Appendices for the West, Williams and Saxtons Rivers and adjacent Connecticut River Tributaries

Contents

For detailed information and explanation of the policy behind basin planning or the tools, activities, stressors and pollutants discussed herein please refer to the

Vermont Surface Water Management Strategy

Appendix A – Existing Uses

Contact Recreation

Waterbody	Site	Location of Use	Town	Documentation of Existing Use
West River Watershed				
West River	West River Park	Rte. 30, town rec area	Brattleboro	Swimming hole in town park
	Deyo's Hole	Rte. 30	Dummerston	Swimming hole off Rte. 30 ROW
	Brookline Bridge	West River crossing Newfane/Brookline town line	Brookline / Newfane	Swimming hole below bridge
	Dummerston Covered Bridge	Rte. 30 jct. of East-West Rd.	Dummerston	Swimming hole below bridge
	Dumplings	Jamaica State Park	Jamaica	Swimming hole in state park
	Jamaica State Park Beach	Jamaica State Park	Jamaica	Swimming beach in state park
	Salmon Hole	Jamaica State Park	Jamaica	Swimming hole in state park
	Scott Covered Bridge	USACE lands	Townshend	Swimming hole below bridge
	South Londonderry	USACE lands	South Londonderry	Swimming hole below bridge
	Townshend Lake Beach	USACE lands	Townshend	Swimming beach iat USACE dam
Winhall River	Winhall Campground Winhall & West confluence	USACE lands	Winhall	Swimming beach at USACE campground
Rock River	Rock River confluence to 1 mi upriver, including Indian Love Call	Town legal trail along Depot Rd. w/ access easement	Newfane	Series of swimming holes from mouth to 1 mile up river
Cobb Brook	Hamilton Falls	Jamaica State Park	Jamaica	Swimming hole in state park
North Branch Ball Mountain Brook	Pikes Falls	Jamaica Town Conservation Land	Jamaica	Swimming hole on town conservation lands
Williams River Watershed				
	Rainbow Rocks	off Green Mountain Turnpike	Chester	Swimming hole off Green Mountain Turnpike, road ROW

Saxtons River Watershed				
	Saxtons River Falls	Below falls under Rte 121 bridge crossing	Saxtons River village	Swimming hole at end of town road
Connecticut River Watershed				
East Putney Brook	River Road Culvert	Below culvert crossing	Putney	Swimming hole off of town road

Boating

Waterbody	Location of Use	Towns	Documentation of Existing Use
West River Watershed			
West River	Weston to Londonderry	Weston, Londonderry	Rated as IMPORTANT for boating (source: Jenkins & Zika, 1992) Put In: Bridge off Village Green Take Out: Rte 11 crossing at dam
	Londonderry to Ball Mountain Dam	Londonderry, Jamaica	Rated as HIGHLY IMPORTANT for boating (source: Jenkins & Zika, 1992) Put In: Rte 11 crossing at dam Take Out: USACE Ball Mountain Dam
	Ball Mountain Dam to Townshend Dam	Jamaica, Townshend	Rated as HIGHLY IMPORTANT for boating[1], nationally known whitewater releases, national team trials site Put In: USACE Ball Mountain Dam Take Out: USACE Townshend Dam
	Townshend Dam to the Connecticut River	Townshend, Newfane, Brookline, Dummerston, Brattleboro	Rated as HIGHLY IMPORTANT for boating[1] Put In: USACE Townshend Dam Take Out: Retreat Meadows boat launch
Winhall River	Kendall Farm Road to the West River	Winhall, Jamaica, Londonderry	Rated as HIGHLY IMPORTANT for boating, continuous Class III run of over 4 miles[1] Put In: GMNF land at Arthur Court bridge crossing Take Out: USACE Winhall Campground

Wardsboro Brook	Wardsboro to Jamaica	Wardsboro, Jamaica	Rated as HIGHLY IMPORTANT for boating[1] (source: Jenkins & Zika, 1992) Put In: South Wardsboro Road crossing Take Out: Eaton Rd. crossing USACE property
Williams River Watershed			
Williams River	Chester to Brockways Mills	Chester, Springfield, Rockingham	Rated as HIGHLY IMPORTANT for boating Put In: VDFW Access jct. of Rts 10 & 103 Take Out: Above Brockways Mills Dam portage
		Rockingham to Connecticut River	Flatwater upstream to Parker Hill Rd bridge[2] Put In: Herricks Cove Take Out: Herricks Cove
Middle Branch Williams River	Five miles above Chester down to Chester center	Andover, Chester	Rated as HIGHLY IMPORTANT for boating[1] Put In: Rte. 11 bridge crossing east of Hill Top Rd. Take Out: Pull off at Jct. of Rte's 11 and 103
Saxtons River Watershed			
Saxtons River	Grafton to Saxtons River village	Grafton, Rockingham	Rated as HIGHLY IMPORTANT for boating[1] Put In: Town park on South Branch of the Saxtons River 0.5 miles up from confluence with the Saxtons mainstem Take Out: Rte. 121 left bank road pull off 0.3 mi. upstream of Pleasant Valley rd jct.
Connecticut River Watershed			
Connecticut River	Springfield to Brattleboro	Springfield, Rockingham, Westminster, Dummerston, Brattleboro	VDFW Access Areas: Hoyts Landing - Use Volume = Heavy Putney Landing - Use Volume = Light Dummerston - Use Volume = Moderate Old Ferry Road - Use Volume = Heavy

			Other Official Access Areas: Herrick's Cove Picnic Area & Boat Launch Bellows Falls Bridge Portage Bellows Falls Historical Society River Access Broad Brook Access

[1] Source: Jenkins & Zika, 1992

[2] Personal Comm. M.L. Caduto

Fishing

Waterbody	Location of Use	Town	Documentation of Existing Use
West River			
- confluence	Confluence with the Connecticut River to Rte 5 bridge	Brattleboro	Special Fishing Regulation Area
- lower	Rte 5 bridge above confluence with the Connecticut River to Townshend Dam	Townshend, Jamaica	Special Fishing Regulation Area
- middle	Above Townshend Dam to Rte 100 bridge in Jamaica	Townshend, Jamaica	Special Fishing Regulation Area
- upper	Cobb Brook to Jamaica State Park entrance bridge	Jamaica	Trout Stocking
Williams River			
- confluence	Mouth to first Rte 5 bridge above confluence with the Connecticut River	Rockingham	Special Fishing Regulation Area
- lower	First Rte 5 bridge above confluence with the Connecticut River to above Brockways Mills Dam	Rockingham	Special Fishing Regulation Area
Saxtons River			
- confluence	Mouth to first Rte 5 bridge above confluence with the Connecticut River	Westminster	Special Fishing Regulation Area

Connecticut River			
	All waters of the river including the bays, set backs and tributaries, up to the first highway bridge crossing said tributaries on the Vermont and New Hampshire sides	several	Special Fishing Regulation Area

Water Supply

Waterbody	Town	Water Supply For	Documentation of Existing Use
West River			
Stickney Brook, above water intake	Marlboro, Newfane, Dummerston	Town of Brattleboro water supply	Class A2
Styles Brooks	Stratton	Stratton Corp.	Class A2, Emergency Use
Sunset Lake	Marlboro, Newfane, Dummerston	Town of Brattleboro water supply	Class A2
Williams River			
Chester Reservoir & the outlet stream	Chester	Village of Chester water supply - emergency	Class A2, Emergency Use
Saxtons River			
Signal Hill Brook (aka Bolles Brook)	Rockingham	Saxtons River & Vermont Academy	Class A2, Emergency Use
Connecticut River			
Ellis Brook, Farr Brook and Back Pond	Rockingham	Village of Bellows Falls – Minards Pond watershed	Class A2
Mill Brook and all waters above the intake in Westminster	Westminster	Kurn Hattin School	Class A2, Emergency Use

Appendix B – Dams in the Basin

Stream	Dam Name	Town	Surface Acres	Dam Status	Purposes	Year Built/ Rebuilt	Hazard Class
Connecticut River							
Connecticut River	Bellows Falls	Rockingham	0	In Service	Hydroelectric		
Connecticut River-TR	Minards Pond	Rockingham	46	In Service	Water Supply	1900	Significant
Fullum Brook-TR	Westminster-1	Westminster	0.1	In Service	Recreation		Low
Sacketts Brook	Sacketts Brook	Putney	0.6	In Service			Low
Whetstone Brook	Chestnut Hill Reservoir	Brattleboro	1.1	Not in Use	Water Supply	1884/2014	High
Whetstone Brook	Hidden Lake Dike	Marlboro	19	In Service	Recreation, Other	1850	Low
Whetstone Brook-TR	Pleasant Valley Reservoir	Brattleboro	25	In Service	Water Supply	1909	High
Saxtons River							
Athens Brook-TR	Athens Pond	Athens	21	In Service			Low
Saxtons River-TR	Hamm Mine	Windham	8	In Service	Other	2012	Low
Weaver Brook	Holbrook	Grafton	7	In Service	Recreation	1978	Low
Saxtons River	Lawrence Four Corners	Windham	1.9	In Service			Low
West River							
Baker Brook-TR	Kenny Pond	Newfane	20	In Service	Recreation	1900	Significant
Ball Mountain Brook-TR	Cole	Stratton	5	In Service		1979	Low
Burnt Meadow Brook	Lyons Pond	Peru	3	In Service			Low
Burnt Meadow Brook	Newman	Peru	10	In Service	Recreation	1981	Significant
Eddy Brook-TR	Gale Meadows Dike	Winhall	204	In Service	Recreation	1965	Low
Farnum Brook	Farnum	Peru	7	In Service	Recreation	1973	Significant
Flood Brook	Hapgood Pond	Peru	4	In Service	Recreation	1939	Low

Stream	Dam Name	Town	Surface Acres	Dam Status	Purposes	Year Built/ Rebuilt	Hazard Class
Flood Brook-TR	Hapgood Pond Dike	Peru	4	In Service	Recreation	1939	Low
Gulf Brook	Stiles Brook Reservoir	Stratton	0.9	In Service		1961	Significant
Gulf Brook	Gulf Brook Reservoir	Stratton	6	In Service	Other	1975	Low
Marlboro Branch-TR	Hidden Lake	Marlboro	19	In Service	Recreation	1850	Low
Marlboro Branch-TR	Ennis	Marlboro	0.6	In Service	Recreation	1970	Low
Mill Brook	Gale Meadows	Londonderry	195	In Service	Recreation	1965	Significant
Mill Brook-OS	Lords Prayer Pond	Peru	2	In Service		1966	Low
Mill Brook-TR	Bromley Snow Pond	Peru	5	In Service	Other	1984	Low
North Branch Ball Brook-TR-OS	Stratton WWTF Lagoon	Winhall	1.4	In Service	Recreation	1996	Low
North Branch Brook-TR	Stratton Mountain Lake	Winhall	18	In Service	Recreation	1977	Low
Red Brook	Strattonwald	Winhall	4	In Service	Recreation	1979	Significant
Stickney Brook	Sunset Lake	Marlboro	95	In Service	Water Supply	ca 1910	Significant
Turkey Mountain Brook	Burbee Pond	Windham	34	In Service	Recreation	1920	Low
Turkey Mountain Brook	Windham-3	Windham	0				
West Brook-TR	Magic Mountain	Londonderry	3	Breached (Partial)	Recreation	1968	Low
West Brook-TR	Magic Mountain Lagoon	Londonderry	3.2	In Service			Low
West River	Ball Mountain	Jamaica	85	In Service	Flood Control, Stormwater, Recreation	1961	High
West River	Williams	Londonderry	8	In Service	Other	1900	Low
West River	Townshend	Townshend	100	In Service	Flood Control, Stormwater, Recreation	1961	High

Stream	Dam Name	Town	Surface Acres	Dam Status	Purposes	Year Built/ Rebuilt	Hazard Class
West River	Weston Mill	Weston	4	In Service	Fire Protection		Low
West River-OS	Thomson	Londonderry	5	In Service		1973	Low
West River-TR	Brattleboro-2	Brattleboro	0				
West River-TR	Londonderry-3	Londonderry	0				
West River-TR	Lowell Lake	Londonderry	100	In Service	Recreation	1850	Significant
West River-TR	Weston (Upper)	Weston	0.1	In Service			Low
West River-TR	Wantastiquet Lake	Weston	45	In Service	Recreation	1880/2010	High
Winhall River-OS	Mahoney Pond	Winhall	15	In Service	Recreation	1997	High
Worden Brook-TR	Manley	Marlboro	3	In Service		1956	Low
Williams River							
Williams River	Brockway Mills	Rockingham	4	In Service	Hydroelectric	1988	Low
Williams River-TR	Tomasso	Chester	3	In Service	Recreation	1983	Low
Williams River-TR	Upper Chester Reservoir	Chester	5	In Service	Recreation, Other	1915	Significant

Appendix C – Fisheries Assessment Summary

Rivers and streams supporting fisheries. See Table 7 for fisheries in lakes and ponds. Abbreviations: Brook Trout, BKT; Brown Trout, BNT; Rainbow Trout, RBT.

Waterbody/reach	Location of use	Town(s)	Documentation of use
WEST RIVER			
Mainstem 1	Mouth upstream to U.S. Route 5 bridge	Brattleboro	Fishing pursuant to New Hampshire Connecticut River fishing regulations
Mainstem 2	U.S. Route 5 bridge upstream to Townshend Dam	Brattleboro, Dummerston, Newfane Townshend	General fishing
Mainstem 3	Townshend Lake/Reservoir	Townshend	Panfish & stocked with RBT
Mainstem 4	VT Route 30 bridge upstream to Depot Street Bridge	Townshend, Jamaica	General fishing
Mainstem 5	Depot Street Bridge upstream to Ball Mountain Dam	Jamaica	Stocked with RBT
Mainstem 6	Winhall River confluence upstream to Weston Mill Dam	Jamaica, Londonderry, Weston	General fishing
Mainstem 7	Weston Mill Pond	Weston	Stocked with BKT
Mainstem 8	Miller Farm bridge upstream to headwaters	Weston	Wild BKT
Stickney Brook	Watershed	Dummerston	Wild BKT
Rock River	Watershed	Newfane, Dover	Wild BKT & BNT
Smith Brook	Watershed	Newfane	Wild BKT & BNT
Grassy Brook	Watershed	Brookline	Wild BKT &
Mill Brook	Watershed	Townshend	Wild BKT & BNT
Fair Brook	Watershed	Townshend	Wild BKT
Wardsboro Brook	Watershed	Jamaica, Wardsboro, Stratton	Wild BKT & BNT
Turkey Mountain Brook	Watershed	Jamaica, Windham	Wild BKT & BNT
Ball Mountain Brook	Watershed	Jamaica, Stratton	Wild BKT & BNT

Waterbody/reach	Location of use	Town(s)	Documentation of use
Cobb Brook	Watershed	Jamaica, Windham	Wild BKT
Winhall River	Watershed	Londonderry, Jamaica, Winhall, Statton	Wild BKT & BNT
Flood Brook	Watershed	Londonderry, Peru	Wild BKT & BNT
Utley Brook	Watershed	Londonderry, Landgrove, Peru	Wild BKT
Greendale Brook	Watershed	Weston, Mount Tabor	Wild BKT
SAXTONS RIVER			
Mainstem 1	Mouth upstream to U.S. Route 5 bridge	Westminster	Fishing pursuant to New Hampshire Connecticut River fishing regulations
Mainstem 2	U.S. Route 5 bridge upstream to confluence with South Branch	Westminster, Rockingham, Grafton	General fishing
Mainstem 3	Confluence with South Branch upstream to headwaters	Grafton	Wild BKT
Bull Creek	Watershed	Rockingham, Athens	Wild BKT
South Branch	Watershed		Wild BKT & BNT
WILLIAMS RIVER			
Mainstem 1	Mouth upstream to U.S. Route 5 bridge	Rockingham	Fishing pursuant to New Hampshire Connecticut River fishing regulations
Mainstem 2	U.S. Route 5 bridge upstream to junction of VT Route 103 and Smokeshire Road	Rockingham, Chester	Wild BKT
Middle Branch	Watershed	Chester, Andover	Wild BKT & BNT
South Branch	Watershed	Chester, Windham	Wild BKT & BNT
LESSER CONNECTICUT RIVER TRIBUTARIES			
Salmon Brook	Watershed	Dummerston, Putney	Wild BKT, BNT & RBT
Canoe Brook	Watershed	Dummerston, Putney	Wild BKT, BNT & RBT
Sacketts Brook	Watershed	Putney, Westminster	Wild BNT from mouth upstream to dam; wild BKT in remaining watershed

Waterbody/reach	Location of use	Town(s)	Documentation of use
East Putney Brook	Watershed	Putney, Westminster	Wild BKT, BNT & RBT from mouth upstream to falls; wild BKT & BNT in remaining watershed
Fullam Brook	Watershed	Westminster	Wild BKT
Mill Brook	Watershed	West minster	Wild BKT
Cobb Brook	Watershed	Westminster	Wild BKT & RBT from mouth to I-91; wild BKT in remaining watershed

Appendix D – Lakes and Ponds Program Priority Activities in Basin 11 - 13

Lake	Town	LakeWise	AIS Spread Prevention*	Monitoring	Technical Assistance
Athens	Athens	Recruit local demonstration sites	Looking for interested volunteer monitors		Shoreland Best manage-ment training for contractors
Ball Mountain	Jamaica	"	Establish public access greeter program		"
Burbee	Windham	"			"
Cole	Jamaica	"	Establish public access greeter program	LMP volunteer support	"
Forester	Jamaica	"			"
Gale Meadows	Londonderry	"	Establish public access greeter program		"
Kenny	Newfane	"			"
Lily	Londonderry	"			"
Little	Windhall	"			"
Lowell	Londonderry	"			"
Moses	Weston	"			"
Stratton	Stratton	"			"
Sunset	Marlboro	"			"
Telephone	Chester	"			"
Townshend	Townshend	"			"
Wantastiquet	Weston	"			"
Beaver	Weathersfield	"			"
Hidden	Marlboro	"			"
Minards	Rockingham	"			Shoreland Best manage-ment training for contractors

The Vermont Lake Wise Program

The Lake Wise Program is offered through the Vermont Lakes and Ponds Program to provide trainings on lake-friendly shoreland management. Recent data from Vermont and the nation has shown that shoreline development can pose a significant threat to lake water quality. Through Lake Wise, lake property is assessed in four categories of property management– shoreland , recreation area, driveway, and septic /structures. Technical assistance then helps property owners identify locations where the use of best management practices can control run-off and prevent erosion. Properties that meet all Lake Wise criteria receive the Lake Wise award and accompanying sign designating their property as lake-friendly. Lake Associations are also eligible for the "Gold Award" if they assist 15% of their fellow lake residents to participate in Lake Wise.

Beginning in 2016, Lake Wise will be offering training in shoreland best management practices for contractors, landscapers and other shoreland site workers. See the Lake Wise Current events page for more information.

For more information, contact Amy Picotte at amy.picotte@vermont.gov or (802) 490-6128

Vermont Invasive Patrollers (VIPs)

VIPs are local volunteers who monitor a waterbody for new invasive species. They are trained to distinguish between native and invasive aquatic plants and animals during routine systematic surveys. These individuals provide a vital line of defense in Vermont's efforts to protect lake ecology and recreation. Finding an invasive organism before it becomes well established in a lake or pond increases management options and may make eradication possible.

For more information, contact Bethany Sargent at bethany.sargent@vermont.gov or (802)490-6129

The Vermont Public Access Greeter Program

The Lakes and Pond Program partners with local watershed associations to operate greeter programs at lake access points. Public access greeters educate lake visitors about invasive species, provide courtesy watercraft inspections and STOP introductions while providing needed data on the ways invasive organisms hitch rides on equipment. In 2014, greeters intercepted and removed aquatic invasive species 361 times, more than half of the recorded intercepts for the year.

Training sessions are offered annually. For more information, contact Josh Mulhollem at josh.mulhollem@vermont.gov or (802)490-6121

The Lay Monitoring Program (LMP)

For more than 35 years, the Lakes and Ponds Program has provided technical training and support for local water quality monitors around the state. Following a rigorously documented and quality assured method, these volunteers track changes in chlorophyll, phosphorus and lake transparency. The data support protection and restoration activities around the lake and in the watershed. Currently, there are monitors on approximately 55 inland lakes and 15 locations on Lake Champlain.

For more information, contact Bethany Sargent at Bethany.sargent@vermont.gov or (802)490-6129

Technical Assistance – Aquatic Invasive Species

The Lakes and Pond Program provides local watershed associations and municipalities with technical assistance to implement aquatic invasive species like Eurasian watermilfoil control programs on Vermont waterbodies.

For more information, contact Ann Bove or Josh Mulhollem at ann.bove@vermont.gov or josh.mulhollem@vermont.gov, or (802) 490-6120 (Ann) or (802) 490-6121 (Josh).

Appendix E – Regulatory and Non-regulatory Programs Applicable to Protecting and Restoring Waters

The Vermont Surface Water Management Strategy maintains a continually updated roster of regulatory and non-regulatory technical assistance programs.

Regulatory programs may be accessed at:
http://www.vtwaterquality.org/wqd_mgtplan/swms_appA.htm

Non-regulatory programs may be accessed at:
http://www.vtwaterquality.org/wqd_mgtplan/swms_appD.htm

Appendix F –Flood Control Dams and Whitewater Releases

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

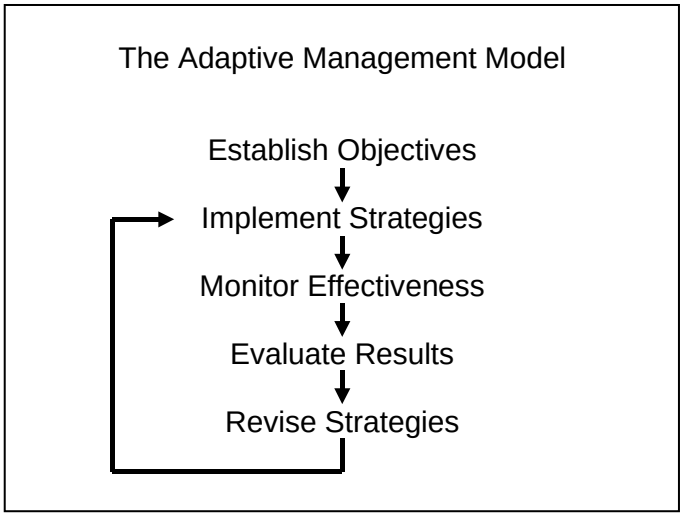
Background

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.

_____ _____

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

Date

_____ _____

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

Date

_____ _____

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

Whitewater Paddling Releases on the West River

Vermont Fish and Wildlife Department; September 2004

What is the concern associated with the whitewater paddling release?

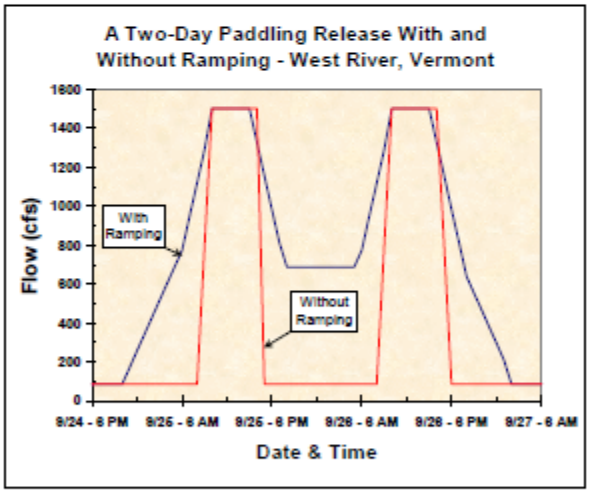
In the past, the paddling release has been turned on and off like a faucet, resulting in very rapid increases and decreases in the river flow. These abnormally rapid changes create problems for fish and other aquatic life in the river because they cannot react quickly enough to the changing conditions. Perhaps the most obvious impact is stranding. Fish get stuck in the rocks and left high and dry when the water levels drop rapidly (such as upon completion of the paddling release). The rapid increase in flow associated with the beginning of the paddling release is also a concern. Aquatic insects and mussels living on the bottom become dislodged, and along with smaller fish, are dislocated. This situation is not unlike the difficulty a paddler experiences when faced with an unexpected swim down a rapid. It's hard to find and get to shelter, and it saps your energy.

What characteristics of the release are of concern?

The magnitude of the 1500 cfs paddling release is acceptable. Natural river flows of this amount are not unusual during the spring and fall. The concern is with how fast the river flow is increased and then decreased again. To lessen the extent of the disturbance to aquatic organisms caused by a two-day release (a rapid flow drop at the end of day 1 followed by a rapid increase just hours later), the overnight flow should not be lowered beyond a certain point.

What is ramping?

In order to address the problems associated with overly rapid transitions on each end of the paddling release, the release can be changed in small steps over a specified period of time. This is called "ramping," because the flow is ramped up to the paddling release and then ramped down afterward.



Has the Agency of Natural Resources recommended ramping protocols to minimize the negative impacts of the paddling release on aquatic organisms?

Yes, ANR developed ramping rates that mimic the rates at which flows change naturally before and after a heavy rain. Flow data from a gage on the nearby, unregulated Williams River were used to develop the protocol. The logic is simple: aquatic organisms have become adapted to the dynamic character of the natural flow regime, so ramping that is similar to what occurs in nature should be fine.

Why is a two-day release in September no longer assured?

The second day has always been weather-dependent, although the need for ramping means that enough water will only be available in years when a lot of rain falls within a few days prior to the release. It takes more water to change flows at a slower, environmentally sound rate, and that means less water is available for

paddling releases. Ball Mountain Reservoir is much smaller in size than Army Corps reservoirs that support famous paddling releases in other parts of the country, such as the Gauley River in West Virginia.

If there isn't enough water for the release with ramping, why can't more water simply be stored in the reservoir?

There are a couple problems with trying to fill the reservoir up more. The reservoir is lowered in the spring to provide the spring paddling release. Refilling the reservoir is problematic when natural flows into the reservoir are low. The second problem is that filling the reservoir to higher levels floods out more of the river upstream, as well as upland areas, negatively affecting those resources.

Doesn't the U.S. Army Corps of Engineers manipulate river flows year around to such an extent that the whitewater paddling release represents little additional impact?

There have been a number of flow-related problems associated with Ball Mountain and other Vermont dams operated by the U.S. Army Corps of Engineers. However, the Corps, Vermont Fish and Wildlife Department, Vermont Department of Environmental Conservation and U.S. Fish and Wildlife Service are working cooperatively to resolve them. The paddling release is only one of a number of areas being worked on. For example, the same ramping protocol used during the paddling release will now be applied at all times, unless the project is in flood control mode, which generally happens a few times a year and is still under discussion. Other issues include low flow management, flow maintenance during conduit inspections and more.

Have site-specific studies been done that document environmental damage to the West River?

These studies have not been conducted, because they would be very expensive, requiring considerable field work to be done over a period of years. But, we are not inventing the wheel here. Many studies have been done elsewhere in the U.S. and in other countries. There is a large body of scientific evidence about the relationship between flows and aquatic resources. The effects of rapid changes in stream flows are known. An expensive study could be done but it is unrealistic to expect that it would show "no impact." Typically, the burden of proof is on a water user to demonstrate that the proposed activity will not harm the public resources.

Is there a concern about the spring release too?

The concerns are the same but because the river flow is much higher in the spring, there is almost always enough water for a two-day release with proper ramping.

Is this a choice between the paddling release and the environment?

It must be recognized that special releases are not without their harmful effects. However, an attempt has been made to enable the paddling releases to occur in a way that reduces their environmental impacts. This means that in most cases the spring paddling release will be a two-day event and the fall paddling release will be a one-day event. In addition to enjoying their sport, most paddlers are river stewards and support natural resource conservation.

Appendix G – Responsiveness Summary