminate this Agreement. Such termination will not alter responsibilities regarding existing contractual obligations under the CREP between participants and USDA or CCC, or between participants and the State.

IT IS SO AGREED:

FOR THE U.S. DEPARTMENT OF AGRICULTURE AND THE COMMODITY CREDIT CORPORATION

_____ _____

James R. Mosely
Deputy Secretary
U.S. Department of Agriculture and
Vice Chairman of the Board
Commodity Credit Corporation

Date

FOR THE STATE OF VERMONT

_____	_____
Howard Dean, M.D.	Date
Governor State of Vermont	

The undersigned witnessed the signing of the Conservation Reserve Enhancement Program Agreement between the State of Vermont and the U.S. Department of Agriculture.

_____	_____
_____	_____
_____	_____
_____	_____
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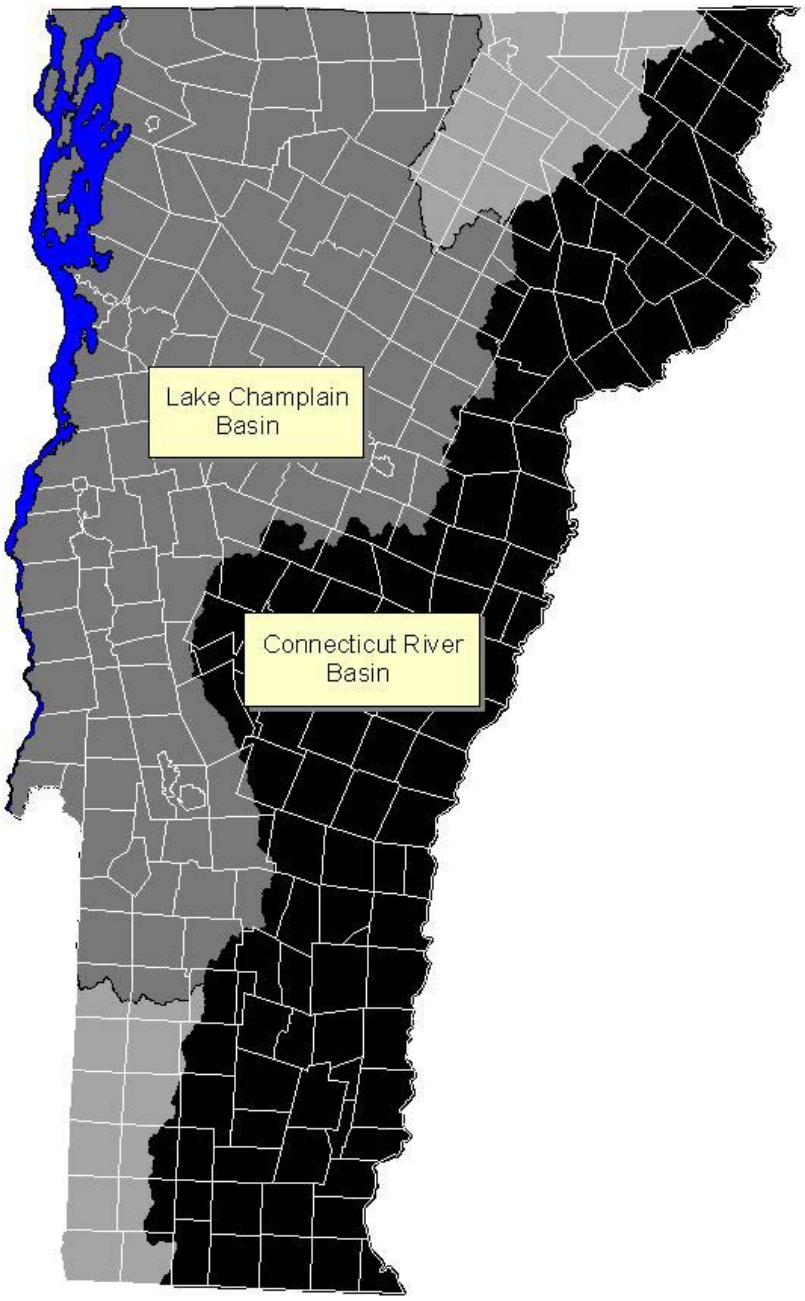
TABLE 1. State Acreage and Dollar Commitments

Conservation Practice	10 Year Contract	15 Year Contract	30 Year Contract	State Dollars Committed
Cropland (CP21 & CP22) $117/acre per year	[3 Acres] $3,861	[255 Acres] $447,525		[258 Acres] $451,386
Cropland (CP21 & CP22) $53/acre per year		[50 Acres] $39,750		[50 Acres] $39,750
Marginal Pasture Land (CP22) $21/acre per year		[701 Acres] $220,815		[701 Acres] $220,815
Marginal Pasture Land (CP22) $28/acre per year for 15 years			[322 Acres] $135,240	[322 Acres] $135,240
Totals:	[3 Acres] $3,861	[1,006 Acres] $708,090	[322 Acres] $135,240	[1,331 Acres] $847,191

(Amended 12/04/2003)

EXHIBIT 1. Lake Champlain and Connecticut River Basin Watersheds
(Amended 12/04/2003)



Lake Champlain and Connecticut River Basins In Vermont

Addendum Agreement
between
The State of Vermont
and the U.S. Department of Agriculture
Commodity Credit Corporation
concerning the implementation of
Vermont's Conservation Reserve Enhancement Program

This amendment hereby modifies the Memorandum of Agreement (Agreement) entered into between Commodity Credit Corporation (CCC), U.S. Department of Agriculture (USDA), and the State of Vermont (State) to implement A Conservation Reserve Enhancement Program (CREP) to achieve non-point source pollutant reduction, enhance fish and wildlife habitat and to attain conservation goals established by the State. The CREP is part of the national Conservation Reserve Program (CRP), operated by USDA for CCC.

The following revisions are made as an Addendum to the Agreement and to modify the respective clause numbers.

Sections II, III(B), IV(A), IV(C), VI(A), and VI(B)(1) of the Agreement are hereby amended by:

1) adding the Lake Memphremagog Basin and Hudson River Basin to the watersheds eligible for participation in the Vermont CREP (Section II),
2) changing the document to reflect name change from “Department” to “Agency” (Section III(B)),
3) reflecting an increase of the amount of acreage eligible for enrollment under the Vermont CREP from 1,331 to 7,500 acres (Section IV(A)),
4) increasing the State dollars available for the program from $847,191 to $3,750,000 (Sections IV(A)),
5) creating 30-year State contracts for crop land enrollment (Section IV(C)),
6) creating different incentive levels for crop land enrolled in 30-year contracts and for crop land implementing the CRP practice CP22 (Section VI(B)(1)), and
7) amending Table 1 of the Agreement by specifying titles and practices eligible for enrollment in each category and subcategory and State dollar incentive rates for each category and subcategory.

Accordingly, sections II, III(B), IV(A), IV(C), VI(A), VI(B)(1), Table 1 and Exhibit 1 of the Agreement are hereby amended to read as follows:

* * * * *

II. GENERAL PROVISIONS

The State has identified the watersheds in the Lake Champlain Basin, Connecticut River Basin, Lake Memphremagog Basin and Hudson River Basin for treatment. The main tributaries of Lake Champlain are the Lamoille, LaPlatte, Mettawee, Missisquoi, Poultney and Winooski Rivers, and Otter Creek. The main tributaries of the Connecticut River Basin are the Black, Connecticut, Deerfield, Ompompanoosuc, Ottaquechee, Passumpsic, Saxtons, Stevens, Waits, Wells, West, White and Williams Rivers. The main tributaries of the Lake Memphremagog Basin are the Barton, Black, Clyde, Coaticook, Tomifobia and Willoughby Rivers and Lords Creek. The main tributaries of the Hudson River Basin are the Batten Kill, Hoosic, Little Hoosic, Roaring Branch, South Stream, Walloomsac Rivers and White Creek. (See Exhibit 1)

The CREP described within this Agreement is designed to reduce pollutant loading to Lake Champlain, the Connecticut River, Lake Memphremagog and Hudson River and enhance wildlife habitat. This Agreement is intended to enhance the ability of agriculture producers to enroll certain acreage under the Conservation Reserve Program (CRP), where deemed desirable by USDA, CCC, and the State. This Agreement is not intended, and does not, supersede any rules or regulations which have been, or may be, promulgated by either USDA, CCC, or the State.

It is the intent of USDA, CCC, and the State of Vermont that this Agreement will address the following objectives:

"1. Supplement existing efforts to achieve phosphorus reductions attributable to non-point sources (NPS) described in the Lake Champlain Basin Program (LCBP). The LCBP identifies a NPS phosphorus reduction target of 48.3 tons per year."

"2. Assist existing efforts to achieve nitrogen reductions attributable to NPS required by the Long Island Sound Total Maximum Daily Load (TMDL). The Connecticut River Basin and Hudson River Basin drain into Long Island Sound. The TMDL identifies a nitrogen reduction target of 1,173 tons per year for Massachusetts, New Hampshire and Vermont. The TMDL provides that point sources and NPS must show a 25 and 10 percent reduction, respectively. Vermont's CREP efforts in the Connecticut River Basin will account for a majority of Vermont's nitrogen reduction for the Long Island Sound TMDL."

"3. Supplement existing efforts to achieve phosphorus reductions in the Lake Memphremagog Basin. The Lake Memphremagog Basin has been identified as a phosphorus-impacted watershed."

"Vermont's CREP efforts in the Lake Memphremagog Basin is designed to help reduce the NPS phosphorus level by 10 percent."

"4. Provide secondary benefits to wildlife and aquatic habitat."

III. AUTHORITY

B. State.

The Vermont Agency of Agriculture, Food and Markets of the State of Vermont is provided the statutory authority to perform all activities contemplated by this Agreement by the provisions of Vermont Statutes Annotated 6 V.S.A '4821(a) and '4810(b).

IV. PROGRAM ELEMENTS

A. This Vermont CREP will consist of a special continuous sign-up CRP component and a State of Vermont incentive program. The Vermont CREP will seek to enroll up to 7,500 acres of eligible crop land or marginal pasture land located within the watersheds located in the project area. State payments under this CREP will not exceed $3,750,000 as set forth in Table 1 unless the State shall agree, by a subsequent declaration, to a higher amount.

C. Enrollments in the CRP will be by continuous sign-up. The CRP contract must be for a minimum of 10 years but may not exceed a maximum of 15 years; however, the State will endeavor to enroll acreage in contracts which shall run for a total of 30 years, encompassing the term of the CRP contract itself, and for which the State shall pay to the producer an incentive. In this Agreement, such contracts shall be designed to extend the benefits of the CRP enrollment for such additional period as needed to complete the 30 year period.

VI. STATE COMMITMENTS

A. Contribute not less than 20 percent of the overall annual in-kind and direct program costs. However, incentive payments paid under this Agreement by the State shall not, unless separately agreed, exceed $3,750,000.

B. (1) With respect to all land qualifying for this CREP as "crop land" under CRP, paying an up-front, one-time signing incentive equal to the product of multiplying a

preset rate per acre by the number equal to the number of years of the CRP contract period. The preset rates are based on factors including the length of the state contract, the number of years the land has produced an annual crop within the past six (6) years, and type of practice being installed. The preset rates are:

(a.) $117 per acre for land which has produced an annual crop for at least three (3) out of the past six (6) years except that this calculation shall be $127

per acre for such crop land installing CRP practice CP22 or enrolled in 30 year contracts installing CRP practice CP21 and $137 per acre for such crop land enrolled in 30 year contracts installing CRP practice CP22, rather than $117, under this program.

(b.) $53 per acre for land which has produced an annual crop for one (1) or two (2) of the past six (6) years except that this calculation shall be $63 per acre for such crop land installing CRP practice CP22 or enrolled in 30 year contracts installing CRP practice CP21 and $73 per acre for such crop land enrolled in 30 year contracts installing CRP practice CP22, rather than $53, under this program.

(c.) $53 per acre for land which has produced an annual crop for zero (0) of the past six (6) years installing CRP practice CP22 except that this calculation shall be $63 per acre, rather than $53, for such crop land enrolled in 30 year contracts under this program.

Signed this _____ Day of _____, 2004.

John Johnson
Deputy Administrator for Farm Programs
Farm Service Agency

S.R. Kerr
Secretary
Vermont Agency of Agriculture,

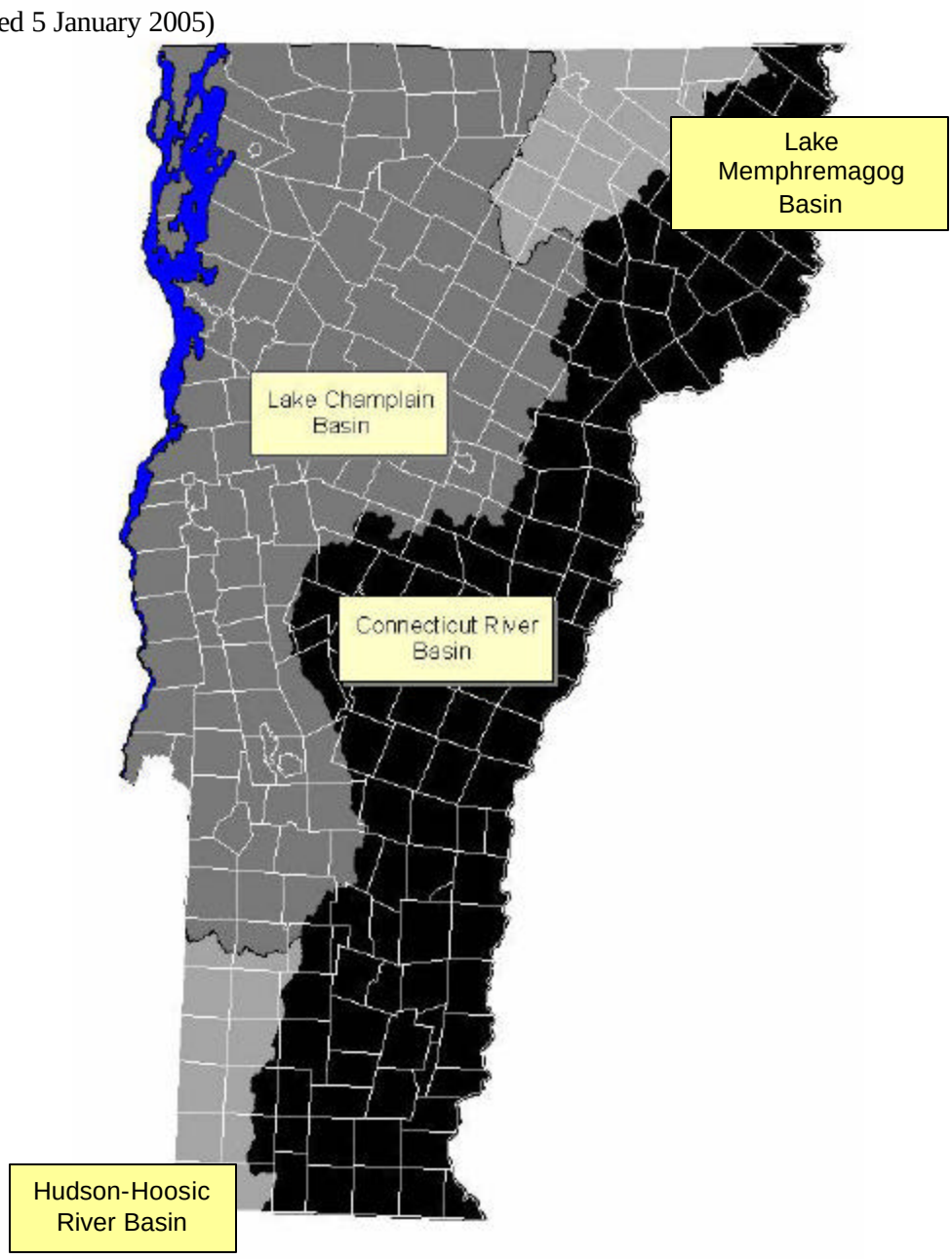
Deputy Vice President
Commodity Credit Corporation

Food & Markets

TABLE 1. State Acreage and Dollar Commitments

	15 Year Contract	**30 Year Contract**
Cropland producing an annual crop for at least three (3) out of the past six (6) years	CP21 - $117/acre per year CP22 - $127/acre per year	CP21 - $127/acre per year CP22 - $137/acre per year
Cropland producing an annual crop for one (1) or two (2) of the past six (6) years	CP21 - $53/acre per year CP22 - $63/acre per year	CP21 - $63/acre per year CP22 - $73/acre per year
Cropland producing an annual crop for zero (0) of the past six (6) years	CP22 - $53/acre per year	CP22 - $63/acre per year
Marginal Pasture Land	CP22 - $21/acre per year	CP22 - $28/acre per year
Totals	[7,500 Acres] $3,750,000	

EXHIBIT 1: CREP Watershed Basins in Vermont
(Amended 5 January 2005)



Major River Basins in Vermont

Appendix B

Vermont CREP Conservation Practices Summary Tables

Conservation Practices Summary Table

FSA CRP Conservation Practices		NRCS National Conservation Practice Standards			
CP	**Practice**	**Practice Code**	**Practice**	**Purpose**	**Maintenance**
8A	Grassed Waterways	412	Grassed Waterways	• To convey runoff from terraces, diversions, or other water concentrations without causing erosion flooding • To reduce gully erosion • To protect/improve water quality	• Protect from concentrated flow and grazing until vegetation is established. • Mininimize damage to vegetation by excluding livestock whenever possible. • Inspect regularly, especially following heavy rains. • Damaged areas should be filled, copacted, and seeded immediately. • Prescribed burning and mowing may be appropriate to enhance wildlife values, but must be conducted to avoid peak nesting seasons and reduce winter cover.
8A	Grass Waterways, Non-Easement	362	Diversions	• To reduce runoff damages from upland runoff. Divert water away from farmsteads, agricultural waste systems, and other improvements • To increase or decrease the drainage area above ponds • To protect terrace systems by diverting water from the top terrace where topography, land use, or land ownership prevents terracing the land above. Intercept surface and shallow subsurface flow	• Construction and maintenance activities should be done in such a way as to minimize disturbance to wildlife habitat. • Opportunities should be explored to restore and improve wildlife habitat, including habitat for threatened, endangered, and other species of concern. • Vegetation should be maintained and trees and brush controlled by hand, chemical and/or mechanical means. • Planting native vegetation should be considered at non-cropland sites. • Periodic inspections are necessary, especially immediately following significant storms. • Promptly repair or replace damaged components of the diversion as necessary.

Conservation Practices Summary Table (continued)

FSA CRP Conservation Practices		NRCS National Conservation Practice Standards			
CP	**Practice**	**Practice Code**	**Practice**	**Purpose**	**Maintenance**
22	Riparian Buffer	340	Cover and Green Manure Crop	• To reduce erosion from wind and water • To increase soil organic matter • To manage excess nutrients in the soil profile • To promote biological nitrogen fixation • To increase biodiversity • Weed suppression • To provide supplemental forage • To manage soil moisture	• Control growth of the cover crop to reduce competition from volunteer plants and shading. • Control weeds in the cover crop by mowing or herbicide application • Avoid cover crop species that attract potentially damaging insects.
22 and 23	Riparian Buffer and Wetland Restoration	643	Restoration and Management of Declining Habitat	• To restore land or aquatic habitats degraded by human activity • To provide habitat for rare and declining wildlife species by restoring and conserving native plant communities • To increase native plant community diversity • To manage unique or declining native habitats	• Where feasible, prescribed burning should be utilized instead of mowing. • Management measures must be provided to control invasive species and noxious weeds. • Species used in restoration should be suitable for the planned purpose. • Only certified, high quality, and ecologically adapted native seed and plant material should be used. • Proper planting dates, and care in handling and planting of the seed or plant material will ensure that established vegetation will have an acceptable rate of survival. • Site preparation should be sufficient for establishment and growth of selected species. • Timing and use of equipment should be appropriate for the site and soil conditions.

Conservation Practices Summary Table (continued)

FSA CRP Conservation Practices		NRCS National Conservation Practice Standards			
CP	**Practice**	**Practice Code**	**Practice**	**Purpose**	**Maintenance**
23	Wetland Restoration	657	Wetland Restoration	• To restore hydric soil conditions, hydrologic conditions, hydrophytic plant communities, and wetland functions that occurred on the disturbed wetland site prior to modification to the extent practicable	• A permanent water supply should be available approximating the needs of the wetlands. • A functional assessment (Hydrogeomorphic Approach or similar method) should be performed on the site prior to restoration. • The vegetation should be restored, as close to the original natural plant community as the restored site conditions will allow. • Adjust timing and level setting of water control structures required for the establishment of desired hydrologic conditions or for management of vegetation. • Develop inspection schedule for embankments and structures for damage assessment. • Monitor depth of sediment accumulation to be allowed before removal is required.
21 and 22	Filter Strips and Riparian Buffer	658	Wetland Creation	• To create wetlands that have wetland hydrology, hydrophytic plant communities, hydric soil conditions, and wetland functions and/or values	• Created wetlands should only be located where the soils, hydrology, and vegetation can be modified to meet the current NRCS criteria for a wetland. • Establish vegetative buffers on surrounding uplands to reduce sediment and soluble and sediment-attached substances carried by runoff and/or wind. • Timing and level setting of water control structures should be established to reach the desired hydrologic conditions or for management of vegetation. • Inspection of embankments should be done at regular intervals. • The depth of sediment accumulation to be allowed before removal should be determined prior to wetland creation. • Haying and grazing should be managed to protect and enhance established and emerging vegetation.

Conservation Practices Summary Table (continued)

FSA CRP Conservation Practices		NRCS National Conservation Practice Standards			
CP	**Practice**	**Practice Code**	**Practice**	**Purpose**	**Maintenance**
21, 22 and 23	Filter Strips, Riparian Buffer, and Wetland Restoration	395	Stream Habitat Improvement and management	• To provide suitable habitat for desired aquatic species and diverse aquatic communities • To provide channel morphology and associated riparian characteristics important to desired aquatic species	• Establish soil conservation, nutrient management, pesticide management practices, and other management techniques for non point sources of pollution. • Restore or protect riparian and floodplain vegetation and associated riverine wetlands. • Maintain suitable flows for aquatic species and channel maintenance • If needed, improve floodplain-to-channel connectivity including off-channel habitats.
21	Filter Strips	386	Field Border	• To reduce erosion from wind and water • To protect soil and water quality • To manage harmful insect populations • To provide wildlife food and cover	• Field borders should be established around the field edges and should be seeded with adapted species of permanent grass, legumes, and/or shrubs. • Repair storm damage. • Remove sediment when 6 inches of sediment have accumulated at the field border/cropland interface. • Shut off sprayers and raise tillage equipment to avoid damage to field borders. • Shape and reseed border areas damaged by chemicals, tillage or equipment traffic • Fertilize, mow, harvest, and control noxious weeds to maintain plant vigor. • Ephemeral gullies and rills that develop in the border should be filled and reseeded.

Conservation Practices Summary Table (continued)

FSA CRP Conservation Practices		NRCS National Conservation Practice Standards			
CP	**Practice**	**Practice Code**	**Practice**	**Purpose**	**Maintenance**
21	Filter Strips	393A	Filter Strip	• To reduce sediment, particulate organics, and sediment adsorbed contaminant loadings in runoff • To reduce dissolved contaminant loadings in runoff • To reduce sediment, particulate organics, and sediment adsorbed contaminant loadings in surface irrigation tailwater • To restore, create or enhance herbaceoushabitat for wildlife and beneficial insects • To maintain or enhance watershed functions and values	• Permanent filter strip vegetative plantings should be harvested as appropriate to encourage dense growth, maintain an upright growth habit, and remove nutrients and other contaminants that are contained in the plant tissue. • Undesired weed species, especially state-listed noxious weeds, should be controlled with spot spraying of herbicide. • Prescribed burning may be used to manage and maintain the filter strip when an approved burn plan has been developed. • Prescribed burning may be used to manage and maintain the filter strip when an approved burn plan has been developed.
22 and 21	Riparian Buffer, and Filter Strips	391	Riparian Forest Buffer	• To create shade to lower water temperatures to improve habitat for aquatic organisms • To provide a source of detritus and large woody debris for aquatic and terrestrial organisms. • Create wildlife habitat and establish wildlife corridors • To reduce excess amounts of sediment, organic material, nutrients and pesticides in surface runoff and reduce excess nutrients and other chemicals in shallow ground water flow • To provide protection against scour erosion within the floodplain. • To restore natural riparian plant communities	• The riparian forest buffer should be inspected periodically and protected from adverse impacts • Replacement of dead trees or shrubs and control of undesirable vegetative competition should continue until the buffer is, or will progress to, a fully functional condition. • An adjacent filter strip should be used to control excessive erosion and sediment deposition within the stream.

Conservation Practices Summary Table (continued)

FSA CRP Conservation Practices		NRCS National Conservation Practice Standards			
CP	**Practice**	**Practice Code**	**Practice**	**Purpose**	**Maintenance**
22, and 21	Riparian Buffer and Filter Strips	390	Riparian Herbaceous Cover	• To intercept direct solar radiation to help maintain or restore suitable water temperatures for fish and other aquatic organisms • To improve and protect water quality by reducing the amount of sediment and other pollutants, such as pesticides, organic, and nutrients in surface runoff as well as nutrients and chemicals in shallow ground water flow • To provide food for aquatic insects that are important food items for fish. • To help stabilize the channel bed and stream bank. • To serve as corridors between existing habitats	• Plant species selected must be adapted to the duration of saturation and inundation of the site. • Upland erosion control measures should be put into place in order to slow the movement of soil and other debris in order to maintain riparian function. • The use of any fertilizers, pesticides or other chemicals in the riparian area should be used only when necessary.
21	Filter Strips	601	Vegetative Barrier	• To reduce sheet and rill erosion • To reduce ephemeral gully erosion • To manage water flow • To stabilize steep slopes • To trap sediment	• All tillage and equipment operations in the interval between barriers should be parallel to the vegetative barrier. • Obstructions, such as trees and debris that interfere with vegetative growth and maintenance, should be removed to improve vegetation establishment and alignment. • Mowing may be used as a management practice to encourage the development of a dense stand and prevent shading of crops in adjacent fields. • Weed control should be accomplished by mowing or by spraying or wick application of labeled herbicides. • Crop tillage and planting operations should be parallel with the vegetative barrier. • Washouts or rills that develop should be filled and replanted immediately.

Conservation Practices Summary Table (continued)

FSA CRP Conservation Practices		NRCS National Conservation Practice Standards			
CP	**Practice**	**Practice Code**	**Practice**	**Purpose**	**Maintenance**
23	Wetland Restoration	644	Wetland Wildlife Habitat Management	• To maintain, develop, or improve habitat for waterfowl, fur-bearers, or other wetland associated flora and fauna	• Native plants should be used wherever possible. • Haying and livestock grazing plans should be developed so as to allow the establishment, development, and management of wetland and associated upland vegetation for the intended purpose. • Biological control of undesirable plant species and pests (e.g., using predator or parasitic species) shall be implemented where available and feasible.
22	Riparian Buffer	612	Tree/Shrub Establishment	• To establish woody plants for forest products, wildlife habitat, long-term erosion control and improvement of water quality, treat waste, reduction of air pollution, sequestration of carbon, energy conservation, and enhance aesthetics	• Competing vegetation should be controlled until the woody plants are established. • Noxious weeds should be controlled. • Replant when survival is inadequate • Supplemental water should be provided as needed. • Trees and shrubs should be inspected periodically and protected from adverse impacts including insects, diseases, competing vegetation, fire, and damage from livestock or wildlife. • Periodic applications of nutrients may be needed to maintain plant vigor

Appendix C

Vermont's Threatened, Endangered, Special Concern, and Special Interest Species

Vermont Listed Animal and Plants

Vermont State Threatened and Endangered Species

Common Name	Scientific Name	State Status	Federal Status
MAMMALS			
Eastern mountain lion (cougar)	*Felis concolor*	E	LE
Lynx	*Lynx canadensis*	E	LT
Marten	*Martes americana*	E	
Small-footed bat	*Myotis leibii*	T	
Indiana bat	*Myotis sodalis*	E	LE
BIRDS			
Henslow's sparrow	*Ammodramus henslowii*	E	
Grasshopper sparrow	*Ammodramus savannarum*	T	
Upland sandpiper	*Bartramia longicauda*	T	
Black tern	*Chlidonias niger*	T	
Sedge wren	*Cistothorus platensis*	E	
Spruce grouse	*Falcipennis canadensis*	E	
Peregrine falcon	*Falco peregrinus*	E	
Common loon	*Gavia immer*	E	
Bald eagle	*Haliaeetus leucocephalus*	E	LT
Loggerhead shrike	*Lanius ludovicianus*	E	
Osprey	*Pandion haliaetus*	E	
Common tern	*Sterna hirundo*	E	
AMPHIBIANS			
Western (Striped) chorus frog	*Pseudacris triseriata*	E	
REPTILES			
Spiny softshell (turtle)	*Apalone spinifera*	T	
Spotted turtle	*Clemmys guttata*	E	
Timber rattlesnake	*Crotalus horridus*	E	
Five-lined skink	*Eumeces fasciatus*	E	
FISH			
Lake sturgeon	*Acipenser fulvescens*	E	
Eastern sand darter	*Ammocrypta pellucida*	T	
Northern brook lamprey	*Ichthyomyzon fossor*	E	
American brook lamprey	*Lampetra appendix*	T	
Stonecat	*Noturus flavus*	E	
Channel darter	*Percina copelandi*	E	
AMPHIPODS			
Taconic cave amphipod	*Stygobromus borealis*	E	
INSECTS			
Beach-dune tiger beetle	*Cicindela hirticollis*	T	
Cobblestone tiger beetle	*Cicindela marginipennis*	T	
Puritan tiger beetle	*Cicindela puritana*	T	LT
MOLLUSKS			
Dwarf wedgemussel	*Alasmidonta heterodon*	E	LE
Brook floater	*Alasmidonta varicosa*	T	
Cylindrical papershell	*Anodontoides ferussacianus*	E	
Pocketbook	*Lampsilis ovata*	E	
Fluted-shell	*Lasmigona costata*	E	
Fragile papershell	*Leptodea fragilis*	E	
Black sandshell	*Ligumia recta*	E	
Eastern (pearlshell) pearl mussel	*Margaritifera margaritifera*	T	

State Status As per the Vermont Endangered Species Law (10 V.S.A. Chap. 123)

- E: Endangered: in immediate danger of becoming extirpated in the state
- T: Threatened: with high possibility of becoming endangered in the near future

There are 29 state endangered and 13 state threatened animals in Vermont.

Federal Status As per the Federal Endangered Species Act (P.L. 93-205)

- LE: Listed endangered
- LT: Listed threatened

http://www.anr.state.vt.us/fw/fwhome/index.htm

http://www.vt.audubon.org/IBAIntro.html

Rare and Uncommon Native Animals of Vermont Nongame and Natural Heritage Program
Vermont Fish and Wildlife Department
October 2000

This list of Vermont's Rare and Uncommon Animal list is produced by the Vermont Nongame and Natural Heritage Program (NNHP). The NNHP is housed in the Vermont Fish and Wildlife Department of the Vermont Agency of Natural Resources. NNHP is the state's official repository for records of rare, threatened, and endangered species. Information in the NNHP database is the result of work from past and current zoologists and interested amateurs.

This list is published to inform naturalists, biologists, planners, developers and the general public about our rare native fauna. These animals are rare because they have very particular habitat requirements, are at the edges of their ranges, are vulnerable to disturbance or collection, or have difficulty reproducing for unknown reasons. There are also a number of species listed which we consider uncommon in the state, but this is an incomplete listing. The list is organized by major group, and follows general phylogenetic order, so related species are found together.

Species with a state status of Threatened or Endangered are protected by **Vermont's Endangered Species Law (10 V.S.A. Chap. 123)** and a federal status of Threatened or Endangered are protected by the **Federal Endangered Species Act (P.L. 93-205).**

The state and global ranks are informational categories regarding the rarity of the species. A brief explanation of legal status and informational ranks is attached to the end of the rare and uncommon animal list. Members of the Scientific Advisory Group of Birds, Mammals, Reptiles and Amphibians, and Invertebrates to the Vermont Endangered Species Committee, review the state ranks periodically for changes.

We are actively tracking rare species with the following state ranks: SH, S1, S2 (breeding records only for birds). However, we are also interested in information on uncommon species (S3). If you locate a rare or uncommon species, we would appreciate receiving information on its occurrence. Attached is a rare animal report form to summarize information on a rare or uncommon animal occurrence. Copies may be made of this list and rare animal forms. Forms are also available on our website at: http://www.anr.state.vt.us/fw/fwhome/nnhp/index.html

Please respect the rights of private property owners and obtain landowner permission before entering private property.

For further information, suggestions or comments about this list please contact:

Mark Ferguson, NNHP Zoologist (802)241-3117; markf@fwd.anr.state.vt.us
Steve Parren, NNHP Program Coordinator (802) 241-3717; sparren @fwd.anr.state.vt.us
Everett Marshall, NNHP Information Manager (802) 241-3715; everett.marshall @anr.state.vt.us Nongame and Natural Heritage Program, Vermont Dept. of Fish and Wildlife, 103 South Main Street, Building 10 South, Waterbury, VT 05671-0501

Vermont Listed Animal and Plants

Rare and Uncommon Native Animals
Non-game and Natural Heritage Program
Vermont Fish and Wildlife Department
October 2000

VERTEBRATES

FISH

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Ichthyomyzon fossor	Northern brook lamprey	S 1	G4	E	
Ichthyomyzon unicuspis	Silver lamprey	S2?	G5		
Lampetra appendix	American brook lamprey	S 1	G4	T	
Cottus bairdi	Mottled sculpin	S2	G5		
Acipenser fulvescens	Lake sturgeon	S 1	G3	E	
Anguilla rostrata	American eel	S4	G5	SC	
Prosopium cylindraceum	Round whitefish	S1	G5	SC	
Salvelinus alpinus oquassa	Artic char or sunapee trout	SX	G5T2Q		
Esox masquinongy	Muskellunge	S 1	G5	SC	
Exoglossum maxillingua	Cutlips minnow	S3	G5		
Hybognathus hankinsoni	Brassy minnow	S 1	G5	SC	
Hybognathus regius	Eastern silvery minnow	S2	G5		
Notropis bifrenatus	Bridle shiner	S1?	G5	SC	
Notropis heterodon	Blackchin shiner	S 1	G5	SC	
Notropis heterolepis	Blacknose shiner	S 1	G5		
Notropis rubellus	Rosyface shiner	S2S3	G5		
Phoxinus neogaeus	Finescale dace	S3	G5		
Carpiodes cyprinus	Quillback	S 1	G5	SC	
Moxostoma anisurum	Silver redhorse	SU	G5	SC	
Moxostoma carinatum	River redhorse	SP	G4	SC	
Moxostoma hubbsi	Copper redhorse	SP	G1	SC	
Moxostoma valenciennesi	Greater redhorse	SU	G3	SC	
Noturus flavus	Stonecat	S 1	G5	E	
Culaea inconstans	Brook stickleback	S2S3	G5		
Ammocrypta pellucida	Eastern sand darter	S 1	G3	T	
Etheostoma exile	Iowa darter	SR	G5	SC	
Etheostoma flabellare	Fantail darter	S3	G5		
Percina copelandi	Channel darter	S 1	G4	E	

AMPHIBIANS

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Ambystoma jeffersonianum	Jefferson salamander	S2	G5	SC	
Ambystoma laterale	Blue-spotted salamander	S3	G5	SC	
Ambystoma opacum	Marbled salamander	SR	G5		
Desmognathus ochrophaeus	Allegheny dusky salamander	SR	G5		
Hemidactylium scutatum	Four-toed salamander	S2	G5	SC	
Necturus maculosus	Common mudpuppy	S2	G5	SC	
Bufo fowleri	Fowler's toad	S 1	G5	SC	
Pseudacris triseriata	Western (striped) chorus frog	S1	G5	E	
Ambystoma jeffersonianum	Jefferson salamander	S2	G5	SC	

Vermont Listed Animal and Plants

REPTILES

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Clemmys guttata	Spotted turtle	S 1	G5	E	
Clemmys insculpta	Wood turtle	S3	G4	SC	
Graptemys geographica	Common map turtle	S3	G5	SC	
Sternotherus odoratus	Common musk turtle (stinkpot)	S2	G5	SC	
Apalone spinifera	Spiny softshell	S 1	G5	T	
Eumeces fasciatus	Five-lined skink	S1	G5	E	
Coluber constrictor	Eastern racer	S 1	G5	SC	
Elaphe obsoleta	Eastern rat snake	S2	G5	SC/PT	
Nerodia sipedon	Northern water snake	S3	G5		
Thamnophis sauritus	Eastern ribbon snake	S2	G5	SC	
Crotalus horridus	Timber rattlesnake	S 1	G4	E	

MAMMALS

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Sorex palustris	Water shrew	S3	G5		
Sorex dispar	Long-tailed or rock shrew	S2	G4	SC	
Sorex hoyi	Pygmy shrew	S2	G5		
Myotis sodalis	Indiana bat	S 1	G2	E	LE
Myotis leibii	Small-footed bat	S 1	G3	T	
Myotis septentrionalis	Northern long-eared bat	S3	G4		
Lasionycteris noctivagans	Silver-haired bat	S3?	G5		
Pipistrellus subflavus	Eastern pipistrelle	S3	G5		
Sylvilagus transitionalis	New england cottontail	SU	G4	SC	
Sylvilagus transitionalis pop 1	New england cottontail	SU	G4T4	SC	
Microtus chrotorrhinus	Rock vole	S2	G4	SC	
Microtus pinetorum	Woodland vole	S3	G5		
Synaptomys cooperi	Southern bog lemming	S3	G5		
Martes americana	American marten	S1?	G5	E	
Felis concolor	Mountain lion	SH	G5	E	LE
Lynx canadensis	Lynx	SA	G5	E	
Sorex palustris	Water shrew	S3	G5		

BIRDS

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Gavia immer	Common loon	S2B,S4N	G5	E	
Podilymbus podiceps	Pied-billed grebe	S2B,S3N	G5	SC	
Botaurus lentiginosus	American bittern	S3B,S3N	G4		
Ixobrychus exilis	Least bittern	S2B,S2N	G5	SC	
Ardea herodias	Great blue heron	S2S3B,S5N	G5		
Egretta thula	Snowy egret	SAB	G5		
Bubulcus ibis	Cattle egret	S1B,S1S2N	G5		
Nycticorax nycticorax	Black-crowned night-heron	S1B,S2N	G5		
Anas crecca	Green-winged teal	S2B,S5N	G5		

BIRDS (Continued)

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Anas acuta	Northern pintail	S1B,S5N	G5		
Anas strepera	Gadwall	S1B,S3N	G5		
Anas americana	American wigeon	S1B,S3N	G5		
Mergus serrator	Red-breasted merganser	S1B,S3S4N	G5		
Cathartes aura	Turkey vulture	S3B,S4N	G5		
Pandion haliaetus	Osprey	S2B,S4N	G5	E	
Haliaeetus leucocephalus	Bald eagle	SHB,S2N	G4	E	LE
Circus cyaneus	Northern harrier	S2B,S3S4N	G5	SC	
Accipiter cooperii	Cooper's hawk	S2S3B,SZN	G5	SC	
Falco columbarius	Merlin	S1BSZN	G5		
Falco peregrinus	Peregrine falcon	S2B,S2N	G4	E	
Falcipennis canadensis	Spruce grouse	S 1	G5	E	
Porzana carolina	Sora	S2S3B,S3N	G5	SC	
Gallinula chloropus	Common moorhen	S2B,S2N	G5		
Fulica americana	American coot	SAB,S2N	G5		
Bartramia longicauda	Upland sandpiper	S2S3B,S3N	G5	T	
Larus marinus	Great black-backed gull	S1B,S5N	G5		
Sterna hirundo	Common tern	S1S2B,S2N	G5	E	
Chlidonias niger	Black tern	S2B,S2N	G4	T	
Tyto alba	Barn owl	S1B,S1N	G5	SC	
Asio otus	Long-eared owl	S2B,S2N	G5	SC	
Asio flammeus	Short-eared owl	S1B,S2N	G5	SC	
Chordeiles minor	Common nighthawk	S2S3B,SZN	G5	SC	
Caprimulgus vociferus	Whip-poor-will	S2B,SZN	G5	SC	
Melanerpes erythrocephalus	Red-headed woodpecker	S1S2B,SZN	G5	SC	
Picoides tridactylus	Three-toed woodpecker	SAB,S?N	G5	SC	
Picoides arcticus	Black-backed woodpecker	S2B,S2N	G5	SC	
Perisoreus canadensis	Gray jay	S1S2B,S1S2N	G5	SC	
Thryothorus ludovicianus	Carolina wren	S1S2B,S2N	G5		
Cistothorus platensis	Sedge wren	S1B,SZN	G5	E	
Polioptila caerulea	Blue-gray gnatcatcher	S3B,SZN	G5		
Catharus bicknelli	Bicknell's thrush	S3B,SZN	G4	SC	
Lanius ludovicianus migrans	Migrant loggerhead shrike	S1B,SZN	G5T3Q	E	
Vireo philadelphicus	Philadelphia vireo	S2S3B,SZN	G5		
Vermivora pinus	Blue-winged warbler	S2S3B,SZN	G5		
Vermivora c hrysoptera	Golden-winged warbler	S2S3B,SZN	G4		
Vermivora peregrina	Tennessee warbler	S2S3B,SZN	G5		
Dendroica tigrina	Cape may warbler	S2S3B,SZN	G5		
Dendroica pinus	Pine warbler	S3B,SZN	G5		
Dendroica discolor	Prairie warbler	S3B,SZN	G5		
Dendroica palmarum	Palm warbler	S1BSZN	G5		
Dendroica castanea	Bay-breasted warbler	S1B,SZN	G5		
Dendroica cerulea	Cerulean warbler	S1B,SZN	G4	SC	
Wilsonia pusilla	Wilson's warbler	S1B,SZN	G5	SC	
Pooecetes gramineus	Vesper sparrow	S3B,SZN	G5	SC	

BIRDS (Continued)

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Ammodramus savannarum	Grasshopper sparrow	S2B,SZN	G5	T	
Ammodramus henslowii	Henslow's sparrow	S1B,SZN	G4	E	
Euphagus carolinus	Rusty blackbird	S3B,SZN	G5	SC	
Icterus spurius	Orchard oriole	S 1 S2B	G5		
Loxia curvirostra	Red crossbill	S1S2B?,S3N	G5		

INVERTEBRATES

ISOPODS and AMPHIPODS

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Lirceus lineatus	An isopod	S1?	G5	SC	
Stygobromus borealis	Taconic cave amphipod	S1	G3G4	E	
Pontoporeia affinis	An amphipod	S 1	G?	SC	

CRAYFISH

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Cambarus bartonii	Appalachian brook crayfish	S3	G5		

BEETLES

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Cicindela puritana	Puritan tiger beetle	SH	G1G2	T	LT
Cicindela marginipennis	Cobblestone tiger beetle	S 1	G2G3	T	
Cicindela ancocisconensis	Boulder-beach tiger beetle	S 1	G3		
Cicindela hirticollis	Beach-dune tiger beetle	S1	G5	T	
Cicindela patruela	A tiger beetle	S 1	G3	SC	
Cicindela purpurea	A tiger beetle	SU	G5	SC	
Cicindela longilabris	A tiger beetle	S2	G5		
Sphaeroderus nitidicollis brevoorti	A ground beetle	S2	G?T?		
Agonum crenistriatum	A ground beetle	S2	G?		
Agonum darlingtoni	A ground beetle	S2	G?		
Agonum decorum	A ground beetle	S3	G?		
Agonum moerens	A ground beetle	S3?	G?		
Agonum picicornoides	A ground beetle	S3	G?		
Agonum punctiforme	A ground beetle	S2?	G?		
Agonum superioris	A ground beetle	S3?	G?		
Scaphinotus bilobus	A ground beetle	S2	G?		
Pterostichus brevicornis	A ground beetle	S3	G?		
Pterostichus castor	A ground beetle	S3	G?		
Pterostichus lachrymosus	A ground beetle	S3	G?		
Pterostichus pinguedineus	A ground beetle	S2	G?		
Pterostichus punctatissimus	A ground beetle	S3	G?		
Nebria suturalis	A ground beetle	S 1	G?		
Notiophilus nemoralis	A ground beetle	S3	G?		
Bembidion rufotinctum	A ground beetle	S2	G?	SC	

BEETLES (Continued)

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Bembidion cordatum	A ground beetle	S 1	G?		
Bembidion grapei	A ground beetle	S2	G?		
Bembidion muscicola	A ground beetle	S3	G?		
Bembidion mutatum	A ground beetle	S2	G?		
Bembidion quadratulum	A ground beetle	S2	G?		
Bembidion robusticolle	A ground beetle	S 1?	G?		
Bembidion rolandi	A ground beetle	S2	G?		
Bembidion affine	A ground beetle	S3	G?		
Acupalpus alternans	A ground beetle	S1?	G?		
Acupalpus rectangulus	A ground beetle	S2?	G?		
Diplocheila impressicollis	A ground beetle	S3	G?		
Diplocheila striatopunctata	A ground beetle	S3	G?		
Diplocheila assimilis	A ground beetle	S3	G?		
Pseudamara arenaria	A ground beetle	S3	G?		
Dyschirius brevispinus	A ground beetle	S2	G?		
Dyschirius erythrocerus	A ground beetle	S2	G?		
Dyschirius politus	A ground beetle	S2	G?		
Elaphropus dolosus	A ground beetle	S2	G?		
Elaphropus levipes	A ground beetle	S2	G?		
Elaphrus fuliginosus	A ground beetle	S2	G?		
Geopinus incrassatus	A ground beetle	S2	G?		
Harpalus fulvilabris	A ground beetle	S2	G?		
Harpalus indigens	A ground beetle	S2	G?		
Harpalus providens	A ground beetle	S2	G?		
Lophoglossus scrutator	A ground beetle	S1	G?		
Miscodera arctica	A ground beetle	S 1	G?		
Notiobia sayi	A ground beetle	S2	G?		
Notiophilus aquaticus	A ground beetle	S2	G?		
Notiophilus borealis	A ground beetle	S 1	G?		
Notiophilus novemstriatus	A ground beetle	S2	G?		
Olisthopus micans	A ground beetle	S2	G?		
Parastachys oblitus	A ground beetle	S2	G?		
Parastachys rhodeanus	A ground beetle	S2	G?		
Patrobus foveocollis	A ground beetle	S2	G?		
Pentagonica picticornis	A ground beetle	S2	G?		
Pericompsus ephippiatus	A ground beetle	S 1	G?		
Platynus cincticollis	A ground beetle	S 1?	G?		
Platynus parmaginatus	A ground beetle	S2	G?		
Platypatrobus lacustris	A ground beetle	S 1	G?		
Schizogenius ferrugineus	A ground beetle	S 1	G?		
Sericoda obsoleta	A ground beetle	S 1	G?		
Sericoda quadripuncata	A ground beetle	S 1	G?		
Tetragonoderus fasciatus	A ground beetle	S2	G?		
Trichocellus cognatus	A ground beetle	S2	G?		

Vermont Listed Animal and Plants

BEETLES (Continued)

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Atranus pubescens	A ground beetle	S2	G?		
Amara laevipennis	A ground beetle	S3	G?		
Amara erratica	A ground beetle	S2	G?		
Anchomenus picticornis	A ground beetle	S2	G?		
Apristus latens	A ground beetle	S2	G?		
Blethisa quadricollis	A ground beetle	S 1	G?		
Blethisa julii	A ground beetle	S2	G?		
Blethisa multipuncata	A ground beetle	S3	G?		
Carabus goryi	A ground beetle	S3	G?		
Carabus maeander	A ground beetle	S3	G?		
Dicaelus dilatus	A ground beetle	S 1	G?		

MOTHS AND BUTTERFLIES

Argyresthia castaneella	Chestnut ermine moth	SX	GH	SC	
Hesperia metea	Cobweb skipper	SU	G4G5		
Poanes massasoit	Mulberry wing	S1?	G4		
Euphyes dion	Sedge skipper	S 1 S2	G4		
Euphyes bimacula	Two-spotted skipper	SU	G4		
Pieris virginiensis	West virginia white	SU	G3G4	SC	
Satyrium caryaevorum	Hickory hairstreak	SH	G4		
Mitoura grynea	Olive hairstreak	SU	G5		
Speyeria idalia	Regal fritillary	SX	G3	SC	
Eacles imperialis	Imperial moth	SH	G5	SC	
Sphinx eremitus	Hermit sphinx	SH	G4	SC	
Sphinx drupiferarum	Plum sphinx	SH	G4	SC	
Zanclognatha martha	Pine barrens zanclognatha	S1?	G4		
Zale submediana	A noctuid moth	S1?	G4		
Catocala marmorata	Marbled underwing moth	SH	G3G4		
Papaipema sp 2	Ostrich fern borer	S2	G2G4		
Properigea sp 1	Barrens moth	SH	G2G3Q		
Lasionycta taigata	A noctuid moth	SH	G4		
Anomogyna fabulosa	A noctuid moth	S 1 S2	G4		
Anomogyna rhaetica	A noctuid moth	S 1 S2	G4		

MOLLUSKS

Alasmidonta heterodon	Dwarf wedgemussel	S1	G1G2	E	LE
Alasmidonta marginata	Elktoe	S1?	G4	SC	
Alasmidonta varicosa	Brook floater	S 1	G3	T	
Anodontoides ferussacianus	Cylindrical papershell	S 1 S2	G5	E	
Lampsilis ovata	Pocketbook	S2	G5	E	
Lasmigona compressa	Creek heelsplitter	S2	G5		
Lasmigona costata	Fluted-shell	S2	G5	E	
Leptodea fragilis	Fragile papershell	S2	G5	E	
Ligumia recta	Black sandshell	S1	G5	E	
Margaritifera margaritifera	Eastern pearlshell	S2	G4	T	
Potamilus alatus	Pink heelsplitter	S2	G5	E	
Pyganodon grandis	Giant floater	S2S3	G5	T	

Vermont Listed Animal and Plants

Rare and Uncommon Native Plants of Vermont
Nongame and Natural Heritage Program
Vermont Department of Fish and Wildlife
March 2000

The Vermont Rare and Uncommon Plants list is produced by the Vermont Nongame and Natural Heritage Program (NNHP). The NNHP is housed in the Vermont Department of Fish and Wildlife of the Vermont Agency of Natural Resources. NNHP is the state's official repository for records of rare, threatened, and endangered species. Information in the NNHP database is the result of work from past and current botanists and interested amateurs.

This list is intended to inform naturalists, biologists, planners, developers and the general public about our rare native flora. It contains a listing of all the rare native vascular plants, and a few moss species, of Vermont. A native species is one that can be shown to have been present in our region for at least 100 years, and for which there is no evidence that it had an exotic origin, or was introduced. These plants are rare because they have very particular habitat requirements, are at the edges of their ranges, are vulnerable to disturbance or collection, or have difficulty reproducing for unknown reasons. There are also a number of species listed which we consider uncommon in the state, but this is an incomplete listing.

Species with a state status of Threatened or Endangered (T or E) are protected by **Vermont's Endangered Species Law (10 V.S.A. Chap. 123)** and a federal status of Threatened or Endangered (T or E) are protected by the **Federal Endangered Species Act (P.L. 93-205).**

The state and global ranks are informational categories regarding the rarity of the species. A brief explanation of legal status and informational ranks is attached to the end of the rare and uncommon plant list. Members of the Scientific Advisory Group for Vascular Plants to the Vermont Endangered Species Committee review the state ranks periodically for changes.

We are actively tracking rare species with the following state ranks (SH, S1, S2). However, we are also interested in information on uncommon species (S3). If you locate a rare or uncommon species, we would appreciate receiving information on its occurrence. Attached is a rare plant report form to summarize information on a rare or uncommon plant occurrence. Copies may be made of this list and rare plant forms. It is also available on our website at
http://www.anr. state.vt.us/fw/fwhome/nnhp/index.html.

Please respect the rights of private property owners and obtain landowner permission before accessing private property.

For further information, suggestions or comments about this list please contact:

Robert Popp, NNHP Botanist (802) 241-3718; rpopp@fwd.anr.state.vt.us
Everett Marshall, NNHP Information Manager (802) 241-3715; everett.marshall@anr.state.vt.us Nongame and Natural Heritage Program, Vermont Dept. of Fish and Wildlife, 103 South Main Street, Building 10 South, Waterbury, VT 05671-0501

Vermont Listed Animal and Plants

Explanation of Legal Status and Information Ranks

State Status As per the Vermont Endangered Species Law (10 V.S.A. Chap. 123)

E: Endangered: in immediate danger of becoming extirpated in the state
T: Threatened: with high possibility of becoming endangered in the near future

Information categories only; not established by this law

SC: Special Concern: rare; status should be watched
PE: Proposed for endangered
PT: Proposed for threatened

Federal Status As per the Federal Endangered Species Act (P.L. 93-205)

LE: Listed endangered
LT: Listed threatened

NATURAL HERITAGE RANKING Informational categories only; not established by law. Developed by the Science Division of The Nature Conservancy.

State Ranks of Plants, Animals, and Natural Communities

State ranks are assigned by the Nongame & Natural Heritage Program based on the best available information. Ranks are reviewed annually. For bird species the ranks refer to breeding status only.

S1: Very rare, generally 1 to 5 occurrences believed to be extant and/or some factor(s) making it especially vulnerable to extirpation from the state
S2: Rare, generally 6 to 20 occurrences believed to be extant and/or some factor(s) making it vulnerable to extirpation in the state
S3: Uncommon, believed to be more than 20 occurrences and/or there is some threat to it in the state
S4: Apparently secure in state, often with more than 100 occurrences
S5: Demonstrably secure in state
SA: Accidental in state
SE: An exotic established in state
SH: Known from historical records only
SR: Reported from the state, but without persuasive documentation
SRF: Reported in error but this error persisted in the literature
SP: Possible in the state but no reported or documented records SSYN: No longer considered a taxon in the state.
SZ: Not of practical conservation concern because there are no definable occurrences
SX: Extirpated from the state
SU: Status uncertain
?: Denotes provisional rank

Breeding Status (primarily birds) only for species which have distinct breeding and or nonbreeding populations

B: Breeding status e.g. S1B is a very rare breeder
N: Nonbreeding status e.g. S1N is a very rare nonbreeder; and SZN is a migrant that occurs in an irregular, transitory, and/or dispersed manner

Global Ranks of Plants, Animal, and Natural Communities

Global Ranks are assigned by the international network of Natural Heritage Data Centers. The ranks are tracked by The Nature Conservancy and by The Natural Heritage Programs. They reflect the rarity and endangerment of species worldwide.

G1: - Critically imperiled globally (on the order of 1-5 occurrences worldwide)
G2: - Endangered globally (ca. 6-20 occurrences worldwide)
G3: - Threatened globally: rare and/or local
G4: - Apparently secure globally, though perhaps locally rare
G5: - Demonstrably secure globally
T: - Subrank for subspecies and varieties; 1-5 ranking similar to G ranks
Q: - Questionable taxonomic assignment
?: - Denotes provisional rank
NE: - Exotic established in nation
GU: - Status uncertain

For further information contact the Vermont Nongame and Natural Heritage Program, Dept. of Fish and Wildlife, Waterbury, VT 05671

Rare and Uncommon Native Plants of Vermont

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Acalypha gracilens	Slender copperleaf	S1	G5		
Acer nigrum	Black maple	S3	G5Q		
Achillea ligustica	Lovage yarrow	SEH	G?		
Adiantum aleuticum	Aleutian maidenhair-fern	S 1	G5?		
Adiantum viridimontanum	Green Mountain maidenhair-fern	S2	G2	T	
Adlumia fungosa	Climbing fumitory	S3	G4		
Agastache nepetoides	Yellow giant hyssop	S 1	G5	T	
Agastache scrophulariifolia	Purple giant hyssop	S 1	G4	T	
Agrimonia pubescens	Hairy agrimony	SH	G5		
Agropyron trachycaulum	Slender w heatgrass	S3	G5T5		
Agrostis borealis	Boreal bentgrass	S 1	G5		
Allium canadense	Wild garlic	S 1	G5	T	
Allium schoenoprasum var sibiricum	Siberian chives	S1	G5T5		
Alnus viridis	Green alder	S3	G5		
Alopecurus aequalis	Short-awn foxtail	S3	G5		
Amaranthus tuberculatus	Water hemp	S2	G4G5		
Amerorchis rotundifolia	Small round-leaved orchis	SH	G5		
Ammophila champlainensis	Champlain beach grass	S1	G1Q	E	
Anemone multifida	Early thimbleweed	S 1	G5	E	
Anemonella thalictroides	Rue-anemone	S 1	G5		
Aplectrum hyemale	Putty-root	S 1	G5	T	
Arabis divaricarpa	Limestone rock-cress	S2S3	G5		
Arabis drummondii	Drummond's rock-cress	S 1	G5	E	
Arabis lyrata	Lyre-leaved rock-cress	S 1 S2	G5	T	
Arabis missouriensis	Green rock-cress	S 1	G4?		
Arceuthobium pusillum	Dwarf mistletoe	S1S2	G5		
Arethusa bulbosa	Arethusa	S 1	G4	T	
Arisaema dracontium	Green dragon	S2	G5	T	
Aristida longespica	Spiked grass	S1	G5		
Arnica mollis	Hairy arnica	SX	G5		
Artemisia campestris ssp borealis	Boreal wormwood	S2	G5T5		
Artemisia campestris ssp caudata	Beach wormwort	S1	G5T5		
Asclepias amplexicaulis	Blunt-leaved milkweed	S 1	G5	T	
Asclepias exaltata	Poke milkweed	S3	G5		
Asclepias quadrifolia	Four-leaved milkweed	S3S4	G5		
Asclepias tuberosa	Butterfly-weed	SH	G5	T	
Asclepias verticillata	Whorled milkweed	SH	G5		
Asplenium montanum	Mountain spleenwort	S 1	G5	T	
Asplenium ruta-muraria	Wall rue	S3S4	G5		

Rare and Uncommon Native Plants of Vermont

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Asplenium trichomanes-ramosum	Green spleenwort	S 1	G4	T	
Aster borealis	Boreal aster	SH	G5		
Aster laevis	Smooth blue aster	S3	G5		
Aster nemoralis	Bog aster	S2S3	G5		
Aster ptarmicoides	Snowy aster	S2S3	G5		
Aster sagittifolius	Arrow-leaved aster	S1	G5T?Q		
Aster vimineus	Small white aster	S2?	G5T5		
Astragalus alpinus var brunetianus	Alpine milk-vetch	SX	G5T2T4		
Astragalus canadensis	Canadian milk-vetch	S2	G5	T	
Astragalus robbinsii var jesupii	Jesup's milk-vetch	S1	G5T1	E	LE
Astragalus robbinsii var minor	Blake's milk-vetch	S2	G5T5		
Astragalus robbinsii var robbinsii	Robbins milk-vetch	SX	G5TX		
Aureolaria flava	Smooth false-foxglove	S2	G5		
Aureolaria pedicularia	Feverweed	S 1	G5		
Aureolaria virginica	Downy false-foxglove	S2?	G5		
Baptisia tinctoria	Yellow wild-indigo				
Bartonia virginica	Yellow bartonia				
Betula borealis	Northern birch	SH	G4G5		
Betula pumila var glandulifera	Swamp birch	SH	G5T5	E	
Bidens discoidea	Small bidens	S2S3	G5		
Blephilia ciliata	Downy wood-mint	SH	G5		
Blephilia hirsuta	Hairy wood-mint	S 1	G5?	T	
Botrychium lanceolatum var angustisegmentum	Narrow triangle moonwort	S3	G5T4		
Botrychium lunaria	Moonwort	SH	G5	E	
Botrychium multifidum	Leathery grape-fern	S3	G5		
Botrychium oneidense	Blunt-lobed grapefern	S1S2	G4		
Botrychium rugulosum	Rugulose grape-fern	S 1 S2	G3		
Braya humilis	Northern rock-cress	S 1	G5	T	
Bromus kalmii	Wild chess	S2S3	G5		
Calamagrostis pickeringii	Pickering's reed bent-grass	SH	G4		
Calamagrostis stricta ssp inexpansa	Bentgrass	S1	G5T5	E	
Calliergon obtusifolium	A moss	S2	G2G4		
Calliergon richardsonii	A moss	S2	G3		
Callitriche hermaphroditica	Water-starwort	SH	G5		
Calopogon tuberosus	Tuberous grass-pink	S3	G5		
Calypso bulbosa	Fairy slipper	S1	G5	T	
Calystegia spithamaea	Low bindweed	S2	G4G5	T	
Cardamine bulbosa	Spring cress	S1	G5		

Rare and Uncommon Native Plants of Vermont

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Cardamine concatenata	Cutleaf toothwort	S3	G5		
Cardamine parviflora	Small-flower bitter-cress	S2S3	G5		
Cardamine pratensis var palustris	Cuckoo flower	S2S3	G5T5		
Carex aestivalis	Summer sedge	S1	G4		
Carex albursina	Minnesota sedge	S3	G5		
Carex alopecoidea	Foxtail sedge	S1	G5		
Carex aquatilis	Water sedge	S2S3	G5		
Carex arcta	Contracted sedge	S 1	G5	E	
Carex argyrantha	Hay sedge	S2	G5		
Carex atlantica	Eastern sedge	S 1	G5		
Carex atlantica ssp capillacea	Howe's sedge	S1	G5T5?		
Carex atratiformis	Blackish sedge	S1	G5	T	
Carex backii	Back's sedge	S3	G4		
Carex bicknellii	Bicknell's sedge	SH	G5		
Carex bigelowii	Bigelow's sedge	S1	G5		
Carex brevior	Sedge	S2S3	G5?		
Carex bushii	Bush's sedge	SH	G4		
Carex buxbaumii	Buxbaum's sedge	S 1	G5	E	
Carex capillaris	Capillary sedge	S 1	G5	T	
Carex chordorrhiza	Creeping sedge	S 1	G5	E	
Carex cryptolepis	Northeastern sedge	S3	G4		
Carex cumulata	Clustered sedge	S 1	G4?		
Carex davisii	Davis' sedge	S 1	G4		
Carex emmonsii	Emmon's sedge	S1	G5T5		
Carex exilis	Bog sedge	S2	G5		
Carex foenea	Bronze sedge	S 1 S2	G5	E	
Carex folliculata	Long sedge	S3	G4G5		
Carex formosa	Handsome sedge	S3	G4		
Carex garberi	Garber's sedge	S 1	G4	T	
Carex gracilescens	Slender sedge	SH	G5?		
Carex grayi	Gray's sedge	S3	G4		
Carex haydenii	Hayden's sedge	S 1	G5		
Carex hitchcockiana	Hitchcock's sedge	S3	G5		
Carex houghtoniana	Houghton's sedge	S 1	G5		
Carex laevivaginata	Smooth sedge	S3	G5		
Carex laxiculmis	Loose sedge	S2S3	G5		
Carex lenticularis	Shore sedge	S2S3	G5		
Carex livida	Pale sedge	S 1	G5	T	
Carex lupuliformis	False hop sedge	S2	G3G4		

Rare and Uncommon Native Plants of Vermont

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Carex merritt-fernaldii	Sedge	S 1 S2	G5		
Carex michauxiana	Michaux sedge	S3	G5		
Carex molesta	Troublesome sedge	S 1	G4		
Carex muehlenbergii	Muehlenberg's sedge	S 1	G5	T	
Carex nigra	Black sedge	SU	G5		
Carex oligocarpa	Few -fruited sedge	S 1	G4	E	
Carex pseudocyperus	False cyperus	S3	G5		
Carex richardsonii	Richardson's sedge	S 1	G4	E	
Carex schweinitzii	Schweinitz's sedge	S2	G3		
Carex scirpoidea	Scirpus-like sedge	S2	G5		
Carex siccata	Hay sedge	S1	G5T5	E	
Carex tenuiflora	Thin-flowered sedge	S 1	G5		
Carex tincta	Tinged sedge	SH	G4G5		
Carex trichocarpa	Hairy sedge	S2	G4		
Carex typhina	Cat-tail sedge	S2S3	G5		
Carex umbellata	Hidden sedge	SU	G5		
Carex vaginata	Sheathed sedge	S 1	G5	E	
Carex viridula ssp oedocarpa	A sedge	SH	G5?T?		
Carex viridula var viridula	Greenish sedge	S3	G5?T?		
Carex wiegandii	Wiegand's sedge	SH	G3		
Carex willdenowii	Willdenow's sedge	SH	G5		
Carya glabra	Pignut hickory	S2	G5		
Cassia nictitans	Wild sensitive plant	S2	G5		
Castilleja septentrionalis	Pale painted-cup	S1	G5	T	
Ceanothus herbaceus	Prairie redroot	S 1	G5	E	
Cerastium nutans	Nodding chickweed	S2	G5		
Ceratophyllum echinatum	Prickly hornwort	S 1	G4?		
Chenopodium capitatum	Strawberry blite	S2?	G5		
Chenopodium desiccatum	Fogg's goosefoot	SH	G5		
Chimaphila maculata	Spotted wintergreen	S2	G5		
Cinclidium stygium	A moss	S1?	G5		
Cinna arundinacea	Stout wood reed-grass	S3	G5		
Cirsium discolor	Field thistle	S 1 S2	G5		
Cirsium muticum	Swamp thistle	S3	G5		
Cladium mariscoides	Bog-rush	S2S3	G5		
Claytonia virginica	Virginia spring beauty	S2	G5		
Clematis occidentalis	Purple clematis	S3	G5		
Collinsia parviflora	Small-flowered collinsia	SH	G5		
Collinsonia canadensis	Canada horse-balm	S 1	G5		

Rare and Uncommon Native Plants of Vermont

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Conopholis americana	Squaw-root	S2S3	G5		
Corallorhiza odontorhiza	Autumn coral-root	S2	G5	T	
Cornus florida	Flowering dogwood	S 1	G5	T	
Corydalis aurea	Golden corydalis	S2	G5	T	
Corylus americana	American hazelnut	S2	G5		
Crataegus intricata	A hawthorn	S 1	G5		
Crataegus mollis	A hawthorn	SH	G5		
Crotalaria sagittalis	Rattlebox	S 1	G5	T	
Cryptogramma stelleri	Fragile rockbrake	S3	G5		
Cynoglossum virginianum var boreale	Northern wild comfrey	S1	G5T4	T	
Cyperus aristatus	Awned cyperus	S3	G5		
Cyperus diandrus	Low cyperus	S 1	G5	E	
Cyperus engelmannii	Engelmann's cyperus	SH	G4Q		
Cyperus houghtonii	Houghton's cyperus	S2	G4?	T	
Cyperus odoratus	Rusty flat segde	SH	G5		
Cypripedium arietinum	Ram's head lady's-slipper	S2S3	G3	T	
Cypripedium calceolus var parviflorum	Small yellow lady's-slipper	S3	G5		
Cypripedium calceolus var pubescens	Large yellow lady's-slipper	S3	G5		
Cypripedium pubescens var makasin	Makasin's yellow lady's-slipper	S3	G5TUQ		
Cypripedium reginae	Showy lady's-slipper	S3	G4		
Deschampsia atropurpurea	Mountain hairgrass	SH	G5		
Descurainia pinnata	Tansy-mustard	S1	G5		
Desmodium cuspidatum	Large-bracted tick-trefoil	S 1	G5	E	
Desmodium paniculatum	Panicled tick-trefoil	S3	G5		
Desmodium perplexum	Perplexed tick-trefoil	S3	G5		
Desmodium rotundifolium	Prostrate tick-trefoil	S 1	G5	T	
Diapensia lapponica	Diapensia	S1	G5	E	
Dichanthelium xanthophysum	Yellow panic-grass	S3	G5		
Diphasiastrum complanatum	A clubmoss	S 1 S2	G5		
Diphasiastrum sabinifolium	Ground-fir	S2S3	G4		
Diphasiastrum sitchense	Alaskan clubmoss	SH	G5	T	
Diplazium pycnocarpon	Glade fern	S3	G5		
Draba arabisans	Rock-cress	S2S3	G4		
Draba cana	Lanceolate cress	S1	G5	T	
Draba glabella	Smooth draba	S 1	G4G5	T	
Dracocephalum parviflorum	American dragonhead	S 1	G5	T	
Dryopteris filix-mas	Male fern	S2	G5	T	
Dryopteris fragrans	Fragrant fern	S2	G5		
Elatine minima	Small water-wort	S 1	G5		

Rare and Uncommon Native Plants of Vermont

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Eleocharis decumbens	Decumbent spikerush	SRF	G3?		
Eleocharis intermedia	Matted spikerush	S2S3	G5		
Eleocharis nitida	Slender spikerush	SH	G3G4		
Eleocharis olivacea	Olive spikerush	S1	G5		
Eleocharis ovata	Ovate spikerush	S 1	G5		
Eleocharis pauciflora	Few -flowered spikerush	S 1	G5	T	
Eleocharis robbinsii	Robbins spikerush	S 1	G4G5		
Elodea nuttallii	Nuttall waterweed	S2	G5		
Elymus villosus	Hairy wild-rye	S 1	G5		
Elymus wiegandii	Wild-rye	S3	G5T?		
Empetrum atropurpureum	Purple crowberry	SX	G5		
Empetrum nigrum	Black crowberry	S 1	G5		
Epilobium palustre	Marsh willow -herb	SH	G5		
Equisetum palustre	Marsh horsetail	S2	G5	T	
Equisetum pratense	Meadow horsetail	S3	G5		
Eragrostis capillaris	Lace love-grass	S2S3	G5		
Eragrostis frankii	Frank's love-grass	S2S3	G5		
Eragrostis hypnoides	Creeping love-grass	S2S3	G5		
Erigeron hyssopifolius	Hyssop-leaved fleabane	S2	G5		
Eriophorum gracile	Slender cotton-grass	S 1	G5		
Eriophorum tenellum	Rough cotton-grass	SU	G5		
Eupatorium fistulosum	Hollow joe-pye weed	SR	G5?		
Eupatorium purpureum	Sweet joe-pye weed	S2	G5		
Eupatorium sessilifolium	Sessile-leaved boneset	S 1	G5	E	
Euphorbia glyptosperma	Corrugate-seed broomspurge	SU	G5		
Festuca saximontana	Sheep fescue	S 1	G5		
Fimbristylis autumnalis	Autumn fimbristylis	S 1	G5	E	
Floerkea proserpinacoides	False mermaid-weed	SH	G5		
Galium boreale	Northern bedstraw	S3	G5		
Galium brevipes	Limestone swamp bedstraw	SH	G4?		
Galium kamtschaticum	Boreal bedstraw	S2S3	G5		
Galium labradoricum	Bog bedstraw	S 1	G5	T	
Galium obtusum	Large marsh-bedstraw	S 1	G5		
Galium pilosum	Hairy bedstraw	SH	G5		
Galium trifidum	Small bedstraw	S3	G5		
Gentiana andrewsii	Fringe-top closed gentian	S 1	G4	T	
Gentianella amarella	Felwort	SH	G5	T	
Gentianella quinquefolia	Stiff gentian	S 1	G5	T	
Gentianopsis crinita	Fringed gentian	S3	G4		

Rare and Uncommon Native Plants of Vermont

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Geocaulon lividum	Northern toadflax	SX	G5		
Geranium bicknellii	Bicknell Northern crane's-bill	S3	G5		
Geranium carolinianum	Carolina crane's-bill	SH	G5		
Geum laciniatum	Rough avens	S2	G5		
Geum macrophyllum	Large-leaved avens	S3	G5		
Geum vernum	Spring avens	S 1	G5		
Glyceria acutiflora	Sharp manna-grass	S 1	G5	E	
Gnaphalium macounii	Winged cudweed	S3	G5		
Gymnocarpium jessoense	Northern oak fern	SH	G5		
Hackelia deflexa var americana	Nodding stickseed	S2S3	G5T5	T	
Halenia deflexa	Spurred gentian	SH	G5		
Hedysarum alpinum	Apline sweet-broom	S 1	G5		
Helenium autumnale	Sneezeweed	S 1	G5		
Helianthemum bicknellii	Plains frostweed	S2S3	G5	T	
Helianthemum canadense	Canada frostweed	S2S3	G5		
Helianthus strumosus	Harsh sunflower	S2S3	G5	T	
Hieracium venosum	Rattlesnake hawkweed	S3	G5		
Hierochloe alpina	Alpine sweet-grass	S 1	G5	T	
Hippuris vulgaris	Mare's-tail	S 1	G5	E	
Houstonia longifolia	Longleaf bluet	S2S3	G4G5		
Hudsonia ericoides	Golden-heather	SH	G4		
Hudsonia tomentosa	Beach heather	S 1	G5	E	
Huperzia appalachiana	Mountain fir-clubmoss	S2	G4G5		
Huperzia selago	Northern fir-clubmoss	S 1	G5		
Hybanthus concolor	Green violet	S 1	G5		
Hydrastis canadensis	Golden-seal	S1	G4	E	
Hydrophyllum canadense	Broad-leaved waterleaf	S 1	G5	T	
Hypericum ascyron	Great St. John's-wort	S2	G4	T	
Hypericum gentianoides	Orange-grass St. John's-wort	S2S3	G5		
Hypoxis hirsuta	Star grass	SH	G5		
Isoetes engelmannii	Engelmann's quillwort	S 1	G4	T	
Isoetes macrospora	Lake quillwort	S1S2	G5		
Isoetes riparia	River-bank quillwort	S 1	G5?		
Isoetes tuckermanii	Tuckerman's quillwort	S1?	G4?		
Isotria medeoloides	Small whorled pogonia	SH	G2G3	E	LT
Isotria verticillata	Large whorled pogonia	S2	G5	T	
Juncus acuminatus	Tapering rush	S 1	G5		
Juncus alpinus	Alpine rush	S2	G5		
Juncus gerardii	Black-grass rush	S 1	G5		

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Juncus greenei	Greene's rush	S 1	G5	E	
Juncus marginatus	Grass rush	S2	G5		
Juncus militaris	Soldier rush	S 1	G4	E	
Juncus secundus	Secund rush	S1	G5?	E	
Juncus torreyi	Torrey's rush	S1	G5	E	
Juncus trifidus	Highland rush	S 1	G5		
Juncus vaseyi	Vasey rush	S1	G5?		
Juniperus horizontalis	Creeping juniper	S1	G5	T	
Justicia americana	Common water-willow	SX	G5		
Kalmia latifolia	Mountain laurel	S3	G5		
Lactuca hirsuta	Hairy lettuce	S2	G4?	T	
Lathyrus maritimus	Beach pea	S2	G5T4T5	T	
Lathyrus ochroleucus	Pale vetchling	S2	G4G5		
Lathyrus palustris	Marsh vetchling	S2	G5	T	
Lechea minor	Lesser pinweed	SH	G5		
Lechea mucronata	Hairy pinweed	S 1	G5	E	
Lespedeza capitata	Round-head bush-clover	S3	G5		
Lespedeza hirta	Hairy bush-clover	S 1	G5	T	
Lespedeza stuevei	Tall bush-clover	SH	G4?		
Lespedeza violacea	Violet bush-clover	S1	G5	T	
Lilium philadelphicum	Wood lily	S3	G5		
Lindera benzoin	Spicebush	S3S4	G5		
Linum medium	Stiff yellow flax	SH	G5		
Linum sulcatum	Grooved yellowflax	SH	G5		
Liparis liliifolia	Lily-leaved twayblade	S 1	G5	T	
Liparis loeselii	Loesel's twayblade	S3	G5		
Liriodendron tulipifera	Tulip tree	SH	G5		
Listera auriculata	Auricled twayblade	S 1	G3	E	
Listera australis	Southern twayblade	S 1	G4	E	
Listera cordata	Heart-leaved twayblade	S3	G5		
Littorella americana	American shore-grass	S2	G5		
Lobelia siphilitica	Great blue lobelia	S 1	G5		
Lonicera hirsuta	Hairy honeysuckle	S2	G4G5		
Lonicera oblongifolia	Swamp fly-honeysuckle	S2	G4		
Lonicera villosa	Mountain fly-honeysuckle	S3	G5		
Ludwigia polycarpa	Many-fruited false-loosestrife	S 1	G4	E	
Lupinus perennis	Wild lupine	S 1	G5	E	
Luzula parviflora	Small-flowered rush	S2	G5		
Luzula spicata	Spiked wood-rush	S 1	G5		

Rare and Uncommon Native Plants of Vermont

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Lycopodium appressa	Slender bog-clubmoss	SH	G5		
Lycopus virginicus	Virginia bugleweed	S2	G5		
Lygodium palmatum	Climbing fern	S 1	G4	E	
Lyonia ligustrina	Maleberry	S3	G5		
Lysimachia hybrida	Lance-leaved loosestrife	S1	G5		
Malaxis bayardii	Bayard's malaxis	SH	G2?		
Malaxis brachypoda	White adder's mouth	S2S3	G4Q	T	
Malaxis unifolia	Green adder's mouth	S2	G5		
Meesia triquetra	A moss	S1	G5		
Milium effusum	Tall millet-grass	S3	G5		
Mimulus moschatus	Musk flower	S2S3	G4G5		
Minuartia groenlandica	Mountain sandwort	S 1	G5		
Minuartia marcescens	Marcescent sandwort	S 1	G2	T	
Minuartia rubella	Marble sandwort	S 1	G5	T	
Moehringia lateriflora	Blunt-leaf sandwort	S3	G5		
Moehringia macrophylla	Large-leaved sandwort	S2	G4		
Monarda punctata	Dotted horsemint	S 1	G5		
Morus rubra	Red mulberry	S 1	G5	T	
Muhlenbergia schreberi	Schreber's muhly	S 1	G5		
Muhlenbergia sobolifera	Sprout muhly	S3	G5		
Muhlenbergia sylvatica	Woodland muhly	SH	G5		
Muhlenbergia tenuiflora	Slender muhly	S3	G5		
Muhlenbergia uniflora	Fall dropseed muhly	S2?	G5		
Myosotis laxa	Smaller forget-me-not	S2	G5		
Myosotis verna	Spring forget-me-not	S 1 S2	G5		
Myriophyllum alterniflorum	Water milfoil	S2	G5		
Myriophyllum farwellii	Farwell's water-milfoil	S2	G5		
Myriophyllum humile	Low water-milfoil	S2	G5		
Myriophyllum verticillatum	Whorled water-milfoil	S 1	G5		
Najas gracillima	Slender naiad	S1	G5?		
Najas guadalupensis	Guadalupe naiad	S1	G5		
Neobeckia aquatica	Lake-cress	S 1	G4?	T	
Nymphaea leibergii	Dwarf water-lily	S 1	G5		
Nyssa sylvatica	Black gum or tupelo	S2	G5		
Oenothera cruciata	Narrow evening-primrose	S1	G5		
Omalotheca sylvatica	Woodland cudweed	S 1	G5	E	
Oryzopsis pungens	Slender mountain-rice	S2	G5	T	
Osmorhiza chilensis	Mountain sweet-cicely	SH	G5		
Osmorhiza depauperata	Blunt-fruited sweet-cicely	SH	G5		

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Oxalis violacea	Violet wood-sorrel	SH	G5		
Paludella squarrosa	A moss	S1S2	G3G5		
Panax quinquefolius	American ginseng	S2S3	G4		
Panicum columbianum	A panic-grass	S3	G5		
Panicum depauperatum	Depauperate panic-grass	S3	G5		
Panicum dichotomum	Cypress witchgrass	S3	G5		
Panicum flexile	Stiff witch-grass	S 1	G5	E	
Panicum oligosanthes	Few -flowered panic-grass	S2	G5		
Panicum philadelphicum	Philadelphia panic-grass	SH	G5		
Panicum rigidulum	Redtop panic-grass	S3	G5		
Panicum sphaerocarpon	Spherical panic-grass	S 1	G5		
Panicum tuckermanii	Tuckerman's panic-grass	S2	G3G5		
Panicum virgatum	Switch grass	S3	G5		
Paronychia canadensis	Smooth forked chickweed	S 1	G5		
Paspalum ciliatifolium	Slender paspalum	S2	G3G5		
Pellaea atropurpurea	Purple-stem cliff-brake	S3	G5		
Pellaea glabella	Smooth cliff-brake	S3	G5		
Peltandra virginica	Arrowleaf	S 1	G5		
Penstemon hirsutus	Hairy beardtongue	S3	G4		
Penstemon pallidus	Pale beardtongue	SH	G5		
Petasites frigidus var palmatus	Sweet coltsfoot	S 1	G5T5	T	
Physalis grandiflora	Large white-flowered ground-cherry	SH	G3?		
Physalis pubescens	Low hairy ground-cherry	SH	G5		
Physalis subglabrata	Smooth ground-cherry	SH	G?Q		
Physostegia virginiana	Obedience	S2	G5	T	
Pinguicula vulgaris	Butterwort	S 1	G5		
Pinus banksiana	Jack pine	SH	G5	T	
Plagiobryum zieri	A moss	S1	G3G4	E	
Platanthera blephariglottis	White-fringed orchis	S 1	G4G5		
Platanthera flava	Tubercled orchis	S1S2	G4	T	
Platanthera hookeri	Hooker's orchis	S2	G5	T	
Poa fernaldiana	Wavy bluegrass	S 1	G2G3		
Poa glauca	Glaucous bluegrass	S 1	G5		
Poa languida	Drooping speargrass	SSYN	G3G4Q		
Poa nemoralis	Woods bluegrass	S2	G5		
Poa saltuensis	Drooping bluegrass	S2S3	G5		
Podophyllum peltatum	May-apple	S 1	G5		
Podostemum ceratophyllum	Riverweed	S 1	G5		
Pogonia ophioglossoides	Rose pogonia	S3	G5		

Rare and Uncommon Native Plants of Vermont

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Polemonium vanbruntiae	Eastern Jacob's ladder	S2	G3	T	
Polygala polygama	Racemed milkwort	S2	G5		
Polygala sanguinea	Field milkwort	S2S3	G5		
Polygala senega	Seneca snakeroot	S2S3	G4G5		
Polygala verticillata	Whorled milkwort	S2	G5		
Polygonatum biflorum var commutatum	Giant Solomon's seal	S1	G5T5		
Polygonum achoreum	Blue knotweed	S2	G5		
Polygonum careyi	Carey's smartweed	SH	G4		
Polygonum douglasii	Douglas knotweed	S 1	G5	E	
Polygonum erectum	Erect knotweed	S 1	G5		
Polygonum hydropiperoides	Mild water-pepper	S3	G5		
Polygonum tenue	Slender knotweed	S1	G5		
Polygonum viviparum	Alpine smartweed	SX	G5		
Polymnia canadensis	White-flowered leafcup	S 1	G5	E	
Potamogeton bicupulatus	Snail-seed pondweed	S2	G4?		
Potamogeton diversifolius	Water-thread pondweed	SSYN	G5		
Potamogeton filiformis var b orealis	Slender pondweed	S2	G5T5		
Potamogeton friesii	Fries' pondweed	S3	G4		
Potamogeton hillii	Hill's pondweed	S3	G3		
Potamogeton obtusifolius	Blunt-leaf pondweed	S3	G5		
Potamogeton ogdenii	Ogden's pondweed	S1	G1		
Potamogeton strictifolius	Straight-leaf pondweed	S2	G5		
Potamogeton vaseyi	Vasey's pondweed	S2	G4		
Potamogeton x haynesii	Haynes' pondweed	S 1	HYB		
Potentilla arguta	Tall cinquefoil	S3	G5		
Potentilla pensylvanica var bipinnatifida	Northern cinquefoil	S 1	G4G5	E	
Prenanthes boottii	Boott's rattlesnake-root	S 1	G2	E	
Prenanthes trifoliolata	Three-leaved rattlesnake-root	S1	G5		
Primula mistassinica	Bird's-eye primrose	S 1	G5	T	
Proserpinaca palustris	Marsh mermaid-weed	S 1	G5		
Prunus americana	Wild plum	S1?	G5	T	
Prunus pumila var depressa	Low sand cherry	S2	G5T5		
Prunus pumila var pumila	Sand cherry	S1	G5T?		
Pterospora andromedea	Pinedrops	S1	G5	E	
Puccinellia fernaldii	Fernald alkali grass	S3	G5?T4Q		
Pycnanthemum incanum	Hoary mountain-mint	S 1	G5	E	
Pycnanthemum muticum	Blunt mountain-mint	SH	G5		
Pycnanthemum verticillatum	Whorled mountain-mint	SU	G5		
Pyrola asarifolia	Bog wintergreen	S2S3	G5	T	

Rare and Uncommon Native Plants of Vermont

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Pyrola minor	Lesser pyrola	S 1	G5	E	
Quercus coccinea	Scarlet oak	S1	G5		
Quercus ilicifolia	Scrub oak	S 1	G5	E	
Quercus muehlenbergii	Yellow oak	S3	G5		
Quercus prinoides	Dwarf chinquapin oak	S1	G5		
Ranunculus allegheniensis	Allegheny crowfoot	S2	G4G5	T	
Ranunculus fascicularis	Early buttercup	SH	G5		
Ranunculus flabellaris	Yellow water-crowfoot	S3	G5		
Ranunculus hispidus var hispidus	Bristly buttercup	S1	G5T5		
Ranunculus longirostris	White water-crowfoot	S2S3	G5		
Ranunculus pensylvanicus	Bristly crowfoot	S2	G5		
Ranunculus sceleratus	Cursed crowfoot	S2	G5		
Ranunculus subrigidus	White-water crowfoot	S1?	G5		
Rhexia virginica	Virginia meadow-beauty	S1	G5	T	
Rhododendron maximum	Great laurel	S2	G5	T	
Rhododendron nudiflorum	Pinxter-flower	SH	G5		
Rhododendron viscosum	Swamp azalea	SH	G5		
Rhus aromatica	Fragrant sumac	S3	G5		
Rhynchospora capillacea	Capillary beak-rush	S 1	G5	T	
Rosa acicularis	Needle-spine rose	S1	G5	E	
Rosa nitida	Shining rose	S 1	G5		
Rumex maritimus	Sea-side dock	SH	G5		
Rumex occidentalis	Western dock	SH	G5		
Rumex pallidus	Seabeach dock	SH	G4		
Sagina decumbens	Small pearlwort	SH	G5		
Sagittaria rigida	Sessile-fruited arrowhead	S3	G5		
Salix candida	Hoary willow	S3	G5		
Salix exigua	Sandbar willow	S3S4	G5		
Salix pedicellaris	Bog willow	S 1	G5		
Salix pellita	Satiny willow	S 1	G5		
Salix planifolia	Tea-leaved willow	S1	G5	T	
Salix serissima	Autumn willow	S1	G4		
Salix uva-ursi	Bearberry willow	S 1	G5	E	
Samolus parviflorus	Water pimpernel	S1	G5		
Sanguisorba canadensis	Canada burnet	S2	G5		
Sanicula canadensis	Short-styled snakeroot	S2	G5	T	
Sanicula trifoliata	Long-fruited snakeroot	S3	G4		
Sassafras albidum	Sassafras	S3	G5		
Saxifraga aizoides	Yellow mountain saxifrage	S 1	G5		

Rare and Uncommon Native Plants of Vermont

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Saxifraga oppositifolia	Purple mountain saxifrage	S 1	G4G5		
Saxifraga paniculata	White mountain-saxifrage	S 1	G5		
Scapania umbrosa	A liverwort	S1	G4G5		
Scheuchzeria palustris ssp americana	Pod-grass	S1	G5T5	T	
Scirpus ancistrochaetus	Barbed-bristle bulrush	S2	G3	E	LE
Scirpus cespitosus	Deer-hair sedge	S1	G5		
Scirpus heterochaetus	Slender bulrush	S2S3	G5		
Scirpus maritimus	Salt-marsh bulrush	S 1	G5		
Scirpus pendulus	Pendulous bulrush	S3	G5		
Scirpus polyphyllus	Many-leaved sedge	S2	G5	E	
Scirpus purshianus	Pursh's bulrush	S2S3	G4G5		
Scirpus smithii	Smith's bulrush	S1	G5?		
Scirpus torreyi	Torrey's bulrush	S2S3	G5?		
Scirpus verecundus	Bashful bulrush	S1	G4G5	E	
Scorpidium scorpioides	A moss	S 1 S2	G4G5		
Scrophularia lanceolata	Hare figwort	S3?	G5		
Scrophularia marilandica	Carpenter's-square	S3	G5		
Scutellaria parvula	Small skullcap	S2	G4		
Sedum rosea	Roseroot	S 1	G5	T	
Selaginella rupestris	Rock spikemoss	S3	G5		
Senna hebecarpa	Wild senna	SH	G5	T	
Sericocarpus asteroides	White-topped aster	SH	G5		
Shepherdia canadensis	Canada buffaloberry	S3	G5		
Silene stellata	Starry catchfly	SH	G5		
Sisyrinchium angustifolium	Narrow blue-eyed grass	S2	G5		
Sisyrinchium atlanticum	Eastern blue-eyed-grass	SH	G5		
Sisyrinchium mucronatum	Slender blue-eyed grass	SH	G5		
Solidago cutleri	Cutler's goldenrod	S1	G5T4		
Solidago macrophylla var thyrsoidea	Large-leaf goldenrod	S3	G5T?		
Solidago odora	Sweet goldenrod	S1	G5	T	
Solidago patula	Roughleaf goldenrod	S3	G5		
Solidago squarrosa	Squarrose goldenrod	S2S3	G4?		
Solidago ulmifolia	Elm-leaved goldenrod	S 1	G5	E	
Sorbus decora	Northern mountain-ash	S3	G4G5		
Sorghastrum nutans	Indian grass	S3	G5		
Sparganium androcladum	Branching bur-reed	S 1	G4G5		
Sparganium fluctuans	Water bur-reed	S2	G5		
Sparganium natans	Lesser bur-reed	S2S3	G5	T	
Sphagnum nitidum	A peatmoss	S 1	G?	E	

Rare and Uncommon Native Plants of Vermont

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Sphenopholis nitida	Shiny wedgegrass	S 1	G5	E	
Sphenopholis obtusata	Blunt sphenopholis	S1	G5	E	
Spiranthes casei	Ladies'-tresses	SU	G4		
Spiranthes lacera	Ladies'-tresses	S3	G5		
Spiranthes lucida	Shining ladies'-tresses	S3	G5		
Spiranthes ochroleuca	Yellow nodding ladies'-tresses	S2	G4		
Spiranthes romanzoffiana	Hooded ladies'-tresses	S3	G5		
Splachnum ampullaceum	A moss	S2S3	G4		
Sporobolus asper	Rough dropseed	S 1	G5	E	
Sporobolus neglectus	Small dropseed	S1	G5		
Stachys pilosa	Woundwort	S3S4	G5		
Stellaria alsine	Trailing stitchwort	S1	G5		
Subularia aquatica	Water awlwort	SH	G5		
Symphoricarpos albus	Snowberry	S3S4	G5		
Taenidia integerrima	Yellow pimpernel	S2	G5	T	
Thalictrum venulosum	Border meadow-rue	S3	G5		
Thelypteris hexagonoptera	Broad beech-fern	S2	G5		
Thelypteris simulata	Massachusetts fern	S 1	G4G5		
Tillaea aquatica	Pygmyweed	S2	G5		
Tofieldia glutinosa	Sticky false-asphodel	S 1	G5	T	
Trichostema brachiatum	False pennyroyal	SH	G4G5		
Triglochin maritimum	Common arrow-grass	S 1	G5		
Trillium cernuum	Nodding trillium	S2	G5		
Triosteum aurantiacum	Horse gentian	S3	G5		
Triphora trianthophora	Three-bird orchid	S 1	G4	T	
Trisetum melicoides	Purple false oats	SH	G4		
Trisetum spicatum var pilosiglume	Spiked bristle grass	S 1	G5T3?Q		
Ulmus thomasii	Cork elm	SH	G5		
Utricularia geminiscapa	Hidden-fruited bladderwort	S3	G4G5		
Utricularia gibba	Humped bladderwort	S3	G5		
Utricularia inflata var minor	Inflated bladderwort	SH	G4		
Utricularia purpurea	Purple bladderwort	S3	G5		
Utricularia resupinata	Northeastern bladderwort	S 1	G4	T	
Uvularia perfoliata	Perfoliate bellwort	S2	G5		
Vaccinium boreale	Boreal blueberry	S1	G4		
Vaccinium cespitosum	Dwarf bilberry	S2S3	G5		
Vaccinium stamineum	Deerberry	S 1	G5	E	
Vaccinium uliginosum	Alpine bilberry	S 1	G5		
Vaccinium vitis-idaea	Mountain cranberry	S 1	G5		

Rare and Uncommon Native Plants of Vermont

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Valeriana uliginosa	Marsh valerian	S 1	G4Q	E	
Verbena bracteata	Large-bract vervain	S 1	G4G5		
Verbena simplex	Narrow-leaved vervain	SH	G5		
Veronica anagallis-aquatica	Brook pimpernell	S1S2	G5		
Veronica catenata	Water-speedwell	S 1	G5		
Veronicastrum virginicum	Culver's-root	S1	G5	E	
Viburnum edule	Squashberry	S1	G5	T	
Viola lanceolata	Lance-leaved violet	S 1	G5	T	
Viola palmata	Early blue violet	S 1	G5		
Viola triloba	Three-lobed violet	S2	G5T5		
Vitis novae-angliae	New England grape	S1?	G4G5Q		
Vulpia octoflora	Eight-flowered fescue	S 1	G5	E	
Woodsia alpina	Alpine woodsia	S 1	G4	E	
Woodsia glabella	Smooth woodsia	S2	G5		
Woodsia obtusa	Blunt-leaved woodsia	S3	G5		
Woodwardia virginica	Virginia chain-fern	S1	G5	T	
Xyris difformis	Yellow-eyed-grass	SH	G5		
Xyris montana	Northern yellow-eyed grass	S1	G4	T	
Zannichellia palustris	Horned pondweed	S 1	G5		
Zigadenus elegans ssp glaucus	White camas	SX	G5T4T5		

Appendix D

Vermont CREP Watershed Fact Sheets and Impairment Summaries

2000 Section 303(d) List Fact Sheet for VERMONT
Waters Listed by Watershed

Watershed Name	Number of Waters on List	Percent of Reported
Not Reported	57	27.94
Lamoille	29	14.22
Winooski	25	12.25
Otter	23	11.27
Deerfield	17	8.33
Hudson-Hoosic	10	4.90
St. Francois	8	3.92
Waits	7	3.43
West	7	3.43
Missisquoi	5	2.45
Passumpsic	4	1.96
Upper Connecticut-Mascoma	4	1.96
White	4	1.96
Lake George	3	1.47
Black-Ottauquechee	2	.98
Upper Connecticut	1	.49

Total Number of Impaired Waters Reported: 204

Impairments

General Impairment Name	Impairments Reported	Percent of Reported
METALS	51	19.17
PH	43	16.17
PATHOGENS	39	14.66
NUTRIENTS	34	12.78
SEDIMENT/SILTATION	32	12.03
CAUSE UNKNOWN	21	7.89
ORGANIC ENRICHMENT/LOW DO	16	6.02
PCBS	12	4.51
UNKNOWN TOXICITY	5	1.88
THERMAL MODIFICATIONS	3	1.13
OIL AND GREASE	3	1.13
PRIORITY ORGANICS	3	1.13
NONPRIORITY ORGANICS	1	.38
SALINITY/TDS/CHLORIDES	1	.38
FISH CONSUMPTION ADVIS.	1	.38
OTHER HABITAT ALTERATIONS	1	.38

Total Number of Impairments Reported: 266

Black-Ottauquechee Watershed Section 303(d) List Fact Sheet
USGS Cataloging Unit: 01080106

Places Involving this Watershed

Counties:
- Rutland
- Windsor

American Heritage Rivers:
- Connecticut River

National Estuary Programs:
- Long Island Sound

States:
- Vermont

Other Watersheds Upstream:
- None

Other Watersheds Downstream:
- Upper Connecticut-Mascoma

Impairments

Impairment Name	Impairments Reported	Percent of Reported
NUTRIENTS	1	50.00
SEDIMENT	1	50.00

Total Number of Impairments Reported: 2

Deerfield Watershed Section 303(d) List Fact Sheet
USGS Cataloging Unit: 01080203

Places Involving this Watershed

Counties:
- Franklin
- Windham
- Berkshire
- Bennington
- Hampshire

American Heritage Rivers:
- None

National Estuary Programs:
- Long Island Sound

States:
- Massachusetts
- Vermont

Other Watersheds Upstream:
- None

Other Watersheds Downstream:
- Middle Connecticut

Impairments

Impairment Name	Impairments Reported	Percent of Reported
PH	9	29.03
MERCURY	6	19.35
PATHOGENS	5	16.13
METALS	3	9.68
CAUSE UNKNOWN	2	6.45
CHLORINE	1	3.23
UNKNOWN TOXICITY	1	3.23
NOXIOUS AQUATIC PLANTS	1	3.23
SEDIMENT	1	3.23
TASTE, ODOR AND COLOR	1	3.23
PCBS	1	3.23

Total Number of Impairments Reported: 31

Hudson-Hoosic
USGS Cataloging Unit: 02020003

Places Involving this Watershed

Counties:
- Albany
- Windham
- Berkshire
- Rensselaer
- Warren
- Washington
- Bennington
- Saratoga

American Heritage Rivers:
- None

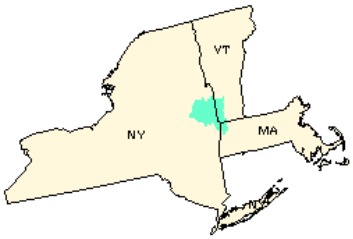
National Estuary Programs:
- NY/NJ Harbor

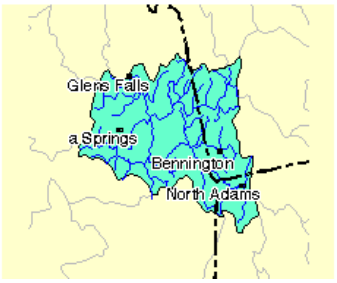
States:
- Massachusetts
- Vermont
- New York

Other Watersheds Upstream:
- Upper Hudson

Sacandaga
- Mohawk

Other Watersheds Downstream:
- Middle Hudson





Impairments

Impairment Name	Impairments Reported	Percent of Reported
PH	8	19.51
PATHOGENS	7	17.07
PCBS	7	17.07
CAUSE UNKNOWN	4	9.76
NUTRIENTS	3	7.32
MERCURY	2	4.88
SILTATION	2	4.88
PRIORITY ORGANICS	2	4.88
NOXIOUS AQUATIC PLANTS	1	2.44
ORGANIC ENRICHMENT	1	2.44
SUSPENDED SOLIDS	1	2.44
TURBIDITY	1	2.44
ORGANIC ENRICHMENT/LOW DO	1	2.44
OXYGEN DEMAND	1	2.44

Total Number of Impairments Reported: 41

Lake George Section 303(d) List Fact Sheet
USGS Cataloging Unit: 02010001

Places Involving this Watershed

Counties:
- Addison
- Essex
- Rutland
- Warren
- Washington
- Bennington

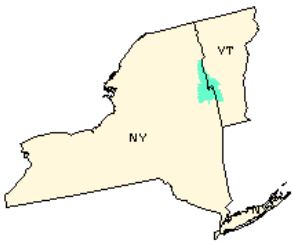
American Heritage Rivers:
- None

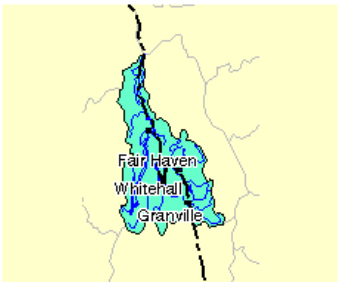
National Estuary Programs:
- None

States:
- Vermont
- New York

Other Watersheds Upstream:
- None

Other Watersheds Downstream:
- Winooski





Impairments

Impairment Name	Impairments Reported	Percent of Reported
NUTRIENTS	1	25.00
PATHOGENS	1	25.00
PH	1	25.00
TEMPERATURE	1	25.00

Total Number of Impairments Reported: 4

Lamoille Watershed Section 303(d) List Fact Sheet, USGS Cataloging Unit: 02010005

Places Involving this Watershed

Counties:
- Caledonia
- Chittenden
- Clinton
- Franklin
- Grand Isle
- Lamoille
- Orleans
- Washington

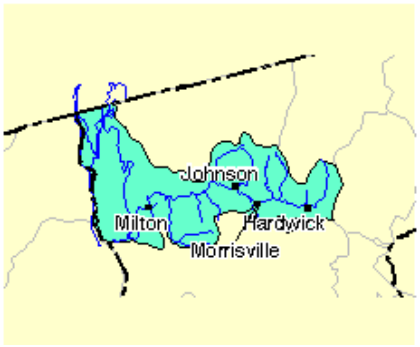
American Heritage Rivers:
- None

National Estuary Programs:
- None

States:
- Vermont
- New York

Other Watersheds Upstream:
- Winooski
- Ausable
- Great Chazy-Saranac
- Missisquoi

Other Watersheds Downstream:
- Great Chazy-Saranac



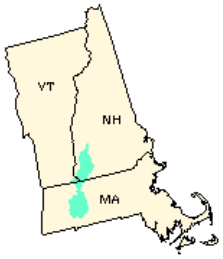
Impairments

Impairment Name	Impairments Reported	Percent of Reported
MERCURY	7	16.28
SEDIMENT	7	16.28
PATHOGENS	5	11.63
NUTRIENTS	4	9.30
PCBS	4	9.30
ORGANIC ENRICHMENT	4	9.30
PHOSPHORUS	3	6.98
PH	2	4.65
UNKNOWN	2	4.65
HYDROCARBONS - NON PRIORITY	1	2.33
OIL AND GREASE	1	2.33
TOXICS (METALS AND ORGANICS)	1	2.33
IRON	1	2.33
LOW DISSOLVED OXYGEN	1	2.33

Total Number of Impairments Reported: 43

Middle Connecticut Watershed Section 303(d) List Fact Sheet
USGS Cataloging Unit: 01080201

Places Involving this Watershed:



- Counties:
  - Cheshire
  - Franklin
  - Hampden
  - Sullivan
  - Windham
  - Worcester
  - Hampshire
- American Heritage Rivers:
  - Connecticut River

- National Estuary Programs:
  - Long Island Sound
- States:
  - New Hampshire
  - Massachusetts
  - Vermont
- Other Watersheds Upstream:
  - Upper Connecticut-Mascoma
  - Miller
  - Deerfield
- Other Watersheds Downstream:
  - Lower Connecticut

No impairments are listed for this watershed in the State of Vermont

Missisquoi Watershed Section 303(d) List Fact Sheet
USGS Cataloging Unit: 02010007

Places Involving this Watershed

Counties:
- Franklin
- Lamoille
- Orleans

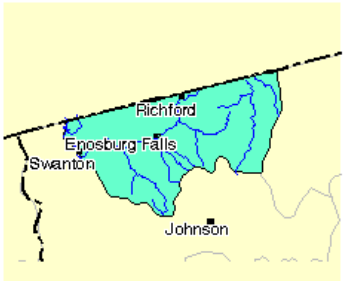
American Heritage Rivers:
- None

National Estuary Programs:
- None

States:
- Vermont

Other Watersheds Upstream:
- St. Francois

Other Watersheds Downstream:
- Lamoille



Impairments

Impairment Name	Impairments Reported	Percent of Reported
NUTRIENTS	2	22.22
ORGANIC ENRICHMENT	2	22.22
MERCURY	1	11.11
PATHOGENS	1	11.11
PHOSPHORUS	1	11.11
SEDIMENT	1	11.11
UNKNOWN	1	11.11

Total Number of Impairments Reported: 9

Otter Watershed Section 303(d) List Fact Sheet
USGS Cataloging Unit: 02010002

Places Involving this Watershed

Counties:
- Addison
- Chittenden
- Essex
- Rutland
- Washington
- Bennington
- Windsor

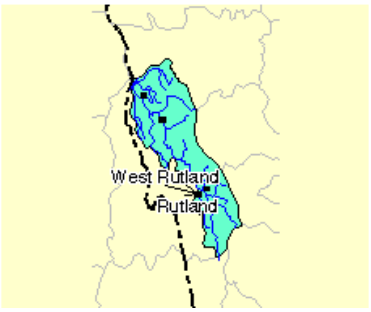
American Heritage Rivers:
- None

National Estuary Programs:
- None

States:
- Vermont
- New York

Other Watersheds Upstream:
- None

Other Watersheds Downstream:
- Winooski



Impairments

Impairment Name	Impairments Reported	Percent of Reported
PATHOGENS	6	26.09
PH	6	26.09
MERCURY	4	17.39
UNKNOWN	3	13.04
IRON	1	4.35
PHOSPHORUS	1	4.35
PCBS	1	4.35
LOW DISSOLVED OXYGEN	1	4.35

Total Number of Impairments Reported: 23

Passumpsic Watershed Section 303(d) List Fact Sheet
USGS Cataloging Unit: 01080102

Places Involving this Watershed

Counties:
- Caledonia
- Orleans
- Washington
- Essex

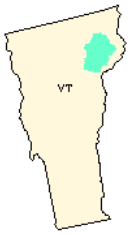
American Heritage Rivers:
- Connecticut River

National Estuary Programs:
- Long Island Sound

States:
- Vermont

Other Watersheds Upstream:
- None

Other Watersheds Downstream:
- Upper Connecticut



Impairments

Impairment Name	Impairments Reported	Percent of Reported
PATHOGENS	4	100.00

Total Number of Impairments Reported: 4

St. Francois Watershed Section 303(d) List Fact Sheet
USGS Cataloging Unit: 01110000

Places Involving this Watershed

Counties:
- Caledonia
- Lamoille
- Orleans
- Essex

American Heritage Rivers:
- None

National Estuary Programs:
- None

States:
- Vermont

Other Watersheds Upstream:
- Upper Connecticut

Other Watersheds Downstream:
- Missisquoi

Impairments

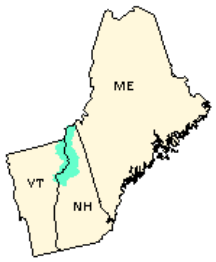
Impairment Name	Impairments Reported	Percent of Reported
PH	4	44.44
PHOSPHORUS	2	22.22
ORGANIC ENRICHMENT	1	11.11
SEDIMENT	1	11.11
PATHOGENS	1	11.11

Total Number of Impairments Reported: 9

Upper Connecticut Watershed Section 303(d) List Fact Sheet
USGS Cataloging Unit: 01080101

Places Involving this Watershed

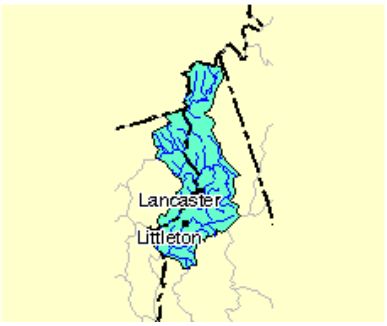
Counties:
- Caledonia
- Orange
- Oxford
- Essex
- Carroll
- Coos
- Grafton



American Heritage Rivers:
- Connecticut River

National Estuary Programs:
- Long Island Sound

States:
- New Hampshire
- Maine
- Vermont



Other Watersheds Upstream:
- Upper Androscoggin
- Passumpsic
- Waits

Other Watersheds Downstream:
- Upper Connecticut-Mascoma
- St. Francois

Impairments

Impairment Name	Impairments Reported	Percent of Reported
PATHOGENS	2	25.00
PHOSPHORUS	2	25.00
ALUMINUM	1	12.50
FCA (CADMIUM)	1	12.50
PH	1	12.50
FCA (PCBS)	1	12.50

Total Number of Impairments Reported: 8

Upper Connecticut-Mascoma Watershed Section 303(d) List Fact Sheet
USGS Cataloging Unit: 01080104

Places Involving this Watershed

Counties:
- Cheshire
- Sullivan
- Windham
- Merrimack
- Orange
- Windsor
- Grafton

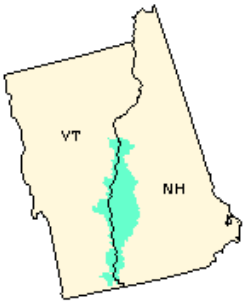
American Heritage Rivers:
- Connecticut River

National Estuary Programs:
- Long Island Sound

States:
- New Hampshire
- Vermont

Other Watersheds Upstream:
- Upper Connecticut
- Waits
- White
- Black-Ottauquechee
- West

Other Watersheds Downstream:
- Middle Connecticut]



Impairments

Impairment Name	Impairments Reported	Percent of Reported
PATHOGENS	11	57.89
FCA (CADMIUM)	1	5.26
FCA (PCBS)	1	5.26
PH	1	5.26
SEDIMENT	1	5.26
UNKNOWN	1	5.26
PRIORITY ORGANICS	1	5.26
NUTRIENTS	1	5.26
OIL AND GREASE	1	5.26

Total Number of Impairments Reported: 19

Waits Watershed Section 303(d) List Fact Sheet
USGS Cataloging Unit: 01080103

Places Involving this Watershed

Counties:
- Caledonia
- Orange
- Washington
- Windsor
- Grafton

American Heritage Rivers:
- Connecticut River

National Estuary Programs:
- Long Island Sound

States:
- New Hampshire
- Vermont

Other Watersheds Upstream:
- None

Other Watersheds Downstream:
- Upper Connecticut
- Upper Connecticut-Mascoma

Impairments

Impairment Name	Impairments Reported	Percent of Reported
METALS	4	40.00
PH	4	40.00
PATHOGENS	2	20.00

Total Number of Impairments Reported: 10

West Watershed Section 303(d) List Fact Sheet
USGS Cataloging Unit: 01080107

Places Involving this Watershed

Counties:
- Cheshire
- Windham
- Rutland
- Bennington
- Windsor

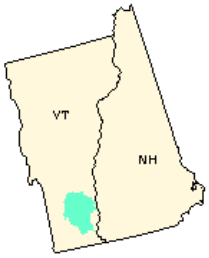
American Heritage Rivers:
- Connecticut River

National Estuary Programs:
- Long Island Sound

States:
- New Hampshire
- Vermont

Other Watersheds Upstream:
- None

Other Watersheds Downstream:
- Upper Connecticut-Mascoma



Impairments

Impairment Name	Impairments Reported	Percent of Reported
PH	4	57.14
SEDIMENT	2	28.57
PCBS	1	14.29

Total Number of Impairments Reported: 7

White Watershed Section 303(d) List Fact Sheet
USGS Cataloging Unit: 01080105

Places Involving this Watershed

Counties:
- Addison
- Orange
- Rutland
- Washington
- Windsor

American Heritage Rivers:
- Connecticut River

National Estuary Programs:
- Long Island Sound

States:
- Vermont

Other Watersheds Upstream:
- None

Other Watersheds Downstream:
- Upper Connecticut-Mascoma

Impairments

Impairment Name	Impairments Reported	Percent of Reported
PH	2	50.00
UNKNOWN	2	50.00

Total Number of Impairments Reported: 4

Winooski Watershed Section 303(d) List Fact Sheet
USGS Cataloging Unit: 02010003

Places Involving this Watershed

Counties:
- Addison
- Caledonia
- Chittenden
- Clinton
- Essex
- Grand Isle
- Lamoille
- Orange
- Washington

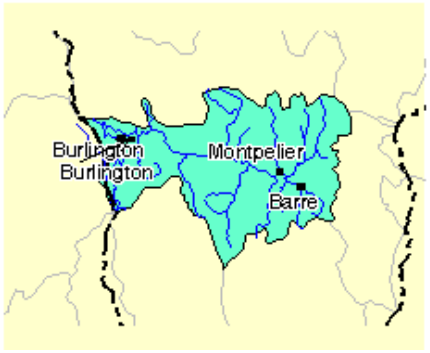
American Heritage Rivers:
- None

National Estuary Programs:
- None

States:
- Vermont
- New York

Other Watersheds Upstream:
- Lake George
- Otter
- Ausable

Other Watersheds Downstream:
- Lamoille



Impairments

Impairment Name	Impairments Reported	Percent of Reported
PATHOGENS	9	21.95
SEDIMENT	8	19.51
UNKNOWN	5	12.20
IRON	3	7.32
TOXICS	3	7.32
COPPER	2	4.88
LOW DISSOLVED OXYGEN	2	4.88
ORGANIC ENRICHMENT	2	4.88
NUTRIENTS	2	4.88
CONDUCTIVITY	1	2.44
PHOSPHORUS	1	2.44
UNKNOWN TOXICITY	1	2.44
TEMPERATURE	1	2.44
PHYSICAL HABITAT CHANGES	1	2.44

Total Number of Impairments Reported: 41

STATE OF VERMONT

2004

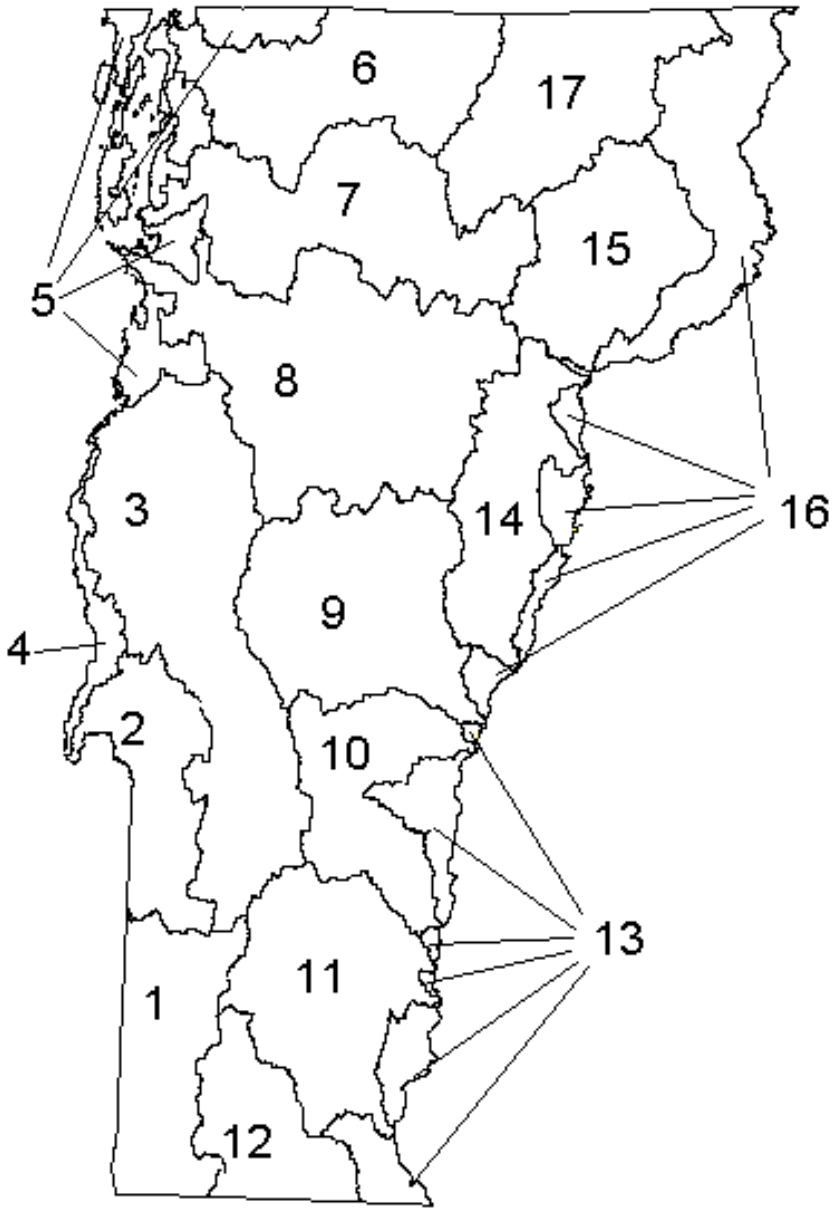
303(d) LIST OF WATERS

(APPROVED BY USEPA REGION 1: JULY 19, 2004)

PART A - IMPAIRED SURFACE WATERS IN NEED OF TMDL

Prepared by:

Vermont Department of Environmental Conservation
Water Quality Division
Building 10 North
103 South Main Street
Waterbury, VT 05671-0408
(802) 241-3770
(802) 241-3287 FAX



Major Vermont River Basins

1. Battenkill
2. Poultney-Mettawee
3. Otter Creek
4. Lower Lake Champlain
5. Upper Lake Champlain
6. Missisquoi
7. Lamoille
8. Winooski
9. White
10. Ottauquechee
11. West
12. Deerfield
13. Lower Connecticut
14. Wells, Waits, Ompompanoosic
15. Passumpsic
16. Upper Connecticut
17. Lake Memphremagog

List of Acronyms and Terms

As	arsenic
BMP	best management practice
Cfu	colony forming unit
CRJC	CT River Joint Commissions
CSO	combined sewer overflow
Cu	copper
DAF&M	VT Department of Agriculture, Food & Markets
DEC-AP	VT DEC, Air Pollution Division
DEC-ENF	VT DEC, Enforcement Division
DEC-FE	VT DEC, Facilities Engineering Division
DEC-HM	VT DEC, Hazardous Materials Section (of DEC-WM)
DEC-SW	VT DEC, Solid Waste Section (of DEC-WM)
DEC-WM	VT DEC, Waste Management Division
DEC-WQ	VT DEC, Water Quality Division
DEC-WS	VT DEC, Water Supply Division
DEC-WWM	VT DEC, Wastewater Management Division
DF&W	VT Department of Fish & Wildlife
DFP&R	VT Department of Forests, Parks & Recreation
D.O.	dissolved oxygen
DOH	VT Department of Health
E.COLI	Escherichia coli (an indicator bacterium)
EPT	Ephemeroptera/Plecoptera/Tricoptera
FERC	Federal Energy Regulatory Commission
Fe	iron
F/S	feasibility study
Hg	mercury
-HUA	Hydrologic Unit Area (a USDA cost share program)
LCBP	Lake Champlain Basin Program
MG/L	milligrams per liter (same as parts per million)
MOU	memorandum of understanding
MT/YR	metric tons per year
Ni	nickel
NOx	nitrogen oxide
NPL	National Priority Listing
NPS	nonpoint source
P	phosphorus
Pb	lead
PCB	poly-chlorinated biphenol
pH	hydrogen ion concentration (measurement of)
RCWP	Rural Clean Water Program
RI/FS	Remedial Investigation/Feasibility Study
RM	river mile
SCS	Soil Conservation Service (same as USDA-NRCS)
SECT 319	Section 319 [of federal Clean Water Act]
SHG	Small High Gradient
SO2	sulfur dioxide
SRF	State Revolving Fund
UG/L	micrograms per liter (same as parts per billion)
USACOE	US Army Corps of Engineers
USBOM	US Bureau of Mines
USDA	US Department of Agriculture
USDA-ACP	- Agriculture Conservation Program
USDA-HUA	- Hydrologic Unit Area
USDA-SpP	- Special Project
USDA-WQIP	- Water Quality Incentive Program
USDA-NRCS	- Natural Resource Conservation Service
USEPA	US Environmental Protection Agency
USF&WS	US Fish & Wildlife Service
UVM	University of Vermont
UVM-SNR	- School of Natural Resources
VSA	VT Statutes Annotated
VTDEC	Vermont Department of Environmental Conservation
WQ	water quality
WQS	Water Quality Standards
WWTF	wastewater treatment facility
Zn	zinc
1272	Section 1272 of 10 VSA Chapter 47
1272 Order	An order issued by the ANR Secretary to properly manage or eliminate an existing discharge to waters that may cause a violation of the Water Quality Standards.
1277	Section 1277 of 10 VSA Chapter 47
1277 Order	An order issued by the ANR Secretary to a municipality that is discharging untreated or improperly treated sewage that causes a reduction in water quality to construct a sewage collection and treatment system to correct or abate the discharge.
566	PL83-566 (a USDA cost share program)

PART A - IMPAIRED SURFACE WATERS IN NEED OF TMDL

Part A of the 2004 List of Waters identifies impaired surface waters that are scheduled for total maximum daily load (TMDL) development. Part A of the List has been prepared in accordance with the 2004 Vermont Surface Water Assessment and Listing Methodology, current EPA 2004 Guidance and the Environmental Protection Regulations 40 CFR 130.7 ("Total maximum daily loads (TMDL) and individual water quality-based effluent limitations"). A TMDL is deemed necessary for these waters (unless remediation will be completed prior to the scheduled TMDL) in order to establish the maximum amount of a pollutant that may be introduced into the water after the application of required pollution controls and to ensure the Water Quality Standards are attained and maintained.

Explanation of Column Headings for Part A

Waterbody ID - An alphanumeric code used to spatially locate designated surface waterbodies. For example, VT01-02 and VT01-03L05 represent a river and a lake waterbody, respectively, located in Vermont river basin #01. River basin #01 includes the Batten Kill, Hoosic and Walloomsac rivers; there are 17 river basins for planning purposes identified in Vermont. A statewide map illustrating designated lake and river waterbodies can be obtained upon request from the Water Quality Division, Department of Environmental Conservation in Waterbury, Vermont.

Segment Name/Description - The name of the river/stream segment or lake/pond. Entries denoted by "**" indicate newly discovered impairments since the Year 2002 list.

Pollutant(s) - The pollutant or pollutants that cause a violation of the Vermont Water Quality Standards (VWQS).

Use(s) Impaired - An indication of which designated or existing uses (as defined in the VWQS) are impaired. The following conventions are used to represent a specific use:

AES – aesthetics
ALS - aquatic life support
AWS - agricultural water supply
2CR - secondary contact recreation (fishing, boating)
FC - fish consumption
DWS - drinking water supply
CR - contact recreation (i.e. swimming)

Surface Water Quality Problem - A brief description of the problem found in the particular segment.

TMDL Completion Year - An indication of when the TMDL will be completed.

	Lakes and Ponds	Streams and Rivers	Total
Total number of impairment entries listed in Part A:	44	111	155

Part A. Impaired Waters in Need of a TMDL

Waterbody ID	Segment Name/ Description	Pollutant(s)	Use(s) Impaired	Surface Water Quality Problem(s)	TMDL Completion Year
VT01-02	HOOSIC RIVER, ENTIRE 7 MILE LENGTH IN VERMONT	PCBs	FC	ELEVATED LEVELS OF TOXIC CONTAMINANT IN BROWN TROUT	2008
VT01-05	LYE BROOK, RM 2.5 TO HEADWATERS (4.5 MILES)	ACID	ALS	ATMOSPHERIC DEPOSITION: CRITICALLY ACIDIFIED; CHRONIC ACIDIFICATION	2005
VT01-05L10	LITTLE MUD (Winhall)	ACID	ALS	ATMOSPHERIC DEPOSITION: CRITICALLY ACIDIFIED; CHRONIC ACIDIFICATION	2004
VT01-06	BRANCH POND BROOK (POND TO ROARING BRANCH)	ACID	ALS	ATMOSPHERIC DEPOSITION: CRITICALLY ACIDIFIED; CHRONIC ACIDIFICATION	2005
VT01-06L02	BEEBE POND (Sunderland)	ACID	ALS	ATMOSPHERIC DEPOSITION: EXTREMELY SENSITIVE TO ACIDIFICATION; EPISODIC	2004
VT02-01	POULTNEY RIVER, FROM CARVERS FALLS UP TO CASTLETON RIVER (2.8 MILES)	NUTRIENTS	ALS	NUTRIENT ENRICHMENT FROM AGRICULTURAL RUNOFF, EROSION	2010
	POULTNEY RIVER, MOUTH UPSTRM TO CARVERS FALLS (10.4 MILES)	MERCURY	FC	ELEVATED LEVELS OF Hg IN WALLEYE	2008
VT02-02	UNNAMED TRIB TO HUBBARDTON RIVER, BELOW WWTF DISCHARGE	E. COLI, NUTRIENTS, TEMPERATURE	ALS, CR, 2CR	BENSON WWTF DISCHARGE POSSIBLE SOURCE; SITUATION NEEDS MORE MONITORING & ASSESSMENT ESP UPSTREAM OF WWTF DISCHARGE (LAND USES & WETLAND)	2008
VT02-03	CASTLETON RIVER, FAIR HAVEN	E. COLI	CR	WWTF PUMP STATION OVERFLOWS	2009
VT02-04	POULTNEY RIVER, 0.5 MI ABOVE TO 0.5 MI BELOW CASTLETON RIVER CONFL	NUTRIENTS	ALS	AGRICULTURAL RUNOFF	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	2004
	UNNAMED TRIB TO METTAWEE RIVER	METALS (IRON, ZINC)	ALS	PAWLET LANDFILL LEACHATE	2010
VT03-01	LOWER OTTER CREEK, BELOW VERGENNES WWTF (APPROX 7 MILES)	E. COLI	CR	PERIODIC & RECURRING OVERFLOWS AT LAGOONS OF WWTF; PARTIALLY TREATED	2009
	LOWER OTTER CREEK, MOUTH UPSTREAM TO VERGENNES DAM (APPROX 7.6 MILES)	MERCURY	FC	ELEVATED LEVELS OF Hg IN WALLEYE	2008
	OTTER CREEK, BELOW MOUTH OF MIDDLEBURY RIVER TO WEYBRIDGE DAM (6 MILES)	E. COLI	CR	AGRICULTURAL RUNOFF, POSSIBLE FAILED SEPTIC SYSTEMS	2013
VT03-04	SUCKER BROOK, FROM SUGAR HILL RESERVOIR DAM TO 0.25 MILES DOWNSTREAM	LOW D.O.	ALS	D.O. PROBLEMS DUE TO HYPOLIMNETIC WITHDRAWAL; PROBLEM IS FOR 0.25 MILES NOT FOR 2.5 MILES AS PREVIOUSLY REPORTED	2005

Certain local, state and federal regulatory programs refer to impaired segments (or waters draining to those segments) listed on the 303d List of Impaired Waters as part of program operations. Contact the respective regulatory program for details regarding regulated activities in these waters and their watersheds.

Part A. Impaired Waters in Need of a TMDL

Waterbody ID	Segment Name/ Description	Pollutant(s)	Use(s) Impaired	Surface Water Quality Problem(s)	TMDL Completion Year
VT03-05	OTTER CREEK BELOW RUTLAND CITY WWTF	E. COLI	CR	RUTLAND CITY WWTF COLLECTION SYSTEM PASSES CSOs	2009
VT03-06	MOON BROOK, MOUTH TO RM 2.3	STORMWATER	ALS	STORMWATER RUNOFF; EROSION; NO MONITORING DATA ON POLLUTANTS	2012
	MOON BROOK, MOUTH TO RUTLAND CITY LANDFILL	IRON	ALS	GLEASON RD UNLINED LANDFILL LEACHATE ENTERING SURFACE WATER VIA GROUNDWATER	2013
VT03-07	LITTLE OTTER CREEK - LOWER - FROM MOUTH UPSTREAM 9 MILES	E. COLI, UNDEFINED	ALS, AES, CR	AGRICULTURAL RUNOFF	2007
	LITTLE OTTER CREEK - UPPER - FROM RM 15.4 TO RM 16.4	E. COLI, UNDEFINED	ALS	AGRICULTURAL RUNOFF	2007
	LITTLE OTTER CREEK, MOUTH UPSTRM TO FALLS/LEDGE WEST RT 7 (CIRCA 1 MI)	MERCURY	FC	ELEVATED LEVELS OF Hg IN WALLEYE; FISH PRESENT ONLY SEASONALLY; EXTREMELY LOW #s	2008
VT03-08	LEWIS CREEK, FROM LOWER COV'D BRIDGE UPSTRM TO FOOTBRIDGE (12.3 MI)	E. COLI	CR	AGRICULTURAL RUNOFF	2007
	POND BROOK, FROM LEWIS CREEK CONFLUENCE UPSTREAM (1.5 MILES)	E. COLI	CR	AGRICULTURAL RUNOFF	2007
VT03-09	LOWER DEAD CREEK, FROM MOUTH UPSTREAM (APPROX 3 MILES)	MERCURY	FC	ELEVATED LEVELS OF Hg IN WALLEYE	2008
VT03-12	MIDDLEBURY RIVER, FROM MOUTH UPSTREAM 2 MILES	E. COLI	CR	AGRICULTURAL RUNOFF, LIVESTOCK, POSSIBLE FAILED SEPTIC SYSTEMS	2005
VT03-14	EAST CREEK, MOUTH TO 0.2 MI (BELOW CSO DISCHARGE PTS #2 AND #9)	E. COLI	CR, AES	RUTLAND CITY COLLECTION SYSTEM CSO	2009
VT03-14L03	**CHITTENDEN RESERVOIR (Chittenden)	MERCURY	FC	ELEVATED LEVELS OF MERCURY IN WALLEYE	2008
VT04-01L01	OTTER CREEK SECTION - LAKE CHAMPLAIN (Ferrisburg)	PCBs	FC	ELEVATED LEVELS OF PCBs IN LAKE TROUT	2011
	OTTER CREEK SECTION - LAKE CHAMPLAIN (Ferrisburg)	MERCURY	FC	ELEVATED LEVELS OF MERCURY IN WALLEYE	2008
VT04-01L02	PORT HENRY SECTION - LAKE CHAMPLAIN (Ferrisburg)	PCBs	FC	ELEVATED LEVELS OF PCBs IN LAKE TROUT	2011
	PORT HENRY SECTION - LAKE CHAMPLAIN (Ferrisburg)	MERCURY	FC	ELEVATED LEVELS OF MERCURY IN WALLEYE	2008
VT04-02L01	SOUTHERN SECTION - LAKE CHAMPLAIN	MERCURY	FC	ELEVATED LEVELS OF MERCURY IN WALLEYE	2008

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	SOUTHERN SECTION - LAKE CHAMPLAIN	PCBs	FC	ELEVATED LEVELS OF PCBs IN LAKE TROUT	2011
VT05-01	ROCK RIVER - MOUTH TO VT/QUE BORDER (3.6 MILES)	UNDEFINED	AES	ALGAL GROWTH; AGRICULTURAL RUNOFF; FISH KILL (91)	2005
	ROCK RIVER, UPSTREAM FROM QUE/VT BORDER (APPROX 13 MILES)	UNDEFINED	ALS	AGRICULTURAL RUNOFF; NUTRIENT ENRICHMENT	2005
	SAXE BROOK (TRIB TO ROCK RIVER) FROM MOUTH UPSTREAM 1 MILE	UNDEFINED	ALS	AGRICULTURAL RUNOFF	2005
VT05-01L01	MISSISQUOI BAY - LAKE CHAMPLAIN (Alburg)	MERCURY	FC	ELEVATED LEVELS OF MERCURY IN WALLEYE	2008
VT05-02L01	LAKE CARMI (Franklin)	PHOSPHORUS	AES, CR	ALGAE BLOOMS	2012
VT05-04L01	NORTHEAST ARM - LAKE CHAMPLAIN (Swanton)	MERCURY	FC	ELEVATED LEVELS OF MERCURY IN WALLEYE	2008
	NORTHEAST ARM - LAKE CHAMPLAIN (Swanton)	PCBs	FC	ELEVATED LEVELS OF PCBs IN LAKE TROUT	2011
VT05-04L02	ISLE LAMOTTE - LAKE CHAMPLAIN (Alburg)	PCBs	FC	ELEVATED LEVELS OF PCBs IN LAKE TROUT	2011
	ISLE LAMOTTE - LAKE CHAMPLAIN (Alburg)	MERCURY	FC	ELEVATED LEVELS OF MERCURY IN WALLEYE	2008
VT05-07	**RUGG BROOK, RM 4.3 (CROSBY ST) UPSTREAM 0.4 MILES	STORMWATER	ALS	STORMWATER RUNOFF	2012
	JEWETT BROOK (3.5 MILES)	SEDIMENT, NUTRIENTS, E. COLI	ALS, CR	AGRICULTURAL RUNOFF	2010
	MILL RIVER, FROM ST. ALBANS BAY TO 1.8 MILES UPSTREAM	SEDIMENT, NUTRIENTS, E. COLI	ALS, CR	AGRICULTURAL RUNOFF, STREAMBANK EROSION	2010
	RUGG BROOK, FROM MOUTH TO APPROX 4.3 MILES UPSTREAM	E. COLI, UNDEFINED	ALS, CR	AGRICULTURAL RUNOFF	2010
VT05-07	STEVENS BROOK, RM 6.8 (PEARL ST) TO RM 9.3	STORMWATER	ALS	STORMWATER RUNOFF, EROSION/SEDIMENTATION, MORPHOLOGICAL INSTABILITY	2008
	STEVENS BROOK, APPROX. 1 MILE BELOW CTRL VT RAIL YARD UPSTREAM TO YARD	SEDIMENT, OIL, GREASE, HYDROCARBONS	AES, ALS, AWS, DWS, CR	SEDIMENT, SOIL & WATER CONTAMINATION FROM FUEL SPILLS & MANAGEMENT	2013
	STEVENS BROOK, MOUTH UPSTREAM 6.8 MILES	SEDIMENT, NUTRIENTS, E. COLI	ALS, CR	AGRICULTURAL RUNOFF; MORPHOLOGICAL INSTABILITY	2010
VT05-07L01	ST. ALBANS BAY - LAKE CHAMPLAIN (St. Albans)	MERCURY	FC	ELEVATED LEVELS OF MERCURY IN WALLEYE	2008
	ST. ALBANS BAY - LAKE CHAMPLAIN (St. Albans)	PCBs	FC	ELEVATED LEVELS OF PCBs IN LAKE TROUT	2011

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VT05-08	STONE BRIDGE, FROM MOUTH UPSTREAM 2 MI.	UNDEFINED	ALS	AGRICULTURAL RUNOFF, LAND DEVELOPMENT	2006
VT05-09	DIRECT SMALLER DRAINAGES TO INNER MALLETTS BAY	E. COLI	CR	URBAN RUNOFF, FAILED/FAILING SEPTIC SYSTEMS; INCLUDES SMITH HOLLOW BROOK & CROOKED CREEK	2009
	INDIAN BROOK, RM 5.8 (SUZIE WILSON RD) TO RM 9.8	STORMWATER	ALS	STORMWATER RUNOFF, LAND DEVELOPMENT, EROSION	2009
VT05-09L01	MALLETTS BAY - LAKE CHAMPLAIN (Colchester)	PCBs	FC	ELEVATED LEVELS OF PCBs IN LAKE TROUT	2011
	MALLETTS BAY - LAKE CHAMPLAIN (Colchester)	MERCURY	FC	ELEVATED LEVELS OF MERCURY IN WALLEYE	2008
VT05-10	ENGLESBY BROOK, MOUTH TO RM 1.3	STORMWATER, E. COLI	ALS, CR	STORMWATER RUNOFF, BLANCHARD BEACH CLOSURE	2009
VT05-10L01	BURLINGTON BAY - LAKE CHAMPLAIN	MERCURY	FC	ELEVATED LEVELS OF MERCURY IN WALLEYE	2008
	BURLINGTON BAY - LAKE CHAMPLAIN	PCBs	FC	ELEVATED LEVELS OF PCBs IN LAKE TROUT	2011
VT05-10L02	MAIN SECTION - LAKE CHAMPLAIN (South Hero)	MERCURY	FC	ELEVATED LEVELS OF MERCURY IN WALLEYE	2008
	MAIN SECTION - LAKE CHAMPLAIN (South Hero)	PCBs	FC	ELEVATED LEVELS OF PCBs IN LAKE TROUT	2011
VT05-11	**LAPLATTE RIVER, AT MOUTH	MERCURY	FC	ELEVATED LEVELS OF Hg IN WALLEYE	2008
	BARTLETT BROOK, MOUTH TO RM 0.7	STORMWATER	ALS	STORMWATER RUNOFF, LAND DEVELOPMENT, EROSION	2009
VT05-11	LAPLATTE RIVER FROM HINESBURG TO MOUTH (10.5 MILES)	FECAL COLIFORM	CR	AGRICULTURAL RUNOFF	2010
	MUD HOLLOW BROOK, FROM MOUTH TO 3 MILES UPSTREAM	FECAL COLIFORM	CR	AGRICULTURAL RUNOFF, STREAMBANK	2010
	MUNROE BROOK, MOUTH TO RM 2.8	STORMWATER	ALS	STORMWATER RUNOFF, EROSION, LAND DEVELOPMENT	2009
	POTASH BROOK, MOUTH TO RM 5.2	STORMWATER, E. COLI	ALS, CR	STORMWATER RUNOFF, LAND DEVELOPMENT, EROSION; BEACH CLOSURES (RED ROCKS)	2009
VT05-11L01	SHELBURNE BAY - LAKE CHAMPLAIN (Shelburne)	MERCURY	FC	ELEVATED LEVELS OF MERCURY IN WALLEYE	2008
	SHELBURNE BAY - LAKE CHAMPLAIN (Shelburne)	PCBs	FC	ELEVATED LEVELS OF PCBs IN LAKE TROUT	2011
VT06-01	MISSISQUOI RIVER, MOUTH UPSTRM TO SWANTON DAM (APPROX 8 MILES)	MERCURY	FC	ELEVATED LEVELS OF Hg IN WALLEYE	2008

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VT06-04	BERRY BRK UP TO NO.TRIB (MOUTH TO 1 MI UPSTRM)	SEDIMENT, NUTRIENTS, E. COLI	ALS, CR	AGRICULTURAL RUNOFF, AQUATIC HABITAT IMPACTS	2007
	GODIN BROOK	SEDIMENT, E. COLI, NUTRIENTS	ALS, CR	AGRICULTURAL RUNOFF, AQUATIC HABITAT IMPACTS	2007
	SAMSONVILLE BROOK	SEDIMENT, NUTRIENTS, E. COLI	ALS, CR	AGRICULTURAL RUNOFF, AQUATIC HABITAT IMPACTS	2007
	TROUT BROOK, UPSTREAM FROM MOUTH FOR 2.3 MILES	UNDEFINED	ALS	AGRICULTURAL RUNOFF	2006
VT06-05	CHESTER BROOK	UNDEFINED	ALS	AGRICULTURAL RUNOFF	2006
	WANZER BROOK	UNDEFINED	ALS	AGRICULTURAL RUNOFF	2006
VT06-08	**COBURN BROOK	NUTRIENTS	ALS	AGRICULTURAL ACTIVITY AND RUNOFF	2014
	MUD CREEK, FROM RM6.5 DOWNSTREAM TO QUE/VT BORDER	UNDEFINED	ALS	AGRICULTURAL RUNOFF; NUTRIENT ENRICHMENT	2007
	TAFT BROOK IN TROY, FROM MOUTH UPSTREAM 0.1 MILE	NUTRIENTS	ALS	AGRICULTURAL RUNOFF	2009
VT07-01	LAMOILLE RIVER, MOUTH TO CLARKS FALLS DAM (8.5 MILES)	MERCURY	FC	ELEVATED LEVELS OF Hg IN WALLEYE	2008
	LOWER LAMOILLE RIVER FROM CLARKS FALLS DAM TO ROUTE 2 BRIDGE (6 MILES)	LOW D.O.	ALS	3 DAMS (CLARKS, MILTON, PETERSON) CREATE D.O. PROBLEMS DOWNSTREAM	2006
VT07-03	DEER BROOK, MOUTH TO 2.5 MILES UPSTREAM	NITROGEN; UNDEFINED	ALS	INDUSTRIAL PARK STORMWATER DISCHARGE; SAND PIT; CORRODING ROAD CULVERTS; NO MONITORING DATA ON POLLUTANTS ABOVE	2006
VT07-03L03	ARROWHEAD MOUNTAIN LAKE (Milton)	MERCURY	FC	ELEVATED LEVELS OF MERCURY IN WALLEYE	2008
VT07-09	MILL BROOK IN FAIRFAX, MOUTH TO 5.0 MILES UPSTREAM	SEDIMENT, NUTRIENTS	AES, ALS	ALGAE GROWTH	2011
VT07-11	STEVENSVILLE BROOK (UPSTREAM FROM RM 2.1 TO HEADWATERS)	ACID	ALS	ATMOSPHERIC DEPOSITION: EXTREMELY SENSITIVE TO ACIDIFICATION	2005
VT07-13	TRIB TO BREWSTER RIVER (1 MILE)	METALS (IRON)	AES, ALS	IRON SEEPS ON STREAMBANK	2013
VT08-01	WINOOSKI RIVER	MERCURY	FC	ELEVATED LEVELS OF Hg IN WALLEYE	2008

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VT08-02	ALLEN BROOK, RM 2.4 TO RM 7.6	STORMWATER, E.COLI	ALS, CR	STORMWATER RUNOFF, LAND DEVELOPMENT; EROSION	2009
	CENTENNIAL BROOK, MOUTH TO RM 1.2	STORMWATER	ALS	STORMWATER RUNOFF, LAND DEVELOPMENT; EROSION	2009
	MOREHOUSE BROOK, MOUTH TO RM 0.6	STORMWATER	ALS	STORMWATER RUNOFF, EROSION	2009
	MUDDY BROOK, MOUTH TO 7 MILES	TOXICS, NUTRIENTS, TEMP.	ALS	LACK OF BUFFER, LAND DEVELOPMENT;	2009
	SUNDERLAND BROOK, RM 3.5 (RT. 7) TO RM 5.3	STORMWATER	ALS	STORMWATER RUNOFF, LAND DEVELOPMENT; EROSION	2009
	UNNAMED TRIB TO MUDDY BROOK, BELOW ALLING IND PRK (2 MI)	TOXICS (TCE)	DWS, AWS	SURFACE WATER IMPACT FROM PAST DISPOSAL ACTIVITIES	2007
VT08-02L01	SHELBURNE POND (Shelburne)	LOW D.O., PHOSPHORUS	ALS	EXCESSIVE ALGAE AND NATIVE PLANT GROWTH CAUSES PERIODIC LOW D.O./FISH KILLS	2006
VT08-03	**WINOOSKI RIVER, ALDER BROOK UPSTRM TO BOLTON FALLS DAM (10.5 MILES)	MERCURY	FC	ELEVATED LEVELS OF Hg IN WALLEYE	2008
VT08-04	UNNAMED TRIB TO JOINER BROOK (0.5 MILE)	SEDIMENT	ALS	EROSION & RUNOFF FROM 2 - 3 PRIOR LOGGING OPERATIONS; LOGGING OPERATIONS CEASED	2005
VT08-05	WINOOSKI RIVER ABOVE MONTPELIER WWTF DISCHARGE	E. COLI	CR	MONTPELIER WWTF COLLECTION SYSTEM PASSES COMBINED SEWER OVERFLOWS	2013
VT08-11	LOWER LITTLE RIVER BELOW HYDRO DAM TO USGS GAGE & GORGE (0.75 MILES)	LOW D.O.	ALS	LOW DOWNSTREAM DISSOLVED OXYGEN FROM HYPOLIMNETIC WITHDRAWAL; PROBLEM DOES NOT EXTEND 2.3 MILES AS PREVIOUSLY REPORTED	2005
VT08-11L02	WATERBURY RESERVOIR (Waterbury)	SEDIMENT	ALS, AES	SEDIMENTATION, TURBIDITY	2006
VT08-13	LOWER NORTH BRANCH, WINOOSKI RIVER (APPROX 1 MILE)	E. COLI	CR	MONTPELIER WWTF COLLECTION SYSTEM PASSES COMBINED SEWER OVERFLOWS	2013
VT08-16	GUNNER BROOK, BELOW FARWELL ST. DUMP (APPROX 0.5 MILE)	METALS (Cu, Fe), NUTRIENTS, CONDUCTIVITY, SEDIMENT, E. COLI	AES, ALS	FARWELL ST. LANDFILL LEACHATE, SURFACE RUNOFF FROM DEVELOPED AREA	2013
VT08-18	MAD RIVER, MOUTH TO WAITSFIELD COVERED BRIDGE (12 MILES)	E. COLI	CR	FAILING SEPTIC SYSTEMS AND OTHER UNKNOWN SOURCES; ELEVATED BACTERIA LEVELS	2007
VT08-19	TRIBS TO DOWSVILLE BROOK (TRIBS #1 & 11)	SEDIMENT	ALS	LOGGING RELATED EROSION; LOGGING OPERATIONS CEASED	2005

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VT08-20	CLAY BROOK, RM 1.8 UPSTREAM 0.1 MILES	STORMWATER, IRON	ALS	STORMWATER RUNOFF, EROSION FROM CONSTRUCTION ACTIVITIES & GRAVEL PARKING LOT; INCREASED PEAK STORMWATER FLOWS	2007
	FOLSOM BROOK	E. COLI	CR	FAILED/FAILING SEPTIC SYSTEMS; SOME AGRICULTURAL RUNOFF	2007
	RICE BROOK, MOUTH TO RM 0.6	STORMWATER	ALS	STORMWATER RUNOFF, EROSION FROM UPSTRM AREAS, LAND DEVELOPMENT	2006
VT09-06	**SMITH BROOK	IRON	ALS, AES	APPARENT LEACHATE FROM ADJACENT DUMP	2014
VT09-07L01	SKYLIGHT POND (Ripton)	ACID	ALS	ATMOSPHERIC DEPOSITION: EXTREMELY SENSITIVE TO ACIDIFICATION; EPISODIC	2004
VT10-04	WETLAND DRAINING TO SMALL STREAM TO OTTAUQUECHEE RIVER (BRIDGEWATER)	METALS (Fe)	ALS	BRIDGEWATER LANDFILL; LEACHATE ENTERING SURFACE WATER VIA WETLAND	2010
VT10-06	EAST BRANCH ROARING BROOK, RM 0.1 TO RM 0.6	STORMWATER, IRON	AES, ALS	STORMWATER RUNOFF, LAND DEVELOPMENT, EROSION	2008
	ROARING BROOK, RM 1.4 UPSTREAM 0.2 MILES	STORMWATER	AES, ALS	STORMWATER RUNOFF, LAND DEVELOPMENT; EROSION	2005
VT10-11	BLACK RIVER; FROM MOUTH TO 2.5 MI UPSTRM (SPRINGFIELD)	E. COLI	CR	COMBINED SEWER OVERFLOWS	2006
VT10-14	SOAPSTONE BROOK, LUDLOW	METALS (Fe, As), SEDIMENT	AES, ALS	AQUATIC HABITAT IMPAIRMENT; SOME EFFECT LIKELY FROM ACTIVE TALC MINE DRAINAGE; NEEDS ADDITIONAL UPSTREAM ASSESSMENT	2006
	TRIBUTARY TO JEWELL BROOK - LUDLOW	IRON	AES	EVIDENCE OF LUDLOW LANDFILL LEACHATE ENTERING SURFACE WATER	2010
VT11-10	WEST RIVER, BELOW BALL MOUNTAIN DAM TO TOWNSEND DAM (10 MILES)	SEDIMENT, TEMPERATURE	2CR	AQUATIC HABITAT DEGRADED FROM SEDIMENT RELEASES (93 & 95); ELEVATED TEMPERATURES	2005
VT11-15	BALL MOUNTAIN BROOK, ABOVE NORTH BRANCH CONFLUENCE	ACID	ALS	ATMOSPHERIC DEPOSITION: CRITICALLY ACIDIFIED; CHRONIC ACIDIFICATION	2005
VT11-15L02	LITTLE POND (Winhall)	ACID	ALS	ATMOSPHERIC DEPOSITION: EXTREMELY SENSITIVE TO ACIDIFICATION; EPISODIC	2004
VT12-01L01	HARRIMAN RESERVOIR (Whitingham)	ACID	ALS	ATMOSPHERIC DEPOSITION: EXTREMELY SENSITIVE TO ACIDIFICATION; EPISODIC	2004

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	HARRIMAN RESERVOIR (Whitingham)	MERCURY	FC	ELEVATED LEVEL OF MERCURY IN ALL FISH EXCEPT BROWN BULLHEAD	2008
VT12-01L04	SHERMAN RESERVOIR (Whitingham)	MERCURY	FC	ELEVATED LEVEL OF MERCURY IN ALL FISH EXCEPT BROWN BULLHEAD	2008
VT12-03	EAST BRANCH DEERFIELD RIVER, BELOW SOMERSET DAM	ACID	ALS	ATMOSPHERIC DEPOSITION: CRITICALLY ACIDIFIED; CHRONIC ACIDIFICATION	2005
	EAST BRANCH DEERFIELD RIVER, BELOW SOMERSET DAM	MERCURY	FC	ELEVATED LEVELS OF Hg IN ALL FISH	2008
VT12-03L01	GROUT POND (Stratton)	MERCURY	FC	ELEVATED LEVEL OF MERCURY IN ALL FISH EXCEPT BROWN BULLHEAD	2008
VT12-03L02	SOMERSET RESERVOIR (Somerset)	MERCURY	FC	ELEVATED LEVEL OF MERCURY IN ALL FISH EXCEPT BROWN BULLHEAD	2008
VT12-04	UPPER DEERFIELD RIVER, BELOW SEARSBURG DAM	MERCURY	FC	ELEVATED LEVELS OF Hg IN ALL FISH	2008
	UPPER DEERFIELD RIVER, BELOW SEARSBURG DAM	ACID	ALS	ATMOSPHERIC DEPOSITION; CRITICALLY ACIDIFIED; CHRONIC ACIDIFICATION	2005
VT12-04L02	LOST POND (Glastenbury)	ACID	ALS	ATMOSPHERIC DEPOSITION: CRITICALLY ACIDIFIED; CHRONIC ACIDIFICATION	2004
VT12-04L05	SEARSBURG RESERVOIR (Searsburg)	MERCURY	FC	ELEVATED LEVEL OF MERCURY IN ALL FISH EXCEPT BROWN BULLHEAD	2008
VT12-05	IRON STREAM, TRIB TO TANNERY BROOK (0.3 MILE)	IRON	ALS	LAND DEVELOPMENT, SOURCE(S) NEED FURTHER ASSESSMENT	2006
	NO. BRANCH DEERFIELD RIVER, TANNERY BRK RD TO 0.2 MI ABOVE SNOW LAKE	STORMWATER	AES, ALS	STORMWATER RUNOFF, LAND DEVELOPMENT & CONSTRUCTION RELATED EROSION	2006
	NO. BRANCH, DEERFIELD RIVER, VICINITY OF WEST DOVER	E. COLI	CR	HIGH E.COLI LEVELS; CAUSE(S) & SOURCE(S) UNKNOWN; NEEDS ASSESSMENT	2006
VT13-12	SACKETTS BROOK	UNDEFINED	ALS	HABITAT DEGRADATION; POSSIBLE PERIODIC SPILLS AT PAPER COMPANY; NEEDS ADDITIONAL UPSTREAM MONITORING	2005
VT13-14	WHETSTONE BROOK - BRATTLEBORO	E. COLI	CR	SOURCES UNKNOWN, POTENTIALLY FAULTY SEWER LINE/SEPTIC SYSTEM	2005
VT13-16	NEWTON BROOK (MOUTH UPSTREAM 2 MILES)	SEDIMENT	ALS	AGRICULTURAL ACTIVITY	2010

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VT14-02	COPPERAS BROOK (1 MILE)	METALS, ACID	AES, ALS, AWS, DWS	HIGH METALS IN DRAINAGE FROM ABANDONED ELIZABETH MINE & FROM TAILINGS PILES	2013
	LORDS BROOK (0.5 MILES ABOVE MOUTH UPSTREAM TO RM 3.3)	METALS, ACID	ALS	ABANDONED MINE DRAINAGE, BELOW "SOUTH CUT"	2011
	WEST BRANCH OF OMPOMPANOOSUC RIVER (3.8 MILES)	METALS, ACID	AES, ALS	HIGH METALS IN DRAINAGE FROM ABANDONED ELIZABETH MINE & FROM TAILINGS	2013
VT14-03	BRIMSTON CRN TO BELOW W. FAIRLEE VILLAGE, LOWER OMPOMPANOOSUC (2.4 MI)	E. COLI	CR	HIGH BACTERIA LEVELS; SOURCE(S) UNKNOWN	2007
	ELY BROOK (aka SCHOOLHOUSE BRK) BELOW ELY MINE (2.2 MILES)	METALS, ACID	AES, ALS, AWS, DWS	HIGH METALS IN DRAINAGE FROM ABANDONED ELY MINE	2013
VT14-03	OMPOMPANOOSUC RIVER BELOW ELY MINE (1.5 MILES)	METALS	AES	HIGH METALS IN DRAINAGE FROM ABANDONED ELY MINE & FROM TAILINGS	2013
	SAWNEE BEAN BR. TO USACOE BEACH AREA, LOWER OMPOMPANOOSUC (2.4 MILES)	E. COLI	CR	FREQUENT BEACH CLOSURES; HIGH BACTERIA LEVELS; SOURCE(S) UNKNOWN	2007
VT14-05	PIKE HILL BROOK, FROM MOUTH TO 3 MILES UPSTREAM	METALS	AES, ALS	HIGH METALS IN DRAINAGE FROM ABANDONED PIKE HILL MINE & TAILINGS	2013
	TRIBUTARY TO TABOR BRANCH, MOUTH UPSTREAM APPROX 0.1 MILE	UNDEFINED	ALS	AGRICULTURAL & BARNYARD RUNOFF; MILKHOUSE EFFLUENT	2008
VT14-07L01	LEVI POND (Groton)	ACID	ALS	ATMOSPHERIC DEPOSITION: EXTREMELY SENSITIVE TO ACIDIFICATION; EPISODIC	2004
VT14-07L02	TICKLENAKED POND (Ryegate)	PHOSPHORUS	AES, ALS, CR	ALGAE BLOOMS, HIGH PH, LOW D.O.	2008
VT15-01	PASSUMPSIC RIVER FROM PIERCE MILLS DAM TO 5 MILES BELOW PASSUMPSIC DAM	E. COLI	CR	ST. JOHNSBURY WWTF COLLECTION SYSTEM PASSES COMBINED SEWER OVERFLOWS	2011
VT15-04	LOWER SLEEPERS RIVER IN ST. JOHNSBURY	E. COLI	CR	ST. JOHNSBURY WWTF COLLECTION SYSTEM PASSES COMBINED SEWER OVERFLOWS	2011
VT16-04L01	MOORE RESERVOIR (Waterford)	MERCURY	FC	ELEVATED LEVELS OF MERCURY IN ALL FISH	2008
VT16-05L01	COMERFORD RESERVOIR (Barnet)	MERCURY	FC	ELEVATED LEVELS OF MERCURY IN ALL FISH	2008

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VT17-01	CRYSTAL BROOK IN DERBY (0.3 MILE)	SEDIMENT, NUTRIENTS	ALS	AGRICULTURAL RUNOFF	2007
VT17-01L01	LAKE MEMPHREMAGOG (Newport)	PHOSPHORUS	AES, CR	EXCESSIVE ALGAE GROWTH, NUTRIENT ENRICHMENT	2010
VT17-01L02	SOUTH BAY (Newport)	PHOSPHORUS	AES, CR	NUTRIENT ENRICHMENT, NUISANCE ALGAL	2010
VT17-02	TRIBUTARY TO STEARNS BROOK (HOLLAND)	UNDEFINED	ALS	AGRICULTURAL RUNOFF	2007
VT17-04L04	LAKE SALEM (Derby)	MERCURY	FC	ELEVATED LEVELS OF MERCURY IN WALLEYE	2008

Certain local, state and federal regulatory programs refer to impaired segments (or waters draining to those segments) listed on the 303d List of Impaired Waters as part of program operations. Contact the respective regulatory program for details regarding regulated activities in these waters and their watersheds.

Appendix E

Major Aquifer Types and Groundwater Protection Programs in Vermont

Appendix E1: Vermont Aquifer Types, Geology, and Hydrology

Source: Ground Water Atlas of the United States HA 730-M ("Section 12")
Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, Vermont
http://capp.water.usgs.gov/gwa/ch_m/M-text1.html

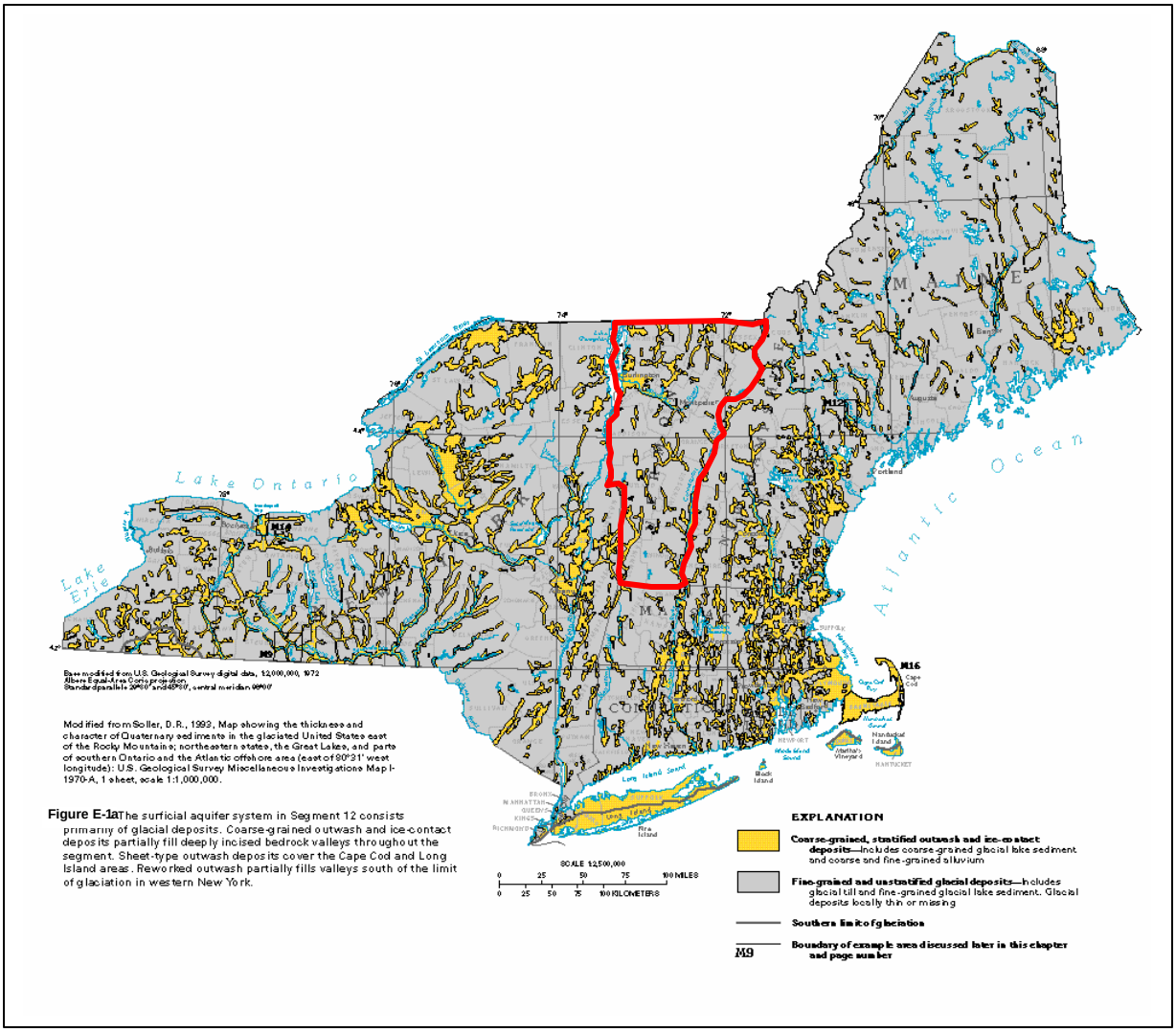


Figure E-1a: Surficial Aquifer Systems in the New England Region

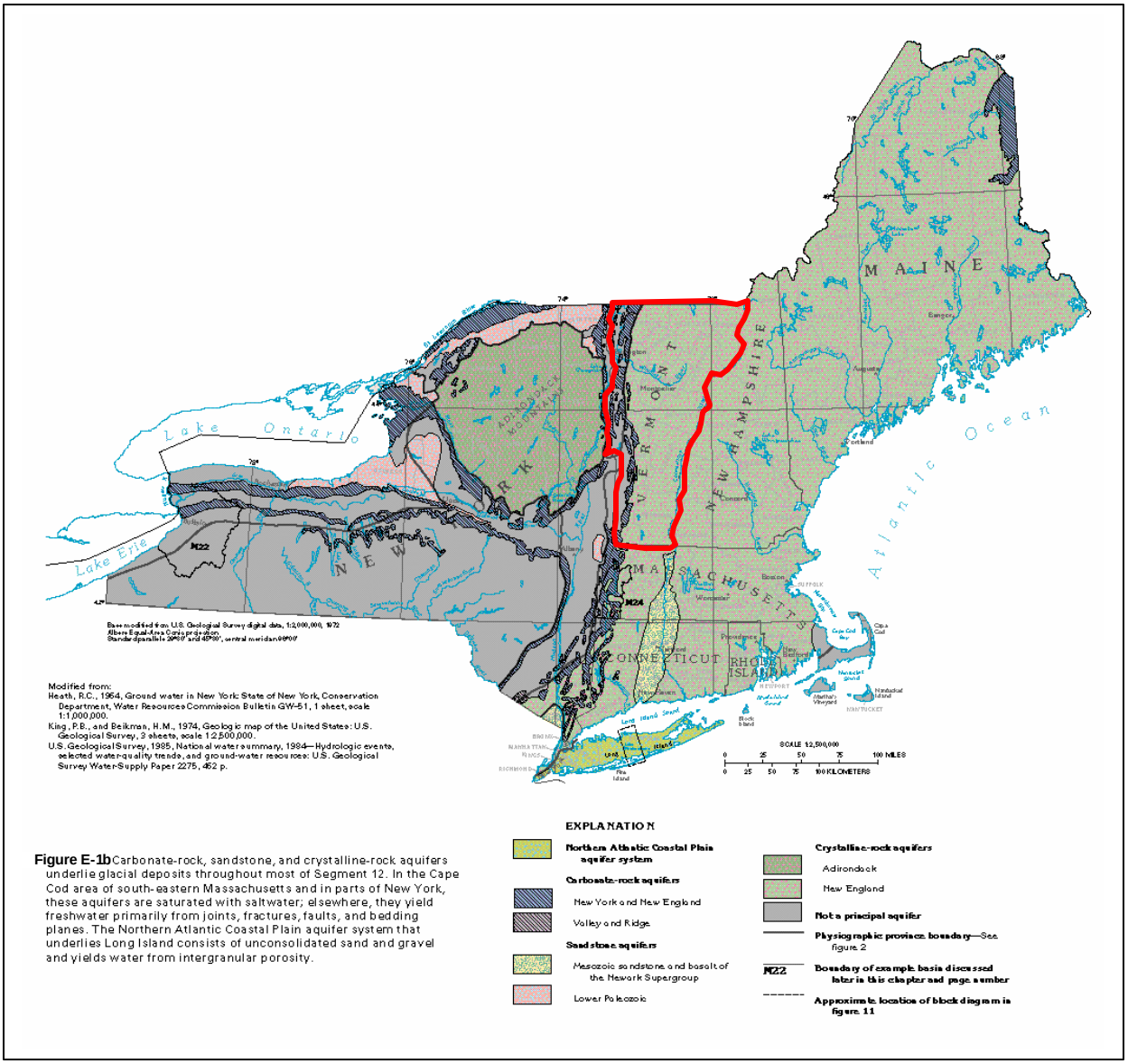


Figure E-1b Carbonate-rock, sandstone, and crystalline-rock aquifers underlie glacial deposits throughout most of Segment 12. In the Cape Cod area of south-eastern Massachusetts and in parts of New York, these aquifers are saturated with saltwater; elsewhere, they yield freshwater primarily from joints, fractures, faults, and bedding planes. The Northern Atlantic Coastal Plain aquifer system that underlies Long Island consists of unconsolidated sand and gravel and yields water from intergranular porosity.

Figure E-1b: Aquifer Types in the New England Region

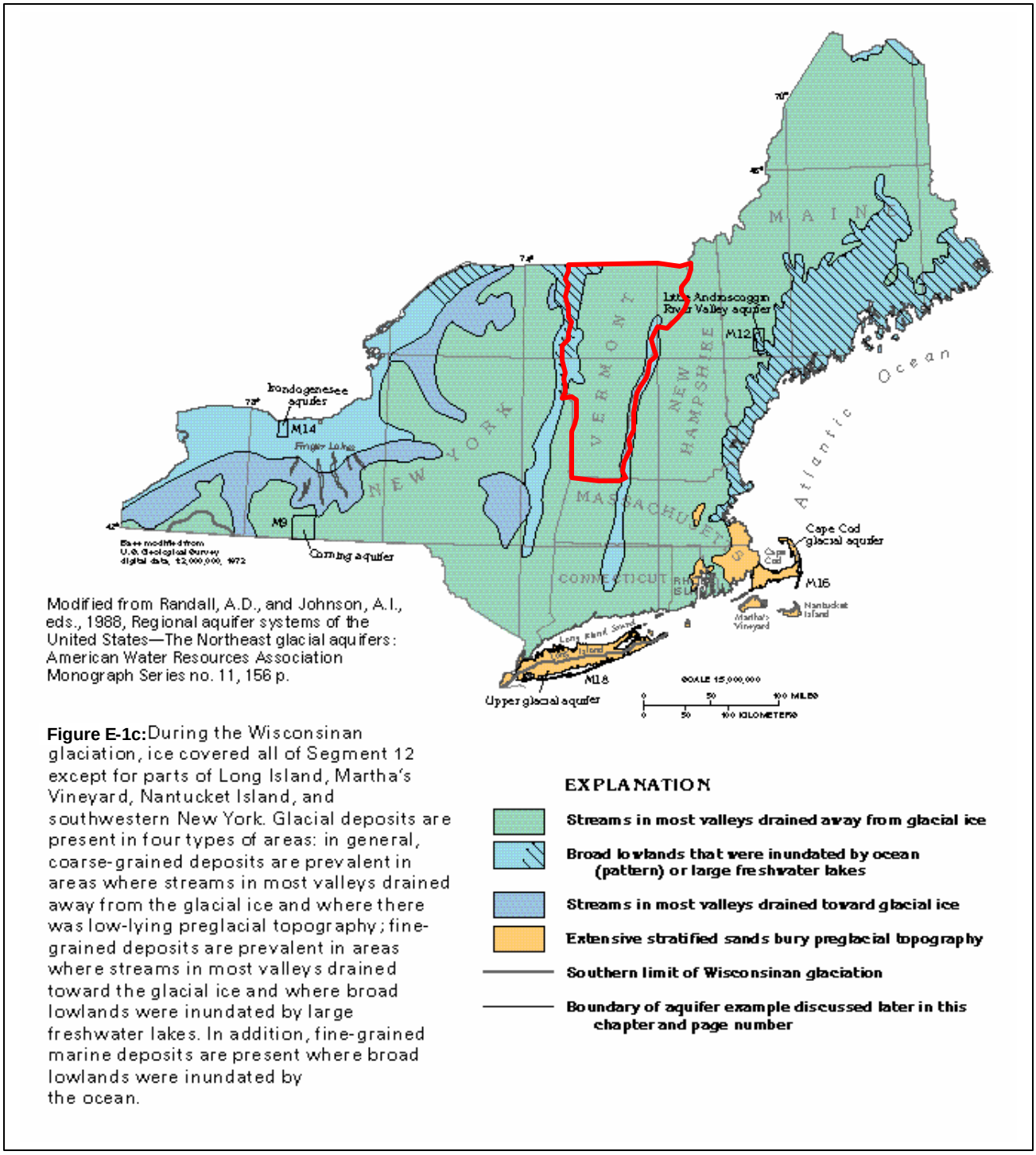


Figure E-1c: During the Wisconsinan glaciation, ice covered all of Segment 12 except for parts of Long Island, Martha's Vineyard, Nantucket Island, and southwestern New York. Glacial deposits are present in four types of areas: in general, coarse-grained deposits are prevalent in areas where streams in most valleys drained away from the glacial ice and where there was low-lying preglacial topography; fine-grained deposits are prevalent in areas where streams in most valleys drained toward the glacial ice and where broad lowlands were inundated by large freshwater lakes. In addition, fine-grained marine deposits are present where broad lowlands were inundated by the ocean.

Figure E-1c: Glacial Deposits and Drainage Patterns in the New England Region

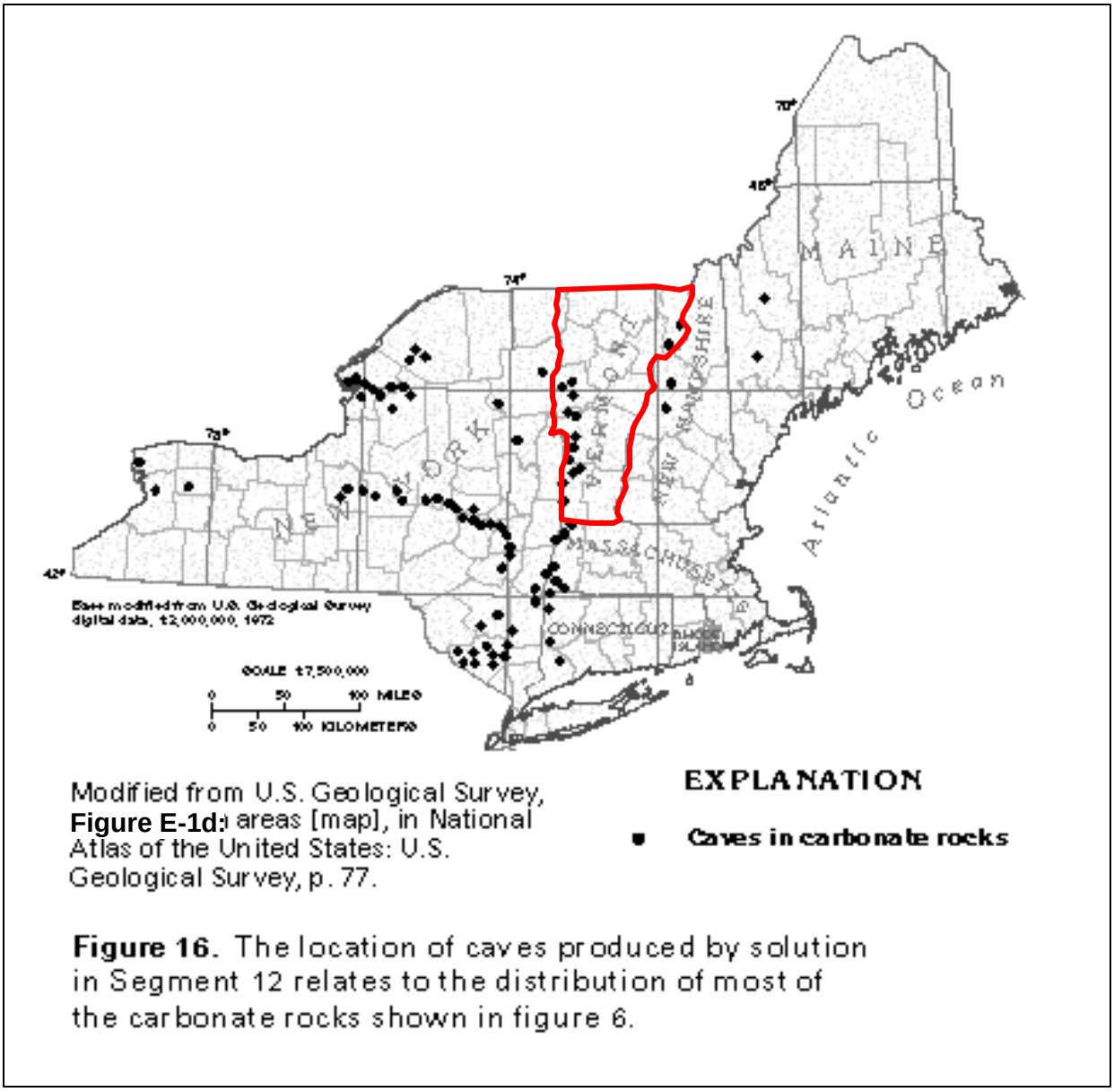
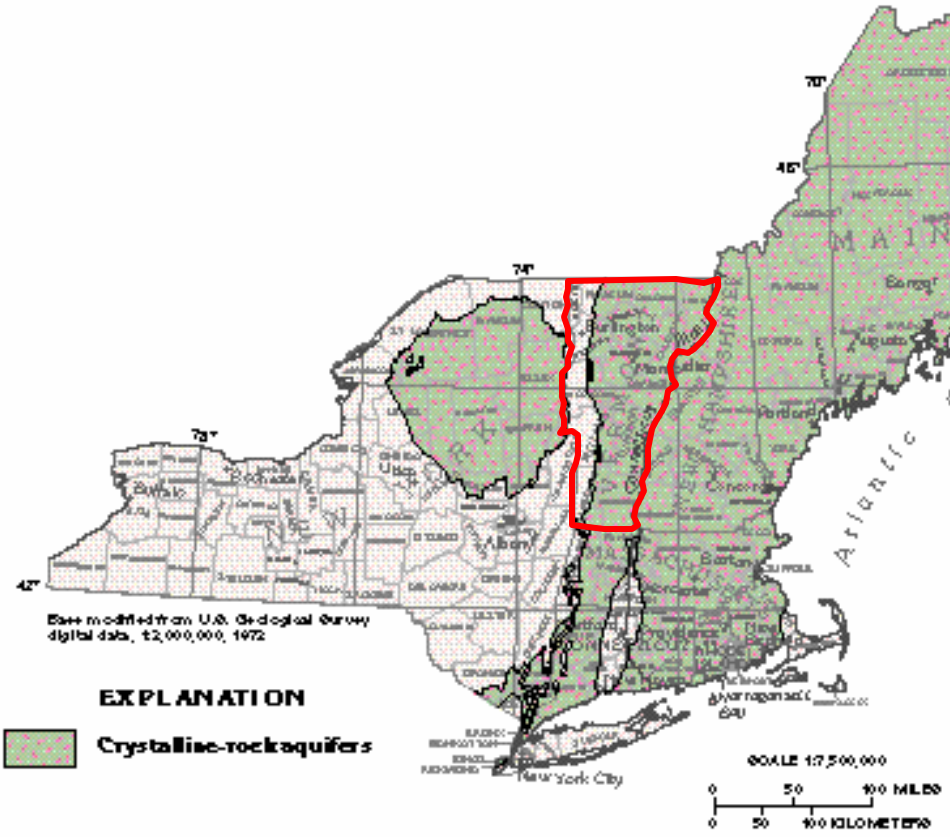


Figure E-1d: Cave Locations in Carbonate Formations in the New England Region



Data from U.S. Geological Survey, 1990, National water summary, 1987—Hydrologic events and water supply and use: U.S. Geological Survey Water-Supply Paper 2350, 553 p.

Figure E-1e: About 65 percent of the bedrock surface in Segment 12 consists of crystalline rocks of igneous or metamorphic origin which comprise aquifers.

Figure E-1e: Igneous and Metamorphic Formation Aquifers in the New England Region

Appendix E-2: Groundwater Monitoring & Assessment
Part Seven of the State of Vermont
2004 Water Quality Assessment Report (305B Report)
Vermont Department of Environmental Conservation
Water Quality Division

It is the policy of the state of Vermont to protect its groundwater resources (Chapter 48: Groundwater Protection). To this end, the Secretary of the Vermont Agency of Natural Resources is responsible for the development of a comprehensive groundwater management program and has established a Groundwater Coordinating Committee with representation from the private sector as well as other departments and agencies. The Committee's role is to advise the Secretary regarding the development of the groundwater program and its corresponding implementation. Also, the Secretary shall, after review by the Groundwater Coordinating Committee, adopt rules for the protection of public water source protection areas (Chapter 56: Public Water Supply). The administrative arm of the Committee is the Water Supply Division (WSD) of DEC.

The purpose of the groundwater program is to protect the quality of groundwater through a variety of mechanisms. Such mechanisms include the development of a strategy for the management and protection of the state's groundwater. This strategy is to be integrated with other regulatory programs administered by the Secretary. Continuing studies and investigation of groundwater, identifying and mapping groundwater, and classifying groundwater per technical criteria and standards, are also components of the program. Cooperation with the federal government in the development of groundwater protection programs along with cooperating with other government agencies in collecting and compiling data on the quantity and quality of groundwater and location of aquifers are yet additional aspects of the groundwater program. Finally, the strategy also includes developing public information and education materials along with providing technical assistance to municipalities for the purpose of protecting the groundwater resources.

Groundwater Strategy and Management
During 2003, the WSD and the Groundwater Coordinating Committee (GWCC) focused on revising the Groundwater Rule and Strategy (GWR&S). The GWR&S is required under 10 VSA §1392(d) of the Groundwater Protection statute. This same statute establishes the GWCC in 10 VSA §1392(c). The purpose of the rule and strategy as well as the committee is, in part, to develop and implement a groundwater program. Improvements to the existing groundwater program were thought attainable by revising the GWR&S. Because groundwater quality standards are continuously changing the rule was updated to include these changes. Revisions to the GWR&S include updates to water quality standards that establish groundwater remediation requirements. Protection of groundwater is sought through compliance with the groundwater quality standards. Compliance with these standards can require remediation of groundwater contamination.

Related to the strategy and management of groundwater and during 2002, the state's on-site sewage statute was comprehensively reformed to provide universal jurisdiction over all on-site sewage (i.e. septic) systems. Existing sewage ordinances and bylaws regulating private water supplies and wastewater systems are superceded by the uniform statewide technical standards beginning July 1, 2007. There were several other provisions contained in the legislation, one of which required the Agency of Natural Resources to develop a model groundwater protection ordinance that municipalities may use as part of their municipal planning efforts. The legislation affecting sewage reform is considered a major event in the protection and improvement of Vermont's groundwater quality.

Cooperation and Coordination

Under the provisions of 10 VSA, §1392(c), the GWCC has the responsibility of advising the Secretary on groundwater issues. The Committee consists of representatives of all state agencies whose programs impact groundwater, plus members of outside organizations interested in groundwater issues. In 2003, the Committee met on a monthly basis and has provided significant coordination with the Waste Management Division (WMD) of DEC regarding the classification of groundwater. In particular, several groundwater areas identified by the WMD as contaminated were subsequently classified as Class IV groundwater areas. This designation defines the groundwater area as nonpotable.

State and federal regulations govern drinking water, wastewater, and waste disposal as related to groundwater. The GWCC provides input to these regulations and has focused on a number of recent regulations. Included in this review is the *Groundwater Rule and Strategy.* This rule has been updated to include198 primary groundwater quality standards and14 secondary groundwater quality standards. These standards are listed with Enforcement Standards and Preventative Action Levels in the 2003 revised rule. Other regulations recently revised, with input from the GWCC, include the Environmental Protection Rules, Chapter 1, *Wastewater System and Potable Water Supply Rules:* Chapter 1 and the *Water Supply Rule:* Chapter 21. Updates to Appendix A, Parts 11 and 12, *Small Scale Water Systems* and *Construction & Isolation Standards for Wells,* of Chapter 21 are also being considered.

It is expected that the federal Groundwater Rule is to be promulgated by EPA in the fall 2004. DEC anticipates this rule will require that sanitary surveys be conducted every three years for community water systems and every five years for the remaining systems. The Rule will likely increase state efforts to identify sources of fecal contamination, require source water microbial sampling for nondisinfecting systems, and require the state to conduct hydrogeological sensitivity assessments for nondisinfecting public water systems that are vulnerable to contamination.

Proposed state legislation in 2003 was discussed among GWCC members. The proposed legislation included requiring testing of private water supplies at the time of property sale is being considered and a separate legislation requiring the permitting of certain groundwater withdrawals.

Members of WSD and the Vermont Geological Survey (VGS) provided a report outlining a proposed strategy for mapping Vermont's aquifers. The report, requested by the Legislature, contains information on the current status of groundwater reclassification and groundwater mapping in Vermont along with proposed strategies for mapping the state's aquifers by 2007. The report is provided as Appendix E.

The VGS coordinated with the WSD and the Agency of Agriculture, Food, and Markets regarding the nitrate contamination of groundwater near a farm in East Montpelier. Elevated nitrate has been found in several private residential wells near some of the farm's fields. In April 2003, VGS and WSD submitted a nonpoint source pollution control grant proposal and obtained $30,000 in Clean Water Act Section 319 funding for VGS to continue its work. Plans include using a borehole camera down 10-12 residential wells to look at the well construction and identify fractures, bedding, and water-bearing zones. A subset of wells will be sampled for major and trace element geochemistry, nitrogen and oxygen isotopes, and chlorofluorocarbon dates. A tracer study using fluorescent dyes is also under consideration.

Throughout 2003, experts from DEC and others addressed a variety of GWCC concerns. These concerns included the occurrence of naturally occurring arsenic and radionuclides. The wastewater disposal issue regarding radionulcides at public drinking water system is particularly problematic. MTBE is also of major concern regarding groundwater. In Vermont, about 75,000 private wells near hazardous waste sites have been sampled for MTBE. More than 250 wells have detections across the state. The GWCC

agreed that this topic warrants further investigation. In some cases, depending on the extent of contamination and the hydrogeological setting, a Class IV designation could be appropriate.

The GWCC has examined its own roles and responsibilities and determined that to be an effective committee it must have a stronger relationship with the Secretary of the Agency of Natural Resources. To strengthen its role in protecting groundwater, Vermont must better coordinate groundwater concerns and design an educational strategy.

Groundwater Investigations

Investigations between 2001-2003 were pursued by WSD's Water Resource Management staff. The staff identified approximately 80 public community water systems with simple 3000 foot radius circles for Source Protection Areas (SPAs). WSD staff identified existing data for water systems in an effort to hydrogeologically delineate a corresponding SPA. Data examined often included well completion reports, pump tests or aquifer analysis data, bedrock and surficial geology information, along with orthophoto and topographic maps. In addition, a site visit was conducted at the corresponding water system. With this data in mind, appropriate hydrogeologic calculations and principles were used to provide a hydrogeologically based SPAs for the water systems. A rationale explaining the SPA was also provided. Of the 80 SPAs identified, 9 reports have been completed and another 10 are being drafted. The result of this work has been to optimize data provided by WSD's permitting programs.

The WSD's 30 year old water level monitoring program was discontinued in 1995 due to lack of resources. The program provided water level trends for about twenty wells throughout the State. The WSD has entered into a contract with the US Geological Survey to continue monitoring 12 of the 20 monitoring wells to continue this program.

Information and Public Education

Each of the above SPA delineations includes a public notice. The town, residents or property owners in the SPA, and officials of the water system were contacted. An opportunity for a hearing regarding the SPA was also provided. This process is also provided in the reclassification of groundwater. The outcome of both processes includes the identification of the groundwater resources along with an excellent rapport developed with concerned citizens at the town level. Groundwater planning at the local level can be better afforded through such efforts. It is hoped that such studies will go a long way with respect to educating the public and protecting the resource.

Staff of the WSD met with town officials of Brandon, Vermont regarding their SPA. Brandon officials are considering enhancing the protective measure of the SPA by reclassifying their aquifer as Class II groundwater. They are also considering whether their aquifer would benefit from a Federal Sole Source Aquifer designation. The WSD and EPA Region I have discussed the requirements of this designation and plan to work with the town to explore this designation.

EPA Region I, the Vermont Department of Health and the WSD have collaborated on groundwater support documents, such as *Guide to Water Quality Testing in Private Wells* and *Private Well Brochure for New England Real Estate Agents.* In addition, a groundwater protection handbook for local officials, the *Ounce of Prevention,* is being updated and will include a groundwater model ordinance. The Vermont Department of Health (DOH) continues to provide groundwater related fact sheet to other departments and agencies as well as the public. Websites specific to groundwater in Vermont include those maintained by WSD, VGS, WMD, and DOH. These sites contain information regarding regulations, groundwater, geology, and provides access to the well completion report data base.

The WSD annually sponsors Drinking Water Day at the Statehouse. The event provides a number of exhibits that explains the importance of drinking water and its protection. Attendance often includes students, the general public, interested parties, and members of the legislature.

The remainder of this chapter is devoted to a summary discussion of significant aspects concerning the status of groundwater in Vermont.

State of Groundwater Quality

The quality of Vermont's groundwater varies due to both natural and human influences. No comprehensive studies have been completed on the quality of the resource. The WSD requires water quality monitoring at public community and non-transient non-community water systems. A map showing the approximate location of the public community and non-transient waters systems[1] in Vermont is provided at the end of this chapter. Below are results of the monitoring as it pertains to water systems on increased monitoring:

> In 2003, 113 groundwater supplied public water systems received boil-water notices mostly due to bacterial contamination. Boil-water requirements were also due to leaks in the distribution system, water system infrastructure deficiencies, lack of water, or other reasons. Of these 113 systems, 28 were Transient Non-community water systems, 28 were Non-transient Non-community water systems, and 59 were Public Community water systems (WSD, 2003).
>
> 5 public water systems are on increased monitoring due to arsenic levels equal to or above the Maximum Contaminant Level (MCL) concentration of 0.010 ppm (WSD, 2003). A map of arsenic detections appears at the end of this chapter.
>
> 9 public water systems are on increased monitoring because either the gross alpha particle radiation was above 10 pCi/l (the gross alpha MCL is 15 pCi/L) or was above the MCL of 5pCi/l for radium (WSD, 2003). A map of gross alpha values is provided at the end of this chapter.
>
> 9 public water systems have nitrate concentrations equal to or above the 5 mg/l limit which triggers increased monitoring. The MCL for nitrate is 10 mg/l (WSD, 2003).
>
> 28 public water systems are required to perform increased monitoring because these systems have had VOC detections over the 5 ug/l limit (WSD, 2003).

Vermont's Agency of Agriculture, Food, and Markets oversees agricultural activities and promotes best management practices with respect to groundwater protection. As part of this effort the Agency found:

> There are 1,294 private agricultural monitoring wells. All of the wells do not necessarily serve farms but all are subject to agricultural land use. Of these 1,294 monitoring wells (863 are farm wells and 431 are neighboring wells), 78 wells (6%) exceed the MCL for nitrate-N of 10 mg/l (Vermont Agency of Agriculture, 2003).

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[1] A **Public Community System** means a water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents. A **Non-transient System** means a system that regularly serves at least 25 of the same persons daily for more than 6 months per year (e.g. schools, factories, office buildings).

> Of the 1,294 agricultural monitoring wells, 55 wells (4.2%) tested positive for herbicides but only one well exceeded the MCL or Health Advisory. (Vermont Agency of Agriculture, 2003).

The Waste Management Division (WMD) of DEC regulates and manages a wide variety of hazardous waste along with the groundwater clean-up that occurs regarding this waste. The WMD reports that:

> There are approximately 1,400 petroleum or hazardous waste sites in Vermont which have degraded or have the potential to degrade groundwater to the point where it is non-potable. There are approximately 1,600 sites where the WMD has addressed the existing potential release of hazardous substances and completed site management (WMD, 2003). A map showing the approximate location of known hazardous waste sites in Vermont appears at the end of this chapter.

> There are 2,476 underground storage tanks (UST) in Vermont that could each individually pose a threat to groundwater quality in the event of a leak (WMD, 2003). A map showing the approximate location of known USTs in Vermont is provided at the end of this chapter.

In 2003, the WSD provided the VGS with data regarding the occurrence of radionuclides and arsenic at public water systems. VGS mapped the location of this information and determined the geologic characteristics of corresponding problem areas. As part of this investigation it was determined that:

> Approximately 90% of the state has been mapped for elevated radioactivity, however, areas of elevated radioactivity may or may not correlate to contamination in groundwater (VGS, 2003).

The USGS for New England examined data on arsenic levels for 1,600 public and private water sources. The study focused primarily on the eastern part of the region, which contains the highest population density and where large amounts of groundwater are used for the water supply. Although there are some water supplies with high arsenic levels in western New England, the problem is not as extensive as it is in the eastern part of the region (USGS, 2003). As mentioned, only five water systems in Vermont require increased monitoring due to arsenic.

State of Groundwater Assessment and Use

Public groundwater sources are expected to supply sufficient water quantities. However, other than those regulated as public water sources, groundwater withdrawals are not regulated. Likewise, the significance of groundwater to the ecosystem is not routinely evaluated. Groundwater assessments are driven by the rules mentioned above and by several interested parties such as the USGS. Information from these assessments provides the basis for characterizing groundwater in the State. The following provides some facts regarding groundwater:

> About 50 million gallons of groundwater is withdrawn on a daily basis in Vermont. Withdrawals from public and private groundwater sources account for 33 million gallons per day. Agricultural withdrawal accounts for 2 million gallons daily, another 12 million is used for commercial and industrial purposes, and the remaining groundwater withdrawals are used for mining and the generation of thermoelectric power. (USGS, 1997)

> Groundwater is currently used for drinking water by approximately 70% of Vermont's population. About 46% of the population are self supplied while about 24% are served by public water systems using groundwater (USGS, 1997). In 2003, there were 22 new or modified groundwater sources that required a source permit from WSD.

> Of the 2,078 active farms within Vermont, 85-90% rely on groundwater for agriculture use (Vermont Agency of Agriculture, 2003). It is estimated that 320,000 of Vermonters get their drinking water from about 93,500 private wells. This number does not include dug wells or springs. Approximately 2,000 new private wells

were drilled and reported to the WSD in 2003.

It is estimated that 80% of the private wells are completed in bedrock and 20% in gravel aquifers. The mean well depth is about 200 feet and the mean yield is about 6 gallons per minute (WSD, 2003).

Groundwater levels in Vermont are measured at 12 monitoring wells located throughout the state. For the year 2003, groundwater levels were normal from 1/03 to 6/03 and above normal from 7/03 to 12/03 (USGS, 2003).

Six public water supplies currently lack sufficient water quantity to meet their water demands. Water shortages have occurred at Jericho Heights (Jericho), Oglewood (Milton), Magic Village (Londonderry), Deep Rock Water FD#8 (Barre Town), Eatons Mobile Home Park (Royalton), and Windy Hill Acres located in Springfield (WSD, 2003).

87% of the public community water systems in the State have their corresponding Source Protection Areas or aquifer recharge areas mapped. The remaining public community water systems are using 3,000 foot radius circles as their Source Protection Areas (WSD, 2003).

Existing aquifer maps include the *Groundwater Favorability Maps* (1966 to 1968) which cover the entire state, the *Geology for Environmental Planning* series (1975) that covers 66% of Vermont and was primarily based on data from the *Surficial Geologic Map of Vermont* (1970) and the *Centennial Geologic Map of Vermont* (1961). In the 1980s, ANR provided aquifer maps to 20 towns for planning purposes while just 2 years ago VGS produced an aquifer map in Arlington. These maps included a depth to groundwater map, a thickness of overburden map, and an aquifer yield maps. (Report on the Status of Groundwater and Aquifer Mapping in the State of Vermont, 2003).

Vermont's groundwater classification systems defines Class I groundwater as suitable for a public water supply with character that is uniformly excellent and is not exposed to any activities that pose a risk to its use. Currently, there are no Class I groundwater areas classified in Vermont.

Vermont's groundwater classification system defines Class II groundwater as suitable for public water supply with character that is uniformly excellent but exposed to activities that may pose a risk to its use. There are no Class II groundwater areas in Vermont although one area is currently being proposed as a Class II groundwater area (Brandon, Vermont).

Vermont's groundwater classification system defines Class IV groundwater as not suitable as a source of potable water but suitable for some agricultural, industrial, and commercial uses. There are 8 areas classified as Class IV groundwater areas in Vermont, including the Burgess Brothers Landfill (Bennington), Parker Landfill (Lyndon), Transitor Electronics (Bennington), UniFirst Sites (Williamstown, Brookfield, and Randolph), Pine Street Barge Canal (Burlington), Maska Inc. (Bradford), Windham Solid Waste District Unlined Landfill (Brattleboro), and the Bennington Landfill located in Bennington.

With the exception of the 8 Class IV groundwater areas, Vermont's remaining groundwater is classified as Class III. Class III groundwater is defined as suitable as a source of water for individual water supply, irrigation, agricultural use, and general industrial and commercial use. Groundwater is a critical resource for the State of Vermont and continues to be vulnerable to numerous man-made and natural risks. It supplies a significant portion of the drinking water to Vermont's population. While drinking water is a top priority environmental concern in the State, the clear connection between drinking water and groundwater is lacking. Groundwater efforts, however, are most limited regarding its interaction with surface water. Specifically, the contribution groundwater makes to wetlands, streams, rivers, ponds and

lakes receives little attention. Its importance to sustaining the drinking water needs of the State along with Vermont's flora and fauna appears to be taken for granted. The lack of attention given to groundwater when compared to the attention given to surface waters may be due, in part, to the lack of public education regarding groundwater and the associated costs required to comprehensively evaluate this resource.

Appendix F

Soils in Vermont

Vermont Soil Fact Sheet- Detailed Definitions and Explanations

General Information

The Vermont Soil Fact Sheet was developed to organize a variety of data about a particular soil map unit on one page.

Vermont Important Farmland Classification

Important Farmland ratings help to identify soil map units that represent the best land for producing food, feed, fiber, forage, and oilseed crops. Important Farmland inventories identify soil map units that are Prime Farmland, Additional Farmland of Statewide Importance, and Additional Farmland of Local Importance

Prime Farmland (**Prime**)

The national definition of Prime Farmland was modified to include information that applies to soils in Vermont. The national definition can be found in the Code of Federal Regulations (7CFR657).

Soil map units are Prime Farmland if they have the best combination of physical and chemical characteristics for producing food, feed fiber, forage, and oilseed crops and are also available for these uses. The present land use may be cropland, pasture, forestland, or other land uses, but not urban and built-up or water. Location, tract size, and accessibility to markets and support industries are not considered when making a Prime Farmland determination.

Prime Farmland has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed according to acceptable farming methods. These soils have an adequate and dependable water supply from precipitation, a favorable temperature and growing season, acceptable acidity or alkalinity, and few or no surface stones or boulders. They are permeable to water and air, are not excessively erodible or saturated with water for a long period of time, and don't flood frequently or are protected from flooding.

To qualify as a Prime Farmland soil map unit, the dominant soils must meet all of the following conditions:

* Soil temperature and growing season are favorable.

* Soil moisture is adequate to sustain commonly grown crops throughout the growing season in 7 or more years out of 10.

* Water moves readily through the soil and root-restricting layers are absent within 20 inches of the surface.

* Less than 10 percent of the surface layer consists of rock fragments larger than 3 inches in diameter.

* The soils are neither too acid nor too alkaline for, or the soils respond readily to additions of lime.

* The soils are not frequently flooded (less often than once in 2 years) and have no water table, or the water table can be maintained at a sufficient depth during the growing season for the growth of commonly grown crops.

* Slope is favorable (generally less than 8 percent) and the soils are not subject to serious erosion.

* The soils are typically deep (greater than 40 inches to bedrock), but include moderately deep soils (20 to 40 inches) with adequate available water capacity.

Additional Farmland of Statewide Importance (**Statewide**)

This is land, in addition to Prime Farmland, that is of Statewide importance for the production of food, feed, fiber, forage, and oilseed crops. In Vermont, criteria for defining and delineating Statewide Important Farmland was determined by the appropriate state agencies, working with the Natural Resources Conservation Service.

The dominant soils, in these soil map units, have limitations resulting from one or more of the following:

* Excess slope and erosion hazard,

Vermont Important Farmland Classification

* Excess wetness or slow permeability,

* A flooding hazard,

* Shallow depth (less than 20 inches) to bedrock or other layers that limit the rooting zone and available water capacity,

* Moderately low to very low available water capacity.

Additional Farmland of Local Importance (**Local**)

In some areas, there is a need to identify additional farmlands for the production of food, feed, fiber, forage, and oilseed crops that has not been identified by the other categories in the Important Farmland system. These lands can be identified as Additional Farmland of Local Importance by the appropriate local agencies. In places, Additional Farmlands of Local Importance may include tracts of land that have been designated for agriculture by local ordinance.

In Vermont, a few soil map units in certain counties have been identified as Additional Farmland of Local Importance. The local Natural Resources Conservation Districts made these designations, with assistance from local NRCS personnel and concurrence by the State Conservationist.

For many soil map units on less than 15 percent slope that are somewhat poorly drained to very poorly drained the major limiting factors that need to be overcome are surface stones that cover 0.1 to 3.0 percent of the surface and wetness. However, many of these areas may have never been cleared of surface stones because the wetness limitation was too difficult to overcome.

NPSL. stands for “Not Prime, Statewide, or Local” and replaces “not rated”

Important Farmland Determinations

An Important Farmland classification of Prime, Statewide, Local is assigned to soil map units based on the characteristics of the dominant soils in the soil map unit. Determinations of unique are based on the specific crop and are not directly related to the soil map unit.

In most cases, Important Farmland determinations are made on a soil map unit basis. They are never made for individual components of a soil map unit. For example, if the area in question is a delineation of a Prime soil map unit the whole area is considered Prime regardless of any map unit inclusions within the delineation.

The Important Farmland designation of individual delineation's of a soil map unit can't be changed without an onsite investigation and a change in the official copy of the soil map where the area is located. This would only occur after an evaluation of a representative sample of all delineation's of the specific soil map unit within the soil survey area.

There are exceptions. Prime, Statewide, and Local soil map units can't be urban or buildup. A delineation of a Prime, Statewide, or Local soil map unit, which has been converted to urban or build up, should no longer be considered Important Farmland. The delineation should be changed to an appropriate soil map unit on the official copy of the soil map.

Delineations of some soil map units that are Prime, Statewide, or Local have a wetness, bedrock, or slope limitation. These soil map units are footnoted in the soil surveys legends at the end of this report. It is assumed that delineations of these map units are Prime, Statewide, or Local unless an onsite determines that the delineation should not be Important Farmland. A determination that the delineation is not Important Farmland doesn't require that change is made in the soil map unit symbol. See the FOOTNOTES section for more details.

The following footnotes are used:

FOOTNOTE “a” - If the upper slope class limit of the soil map unit is between 9 and 15 percent then the areas of the soil map unit that exceed 8 percent slope don’t qualify as Prime, Statewide, or Local. If the upper slope class limit exceeds 15 percent then the areas of the soil map unit that exceed 15 percent slope don’t qualify as Important Farmland.

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FOOTNOTE “b” - The soils in this soil map unit have a wetness limitation that may be difficult and/or unfeasible to over come. Areas of this soil map unit don’t qualify as Prime, Statewide, or Local, if artificial drainage is not feasible.

FOOTNOTE “c” - Bedrock outcrops commonly cover more than 2 percent of the surface. Areas of this soil map unit will not qualify as Prime, Statewide, or Local, if bedrock outcrops are extensive enough to prohibit efficient farming.

Vermont Agricultural Value Group

Agricultural value groups are a land classification system that can be used to compare the "relative value" for crop production of one soil map unit to another. They can be a useful tool in administering national, state, and local land use programs and regulations.

Soil map units were placed in their respective Agricultural Value Groups assuming that it was feasible to apply the corrective measures needed to overcome the soil limitations identified in the soil potential study. Soil map units associated with bedrock or wetness are identified by footnotes, defined in the section Footnotes, and are listed on the soil survey legends. Users of this report are encouraged to consider the footnotes and the need for on-site investigations.

Agricultural Value Groups Descriptions

Agricultural Value Groups consist of soil map units that have similar characteristics, limitations, management requirements, and potential for crop production. Soil map units in Group 1 have the most potential for crop production and soil map units in Groups 11 and 12 have the least potential for crop production. The description and makeup of the Agricultural Value Groups are as follows:

1 – These soil map units have an Important Farmland rating of Prime. Most of the soil map units are in Land Capability Class 1 or 2. Their relative value is 100.

2 – These soil map units have an Important Farmland rating of Statewide. Most of the soil map units are in Land Capability Class 2. Their relative value is 97.

3 – These soil map units have an Important Farmland rating of Prime. Most of the soil map units are in Land Capability Class 2 or 3. Their relative value is 84.

4 – These soil map units have an Important Farmland rating of Statewide. Most of the soil map units are in Land Capability Class 2, 3, or 4. Their relative value is 82.

5- These soil map units have an Important Farmland rating of Statewide. Most of the soil map units are in Land Capability Class 3. Their relative value is 69.

6- These soil map units have an Important Farmland rating of Statewide. Most of the soil map units are in Land Capability Class 2, 3, or 4. Their relative value is 63.

7- These soil map units have an Important Farmland rating of Statewide. Most of the soil map units are in Land Capability Class 3. Their relative value is 57.

8- These soil map units have limitations for crop production that can be overcome. Most of the soil map units are in Land Capability Class 4 or 6. Low crop yields, low available water capacity, and erosion hazard tend to be the major limitations. This group includes a few soil map units that have an Important Farmland rating of Local. Their relative value is 52.

9- These soil map units have limitations that are difficult to overcome and they are usually considered to be unsuitable for crop production. Limiting factors can include but are not limited to slope, wetness, surface stones, and bedrock outcrops. On-site investigations are strongly recommended to determine the feasibility of installing corrective measures and using these soils for crop production. If the user determines, that corrective measures can't be installed then the area in question should be placed in Agricultural Value Group 11. Normally, the cost of overcoming corrective measures and laws governing the installation of corrective measures should not be considered when making this determination. In some situations, if laws prevent the installation of corrective measures, the area in question should be placed in Agricultural Value Group 11. Most of the soil map units are in Land Capability

Vermont Agricultural Value Group

Class 5, 6, or 7. Their relative value is 43.

10- These soil map units have limitations are very difficult to overcome and they are usually considered to be unsuitable for crop production. Limiting factors can include but are not limited to slope, wetness, surface stones, and bedrock outcrops. They can be used as cropland only after intensive and expensive installation of various corrective measures. On-site investigations are strongly recommended to determine feasibility of installing corrective measures and using these soils for crop production. . If the user determines, that corrective measures can't be installed then the area in question should be placed in Agricultural Value Group 11. Normally, the cost of overcoming corrective measures and laws governing the installation of corrective measures should not be considered when making this determination. In some situations, if laws prevent the installation of corrective measures, the area in question should be placed in Agricultural Value Group 11. Most of the soil map units are in Land Capability Class 5, 6, or 7. Their relative value is 22.

11- These soil map units are considered to have very limited potential for crop production. Most of the soil map units are in Land Capability Class 7 or 8. Only in rare situations, and usually after great expense, are these soil map units converted for crop production. Their relative value is 0.

12- These soil map units are areas within a digitized or published soil survey that have never been mapped because of restricted access or the policy on mapping urban areas that was in place at the time. An onsite should be conducted to determine if areas of these soil map units should be assigned to a different Agricultural Value Group. No relative value is assigned.

FOOTNOTE “d”- The soils in this soil map unit have a wetness limitation that may not be feasible to over come. Areas of this soil map unit, where artificial drainage is not feasible should be placed in Agricultural Value Group 11.

FOOTNOTE “e”- Bedrock outcrops cover more than 2 percent of the surface. Areas of this soil map unit should be placed in Agricultural Value Group 11, if bedrock outcrops are extensive enough to prohibit efficient farming.

Possible Uses

Agricultural Value Groups and relative values may be useful in many state and local programs, including:

* design and implementation of Agricultural Land Evaluation and Site Assessment (LESA) systems;

* implementation of Public Law 97-98, the Farmland Protection Policy Act (FPPA);

* rating of agricultural soils for appraisal under Vermont’s Use Value Program of Agricultural and Forest Land;

* rating of agricultural soils for appraisal under Town Tax Stabilization Programs;

* assessment of agricultural soils by land trusts, landowners, bankers, realtors; and

* broad resource planning by state agencies and town and regional planning commissions.

Vermont Residential On-site Waste Disposal Group

This information identifies the new onsite sewage disposal class and footnote of the map unit.
Ratings are based on Vermont Environmental Protection Rules, August 16, 2002, based on 20% maximum slope – for lots created on or after June 14, 2002.

It doesn’t replace onsite investigation.

These are the five major classes.
Class I - WELL SUITED
Class II - MODERATELY SUITED
Class III - MARGINALLY SUITED

Vermont Residential On-site Waste Disposal Group

Class IV - NOT SUITED
Class V - NOT RATED

The combination of class and footnote provides information on the major soil properties affecting the class assignment. A brief summary of the ratings groups follows. (For more detailed information on the individual classes, see Appendix A.)

Ia - WELL SUITED - Soil map units with rapid permeability
Ib - WELL SUITED - Soil map units with rapid permeability and limited slope
Ic - WELL SUITED - Soil map units with moderate permeability
Id - WELL SUITED - Soil map units with moderate permeability and limited slope

IIa - MODERATELY SUITED - Soil map units with slow permeability
IIb - MODERATELY SUITED - Soil map units with slow permeability and limited slope
IIc - MODERATELY SUITED - Soil map units with moderate depth to bedrock
IId - MODERATELY SUITED - Soil map units with moderate depth to bedrock and limited slope
IIe - MODERATELY SUITED - Soil map units with rapid permeability and steep slope
IIf - MODERATELY SUITED - Soil map units with moderate permeability and steep slope
IIg - MODERATELY SUITED - Soil map units with flooding limitation
IIh - MODERATELY SUITED - Soil map units with moderate depth to seasonal high water table (SHWT)

IIIa - MARGINALLY SUITED - Soil map units with marginal depth to bedrock
IIIb - MARGINALLY SUITED - Soil map units with flooding limitation and moderate depth to SHWT
IIIc - MARGINALLY SUITED - Soil map units with marginal depth to SHWT and gentle slope
IIId - MARGINALLY SUITED - Soil map units with marginal depth to SHWT and moderate slope
IIIe - MARGINALLY SUITED - Soil map units with marginal depth to SHWT and limited slope
IIIf - MARGINALLY SUITED - Soil map units with SHWT and depth to bedrock limitation

IVa - NOT SUITED - Soil map units not suited due to excessive wetness
IVb - NOT SUITED - Soil map units not suited due to limited depth to bedrock and steep slope
IVc - NOT SUITED - Soil map units not suited due to very limited depth to bedrock on moderate slopes
IVd - NOT SUITED - Soil map units not suited due to slow permeability and steep slope

V - NOT RATED MAP UNITS

Physical and Chemical Properties

This table shows estimates of some physical and chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils. **Depth** to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification. The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Soil reaction (**pH**) is a measure of acidity or alkalinity. It is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Vermont Soil Fact Sheet- Detailed Definitions and Explanations

Physical and Chemical Properties

Saturated hydraulic conductivity refers to the ability of a soil to transmit water or air. The term **"permeability**" indicates saturated hydraulic conductivity (Ksat). The estimates in the table indicate the rate of water movement, in inches per hour, when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. The estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water. Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments. Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size. Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Water Features

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms. The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Water table refers to a saturated zone in the soil. The water features table indicates depth to the top (upper limit) of the saturated zone in most years. Estimates of the upper limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Vermont Soil Fact Sheet- Detailed Definitions and Explanations

Water Features

Duration and frequency are estimated. Duration is expressed as extremely brief if 0.1 hour to 4 hours, very brief if 4 hours to 2 days, brief if 2 to 7 days, long if 7 to 30 days, and very long if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. None means that flooding is not probable; very rare that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); rare that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); occasional that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); frequent that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and very frequent that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Soil Features

Hydric Soil?

The three essential characteristics of wetlands are hydrophytic vegetation, hydric soils, and wetland hydrology. Criteria for each of the characteristics must be met for areas to be identified as wetlands. Undrained hydric soils that have natural vegetation should support a dominant population of ecological wetland plant species. Hydric soils that have been converted to other uses should be capable of being restored to wetlands.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. These soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established. These criteria are used to identify a phase of a soil series that normally is associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, USDA, 1999) and in the "Soil Survey Manual" (Soil Survey Staff, USDA, 1993).

If soils are wet enough for a long enough period to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils in this survey area are specified in "Field Indicators of Hydric Soils in the United States" (USDA, NRCS, 2002). (A separate guide, "Field Indicators for Identifying Hydric Soils in New England," is also available. Please consult with the State Wetlands Office for more information.)

Hydric soils are identified by examining and describing the soil to a depth of about 20 inches. This depth may be greater if determination of an appropriate indicator so requires. It is always recommended that soils be excavated and described to the depth necessary for an understanding of the redoximorphic processes. Using the completed soil descriptions, soil scientists can then compare the soil features required by each indicator and specify which indicators have been matched with the conditions observed in the soil. The soil can be identified as a hydric soil if at least one of the approved indicators is present.

This survey can be used to locate probable areas of hydric soils.

Soil components with a value of “yes” meet the definition of hydric soils and, in addition, have at least one of the hydric soil indicators. This rating can help in planning land uses; however, onsite investigation is recommended to determine the hydric soils on a specific site.

Vermont Soil Fact Sheet- Detailed Definitions and Explanations

Soil Features

Depth to Bedrock
This table gives estimates of depth to a bedrock layer, if bedrock is a restrictive feature normally associated with the soil. The estimates are used in land use planning that involves engineering considerations. Depth to top is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

The **Land Capability Classification** system shows the suitability of soils for most agricultural uses. Soils are grouped according to their limitations for agricultural crops, the risk of damage when they are used, and the way they respond to management. The grouping does not consider major, and generally expensive, landforming activities that would change slope, depth, or other characteristics of the soils, nor does it consider major land reclamation projects.

Soils are grouped at three levels: capability class, subclass, and unit. Classes and subclasses have been used in this study. Capability classes are designated by Roman numerals I through VIII in older soil survey reports, and by Arabic numerals 1 through 8 in newer soil survey reports. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have few limitations that restrict their use.

Class 2 soils have moderate limitations that reduce the choice of plants or require moderate conservation practices.

Class 3 soils have severe limitations that reduce the choice of plants or require special conservation practices, or both.

Class 4 soils have very severe limitations that reduce the choice of plants or require very careful management, or both.

Class 5 soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class 6 soils have severe limitations that make them generally unsuitable for crop production.

Class 7 soils have very severe limitations that make them unsuitable for crop production.

Class 8 soils and miscellaneous land areas have limitations that nearly prelude their use for crop production.

Capability subclasses indicate the major kinds of limitations within each capability class. Within most capability classes there can be up to four subclasses. Adding a small letter e, w, s, or c, to the class numeral indicates the subclass. An example is 2e.

The letter e represents a risk of erosion,
w means that water in or on the soil will interfere with plant growth or crop production,
s represents a shallow, droughty, or surface stoniness limitation, and
c represents a climate limitation that is very cold or very dry.

Land Use Limitations

This table shows the degree and kind of soil limitations that affect dwellings with basements and pond reservoir areas. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development.

Slight indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected.

Moderate indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation.

Severe indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Land Use Limitations

Dwellings are single-family houses of three stories or less. For **dwellings with basements**, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet.

The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the saturated hydraulic conductivity (Ksat) of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Agricultural Yield Data

The average yields per acre that can be expected of the principal crops under a high level of management are shown in the crop yield table. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of the soil component(s) in the map unit is shown just above the yield data.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in the crop yield table are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Woodland Management

This table can help forest owners or managers plan the use of soils for wood crops.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of slight indicates that no particular prevention measures are needed under ordinary conditions. A rating of moderate indicates that erosion-control measures are needed in certain silvicultural activities. A rating of severe indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of slight indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of moderate indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of severe indicates

Woodland Management

that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of slight indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of moderate indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of severe indicates that many trees can be blown down during these periods.

Potential productivity of merchantable or common trees on a soil is expressed as a **site index**. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that forest managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability. More detailed information regarding site index is available in the "National Forestry Manual," which is available in local offices of the Natural Resources Conservation Service or on the Internet.

Contacting Support

Questions about the Vermont Soil Fact Sheets should be directed to Martha Stuart, Vermont soils dataset manager. Email: martha.stuart@vt.usda.gov Phone: 802-295-7942 ext 28

For a copy of the report titled “Farmland Classification Systems for Vermont Soils”, dated April, 2003, contact:

Stephen H. Gourley, State Soil Scientist
356 Mountain View Drive
Suite 105
Colchester, VT 05446
802-951-6796 ext. 236
Steve.Gourley@vt.usda.gov

Key to the Soil Series of Vermont

USDA Natural Resources Conservation Service
December 2003

PARENT MATERIAL	NATURAL SOIL DRAINAGE CLASS						
Soil Temperature Regime	**Excessively Drained**	**Somewhat Excessively Drained**	**Well Drained**	**Moderately Well Drained**	**Somewhat Poorly Drained**	**Poorly Drained**	**Very Poorly Drained**
A. Alluvial Deposits	Soils formed in stratified material of mixed composition deposited by running water on floodplains						
Coarse-Silty Deposits							
Mesic			Hadley Hamlin	Winooski Teel		Limerick	Saco
Frigid			Fryeburg	Lovewell	Cornish	Charles *Limerick Variant*	Medomak
Coarse-Loamy Deposits							
Mesic			Tioga	Middlebury			
Sandy Deposits							
Frigid	Sunday						
Coarse-Silty over Organic Deposits							
Mesic							Elvers
Fine-Loamy over Organic Deposits							
Mesic							Wallkill
Coarse-Loamy over Sand or Gravel Deposits							
Mesic			Occum *Ondawa Variant* Wappinger	Pootatuck *Podunk Variant* Pawling		Rippowam *Rumney Variant*	
Frigid			Ondawa Waitsfield	Podunk Weider		Rumney Sunny	
B. Glaciolacustrine Deposits	Soils formed in finely stratified lacustrine and marine sediment deposited under calm water in former glacial lake and marine areas						
Clay Deposits (some with silty layers)							
Mesic				Vergennes Vergennes Variant #	Kingsbury	Covington Panton Scitico	Livingston
Frigid				Buxton	Lamoine	Scantic *Scantic Variant*	Biddeford
Fine-Silty Deposits							
Mesic						Canandaigua	Canandaigua
Frigid				Boothbay		Swanville	
Coarse-Silty Deposits							
Mesic			Hartland Hitchcock Unadilla	Belgrade	Belgrade SWPD Variant	Raynham Binghamville *Raynham Variant*	Birdsall
Frigid			Salmon Adamant # *Salmon Variant #*	Nicholville		Roundabout	
Coarse-Silty over Clay Deposits							
Mesic					Munson		
Coarse-Loamy over Clay Deposits							
Mesic				Elmridge			
Frigid			Melrose	Elmwood		Swanton	Whately
Sandy over Loamy Deposits							
Mesic			Hinesburg	Eldridge		Enosburg	
Frigid				Irasburg		Nasmith	
Sandy over Clay Deposits							
Frigid				Elmwood Variant			
C. Glaciofluvial Deposits	Soils formed in sandy to gravelly material deposited by glacial meltwater on kames, eskers, deltas, terraces and outwash plains						
Sand Deposits							
Mesic	Windsor			Deerfield	Wareham	Wareham	Scarboro
Frigid	Missisquoi	Adams	Adams Variant #	Croghan	Au Gres		Searsport
Coarse-Silty over Sand or Gravel Deposits							
Mesic				Tisbury			
Coarse-Loamy Deposits high in coarse fragments							
Mesic		Warwick	Kars	Castile			
Stratified Sand and Gravel Deposits							
Mesic	Groton Hinckley Quonset	Merrimac		Sudbury		Walpole	
Frigid	Colton		Stetson	Duane Sheepscot			
Coarse-Loamy over Sand or Gravel Deposits							
Mesic			Agawam Copake	Hero Ninigret	Fredon		
Frigid			Allagash Duxbury	Machias Madawaska		Grange Moosilauke	

D. Non-compacted Till	Soils formed in poorly sorted sediment deposited or transported by glacial ice on uplands						
Fine-Loamy Till							
Mesic					Kendaia	Lyons	Lyons
Coarse-Loamy Till							
Mesic *carbonates less than 40 in.* *no spodic horizon*	Galoo #	Farmington # Galoo #	Farmington # *Farmington Variant #* Galway # Nellis		Massena	Massena	
Mesic *carbonates deeper than 40 in.* *no spodic horizon*			Cardigan # Dutchess Lordstown # Pittsfield St Albans Stockbridge	Georgia			
Frigid *no spodic horizon*		Glover # Woodstock #	Colrain Dummerston Lombard Vershire #				
Frigid *thin spodic horizon*		Lyman #	Tunbridge # Berkshire	Sunapee		Lyme	
Frigid *thick spodic horizon*			Hogback # Houghtonville Rawsonville #				
Cryic *elevation >2500 ft*			Glebe # Londonderry #				
Coarse-Loamy Till - high in coarse fragments							
Mesic *carbonates less than 40 in.*		Benson #	Palatine #				
Mesic *carbonates greater than 40 in.*		Nassau #					
Frigid *no spodic horizon*	Hubbardton #	Taconic #	Macomber #				
Frigid *thick spodic horizon*		Killington #					
Cryic *elevation greater than 2500 ft* *thick spodic horizon*			Stratton #				
Coarse-Loamy over Gravelly Sandy Till							
Frigid *thin spodic horizon*			Monadnock				
Sandy Till and/or Residuum							
Frigid *no spodic horizon*		Pomfret # Teago #					
Thin Organic Deposits over Thin Coarse-Loamy Till and/or Bedrock							
Cryic			Ricker #				
E. Dense Compact Till	Soils formed in poorly sorted, dense, compacted sediment deposited or transported by glacial ice on uplands						
Coarse-Loamy Dense Till							
Mesic *carbonates less than 40 in.* *no spodic horizon*				Amenia			
Mesic *no spodic horizon*			Paxton	Bomoseen Pittstown			Mansfield
Frigid *no spodic horizon*			Shelburne Stowe *Calais*	Buckland Fullam		Brayton Cabot	Peacham
Frigid *thin spodic horizon*			Marlow Potsdam Becket	Dixfield Peru Skerry	Colonel Westbury		
Frigid *thick spodic horizon*				Mundal	Worden	Wilmington	
Cryic *elevation greater than 2500 ft* *thick spodic horizon*			Sisk				
F. Organic Deposits	Very poorly drained soils formed in organic materials (OM) of varying depth in wetlands						
	Soil Temperature Class	Reaction Class	16 to 50 inches of OM over sandy material	16 to 50 inches of OM over loamy material	More than 50 inches of organic material		
Moderately Decomposed Organic Material							
	Mesic	Euic			*Balch*		
	Frigid	Euic			Rifle		
Highly Decomposed Organic Material							
	Mesic	Euic	Adrian	Linwood	Carlisle Pinnebog		
	Frigid	Euic	Markey Pondicherry	Wonsqueak	Bucksport Lupton		

FOOTNOTES

# denotes soils with bedrock within 40 inches of the surface.

Soil series in *italics* are inactive series and are not currently mapped.

Last updated December 2, 2003

By NRCS

Email: thomas.villars@vt.usda.gov

Appendix G

Environmental Evaluation Worksheet (NRCS-CPA-52)

U.S. Department of Agriculture NRCS-CPA-52
Natural Resources Conservation Service 10-03

Environmental Evaluation Worksheet

A. Client:

B. Plan ID No:

C. CMU/Fields:

D. Client's objective

E. Purpose and need for action

F. Resource Considerations	**H.** Alternatives and Effects (Attach additional pages as necessary)			
	Proposed Action	No Action	Alt 1	Alt 2
SOIL				
Erosion				
Condition				
Deposition				
WATER				
Quantity				
Quality				
AIR				
Quality				
Condition				
PLANT				
Suitability				
Condition				
Management				
ANIMAL				
Habitat				
Management				

G. Economic and Social Considerations	**I.** Effects			
	Proposed Action	No Action	Alt 1	Alt 2
Land use				
Capital				
Labor				
Management level				
Profitability				
Risk				

J. Special Environmental Concerns (See "Evaluation Procedure Guide Sheets")	**K.** Effects			
	Proposed Action	No Action	Alt 1	Alt 2
Clean Water Act/Waters of the U.S .				
*Coastal Zone Management Areas				
Coral Reefs				
*Cultural Resources				
*Endangered and Threatened Species				
Environmental Justice				
*Essential Fish Habitat				
*Fish and Wildlife Coordination				
Floodplain Management				
Invasive Species				
Migratory Birds				
Natural Areas				
Prime and Unique Farmlands				
Riparian Area				
Scenic Beauty				
Wetlands				
*Wild and Scenic Rivers				

* These items may require consultation or coordination between the lead agency/RFO and another governmental unit.

L. Easements, permissions, or permits. _____

M. Mitigation _____

_____

N. The information recorded above is based on the best available information:

_____ _____ _____

Signature Title Date

O. Agencies, persons, and references consulted _____

P. Findings. Indicate which of the alternatives from Section H is the preferred alternative. _____

I have considered the effects of this action and the alternatives on the Resource, Economic, and Social Considerations; the Special Environmental Concerns; and the extraordinary circumstances criteria in the instructions for form NRCS-CPA-52. I find, for the reasons stated in (Q) below, that the selected alternative:

_____ is **not a federal action**. No additional analysis is required.

_____ is **categorically excluded** from further environmental analysis and there are no extraordinary circumstances. No additional analysis is required.

_____ has been **sufficiently analyzed** in an existing NRCS environmental document. No additional analysis is required.

_____ may require preparation of an EA or EIS. The action will be referred to the State Office.

Q. Rationale supporting the finding_____

_____

_____

R. _____ _____ _____

Signature Title Date

Instructions for Completing Form NRCS-CPA-52, "Environmental Evaluation Worksheet"

COMPLETING THE FORM

The form NRCS-CPA-52 is the instrument used to summarize the effects of conservation practices and systems. It also provides summary documentation of the environmental evaluation (EE) of the planned actions. The EE is "a concurrent part of the planning process in which the potential long-term and short-term impacts of an action on people, their physical surroundings, and nature are evaluated and alternative actions explored" (NPPH-Amendment 3 January 2000). The EE applies to all assistance provided by NRCS (GM190 Part 410.5).

The following are instructions for completing form NRCS-CPA-52:

A Record the client's name.

B Enter the conservation plan identification number.

C Enter the conservation management unit to which this evaluation applies. This may be done by field, pasture, tract, landuse (i.e. cropland, rangeland, woodland, etc.), by resource area (i.e. riparian corridor or wetland area) or any other suitable geographic division.

D Briefly summarize the client's objective(s).

E Briefly identify the purpose and need for action. Reference the resource concern(s) to be addressed.

F, G Use the provided resource, economic, and social considerations or list considerations identified during scoping or by any existing areawide, watershed or other resource document appropriate for the planning area. The list of considerations may be expanded by listing subcategories, such as wind erosion, sheet erosion, gully erosion etc. Refer to the applicable quality criteria.

H, I Briefly summarize the practice/system of practices being proposed, as well as any alternatives being considered. Document the effects of the proposed action for the considerations listed in E and F. Reference applicable quality criteria, information in the CPPE, and quantify effects whenever possible. Consider both long-term and short-term effects. Consider any effects which may be individually minor but cumulatively significant at a larger scale or over an extended time period. At the request of the client, additional alternatives may be developed and their effects evaluated. This may be done in order to more fully inform the client about the decision to be made. In these cases, briefly describe alternatives to the proposed action, including the "no action" alternative. The no action alternative is the predicted future condition if no action is taken. Clearly define the differences between proposed action, no action, and the other alternatives if applicable.

J, K See the Special Environmental Concerns Evaluation Procedure Guide Sheets in Appendix 610.70 of the National Environmental Compliance Handbook. Completion of Help Sheets is not required, but may provide additional documentation that the appropriate processes have been followed. Complete section J by documenting the effects of each alternative on the special environmental concerns listed in I. Quantify effects whenever possible. Consider both long-term and short-term effects. Consider any effects, which may be individually minor but cumulatively significant at a larger scale or over an extended time period.

L List any necessary easements, permissions, or permits (i.e. 404, ESA section 10, State or county permits or requirements).

M Describe mitigation to be applied that will offset any adverse impacts. Attach documentation from other agencies.

N The individual responsible for completing the CPA-52 must sign and date the Form indicating they have used the best available information. This signature is particularly important when a TSP is completing the CPA-52 or when NRCS is providing technical assistance on behalf of another agency.

O Document contact and communications with USFWS, NOAA Fisheries, COE, EPA, NRCS State Biologist, State Environmental Agencies, or any others consulted. Include public participation activities, if applicable.

P Check the applicable finding being made.

Q Explain the reasons for making the finding identified in P. Cite any references, analysis, data, or documents which support the finding. Add additional pages as necessary. To find that an action has been sufficiently analyzed in an existing NRCS environmental document, the document must cover the area in which the action is being implemented.

R NRCS responsible official must sign and date for NRCS actions. The FSA or other federal agency responsible official must sign and date for FSA or other agency funded activities.

CRITERIA FOR IDENTIFYING EXTRAORDINARY CIRCUMSTANCES

Extraordinary circumstances usually involve impacts on environmental concerns such as wetlands, floodplains, or cultural resources. The circumstances that may lead to a determination of extraordinary circumstances are the same factors used to make determinations of significance and include

1. Impacts that may be both beneficial and adverse and that significantly affect the quality of the human environment.
2. The degree to which the proposed action affects public health or safety.

3. Unique characteristics of the area, such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.
4. The degree to which the effects on the quality of the human environment are likely to be controversial.
5. The degree to which the possible effects on the quality of the human environment are highly uncertain or involve unique or unknown risks.
6. The degree to which the action may establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration.
7. Individually insignificant but cumulatively significant activities that have not been analyzed on a broader level, such as on a program-wide or priority area basis.
8. Adverse effects on areas listed in or eligible for listing in the National Register of Historic Places, or that may result in loss or destruction of significant scientific, cultural, or historical resources.
9. Adverse effects on an endangered or threatened species or its designated critical habitat.
10. Circumstances threatening the violation of Federal, State or local law or requirements imposed for the protection of the environment.

If one or more extraordinary circumstances are found to apply to the proposed action, determine whether the proposal can be modified to mitigate the adverse effects and prevent the extraordinary circumstances. If this can be done and the client agrees to the change, then the proposed action may be modified and categorically excluded. If the proposed action cannot be modified or the client refuses to accept a proposed change, prepare an EA or EIS as indicated above.

If none of the extraordinary circumstances are determined to apply to the proposed action (or modified action), then it may be categorically excluded. Document the rationale for the determination in Q.

Appendix H

Interagency Correspondence and Public Comments

USDA Farm Service Agency

23 February 2005

Christopher E. Smith USFWS and Partners for Wildlife
Lake Champlain Fish and Wildlife Resources Office
11 Lincoln Street
Essex Junction, VT 05452

RE: Programmatic Environmental Assessment (PEA) for Proposed Implementation of Vermont Conservation Reserve Enhancement Program (CREP) Agreement.

Dear Mr. Smith,

Our Contractor, J. M. Waller Associates, Inc. (JMWA) is preparing a PEA for the proposed implementation of the Vermont CREP agreement. The agreement would enroll up to 7,500 acres of eligible crop land or marginal pasture land located within the watersheds drained by the following tributaries: In the Lake Champlain Basin - the Lamoille, LaPlatte, Mettawee, Missisquoi, Poultney and Winooski Rivers, and Otter Creek; in the Connecticut River Basin - the Black, Connecticut, Deerfield, Ompompanoosuc, Ottaquechee, Passumpsic, Saxtons, Stevens, Waits, Wells, West, White and Williams Rivers; in the Lake Memphremamog Basin - the Barton, Black, Clyde, Coaticook, Tomifobia, and Willoughby Rivers and Lords Creek; in the Hudson River Basin - the Batten Kill, Hoosic, Little Hoosic, Roaring Branch, South Stream, Walloomsac Rivers and White Creek. Approved conservation practices would be established on these lands and landowners would receive support for the costs of installing and maintaining such practices as well as annual rental payments for lands enrolled in the program.

Pursuant to the National Environmental Policy Act (NEPA) and the National Historic Preservation Act (NHPA), we are requesting information regarding the potential impacts on fish and wildlife resources that may be present in the project area. The anticipated date of availability of the Draft PEA is 1 March 2005. View the Draft PEA on the internet website at:

http://www.fsa.usda.gov//dafp/cepd/epb/assessments.htm

Please forward your responses by 15 March 2005 to Robert Moyer, JMWA program manager.

J.M. Waller Associates
8610 N. New Braunfels Ave.
Suite 606
San Antonio, TX 78217-6359

Responses may also be emailed to: robert.moyer@jmwaller.com. If you have any questions regarding this request, please fell free to contact Mr. Moyer by telephone at 210-822-8006. Thank you in advance for your input, it will greatly assist us in our planning for this program.

Sincerely,

Roger Allbee
State Executive Director
Farm Service Agency, USDA

USDA

4/25/05

United States Department of Agriculture

Farm and Foreign Agricultural Services

Farm Service Agency

1400 Independence Ave, S.W.
Stop 0513
Washington, D.C.
20250-0513

Mr. Michael Amaral
Senior Endangered Species Specialist
New England Field Office
U.S. Fish and Wildlife Service
70 Commercial Street, Ste 300
Concord, NH 03301

Dear Mr. Amaral:

Thank you for your email response to my inquiry into how best to initiate informal consultation with your office regarding the Vermont Conservation Reserve Enhancement Program (CREP) in order to comply with the provisions of section 7 of the Endangered Species Act.

As you know from our prior email correspondence, we are completing a programmatic environmental assessment (EA) in order to comply with the provisions of the National Environmental Policy Act. This EA addresses potential effects of the CREP on listed threatened and endangered species and critical habitat. In addition to this programmatic EA, FSA is required to complete a site-specific environmental evaluation for each contract under the CREP Agreement.

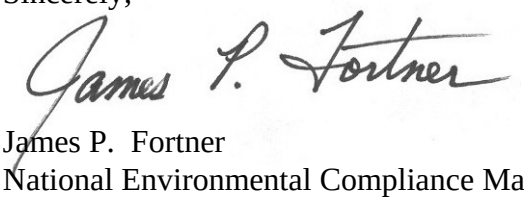
Implementation of the Vermont CREP Agreement will support goals to achieve non-point source pollutant reduction, enhance fish and wildlife habitat, and attain specific conservation goals established by the State of Vermont. Specific areas for this action are all of the watersheds in Vermont. The CREP Agreement will address the objectives set forth in Section 1.3 of the draft programmatic EA.

The table in Appendix B of the draft programmatic EA sets forth the Conservation Practices (CPs) to be implemented in this CREP. Implementation of the CPs may involve site preparation such as tillage and herbicide application. In the case of restoring wetlands, some moving of dirt and excavation may occur. Maintenance of the CPs may involve mowing, grazing, prescribed burning, and herbicide application.

The conservation plan developed for each CREP contract will include provisions to minimize any potential adverse effects to be caused by implementation or maintenance of CPs. In addition, FSA will make a determination during the completion of the site-specific environmental evaluation for each CREP contract as to whether the specific CPs for that contract may affect a listed species or critical habitat and if consultation for that particular contract is required. Your assistance in determining if this type of consultation will be necessary on a contract-by-contract basis for all CPs would be greatly appreciated.

I am faxing this letter and providing a copy of the draft programmatic EA by overnight mail. I understand that your schedule is to try to provide written response within 30 days. If possible, we would very much appreciate an expedited process. Please contact me if there is anything I can do to assist you in this matter. I can be reached at (202) 720-5533 or by email at jfortner@wdc.usda.gov.

Sincerely,



James P. Fortner
National Environmental Compliance Manager

cc
Michael Toussaint – Vermont FSA
Sue Monahan – Vermont FSA

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Field Office
70 Commercial Street, Suite 300
Concord, New Hampshire 03301-5087

May 13, 2005

James P. Fortner
National Environmental Compliance Manager
USDA/ FSA
1400 Independence Avenue, S.W.
Washington, D.C. 20250-0513

Dear Mr. Fortner:

This responds to your recent correspondence requesting that this office review the Programmatic Environmental Assessment (EA) for the Implementation of the Conservation Reserve Enhancement Program for Vermont (CREP).

We have reviewed the programmatic EA and concur with your determination that the implementation of the preferred alternative will result in beneficial effects to biological resources. However, there are certain areas and practices where unanticipated adverse impacts to fish and wildlife resources, including federally-listed species, could occur. In view of the above, we request that your Vermont office consult with us for individual CREP projects or other conservation practices that are located within 100 feet of the Connecticut River main stem. A site- and project-specific review will ensure that our agencies can work together to avoid potential adverse impacts to the endangered dwarf-wedge mussel (*Alasmidonta heterodon*) and Jesup's milk-vetch (*Astragalus robbinsii var. Jesupi*).

We also request that this office be consulted when project implementation or maintenance results in tree cutting or timber harvesting in Addison and Rutland Counties in the Champlain Valley, where the endangered Indiana bat (*Myotis sodalis*) is known to occur. Except in the two categories of actions noted above, other CREP projects are not expected to have any potential to adversely affect threatened or endangered species and therefore, require no further consultation with this office.

Thank you for your coordination. Please contact Susi von Oettingen or Anthony Tur at 603-223-2541 for questions or if we can be of further assistance.

Sincerely yours,

Michael J. Amaral

Michael J. Amaral
Endangered Species Specialist
New England Field Office

United States Department of Agriculture

Farm Service Agency

Watertower Hill
356 Mountain View Dr., Ste. 104
Colchester, VT 05446
(802) 658-2803
TTY: (800) 253-0191

April 6, 2005

Ms. Jane Lendway, SHPO
Vermont Division for Historic Preservation
National Life Building, Drawer 20
Montpelier, VT 05620-0501

Dear Ms. Lendway:

Reference: Programmatic Environmental Assessment (PEA) for Proposed Implementation of the Vermont Conservation Reserve Enhancement Program (CREP) Agreement

The Farm Service Agency (FSA) with the assistance of J. M. Waller Associates, Inc. (JMWA) is preparing a programmatic environmental assessment (PEA) for the proposed implementation of the Vermont Conservation Reserve Enhancement Program (CREP). The draft PEA is available at: http://www.fsa.usda.gov/dafp/cepd/epb/assessments.htm.

Under the agreement, CREP environmental protection practices will be offered to landowners in all Vermont counties. Relatively small areas, usually 10 acres or less of eligible farmland immediately adjacent and running parallel to streams draining into Lake Champlain and the Connecticut River would be voluntarily removed from production. Approved conservation practices including grassed filter strips, treed riparian buffers, and grassed waterways would be implemented.

Typically, grassed buffers and treed riparian areas would be about 35 to 100 feet wide running thousands of feet along streams. Some could be 180 feet wide, depending on the environmental need. In exchange for "setting aside" cropland or marginal pastureland, landowners would be eligible for annual rental payments for 10 or 15 years, special signup incentives, and cost sharing payments to implement approved conservation and environmental protection practices. Though there is a potential for encountering historic resources, site specific, case-by-case inspections would be made by trained USDA personnel. On difficult sites, where more expertise is required, Vermont's Natural Resource Conservation Service (NRCS) Archaeologist David Skinas would perform on-site inspection and evaluations before any contract is approved or any disturbance begins.

Pursuant to the National Environmental Policy Act (NEPA) and section 106 of the National Historic Preservation Act (NHPA), FSA is considering the potential impacts to archeological, historical, or cultural resources or other issues that may be present or are a concern in the CREP area. Please note that our analysis contained in the PEA is completed on a programmatic level. Again, before FSA approves individual CREP contracts on a landowner basis, each site will be reviewed to determine the potential effects of the recommended conservation practices on any historic or cultural resource within the area of potential effect. If necessary, consultation with your office will occur for an individual CREP contract.

We would be very glad to provide more information on the program and reach an agreement as to what conservation practices you may have concern with in regards to potential effects on historic and cultural resources.

If you have any questions about this request, please feel free to contact Mike Toussaint, Agricultural Program Specialist by telephone at (802) 660-0799, extension 254 (direct); or (802) 658-2803; or cell phone (802) 309-3129. Mike's email is: michael.toussaint@vt.usda.gov.

Sincerely,

Alan H. Rogers
Acting State Executive Director

Record of Communication/Interview Summary

Person Interviewed/Organization:	Mr. Scott Dillon, Survey Archeologist for the Vermont Division for Historic Preservation
Phone No./Email Address:	802 828 3048, scott.dillon@state.vt.us
Date and Location of Interview:	11 May 2005, telephone discussion
Subject of Interview:	Vermont CREP Agreement, issues regarding archeological, historical, cultural resources and Section 106 consultation process
Interviewer and Project Name:	Robert Moyer, Vermont CREP Programmatic Environmental Assessment

Details of Interview: Mr. Dillon responded to a written request by the Vermont office of FSA dated 6 April 2005 for a review of the Vermont CREP Programmatic Environmental Assessment (PEA) and to provide comments regarding the Vermont Division for Historic Preservation's concerns in relation to potential impacts to archeological, historical, and other cultural resources from implementing the actions contained in the CREP. This request was made with reference to Section 106 of the National Historic Preservation Act (NHPA) concerning interagency consultations. At the request of the Vermont FSA office, Mr. Dillon was contacted by Mr. Moyer, PEA project manager at J.M. Waller Associates, Inc. (JMWA) by telephone on 11 May 2005 and they discussed the appropriate protocol for conducting site-specific investigations of agricultural property that would be considered candidates for participating in the Vermont CREP. Mr. Dillon stated that his agency already has an established relationship with the USDA Natural Resources Conservation Service (NRCS) field technical service providers that are specialists in archeological and historical resources in Vermont. He stated that his agency had no formal comments to make regarding the Vermont CREP or the PEA and that any land that would be disturbed during the implementation of conservation practices in the CREP would be identified by the NRCS personnel during the site-specific Environmental Evaluation as outlined in NRCS form CPA-52 under the instructions for completing this form in Criteria for Identifying Extraordinary Circumstances, paragraph 8. Further coordination with the Vermont Division for Historical Preservation would only be necessary if NRCS recognized existing cultural resources that could be affected and should make a request for his agency to assist with a supplementary assessment. Mr. Dillon could provide no other formalized procedure, forms, or written policies his office or the State has that specifically applies to this process. However, Mr. Dillon expressed his confidence in the relationship between the USDA/NRCS and that appropriate measures would be accomplished to meet the intent of Section 106in an effective manner.

Record of Communication/Interview Summary

Person Interviewed/Organization:	Phil Benedict, Vermont's Agency of Agriculture, Food & Markets
Phone No./Email Address:	116 State Street, Drawer 20, Montpelier, VT 05620-2901 Phone: (802) 828-2416; phil@agr.state.vt.us
Date and Location of Interview:	14 February 2005, telephone discussion, JMWA
Subject of Interview:	Amendments to Vermont CREP Agreement, issues of prescribed burning and access to private property funded by CREP
Interviewer and Project Name:	Robert Moyer, Vermont CREP Programmatic Environmental Assessment

Details of Interview:

1) As the principal author of the Vermont CREP Agreement and its amendments, Mr. Benedict provided clarification regarding two questions relating to the addendum and JMWA's understanding of them in order to describe the proposed action in an abbreviated form in the text of the PEA:

a) Addendum, State Commitments section VI, B:
This section refers to the state's commitments and the rates at which they will be reimbursing farmers with eligible lands. However, only CPs 21 and 22 are mentioned here, there is no discussion regarding CPs 8a or 23. There is nowhere else in the state commitments section (of the original CREP agreement or the Addendum) that refers to fiscal contributions to the program for these CPs (8a or 23).

b) Original CREP Agreement Federal Commitments section V:
CP 23 is not mentioned in this section. The other CPs are referred to in section E as being eligible for the signing incentive payments (SIP).

The apparent "omissions" relating to funding commitments for CPs 8a and 23 are intentional. These CPs will be considered on a case-by-case basis and the awarding and amounts of contracts would depend upon the existing use of the selected site(s) and other needs of the State.

2) Regarding the use of prescribed burning in Vermont: The use of fire as a management tool is uncommon or non-existent and not regarded as a significant portion of the implementation of the CPs under the Vermont CREP.

3) Regarding the policies for requiring that private lands be available to the public if they are funded under CREP: This is not a policy in Vermont and not part of the Vermont CREP. Private landowners have the option whether or not to allow access to their property even if government funds are used to implement certain programs.

Notice of Availability of a Draft Programmatic Environmental Assessment (PEA) for Proposed Implementation of the Vermont Conservation Reserve Enhancement Program (CREP) Agreement

The US Department of Agriculture Farm Services Agency (USDA/FSA) and the State of Vermont propose to implement an Agreement to provide a Conservation Reserve Enhancement Program in the watersheds of Vermont including the following Counties:

Addison, Bennington, Caledonia, Chittenden, Essex, Franklin, Grand Isle, Lamoille, Orange, Orleans, Rutland, Washington, Windham, and Windsor.

The Draft PEA will be available commencing on March 1, 2005 and copies will be provided to the following libraries:

Rutland Free Library, 10 Court Street, Rutland VT 05701 PH. 802-773-1860
Fletcher Free Library, 235 College St., Burlington VT 05401 PH. 802-863-3403
Kellog-Hubbard Library, 135 Main St., Montpelier VT 05602 PH. 802-223-3338
Brooks Memorial Library, 224 Main St., Brattleboro VT 05301 PH. 802-254-5290

The USDA/FSA will also post the Draft Vermont CREP PEA on their website at:

http://www.fsa.usda.gov//dafp/cepd/epb/assessments.htm

Comments regarding this PEA should be provided by 15 March, 2005 and addressed to:

Michael P. Toussaint
USDA/FSA Agricultural Program Specialist
356 Mountainview Drive
Colchester, VT 05446

Email: michael.toussaint@vt.usda.gov.

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(PH) 802-254-5290

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Comments regarding this PEA should be provided by 15 March, 2005 and addressed to:

Michael P. Toussaint
USDA/FSA Agriculture Program Specialist
356 Mountainview Drive
Colchester, VT 05446

Email: michael.toussaint@vt.usda.gov

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NOTICE OF AVAILABILITY OF A DRAFT PROGRAMMATIC ENVIRONMENTAL ASSESSMENT (PEA) FOR PROPOSED IMPLEMENTATION OF THE VERMONT CONSERVATION RESERVE ENHANCEMENT PROGRAM (CREP) AGREEMENT

The US Department of Agriculture Farm Services Agency (USDA-/FSA) and the State of Vermont proposed to implement an Agreement to provide a Conservation Reserve Enhancement Program in the watersheds of Vermont including the following counties:

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Brooks Memorial Library 224 Main St. Brattleboro, VT 05301 PH 802-254-5290

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Comments regarding this PEA should be provided by 15, March, 2005 and addressed to;

Michael P. Toussaint
USDA/FSA Agricultural Program Specialist
356 Mountainview Drive
Colchester, VT 05446

e-mail: michael.toussaint@vt.usda.gov

February 27, 2005