

# Basin 10 Management Plan

## ANR May 2012

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## APPENDIX A

### APPENDIX A.1 - Basin 10 Council Members and Technical Advisors

Council Members	
Steering Committee	<p>John Broker-Campbell – Southern Windsor County Regional Planning Commission</p> <p>Sylvia Harris – VT Association of Conservation Districts</p> <p>Sally Hull – Two River-Ottawaquechee Regional Commission</p> <p>Todd Menees – Ottawaquechee River Group</p> <p>Linda Schneider – Ottawaquechee Natural Resources Conservation District</p> <p>Kelly Stettner – Black River Action Team</p>
State & Municipal officials	<p>Steve Adams – State Representative</p> <p>Alison Clarkson – State Representative</p> <p>Alice Emmons – State Representative</p> <p>Jim Masland – State Representative</p> <p>Alice Nitka – State Senator</p> <p>Hartford Conservation Commission</p> <p>Hartland Conservation Commission</p> <p>Hartland Selectboard</p> <p>Woodstock Conservation Commission</p> <p>Woodstock Selectboard</p>
Natural Resources Conservation Districts	Ottawaquechee Natural Resources Conservation District
Farmers	<p>Barlow's Lookaway Farm</p> <p>Barron Hill Farm</p> <p>Beef Farm</p> <p>Beef Farm</p> <p>Billings Farm</p> <p>Birch Hill Farm</p> <p>Black Watch Farm</p> <p>Bridge Overlook Farm</p> <p>Bull Run Farm</p> <p>Cas-Cad-Nac Farm</p> <p>Cedar Mt Farm at Cobb Hill</p> <p>Clay Hill Farm</p> <p>Cloudland Farm</p> <p>Covered Bridge Farm</p> <p>Dolloff Acres</p> <p>Doten Family Farm</p> <p>Dream Come True Farm</p> <p>Elm Valley Farm</p>

	<p> Felicity Farm  Fox Crossing Farm  Fox Valley Farm  Fuller Farms Inc  Greenacres Farm  Happy Acres Farm  Harlow Brook Farm  Hartland Flower Farm  Hinterlands Organic Farm  Jenne Farm  Lemax Farm  Maple Valley Farm  Mile Hill Farm  Newhall Farms  Old Perkins Farm  On the Edge Farm LLC  Parris Hill Farm  Perry Family Farm  Pinnacle Farm  Richardson Farm  Rocky Ridge Farm  Rolling Meadow Farm  Shepherd's Hill Farm  Side Track Farm  Sugarbush Farm  Tail Gait Farm  The Stand at South Woodstock  Tracer Brook Farm  Wellwood Orchards  Winterfound Farm  Wood's Cider Mill </p>
Local Organizations	<p> Chester Conservation Committee  Crown Point Road Association  Green Mountain Horse Association  Ludlow Garden Club  Vermont Institute of Natural Science </p>
Lake and River Associations	<p> Black River Action Team  Connecticut River Joint Commissions  Connecticut River Watershed Council  Lake Rescue Association  Ninevah Foundation  Ottawaquechee River Group  Scott Terrace Association on Echo Lake  White River Partnership </p>

Foresters / Loggers	Ben Machin – Redstart Forestry and Consulting	
Residents	Peter Allison Sandy Audsley Tina Barney Becky Basch Karen Bennett Connie Beresin Allan Berggren Lynne Bertram Joanna Bombadil Jeanne Veatch Bragdon Josette Carter Steve Carter Jerry Chichester Erik Chrisyman Dave & Charlotte Cleveland Guy Crosby Kip Dalury Scott Davison Ann Taylor Debevoise Thomas Debevoise Mike Doran Julie Dupont David Eastman Bill & Cathy Emmons Ed Finley Dottie Finnerty G.K. Fredrickson Jonathan Frishtick Sue Greenall Tom Gubbins Anne Hamilton David Hearne Clay Hillgrove Josephine Hingston David Hoffer Frank and Billie Holcombe Judith Howland Jackie Hunt Marty Hunt Sue Hunter Marita Johnson Jim & Lea Kachadorian Lalita Karoli Larry Kasden	Dave Martin Christina Marts Pat & Roland Marx Ted & Nancy Matthews Mary McCuaig Betsey McGee Todd Menees Cordie Merritt Karen Metersky George Miller Chris Moore Alice Paglia Joseph Pasquariello Curt Peterson Jon & Chris Piana Sue Poirier Robin Reilly Ron Rhodes Karl Rosengrant Daniel Ruddell Christina Salerno Bill Salmon Will Saunders Linda Schneider Andy Schulz Judith Senderowitz Miranda Shackleton Brian Shepa Tim Sink Liz Spaulding Matthew & Laura Spittle Natalie Starr Kelly Stettner Michael Stoner Rich Svec Steve Sysco Andy & Marty Tanger Ron Unterman Jay Van Arman Chris Voutas Tambrey Vutech Richard Waddell Sarah Waring Eric Wegner Dano Weisbord

	Richard & Marge Killian Cyndy Kozara Jan Lambert Priscilla & Lorens Lindberge Skip Lisle Xaxakwetet Little Tree Steve MacDonald Ben Machin	Hallie Whitcomb Allen Willard Linda Wilson Frank Wingate Willis & Tina Wood Judy Zilvitis
Businesses	DSM Environmental Services Killington Ski Area Luzenac America / Rio Tinto Okemo Mountain Resort Quechee Club Quechee Lakes Development Corp Redstart Forestry & Consulting SP Land Company, LLC Woodstock Farmers Market Woodstock Renewable	
Regional Planning Commissions	Southern Windsor County Regional Planning Commission Two River-Ottauquechee Regional Commission	
Anglers	Marty Banak – Wilderness Trails & Trout Unlimited David Eastman – Trout Unlimited Chris Moore – Trout Unlimited Jim Otranto – Trout Unlimited Curt Peterson – Trout Unlimited Ron Rhodes – Trout Unlimited Bill Salmon – VOGA	
Technical Advisors		
Land Trusts	Mt. Holly Conservation Trust Upper Valley Land Trust	
USACE	Gary Pelton – North Hartland & Springfield	
USDA/NRCS/FSA	Chuck Armstrong – Soil Conservationist Dana Young – District Conservationist	
USNPS	Marsh-Billings Rockefeller National Historic Park	
Vermont Department of Environmental Conservation	Ann Bove, Susan Warren – Lakes and Ponds Gretchen Alexander, Chris Brunell, Brian Fitzgerald, Mike Kline, Todd Menees, Rebecca Pfeiffer, Patrick	

	Ross – River Management Rodney Pingree – Water Resources Rebecca Chalmers – Wetlands
Vermont Fish and Wildlife Department	Ken Cox – Fisheries Biologist Jens Hilke – Wildlife Conservation Planner Rich Kirn – Fisheries Biologist
Vermont Department of Forests, Parks and Recreation	John Boutin – Forester, Windsor County Jay Maciejowski – Forest Supervisor

## **APPENDIX A.2 – Public Meetings Held in Basin 10**

### **Introductory Forums**

#### 2008

April 17	Fletcher Memorial Library, Ludlow
April 22	Marsh/Billings/Rockefeller NHP, Woodstock
April 24	State Office Building, Springfield
April 30	Sherburne Memorial Library, Killington

### **Watershed Council Meetings**

#### 2008

June 17	Uses & Values
July 15	Fisheries
August 19	Dams & Flow Issues
September 16	Riparian Buffer Issues
October 21	Road Maintenance and Water Quality Issues
November 17	Agriculture and Water Quality Issues

#### 2009

January 20	Water Quality in Town Plans and Bylaws
February 17	Wildlife and Travel Corridors
March 17	Flood and Erosion Hazards
June 16	Forests and Water Quality
July 21	Lakes & Ponds
August 18	Recreation
September 15	Invasives
October 20	Current Water Quality Conditions
November 17	Stormwater & Low Impact Development
November 19	Farmer Discussion Group – Bridgewater

#### 2010

January 19	Groundwater Source Protection
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### **Stakeholder Meetings**

#### 2009

March 18	Ag Section Discussion with Ottauquechee Natural Resources Conservation District Board
March 18	Ag Section Discussion with Windsor FSA County Committee
June 10	Ag Section Discussion with Ottauquechee Natural Resources Conservation District Board
June 16	Farmer Discussion Group – Bridgewater
October 20	Ag Section Discussion with Ottauquechee Natural Resources Conservation District Board
October 21	Ag Section Discussion with Windsor County Farm Bureau Board

#### 2010

January 13	Ag Section Discussion with Ottauquechee Natural Resources Conservation District Board
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January 20	Ag Section Discussion with Windsor FSA County Committee
January 26	CRJC Mt. Ascutney Region River Subcommittee
February 4	Ag Section Discussion with Windsor County Farm Bureau Board
March 3	Farmer Discussion Group - Billings
March 16	FEH discussion - Ludlow Planning Commission
April 15	Farmer and Landowner Discussion Group - GMHA & Kedron Brook Landowners
April 21	Ag Section Discussion with Windsor FSA County Committee
May 6	Weathersfield FEH, Weathersfield Conservation Commission
May 18	Ag Section Discussion with Ottawaquchee Natural Resources Conservation District Board
June 2	Cavendish FEH, Cavendish Planning Commission
June 15	Woodstock Selectboard meeting
August 7	Lake Rescue Association Annual
August 19	OCISMA meeting
October 14	Ag Section Discussion with Ottawaquchee Natural Resources Conservation District Board

#### 2011

February 1	Ottauquechee Natural Resource Conservation District meeting
April 20	Woodstock Conservation Commission

#### 2012

February 27	Draft plan public comment hearing - Woodstock
March 7	Draft plan public comment hearing - Cavendish

### APPENDIX A.3 - Selected Important Wetlands in Basin 10

Documented State-significant Natural Community	Town	Site Description
Dwarf Shrub Bog	Plymouth	Two small floating peat islands, likely formed in bay of previously shallower lake. Intact in spite of water level change. Sphagnum mat with 6-10" Chamaedaphne dominating. Other plants: Vaccinium oxycoccos, Drosera rotundifolia, Sarracenia purpurea, Kalmia.
Red Maple-Sphagnum Acidic Basin Swamp	Weathersfield	Large (10 acre) swamp. Red Maple ( <i>Acer rubrum</i> ) is the clear dominant, Tamarack ( <i>Larix laricina</i> ) is quite common, especially as saplings. The swamp contains some species of cooler conditions such as Red Spruce ( <i>Picea rubens</i> ) and Mountain Holly ( <i>Nemopanthus mucronatus</i> ). With 45% canopy closure, this swamp is considerably more open than is typical for this type. The shrub layer is very diverse with Mountain Holly ( <i>Nemopanthus mucronatus</i> ), Silky Dogwood ( <i>Cornus amomum</i> ), Speckled Alder ( <i>Alnus incana</i> ), Sheep Laurel ( <i>Kalmia angustifolia</i> ), Winterberry Holly ( <i>Ilex verticillata</i> ), Highbush Blueberry ( <i>Vaccinium corymbosum</i> ), Northern Wild Raisin ( <i>Viburnum nudum</i> var. <i>cassinoides</i> ), Arrowwood ( <i>Viburnum dentatum</i> ), and Purple Chokeberry ( <i>Aronia melanocarpa</i> ). The herbaceous layer is also quite dense and is largely dominated by a single species, Cinnamon Fern ( <i>Osmunda cinnamomea</i> ). Byrophytes cover approximately 25% of the ground with most of this comprised of two Sphagnum species. Saturated muck layer extends down over 3.5 meters (11 feet), evidence that this swamp has been on the landscape for a long time. The following wildlife were noted during the field visit: Eastern wood-pewee, Bluejay, Veery, Catbird, Common Grackle, and American Goldfinch.

Red Maple-Sphagnum Acidic Basin Swamp	Chester	22 acre wetland complex of hardwood swamp, shallow emergent marsh, and beaver impoundment is associated with a stream eventually draining into the Black River. The northern end of the wetland complex is a mixture of active beaver impoundment and shallow emergent marsh that together occupy 4 acres. South of the marsh, there are three variations of the red maple-sphagnum acidic basin swamp that appear to be associated with differences in water levels and proximity to the stream. The shrub and herbaceous layers include several species that are characteristic of very acidic conditions and are commonly found in open bogs: leatherleaf ( <i>Chamaedaphne calyculata</i> ), bog laurel ( <i>Kalmia polifolia</i> ), large cranberry ( <i>Vaccinium macrocarpon</i> ), the insectivorous pitcher plant ( <i>Sarracenia purpurea</i> ), and <i>Spagnum capillifolium</i> var. <i>tenellum</i> . Peat depth in these areas is greater than 16 feet. There is abundant waterfowl habitat in the marsh and open water parts of the wetland. Within the swamp there is abundant use by white-tail deer and evidence of black bear use. The swamp provides nesting habitat to many species of songbirds.
Rich Fen	Hartland	A good sized (2.5 acres) shrub wetland, with some areas of open fen. It is a diverse site, and may have some history of disturbance. It is an elongate wetland sitting on a bench at the base of a small hill. Seepage water enters the fen from upslope (southwest), and water then drains out both ends of the fen, to the southwest and to the northeast. The fen/shrub swamp has scattered trees; the canopy cover is about 20%. Among the trees are tamarack ( <i>Larix laricina</i> ), yellow birch ( <i>Betula allegheniensis</i> ), red maple ( <i>Acer rubrum</i> ), paper birch ( <i>Betula papyrifera</i> ) and white pine ( <i>Pinus strobus</i> ). Tall shrubs are abundant, and fen vegetation is interspersed among the shrubs along with vegetation that really is typical of marshes rather than fens. Among the marsh plants are such things as swamp saxifrage ( <i>Saxifraga pensylvanica</i> ), marsh-marigold ( <i>Caltha palustris</i> ) and touch-me-not ( <i>Impatiens capensis</i> ). The fen areas may well be defined by greater depths of peat in comparison with the marshy areas, but this is not known. In any case, the fen areas are characterized by such species as fen sedge ( <i>Carex interior</i> ), yellow sedge ( <i>Carex flava</i> ), water avens ( <i>Geum rivale</i> ), and green-keeled cotton grass ( <i>Eriophorum viridi-carinatum</i> ).

Rich Fen	Pomfret	The fen occupies the upper 3 acre portion of a 7 acre wetland. <i>Cornus stolonifera</i> dominates with <i>Potentilla fruticosa</i> a local codominant. Meadowsweet, <i>Onoclea</i> , <i>Typha</i> , <i>Carex stipata</i> , <i>Glyceria striata</i> & <i>Scirpus atrovirens</i> are also common. Below the fen trees, especially willow, elm & red spruce, become more common. Site is still relatively undisturbed. The trail to the site appeared to be traveled only occasionally and deer trails were observed through the fen.
Rich Fen	Woodstock	Highly alkaline or circumneutral graminoid fen. Limy sedge meadow with occasional shrubs. Springs in meadow above pond and wetland. Low tussocks of <i>Carex interior</i> , <i>Agrostis gigantea</i> , <i>Glyceria striata</i> , <i>Muhlenbergia glomerata</i> and <i>Carex ovals</i> . Shrubs: <i>Potentilla fruticosa</i> , <i>Salix lucida</i> , <i>Alnus rugosa</i> , several peatland herbs.
Vernal Pool	Bridgewater	A vernal pool occupying an approximately 40 x 15' basin with steep slopes on both sides. Vegetation was limited to fallen logs which were covered w/ <i>Sphagnum</i> & <i>Glyceria grandis</i> .
Vernal Pool	Pomfret	A vernal pool in a small 20 x 60' basin in a mixed hardwood forest. There is a small intermittent outlet to the south and a steep slope to the west.
Vernal Pool	Pomfret	Vernal pool in large (0.5 acre) depression on a side-slope terrace in birch -beech-maple forest. Exposed ledge along west side of pool. May be semi-permanent (held water in August). Water surface virtually covered with duckweed. Supports wood frogs, ambystomid salamanders, red-spotted newts, and green frogs.
Vernal Pool	Pomfret	Vernal pool occupying a small basin, 20 x 30', in an area of mixed deciduous woods. It is unvegetated except along the edges.
OTHER:	Chester	A pond surrounded by wetlands which together comprise about 40 acres. The wetlands consist of emergent marsh, scrub shrub dominated swamp, and areas of standing dead trees. Extensive beaver meadow to the north. Pond has a narrow fringe of sedges along the edge which become very dense in the marsh to the north.
	Chester	Topo indicates that site is an old gravel pit, but appears to be more of a beaver pond with a fringe of PSS1/EM. The pond has dead trees along the edges, dead shrubs in the pond, and beaver cut stumps along the edges.
	Springfield	An apparently occupied beaver pond with a fairly narrow but dense emergent zone. Dominants include <i>Scirpus cyperinus</i> , <i>S. pedicellatus</i> , <i>Leersia</i> , meadowsweet, and cattail.
	Springfield	A backwater of the Connecticut River with some marshy areas along the margins.
	Springfield	Artificial lake with substantial acreage of marsh land.

	Springfield	A wet meadow in the floodplain of the Black River.
	Weathersfield	A hemlock-hardwood swamp, with red maple, black ash and yellow birch most abundant. The swamp has many boreal characteristics, including very prominent mosses. The trees are mostly 4-8" dbh, though there are a few larger ones. In the low spots there are patches of <i>Calla palustris</i> . There are two inlets and one outlet.
	Weathersfield	An artificial lake with extensive wetlands at the north end.
	Weathersfield	A mixed hardwood/softwood swamp, with young hemlock, black ash, white pine, elm and yellow birch most abundant. Shrubs are sparse. Common herbs are manna grass, cinnamon fern, swamp saxifrage, purple stemmed aster, blue joint grass and sensitive fern.
	Woodstock	Calcareous riverside seep with <i>Carex flava</i> , <i>C. hystericina</i> , <i>C. granularis</i> , <i>C. viridula</i> , <i>C. lasiocarpa</i> , <i>L. kalmii</i> , <i>S. lucida</i> , <i>Parnassia</i> , <i>Eleocharis obtusa</i> , <i>S. stellata</i> , <i>T. palustris</i> , <i>A. incana</i> , and <i>C. amomum</i> . Extends ca. 500ft on both sides of the river. Not as well developed on the west side.

**APPENDIX A.4 - Summary of Physical, Chemical, and Biological Assessments of Basin 10  
Completed or Underway**

Assessment Title	Date	Lead Organization(s)	Waterway/Location	Protocols/Summary/ E-Link
<b>Geomorphic/ Physical Assessments</b>				
Geomorphic Assessment	2007 - 2009	Southern Windsor County Regional Planning Commission	Black River mainstem North Branch Twenty Mile Stream	ANR Phase 1 and 2 Geomorphic Assessment Protocols and Corridor Plan <a href="https://anrnode.anr.state.vt.us/SGA/finalReports.aspx">https://anrnode.anr.state.vt.us/SGA/finalReports.aspx</a>
	2009 – 2010	Southern Windsor County Regional Planning Commission	Patch Brook, Buffalo Brook, Reading Pond Brook tributaries	ANR Phase 1 and 2 Geomorphic Assessment Protocols and Corridor Plan <a href="https://anrnode.anr.state.vt.us/SGA/finalReports.aspx">https://anrnode.anr.state.vt.us/SGA/finalReports.aspx</a>
	2011 – 2012	Two Rivers-Ottawaquechee Regional Commission	Ottawaquechee River Major tributaries	ANR Phase 1 and 2 Geomorphic Assessment Protocols
We All Live Downstream: A Visual Assessment of the Black River	2005	Black River Action Team	Black River mainstem	Streambank erosion, buffer condition
Ottawaquechee River Tributary Bridge Survey Bridgewater and Plymouth, VT	2008	Two Rivers-Ottawaquechee Regional Commission	Ottawaquechee River Tributaries: Arthur Davis Brook Bridgewater Hollow Brook Broad Brook Broad Brook tributary Chateauguay trib to North Branch Dailey Hollow Brook Lynds Hill Brook North Branch Pinney Hollow Brook	The geomorphic data from the bridge assessment are used to identify structures that have the potential to fail because of erosion, scour, or alignment problems, or structures that may have an impact on the stream.

<b>Biomonitoring/ Biological Assessments</b>				
Macroinvertebrate & fish community diversity monitoring	5 year rotation	DEC / WQD BASS Lab	<p>Black River Coleman Brook Great Brook Proctor Piper Trib Serpentine Brook Soapstone Brook Soapstone Brk.Trib3</p> <p>Ottauquechee River Trib 57 Ottauquechee Broad Brook Trib.to Broad Brook Carpenter Brook???? E.Trib.Roaring Brook Falls Brook Falls Brk Trib #4 Kedron Brook Kent Brook Trib #8 Roaring Brook W.Trib.Roaring Brook Tinker Brook Woodward Reservoir</p>	<p>Monitoring data from assessment of the biological health of Vermont's aquatic environment through macroinvertebrate and fish communities is one parameter used in determining if waterways meet Vermont Water Quality Standards (impaired waters list)</p> <p><a href="http://www.anr.state.vt.us/dec/waterq/bass/html/bs_biomon.htm">http://www.anr.state.vt.us/dec/waterq/bass/html/bs_biomon.htm</a></p>
A Probability-Based Comprehensive Statewide Assessment of Wadeable Stream Biological Condition	2002 – 2006	DEC / WQD BASS Lab	<p>2 sites: Kent Pond Outlet Seavers Brook</p>	<p><a href="http://www.anr.state.vt.us/dec/waterq/bass/docs/bs_streambiocond.pdf">http://www.anr.state.vt.us/dec/waterq/bass/docs/bs_streambiocond.pdf</a></p>
<b>Chemical Assessments</b>				
Ottauquechee River Group LaRosa Partnership monitoring program	On-going since 2010	ORG	Ottauquechee and tributaries	<p>E. coli, turbidity, phosphorus, chloride</p> <p><a href="http://www.vtwaterquality.org/cfm/larosavm/mp_larosavolmon.cfm">http://www.vtwaterquality.org/cfm/larosavm/mp_larosavolmon.cfm</a></p>

USACE	On-going since 1971	USACE	Black River and Ottauquechee River watersheds	E. coli, alkalinity, ammonia, nitrate, phosphorus, hardness, mercury, chlorophyll
<b>Wetlands Assessments</b>				
VERMONT WETLANDS BIOASSESSMENT PROGRAM: An Evaluation of the Chemical, Physical, and Biological Characteristics of Seasonal Pools and Northern White Cedar Swamps Final Report	2003	DEC & DFW, Nongame and Natural Heritage Program	Carlton Hill Rd., Woodstock MBR Lake, Woodstock MBR Saddle, Woodstock Okemo, Ludlow Pine Hill, Weathersfield Thistle Hill, Pomfret Woodstock Inn, Woodstock	<a href="http://www.vtwaterquality.org/bass/htm/bs_vernal.htm">http://www.vtwaterquality.org/bass/htm/bs_vernal.htm</a>
<b>Lake Assessments</b>				
Spring Phosphorus	On-going rotational	DEC / WQD Lakes and Ponds Section	Basin 10 lakes & ponds	Collects spring-overturn nutrient and physical and chemical data on Vermont lakes and ponds 20 acres in size or larger <a href="http://www.anr.state.vt.us/dec/waterq/cfm/springp/springp_select.cfm">http://www.anr.state.vt.us/dec/waterq/cfm/springp/springp_select.cfm</a>
Lake Assessments	On-going	DEC / WQD Lakes and Ponds Section		Substrate, access, shoreline features, adjacent land use, pH, DO, clarity, algae, shoreline development & erosion, wilderness characteristics, natural communities, & non-native species <a href="http://www.anr.state.vt.us/dec/waterq/cfm/lakerep/lakerep_select.cfm">http://www.anr.state.vt.us/dec/waterq/cfm/lakerep/lakerep_select.cfm</a>



Lake Rescue 2008 Water Quality Monitoring Summary Report	2008	DEC / WQD Lakes and Ponds Section		<a href="http://www.anr.state.vt.us/dec/waterq/lakes/docs/lp_2008lakerescuereport.pdf">http://www.anr.state.vt.us/dec/waterq/lakes/docs/lp_2008lakerescuereport.pdf</a>
VT National Lake Survey Final Report	2009	DEC / WQD	North Springfield Reservoir Reservoir Pond - Ludlow	The survey's goal was to collect extensive data from lakes across the lower 48 states in order to assess the condition of the nation's lakes. <a href="http://www.anr.state.vt.us/dec/waterq/lakes/docs/lp_VT_LakeSurvey_07-08.pdf">http://www.anr.state.vt.us/dec/waterq/lakes/docs/lp_VT_LakeSurvey_07-08.pdf</a>
Development of Biocriteria for Vermont and New Hampshire Lakes	2003 2007	DEC / WQD	Ninevah Woodward	This monitoring project was designed to develop biological criteria and consistent protocols by which the trophic status, and the phytoplankton, macrophyte, and macroinvertebrate communities in lakes can be measured. <a href="http://www.anr.state.vt.us/dec/waterq/lakes/html/lp_monitoring.htm">http://www.anr.state.vt.us/dec/waterq/lakes/html/lp_monitoring.htm</a>
Vermont Lay Monitoring Program		DEC / WQD Lakes and Ponds Section	Lake Rescue	<a href="http://www.anr.state.vt.us/dec/waterq/lakes/html/lp_lmp.htm">http://www.anr.state.vt.us/dec/waterq/lakes/html/lp_lmp.htm</a>
<b>Hazardous Waste, Landfill, &amp; Wastewater Treatment Facility Monitoring</b>				
Various DEC site monitoring database inventories	On-going	DEC- Waste Management & Wastewater Management Divisions	Sites throughout Basin 10	Groundwater and surface water monitoring at hazardous waste sites, wastewater treatment facilities, and landfills

<b>Comprehensive Watershed Assessments &amp; Plans</b>				
Water Quality and Aquatic Habitat Assessment Report - Black and Ottawaquechee Watersheds	2000 5- year rotation	DEC / WQD MAPP Planning Section	Black and Ottawaquechee Rivers Watersheds	Comprehensive review of physical, chemical, & biological monitoring & assessments. <a href="http://www.vtwaterquality.org/mapp/docs/mp_basin10.assessment_report.pdf">http://www.vtwaterquality.org/mapp/docs/mp_basin10.assessment_report.pdf</a>
River Basin Water Quality Management Plan - Upper Ottawaquechee	1984	DEC / WQD Planning Section	Upper Ottawaquechee River Watershed	Inventory of water related resources, public desires for waters and DEC plans to address conditions.
Black and Ottawaquechee River Water Quality Management Plan	1976	DEC / WQD Planning Section	Black and Ottawaquechee Rivers Watersheds	Addresses municipal wastewater facility needs and to a lesser degree non-point source pollution & lake eutrophication.
TMDL for Phosphorus Black River at Ludlow	2001	DEC / WQD MAPP Planning Section	Black River at Ludlow	A phosphorus loading analysis of the Black River in Ludlow describing necessary actions to meet the Water Quality Standards <a href="http://www.anr.state.vt.us/dec/waterq/mapp/docs/mp_BlackLudTMDL_FinalComplete.pdf">http://www.anr.state.vt.us/dec/waterq/mapp/docs/mp_BlackLudTMDL_FinalComplete.pdf</a>

**Key:**

BASS Lab – Biomonitoring and Aquatic Studies Section

DEC – Department of Environmental Conservation

MAPP – Monitoring Assessment and Planning Program

ORG – Ottawaquechee River Group

RPCs – Windham Regional and Southern Windsor County Regional Planning Commissions

USACE – US Army Corps of Engineers

WQD – Water Quality Division

## APPENDIX A.5 – Rare, Threatened and Endangered Species in Basin 10

Species	Scientific Name	Common Name	Town	State Rank	Federal Status	VT Status
Animals						
	Alasmodonta heterodon	Dwarf Wedgemussel	Hartland	S1	LE	E
			Springfield	S1	LE	E
	Ambystoma jeffersonianum	Jefferson Salamander	Pomfret	S2		
			Woodstock	S2		
	Ammodramus savannarum	Grasshopper Sparrow	Springfield	S1B		T
			Weathersfield	S1B		T
	Ardea herodias	Great Blue Heron	Hartford	S3,S4B		
			Weathersfield	S3,S4B		
	Bartramia longicauda	Upland Sandpiper	Springfield	S2B		E
	Caprimulgus vociferus	Whip-poor-will	Hartford	S2B		
	Catharus bicknelli	Bicknell's Thrush	Killington	S2B		
			Mendon	S2B		
			Shrewsbury	S2B		
	Falco peregrinus	Peregrine Falcon	Weathersfield	S3B		
	Gavia immer	Common Loon	Mount Holly	S3B		
			Plymouth	S3B		
			Reading	S3B		
	Gomphus quadricolor	Rapids Clubtail (dragonfly)	Weathersfield	S2		
	Haliaeetus leucocephalus	Bald Eagle	Weathersfield	S1B,S4N		E
	Hybognathus regius	Eastern Silvery Minnow	Weathersfield	S3,S4		
	Ischnura kellicotti	Lilypad Forktail (dragonfly)	Hartford	S1,S2		
	Libellula cyanea	Spangled Skimmer (dragonfly)	Weathersfield	S2		
	Myotis leibii	Eastern Small-footed Bat	Hartland	S1		T
			Plymouth	S1		T

Myotis sodalis	Indiana Bat	Plymouth	S1	LE	E
Necturus maculosus	Mudpuppy	Springfield	S2		
Notropis heterolepis	Blacknose Shiner	Springfield	S1		
		Weathersfield	S1		
Perimyotis subflavus	Tri-colored Bat	Plymouth	S2,S3		
Sorex dispar	Long-tailed or Rock Shrew	Killington	S2		
		Mendon	S2		
Plants					
Anemone multifida	Early Thimbleweed	Hartford	S1		E
Anomobryum filiforme	A Moss	Cavendish	S1		
Arethusa bulbosa	Arethusa	Plymouth	S1		T
Asplenium viride	Green Spleenwort	Plymouth	S1		T
Botrychium minganense	Mingan's Moonwort	Woodstock	SH		E
Botrychium multifidum	Leathery Grape-fern	Woodstock	S3		
Carex aestivalis	Summer Sedge	Bridgewater	S3		
		Killington	S3		
Carex albursina	Minnesota Sedge	Woodstock	S3		
Carex argyrantha	Hay Sedge	Hartford	S2		
		Springfield	S2		
Carex backii	Back's Sedge	Weathersfield	S3		
Carex brevior	Fescue Sedge	Hartford	S2		
		Hartland	S2		
Carex foenea	Bronze Sedge	Killington	S1		E
Carex garberi	Garber's Sedge	Hartford	S1		T
		Hartland	S1		T
		Woodstock	S1		T
Carex gracilescens	Slender Sedge	Barnard	S1		
		Bridgewater	S1		
Carex hitchcockiana	Hitchcock's Sedge	Woodstock	S3		

<i>Carex siccata</i>	Hay Sedge	Weathersfield	S1	E
<i>Ceratophyllum echinatum</i>	Prickly Hornwort	Killington	S2	
<i>Chimaphila maculata</i>	Spotted Wintergreen	Hartland	S2	
<i>Conopholis americana</i>	Squaw-root	Bridgewater	S2,S3	
<i>Cypripedium parviflorum</i> var. <i>makasin</i>	Makasin's Yellow Lady's-slipper	Hartland	S3	
<i>Cypripedium parviflorum</i> var. <i>pubescens</i>	Large Yellow Lady's-slipper	Ludlow	S3	
<i>Cypripedium reginae</i>	Showy Lady's-slipper	Hartland	S3	
<i>Diphasiastrum sabinifolium</i>	Ground-fir	Hartland	S2,S3	
		Woodstock	S2,S3	
<i>Dryopteris filix-mas</i>	Male Fern	Barnard	S2	T
		Bridgewater	S2	T
		Hartland	S2	T
		Pomfret	S2	T
		Woodstock	S2	T
<i>Eleocharis intermedia</i>	Matted Spikerush	Woodstock	S3	
<i>Eleocharis quinqueflora</i>	Few-flowered Spikerush	Woodstock	S2	T
<i>Elodea nuttallii</i>	Nuttall Waterweed	Hartland	S3	
		Plymouth	S3	
<i>Erigeron hyssopifolius</i>	Hyssop-leaved Fleabane	Hartford	S2	
<i>Geum laciniatum</i>	Rough Avens	Cavendish	S3	
		Springfield	S3	
<i>Hypericum ascyron</i>	Great St. John's-wort	Hartford	S2	T
<i>Juncus marginatus</i>	Grass Rush	Weathersfield	S3	
<i>Luzula parviflora</i>	Small-flowered Rush	Killington	S2,S3	
		Mendon	S2,S3	
<i>Lycopus virginicus</i>	Virginia Bugleweed	Chester	S2	
<i>Malaxis monophyllos</i> ssp. <i>brachypoda</i>	White Adder's-mouth	Mount Holly	S2,S3	T
<i>Malaxis unifolia</i>	Green Adder's-mouth	Weathersfield	S2	
<i>Moehringia macrophylla</i>	Large-leaved Sandwort	Cavendish	S2	

<i>Muhlenbergia schreberi</i>	Schreber's Muhly	Bridgewater	S1	
<i>Myriophyllum alterniflorum</i>	Water Milfoil	Plymouth	S2	
<i>Myriophyllum farwellii</i>	Farwell's Water-milfoil	Ludlow	S2	
		Mount Holly	S2	
		Plymouth	S2	
<i>Myriophyllum humile</i>	Low Water-milfoil	Ludlow	S2	
<i>Panax quinquefolius</i>	American Ginseng	Bridgewater	S3	
		Hartford	S3	
		Pomfret	S3	
		Weathersfield	S3	
		Woodstock	S3	
<i>Panicum philadelphicum</i>	Philadelphia Panic-grass	Hartland	S2,S3	
<i>Parathelypteris simulata</i>	Massachusetts Fern	Cavendish	S2	
<i>Penstemon pallidus</i>	Pale Beardtongue	Bridgewater	S1	
<i>Physostegia virginiana</i>	Obedient Plant	Hartford	S2	T
		Hartland	S2	T
		Pomfret	S2	T
		Woodstock	S2	T
<i>Poa saltuensis</i> ssp. <i>saltuensis</i>	Drooping Bluegrass	Bridgewater	S3	
		Hartland	S3	
<i>Potamogeton strictifolius</i>	Straight-leaf Pondweed	Plymouth	S3?	
<i>Pseudotaxiphyllum distichaceum</i>	A Moss	Cavendish	S2,S3	
<i>Rhus aromatica</i>	Fragrant Sumac	Hartford	S3	
<i>Rhynchospora capillacea</i>	Capillary Beak-rush	Woodstock	S1	T
<i>Scapania umbrosa</i>	A Liverwort	Cavendish	S1	
<i>Scheuchzeria palustris</i>	Pod-grass	Mount Holly	S2	T
<i>Schoenoplectus purshianus</i>	Pursh's Bulrush	Springfield	S3	
		Weathersfield	S3	
<i>Schoenoplectus smithii</i>	Smith's Bulrush	Chester	S1	

<i>Scirpus ancistrochaetus</i>	Barbed-bristle Bulrush	Chester	S2	LE	E
<i>Sisyrinchium angustifolium</i>	Narrow Blue-eyed-grass	Woodstock	S2		
<i>Solidago ptarmicoides</i>	Snowy Aster	Hartland	S2		
<i>Solidago squarrosa</i>	Squarrose Goldenrod	Bridgewater	S2,S3		
<i>Sorbus decora</i>	Northern Mountain-ash	Killington	S3		
		Mendon	S3		
<i>Spiranthes lucida</i>	Shining Ladies'-tresses	Woodstock	S3		
<i>Stellaria alsine</i>	Trailing Stitchwort	Ludlow	S1		
<i>Triantha glutinosa</i>	Sticky False-asphodel	Woodstock	S1		T
<i>Trillium cernuum</i>	Nodding Trillium	Weathersfield	S3		
<i>Veronicastrum virginicum</i>	Culver's-root	Hartford	S1		E
<i>Woodsia alpina</i>	Alpine Woodsia	Hartford	S1		E
<i>Woodsia glabella</i>	Smooth Woodsia	Hartford	S2		
<i>Zannichellia palustris</i>	Horned Pondweed	Hartford	S2		
Natural Communities					
Boreal Calcareous Cliff		Hartford	S2		
Boreal Talus Woodland		Mount Holly	S3		
Dry Oak-Hickory-Hophornbeam Forest		Weathersfield	S3		
Dwarf Shrub Bog		Plymouth	S2		
Hemlock-Sphagnum Acidic Basin Swamp		Springfield	S2		
Lowland Spruce-Fir Forest		Mount Holly	S3		
Montane Spruce-Fir Forest		Killington	S3		
		Ludlow	S3		
		Mendon	S3		
		Mount Holly	S3		
		Plymouth	S3		
		Shrewsbury	S3		
Montane Yellow Birch-Red Spruce Forest		Ludlow	S3		
		Mount Holly	S3		

Northern Hardwood Talus Woodland	Mount Holly	S3
Red Maple-Sphagnum Acidic Basin Swamp	Chester	S3
	Ludlow	S3
	Springfield	S3
	Weathersfield	S3
Red Pine Forest or Woodland	Killington	S2
	Plymouth	S2
Red Spruce-Cinnamon Fern Swamp	Chester	S3
	Ludlow	S3
	Mount Holly	S3
Red Spruce-Heath Rocky Ridge Forest	Ludlow	S3
	Mount Holly	S3
Rich Fen	Hartland	S2
	Pomfret	S2
	Woodstock	S2
Subalpine Krummholz	Killington	S1
	Mendon	S1
Sugar Maple-Ostrich Fern Riverine Floodplain Forest	Mount Holly	S2
Temperate Calcareous Cliff	Bridgewater	S3
Temperate Calcareous Outcrop	Bridgewater	S3
Transition Hardwood Talus Woodland	Weathersfield	S3
Vernal Pool	Bridgewater	S3
	Pomfret	S3

**CODES:**

State Rank:

S1-Very Rare

S2-Rare

S3-Uncommon

S4-Common to Uncommon, Secure

Federal Status:

LE-Listed Endangered

LT-Listed Threatened

Breeding Status:

B-Breeding

N-Non-breeding

VT Status:

E- Endangered

T-Threatened

SC-Special Concern



# APPENDIX A.6 – Dams in Basin 10

Dam Name	Stream	Current Purpose	Status	Built	Hazard Class	State ID	Town
<b>Black River</b>							
Billings Pond	Barnard Brook	R	In Service	1890	3	254.00	Woodstock
Breakneck Hill	Barnard Brook	U	Unknown	U	U	157.06	Pomfret
Gray Camp Pond	Barnard Brook-TR	R	In Service		3	11.02	Barnard
Klose / Kellogg Pond	Barnard Brook-TR	R	In Service	1968	2	11.03	Barnard
Line Pond	Barnard Brook-TR	R	Deleted	U	U	11.06	Barnard
Sonnenberg Ski Area	Barnard Brook-TR	-	In Service	1969	3	11.04	Barnard
The Pogue	Barnard Brook-TR	R	In Service	1895	3	254.08	Woodstock
American Woolen Co.	Black River	-	Breached	U	-	117.09	Ludlow
Amherst Lake	Black River	R	In Service	1950	2	156.05	Plymouth
Atherton	Black River	-	Breached	U	-	44.07	Cavendish
Black Bear Woolen Co	Black River	-	Breached	U	-	44.10	Cavendish
Black Pond	Black River	R	In Service	1897	3	156.02	Plymouth
Cavendish	Black River	H	In Service	1907	3	44.01	Cavendish
Comtu Falls	Black River	H	In Service	1952	3	194.04	Springfield
Fellows	Black River	O, H	Not in Use	1900	3	194.02	Springfield
Gay Brothers	Black River	U	Breached	U	-	44.08	Cavendish
Gilman	Black River	H	In Service	1913	3	194.03	Springfield
Kenwood Mills	Black River	U	Breached	U	-	44.03	Cavendish
Lake Rescue	Black River	RS	In Service	1978	3	117.01	Ludlow
Lovejoy	Black River	H	In Service	1912	3	194.06	Springfield
Murdock	Black River	-	Breached	U	-	44.02	Cavendish
North Springfield	Black River	C, R	In Service	1960	1	194.01	Springfield
Parker Bros.	Black River	-	Breached	U	-	44.09	Cavendish
Perkinsville / Tolles Hill	Black River	R	Not in Use	U	-	229.04	Weathersfield
Powerhouse	Black River	-	Breached	U	-	194.13	Springfield
Reservoir Pond	Black River	R	In Service	1920	3	117.02	Ludlow

Dam Name	Stream	Current Purpose	Status	Built	Hazard Class	State ID	Town
Slack (Lower)	Black River	H	In Service	U	3	194.05	Springfield
Slack (Upper)	Black River	H	Not in Use	U	U	194.15	Springfield
Smithville	Black River	U	Unknown	U	U	117.11	Cavendish
Soapstone	Black River	U	Not in Use	U	U	229.03	Weathersfield
Verd Mont Mills	Black River	-	Breached	U	-	117.08	Ludlow
Vermont Snath	Black River	-	Breached	U	-	194.14	Springfield
Village	Black River	-	Breached	U	-	117.03	Ludlow
Bear Creek Snow Reservoir	Black River-OS	O	In Service	U	U	156.10	Plymouth
Okemo Snow Pond	Black River-OS	R	In Service	1994	1	117.13	Ludlow
Carey	Black River-TR	R	In Service	1968	2	194.12	Springfield
Muckross	Black River-TR	R	In Service	1900	3	194.08	Springfield
Springfield Reservoir	Black River-TR	S, O	Not in Use	1903	2	229.02	Weathersfield
Springfield-10	Black River-TR	U	Unknown	U	U	194.10	Springfield
Springfield-11	Black River-TR	U	Unknown	U	U	194.11	Springfield
Springfield-9	Black River-TR	U	Unknown	U	U	194.09	Springfield
Jewell Brook Site No. 2	Grant Brook	C	In Service	1969	1	117.06	Ludlow
Jewell Brook Site No. 1	Jewell Brook	C	In Service	1969	1	117.07	Ludlow
Jewell Brook Site No. 3 Dike	Jewell Brook-TR	C, R	In Service	1970	3	117.12	Ludlow
Amsden	North Branch Black River	U	Unknown	U	U	229.05	Weathersfield
Grist Mill	North Branch Black River	-	Unknown	U	U	163.07	Reading
Stoughton Pond	North Branch Black River	R	In Service	1960	2	229.00	Weathersfield
Widow Hill	North Branch Black River-TR	R	Unknown	U	3	44.06	Cavendish
Knapp Brook Site No. 1	Knapp Brook	R	In Service	1958	2	44.04	Cavendish
Knapp Brook Site No. 2	Knapp Brook	R	In Service	1961	2	44.05	Cavendish
Jewell Brook Site No. 3	Parker Brook	C, R	In Service	1970	1	117.04	Ludlow
Lake Ninevah	Patch Brook	R	In Service	1930	2	135.00	Mount Holly
Plymouth-8	Patch Brook-TR	U	Unknown	U	U	156.08	Plymouth

Dam Name	Stream	Current Purpose	Status	Built	Hazard Class	State ID	Town
Reading Pond	Reading Pond Brook	R	Breached	U	3	163.02	Reading
Jewell Brook Site No. 5	Sanders Brook	C	In Service	1972	1	117.05	Ludlow
Colby Pond	Twentymile Stream	R	In Service	1959	3	156.06	Plymouth
56 Dams							
<b>Ottauquechee River</b>							
Bridgewater Woolen Co.	Ottauquechee River	U	Unknown	U	U	254.07	Woodstock
Bridgewater Woolen Mill	Ottauquechee River	-	Breached	1936	-	28.01	Bridgewater
Briggs	Ottauquechee River	-	Breached	U	-	188.11	Killington
Chevalier	Ottauquechee River	U	Unknown	U	U	188.10	Killington
Deweys Mills	Ottauquechee River	H	In Service	1900	3	94.02	Hartford
Deweys Pond	Ottauquechee River	R, O	In Service	1973	3	94.07	Hartford
Hartland-6	Ottauquechee River	U	Unknown	U	U	95.06	Hartland
North Hartland	Ottauquechee River	C	In Service	1961	1	95.01	Hartland
Quechee Mills	Ottauquechee River	H, O	In Service	1900	3	94.01	Hartford
Taftsville	Ottauquechee River	H	In Service	1905	3	254.05	Woodstock
White Current	Ottauquechee River	H	In Service	1900	3	95.05	Hartland
Woodstock Mills	Ottauquechee River	U	Unknown	U	U	254.06	Woodstock
Carlton Reservoir	Ottauquechee River-TR	S	Unknown	1948	2	254.04	Woodstock
Cox Reservoir	Ottauquechee River-TR	S	In Service	1930	2	254.03	Woodstock
Johnson	Ottauquechee River-TR	R	Unknown	1965	3	188.08	Killington
Lake Pinneo	Ottauquechee River-TR	R	In Service	1975	3	94.08	Hartford
Shelburne-12	Ottauquechee River-TR	-	Breached	U	-	188.12	Killington
Sunny Acres	Ottauquechee River-TR	U	Unknown	U	3	95.04	Hartland
Mecawee Pond	Broad Brook-TR	R	In Service	1920	3	163.00	Reading
Martin	Cloudland Brook-TR	R	In Service	1969	2	157.02	Pomfret
Bear Pond	Falls Brook-TR	U	Unknown	U	U	188.16	Killington
Sunrise Village Lagoon	Falls Brook-TR	O	In Service	1983	3	188.14	Killington
Noble Pond	Gulf Stream-TR	R	In Service	1920	2	28.03	Bridgewater

Dam Name	Stream	Current Purpose	Status	Built	Hazard Class	State ID	Town
Crystal Pond	Happy Valley Brook-TR	R	In Service	U	3	95.08	Hartland
Connors Pond	Kedron Brook-TR	R	In Service	1975	2	254.09	Woodstock
Kent Pond	Kent Brook	R	In Service	1965	2	188.09	Killington
Thundering Falls	Kent Brook	H	In Service	1920	3	188.20	Killington
Pico Pond	Kent Pond-TR	-	Deleted	U	3	188.17	Killington
Sherburne-5	Kent Pond-TR	U	Unknown	U	U	188.05	Killington
Lower Moore Pond	Pinney Hollow Brook	R	In Service	1974	2	156.03	Plymouth
Upper Moore Pond	Pinney Hollow Brook	R	In Service	1974	2	156.04	Plymouth
Pinney Hollow	Pinney Hollow Brook-TR	-	Removed	1933	-	156.09	Plymouth
Woodward Reservoir	Reservoir Brook	R	In Service	1984	1	156.00	Plymouth
Sherburne-14	Reservoir Brook-TR	U	Unknown	U	U	188.13	Bridgewater
Lakota Lake	Richmond Brook	R	In Service	1891	2	11.05	Barnard
Mirror Lake	Roaring Brook-TR-OS	O	In Service	1973	3	188.06	Killington
Snowshed Pond	Roaring Brook-TR-OS	O	In Service	1970	2	188.07	Killington
Vondell Reservoir	Vondell Brook	S	In Service	1962	2	254.02	Woodstock
Rockefeller	Woodward Reservoir-TR	R	In Service	1970	2	156.07	Plymouth

39 Dams

### TOTAL 95 Recorded Dams in Basin 10

<u>Use Codes:</u>	<u>Abbreviations:</u>	<u>Hazard Class:</u>
C – flood control	TR – tributary	1 – High Hazard Potential
H – hydropower	OS – off stream	2 – Significant Hazard Potential
P – fire protection		3 – Low Hazard Potential
R – recreation		U – Undetermined Hazard Potential
S – water supply		
O – other (snowmaking, wastewater, stormwater, etc.)		
U – Unknown		

## **APPENDIX A.7 – Agriculture in Basin 10**

*This report is provided by the Vermont Agency of Agriculture Food & Markets to the Vermont Department of Environmental Conservation for incorporation into the most recent Basin Plan for this watershed. The VAAFM provides funding to the Vermont Association of Conservation Districts to both develop these reports and organize Agricultural Focus Groups within each basin.*

### **Basin 10 Water Quality Management Plan - Agricultural Aspects**

**Sylvia D. Harris - Agricultural Resource Specialist/Basin Planner, Ottauquechee Natural Resources Conservation District**

#### **Purpose**

- Data
- Recommendations
- Goal

#### **Introductory History**

- Land Use
- Local Agriculture
- Conservation Policy

#### **Agricultural Data**

- Farm Types
- Water Withdrawal
- Pesticides & Fertilizers

#### **Conservation Practices**

- Structural Practices
- Land-Based Practices
- BMP Cost-Share Funding

#### **Status & Trends**

- Farms & Acreage
- Economic Challenges
- Land Use Change

#### **Future Concerns**

- Economics & the Working Landscape
- Regulations & Conservation Funding
- Changes in Local Agriculture

#### **Waters of Concern Due to Agricultural Impacts**

- Waters Impaired Due to Agricultural Impacts
- Waters In Need of Further Assessment Due to Agricultural Impacts
- General Needs for Farm Practice Improvements

## **Recommendations for Agricultural NPS Improvement**

- Structural Practices
- Land-based Practices
- Infrastructure Practices

## **Cooperating Partners**

## **Programs To Address Agricultural Issues**

### **PURPOSE**

The purpose of this report is to provide a resource document that compiles relevant agricultural data, details the current status of agriculture, and outlines the concerns and water quality improvement recommendations of the agricultural community within the Ottauquechee/Black Watersheds of Basin 10 in Windsor and Rutland County, Vermont.

### *Data:*

The data and status information summarized is from the most recently available agricultural data for Basin 10. Sources for this data include USDA Farm Service Agency, USDA National Agricultural Statistics Service, USDA Natural Resources Conservation Service, US Fish & Wildlife Service, US Geological Survey, VANR Department of Environmental Conservation, Vermont Agency of Agriculture Food & Markets, Northeast Organic Farmers Association of Vermont, Ottauquechee Natural Resources Conservation District and agricultural texts. Data is reported by watershed if available; otherwise, data represents county information and is so noted.

### *Recommendations:*

The concerns and recommendations for agricultural water quality improvements in this report were developed from input to the Basin 10 Agricultural Focus Group forums held at Windsor County Farm Bureau, Woodstock Area Agricultural Group, Green Mountain Horse Association, Ottauquechee Natural Resources Conservation District and Farm Service County Committee meetings. From September 2008 through June 2010 fourteen (14) meetings were held to discuss agricultural concerns, review relevant information, provide feedback on the overall agricultural section, and to formulate and prioritize the recommendations included in this section.

### *Goal*

The goal of this agricultural section is to provide recommendations and supportive data on agricultural water quality improvements for inclusion in the most recent DEC Basin 10 Water Quality Management Plan. The recommendations outline preferred types and methods of agricultural improvements and point out the changes to infrastructure and funding mechanisms that will be necessary if agriculture is to remain economically and environmentally viable. The continuance and improvement of local agriculture as a viable business must be considered a priority in order for the agricultural community to afford both installing practices that will result in improved water quality and contribute to the maintenance of Vermont's valuable pastoral landscape.

## INTRODUCTORY HISTORY

Agriculture gives the Ottauquechee/Black watersheds (B10) of Windsor & Rutland Counties, a rural character; it also lends it an economic base for trade and tourism, a cultural identity and an environment that combines field, forest, pasture and village.<sup>1</sup> Vermont legislation has recognized this value of agriculture to the degree that state statute requires the primary goal in town planning and development to 'maintain the historic settlement pattern of compact village and urban centers separated by rural countryside'.<sup>2</sup> Regional planning efforts have long included recognition of these valuable contributions and emphasized the need for protection of such local agriculture. Though agriculture is not as prevalent in the region as it once was, 'the farms and open fields that remain are extremely valuable for their contributions to the aesthetic quality of the landscape, the Region's food supply, and for their ability to provide flood storage and wildlife habitat.' <sup>3</sup>

In the historic heart of Vermont, the farms of Windsor County provide a variety of farm products including beef, dairy, chicken, sheep, trout, hogs, quail, hay, silage, apples, Christmas trees, veggies and blueberries (Table 1). A review of the statewide census data for 2007 shows that Windsor County maintained the greatest square feet of vegetable transplants, one of the greatest amounts for maple syrup, the greatest count of horse farms, beef, sheep, alpaca, llamas and quail, and one of the greatest counts of turkeys and goats.<sup>4</sup> Farm-owned forestland well extends farm production into maple syrup and forest products. With the loss of many of the region's dairy farms, diversified farming has 'begun to change the face of agriculture in the region... the ratio of diversified farms to dairy farms is three-to-one'.<sup>5</sup>

### **Land Use:**

Basin 10, at 273,482 acres, stretches across nearly 38% of Windsor County and 6% of Rutland County (as very little of the agricultural land in the basin lies in Rutland County, only Windsor County farm data or Basin farm data will be represented in this report) <sup>6</sup>. Agriculture, the dominant historical land use of the region, is now the second largest land use type in the basin, though far below the primary land use of forestry (Figure 1 & 2).<sup>7</sup> At 9% of B10, agriculture occupies only a fraction of its former acreage, estimated at a high of 75% statewide in the 1800's. <sup>8</sup>

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<sup>1</sup> Wood, N., C. Halbrecht, K. Liang & Q. Wang. 2000. Interdependence of Agriculture and Tourism: Quantifying the Value of the Agricultural Working Landscape in Vermont. Presented at the Am. Agricultural Economics Ass. Meeting, Tampa, FL. August 2, 2000. <http://ageconsearch.umn.edu/bitstream/21814/1/sp00wo02.pdf>.

<sup>2</sup> Vermont Statutes. 2003. VSA Title 24, Chapter 117, Section 4302. [www.leg.state.vt.us/statutes/fullsection.cfm?Title=24&Chapter=117&Section=04302](http://www.leg.state.vt.us/statutes/fullsection.cfm?Title=24&Chapter=117&Section=04302).

<sup>3</sup> Southern Windsor County Regional Planning Commission. 2009. Southern Windsor County Regional Plan, Volume 1 of 2. Ascutney, VT. [www.swcrpc.org](http://www.swcrpc.org).

<sup>4</sup> National Agricultural Statistics Service. 2009. Census of Agriculture, Vermont Data. [www.agcensus.usda.gov/Publications/2007/Census\\_by\\_State/Vermont](http://www.agcensus.usda.gov/Publications/2007/Census_by_State/Vermont).

<sup>5</sup> Two Rivers-Ottawquechee Regional Commission. 2007. Two Rivers-Ottawquechee Regional Plan. Woodstock, VT. [www.trorc.org/pubsrp.html](http://www.trorc.org/pubsrp.html).

<sup>6</sup> Vermont Center for Geographic Information. 2008. GIS Shapefiles: VT County Boundaries 2006, VT Subbasin Boundaries 2003. [www.vcgi.org](http://www.vcgi.org).

<sup>7</sup> Vermont Agency of Natural Resources. 2010. Analysis of 'National Land Cover Database - 2001' [www.mrlc.gov](http://www.mrlc.gov). Dept. of Environmental Cons., Office of GIS.

<sup>8</sup> Cronon, W. 1983. Changes in the Land: Indians, Colonists and the Ecology of New England. Hill & Wang.

Figure 1. Land Use in Basin 10, 2001.

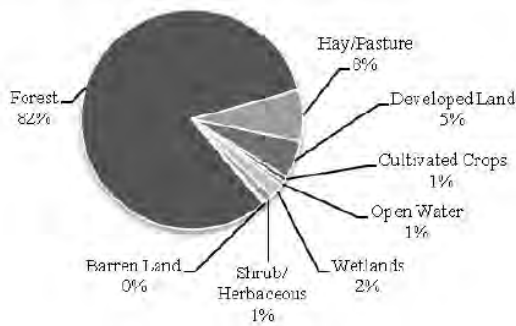
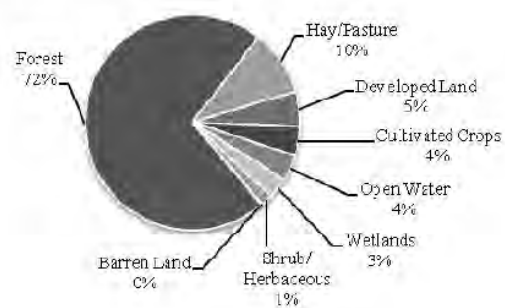


Figure 2. Land Use in Vermont, 2001.



### Local Agriculture:

**Economic Contributions.** Agriculture has an important impact on the county economy. In 2007, dairy alone accounted for over \$11 million (45%) of agricultural products produced in Windsor County (Windsor County ranked 10th in the state with a total of nearly \$494 million for Vermont dairy products). In 2007, direct farm sales and agritourism contributed over \$2.5 million to the county economy (Windsor County ranked 3rd in the state with a total of over \$24 million in Vermont). In 2007 for Vermont, the direct sales income per capita, at over \$36, exceeded all other states by at least 200%.<sup>3</sup> Much of Vermont's tourism, a major economic industry of the state, may be attributed to the state's recognition as a rural countryside of working landscapes. In a 2000 survey at Vermont Welcome Centers, 84% of visitors placed a high value on seeing cows and farms. Additionally, 59% of visitors said they would be less likely to visit if farms were not a part of the scenery.<sup>1</sup> Unfortunately, the economic value of agriculture calculated by the National Agricultural Statistical Services (NASS) above includes only 'farm-gate' cash receipts. When value-added and indirect economic impacts were included using IMPLAN modeling software, however, Vermont's agriculture was calculated as bringing the state \$2.6 billion in 2000.<sup>9</sup> Estimating from this example, agritourism may have actually contributed \$138 million to Windsor County's economy in 2007.

Farms also contribute to the local economy through providing employment, supporting farm-related businesses, production expenses and property taxes. However, Windsor County farms are struggling; in 2007, expenses exceeded market value by over 14% (Figure 3). It should be noted, however, that only 48% of Windsor farmers rely on the farm as the primary source of income (statewide in 2007, market value exceeded expenses by over 18%, with dairy accounting for 73% and 50% relying on primary source of income from the farm, Figure 4.)<sup>3</sup>

<sup>9</sup> Vermont Sustainable Agriculture Council. 2005. Vermont's Agriculture: Generating Wealth from the Land. UVM Center for Sustainable Agriculture. Colchester, VT. [www.uvm.edu/sustainableagriculture](http://www.uvm.edu/sustainableagriculture).



Figure 3. Market Value of Products Sold Versus Production Expenses: Profit Margin for Windsor County.

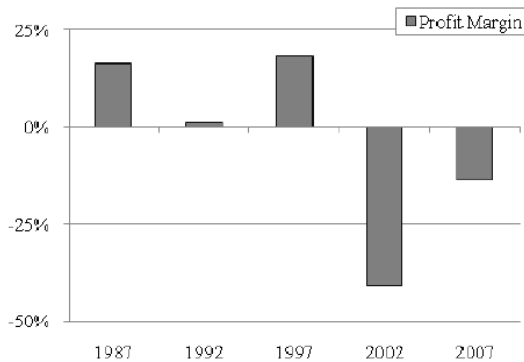
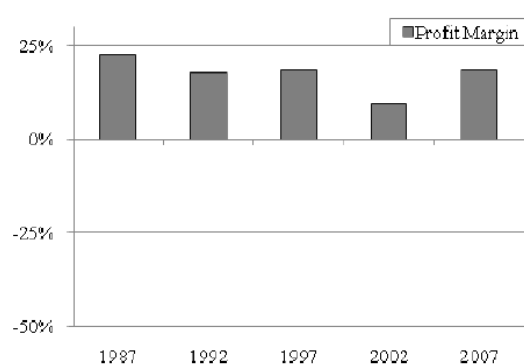


Figure 4. Market Value of Products Sold Versus Production Expenses: Profit Margin for Vermont.



**Environmental Benefits.** Agriculture, as a working landscape, also provides many benefits to the environment. The diversified farming typical of Vermont provides tracts of open space, shelterbelts and forage for many species of birds and mammals.<sup>10</sup> As field soils absorb rainwater more readily than paved and other impervious surfaces, fewer nutrients are released to surface waters from an acre of agricultural land than from an acre of developed land (Figure 5).<sup>11</sup> Farms recycle farm-produced wastes, such as manure and spoiled feed, into soil amendments. Farms also work to prevent runoff of soil, nutrients and pathogens through land management practices like cover cropping, filter strips, no-till and strip farming.

**Environmental Impacts.** Agriculture in the watershed also has the potential to negatively affect the environment. Though the river miles and lake acreage of B10 affected by agriculture represent 9% of the total impaired and only 2% of total threatened miles and acreage, the effects of agriculture on water quality should not be ignored (Figure 6).<sup>12</sup> Excess nutrients, pathogens and sediments all can leave the farm when erosion control methods fail or heavy rains and floods inundate fields.

Figure 5. Ammonia and Phosphorous Concentrations Measured Downstream of Land Uses.

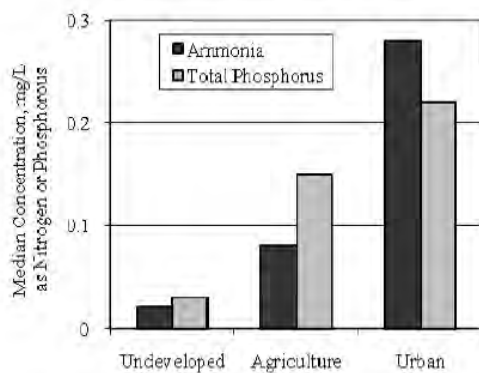
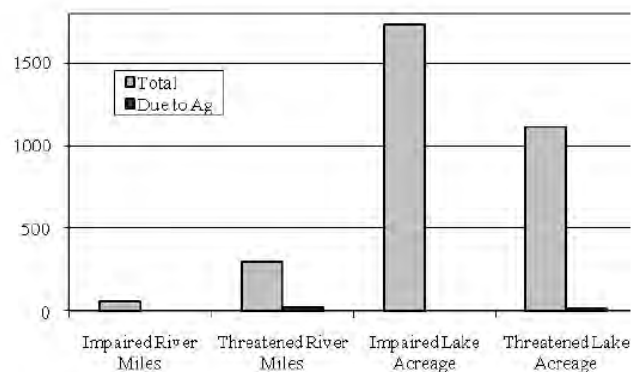


Figure 6. B10 Impacted Rivers & Lakes.



## Conservation Policy:

<sup>10</sup> Carlson, C.A. 1985. Wildlife and agriculture: can they coexist? J. of Soil and Water Conservation. 40, 3: 263-266.

<sup>11</sup> USGS. 1996. Nutrients in the Nation's Waters: Identifying Problems and Progress. Fact Sheet FS-218-96. [pubs.usgs.gov/fs/fs218-96/](https://pubs.usgs.gov/fs/fs218-96/).

<sup>12</sup> Vermont Agency of Natural Resources. 2000. Basin 10 Water Quality Assessment Report. Department of Environmental Conservation, Water Quality Division.

Past. US agricultural policy, from its roots in the 1930's through the 1970's, encouraged farmers to focus on farm improvement practices that enhanced farm productivity, like increasing agricultural land base by clearing vegetation along rivers and expanding into wetlands.<sup>13</sup> A greater awareness of the potential impacts of farming on water quality and a better understanding of the long-term impacts of stream channel and wetland alterations has changed the focus of these government farm programs to environmental management and improvement, beginning with the 1985 Farm Bill and strengthened in successive Farm Bills.<sup>12</sup>

Present. Environmental impacts of older practices, however, are still evident. For example, streambank destabilization on agricultural land can often be associated with past cropping practices that removed riparian vegetation and left banks susceptible to erosion leading to sedimentation of rivers. Additionally, though current agricultural recommendations do address environmental concerns, practice recommendations require constant improvement as knowledge of environmental processes is built. Many of these conservation practices also require time-consuming inspection and maintenance.

Given the low product market value versus production expenses of farming in Windsor County during the last 20 years (Figure 3), it is important to note that farmers, in the B10 portion of the county alone, have nonetheless contributed over \$126,000 (with over \$220,000 additional planned for projects to be completed by 2015) towards state and federal cost-share programs that address farm impacts to water quality through implementation of best management practices since 1996 (Table 6 & 7).

Future. Agriculture has helped to sustain society in the northeast for over 200 years.<sup>14</sup> While soil conservation has been a national effort for over 70 years, it is only within the past 20 years, following the Section 319 amendment to the Clean Water Act, that non-point source pollution from agricultural lands has begun to be purposefully addressed.<sup>12</sup> It will take a great deal of time, work and investment on the part of federal, state and local organizations, as well as farmers, to control the cumulative effects of over two centuries of impact on the environment of Basin 10.

## **AGRICULTURAL DATA**

Much of the agricultural information for this region is available, as yet, only on a countywide basis. While B10 encompass 38% of Windsor County, several of the county's larger dairy farms are outside of this watershed. Therefore, the county information provided here must be used with this caveat.

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<sup>13</sup> Cox, C. 2006. "US Agricultural Conservation Policy and Programs: History, Trends and Implementations" in *US Agricultural Policy and the 2007 Farm Bill*. Arha, K, T Josling, DA Sumner (editors). Woods Institute for the Environment. Stamford University. [environment.stanford.edu/ideas/farmbill.html](http://environment.stanford.edu/ideas/farmbill.html).

<sup>14</sup> Ebeling, W. 1979. *The Fruited Plain: The Story of American Agriculture*. University of California Press.

## Farm Types:

**Diversity** The most recent data available from USDA 2007 Census shows a diversity of farm types in Windsor County (Table 1). The Census defines a farm as ‘any place from which \$1000 or more of agricultural products were produced or sold, or normally would have been sold, during the census year’. Of the 767 Windsor County farms listed in the 2007 Census, only 366 (48%) provide the primary source of income and many are diversified.<sup>3</sup>

**Large Farm Operations** are no longer in Windsor County (20 statewide) per VAAFM. An LFO is defined as a farm with 700 or more mature cows or a poultry operation with over 82,000 birds.<sup>15</sup>

**Medium Farm Operations** include 3 farms in Windsor County (154 statewide) per VAAFM. An MFO is defined as any farm with 200 or more mature cows, 300 or more youngstock or heifers, 150 horses, 300 sheep or 25,000 hens.<sup>16</sup>

**Dairy Farms** include 38 operational dairies in Windsor County (1046 statewide) per VAAFM. With over 5,054 milk cows and their associated crops, this farm type is the predominant agricultural use in Windsor County (139,000 milk cows statewide). <sup>17</sup>

**Organic Farms** include 22 certified farms in Windsor County (548 statewide) per NOFA-VT. These farms have a total of 737 acres in hay, 535 acres in pasture, 153 acres in various crops, 378 acres in sugarbush and another 24,770 square feet in greenhouses.<sup>18</sup>

**Regulations.** To reduce agricultural nonpoint source pollution, all farms in Vermont are required to follow the state Agency of Agriculture’s Accepted Agricultural Practices (AAPs), while large and medium farms must also adopt the state’s Best Management Practices (BMP) through additional regulations of their MFO and LFO permits. The AAPs are regulations involving low-cost improvement of farming techniques.<sup>19</sup> BMPs are typically the more expensive structural farm improvements, such as manure storage systems or

**Table 1. Windsor County: Farm Types – 2007 Census.**

	Farms	Acres	Animals
Pasture	415	10,114	
Hay	366	20,119	
Horse	256		1,502
Maple Sugar	174	55,986 ga	
Poultry-All	158		7,640
Beef	156		1,807
Sheep	101		2,082
Dairy	69		3,112
Goat	69		1,260
Bee	50		249 colonies
Berry	45	68	
Vegetable	39	150	
Corn Silage	38	2,022	
Greenhouse	35	155,340 sf	
Llama	33		157
Hog	30		232
Christmas Tree	29	235	
Orchard	25	249	
Ducks	21		159
Rabbit	12		71
Alpaca	7		368
Quail	3		D
Total Farms	767		

*D = Cannot be disclosed*

<sup>15</sup> Vermont Agency of Agriculture, Food & Markets. 2009. Personal communication from Large Farm Operations Manager. VAAFM.

<sup>16</sup> Vermont Agency of Agriculture, Food & Markets. 2009. Personal communication from Medium Farm Operations Manager. VAAFM.

<sup>17</sup> Vermont Agency of Agriculture, Food & Markets. 2009. Personal communication from Dairy Program Clerk. VAAFM.

<sup>18</sup> Northeast Organic Farming Association of Vermont. 2009. Personal communication from Database Manager. NOFA-VT.

<sup>19</sup> Vermont Agency of Agriculture, Food & Markets. 2006. Accepted Agricultural Practices Regulations.

[www.vermontagriculture.com/ARMES/awq/AAP.html](http://www.vermontagriculture.com/ARMES/awq/AAP.html).

heavy use area protection.<sup>20</sup> Further, MFO and LFO farms are regularly inspected for permit compliance by the VAAFM, dairy farms are inspected annually and must meet strict water quality standards<sup>21</sup> and organic farms have additional requirements designed to protect farm water quality and are regularly inspected by licensed staff of Vermont Organic Farmers LLC.<sup>22</sup>

### ***Water Withdrawal:***

Uses. Water is an important resource for agriculture in the entire county. Vegetables, orchards, berries, and nursery stock are all supported by irrigation. Combined total water withdrawals for animal watering and irrigation account for 7% in Windsor County (Table 2 & Figures 7, 8, 9) of the total water withdrawals by all uses in 2005 (statewide, agriculture accounted for 2%). The vast majority of water withdrawals are for public supply, domestic, industrial and thermoelectric uses.<sup>22</sup>

Irrigated Acres. Between 1985 and 2000, the number of acres under irrigation jumped from 30 to 560, though decreased to 220 by 2005 (Figure 10).<sup>23</sup> While the irrigation figure is small and covers agriculture, golf courses and cemeteries, the availability of irrigation is crucial to producers. Irrigation, depending on the system, crop and climate, can significantly increase crop yield.<sup>24</sup>

***Table 2. Windsor County – Water Withdrawals (Mgal/Day).***

		1985	1990	1995	2000	2005
Surface	<i>All Uses</i>	1.73	0.95	1.42	1.42	0.56
	<i>Irrigation</i>	0.01	0.03	0.38	0.42	0.18
	<i>Livestock</i>	0.10	0.06	0.05	nd	0.06
Ground	<i>All Uses</i>	7.19	5.74	9.13	6.12	5.59
	<i>Irrigation</i>	0.00	0.00	0.04	0.04	0.02
	<i>Livestock</i>	0.15	0.17	0.13	nd	0.18

<sup>20</sup> Vermont Agency of Agriculture, Food & Markets. 2001. Best Management Practices Regulations.

[www.vermontagriculture.com/ARMES/BMP.htm](http://www.vermontagriculture.com/ARMES/BMP.htm).

<sup>21</sup> Vermont Statutes. 2003. VSA Title 6, Chapter 151, Section 2742.

[www.leg.state.vt.us/statutes/fullsection.cfm?Title=06&Chapter=151&Section=02742](http://www.leg.state.vt.us/statutes/fullsection.cfm?Title=06&Chapter=151&Section=02742).

<sup>22</sup> Vermont Organic Farmers. 2000. Guidelines for Production. [www.nofavt.org/programs/organic-certification](http://www.nofavt.org/programs/organic-certification).

<sup>23</sup> United States Geological Service. 2008. Water Use in the United States, <http://water.usgs.gov/watuse>.

<sup>24</sup> Natural Resource Conservation Service-USDA. 1997. National Engineering Handbook (NEH), Part 652, Irrigation Guide.

Figure 7. Windsor County – Irrigation Water Withdrawals.

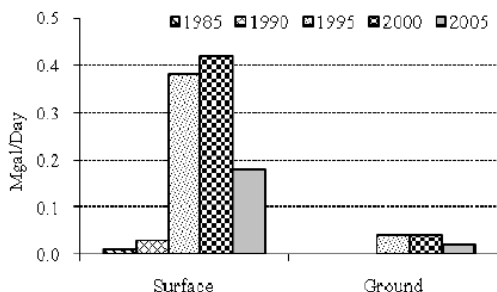


Figure 8. Windsor County – Livestock Water Withdrawals.

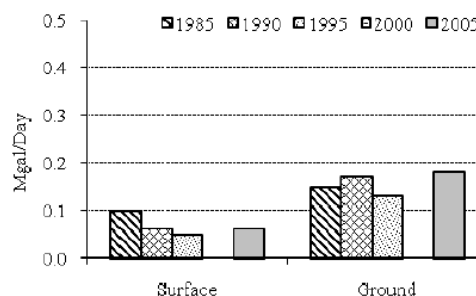


Figure 9. Windsor County – Total Water Withdrawals.

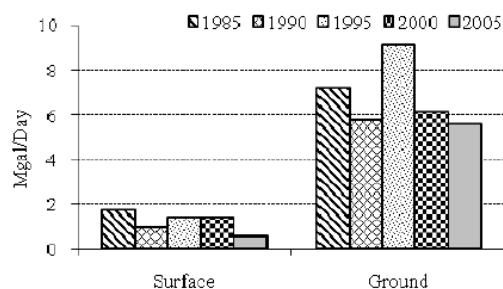
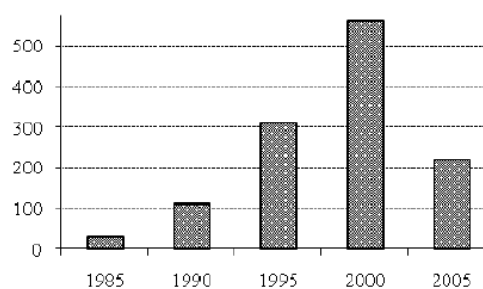


Figure 10. Windsor County – Acres Irrigated.



**Regulations.** Currently, the state has no regulations on quantity of surface water withdrawal other than for snowmaking<sup>25</sup>. The state regulations on quantity of ground water withdrawal require that farming will be exempt from reporting requirements at up to a limit of 57,600 gallons per day per farm, after which a permit will be required.<sup>26</sup>

### **Pesticides:**

**Uses.** Each farm operation uses a unique and specific combination of tools to combat insect, disease and weed problems. Compared to 20 years ago, agrichemicals are utilized on fewer farms (49% reduction) and on fewer acres (37% reduction) in Windsor County (Table 3, Figure 11). In contrast, statewide, although fewer farms used these chemicals (31% reduction), they were used on more acres (23% increase) over this same time period.<sup>3</sup> However, pesticides are not used consistently each year, following Integrated Pest Management Strategy (IPM) and increase in crops like 'Round-Up Ready' corn, so data must be interpreted with this caveat.

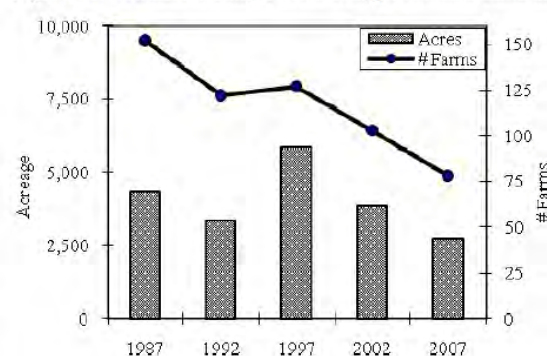
<sup>25</sup> Vermont Statutes. 2009. VSA Title 10, Chapter 41, Section 1032.  
[www.leg.state.vt.us/statutes/fullsection.cfm?Title=10&Chapter=041&Section=01032](http://www.leg.state.vt.us/statutes/fullsection.cfm?Title=10&Chapter=041&Section=01032).

<sup>26</sup> Vermont Statutes. 2009. VSA Title 10, Chapter 48, Section 1418.  
[www.leg.state.vt.us/statutes/fullsection.cfm?Title=10&Chapter=048&Section=01418](http://www.leg.state.vt.us/statutes/fullsection.cfm?Title=10&Chapter=048&Section=01418).

Table 3. Windsor County Farms Using Chemical Controls.

	1987	1992	1997	2002	2007
# Farms Using Chemical Control for Insects	49	34	31	34	23
Acres Treated for Insects	1,128	476	1,053	1,268	385
# Farms Using Chemical Control for Weeds	96	63	81	47	44
Acres Treated for Weeds	2,984	2,575	4,221	1,675	2,235
# Farms Using Chemical Control for Plant Diseases	7	25	15	22	11
Acres Treated for Plant Diseases	234	284	599	942	119

Figure 11. Windsor County Farms Using Chemical Controls.

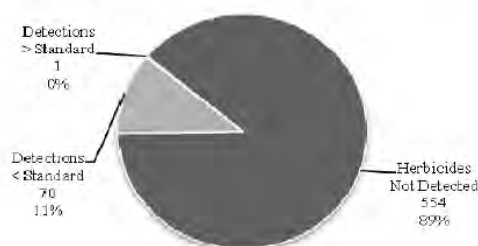


**Monitoring.** VAAFM manages a groundwater-monitoring program to determine the quality of groundwater near Vermont farms. The program includes bacteria, nitrates and corn herbicides. Drinking water samples are collected and analyzed for a suite of herbicides including the most commonly used chemicals such as atrazine and metolachlor. From 2002 to 2006, there were 46 samples collected in Windsor County, with no herbicides detected in any sample (Figure 12). Statewide, 625 samples were analyzed with 11% detections and only 1 above the drinking water standard (Figure 13). Sampling continues to monitor those wells that test positive, while VACD's ARS program provides follow up farm assessments and assistance in developing and sourcing funds for water quality improvement projects to ensure the protection of ground and surface water.<sup>27</sup>

Figure 12. Herbicide Detections in Drinking Water Samples: 2002-2006, Windsor County.



Figure 13. Herbicide Detections in Drinking Water Samples: 2002-2006, Vermont.



Further compounding the complexity of agrichemical use is the weather, cost of chemical control from year to year, the insect and disease resistance of some crops, and the natural lifecycle of pests and diseases. Nitrates and herbicides are good indicators of groundwater quality based on hydrogeologic factors. However, each agrichemical has unique formulations that dictate their fate and transport in the environment.<sup>28</sup> It is, therefore, difficult to screen for each possible compound in groundwater.

**Regulations.** Vermont requires all applicators and dealers to be licensed and to report products used/sold.<sup>29</sup> Additionally, pesticide applicators licensed in Vermont are required to learn the IPM

<sup>27</sup> Vermont Agency of Agriculture, Food & Markets. 2007. Personal Communication from Soil Scientist. VAAFM.

<sup>28</sup> Hancock, T.C., M.W. Sandstrom, J.R. Vogel, R.M.T. Webb, E.R. Bayless and J.E. Barbash. 2008. Pesticide fate and transport throughout unsaturated zones in five agricultural settings, USA. J. Environ. Qual. 37:1086-1100.

<sup>29</sup> Vermont Statutes. 2003. VSA Title 6, Chapter 87, Section 1112. [www.leg.state.vt.us/statutes/fullchapter.cfm?Title=06&Chapter=087](http://www.leg.state.vt.us/statutes/fullchapter.cfm?Title=06&Chapter=087).



standards and to use pesticides in accordance with the law, as per AAP's.<sup>18</sup> The UVM Extension also employs an IPM Coordinator who regularly conducts IPM workshops.<sup>30</sup>

### **Fertilizers:**

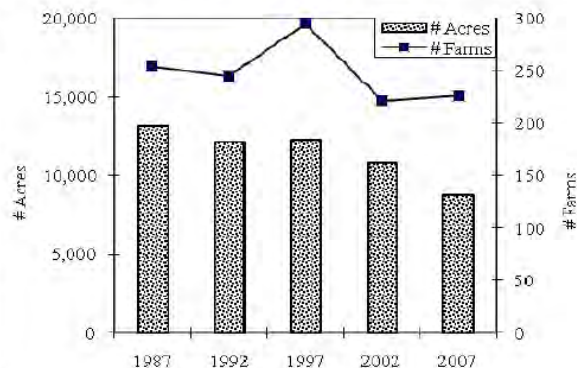
Uses. Compared to 20 years ago, commercial fertilizers were used on fewer farms (11% reduction) and on fewer acres (34% reduction) in Windsor County (Table 4, Figure 14). Statewide, commercial fertilizers were also used on fewer farms (31% reduction) and on fewer acres (20% reduction).<sup>3</sup> However, fertilizers are not used consistently each year, following soil tests and prices, so data must be interpreted with this caveat.

*Table 4. Windsor County Farms Using Fertilizers.*

	1987	1992	1997	2002	2007
# Farms Using Commercial Fertilizer, Lime, Soil Conditioner	254	245	295	221	226
# Acres Spread with Commercial Fertilizer, Lime, Soil Conditioner	13,190	12,147	12,318	10,882	8,731
# Farms Using Manure	na	na	na	165	194
# Acres Spread with Manure	na	na	na	6,848	7,200

na = not available

*Figure 14. Windsor County Farms Using Fertilizers.*



Monitoring. VAAFM manages a groundwater-monitoring program to determine quality of groundwater near farms. Between 2002 and 2006, a total of 46 well samples were collected in Windsor County, with 89% having no detection of nitrates. While 11% had detections between 1-10 ppm, none had detections of nitrates above drinking water standard of 10 ppm (Figure 15). Statewide, a total of 625 samples were analyzed with 48% having no detections of nitrates, 38% had detections between 1-10ppm and 14% had detections above the drinking water standard of 10ppm (Figure 16). Sampling continues to monitor those wells that test positive, while VACD's ARS program provides follow up farm assessments and assistance in developing and sourcing funds for water quality improvement projects.<sup>26</sup>

<sup>30</sup> University of Vermont. 2008. Personal Communication from Integrated Pesticide Management Coordinator. UVM Extension Service. [northeastipm.org/st\\_vt.cfm](http://northeastipm.org/st_vt.cfm).

Figure 15. Nitrate Detections in Drinking Water Samples: 2002-2006, Windsor County.

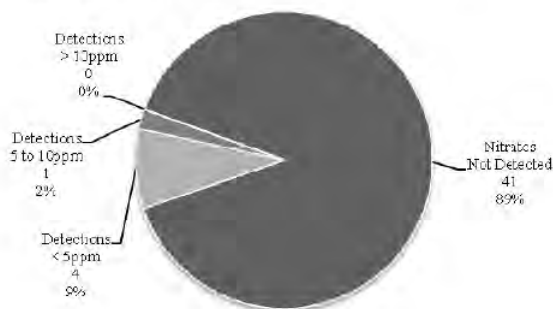
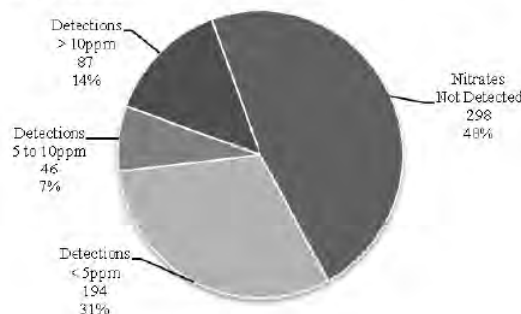


Figure 16. Nitrate Detections in Drinking Water Samples: 2002-2006, Vermont.



**Regulations.** Vermont AAP's require soil testing for all farm fields on which manure is spread, and require farmers to apply manure based on agronomic needs using soil test results. LFO31 and MFO32 farms are also required to develop Nutrient Management Plans<sup>33</sup>, which specify the amount of manure and fertilizers that can be utilized on specific farm fields. Additional rules regarding timing and method of manure application are also stipulated in the state's Accepted Agricultural Practices to protect farm water quality.<sup>18</sup>

## CONSERVATION PRACTICES

Before 1996, prior to state or federal conservation programs, many farmers, on their own, implemented water quality improvements and many continue to do so. Unfortunately, the amount of money spent on these practices is unknown. From 1997 to 2008, nearly \$448,000 federal, state and landowner dollars (Table 6, Figure 17 & 18) were invested in non-point source pollution control practices on farms in Windsor County (\$9.7 million federal and \$3.2 million landowner dollars statewide during 1996-2007)<sup>34</sup>. An additional \$970,000 dollars is planned for best management practices in Windsor County (Table 7, Figure 19 & 20). Each year an average of 3.6 farms in the county are provided with cost-share funds for BMP implementation. Contributions of federal and state dollars can combine to decrease the cost for farmer to 15% (for a typical \$200,000 manure pit project, this is still \$30,000 for a landowner).

Cost-share funds for these 'Best Management Practice' (BMP) improvements to farm structures and land based practices are derived from USDA-NRCS, USDA-FSA, USFWS and VAAFM programs. BMP's are designed to reduce non-point source pollution of waterways from sediment, pathogen and nutrient

<sup>31</sup> Vermont Agency of Agriculture, Food & Markets. 2007. Large Farm Operations Rules.

[www.vermontagriculture.com/ARMES/awq/LFO.html](http://www.vermontagriculture.com/ARMES/awq/LFO.html).

<sup>32</sup> Vermont Agency of Agriculture, Food & Markets. 2007. General Permit for Medium Farm Operations.

[www.vermontagriculture.com/ARMES/awq/MFO.html](http://www.vermontagriculture.com/ARMES/awq/MFO.html).

<sup>33</sup> Vermont Agency of Agriculture, Food & Markets. 2008. Resources for Nutrient Management.

[www.vermontagriculture.com/ARMES/awq/NMP.html](http://www.vermontagriculture.com/ARMES/awq/NMP.html).

<sup>34</sup> Environmental Working Group. 2008. EWG Farm Bill 2007: Policy Analysis Database.

[farm.ewg.org/sites/farmbill2007/region1614.php?fips=50000](http://farm.ewg.org/sites/farmbill2007/region1614.php?fips=50000).



loading and assist farmers in better managing farm nutrients.<sup>35</sup> Structural BMP's include waste storage facilities, improved barnyard and roof-runoff systems. Land-based BMP's include Land Treatment Planning, Nutrient Management Planning, spring development, fencing, streambank stabilization and alternative watering systems.

### **Structural Practices:**

Cost-share funds for BMP structural improvements included in Table 6-7 are from USDA-NRCS and VAAFM programs. Together, these programs installed 3 waste transfer system and 3 heavy use area protections, with over 8 additional structural practices implemented on farms in Windsor County (Table 5-7). <sup>36,37</sup>

**Table 5. Percent of Lactating Cows in Windsor County MFO Dairy Operations Treated Through BMP's (1997 – 2008).**

	Farms	Animals*	% Treated
Total Farms	2	686	
Farms with Improved Barnyards	2	686	100%
Farms with Manure Storage	2	686	100%

\* Animal information is estimated from 2009 VAAFM Data.

### **Land-Based Practices:**

Of the acreage protected through conservation practices noted in Table 6, cost-share funds for BMP land based practices are primarily from USDA-NRCS, USDA-FSA and USFWS programs. While the NRCS WRP (Wetland Reserve Program) and the VAAFM CREP (Conservation Reserve Enhancement Program) have not yet protected farm acreage in Windsor County<sup>38</sup>, the NRCS WHIP (Wildlife Habitat Incentive Program) program has implemented practices such as wildlife food plots and invasive species removal on 13 acres.<sup>35</sup> The FSA GRP (Grassland Reserve Program) has protected 301 acres, and the FSA CRP (Conservation Reserve Program), 1 acre.<sup>39</sup> The FWS PFW (Partners for Fish and Wildlife) has protected 92 acres with fencing to prevent damage to streambanks caused by livestock access.<sup>40</sup> In total, BMP's are protecting nearly 3,000 acres of farmland and resulting in a phosphorous reduction of 23 pounds as per VAAFM (Table 6). Additional funding supports or has supported:

Land Treatment Plans in progress at 4 farms on over 943 acres in Basin 10, through funding from NRCS and VAAFM. The requirement for LFO's and MFO's is that acreage be managed to soil loss tolerance specific to each field. For all other agricultural operations, soil loss must be managed up to twice the tolerance for soil loss for each field.<sup>41</sup> LTP's are assessments of farm resources and management

<sup>35</sup> Yates, A.D., R.C. Bailey, J.A. Schwindt. 2007. Effectiveness of best management practices in improving stream ecosystem quality. *Hydrobiologia*. 583:331-344.

<sup>36</sup> Natural Resource Conservation Service-USDA. 2009. Personal communication from State Resource Conservationist. NRCS-Vermont.

<sup>37</sup> Vermont Agency of Agriculture, Food & Markets. 2009. Personal communication from BMP Cost-Share Administrator. VAAFM.

<sup>38</sup> Vermont Agency of Agriculture, Food & Markets. 2009. Personal communication from CREP Coordinator. VAAFM.

<sup>39</sup> Farm Service Agency-USDA. 2009. Personal communication from GIS Specialist. FSA-Vermont.

<sup>40</sup> United States Fish & Wildlife Service. 2009. Personal communication from Partners for Fish & Wildlife Vermont State Coordinator. USFWS.

<sup>41</sup> Vermont Association of Conservation Districts. 2009. Personal communication from Land Treatment Planner. VACD.

practices, providing recommendations for continued resource stewardship and compliance with regulations.

Nutrient Management Plans developed for 6 farms on over 1158 acres in Basin 10 by NRCS and the Southern Vermont Nutrient Management Program (SVNMP).<sup>15,42</sup> NMP's identify nutrient budgeting, waste management and other practices to minimize the possibility of water quality impacts from non-point sources as well as applicable regulations and resource conservation goals.

Farmland Conservation Easements include 41 farm parcels involving nearly 15,350 acres of farmland in Windsor County. These easements are purchased by or donated to the VLT and UVLT, ensuring that the land will remain as farmland in perpetuity.<sup>43,44</sup>

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<sup>42</sup> Southern Vermont Nutrient Management Program. 2009. Personal communication from Nutrient Management Planner. SVNMP.

<sup>43</sup> Vermont Land Trust. 2009. Personal communication from GIS Specialist. VLT.

<sup>44</sup> Upper Valley Land Trust. 2009. Personal communication from GIS Specialist. UVLT.

**BMP Cost-Share Funding:**

**Table 6. BMP Projects COMPLETED Windsor County, 1997 – 2008.**

Fiscal Year	Farms Funded	Completed Practices	Acres *	Phosphorous Reduced (lbs/yr) **	Actual Total Cost	Actual Federal Cost	Actual State Cost	Actual Landowner Cost
1997	5	5	20	0	\$61,462	\$24,744	\$0	\$36,718
1998	4	4	295	0	\$18,859	\$11,902	\$0	\$6,957
1999	5	5	12	0	\$20,736	\$12,844	\$0	\$7,892
2000	1	2	231	0	\$19,150	\$14,363	\$0	\$4,788
2001	3	11	1735	23	\$38,809	\$27,909	\$2,609	\$8,291
2002	5	5	17	0	\$79,880	\$35,594	\$5,000	\$39,286
2003	8	8	468	0	\$44,550	\$33,367	\$0	\$11,183
2004	5	6	59	0	\$11,759	\$6,725	\$0	\$5,034
2005	5	7	43	0	\$27,711	\$21,374	\$0	\$6,337
2006	1	1	5	0	\$5,000	\$5,000	\$0	\$0
2007	0	0	0	0	\$0	\$0	\$0	\$0
2008	1	1	0	0	\$120,000	\$40,000	\$80,000	\$0
Total	43	55	2884	23	\$447,916	\$233,822	\$87,609	\$126,486

**Table 7. BMP Projects IN PROGRESS Windsor County, 1997 – 2008.**

Fiscal Year	Farms Funded	Remaining Practices	Acres*	Phosphorous Reduced (lbs/yr)**	Estimated Total Cost	Estimated Federal Cost	Estimated State Cost	Estimated Landowner Cost
1997	0	0	0	0	\$0	\$0	\$0	\$0
1998	0	0	0	0	\$0	\$0	\$0	\$0
1999	0	0	0	0	\$0	\$0	\$0	\$0
2000	0	0	0	0	\$0	\$0	\$0	\$0
2001	0	0	0	0	\$0	\$0	\$0	\$0
2002	0	0	0	0	\$0	\$0	\$0	\$0
2003	0	0	0	0	\$0	\$0	\$0	\$0
2004	2	5	280	0	\$367,163	\$275,917	\$0	\$91,246
2005	3	22	305	25.6	\$116,360	\$98,192	\$2,889	\$15,280
2006	3	8	347	0	\$355,384	\$231,953	\$40,000	\$83,430
2007	1	1	71	0	\$14,876	\$13,388	\$0	\$1,488
2008	1	5	206	0	\$114,633	\$85,975	\$0	\$28,658
Totals	10	41	1209	25.6	\$968,415	\$705,424	\$42,889	\$220,102

\* Affected acreages were available only for USDA & USFWS projects.

\*\* Phosphorous reduction estimates were available only for VAAFM projects.

Note: The above data was summarized from VAAFM, FSA, NRCS, and USFWS databases. Data for NRCS & FSA represents only those contracts that have been recorded in the agencies funding database.

Figure 17. Windsor County BMP Projects COMPLETED.

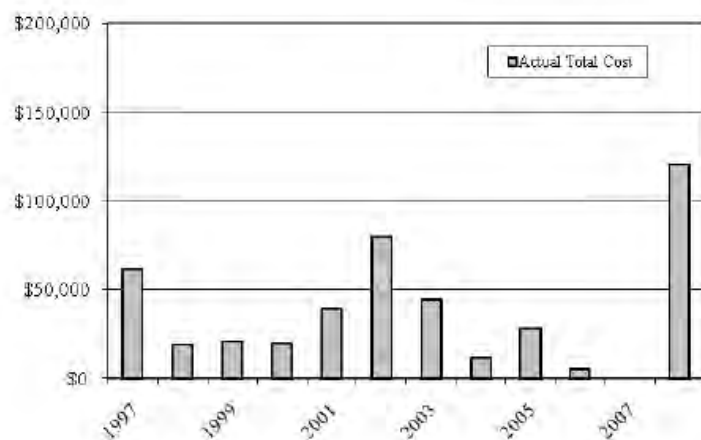


Figure 18. Cost-Share %.

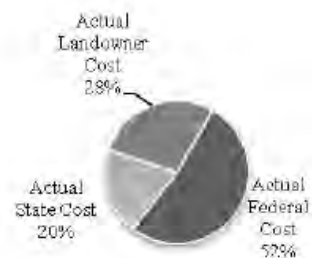


Figure 19. Windsor County BMP Projects IN PROGRESS.

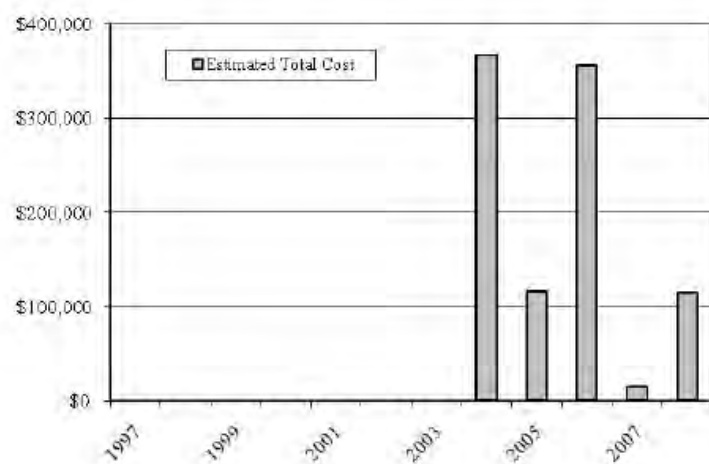
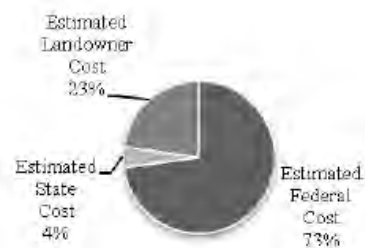


Figure 20. Cost-Share %.



## STATUS & TRENDS

### ***Farms & Acreage:***

The number of farms in Windsor County increased 44% from 1987 to 2007 (compared to a statewide increase of 19%). However, the number of farmed acres in either crops or pasture decreased 21% (compared to a statewide decrease of 34%).<sup>3</sup> Loss of open space to development is evident along many of the major roads in the watershed (Table 8).

**Table 8. Windsor County: Farms and Farmland.**

	1987	1992	1997	2002	2007
Total # Farms	534	505	734	697	767
Acres in Farms	97,430	89,785	99,353	89,952	95,972
Crop + Pasture Acres	60,435	56,142	53,847	43,739	47,719

### ***Economic Challenges:***

The current economic impact of agriculture in the watershed is telling. Although the market value for agricultural products sold in Windsor County increased by 84% from 1987 to 2007, the production cost also increased alarmingly by 150% during this same time period (Table 9). Despite a 14% greater production cost over sales revenue in 2007, agriculture puts a significant amount of money into the local economy; total production expenses in 2007 for Windsor County include over \$3.3 million in property taxes.<sup>3</sup> An additional economic concern is that loss of Vermont's pastoral aesthetic may ultimately affect the tourism revenue.<sup>1</sup>

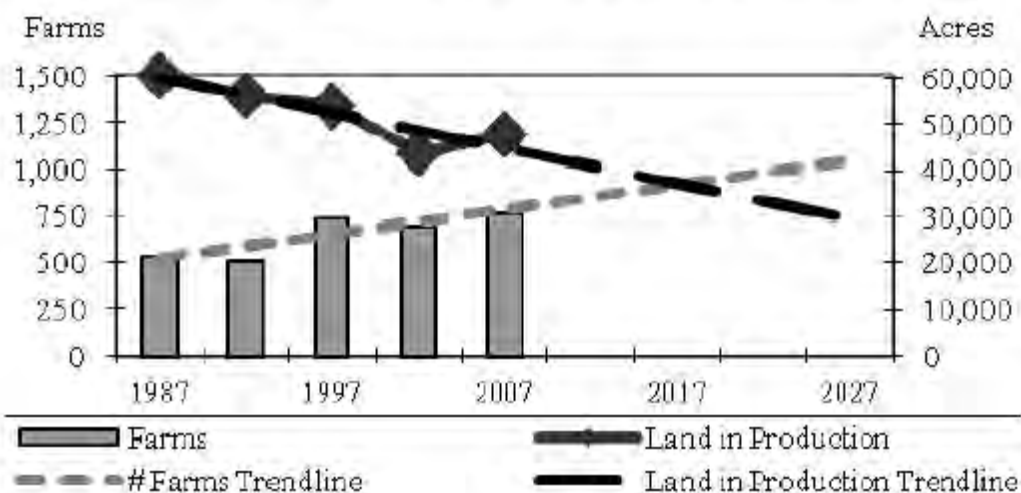
**Table 9. Windsor County: Product Value & Production Costs (millions).**

	1987	1992	1997	2002	2007
Value of Ag Products Sold	\$13.6	\$13.0	\$20.6	\$15.8	\$25.0
Ag Production Costs	\$11.4	\$12.9	\$16.8	\$22.3	\$28.4

### ***Land Use Change:***

Projecting the NASS data out to 2027, at the present rate of loss, there will be fewer than 30,000 acres in agriculture in all of Windsor County. Note that this forecast does not necessarily take into account the compounding factors of economics, climate and the future regulatory environment. The predicted decrease would leave less than 5% of the land base of the county in agriculture by 2027 (Figure 21). This continued loss of over half of the county's farmland would dramatically change the cultural and environmental qualities of the area (recall that the 2001 estimate of agricultural land in B10 alone was 9%). In addition, these smaller farms will leave fewer larger patches of open land, possibly affecting grassland birds and even tourism.

*Figure 21. Windsor County Farms and Land in Production.*



The loss of agricultural land also has a negative implication for water quality. Per acre, urban land has been shown to have a greater adverse impact on surface water quality than agricultural land<sup>45</sup>. The increase in pavement and other impervious areas can increase runoff and carry toxic pollutants into waterways. Increased development means greater disturbance to soils, greater impact on natural resources and greater stress on existing farmland to both produce more on less land and to maintain the pastoral landscape. This becomes increasingly difficult with the concurrent increase in the cost of farming due to higher land costs and higher tax rates.

## FUTURE CONCERNS

Currently, the Ottauquechee/Black watersheds of Basin 10 remain rural and maintain a diverse agricultural industry. Most local towns within the basin are committed to maintaining the rural, agricultural nature of the area. However, the economics of agriculture, including conservation program funding and local food movements will ultimately determine the character, extent and sustainability of the basin's working agricultural landscape.

### *Economics & the Working Landscape:*

Farms in B10 struggle to remain economically viable in the face of development pressure, market competition, labor issues and increasing regulations. Due to their proximity to the Boston-New York corridor, the counties of southeastern Vermont in particular, once experienced a great advantage in available product markets. This same closeness in recent decades now brings increased pressure from development and competition from distant and foreign food markets. Meanwhile, it has become

<sup>45</sup> Hanmer, R. 2006. Food for Thought; Save a Farm, Save the Bay. Bay Journal. V.16, no. 7. <http://www.bayjournal.com/article.cfm?article=2921>

increasingly difficult to recruit new farmers and farm laborers, raising the concern of whether there 'will be a sufficient number of younger Vermonters willing and able to maintain Vermont farms in the future'.<sup>46</sup> Additionally, regulations concerning husbandry, genetics, foods safety and the environment continue to become more and more stringent; adding to the basic costs of maintaining an agricultural business.

While agriculture is identified as a critical economic sector in the county, the economic benefits of agriculture are not limited to direct sales. The rural working landscape of B10 represents not only a local food system, but an aesthetic ideal and a draw for tourism. In polls conducted by the Vermont Center for Rural Development, more than 97% of Vermonters valued the 'working landscape and its heritage'.<sup>47</sup> The tourism industry accounts for 15% of the state's economy and depends largely on the reputation of Vermont's pastoral landscape.<sup>1</sup> Regional development plans in B10 eloquently address the need to preserve the working landscape, recognizing that suitable agricultural land is irreplaceable but that it will be lost forever unless policymakers and citizens confront the economic problems of the industry.<sup>2,4</sup>

### ***Regulations & Conservation Funding:***

Now, more than ever, farmers are under considerable pressure to maintain environmentally sound farming operations. All Vermont agricultural operations are required to comply with the water quality protection regulations of the Accepted Agricultural Practices (AAP).<sup>18</sup> While Vermont's Large and Medium Farm Operations must meet regulations above and beyond AAP's, farms that receive federal conservation program funding must meet further environmental regulations. In complying with the minimum standard AAP's, farmers must address nine key water quality protection concepts:

No Direct Discharge of wastes to surface waters

Nutrient and Pesticide Storage and setback requirements

Nutrient and Pesticide Application, setback and soil testing requirements

Soil Cultivation designed to minimize erosion

Waste Management to minimize impacts to water quality

Buffer Zones maintained on cropland

Farm Structure design and setbacks

Streambank Stabilization to federal standards

Groundwater Quality impacts minimized.

Federal, state and private agencies have taken steps to protect farmland and farm water quality through Land and Conservation Programs that involve federal, state and private funds (see 'Programs to Address Issues'). Land protection helps to ensure availability of agricultural land for future food and fiber production and provides those presently working the farm with some financial assistance to help them succeed. Conservation programs may include assistance for installing conservation practices that reduce non-point source pollution (i.e. fencing animals out of streams to prevent damage to streambanks, providing alternative watering systems and installing waste treatment facilities). Unfortunately, federal and state cost-share dollars for these programs are sometimes limited and competitive.

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<sup>46</sup> Bolduc, V.B. and H. Kessel. 2008. Vermont in Transition: A Summary of Social, Economic and Environmental Trends. Center for Social Science Research at Saint Michael's College for the Council on the Future of Vermont. [futureofvermont.org/node/528](http://futureofvermont.org/node/528).

<sup>47</sup> Vermont Council on Rural Development. 2009. Imagining Vermont: Values and Vision for the Future. Final Report of the Council on the Future of Vermont. VCRD. [futureofvermont.org/Report](http://futureofvermont.org/Report).



Example. The funding issues can be well illustrated using VAAFM data. Of the 38 operating dairy farms in Windsor County, only 2 farms have received BMP cost-share funds to install permanent waste storage facilities designed to federal standards.<sup>36</sup> Of the 36 remaining dairy farms, manure should be field stacked in accordance with AAP standards, though some of these farms may have additional storage structures. Assuming these farms could benefit from waste management systems, the necessary funds are as follows. To complete implementation of systems for these farms, it will take at least \$1,410,864. The figure is based on treatment cost of \$323 per animal for waste management systems and a need to treat the 4,368 estimated lactating cows on these farms. Additionally, these dairy farms may not have installed sufficiently improved barnyards. In order to treat the 4,368 estimated lactating cows on farms that could benefit from this practice, at a cost of \$335 per animal, it will cost an additional \$1,463,280 at minimum.<sup>48</sup>

If funding for dairy BMP structural installation continues at the current level of 1.2 farms per year, it will take nearly 32 years to treat all remaining dairy farms with appropriate practices in Windsor County. During that time, systems now in use will need upgrading as well. Water quality should gradually improve over time as more farms install these systems. Levels of phosphorus and nitrogen in surface waters should decrease but will not be eliminated in the foreseeable future. Even greater improvement should come now that nutrient management planning is a requirement for federal programs funding waste management systems. Further improvement could take place if cost share funding programs are increased for other types of farms and practice implementations such as cover cropping and nutrient management planning updates. An increase in support for these programs would decrease the time it will take to reach maximum nutrient management and the resultant improvement in water quality.

### ***Changes in Local Agriculture:***

Horses: The equine industry is a rapidly growing sector of agriculture in Vermont, contributing significantly to the state economy. In 2002, total value in equine feed costs alone was estimated at \$26 million with 35,000 horses in Vermont.<sup>49</sup> Interestingly, with a similar total horse estimate for Maine in 2006, total value of the equine industry was estimated at \$364 million in sales (indirect, direct and induced impact).<sup>50</sup> (In comparison, for 2000 total value of the agricultural industry to Vermont was estimated at \$2.6 billion.<sup>3</sup>) Windsor County is a focal point for the industry in Vermont; home to the oldest horse organization in the nation (Green Mountain Horse Association)<sup>51</sup> and the second greatest in horse stables per county.<sup>52</sup> For several decades the Census has listed Windsor County with the 3rd greatest number of horses in the state, now at only a few hundred less than Chittenden or Rutland Counties. From 1987 to 2007, Windsor County experienced a 60% increase in number of horses (from 939 to 1502 horses/ponies), while the state experienced a 75% increase in horses (Figure 22 & 23) In fact, the number of horses in the county is now approaching the rising number of beef (1807), is a few hundred less than the dwindling number of sheep (2082) and is half that of the rapidly decreasing dairy cows (3112).<sup>3</sup> If this trend

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<sup>48</sup> Vermont Agency of Agriculture, Food & Markets. 2009. Personal communication from Agricultural Engineer. VAAFM.

<sup>49</sup> Greene, B., J. Ather, & L. King. 2003. "Vermont Horses Count" 2002 Vermont Equine Survey Report. Burlington, VT: University of Vermont.

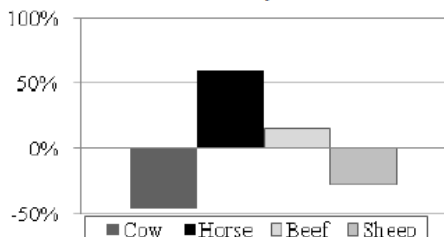
<sup>50</sup> Planning Decisions, Inc. 2007. The economic impact of the equine industry in Maine. Prepared for the Maine Harness Racing Promotion Board and the Maine Farm Bureau Horse Council. 37 pp. South Portland, ME. [www.planningdecisions.com/economic\\_impact\\_studies.htm](http://www.planningdecisions.com/economic_impact_studies.htm).

<sup>51</sup> Green Mountain Horse Association. Fact Sheet. Web. 2010. [www.gmhaine.org/aboutgmha.html#facts](http://www.gmhaine.org/aboutgmha.html#facts).

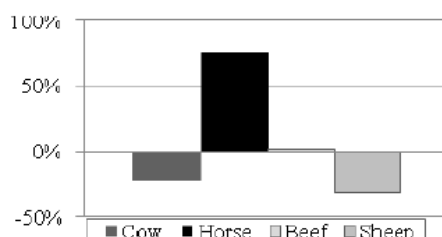
<sup>52</sup> Vermont Equine Directory. Horse Stables. Web. 2010. [www.vermontequinedirectory.com/](http://www.vermontequinedirectory.com/).

continues, Windsor County's future in livestock agriculture may soon revolve solely around beef and horses.

*Figure 22. Percent Change in Livestock: 1987-2007, Windsor County.*



*Figure 23. Percent Change in Livestock: 1987-2007, Vermont.*



The equine industry also has the potential to impact the state's natural resources. Vermont horse farms, typically through converting old livestock and crop farms, are keeping a significant amount of Vermont's landscape open and pastoral, preventing development.<sup>48</sup> However, these operations can contribute to problem issues primarily through imprudent manure and pasture management. Equine operations of any size are required to follow the minimum standards of the AAP's. The applicable AAP's include limitations on manure storage sites, level of animal damage to stream banks and a requirement that any mechanical application of manure to fields is based on soil tests.<sup>18</sup> However, AAP inspections of farms are typically performed in response to complaints or at the owner's request. Only equine operations with over 150 horses are required to obtain an MFO permit.<sup>31</sup> The MFO standards for such farms include developing an approved NMP and routine inspections of farm operations by the VAAFM. NMP's help insure that farms are properly applying nutrients and managing fields to limit erosion, both of which could otherwise lead to water quality impairments.<sup>32</sup>

Based on the growing animal numbers alone, the horse community warrants receiving targeted education on land stewardship and agricultural practices associated with horse keeping. Unfortunately, horse owners typically neither view themselves as members of the traditional agricultural community nor obligated to follow the state's agricultural rules and regulations (AAP's) designed to protect water quality.<sup>53</sup> From 2006 to 2009, horse manure management complaints to VAAFM rose from 10% to 21% of total manure management complaints.<sup>54</sup> However, efforts at AAP education continue to focus primarily on Vermont's dairy industry as this is still the largest sector of animal based agriculture in the State. State and federal conservation programs designed to address water quality issues also continue to focus services to the state's traditional dairy industry. Compounding the AAP and technical assistance outreach need is that most horse owners in Vermont typically own only a few animals, making them difficult to identify and target for such outreach in an efficient manner. An increase in efforts to educate this community on proper manure management was initiated in 2009 by VACD through several horse manure composting workshops and a composting bin program.<sup>55</sup> Horse pasture management workshops have been presented through ONRCD and UVM Extension.<sup>56</sup> These workshops were well received and reached an estimated 300 horseowners. However, with over 35,000 horses estimated in Vermont, much

<sup>53</sup> Thomas, H.S. 2009. Managing Manure. TheHorse.Com. Article # 13973. [www.thehorse.com/ViewArticle.aspx?ID=13973](http://www.thehorse.com/ViewArticle.aspx?ID=13973).

<sup>54</sup> Vermont Agency of Agriculture, Food & Markets. 2010. Personal communication from Compliance Coordinator. VAAFM.

<sup>55</sup> Vermont Agency of Natural Resources. 2010. Vermont Clean & Clear Action Plan, 2009 Annual Report. Submitted to the Vermont General Assembly. Vermont Clean & Clear Plan. Waterbury, VT. 93 pp. [www.anr.state.vt.us/cleanandclear/annualreps.htm](http://www.anr.state.vt.us/cleanandclear/annualreps.htm).

<sup>56</sup> Gilker, R. E. and E. A. Greene. 2009. Improving Pasture Management for Horses. Final Report to USDA SARE. LNE07-254.

more outreach is necessary if there is to be significant improvement in manure and pasture management by horseowners.

Local Food: Windsor County has a rich farming history. The earliest census data from 1860 through 1910 show the county as having the greatest number of farms and farmland acreage of any county in Vermont.<sup>57,58</sup> In the latest 2007 Census, the county was only 6 farms below the top county, although the total farmland acreage had dropped to half that of the highest county.<sup>3</sup> Windsor County is also home to the second greatest number of farmer's markets and the greatest number of farm stands per county.<sup>59</sup> Farms of the county are now typically small, family owned and operated with an average size of 125 acres.<sup>3</sup> Unfortunately, small farms are less profitable than large commercial farms and often cannot serve as the farmer's primary source of income.

The future of agriculture in the county is further challenged by demands to develop land for other uses. As a result, local land costs are rising, making young people less capable of starting up a farm operation without prior assets. As the farm economy then further declines, so also does the necessary farming infrastructure. If local farms are to remain, strategies must be developed to help these small farms to become environmentally and financially sustainable. To this end, the Vermont Sustainable Agriculture Council recommends reestablishing a statewide food system infrastructure with multi-farm distribution, processing and storage centers. The Council also advocates identifying means of making local food available to all Vermonters while ensuring a fair price to farmers.<sup>60</sup>

The benefits of local agriculture are not limited to the obvious supply of local food. Regional plans developed for Windsor County recognize these benefits to also include; preservation of regional heritage, protection of natural resources from development, support of local economy, significant contribution to the tourism industry, and contribution to a highly valued quality of life.<sup>61</sup> However, while there is significant public support for local foods, there is less support for the existence of local farms, especially in growing rural communities. Residents of these communities, frequently relying on limited or inaccurate information about modern farming practices, often express concern over the environmental effects of farming.<sup>62</sup> Additionally, while Vermont has become known for farm products grown in 'one of the healthiest environments in the country',<sup>45</sup> Vermont is currently a net importer of food.<sup>2</sup> However, foreseeable changes may require increasing local food production into the future as transportation costs rise, the costs of farm supplies increase and agricultural regions experience other crises.<sup>2</sup> With the future in mind, Vermont continues to progressively recognize the importance of local agriculture in setting forth supportive statutes. Recently, Vermont state laws have defined local food as that grown within Vermont

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<sup>57</sup> Kennedy, J.C.G. 1864. Agriculture of the United States in 1860; Compiled from the Original Returns of the Eighth Census, under the Direction of the Secretary of the Interior. Government Printing Office. Washington, DC.

<sup>58</sup> Department of Commerce. 1913. Thirteenth census of the United States taken in the year 1910, Volume VII - Agriculture. DOC, Bureau of the Census. Washington, DC.

<sup>59</sup> Vermont Agency of Agriculture, Food & Markets. Buy Local, Buy Vermont. Web. 2010. [vermontagriculture.com/buylocal/visit/index.html](http://vermontagriculture.com/buylocal/visit/index.html)

<sup>60</sup> Vermont Sustainable Agriculture Council. 2009. Annual Report and Recommendations. UVM Center for Sustainable Agriculture. Colchester, VT. [www.uvm.edu/sustainableagriculture](http://www.uvm.edu/sustainableagriculture).

<sup>61</sup> East Central Vermont Steering Committee. 2009. East Central Vermont Comprehensive Economic Development Strategy (CEDS). Woodstock, VT.

<sup>62</sup> Smith, J.M., R.L. Parsons, K. VanDis, and G.N. Matiru. 2008. Love Thy Neighbor-But Does That Include a Six Hundred Eighty-Four Cow Dairy Operation? A Survey of Community Perceptions. J. Dairy Sci. 91:1673-1685.

or within 30 miles,<sup>63</sup> while further establishing a Farm-to-Plate investment program to strategize planning for agricultural economic development. <sup>64,65</sup>

## **WATERS OF CONCERN DUE TO AGRICULTURAL IMPACTS**

### ***Waters Impaired Due to Agricultural Impacts:***

The 2008 State of Vermont 303(d) Part A - C lists no agriculturally impaired surface waters within B10.

### ***Waters in Need of Further Assessment Due to Agricultural Impacts:***

The 2008 State of Vermont 303(d) Part A - C lists 2 waters in need of investigation due to agricultural impacts within B10:

#### VT10/01 Ottauquechee River, Taftsville Dam to Hartland Reservoir

- Current Condition:
  - Possible Pollutants – E. coli, Nutrients
  - Possible Problems Needing Assessment – Failed/Failing Septic Systems, Fertilized Turf, Horse Farms
  - Agricultural Needs: Irrigation and Animal Watering

#### VT10-07 Kedron Brook - Woodstock

- Current Condition:
  - Possible Pollutants – Sediment, Nutrients, E. coli
  - Possible Problems Needing Assessment – Horse Rec., Pasture, Road Runoff, Loss of Riparian Veg, Golf Course
  - Agricultural Needs: Irrigation and Animal Watering

### ***General Needs for Farm Practice Improvements:***

The B10 agricultural community could benefit from additional practices including:

- waste storage facilities
- fencing along streams to exclude animals
- alternative watering systems

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<sup>63</sup> Vermont Statutes. 2008. VSA Title 9, Chapter 63, Section 2465a.  
[www.leg.state.vt.us/statutes/fullsection.cfm?Title=09&Chapter=063&Section=02465a](http://www.leg.state.vt.us/statutes/fullsection.cfm?Title=09&Chapter=063&Section=02465a).

<sup>64</sup> Vermont Statutes. 2009. VSA Title 10, Chapter 15a, Section 330.  
[www.leg.state.vt.us/statutes/fullsection.cfm?Title=10&Chapter=015A&Section=00330](http://www.leg.state.vt.us/statutes/fullsection.cfm?Title=10&Chapter=015A&Section=00330).

<sup>65</sup> VSJF. 2010. Farm to Plate Investment Program: Interim Report to the Legislature and Vermont Sustainable Agriculture Council's Annual Report to the Vermont Legislature. Vermont Sustainable Jobs Fund and Sustainable Agriculture Council. Montpelier, VT [www.vsjf.org](http://www.vsjf.org).

- stream crossings for animals, walkways and access lanes
- roof runoff management
- silage leachate management
- improved barnyards and heavy use area protection
- milkhouse waste management
- surface and subsurface water diversions
- buffers along waterways
- streambank stabilization
- stream channel stabilization
- grade stabilization structures along the river channel
- control of invasive species

## RECOMMENDATIONS FOR AGRICULTURAL NPS IMPROVEMENT IN THE BASIN

The following recommendations were developed and prioritized from input to B10 Agricultural Focus Group forums held at fourteen public meetings with groups including Windsor County Farm Bureau, Ottauquechee Natural Resources Conservation District, Farm Service Agency Windsor County Committee and Green Mountain Horse Association meetings from September 2009 to June 2010.

### Recommendations - Infrastructure

#### 1 Support tax programs that keep land in agriculture.

Strategy	a	Work with legislators to address tax programs affecting farmland.
	.	
	b	Provide sufficient staffing and outreach for such tax programs.
	.	
	c.	Work through organizations like the Conservation Districts with Act 250 party status to identify and recommend protection of prime farmland and forest land.
Lead Agency	d	Work with towns to support zoning that encourages farms in residential areas.
	.	
Funding		VACD, VAAFM, VANR, UVM Ext, NOFA-VT, ONRCD, VHCB, VFB, Farm Operators
Time-line		VAAFM, VHCB
		On-going

#### 2 Continue to support outreach programs on farm viability with an emphasis on profitability as necessary for sustainability.

Strategy	a	Support the Vermont Housing & Conservation Board's Farm Viability Enhancement Program.
	.	
	b	Support the Vermont Agricultural Viability Council's work to outline farm viability needs.
	.	
	c.	Support Women's Agricultural Network and other groups that provide education on business management.
Lead	d	Provide local workshops on business management and related record keeping.
	.	
		VACD, VAAFM, VANR, UVM Ext, NOFA-VT, ONRCD, VFB, Farm Operators, VSJF

Agency  
 Funding RD, VAAFM, UVM Ext, VHCB, VSJF  
 Time-line On-going

3 Support programs that better serve the farming industry in Vermont.

Strategy a Work with state legislators to address milk pricing issues through regional policies.  
 .  
 b Work through local orgs to establish infrastructure for transport, storage processing of  
 . diversified products.  
 c. Work through local organizations to support local farm produce and farmers markets.

Lead  
 Agency VACD, VAAFM, VANR, UVM Ext, NOFA-VT, ONRCD, RPC, VHCB, VFB, Farm Operators, VFF  
 Funding VAAFM, VHCB  
 Time-line On-going

4 Build conservation planning and funding mechanisms for farms not currently participating in USDA/VAAFM conservation programs.

Strategy a Support increased funding for programs like SVNMP that provide TA to farms underserved  
 . by USDA.  
 b Work with state legislators to develop financial assistance programs for the nontraditional  
 . and diversified farms.

Lead  
 Agency VACD, UVM Ext, NOFA-VT, ONRCD, SVNMP, VFB, Farm Operators  
 Funding VAAFM, VANR  
 Time-line On-going

5 Increase support for programs that provide or encourage local learning opportunities for farmers.

Strategy a Coordinate increased farm pasture walks that address local concerns.  
 .  
 b Fund development of on-farm demonstration sites for conservation practices.  
 .  
 c. Develop demonstration farms or sites to provide hands-on education on various  
 conservation practices.  
 d  
 . Develop mentoring programs with experienced and new farmers.

Lead  
 Agency VACD, ONRCD, VAAFM, FSA, NRCS, UVM Ext, NOFA-VT, VFB, Farm Operators  
 Funding VAAFM, VANR  
 Time-line On-going

6 Estimate the cost of BMP agricultural water quality projects and their contribution to meeting the state's goal in reducing phosphorus and nitrate pollution and develop cost projections towards achieving optimum nutrient containment.

Strategy a Compare BMP project cost estimates and nutrient reduction from similar states.  
 .  
 b Research better estimates of N and P reduction for BMP practices.  
 .

Lead Agency	VAAFM, UVM Ext, ONRCD, FSA, NRCS, VFB, Farm Operators
Funding	VAAFM, VANR
Time-line	2015

7 Support Agricultural Education in Vermont schools.

Strategy	<ul style="list-style-type: none"> <li>a. Develop agricultural curriculum specific to Vermont</li> <li>. </li> <li>b. Support programs like FFA, 4-H, agricultural trade schools, Ag in the Classroom and Conservation Field Day.</li> <li>. </li> <li>c. Develop and support local food in schools.</li> </ul>
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Lead Agency	ONRCD, VAAFM, NOFA-VT, VACD, UVM Ext, VFB
Funding	VAAFM, RD, UVM Ext
Time-line	On-going

8 Educate farmers about additional funding sources available for conservation program practices that will enable farm operators to meet their cost-share obligations in a timely manner.

Strategy	<ul style="list-style-type: none"> <li>a. Research, compile, regularly update, and distribute farm funding source information.</li> <li>. </li> <li>b. Support farm business management outreach programs.</li> <li>. </li> <li>c. Regularly hold informational workshops on farm funding sources and assistance with funding applications.</li> <li>. </li> <li>d. Provide one-on-one outreach through programs like VACD's ARS</li> <li>. </li> </ul>
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Lead Agency	VACD, ONRCD, VAAFM, FSA, NRCS, UVM Ext, NOFA-VT, VFB, Farm Operators
Funding	VAAFM, VANR
Time-line	On-going

9 Organize efforts to resolve farm equipment issues and processing needs.

Strategy	<ul style="list-style-type: none"> <li>a. Organize equipment or rental coops.</li> <li>. </li> <li>b. Support insurance for equipment maintenance.</li> <li>. </li> </ul>
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Lead Agency	VACD, ONRCD, VAAFM, FSA, NRCS, UVM Ext, NOFA-VT, VFB, Farm Operators
Funding	VAAFM, VANR
Time-line	On-going

1  
0 Compile agricultural statistics by watershed.

Strategy	<ul style="list-style-type: none"> <li>a. Work with state and federal agencies to begin compiling agricultural statistics in a more flexible format.</li> <li>. </li> </ul>
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Lead Agency	VACD, VAAFM, VANR, FSA, NRCS, NOFA-VT, ONRCD
Funding	EPA, VAAFM, VANR

Time-line 2015

- 1  
1 Prioritize agricultural water quality Best Management Practice programs to areas in need of improvement due to unmet resource concerns.
  - Strategy a Research/compile BMP practice locations throughout B10 and identify areas in need of additional BMP practices.
  - Lead Agency ONRCD, VAAFM, FSA, NRCS, VANR, UVM Ext, Watershed Groups, VFB, Farm Operators
  - Funding NRCS, VAAFM, VANR, NFWF, TNC
  - Time-line On-going

#### Recommendations - Landbased

- 1 Continue outreach to farmers on the Accepted Agricultural Practices.
  - Strategy a. Work with farmers through education and outreach on the Accepted Agricultural Practices.  
b. Encourage development of peer advisory groups for problem solving agricultural resource concerns.
  - Lead Agency ONRCD, SVNMP, VAAFM, UVM Ext, NOFA-VT, VFB, Farm Operators
  - Funding VAAFM, VANR
  - Timeline On-going
- 2 Develop innovative and emerging technology which will result in improved water quality while maintaining the economic integrity of the agricultural land base in the basin.
  - Strategy a. Increase awareness/development of improved manure storage/handling practices and wastewater treatment.  
b. Investigate and coordinate alternative funding sources for projects.
  - Lead Agency ONRCD, SVNMP, VACD, VAAFM, NRCS, VANR, UVM Ext, CVPS, NOFA-VT, VFB, Farm Operators
  - Funding NRCS, VAAFM, VANR, UVM Ext, TNC, TU, NOFA
  - Timeline On-going
- 3 Prevent agricultural pesticide movement/loss to surface waters.
  - Strategy a. Continue technical assistance on pesticide use, safety and alternatives and IPM.  
b. Support outreach programs to garden/lawn care professionals and citizens on IPM.
  - Lead Agency VAAFM, ONRCD, FSA, NRCS, VANR, UVM Ext, VFB, Farm Operators
  - Funding FWS, VAAFM, VANR, NFWF, TNC
  - Timeline On-going
- 4 Increase understanding of the effects of development in the watershed.
  - Strategy a. Provide education on the affects of development in the watershed.  
b. Work with legislators, RPC's and town select boards to protect agriculturally productive soils.  
c. Provide education on the value of our working landscape.
  - Lead VACD, ONRCD, VANR, RPC, VAAFM, UVM Ext, NOFA-VT, VFB, Farm Operators



Agency	
Funding	EPA, FWS, RC&D, VAAFM, UVM Ext, NFWF, TNC
Timeline	On-going
5	Minimize urban and rural practices that contribute to poor water quality.
Strategy	<ul style="list-style-type: none"> <li>a. Identify and assess sections along B10 mainstem and tributaries for development of stormwater retention.</li> <li>b. Educate homeowners and developers on effects of fertilizers/pesticides, impervious surfaces, stormwater runoff.</li> </ul>
Lead Agency	VANR, ONRCD, Watershed Groups, NRCS, UVM Ext, RPC, VFB, Farm Operators
Funding	EPA, FWS, VAAFM, VANR, NFWF, TNC
Timeline	2015
6	Exclude livestock from streambank and shoreline areas and establish alternate water sources, particularly in areas that are at high risk for nitrate leaching, phosphorus loss and soil erosion.
Strategy	<ul style="list-style-type: none"> <li>a. Increase technical and financial assistance to farms willing to exclude livestock from surface waters.</li> <li>b. Increase education on the benefits of livestock exclusion from surface waters.</li> <li>c. Identify and prioritize high risk streambank and shoreline areas.</li> </ul>
Lead Agency	VAAFM, VACD, ONRCD, SVNMP, FSA, FWS, NRCS, VANR, UVM Ext, NOFA-VT, VFB, Farm Operators
Funding	FWS, VAAFM, VANR, NFWF, TNC
Timeline	On-going
7	Continue to work with farmers to develop and implement nutrient management planning regardless of farm acreage.
Strategy	<ul style="list-style-type: none"> <li>a. Increase funding for farmers to create their own nutrient management plans (including alternative sources).</li> <li>b. Increase technical assistance for farms to develop &amp; implement nutrient management plans.</li> <li>c. Provide education on need for NMP including economic benefits.</li> </ul>
Lead Agency	VACD, VAAFM, ONRCD, SVNMP, NRCS, UVM Ext, NOFA-VT, VFB, Farm Operators
Funding	VAAFM, VANR, NRCS, TU, NOFA
Timeline	On-going
8	Increase awareness and implementation of farm soil health improvement practices.
Strategy	<ul style="list-style-type: none"> <li>a. Provide additional technical assistance to farmers on cover cropping, crop rotation, composting, conservation tillage, and soil sampling techniques.</li> <li>b. Provide increased financial support to farmers willing to adapt such newer technologies to their farms.</li> <li>c. Provide local workshops on soils, soil sampling and soil health to farmers.</li> </ul>
Lead Agency	VAAFM, ONRCD, SVNMP, UVM Ext, NRCS, NOFA-VT, VFB, Farm Operators
Funding	NRCS, VAAFM, VANR, UVM Ext

Timeline      On-going

- 9 voluntary farm buffer establishment, as appropriate, along surface waterways and upland wetlands.
- Strategy      a.      Increase financial support to farmers willing to install buffers through programs like CREP and VABP.  
b.      Work with state, federal and local organizations to establish these buffers.  
c.      Provide education on the value and need for buffers.  
d.      Increase funding for projects like 'Trees for Streams'
- Lead Agency      ONRCD, VAAFM, FSA, NRCS, VANR, UVM Ext, NOFA-VT, VFB, Farm Operators
- Funding      EPA, FWS, VAAFM, VANR, NFWF, TNC
- Timeline      On-going
- 10 Increase awareness of NPS Pollution and the AAPs within the equine community.
- Strategy      a.      Hold equine industry workshops on NPS Pollution and the AAPs.  
b.      Research and compile information on numbers and locations of horses.
- Lead Agency      ONRCD, UVM Ext, VAAFM, VANR, VFB, Farm Operators
- Funding      EPA, FWS, VAAFM, VANR, NFWF, TNC
- Timeline      2015
- 11 Develop river maintenance technologies specific to B10 system that purposefully consider the needs of agriculture within the basin.
- Strategy      a.      Research innovative bank stabilization strategies such as forms of armoring, where appropriate and natural channel design techniques.  
b.      Support research and provide outreach specific to the unique characteristics of the B10 river system.
- Lead Agency      NRCS, USACE, VAAFM, VANR, ONRCD, RPC, VACD, Watershed Groups, VFB, Farm Operators
- Funding      USACE, VAAFM, VANR
- Timeline      2015
- 12 Maximize the potential of the next Conservation Security Program allocation for B10.
- Strategy      a.      Identify lands in need of protection through such programs as CSP.  
b.      Provide outreach and education on CSP program prior to the next round of funding for B10.
- Lead Agency      FSA, ONRCD, VAAFM, NRCS, VANR, UVM Ext, NOFA-VT, VFB, Farm Operators
- Funding      FSA, VAAFM, VANR
- Timeline      2015

#### Recommendations - Structural

- 1 Increase funding opportunities for water quality Best Management Practices and equitable distribution of the funds statewide.
- Strategy      a.      Work with USDA to increase funding for programs such as EQIP, CRP, CREP, and WHIP.  
b.      Work with VAAFM to increase funding for programs such as VABP, NMPIG and FAPP.  
c.      Work with FWS to increase funding for PFW to install alternative watering systems,

riparian buffers and fencing.

d. Work with state, federal and local organizations on statewide equitability.

e. Recognize and target funding for watersheds impaired due to nitrates and phosphates.

Lead Agency	VACD, VFB, ONRCD, VAAFM, VANR, FSA, NRCS, RC&D, UVM Ext, NOFA-VT, Farm Operators
Funding	VAAFM, VANR
Timeline	On-going

2 Increase implementation of water quality Best Management Practices.

Strategy	Work with farmers, state/federal agencies, private industry and utilities to design and implement barnyard improvement, innovative biosolid and agricultural waste management practices.
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Lead Agency	VAAFM, NRCS, ONRCD, SVNMP, FSA, UVM Ext, NOFA-VT, VFB, CVPS, Farm Operators
Funding	FSA, NRCS, VAAFM, CVPS, UVM Ext
Timeline	On-going

3 Increase awareness of the MFO and LFO requirements and how they may affect SFO's in the future.

Strategy	a. Work with farmers through outreach and education of MFO and LFO regulations.
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Lead Agency	ONRCD, SVNMP, VAAFM, UVM Ext, NOFA-VT, VFB, Farm Operators
Funding	VAAFM, UVM Ext
Timeline	On-going

## **COOPERATING PARTNERS**

### ***State:***

- University of Vermont, Cooperative Extension Service – UVM Ext.
- Vermont Agency of Agriculture Food & Markets - VAAFM
- Vermont Agency of Natural Resources - VANR

### ***Federal:***

- US Army Corps of Engineers - USACE
- USDA Farm Service Agency - FSA
- USDA Forest Service - FS
- USDA National Agricultural Statistics Services - NASS
- USDA Natural Resource Conservation Service – NRCS
- USDA Resource Conservation and Development – RC&D
- USDA Rural Development - RD
- US Environmental Protection Agency - EPA
- US Fish & Wildlife Service – FWS

### ***Local:***


- Central Vermont Power Service – CVPS
- Natural Resource Conservation Council – NRCC
- Ottauquechee Natural Resources Conservation District - ONRCD
- Southern Vermont Nutrient Management Program – SVNMP
- Southern Windsor County Regional Planning Commission – SWCRPC
- Town Governments, Selectboards & Conservation Commissions
- Two Rivers-Ottauquechee Regional Commission - TRORC
- Vermont Association of Conservation Districts – VACD
- Vermont Housing and Conservation Board – VHCB

### ***Other:***

- Black River Action Team – BRAT
- Farm Operators
- National Fish & Wildlife Foundation - NFWF
- Nature Conservancy of Vermont – TNC
- Northeast Organic Farmers Alliance of Vermont – NOFA-VT
- Ottauquechee River Group - ORG
- Upper Valley Land Trust - UVLT
- Vermont Farm Bureau – VFB
- Vermont Land Trust – VLT

## APPENDIX A.8 – Existing Uses in Basin 10 Waters\*


### Boating

Waterbody	Reach	Public Access	Put In	Take Out	Map Symbol
<b><i>Black River Watershed</i></b>					
<b>Black River</b>	Lake Pauline(Reservoir Pond) to Cavendish	Lake Pauline Dam		Greven Field	
<b>Black River</b>	Cavendish to Weathersfield	Greven Field		Upper Falls Covered Bridge	
<b>Black River</b>	Weathersfield to No. Springfield	Upper Falls Covered Bridge		USACE Rec. area	
<b>Black River</b>	No. Springfield to Springfield Plaza	USGS Guaging Station, Mill Rd.		Plaza walking bridge	
<b>Black River</b>	Springfield to Connecticut River	Welcome Park		Hoyts Landing	
<b>North Branch Black</b>	Branch Brook Rd to Stoughton Pond Dam	USACE lands		USACE lands	
<b><i>Ottauquechee River Watershed</i></b>					
<b>Ottauquechee River</b>	West Bridgewater to Woodstock	Ottauquechee WMA		Bridges Rd. iron bridge crossing	
<b>Ottauquechee River</b>	Woodstock to Taftsville	Bridges Rd. iron bridge crossing		River Rd. above Taftsville Dam	
<b>Ottauquechee River</b>	Taftsville to Connecticut River	Taftsville Dam		Willard Covered bridge	


Contact Recreation					
Waterbody	Site	Location of Use	Town	Ownership	Map Symbol
<b><i>Black River Watershed</i></b>					
Black River	RR Bridge	RR bridge crossing Cavendish village, ~350' below RR bridge	Cavendish	RR ROW	★
Black River	Cavendish Gorge	~300' below CVPS Cavendish dam	Cavendish	CVPS	
Black River	Carlton Rd Crossing	~100' north D/S of Carlton Rd bridge	Cavendish	unknown (ROW)	
Black River	Power Plant Rd	~500' below the end of Power Plant Rd	Cavendish	CVPS??	
Black River	Tolles Hill Dam Area	USACE No. Springfield Recreation Area	Weathersfield	USACE	
North Branch Black River	Bartley Field Rec Area	Bartley Field	Reading	Town of Reading	
North Branch Black River	Twenty-Foot Hole	Tyson Rd. access	Reading	VDFPR / VRC	
North Branch Black River	Branch Brook Rd.	Branch Brook Rd. end	Weathersfield	USACE	
Branch Brook	Buttermilk Falls	Buttermilk Falls	Ludlow	VDFPR / VRC	
<b><i>Ottauquechee River Watershed</i></b>					
Ottauquechee River	Bridgewater Rec Park	Park riverfront	Bridgewater	Town of Bridgewater	
Ottauquechee River	River Road --- Woodstocker's Rope Swing	River Rd. ~500' east of Otis Hill Rd.	Hartford	Town of Hartford	
Ottauquechee River	Quechee Gorge	Bottom end of gorge, ~2250' below Rte 4 bridge	Hartford	USDOD/VDFPR	
Ottauquechee River	Quechee Covered Bridge	Below Covered Bridge	Hartford	Town of Hartford	

				ROW
<b>Ottauquechee River</b>	Elm St. Bridge	Below Elm St. bridge crossing	Woodstock	Town of Woodstock
<b>Harlow Brook</b>	Clay Hill Rd. Hole	Clay Hill Rd. crossing	Hartland	USACE

## Fishing

Waterbody	Reach	Town	Designation	Map Symbol
<b>SPECIAL FISHERING REGULATIONS</b>				
<b>RIVERS</b>				
<b>Lower Black River</b>	I-91 bridge to Clinton St. bridge	Springfield	5	
<b>Lower Black River</b>	mouth to I-91 bridge / Hoyts Landing	Springfield	4	
<b>Black River</b>	Upper Falls Rd covered bridge to Howard Hill Rd.	Weathersfield/Cavendish	6	

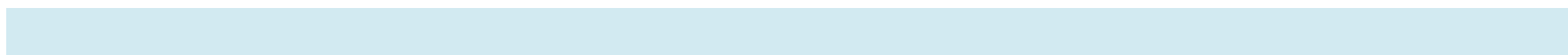
## LAKES

<b>Colby Pond</b>		Plymouth		
<b>Echo Lake</b>		Plymouth		
<b>Kent Pond</b>		Killington		
<b>Knapp Pond 1</b>		Reading / Cavendish		
<b>Knapp Pond 2</b>		Reading / Cavendish		
<b>Lake Rescue</b>		Ludlow		
<b>Stoughton Pond</b>		Weathersfield		

## Fishing Access Areas



Amherst	Plymouth
Ninevah	Mount Holly
No. Hartland Lake	Hartford / Hartland
No. Springfield Lake	Weathersfield / Springfield




Native Brook Trout documented presence		
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## Water Supply

Waterbody	Reach	Supply for:	Documentation	Map Symbol
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### Class A2 Waters

#### *Black River Watershed*

Grant Brook (Off Jewell Brook) – Approx. 3.2 miles	Grant Brook and all waters within its watershed upstream of the flood control dam.	Village of Ludlow water supply. (No longer in use)	WQS	
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Springfield Reservoir Brook – 1.8 miles	Springfield Reservoir Brook and tributaries and all waters in its watershed upstream of Springfield Reservoir.	Village of Springfield water supply. (Reserved for emergency use).	WQS	
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Springfield Reservoir and tributaries – 9.8 acres	Springfield Reservoir all waters within its watershed.	Village of Springfield water supply. (Reserved for emergency use)	WQS	
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### ***Ottauquechee River Watershed***

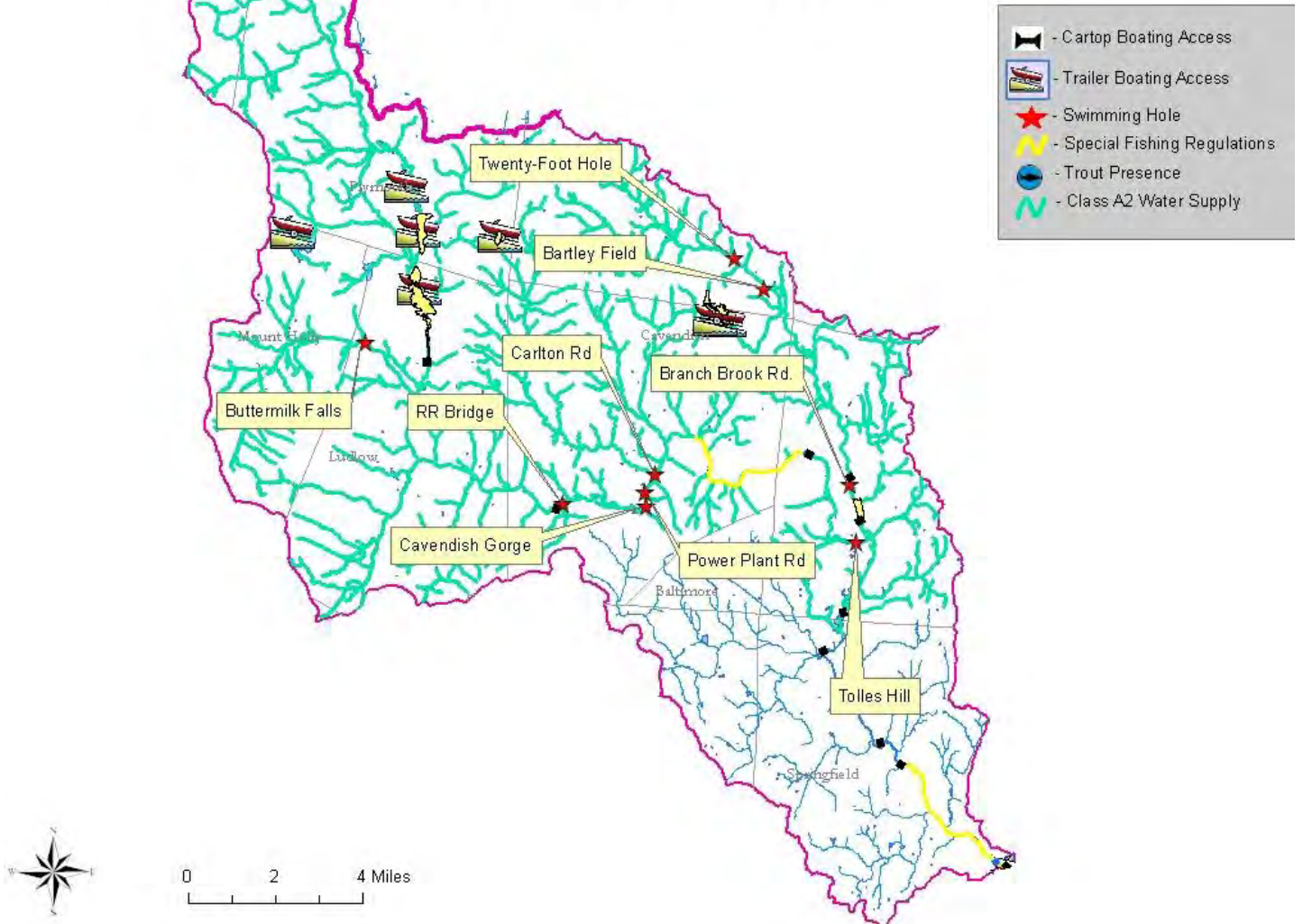
<b>Spring and unnamed tributary to the Ottauquechee River – 0.3 miles</b>	A spring and unnamed tributary to the Ottauquechee River and all waters within its watershed upstream of the water intake. The spring and brook are located approx. 1 mile north-northwest of North Hartland Village.	Village of North Hartland water supply. (Reserved for emergency use)	WQS
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<b>Cox, Vandell and Carlton Hill Reservoirs – Approx. 2.5 miles (Stream only)</b>	Cox, Vandell and Carlton Hill Reservoirs – Approx. 2.5 miles (Stream only)	Village of Woodstock water supply. (Private. Reserved for emergency use. Carlton Hill no longer in the system).	WQS
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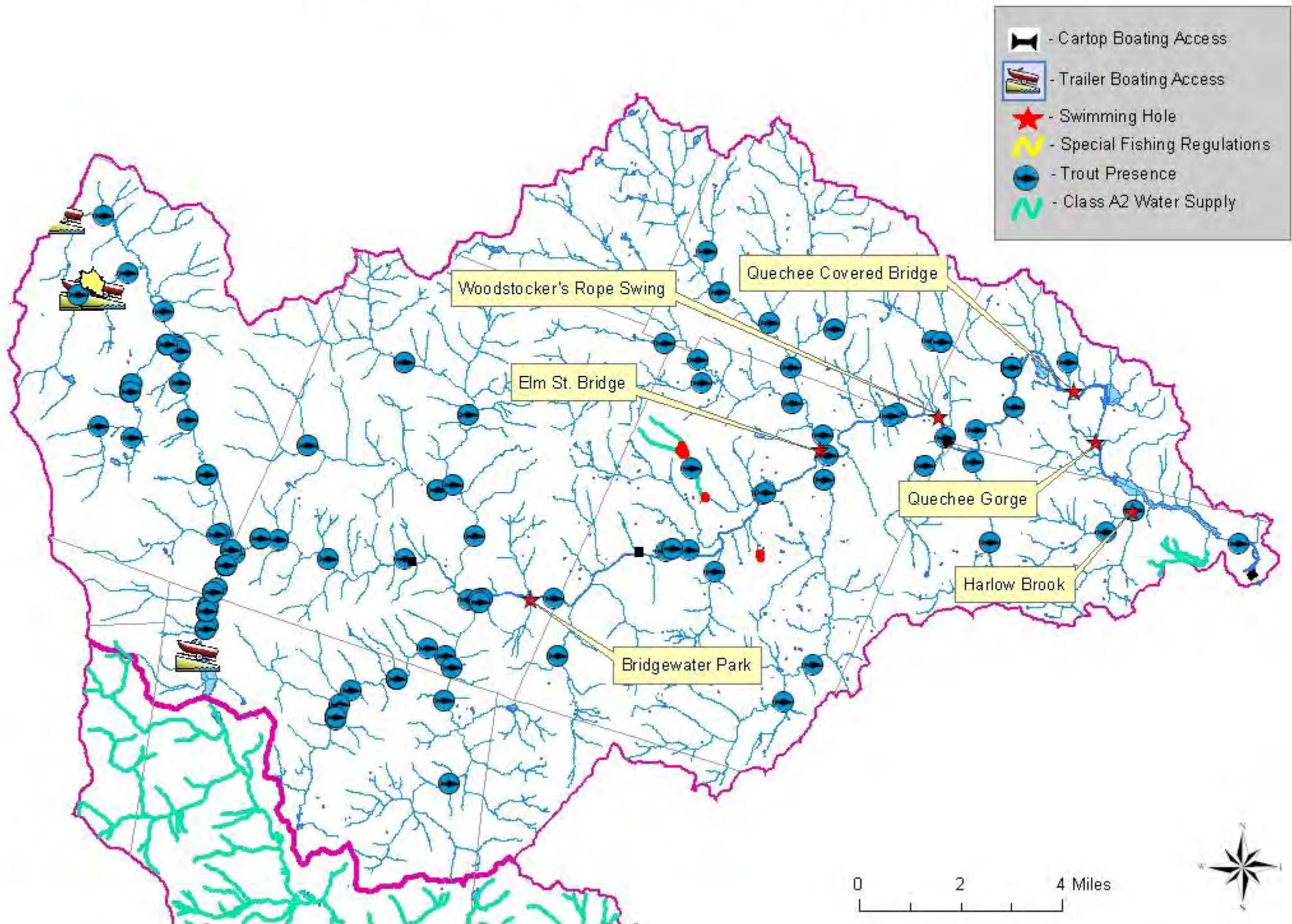
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\* Existing Use Determination is based on the Dept. of Environmental Conservation *Guidelines for Existing Use Determination* which can be found at: [http://www.vtwaterquality.org/htm/documents/ad\\_existing\\_use\\_basin\\_planning.pdf](http://www.vtwaterquality.org/htm/documents/ad_existing_use_basin_planning.pdf).

## Black River Existing Uses



# Ottawaquechee River Existing Uses





## APPENDIX A.9 - Municipal Planning and Water Resources Review

### MUNICIPAL PLANNING AND WATER RESOURCES REVIEW

Town	Andover	Baltimore	Barnard	Bridgewater	Cavendish	Chester	Hartford	Hartland
<b>Town Government</b>								
Planning Commission	yes	yes	yes	yes	yes	yes	yes	yes
Zoning Board of Adjustment	yes	yes	yes	Flood Review Brd	no	no	yes	no
Development Review Board	no	no	no	no	no	yes	no	no
Conservation Commission	no	no	yes	no	no	yes	yes	yes
<b>Town Plan</b>								
Effective Date	8/14/2007 (Draft)	7/5/2006	3/31/2010	1/22/2008	1/8/2007	5/27/2009 (Draft)	6/5/2007	6/5/2007
<b>WQ Areas Covered in Plan</b>								
Agriculture	yes	yes	yes	yes	yes	yes	yes	yes
Aquatic Life	no	no	yes	yes	no	no	yes	no
Buffers	yes	yes	yes	yes	yes	yes	yes	yes
Classification (yes/no)	no	no	no	no	no	no	no	no
Dams & Impoundments	no	no	no	no	no	no	yes	no
Inventory (yes/no) *	no	no	no	no	no	no	partial	no
Earth Resource Extraction	yes	yes	no	yes	yes	yes	yes	yes
Exotic Invasive Species	no	no	yes	no	no	no	yes	no
Fisheries	no	no	yes	yes	yes	no	no	no
Flood Hazard Areas	no	no	yes	yes	yes	no	yes	yes
Floodplains	no	no	yes	yes	yes	no	no	yes
Forestry	yes	yes	yes	yes	yes	yes	yes	yes
Groundwater & Aquifers	no	yes	yes	yes	yes	yes	yes	yes
Lakes & Ponds	yes	no	yes	yes	yes	yes	yes	yes
Inventory (yes/no)	no	no	partial	no	no	no	partial	yes
Natural Communities	yes	yes	yes	no	yes	yes	yes	yes
Natural Habitats	yes	yes	yes	yes	yes	yes	yes	yes
Riparian Zone	yes	no	yes	yes	no	no	yes	yes
Rivers & Streams	yes	no	yes	yes	yes	yes	yes	yes
Inventory (yes/no)	no	no	partial	no	no	no	partial	yes

Town	Andover	Baltimore	Barnard	Bridgewater	Cavendish	Chester	Hartford	Hartland
Shorelands	no	no	yes	no	yes	yes	no	yes
Steep Slope/Ridgeline Development	no	no	yes	yes	no	no	yes	yes
Swimming Areas	no	no	no	no	yes	yes	no	no
Wastewater Systems	yes	yes	yes	yes	yes	yes	yes	yes
Water Quality	yes	yes	yes	yes	yes	yes	yes	no
Water Quality Classification	no	no	yes	yes	no	no	yes	no
Water Recreation	no	no	no	no	yes	yes	yes	yes
Water Quality Protection	no	yes	yes	yes	yes	yes	yes	yes
Wetlands	yes	yes	yes	yes	yes	yes	yes	yes
Inventory (yes/no)	no	no	no	no	no	no	partial	yes
Other								
Zoning Bylaw	8/14/2007							None
Effective Date	(Draft)	8/26/2009	11/13/2007	None	None	12/13/2007	10/14/2008	8/11/11(Prpsd)
WQ Areas Covered in Bylaw								
Bridge & Culvert Assessment	no	no	no			no	no	
Buffers Required	no	no	yes			no	yes	
Erosion & Sediment Control	no	yes	yes			yes	yes	
Fisheries Protection	no	no	no			no	no	
Flood Hazard Area Protection	yes	yes	yes			yes	yes	
Floodplain Protection	no	no	yes			yes	yes	
PRD/PUD	yes	no	yes			yes	no	
Public Access Protection	no	yes	no			yes	no	
Riparian Protection	no	no	no			no	yes	
Road Standards	no	no	no			yes	yes	
Setbacks from Water	no	no	yes			no	no	
Shoreline Protection	no	no	yes			yes	yes	
Site Plan Review	yes	yes	no			yes	yes	
Steep Slope/Ridgeline Development	no	no	yes			yes	yes	
Stormwater / LID	no	yes	yes	yes		no	yes	
Wetlands Protection	no	no	yes			yes	yes	
Other	yes	no	yes (Earth Resource Extraction)			yes	no	

Town	Andover	Baltimore	Barnard	Bridgewater	Cavendish	Chester	Hartford	Hartland
<b>Subdivision Regulations</b>								
Effective Date	3/31/1987	8/26/2009	11/13/2007	None	None	3/1/1977	9/18/1987	None
Bridge & Culvert Assessment	no	no	no			no	yes	
Buffers Required	no	no	yes			no	yes	
Erosion & Sediment Control	yes	yes	no			yes	yes	
Fisheries Protection	no	no	no			no	no	
Flood Hazard Area Protection	no	no	yes			yes	yes	
Floodplain Protection	no	no	yes			no	no	
PRD/PUD	no	no	yes			no	yes	
Public Access Protection	yes	no	no			yes	no	
Riparian Protection	no	no	no			no	yes	
Road Standards	no	yes	no			no	no	
Setbacks from Water	no	no	no			no	yes	
Shoreline Protection	no	no	yes			no	no	
Site Plan Review	no	no	no			no	no	
Steep Slope/Ridgeline Development	no	no	no			no	no	
Stormwater / LID	yes	yes	no		yes	yes	no	
Wetlands Protection	no	yes	yes			no	no	
Other	yes	yes	no			yes	no	

## MUNICIPAL PLANNING AND WATER RESOURCES REVIEW

Town	Ludlow	Plymouth	Pomfret	Reading	Springfield	Weathersfield
<b>Town Government</b>						
Planning Commission	yes	yes	yes	yes	yes	yes
Zoning Board of Adjustment	no	yes	yes	yes	no	yes
Development Review Board	yes	no	no	no	yes	no
Conservation Commission	no	no	no	yes	no	yes
<b>Town Plan</b>						
	Draft					
Effective Date	9/21/2004	2/8/2011	11/21/2007	7/18/2005	4/13/2009	9/15/2005
<b>WQ Areas Covered in Plan</b>						
Agriculture	yes	no	no	yes	yes	yes
Aquatic Life	no	no	no	no	no	no
Buffers	yes	yes	yes	yes	yes	yes
Classification (yes/no)	no	no	no	no	no	no
Dams & Impoundments	no	no	no	no	yes	yes
Inventory (yes/no) *	no	no	no	no	yes	yes
Earth Resource Extraction	yes	yes	yes	yes	yes	yes
Exotic Invasive Species	no	no	no	no	yes	yes
Fisheries	no	no	no	yes	no	yes
Flood Hazard Areas	no	yes	yes	yes	no	yes
Floodplains	no	yes	no	yes	yes	yes
Forestry	yes	no	no	yes	yes	yes
Groundwater & Aquifers	yes	no	yes	no	yes	yes
Lakes & Ponds	yes	no	yes	yes	yes	yes
Inventory (yes/no)	no	no	no	yes	yes	no
Natural Communities	yes	no	no	yes	yes	yes
Natural Habitats	yes	no	yes	yes	yes	yes
Riparian Zone	no	yes	no	yes	yes	yes
Rivers & Streams	yes	yes	yes	yes	yes	yes
Inventory (yes/no)	no	no	no	no	no	no

<b>Town</b>	<b>Ludlow</b>	<b>Plymouth</b>	<b>Pomfret</b>	<b>Reading</b>	<b>Springfield</b>	<b>Weathersfield</b>
<b>Shorelands</b>	yes	yes	no	yes	yes	yes
<b>Steep Slope/Ridgeline Development</b>	no	yes	yes	no	no	no
<b>Swimming Areas</b>	yes	yes	no	no	yes	yes
<b>Wastewater Systems</b>	yes	no	no	yes	yes	yes
<b>Water Quality</b>	yes	no	no	yes	yes	yes
<b>Water Quality Classification</b>	no	no	no	no	no	no
<b>Water Recreation</b>	yes	yes	no	yes	yes	yes
<b>Water Quality Protection</b>	yes	no	no	yes (brief)	yes	yes
<b>Wetlands</b>	yes	no	yes	yes	yes	yes
<b>Inventory (yes/no)</b>	no	no	yes	no	no	no

#### Other

#### Zoning Bylaw

3/7/1989

<b>Effective Date</b>	12/2/2007	10/22/2007	FHA 5/2/07	7/16/2007	9/8/2008	9/18/2007
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#### WQ Areas Covered in Bylaw

<b>Bridge &amp; Culvert Assessment</b>	no	no	no	no	no	no
<b>Buffers Required</b>	no	yes	yes	no	yes	yes
<b>Erosion &amp; Sediment Control</b>	no	yes	yes	no	yes	yes
<b>Fisheries Protection</b>	no	no	no	no	yes	no
<b>Flood Hazard Area Protection</b>	yes	yes	yes	yes	yes	yes
<b>Floodplain Protection</b>	yes	yes	yes	yes	yes	yes
<b>PRD/PUD</b>	yes	yes	no	yes	yes	yes
<b>Public Access Protection</b>	yes	no	no	yes	yes	yes
<b>Riparian Protection</b>	no	yes	no	no	yes	yes
<b>Road Standards</b>	no	yes	yes	no	no	yes
<b>Setbacks from Water</b>	yes	yes	no	no	yes	yes
<b>Shoreline Protection</b>	yes	yes	no	no	yes	yes
<b>Site Plan Review</b>	yes	yes	yes	yes	no	yes
<b>Steep Slope/Ridgeline Development</b>	yes	yes	yes	no	yes	yes
<b>Stormwater / LID</b>	no	no	no	yes	yes	yes
<b>Wetlands Protection</b>	yes	yes	no	no	yes	yes
<b>Other</b>	yes	no	no	no	yes	yes



<b>Town</b>	Ludlow	Plymouth	Pomfret	Reading	Springfield	Weathersfield
<b>Subdivision Regulations</b>						
<b>Effective Date</b>	6/29/2005	None	Draft 11/8/10	None	5/3/1999	10/24/1988
<b>Bridge &amp; Culvert Assessment</b>	no		culverts		yes	no
<b>Buffers Required</b>	yes		no		no	no
<b>Erosion &amp; Sediment Control</b>	yes		no		yes	yes
<b>Fisheries Protection</b>	no		no		no	no
<b>Flood Hazard Area Protection</b>	yes		yes		no	no
<b>Floodplain Protection</b>	no		yes		no	no
<b>PRD/PUD</b>	no		no		no	no
<b>Public Access Protection</b>	yes		no		yes	yes
<b>Riparian Protection</b>	no		no		no	no
<b>Road Standards</b>	yes		yes		yes	no
<b>Setbacks from Water</b>	no		yes		no	no
<b>Shoreline Protection</b>	yes		yes		no	no
<b>Site Plan Review</b>	no		no		no	no
<b>Steep Slope/Ridgeline Development</b>	yes		yes		no	no
<b>Stormwater / LID</b>	yes		no	yes	yes	yes
<b>Wetlands Protection</b>	yes		yes		no	no
<b>Other</b>	yes		no		yes	yes

## MUNICIPAL PLANNING AND WATER RESOURCES REVIEW

Town	West Windsor	Windsor	Woodstock
<b>Town Government</b>			
Planning Commission	yes	yes	yes
Zoning Board of Adjustment	no	no	no
Development Review Board	yes	yes	yes
Conservation Commission	yes	yes	yes
(Paradise Park)			
<b>Town Plan</b>			
Effective Date	9/19/2005	7/25/2006	4/25/2007
<b>WQ Areas Covered in Plan</b>			
Agriculture	yes	yes	no
Aquatic Life	no	no	yes
Buffers	yes	yes	yes
Classification (yes/no)	no	no	no
Dams & Impoundments	yes	no	no
Inventory (yes/no) *	no	no	no
Earth Resource Extraction	no	no	no
Exotic Invasive Species	no	yes	yes
Fisheries	no	no	yes
Flood Hazard Areas	yes	yes	yes
Floodplains	yes	yes	yes
Forestry	yes	yes	yes
Groundwater & Aquifers	yes	yes	yes
Lakes & Ponds	yes	yes	yes
Inventory (yes/no)	no	yes	no
Natural Communities	yes	yes	yes
Natural Habitats	yes	yes	yes
Riparian Zone	yes	yes	yes
Rivers & Streams	yes	yes	yes
Inventory (yes/no)	no	no	no

<b>Town</b>	<b>West Windsor</b>	<b>Windsor</b>	<b>Woodstock</b>
<b>Shorelands</b>	yes	yes	yes
<b>Steep Slope/Ridgeline Development</b>	no	no	yes
<b>Swimming Areas</b>	yes	yes	yes
<b>Wastewater Systems</b>	yes	yes	yes
<b>Water Quality</b>	yes	yes	yes
<b>Water Quality Classification</b>	no	no	no
<b>Water Recreation</b>	yes	yes	yes
<b>Water Quality Protection</b>	yes	yes	yes
<b>Wetlands</b>	yes	yes	yes
Inventory (yes/no)	no	no	yes

**Other**

### **Zoning Bylaw**

<b>Effective Date</b>	6/29/2009	9/25/2007	2002 - 2007
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<b>WQ Areas Covered in Bylaw</b>			
<b>Bridge &amp; Culvert Assessment</b>	no	no	no
<b>Buffers Required</b>	yes	no	yes
<b>Erosion &amp; Sediment Control</b>	yes	yes	yes
<b>Fisheries Protection</b>	no	no	no
<b>Flood Hazard Area Protection</b>	yes	yes	yes
<b>Floodplain Protection</b>	yes	yes	yes
<b>PRD/PUD</b>	yes	yes	yes
<b>Public Access Protection</b>	no	yes	no
<b>Riparian Protection</b>	no	yes	yes
<b>Road Standards</b>	no	yes	no
<b>Setbacks from Water</b>	no	no	yes
<b>Shoreline Protection</b>	no	no	yes
<b>Site Plan Review</b>	yes	yes	yes
<b>Steep Slope/Ridgeline Development</b>	no	no	yes
<b>Stormwater / LID</b>	no	yes	yes
<b>Wetlands Protection</b>	yes	yes	yes
<b>Other</b>	no	yes	no

<b>Town</b>	<b>West Windsor</b>	<b>Windsor</b>	<b>Woodstock</b>
<b>Subdivision Regulations</b>			
<b>Effective Date</b>	2/14/2008	9/26/2006	
<b>Bridge &amp; Culvert Assessment</b>	no	no	no
<b>Buffers Required</b>	yes	yes	yes
<b>Erosion &amp; Sediment Control</b>	yes	yes	yes
<b>Fisheries Protection</b>	no	no	no
<b>Flood Hazard Area Protection</b>	yes	no	yes
<b>Floodplain Protection</b>	no	yes	yes
<b>PRD/PUD</b>	no	no	yes
<b>Public Access Protection</b>	yes	yes	no
<b>Riparian Protection</b>	yes	yes	yes
<b>Road Standards</b>	no	yes	no
<b>Setbacks from Water</b>	yes	no	no
<b>Shoreline Protection</b>	no	yes	no
<b>Site Plan Review</b>	no	no	yes
<b>Steep Slope/Ridgeline Development</b>	yes	yes	yes
<b>Stormwater / LID</b>	yes (very briefly)	yes	no
<b>Wetlands Protection</b>	yes	yes	yes
<b>Other</b>	yes	yes	no

## APPENDIX A.10 – USACE / VT ANR / USFWS Agreement & ANR Factsheet

### U.S Army Corps of Engineers & Vermont Agency of Natural Resources Coordination Plan for Operating Federal Flood Control Dams in Vermont

#### Background

In recent years, a number of concerns have been raised pertaining to the operation and maintenance of Federal flood control dams in Vermont and across the New England District. To address these concerns, the Vermont Agency of Natural Resources (VANR), U.S. Fish and Wildlife Service (USFWS), and U.S. Army Corps of Engineers (Corps) have engaged in collaborative discussions since 1999 to identify ways to improve operations at the five Corps' flood control projects in Vermont: Union Village, North Hartland, North Springfield, Ball Mountain and Townshend. As a result of these discussions, operational improvements have been enacted, including implementation of conservation flows and ramping standards.

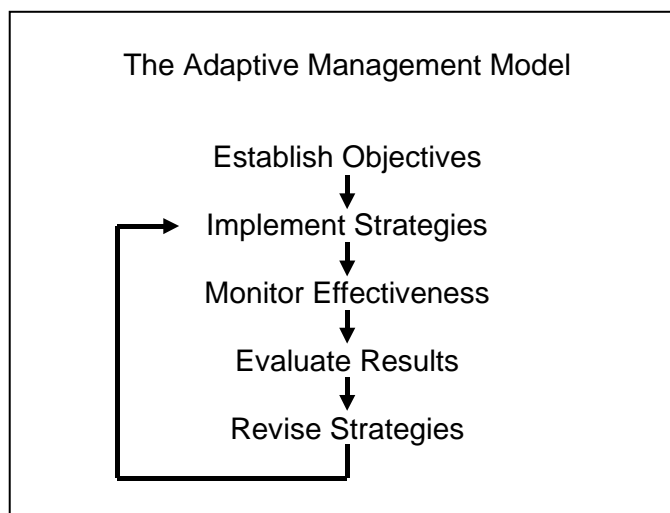
To build on the work performed to date, the three agencies are implementing a three-year adaptive management process (AMP) to use as a framework for identifying and resolving issues of concern. The goal of the process is to evaluate current operational and maintenance practices and identify ways to maintain and restore the integrity of the downstream and upstream aquatic and terrestrial ecosystems while maintaining the projects' primary purpose of flood control and recognizing other recreation and natural resource management objectives.

#### The Adaptive Management Process

A basic tenet of adaptive management involves continued monitoring and evaluation leading to revised strategies that will achieve the desired results (see figure). This approach allows the participants to address problems and areas of uncertainty over time. In this case, issues related to the operation, maintenance and modification of the flood control projects will be addressed.

Each of the three participating agencies will designate representatives to a working group that will implement this plan. Other participants will be called in as needed to provide their expertise on specific issues.

A key part of the process is the annual interagency coordination meeting, to be held in January of each year. This meeting will provide the agencies with an opportunity to review the previous years' operations, revise operational and monitoring procedures, and raise new issues. Other meetings or site visits will be held as needed.



A number of issues identified and discussed in this plan require resolution or effectiveness monitoring. Adaptive management relies upon the collection of data that can be used to make appropriate adjustments. Assessment plans (for monitoring/assessment/evaluation) will be developed for each pending issue so that participating agencies have the information needed to move forward at each annual meeting.

Responsibility for administering the adaptive management process will rotate among the three agencies on an annual basis. The U.S. Fish and Wildlife Service will take the lead in the first year, followed by the Vermont Agency of Natural Resources, and then the U.S. Army Corps of Engineers. Administrative duties include organizing meetings (scheduling, preparing agendas, preparing meeting notes) and site visits. Each agency will be responsible for suggesting meeting agenda topics and preparing any necessary background material. Any modifications or operational changes agreed to by the parties will be incorporated into the operating and maintenance policies and practices of each project.

### The Adaptive Management Plan

Regulation of flood control dams involves both flood control and non-flood control operations. In general, flood control operations involve the coordinated regulation of dams located on tributaries to reduce flood damages downstream of the dam and to reduce flood damages collectively on the Connecticut River. Flood control operations are authorized by Congress and implemented by the reservoir regulation manual for projects in the Upper Connecticut River Basin.

Non-flood control operations describe the scheduled or recurring regulation of the dams for other purposes. Flood control projects in Vermont are authorized to perform natural resources management activities and provide public recreational opportunities. A hydropower facility was added to North Hartland Dam at a later date.

### **Objectives:**

- Maintain the dams' flood control function while mitigating the ecological impacts of flood control operations.
- During non-flood control periods, maintain downstream flows as close to instantaneous run-of-river as feasible, with outflow equal to inflow.

The following sections discuss a number of issues related to dam operation and identify those that will be addressed in the adaptive management process.

### **Flood Control Operations:**

The Corps has maintained that it is necessary to maintain maximum operational flexibility during flood control periods. However, VANR and USFWS have expressed concerns about the ecological impacts of flood control operations. While the Corps has implemented ramping and conservation flow standards, the VANR and USFWS do not consider those standards protective of downstream resources and have advocated that more information be provided on how more protective standards would affect flood control capabilities.

Both ANR and USFWS have expressed an interest in learning when the projects are in flood control operations. The Corps will provide background information on how these decisions are made. Rather than try to define theoretically what may constitute flood operations at the dams, the Corps prefers to find a reliable way to contact and notify ANR and USFWS and incorporate this into the Communication Procedures.

Conservation flow, ramping, and reservoir release/refill standards for flood control operations will be addressed during the adaptive management period.

## **Routine Operations:**

The Corps, ANR, and USFWS have agreed to the concept of routinely operating the dams in instantaneous run-of-river mode (outflow equal to inflow) outside of flood control periods. Differences remain on how closely releases from the dams should equal inflow. These differences are most evident at North Hartland and Ball Mountain, where pools are maintained year-round and outflow is controlled by the gate openings. It is also an issue, to a lesser extent, at Union Village, which has a pool in the winter only. VANR has identified problematic flow fluctuations and instances where flows fall below ABF during routine operations at these projects.

Over a 3-year period, the Corps will increase flow monitoring and gate adjustment frequency to twice a day during the work week and on the weekends if necessary, at Union Village (winter only), North Hartland, and Ball Mountain. Further, the parties will review the procedures used to monitor and adjust gate settings and develop procedures to improve routine daily flow management. The objective of this exercise is to develop procedures that will maintain outflow equal to inflow to the greatest extent feasible.

## **Non-Flood Control Operations:**

While the general goal is run-of-river operation, the parties have identified circumstances, outside of flood control operations, when flow or reservoir stage manipulation is necessary or appropriate. Those circumstances are listed below and described in more detail in subsequent sections.

1. Whitewater boating releases
2. Periodic inspections
3. Beach maintenance
4. Major maintenance and rehabilitation
5. Emergency operations

As noted in the detailed descriptions, there is not consensus among the parties regarding when flow or stage manipulation is necessary.

During such periods, the Corps will employ conservation flow, ramping, and reservoir refill standards that serve to protect the ecological integrity of the downstream reach.

With respect to conservation flows, the Corps has implemented the USFWS Aquatic Base Flow (ABF) standard for non-flood control operations at all projects. The ABF standard is based on the drainage area at the dam and is expressed in cfs/mile or csm. The rates vary seasonally:

October – March: 1.0 csm (or inflow)  
April – May: 4.0 csm (or inflow)  
June – September: 0.5 csm (or inflow)

The Corps has agreed to maintain the seasonal ABF flow at all times when flows are being manipulated (i.e., non run-of-river) outside of flood control operations, provided inflows are equal or greater than ABF.

Similarly, ramping rates have been adopted at all projects for use during all operations (including routine) outside of flood control periods. The ramping rates are 0.5 csm/hr for flows up to 4.0 csm, and 1.0 csm/hr for flows greater than 4.0 csm.

Reservoir water level management is the final water management issue. Reservoir refill standards have been implemented by the Corps. When refilling the reservoir or raising the reservoir to an increased target level during non-flood periods, the seasonal ABF will be maintained at all times except when flows are below ABF. If inflows are less than ABF, then a 70/30 rule will be implemented whereby the dam will pass at least 70 percent of inflow while storing no more than 30 percent.

The Agency of Natural Resources contends that the 70/30 rule does not provide adequate protection for downstream resources, and has proposed a 90/10 rule, with 90 percent of inflow being released downstream. Resolution of this issue will be a priority of the adaptive management process.

During the AMP, a clear statement of seasonal reservoir target elevations will be developed. Other issues related to reservoir water level management will be identified by the parties within the first year of the adaptive management process and addressed.

## **Whitewater boating releases**

The Corps has provided releases to accommodate scheduled recreational boating events at many of its dams for over forty years. At present there are two whitewater release events scheduled at Ball Mountain Dam and Townshend Lake. These releases, which are timed to coincide with planned seasonal regulations of the conservation pool, are scheduled for the last weekend in April and again in late September. In recent years, the resource agencies have raised concerns about the ecological impacts of these releases. In response, beginning in 2003, the Corps adopted the minimum conservation flows and ramping rates recommended by the U.S. Fish and Wildlife Service for each project.

For the spring release on the West River, the Corps will follow the ANR/USFWS ramping and refill rates agreed to by the parties. In addition, an overnight flow of 4.0 csm will be maintained. The target pool elevation at the start of this release will be approximately 75 feet with a target pool elevation of 25 feet at the end. Releases beyond the last weekend in April will not be considered due to the need to pass salmon smolts downstream in the spring.

For the fall release on the West River, the Corps will follow the ANR/USFWS ramping and refill rates agreed to by the parties. Beginning in 2003, the Corps has released water to support a one-day event. A full two-day event may be possible under conditions when where there is sufficient inflow to support a second day while employing ramping and 4.0 csm flows overnight. The target pool elevation at the start of this release will be 65 feet with a target pool elevation of 35 feet at the end.



## **Periodic inspections**

To assure the integrity and ability of a flood control dam to perform its authorized purposes, inspection of the entire dam and related structures is performed every five years. Periodic inspection is required for the continued operation of the dam. In the future, the Corps will perform conduit and outlet works and gate inspections without restricting outflows from the control structures if and when possible. During these inspections, the flood control gates must be operated for structural, mechanical and electrical performance. Minor fluctuations to the outflow could be encountered during periodic inspection; however, testing of flood control gates will generally not occur during low-flow periods.

The preferred time to conduct conduit inspections will be during low-flow periods when this can be completed without interrupting river flows. The Corps will attempt to perform conduit inspections both prior to and during the scheduled fiscal year of the periodic inspection. If this is not feasible, some reduction of river flows may still be required in order to conduct a satisfactory inspection. Periodic inspections of dams in Vermont are scheduled as follows:

2002 – North Springfield Lake, Townshend Lake  
2003 – None  
2004 – Ball Mountain Dam, North Hartland Lake, Union Village Dam  
2005 – None  
2006 – None  
2007 – North Springfield Lake, Townshend Lake

The following monitoring and operational procedures will be performed to minimize impacts during the inspection event:

If the outlet works and conduit can be safely inspected without disruption of flow during low-flow periods, the periodic inspection, and/or the inspection of the conduit/flood control gates, will be conducted at that time. To increase the probability of being able to perform conduit inspections during low-flow periods, the Corps will conduct inspections, if possible, whenever these naturally occur.

If reductions of flow are necessary to perform conduit inspections, outflow will be reduced only to the extent needed to safely inspect the conduit (historically < 1 hour). Under extenuating circumstances, the inspections may take longer to complete. Prior to and during each conduit/flood control gate inspection, the Corps will have biologists evaluate the impact of any planned gate operation on the upstream and downstream communities and habitat. During any shutdown, biologists will be stationed downstream of the conduit to monitor river conditions and rescue stranded fauna. These monitoring activities and protocols will be coordinated with the VANR and USFWS. In 2002, monitoring protocols for performing conduit inspections were developed and implemented at North Springfield Lake. Further refinement of periodic inspection and monitoring procedures are a high-priority for the AMP.

## **Beach Maintenance**

The Corps maintains public swimming beaches in Vermont at North Hartland Lake, Townshend Lake and at Stoughton Pond at North Springfield Lake. These beaches are maintained annually to inspect the public swimming area and to remove debris and sedimentation that collects on the beach over the

winter and when flood storage events inundate the beach and swimming area. The Corps will attempt to perform maintenance of the public swimming beaches without drawing down the conservation pool. As part of this AMP, the parties will develop a process to determine if a satisfactory and safe facility can be maintained without water level manipulation.

The Corps has prepared a draft beach maintenance SOP that addresses issues surrounding the timing and mechanics of performing beach maintenance to minimize impacts to both downstream and reservoir aquatic habitats and species. VANR and USFWS will review the SOP and provide suggestions and alternatives for maintenance activities. Upon review and finalization, the beach maintenance SOP will be submitted to the agency representatives for their review and concurrence.

### **Major Maintenance and Rehabilitation:**

Major maintenance and rehabilitation of the dams and appurtenant structures are necessary for their continued operation. These are large-scale projects, so they will be planned and coordinated separately from other routine or recurring activities. Close coordination with VANR and USFWS will begin early in the planning process and continue through project completion.

### **Emergency Operations:**

Occasionally, the Corps will need to operate the dams in response to unplanned emergencies. These emergencies include acts of God, casualties, disasters, national defense or homeland security emergencies. At these times it may become necessary to take immediate steps to contain, limit, or alleviate an emergency in order to protect human health, safety, and welfare prior to initiating any form of coordination or consultation with other agencies or individuals. In these instances, the Corps will contact VANR and USFWS, among others, as soon as practicable, if emergency modification or interruption of flows has occurred.

### **Fish Migration and Passage:**

Ball Mountain Dam and Townshend Lake have been modified to allow for passage of Atlantic salmon. The facilities at Ball Mountain Dam consist of one automated gate and at Townshend Dam a modified weir to allow for outmigration of salmon smolts. A trap-and-truck facility was constructed at Townshend Lake in 1993 to allow migrating adults to be trapped from the West River below Townshend Dam and transported above Townshend Lake and Ball Mountain Dam to locations identified by Vermont Fish and Wildlife. In 2002, the trap-and-truck facility at Townshend Lake was upgraded to a variable array electric barrier that was designed, constructed and operated in a manner that has significantly reduced gate operations and minimizes impacts to the downstream aquatic habitat. North Springfield Lake also has a modified outlet pool to protect salmon smolts.

### **Project Modifications:**

The Corps recognizes a need to study the performance of the outlet works at Union Village Dam, North Hartland Lake and Ball Mountain Dam. At these projects, the Corps ability to maintain permanent or seasonal conservation pools, as well as maintaining run-of-river conditions, without a weir or static flow control structure is difficult. Another related issue is the repair or modification of the outlet gates at Townshend Lake.

In 1995, the Corps prepared a sedimentation study for Ball Mountain Dam that identifies and evaluates structural alternatives to the project. The study addressed the prevention of unplanned silt discharges into the West River resulting from faulty gate operations or failure of the automated gate operators.

The Corps recognizes the need for further study to identify and implement structural changes to the Vermont flood control dams to alleviate flow regulation problems and enhance the aquatic habitat. Any future study to modify these dams would need to be conducted under existing authorities. If current authorities are not workable, the agency representatives will pursue other funding or authorities. As part of the adaptive management process, the Corps will investigate water temperature problems at North Springfield and Townshend Lakes to address potential warm water invasion created by shallow conservation pools and top-spilling weirs. The Corps Water Quality Team is available to prepare study parameters and provide an alternative analysis of possible solutions.

The agencies have prioritized their respective needs. The agencies will jointly prioritize the respective priorities and propose a plan to implement studies or improvements.

- ❖ Vermont Agency of Natural Resources priorities:
  - Flow regulation improvement at Ball Mountain
  - Flow regulation improvement at North Hartland
  - Winter flow regulation improvement at Union Village
  - Downstream temperature impacts at Townshend
  - Downstream temperature impacts at North Springfield
- ❖ U. S. Fish and Wildlife Service priorities:
  - Feasibility studies of weirs at all gate-operated projects
  - Feasibility studies of converting projects with conservation pools to dry bed systems
- ❖ Corps of Engineers priorities:
  - Feasibility of weirs at Ball Mountain and N. Hartland Lake
  - Instream flow study on West River downstream of Ball Mountain Dam
  - Instream flow study on Black River downstream of N. Springfield Dam
  - Instream flow study on Ompompanoosuc River downstream of Union Village Dam

## Coordination:

The following agency representatives should continue to serve in the capacity of moderators for meetings and dispute resolution. This Adaptive Management Plan and attachments will prevail unless amended and agreed to by all agencies. All parties involved in the preparation, implementation and evaluation of this plan agree to present their recommendations to these representatives for resolution or implementation prior to elevating their concerns to other persons, offices or agencies.

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Supervisor, New England Field Office  
U.S. Fish and Wildlife Service

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Date

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Acting Director, Water Quality Division  
Department of Environmental Conservation  
Vermont Agency of Natural Resources

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Date

---

Chief, Construction/Operations Division  
New England District  
U.S. Army Corps of Engineers

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Date

## **APPENDIX A.11 – Plan Public Comment Responsiveness Summary**

### **Basin 10 Management Plan**

#### **Responsiveness Summary for Comments Received Prior to March 16, 2012**

**Compiled April 2012**

### **BACKGROUND INFORMATION**

**Comment:** In the land use calculation, what is included in the “developed” category?

**Response:** It includes most impervious surfaces such as road, parking lots, buildings, etc. in village and heavily developed areas. It does not include rural impervious surfaces however so the number is generally lower than it should be.

**Comment:** Lake Rescue is listed as being in Plymouth and it is really all in Ludlow.

**Response:** Corrected.

### **EXISTING USES**

**Comment:** How where the fish habitat locations developed?

**Response:** These are the sampling locations used by the Fisheries Department for their fish population surveys. They use electro-shocking techniques to do the surveys.

**Comment:** It is particularly interesting that ALL lakes and ponds are automatically deemed to be used for fishing, but that streams have a tougher standard to meet.

**Response:** Guidelines for determining Existing Uses limit the setting of EUs to rivers and stream reaches that have documented publically owned or permitted access areas. This has determined the current fishing reaches listed as EUs. The guidelines can be found at:

[http://www.vtwaterquality.org/htm/documents/ad\\_existing\\_use\\_basin\\_planning.pdf](http://www.vtwaterquality.org/htm/documents/ad_existing_use_basin_planning.pdf)

**Comment:** ANR continues to use an outdated and inferior process to identify existing uses, especially in terms of fishing. Specifically we object to the double standard used by ANR for determining existing uses on lakes and ponds versus flowing waters. Just as ANR “presumes that all lakes and ponds have existing uses of fishing, contact recreation and boating,” so too should ANR assume that all flowing waters have existing uses of fishing, contact recreation and boating. ANR’s policy states that this “simplifying assumption” is being used for lakes and ponds because of “the well known and extensive use of these types of waters for these activities based upon their intrinsic qualities.” This same simplifying assumption holds true for all flowing waters. Vermont’s rivers and brooks are no less intrinsic and have no less extensive use for recreational activities than our lakes and ponds. In fact many small ponds in Basin 10 get little or no contact recreation, boating or fishing use, while most if not all of our small brook trout streams have swimmers and fisherman who frequent their waters.

**By using such a double standard ANR has placed the burden of proving existing uses for flowing waters on the individual, organization etc., while giving lakes and ponds a “free pass” so to speak. ANR should revise this process for Existing Use determination in this Plan and in all basin plans already adopted by the State.**

**Response:** The Agency has received this comment from other Basin Plan public comment periods, and as a result is beginning to evaluate options for more comprehensive identifications of existing uses as suggested, which would be part of the tactical planning process. For the present plan, the existing procedure has been employed. However, the commenter should be aware that the lack of attribution of an existing use in a particular basin plan in no way precludes ANR from considering the presence of an existing use as part of a permit application. ANR’s present anti-degradation procedure specifically indicates that existing uses may be identified by a Basin Plan, or as part of an application for a permit. Any permitting ANR undertakes where compliancy with VT Water Quality Standards is assessed, must consider existing uses in that application.

## **FLOW ALTERATION**

**Comment:** CRWC appreciates the recommendation to remove the Springfield Reservoir Dam in Weathersfield, but believes a higher priority should be given to additional obsolete dam removal projects in Basin 10. According to the Plan there may be as many as 45 obsolete dams that serve no current purpose, such as hydropower. Their continued presence prohibits aquatic organisms passage, contributes to water quality degradation, water temperature increases and streambank instability. As such, recommendations 13 - 15 of the Plan should be given the highest priority.

**Response:** Many dams remain in place although they no longer are used for their original purpose and in many cases, serve no use at all. Many of these dams are old and are falling into disrepair, creating safety hazards and raising the potential for downstream ecological impacts in the event of failure. In addition, many continue to cause significant ecological impacts. At the same time, they are often considered a permanent feature of the community, since most have been extant in people’s living memory. Dam removal is a complex process and can only be undertaken with dam owner cooperation. VT DEC works with willing dam owners to remove dams that are identified as hazardous to life and property or impede aquatic organism passage. Recommendations of potential dams for removal can be presented to ANR for evaluation.

## **IMPAIRED & LISTED WATERS**

**Comment:** Do we have anticipated dates for the TMDL for the five impaired streams?

**Response:** Segment VT10-14 (Jewell Brook Tributary) has been proposed for de-listing based on recent improvements documented by Agency staff. TMDL’s are assigned a priority level of High, Moderate or Low for TMDL development. This puts the segment in question into the queue as the state works its way through the statewide list of waters needing TMDLs. Some listed waters may be addressed through alternative regulatory means such as stormwater and CSO requirements.

**Comment:** In the PART C. list only two streams list fishing as a use. All of the waters are fished.

**Response:** Under “Use Impaired” the listing means that the listed use is suspected to be impaired but requires further substantiation through monitoring. In this case it is the secondary contact (boating and fishing) use. On the other waters fishing may exist but is not noted to be diminished.

**Comment:** Also on the Part C list, failed septic systems are identified as the problem. What is done about this?

**Response:** The C list is for waters in need of further assessment so the noted problem is suspected at this time. Further monitoring needs to be done to confirm or reject this theory. If the problem is confirmed and the water is moved to the Impaired Waters list, a TMDL will be developed to address the impairment.

**Comment:** What horse farms are there below Taftsville?

**Response:** Good question! Watershed Coordinator will research why these are stated in the list.

**Comment:** What is being done about the large manure storage area above the river at Taftsville?

**Response:** That may be what is being referred to above. Follow-up on this will be conducted.

**Comment:** A consultant should work with the Green Mountain Horse Association to help with water quality issues on Kedron Brook.

**Comment:** In regards to GMHA, can current partner relationships be utilized to broach the subject of buffers and/or Corridor Easements with GMHA?

**Response:** GMHA is actively working with DEC on improvements. Three stream crossing improvements have been installed and other practices are in process. A Phase 1 Stream Geomorphic Assessment has been done and the Phase 2 work is planned. This information will be useful for developing future improvements and protections at GMHA and other nearby facilities.

**Comment:** CRWC has been particularly interested in the recent discussions between the New England states and the U.S. EPA about revisions to the 2001 Long Island Sound TMDL. CRWC encourages the State of Vermont to work with the New England Interstate Water Pollution Control Commission, U.S. EPA, and other states to: require all discharges to identify both the influent and effluent nutrient levels; ensure that development and implementation of CSO long-term control plans include nutrient removal optimization strategies; include regulated stormwater discharges in implementation plans; commit to additional in-stream monitoring to capture changes in nutrient loading reductions; evaluate nonpoint source load reductions; and direct funds to high priority projects on agricultural land.

**Response:** As you are aware, VTDEC is currently working in cooperation with USEPA, the states of NY, CT, MA and NH, and NEIWPCC to develop a revised Long Island Sound TMDL. The current framework for moving forward includes development of allocations to point sources, nonpoint sources, atmospheric sources, regulated stormwater, and potentially bio-harvesting in the Sound. Additionally, following TMDL development, the framework provides for the development of Watershed Implementation Plans that will identify how each state will implement the assigned allocations across all nitrogen sources. At

this point in the development of the TMDL and subsequent implementation plan, all options are on the table and up for consideration, including many of the options the CRWC has proposed.

In the meantime, the VTDEC and the other involved states have agreed to adopt an Enhanced Implementation Plan that outlines commitments to be implemented prior to TMDL approval. For WWTFs in Vermont, this includes capping nitrogen loads, investigating optimization options for nitrogen removal and establishing monitoring. Nonpoint source actions include assessing the scope and effectiveness of current nitrogen control programs. Commitments also include working cooperatively with the other states to develop a tracking system capable of evaluating attainment of future nitrogen allocations. Further, all actions outlined in this Basin Plan that address land and channel erosion, or non-erosion nutrient runoff may be considered as of relevance to TMDL implementation for LIS. S of this writing, there are XX such strategies outlined in this Basin Plan.

VTDEC welcomes the CRWC's continued input during TMDL development and implementation phases and appreciates its unique position in advocating for the protection and improvement of water quality in the Connecticut River.

**Comment: The Black River is listed as in need of further assessment for the lower river from 2.5 to 7.5 miles upstream. What area does this cover along the river?**

**Response:** The reach in question begins at Seavers Brook Road and ends at the North Springfield Reservoir. This reach has documented sediment, nutrient and *E. coli* levels that are above background levels. More assessment needs to be conducted to confirm these impacts and substantiate use impairments under the Vermont Water Quality Standards.

## **MONITORING AND ASSESSMENT**

**Comment: What monitoring has been done since TS Irene?**

**Response:** In this Basin there has been little monitoring due to agency staff focus on flood response and assistance rather than monitoring. However both macroinvertebrate and fish population monitoring has been done in nearby impacted areas. Macroinvertebrate sampling reveals that while overall densities are low, species diversity and community structure remained consistent with the reference condition, indicating high quality condition. Fish sampling indicates that while overall population numbers are low, species diversity remained high, giving hope that fish populations will be able to rebound.

**Comment: The Ottauquechee River Group (ORG) has been doing water quality monitoring. Will that program continue?**

**Response:** The intent is to continue the program however more volunteer help will be needed as leadership of the group is in transition. The program is currently being supported to a relatively high degree with VTDEC staff resources. This is appropriate during startup phases of a new monitoring



program (as ORG has been) however, increased involvement by citizens will be necessary to continue the monitoring work of ORG.

**Comment:** Did any ORG water samples from 2011 get destroyed in the flooding of the LaRosa lab?

**Response:** No. The final sampling was scheduled for Sept. 1 several days after the storm and this was cancelled due to the danger of accessing the rivers so the samples were never taken.

**Comment:** Are there any plans to update acidity information for lakes or has this gone by the wayside because of SO<sub>2</sub> reductions?

**Response:** Acid precipitation and pH is being monitored throughout the state on an on-going basis. Current data is available through the MAP Program of the Watershed Management Division of DEC. There are no identified acid impaired lakes in the area covered by this Basin Plan, although there are 8 lakes and ponds that are considered “stressed” due to relatively low acid neutralizing capacity. These are: Colby Pond, Knapp Bk. Ponds 1 and 2, Lakota and Ninevah Lakes, and Mecawee, Pico, and Reading Ponds.

**Comment:** The color coding on the map of the Phase 1 and Phase 2 stream geomorphic assessments seems to overstate the extent of Phase 2 field based assessments in the watersheds. The picture is instead showing extent of Phase 1 assessment completed, while the actual reaches/segments with Phase 2 data are fewer than depicted.

**Response:** Corrected.

## **PLAN IMPLEMENTATION**

**Comment:** Not many people will read this entire plan. How can we reach a broader audience and get town boards to use this information?

**Response:** There is a three page Executive Summary which covers the main objectives of the Plan and is hopefully more readable to the general public. In working with individual town boards, *APPENDIX A.9 - Municipal Planning and Water Resources Review* – provides an analysis of each town’s planning and zoning requirements. This can be used to review the town’s water resources protections and enhance these if needed. Further, VTDEC is in the process of developing an online watershed information system that will allow the viewer to see monitoring/assessment and implementation components of all Basin Plans in Vermont. This system is designed to provide transparency into the status of surface waters and implementation projects that support restoration or protection. This system is expected to roll out in early 2013.

## **RECOMMENDATIONS**

**Comment:** There are two words to come out of the whole process - buffers and culverts. These should be the main focus of implementation.

**Response:** VTDEC agrees that these are core components of several stressor management chapters within the Surface Water Management Strategy. As such, these have been given more emphasis in the Plan.

**Comment:** How did particular recommendations get the gold star priority rating?

**Response:** The prioritization of these recommendations comes from the number of times each was brought up in discussions at watershed council meetings and on the State's priorities for improving water quality in the Basin. They also represent the top priority in most of the Stressor or Issue categories.

**Comment:** If this is the case then all the recommendations on buffers should be starred, not just Recommendation #24.

**Response:** Rather than star all buffer references, one overarching buffer recommendation was selected to represent the importance of the need for buffers.

**Comment:** Recommendation #6 recommends completing a full set of Fluvial Erosion & Special Flood Hazard Area maps for Basin 10. How do towns go about requesting FEMA to update SFHA maps so they are based on post-Irene data?

**Response:** Requests for SFHA map updates can be made through the Flood Hazard Mapping Coordinator at VT DEC. These requests are submitted to FEMA and enter their queue for future updating. No time frame for FEMA response can be provided by DEC. Requests based on a community's specific need due to physical or climatic changes to the river are more likely to receive attention. FEH maps are created by the VT River Management Program and provided to towns as they are developed.

**Comment:** Recommendation #23, regarding the OCISMA, this is great. The Nature Conservancy has led this effort and now has BMPs for forestry professionals, guidance for landowners, and a new system for sharing data that's been collected (called iMap). They also recently debuted a web site: <http://www.vtinvasives.org> which has much of this information.

**Comment:** A specific item that seems very concerning – the 1-acre Phragmites patch on Woodward Reservoir, that's a troublesome plant.

**Response:** The above information has been incorporated into the Plan.

The Phragmites patch was first identified in the early 1990's and has not grown, to the knowledge of the Department. Through the Departments Lakes and Ponds program, the population will be monitored and partners sought to work at control to prevent further spread.

**Comment:** Recommendation #24, the Conservation Fund (with assistance from the NPS) has been doing some work along the Route 12 corridor with farmers on the issue of land conservation. This may be something that could be woven together with outreach for River Corridor Easements.

**Response:** Partnerships with the Conservation Fund and the NPS will be researched. A partnership with the Conte USF&W Refuge is also underway.

**Comment:** Recommendation #25 on buffer enforcement – how is this going to be implemented?

**Comment:** Although most of West Windsor is not within Basin 10, I was shocked to see no mention of the primary cause of Tropical Storm Irene water damage in that town since it potentially threatens towns throughout Vermont. The primary source of Tropical Storm Irene damage in West Windsor was the storage of large plastic wrapped round hay bales adjacent to a brook. This practice is common throughout Vermont. The Department of Agriculture does not assert a violation of its Accepted Agricultural Practices when farmers store plastic wrapped large round hay bales within the Department's designated buffer zone, or many other similar agricultural practices such as the storage of equipment along streams and brooks. Because of agricultural exemptions, municipalities fail to regulate agricultural structures or storage within buffer zones along streams and brooks.

**Response:** The enforcement of buffer requirements is implemented through the Accepted Agricultural Practices. This is designed as a complaint driven process meaning that when a complaint is filed with the AAFM, agency staff follow-up and work with the producer to come into compliance with the regulation. There is no general compliance monitoring for buffers or activity within the buffer area. Nor are there any restrictions on storage of hay bales or other materials within the buffer area.

**Comment:** Recommendation #25 says the State of Vermont should enforce its own "AAP buffer requirements expand their width and require at least shrub coverage." We concur. As we all know, a ten (10) foot buffer of grass does nothing to prevent erosion, sedimentation, water temperature increases or in any way help prevent nonpoint source pollution runoff. In addition, since this recommendation is one that the State of Vermont has complete control over (e.g. no federal approval is needed), we ask that this recommendation be given the highest priority.

**Response:** While a larger buffer may be more effective, the State chose to set these minimum buffer widths in part to avoid inflicting further financial burden on our relatively small farms. See the following text from the AAPs (<http://www.vermontagriculture.com/ARMES/awq/AAPs.htm>), 'Recognizing the need to protect and improve water quality through improved agricultural practices, the Vermont legislature charged the Agency of Agriculture, Food and Markets with creating a comprehensive Agricultural Nonpoint Source Pollution Reduction Program including Accepted Agricultural Practices and Best Management Practices. The legislature also recognized the need to balance water quality improvements with the need to sustain a healthy economically viable agricultural industry. To achieve this, the Legislature has directed the Agency to promulgate regulations governing Accepted Agricultural Practices and Best Management Practices...Accepted Agricultural Practices are statewide restrictions designed to reduce nonpoint pollutant discharges through implementation of improved farming techniques rather than investments in structures and equipment. The law requires that these practices must be technically feasible as well as cost effective for farmers to implement without government financial assistance.' (Emphasis added.)

**Comment:** We saw the strong over-arching recommendation for buffer planting as a priority watershed wide, and couldn't agree more.

**Response:** So noted. This is the main recommendation of this Plan.

**Comment:** Recommendation #26, regarding the skidder bridge program - have you heard anything about the level of use?

**Response:** As of this writing, the program has just been established by the Ottauquechee Natural Resources Conservation District and the bridge is rented and on site at a logging project.

**Comment:** Recommendation #48 on removing hazardous materials from riverbanks: who is responsible for removal of large objects like fuel tanks and dumpsters?

**Response:** If ownership can be identified the owner is responsible. If they do not respond then it can become an environmental enforcement action. If there is no identification on the item, there is currently no financial means to cover removal. If hazardous materials remain, the state Hazardous Waste Division should be informed of the location for removal. As it stands now the property owner is ultimately responsible for removal. Work is being done to address this problem.

**Comment:** Recommendation #71B, regarding outreach on the Current Use program – we agree that very few landowners and very few foresters understand the options for maintaining beneficial uses such as buffers and wetlands as it is complicated. More outreach on the recent changes to the Use Value Program is needed.

**Response:** So noted.

## **WATER CLASSIFICATION**

**Comment:** How does one petition the State to change the water quality designation of a waterbody?

**Response:** Each waterbody must be submitted as a petition for reclassification to the Water Resources Panel. There are procedures for petitioning for Outstanding Resource Water designation, Class 1 Wetland designation and Class A Water designation. The Watershed Coordinator can provide these to interested participants.

**Comment:** The Hartland Nature Club is interested in pursuing Class 1 wetland designation for Eshqua Bog.

**Comment:** Pursue ORW for Lake Ninevah and Woodward Reservoir.

**Comment:** Trout Unlimited will be pursuing ORW designation for the North Branch of the Ottauquechee River.

**Response:** The Watershed Coordinator can work with groups by providing information and support to the process and will provide information on the petition process.

## **BLACK RIVER ISSUES**

**Comment:** The proposed biomass plant in No. Springfield will be withdrawing and discharging large amounts of water from the Black River, what impacts will this have on the habitat and water quality?

**Comment:** As a resident of North Springfield, VT I am very concerned about the biomass plant that is trying to be built. I am extremely concerned about the 500 gallon per minute estimated water use and what it will do to Springfield's water supply. The proposal even discusses the possible

**development of an intake on the Black River if wells, etc. are unable to meet the project's demands. This would be a travesty.**

**Response:** VT ANR will review the proposed plant operations through the Act 248 process once a permit application is submitted. Act 248 is similar to Act 250 but covers the Public Service Board process for new gas and electric purchases, investments, and facilities. Aspects of water withdrawals and wastewater discharges will be reviewed and commented on through this process.

## **LAKE ISSUES**

**Comment:** Lake Rescue was heavily impacted by TS Irene. Lake Rescue, being at the end of the chain of lakes, has collected much of the damage. Several roads washed out and into the lake, extensive sediment bars have built up in the lake and navigation channels, and large amounts of trash and debris are all through the lake system. Recreation is impaired due to the hazards posed by the hidden debris and shallow channels. Upstream of the lakes from Money Brook and through Pingree Flats, sediment continues to enter the system. Help is needed from the State to address these problems.

**Response:** Lake Rescue as well as Amherst, Echo and Pauline are challenging due their being on-river lakes. The Black River flows from north to south through the whole lakes system carrying everything that the river carries with it into the lakes. The VT-DEC Watershed Management Division will work with LRA and lakeshore owners to address the sediment issues and locate the areas where accumulation of deposits inhibits navigation. There may be limited options for mitigating the inflow of sediment from upriver as the damage is far beyond the scope of standard mitigation projects. The Watershed Management Division is working with the Lake Rescue Association in response to a request for a permit to dredge a small area of that lake to restore navigation.

## **FURTHER INPUT**

**Comment:** Are there particular topics or issues that need more public input?

**Response:** More detailed information on publically accessible fishing accesses to rivers and streams is needed.

**Comment:** TS Irene did extensive damage to hay fields and floodplain wetlands. What are the rules for logging in wetlands?

**Response:** Rules for all logging operations are laid out in *Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont(AMP's)*, ([www.vtfpr.org/watershed/documents/Amp2009pdf.pdf](http://www.vtfpr.org/watershed/documents/Amp2009pdf.pdf)) while wetlands are not specifically called out, they are included in the term "surface waters." All practices for protecting surface waters include wetlands. Silvicultural activity is also regulated through the Vermont Wetlands Rules ([www.nrb.state.vt.us/wrp/publications/VWR%207-16-10.pdf](http://www.nrb.state.vt.us/wrp/publications/VWR%207-16-10.pdf)). In brief, wetlands can be logged in the winter under frozen ground conditions when soils will not be disturbed. If the wetland to be logged is mapped by the VT Fish & Wildlife Dept. as deer wintering area, then the logging operation must comply with silvicultural standards for deer wintering areas established by the VFWD and VDFPR. New roads

and log landings cannot be placed within the wetland but can be in the wetland buffer zone. If further protections are desired, these must be done through town regulations.

**Comment: Why is gravel removal not addressed in the Plan?**

**Response:** Information on gravelling will be added. Two documents from the River Management Program address the policy and reasoning behind it:

- [Stream Gravel Removal Policy](#)
- [River Gravel Excavation: When, Why and Where it Should or Should Not Be Done](#)

**Comment:** Although there is some mention of regulating invasive species along roads and highways by the Towns, there is no mention of controlling for invasive species along utility corridors. In the past, the ANR in proceedings before the Public Service Board has actively suppressed the testimony of its State Foresters with regards to invasive species and public utility corridors. These public utility corridors are especially prone to cause damage because of the Federal vegetation height management practices and create rivers for invasive species to infiltrate into areas which would otherwise be untouched by invasive species.

**Response:** Power lines certainly are rivers for the spread of invasive species and the larger organizations that manage power corridors like VELCO are very familiar with invasive species being a problem and are beginning to take steps to control their spread. The smaller utilities are also becoming better educated about “Best Management Practices” for the prevention and treatment of terrestrial invasive plants. The hope is that they will follow VELCO’s example.

At this time no evidence has been found that PSB testimony has been suppressed. (J.M. 3/27/12)

## **FUTURE PLANNING**

**Comment: When will Lull’s Brook be addressed in a Basin Plan?**

**Response:** While the previous schedule planned to do Basin 13, all the smaller streams draining to the Connecticut River, as the next Basin Plan, the revised tactical basin planning schedule outlined in the Statewide Surface Water Management Strategy now packages these surface waters into adjacent larger Basins. Lull’s Brook would thus be included in the next update of this Basin Plan. However, if there are waters or issues of concern on Lull’s or other brooks, the Watershed Coordinator can, in partnership with a relevant local or watershed organization, update the present Basin Plan to include these.

## **TOWN PLANNING**

**Comment: Can town flood regulations be stricter than State and Federal requirements?**

**Response:** Yes. The FEMA federal standards are the minimum standards required for towns to participate in the National Flood Insurance Program (NFIP). FEMA encourages communities to adopt flood hazard area standards that are more strict and more specific to the flood hazards that the community experiences and has identified. The Vermont River Management Program has model ordinances available for adaptation and adoption by towns. These can be found at:

<http://www.vtwaterquality.org/rivers.htm>.

**Comment:** Why would a town want stricter flood regulations?

**Response:** FEMA flood maps only address inundation flooding. These are based on the elevation the water is likely to reach during a flood event. Vermont experiences much more damage due to erosion hazards than to inundation. State-developed Fluvial Erosion Hazard maps show where erosion is most likely to happen along river channels due to high water and high velocity flows. Towns may want to protect life and property at a higher level than is required by FEMA by limiting development in these highly dangerous areas.

**Comment:** Why did some bridges and culverts remain in place while many others failed during TS Irene?

**Response:** The size of the structure, its height and length compared to the size of the river channel, often determines its survivability. Many bridges and culverts are undersized for the volume of water, sediment, and debris that must pass through during a flood event. Many undersized structures caused upstream jams of trees and a buildup of sediment such that the stream flowed over and around the structure causing it to fail. Culverts that are sized to be at or greater than the width of the natural stream survived better

**Comment:** Has there been much action taken by the State to address rebuilding damaged structures in the areas that were flooded?

**Response:** The State is working with FEMA to assist owners of flood damaged properties through the Hazard Mitigation Grant Program's Buy-out program. This offers home owners 75% of the cost of the home plus the costs of removing the structure and any hazardous materials on the property (septic systems, fuel storage tanks, etc.). The town takes ownership of the property which must permanently remain open space.

The State cannot prevent owners from re-establishing homes in the floodplain. Towns have jurisdiction over floodplain development and are encouraged to address it through local zoning.

**Comment:** Recommendation # 10 states: Use land banking or private land set-asides to mitigate for development of buffer areas when planting is not possible. How does this work?

**Response:** Land banking is a form of mitigation where the impact of land development is offset by restoration and/or preservation of alternative parcels or by on-site practices. Different forms exist from taxes levied on real estate sales collected for land preservation to land swaps to environmental restoration projects. There is no current land banking program in Basin 10.

## **APPENDIX**

**Comment:** It doesn't appear that the rare plant data from Woodstock's Natural Communities Mapping Project (Brett Engstrom, 2008) has been included in Appendix A.5.

**Response:** So noted. Inquiry revealed that some of the data has been incorporated into the state data base but not all. This is taking time, but the goal is to have all the report data compiled into the state system.





## APPENDIX B – Regulatory and Non-regulatory Programs that contain BMPs Applicable to Protecting and Restoring Waters in Basin 10

### APPENDIX B.1 - Agricultural Runoff Control Programs

#### **Programs Not Described in the Vermont Surface Water Management Strategy**

At: [www.vtwaterquality.org/wqd\\_mgtplan/swms\\_appD.htm#\\_Toc280274713](http://www.vtwaterquality.org/wqd_mgtplan/swms_appD.htm#_Toc280274713)

##### ***Local Government Programs:***

**Farm\*A\*Syst (F\*A\*S)** is a free and confidential drinking water protection program for farms which includes voluntary assessments to determine how current practices and structures may pose risks to drinking water. Free water testing for farm wells provides information on bacteria, nitrates and common pesticide levels. If a water quality problem is found, ARS staff will assist the landowner in trying to determine the cause of the contamination and to find the best solution. Voluntary Farm Assessments provide information that help ARS staff offer farm-specific suggestions for protecting the farm's drinking water. Suggested actions are linked with technical resources for design and implementation and financial resources for cost-share opportunities.

[www.vacd.org/](http://www.vacd.org/)

**Southern Vermont Nutrient Management Program (SVNMP)** is a joint project of the Poultney-Mettowee, Rutland, Bennington and Windham Conservation Districts, started in 1999 with a 4-year grant from the Environmental Protection Agency. Additional funding has also come from the VT Agency of Agriculture, Food, and Markets, the Environmental Defense Fund, and the Vermont Community Foundation. Program support currently comes from the USDA Natural Resources Conservation Service and the Lake Champlain Basin Program. The purpose of the SVNMP program is to help agricultural producers address nutrient management needs with the help of on-farm consultant assistance. The program aims to improve management practices to increase farm sustainability while also working to improve local water quality. Employees work one-on-one with agricultural producers, as well as coordinate educational events in the SVNMP region. A key part of the outreach is to assist in implementation of USDA on-farm contracts.

[www.pmONRCD.org/nutrient\\_management/svnmp.php](http://www.pmONRCD.org/nutrient_management/svnmp.php)

##### ***Federal Programs***

The **Healthy Forests Reserve Program (HFRP)** is a voluntary program established for the purpose of restoring and enhancing forest ecosystems to: 1) promote the recovery of threatened and endangered species, 2) improve biodiversity; and 3) enhance carbon sequestration. Restoring and protecting forests contributes positively to the economy of our nation, provides biodiversity of plant and animal populations, and improves environmental quality. Landowner Protections will be made available to landowners enrolled in the HFRP who agree, for a specified period, to restore or improve their land for threatened or endangered species habitat. In exchange, they avoid future regulatory restrictions on the use of that land protected under the Endangered Species Act. Eligibility - To be eligible for enrollment, land must be private land or tribal lands which will restore, enhance, or measurably increase the likelihood of recovery of a threatened or endangered species, must improve biological diversity, or

increase carbon sequestration. Benefits - The Program offers three enrollment options: 1) A 10-year cost-share agreement; for which the landowner may receive 50 percent of the average cost of the approved conservation practices, 2) A 30-year easement, for which the landowner may receive 75 percent of the easement value of the enrolled land plus 75 percent of the average cost of the approved conservation practices, or 3) An easement of not more than 99-years, for which landowners may receive 100 percent of the easement value of the enrolled land plus 100 percent of the average cost of the approved conservation practices.

[www.nrcs.usda.gov/programs/HFRP/ProgInfo/Index.html](http://www.nrcs.usda.gov/programs/HFRP/ProgInfo/Index.html)

**Value-Added Producer Grant (VAPG)** Grant funds for feasibility analysis and economic planning activities for projects where energy generated on-farm comes from agricultural commodities is also available through USDA Rural Development's VAPG. Awards may be made for planning activities or for working capital expenses, but not for both. The maximum grant amount for a planning grant is \$100,000 and the maximum grant amount for a working capital grant is \$300,000.

[www.rurdev.usda.gov/rbs/coops/vadg.htm](http://www.rurdev.usda.gov/rbs/coops/vadg.htm)

### ***Additional Programs***

**Barn Preservation Grants Program (BPGP)** - The Division for Historic Preservation offers BPGP to repair and preserve historic agricultural buildings. The grant program is open to all owners of historic agricultural buildings eligible for the National Register of Historic Places in Vermont. Funds will be awarded for a variety of projects such as foundation, framing, and/or roofing repair.

[www.historicvermont.org/financial/barn.html](http://www.historicvermont.org/financial/barn.html)

The **Current Use Program (CUP)** Vermont's Agricultural and Managed Forest Land Use Value Program -- known as the Current Use Program -- was created in the 1970's as a companion to legislation that required towns to list property at 100% of fair market value. Because of escalating land values, these property taxes were placing a heavy burden on owners of productive farm and forestlands. The CUP offers landowners use value property taxation based on productive value of land rather than traditional "highest and best" use of the land. The CUP includes a Land Use Change Tax as a disincentive to develop land. The tax is 20% of fair market value of a property, or, in case of the sale of part of a property, a pro rata share of the fair market value of the entire property. The program is administered by the Vermont Department of Taxes.

[www.vtfpr.org/resource/for\\_forres\\_useapp.cfm](http://www.vtfpr.org/resource/for_forres_useapp.cfm)

**Farm and Residential Heating Oil Tank Removal Grants (FRHOTR)** The Petroleum Cleanup Fund (PCF) offers grants to residential tank owners towards the removal, replacement, or upgrade of underground storage tanks (USTs) used to heat a residence located in Vermont. The PCF also offers grants to such tank owners towards the removal, replacement, or upgrade of aboveground storage tanks (ASTs). The Department of Environmental Conservation may grant up to \$1000.

[www.anr.state.vt.us/dec/wastediv/ust/ustgrantapplication.htm](http://www.anr.state.vt.us/dec/wastediv/ust/ustgrantapplication.htm)

**Land Link Vermont (LLV)** is a program at University of Vermont Center for Sustainable Agriculture. LLV connects farm seekers with farmland and farming opportunities, and provides information and support on farm start-ups and succession by offering a matching service, education, referrals, and outreach. Interested parties share information on goals, acreage, location, enterprises, and tenure options. Participants are interested in a variety of tenure options including buy/sell, lease, joint farming and other arrangements. Farm seekers are interested in a number of different farming enterprises including

dairy, vegetables, small ruminants and CSA's. Through publications and on-going workshops, LLV provides farmers, landowners and agriculture professionals with links to education on topics like estate and planning, effective leases, farm financing, business planning, and direct marketing. LLV also helps link farmers and landowners to professionals and Vermont agricultural organizations through consultation and referrals.

[www.uvm.edu/landlinkvt/](http://www.uvm.edu/landlinkvt/)

**Microloan Fund for New England Farmers. (MFNEF)** addresses the difficulty that New England farmers have in obtaining credit for projects that improve their operations and increase their income, as well as for emergency needs. The founding organizations are Strolling of the Heifers and The Carrot Project. Loan applications for amounts ranging from \$1,000 to \$15,000, for terms up to 5 years. Acceptable purposes for the loans are capital investments and other expenses that help improve efficiency or quality, or that expand production and sales; repairs necessary to maintain farm operations; short term operating needs such as inventory, supplies or labor; and emergency funds to deal with business interruptions from fire, natural disasters, or other unforeseen events.

[www.strollingoftheheifers.org/](http://www.strollingoftheheifers.org/)

The **National Fish and Wildlife Foundation (NFWF)** conserves healthy populations of fish, wildlife and plants, on land and in the sea, through partnerships, sustainable solutions, and better education. The Foundation meets these goals by awarding challenge grants to projects benefiting conservation education, habitat protection and restoration, and natural resource management. Federal and private funds contributed to the Foundation are awarded as challenge grants to on-the-ground conservation projects. Challenge grants require that the funds awarded are matched with non-federal contributions, maximizing the total investment delivered to conservation projects.

[www.nfwf.org/programs.cfm](http://www.nfwf.org/programs.cfm)

The **Conservation Easements (CE)** Land ownership carries with it a bundle of rights—the right to occupy, lease, sell, develop, construct buildings, farm, restrict access or harvest timber, among others. A landowner can give up one or more right for a purpose such as conservation while retaining ownership of the remainder. Private property subject to a conservation easement remains in private ownership. Many types of private land use, such as farming, can continue under the terms of a conservation easement, and owners can continue to live on the property. The agreement may require the landowner to take certain actions to protect land and water resources, such as fencing a stream to keep livestock out or harvesting trees in certain way; or to refrain from certain actions, such as developing or subdividing the land. Conservation easements do not mean properties are automatically opened up to public access unless so specified in an easement. The terms of a conservation easement are set jointly by landowner and the entity that will hold easement.

Nature Conservancy

[www.nature.org/aboutus/howwework/conservationmethods/privatelands/conservationeasements](http://www.nature.org/aboutus/howwework/conservationmethods/privatelands/conservationeasements)

Vermont River Conservancy

[www.vermontriverconservancy.org](http://www.vermontriverconservancy.org)

Vermont Land Trust

[www.vlt.org](http://www.vlt.org)

Upper Valley Land Trust

[www.uvlt.org](http://www.uvlt.org)

**Small Wind and Solar Incentive Program (SWSIP)** was developed to accelerate and increase market demand for high-quality solar and small wind systems. Program incentives will support the first 5 kW of installed capacity for a solar electric or wind system or the first 500 kBtu/day rating for solar hot water collectors. Larger systems are eligible for program support, but will receive an incentive capped at \$8,750 for solar and \$17,500 for wind. Incentives for wind systems installed by schools, farms, and local and state governments are limited to the lesser of \$20,000 or 50% of the total installed cost of the system.

[www.nerc-vt.org/incentives/](http://www.nerc-vt.org/incentives/)

**Sustainable Agriculture Research & Education Grants (SARE)** through the Northeast Sustainable Agriculture Research & Education Network are offered to farmers, researchers and others in the agricultural community who are working on innovative and interesting approaches to sustainable agriculture. Grants are offered on two different tiers--large, multiyear projects with budgets in excess of \$25,000, and smaller, shorter-term projects with budgets of \$25,000 or less. Farmer Grants are for commercial producers who have an innovative idea to test using a field trial, on-farm demonstration, or other technique. A technical advisor--often extension agent, crop consultant, or other service professional--is required as a project participant. Projects should seek results other farmers can use, and all projects must have the potential to add to our knowledge about effective sustainable practices.

[nesare.org/get/farmers/](http://nesare.org/get/farmers/)

**Technical Assistance Programs (TAP)** through Northeast Organic Farming Association are free to farmers - made possible by grants from the Vermont Housing Conservation Board's Farm Viability Enhancement Program and Agency of Agriculture Food & Markets. Vegetable and Fruit Technical Assistance provides technical assistance to organic farmers in Vermont seeking production and financial assistance on small fruit and vegetable operations. Dairy and Livestock Technical Assistance provides Information, Services and Support for Vermont's Organic Dairy & Livestock Community.

[www.nofavt.org/programs](http://www.nofavt.org/programs)

**Vermont Farm Viability Enhancement Program (FVP)** provides farmers with business planning and technical assistance. Developed by the Vermont Housing & Conservation Board in collaboration with the Vermont Agency of Agriculture, Food and Markets, the FVP is designed to strengthen the economic position of Vermont agriculture and to complement existing programs in farmland conservation. The Program uses consultants to provide technical assistance tailored to a farmer's needs to fulfill specific business goals. Examples include consultations on keeping better production or financial records, financial analysis, meetings with crop or animal health specialist, new farm enterprise analysis, estate and farm transfer planning, labor management, and value-added processing. The business planning process involves the farmer in assessment of farm operation's strengths and weaknesses and in exploration of management changes that could increase profitability. Consultations result in preparation of written business plan.

[www.vhcb.org/viability.html](http://www.vhcb.org/viability.html)

**Vermont Farm Women's Fund (VFWF)** mission is to sustain and assist women pursuing a secure farming future with innovative agricultural businesses and stewardship of the land. The first priority for funding will be women farmers on a currently operating farm located in Vermont who make a majority of their income from farm-related activities. Awards are given from 1) The Farm Business Development Fund to provide funds for education and travel related to helping recipients improve some aspect of their business; and 2) The Leadership Development Fund to ensure that women have the skills, access and opportunity to become leaders in agricultural policy development. Funds are awarded to help defray the

costs of tuition for leadership training, travel expenses, and/or other related costs associated with participation in agricultural policy work that addresses barriers encountered by women in agriculture. Funds may also be requested for costs associated with hiring replacement help when this assistance is essential to taking part in professional development. Applications are accepted on a continuing basis. Awards are capped at \$750 per year.

[www.uvm.edu/wagn](http://www.uvm.edu/wagn)

**APPENDIX B.2 - Direct Discharge Permits In Basin: 10 - Ottauquechee, Black**

<b>DIRECT DISCHARGE PERMITS IN BASIN: 10 - Ottauquechee, Black</b>					
					3/15/2010
<b>Permit ID</b>	<b>Discharge ID</b>	<b>Facility Name</b>	<b>Permit Issued</b>	<b>Permit Expires</b>	<b>Permitted Flow</b>
<b>1-0278</b>	001	Sailer Brothers Construction Inc	12/01/1981	10/30/1983	0
<b>3-0313</b>	001	Springfield Municipal Swimming Pool	9/06/2006	9/30/2011	0.001
<b>3-0348</b>	001	Luzenac America - Argonaut Mine	7/03/2008	3/31/2013	0
<b>3-1154</b>	001	Springfield	9/10/2001	9/30/2003	2.2
<b>3-1156</b>	001	Bridgewater	4/21/2009	3/31/2014	0.043
<b>3-1178</b>	001	Woodstock - South	8/24/2004	12/31/2009	0.05
<b>3-1179</b>	001	Woodstock - Taftsville	8/24/2004	12/31/2009	0.01
<b>3-1185</b>	001	Hartford - Quechee	8/15/2005	9/30/2010	0.3
<b>3-1205</b>	001	Cavendish	5/23/2006	9/30/2011	0.15
<b>3-1208</b>	001	Ludlow	6/15/2006	9/30/2011	1.05
<b>3-1228</b>	001	Woodstock	6/09/2003	9/30/2008	0.45
<b>3-1243</b>	001	Sherburne FD 1	1/24/2008	3/31/2013	0.3
<b>3-1474</b>	001	VT Quarries Corp	8/25/2005	9/30/2010	0.12
<b>3-1506</b>	001	Luzenac America - Rainbow Mine	3/11/2009	3/31/2014	0.432
<b>The PERMITTED FLOW applies to Discharge ID 001 only unless flow for other Discharge ID's is different than 001.</b>					

### APPENDIX B.3 - Indirect Discharge Permits In Basin: 10 - Ottauquechee, Black

<b>BLACK RIVER BASIN</b>				
<b>NUMBER</b>	<b>BASIN FILE</b>	<b>PROJECT NAME</b>	<b>TYPE</b>	<b>RECEIVING WATERS</b>
ID-9-0136	OQE-0136	Green Mountain @ Fox Run	Leachfield	
ID-9-0258	OQE-0258	Crowley Cheese, Incorporated	Land Application of Dairy Processing Wastewater	
ID-9-0180	OQE-0180	Salt Ash Colony	Leachfield	
ID-9-0181	OQE-0181	Salt Ash Colony II & III	Leachfield	
ID-9-0284	OQE-0284	Plymouth Cheese Factory	Land Application of Dairy Processing Wastewater	
ID-9-0086	OQE-0086	Windy Hill Acres MHP	WWTF and Sprayfield Discharging System	Unnamed tributary of Black River

## OTTAUQUECHEE RIVER BASIN

NUMBER	BASIN FILE	PROJECT NAME	TYPE	RECEIVING WATERS
ID-9-0232	OQE-0232	Twin Farms Development Co.	Leachfield	
ID-9-0101	OQE-0101	Northeast Passage	Leachfield	
ID-9-0148	OQE-0148	Fairway Village Condo. Assoc.	Leachfield	
ID-9-0156	OQE-0156	Quechee Gorge Village	Leachfield	
ID-9-0195	OQE-0195	Quechee Lakes	Leachfield	
ID-9-0196	OQE-0196	Quechee Lakes	Leachfield	
ID-9-0197	OQE-0197	Quechee Lakes	Leachfield	
ID-9-0198	OQE-0198	Quechee Lakes: 3B-Birchwood	Leachfield	
ID-9-0200	OQE-0199	Quechee Lakes	Leachfield	
ID-9-0201	OQE-0201	Quechee Lakes	Leachfield	
ID-9-0202	OQE-0202	Quechee Lakes	Leachfield	
ID-9-0029	OQE-0029	Killington Ski Resort	WWTFs and Sprayfield Discharging Systems	E. Branch Roaring Brook Carpenters Brook Falls Brook
ID-9-0049	OQE-0049 (discharges to ID-9-0029 storage lagoon)	Edgemont Owners Assoc.	WWTF and then disposal through ID-9-0029 Sprayfield	See above



			Discharging Systems	
ID-9-0087	OQE-0087	Sunrise Condominium Assoc.	WWTF and Sprayfield Discharging System	Unnamed tributary of the Ottawaquechee River
ID-9-0193	OQE-0193	Moon Ridge Corporation	Leachfield	
ID-9-0247	OQE-0247	Grey Bonnet Inn	Leachfield	
ID-9-0107	OQE-0107	Suicide Six Ski Area	Leachfield	
ID-9-0160	OQE-0160	Riverside Mobile Home Park	Leachfield	

## **APPENDIX B.4 - Construction Runoff Control Program**

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

### **General Permit for Stormwater Runoff from Construction Sites**

The development of an erosion control plan helps to protect water quality by preventing the discharge of sediment from construction sites, minimizing the extent and duration of soil disturbance, maintaining existing drainage ways and vegetation, and protecting riparian buffer areas from disturbance.

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

A General Permit to permit discharge of stormwater from construction sites; requires the development and submittal of an erosion and sediment control plan.

At least 30 days prior to the commencement of construction activity.

Where:

An application can be obtained from:  
Vermont Agency of Natural Resources  
Department of Environmental Conservation  
Division of Water Quality, Stormwater Section  
103 South Main Street, Building 10 North  
Waterbury, VT 05671-0408  
Stormwater Hotline 241-4320

[http://www.anr.state.vt.us/dec/waterq/stormwater/htm/sw\\_cgp.htm](http://www.anr.state.vt.us/dec/waterq/stormwater/htm/sw_cgp.htm)

## **APPENDIX B.5 - Mine Runoff Control Program**

### **Sand & Gravel Pits**

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

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

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

*Also refer to Hazardous Waste Management Program.*

## **APPENDIX B.6 - Fisheries Protection Regulations**

### ***Statutory references***

Title 10 and Chapters 101 through 123

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

Title 10, Chapter 43 Dams

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

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

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

Title 10, Chapter 47 Vermont Water Pollution Control Act

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

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

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

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

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

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

A person may not change the cross-section of a stream or modify or alter it in any way by moving more than 10 cu. yd. of material without a permit from the Department of Environmental Conservation. This subchapter does not apply to dams subject to Chapter 43 or highways and bridges subject to section 5 of Title 19. Exemptions include personal use of 50 cu. yd. of gravel/year by riparian landowners (this gravel exemption also includes streams having drainage area of less than 10 mi<sup>2</sup>) and accepted agricultural and silvicultural practices. A permit will be granted if, among other criteria, it appears the project will not significantly damage fish life. There are also special provisions for protecting outstanding resource waters.

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

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

#### Title 29, Chapter 11 Management of Lakes and Ponds

This statute addresses encroachment onto lands lying under public waters such as from docks, marinas, boathouses, etc. Exceptions include water pipes <2 inches (inside diameter), buoys and duck blinds, docks of certain size, rafts, etc. Criteria for granting or denying a project include determination of public good (Section 405), which addresses impacts on fish habitat and recreation. In 1989, interim procedures for issuance or denial of encroachment included whether or not the project meets the requirements of the public trust doctrine. In a recent case the Vermont Superior Court ruled that the Department of Environmental Conservation overstepped its authority by including the public trust doctrine criteria in its interim procedures for permit denial. The interim procedures also addressed the potential cumulative effect of encroachment. In 1984, the Water Resources Board overturned the Department's denial of a permit by concluding "... the consideration of the potential cumulative effect of possible future encroachments is neither contemplated nor authorized by 29 V.S.A. 405(6)." (LaFleur Appeal).

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

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

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



Agency of Natural Resources  
Department of Environmental Conservation  
Water Quality Division  
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