Basin 9

White River Watershed
Water Quality & Aquatic Habitat
Assessment Report

Updated November 2002

Agency of Natural Resources
Department of Environmental Conservation
Water Quality Division

This publication is an update of the November 1997 White River Watershed Water Quality and Aquatic Habitat Assessment Report. For more information or for a copy of the earlier version, please contact:

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Introduction to the 2002 White River Assessment Report

This copy of the White River Water Quality and Aquatic Habitat Assessment Report is an update of the report done in November 1997. The following information has been added since the 1997 report: lakes and ponds assessment data and information; significant natural communities and rare, threatened and endangered species information; a summary of the watershed's fisheries; a table of the macroinvertebrate sampling sites from 1992 to 2001; a table of the dams in the watershed; and a list of resources and references.

The numbers in this assessment report with respect to miles of threats or lack of full support for designated uses as well as miles affected by various pollutants or activities are not very different than those numbers in the 1997 assessment report. Although there has been a lot of work in the watershed over the past five years, much of that effort that has been monitoring or assessment work that has confirmed with data the problems that were identified earlier based on projections and judgement using land use information or known conditions or activities. Vermont DEC and the many other agencies and organizations working in the watershed have gained a much better understanding of the problems and possible solutions to those problems in the White River watershed over these last five years.

The activity and interest in the White River watershed is what has changed the most in the last 5 years. Since the November 1997 assessment, the White River Partnership has catalyzed formation of a number of stream teams in the watershed who in turn have gotten citizens involved in discussing, monitoring, protecting, restoring, and appreciating their local waters. Data have been gathered from numerous sites on the White River and tributaries in the 2001 and 2002 sampling season by White River Partnership volunteers. The Vermont Department of Environmental Conservation has done biological sampling at a number of sites in addition to those they regularly visit; has been involved in a number of stream and buffer projects including the large Granville stream channel stabilization project; and has worked with the Partnership to highlight the watershed issues and find solutions to specific watershed problems. Vermont DEC has also written a basin plan focused on the White River watershed. The U.S. Forest Service and U.S. Fish and Wildlife Service have been active in a number of protection and restoration projects. The Vermont Department of Fish and Wildlife has done a number of trout population surveys in watershed rivers and streams. The Department has also stocked Atlantic salmon in the White River mainstem.

There is reason to be hopeful that the continued interest and energy of the White River watershed citizens and numerous agencies and organizations on behalf of river and stream water quality and aquatic habitat will be able to counter to a certain extent the trends of population and housing growth and increased development and protect and restore the unique and special resource that is the White River watershed.

General Description of the Basin *

The White River Basin encompasses 710 square miles or approximately 454,400 acres in Vermont draining portions of Addison, Orange, Rutland, Washington, and Windsor Counties. The White River itself is approximately 50 miles long. It originates in the town of Ripton on the slope of Battell Mountain then flows southerly and easterly before emptying into the Connecticut River at White River Junction in the town of Hartford. Vermont Department of Environmental Conservation (DEC) has a count of 457 waterbody miles for the watershed, which includes two mainstem segments (VT09-01 and VT09-02) and five subbasins (VT09-03 through VT09-07).

The White River has five major tributaries: the First Branch with a length of 24 miles and drainage area of 103 square miles; the Second Branch with a length of 20 miles and a drainage area of 74 square miles; the Third Branch with a length of 19 miles and a drainage area of 136 square miles; Locust Creek with a length of 11 miles and a drainage area of 26 square miles; and the Tweed River with a length of 10 miles and a drainage area of 51 square miles.

The dominant land cover in the White River watershed according to data from the Vermont Satellite Land Cover project (1997) is forested land with 385,189 acres or 84% of the watershed area either deciduous, coniferous or mixed forest. Agricultural land including row crops, hay, permanent pasture, and other agricultural uses occupy 32,553 acres or 7% of the watershed area. Developed land, including residential, commercial, industrial, transportation and utilities, covers about 21,145 acres or about 5% of the watershed. Of the developed land area, 86% is transportation or utility uses. Surface water covers 13,708 acres or 3% of the basin and wetland only cover 3,205 acres or 0.7% according to the satellite data analysis. The other two categories identified were brush or transitional (749 acres) and barren land (201 acres).

This breakdown of land cover type is useful for comparisons between the major basins of the state as well as for comparing gross changes in each watershed's land cover over time. The numbers at least over- represent the amount of forested land in a watershed and under represent the amount of developed land because scattered individual homes in wooded areas are not identified as residential but lumped with forested. Scattered residential development is a common land use in many parts of the state and can have significant water quality consequences so additional data sources need also to be drawn upon to refine the above information.

* Some of this general description comes from the 1975 White River Basin Management Plan.

Wetlands of the White River Watershed

There are approximately 3830 acres of National Wetland Inventory mapped or Class I and II wetlands in the White River basin, which is a relatively small area of wetlands for a watershed. Based on project data kept by Vermont DEC since 1990, approximately 15 acres of wetland (either Class I, II, or III) have been altered or lost.

Significant Natural Communities and Rare, Threatened and Endangered Species of the Basin

There are a total of 99 occurrences of species or natural communities in the White River watershed that are considered state significant. Of these 99 occurrences, 60 are plant species, 9 are animal species, and 30 are natural communities. A number of the significant natural communities identified in the White River watershed are communities integrally connected to the White River itself. Three of the community occurrences are Calcareous Riverside Seeps found along the stretch of river that flows through Sharon, Pomfret and West Hartford. Five of the significant community occurrences are Sugar Maple-Ostrich Fern Riverine Floodplain Forest community. One of the community occurrences is the Riverside Sand or Gravel Shore community - a community that is the product of dynamic river systems. Spring flooding or other high water and ice scour shape these often sparsely vegetated depositional communities.

An inventory and study of the state's floodplain forest communities was conducted by the state Natural Heritage Program in 1997 and it was during that inventory that the White River floodplain communities were described. Approximately 514 acres of floodplain forest along the White River, the Third Branch of the White River, and the West Branch of the White River were identified as potential high quality floodplain forest. Along the Third Branch, from Gilead Brook upstream to above Randolph Village, there is a stretch containing a number of significant floodplain forest communities. This 6.5 mile length of floodplain vegetation may be an important wildlife corridor as well as buffer for the aquatic habitat. (See Appendix A for the White River watershed floodplain sites.)

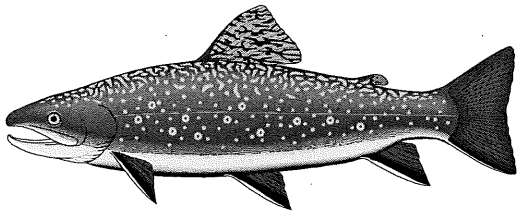
Fisheries of the White River and Its Tributaries

The Department of Fish and Wildlife has conducted trout population surveys of the White River mainstem between 1954 and 2000, however, the following discussion is based on surveys taken between 1972 and 2000. Although non-game fish species were also documented in many of these surveys, the focus below is on naturally reproducing (wild) trout populations. In addition, Atlantic salmon fry have been stocked in some mainstem sections of the White River each spring since about 1993. These populations, usually consisting of 2 or 3 age classes (0+, 1+, and 2+) are also included, although these fish are not the result of natural reproduction. Some White River tributaries also have been stocked with Atlantic salmon since the 1980s. Like the mainstem, these populations usually consist of 2 or 3 age classes.

The mainstem of the White River supports varying population levels of trout. The upper stations, at elevations 1339 and 1200, support relatively low populations of brook trout in contrast with other Vermont streams of similar sizes and elevations. Brown trout were absent in these surveys, while low numbers of rainbow trout also were reported. At elevation 930 in Hancock (the station with the longest period of record), data from 1972-1995 appear to indicate trout populations in this section of the river have declined. Below the confluence of the White with the Tweed, few population surveys have been conducted due to the size of the river. While surveys that have been conducted here have documented species composition as well as size classes present, actual population data are difficult to quantify in this area. Near the town of Sharon, anecdotal evidence from creel surveys indicates anglers fish this area in pursuit of large trout. However, south of this point summer water temperatures may exceed thermal tolerances for many trout and they may be forced into coldwater refuges such as deep pools or tributaries. At this point, smallmouth bass (which rarely exceed 12 inches in total length) appear more frequently in creel surveys. Although Claussen (1978) concludes the majority of spawning occurs in tributary streams, the presence of young-of-the-year (yoy) fish indicates some degree of spawning occurs throughout the mainstem.

The Department of Fish and Wildlife and U.S. Forest Service have coordinated hundreds of fish population surveys of selected tributaries. While the mainstem supports a large population of trout, many tributaries support dense trout populations. White River tributaries generally possess high biomasses of trout, with many stream population estimates exceeding 30 lbs/acre. Other streams have maintained high levels of productivity, with some producing very stable dense populations (>25 lbs/acre) over the last 20 years. Annual recruitment of yoy rainbow trout for example, commonly exceeds 2,000 fish/mile in many streams. Many other small tributaries provide good fisheries for all species of trout, with population estimates exceeding 20 lbs/acre. Tributaries are very important to sustaining naturally reproducing trout populations and account for a considerable amount of recruitment within the White River drainage.

While the White River in Hancock has shown declines in trout populations, other streams in the drainage with declining populations have shown rebounds. In Alder Meadow Brook near Granville, population surveys from 1976 indicated a biomass of 22.1 lbs/acre. Populations declined until 1994, reaching a low of 2.8 lbs/acre. Brown and rainbow trout were both missing from surveys in this year. However, from 1996-2000 there have been overall increases in numbers, with brown and rainbow trout being observed. The most recent survey (2000) shows population levels at over 40 lbs/acre. Since this recovery has taken place naturally over the last six years, it is possible that population declines observed in the upper White River mainstem will rebound.



Exceptional Uses and Values of Basin Rivers and Streams

The entire length of the main stem of the White River, at approximately 50 miles, is the longest free-flowing large river in the state because of the lack of flow-regulating dams. It is unique and significant for this characteristic.

Waterfalls, Cascades and Gorges

Waterfalls, cascades and gorges are abundant in the basin. One of the most well known waterfalls, Moss Glen Falls I, is located on Deer Hollow Brook in Granville Gulf Natural Area. It is actually a high-angle cascade that drops approximately 30' over a rock face 15' to 25' wide. It is a popular scenic attraction on Route 100. Another and equally well-known waterfall is Texas Falls on the Hancock Branch in Hancock. It is a small gorge and cascade with a small falls and some nice pools. The area has been developed by the U.S. Forest Service with trails and picnic areas. Another important waterfall and cascades in the White River watershed is Web Falls and Granville Cascade Chain on Sandusky Brook in Granville.

Cascades, waterfalls, gorges and pools occur in the headwaters of many streams in the basin, including the White River in the Green Mountain National Forest in Granville, on Thatcher Brook in Granville, and on Fletcher Brook in Stockbridge.

Boating

The White River has one of the longest uninterrupted kayak runs on a major river in New England and is known nationally for this fact. From Stockbridge to Bethel, the river is considered a classic Vermont whitewater run. The first three miles from Stockbridge contains intermittent Class II rapids. The last three miles to Bethel are quickwater. From Bethel to the Connecticut River, the river is mostly quickwater, but there are a variety of short drops and narrows and Class II rapids.

The first portion of the First Branch below Chelsea is Class II with a low Class III segment, and is a nice whitewater run. The next segment downstream contains a mile of interesting ledges, followed by a nice touring section. The segment contains a total of 5 ledges from 2' to 4' high.

The Third Branch of the White River is boatable from Roxbury to Randolph. Whitewater boating also takes place on the Hancock Branch, from its confluence with the Robbins Branch to the White River. The Hancock Branch is hydrologically distinguished by being the smallest stream in the state known to be used as a whitewater run. It is a Class II run with some Class III spots, lots of rocks and current.

Fishing

The river and its tributaries play an important role in the Atlantic salmon restoration program, due to the presence of gravel beds and its free-flowing nature. The river is also well used and highly valued for trout fishing opportunities.

Creel surveys were performed in 1971, 1986, 1991, 1992, 1995, 1997 and 1998 along several miles of the mainstem of the White River by the Vermont Department of Fish and Wildlife. Angler effort expended on the White River is very high, ranging from 820 angler hours/mile in the upper section (from the Route 100 bridge in Stockbridge to the Route 100 bridge in Rochester), from 482 to 815 angler hours/mile in the middle section (from the Route 100 bridge in Stockbridge to the Route 107 bridge in Bethel village) to as high as 852 angler hours/mile in the lower section of the river (from the railroad trestle in Hartford upstream to the railroad trestle in Royalton). Average catch rates in the middle section of the river have been good ranging from 0.55 trout per hour in 1971 to 0.94 trout per hour in 1998. In 1994, stocking was discontinued in favor of managing this portion of the river as a wild trout fishery. Special regulations were imposed that limited the creel to one sih and restricted bait usage.

Swimming

An abundance of swimming holes are located in the White River basin. The White River mainstem contains many large holes with jumping ledges, including Big Parker Swimming Hole in Bethel, Twin Bridge Swimming Hole in Gaysville, Little Parker in Stockbridge, plus many other unnamed holes along its entire length. Tubing is also popular along the river, with at least one tube rental establishment in Gaysville. An important swimming hole is located on the Tweed River, near its mouth in Stockbridge. There are swimming holes on the Third Branch in Braintree, and on Locust Creek in Bethel. Wading takes place on the Third Branch at its mouth at the town park in Bethel.

Lakes with Special Significance or Features

Vermont DEC's Lake Protection Classification System is a framework within which lakes can be evaluated for their special significance when compared to other lakes statewide. The Lake Protection Classification System identifies unique lakes based on: wilderness status; occurrence of scenic and natural features; existence of very high water quality; and/or, the presence of rare, threatened and endangered species. One White River Basin lake, North Pond in Brookfield, is notable for its Lake Protection Classification System ranking. Another waterbody, Rood Pond, is notable in that it provides for what would otherwise be relatively scarce recreational potential.

North Pond, Brookfield:
North Pond is a 24 acre warmwater wetland-pond system, which has a remote feeling despite being close to two main roads in Brookfield. Indeed, this pond ranks eight on a scale of 10 for its wilderness-like setting. The pond has three distinct sections, each separated by constrictions in the shoreline. The water is occupied largely by a diverse mix of native macrophytes, and the shoreline itself is undisturbed. A Vermont Association of Snow Travelers snowmobile trail crosses one arm of the pond.

Rood Pond, Williamstown:
While it is not specifically identified by the Lake Protection Classification system, Rood Pond is noteworthy from a recreational standpoint. There are few ponds with boat launches in the White River Basin. Rood Pond, with its boat ramp and handicapped-accessible fishing platform, is an important angling resource in the White River Basin.

Permitted Discharges

Four wastewater treatment facilities (Bethel, Royalton, Chelsea, Randolph) and two fish hatcheries discharge to waters of the White River watershed. There are also thirty-one permitted stormwater discharges in the watershed. Eight of the stormwater discharges go to the White River mainstem (waterbodies VT09-01, VT09-02, and VT09-07); eight go to small tributaries that flow to the lower White River (VT09-03); and the remaining fifteen go to either the First Branch, Second Branch, or Third Branch (VT09-04 to VT09-06). Infiltration swales or vegetated infiltration areas are the dominant treatment required for these permitted stormwater discharges.

A combined sewer overflow (CSO) separation project occurred in Randolph where pipes carrying domestic wastewater and those carrying stormwater are now separated. The water quality benefit is that the pathogens and organic matter from domestic sewage do not go directly to the river during storm events. However, stormwater from the downtown area of Randolph, the first flush of which used to go to the wastewater treatment facility, now goes directly to the Third Branch following a storm along with its attendant pollutants (oil, grease, heavy metals, organics, sand, bacteria...).

Growth in Watershed Towns

Most of the towns in the White River watershed experienced high population and housing growth rates between 1970 and 1980 as well as between 1980 and 1990. The land use changes that are a result of the growing number of houses and people are important in terms of potential and actual water and aquatic habitat impacts. Two tables showing population and housing information from the U.S. Census for the towns that wholly or primarily occur in the White River watershed are in Appendix B.

The rates of population growth in all of the watershed towns from 1970 to 1980 were very high with the lowest growth rate at 11% and the highest in Brookfield and Pittsfield at 58.2% and 59% respectively. From 1980 to 1990, the pace of growth slowed somewhat with the low being the growth rate in Pittsfield of -1.8% and the high in Sharon at 46.2%. From 1990 to 2000, the growth rate slowed somewhat again in all but five towns in the watershed, but still the population grew significantly: only one town had a stable population; only two lost people and the remaining 16 towns grew from 1.7% to 16.5%. Overall, the population of the watershed grew approximately 28.1% between 1970 and 1980, 12.8% between 1980 and 1990 and 7.3% between 1990 and 2000.

The approximate number of housing units in the watershed increased 24.0% from 1980 to 1990 with the greatest increase in new houses occurring in Roxbury, Hartford, and Sharon. Between 1990 and 2000, the number of houses in the watershed increased 7.6% with Washington, Sharon, and Royalton seeing the highest growth rates.

Dams in the Watershed

In the summer of 2001, the Vermont Agency of Natural Resources and Vermont Division for Historic Preservation sponsored a dam assessment in the White River and Lamoille River watersheds. A total of 104 dams were assessed in the White River watershed. Among these, 52 were intact and in good condition, 4 intact and in fair condition , and 6 intact but in poor condition. A total of 39 dams were breached: 28 fully breached (no remnants or abutments only), and 11 partially breached (approximately 75% of dam structure remains, though does not necessarily impound any water). Three dams were beaver dams, and were not fully assessed.

A large number of the dams (58) were earthfill dams creating a ponded impoundment used for recreation. Out of 62 intact dams, 38 consisted of this type of privately owned pond. The majority of these dams were constructed within the last 30 years, many within the last 5-10 years. These possess little or no cultural significance at this time. In the White River watershed, 14 dams are over 50 years old, of which 11 are intact and 3 are partially breached. Out of a total of 38 dams breached (full and partial), at least 13 were known to be hydropower sites. More research would most likely uncover that a much higher number of dams were actually used for hydropower. Out of 104 dams, only 16 currently demonstrate some kind of cultural or historical significance.

River Water Quality and Aquatic Habitat Impacts and Threats

Status of Support of Designated Uses

Aquatic biota and habitat is the most affected designated use in the White River basin with approximately 104 miles threatened and 33 miles partially supported. It follows that aquatic habitat, which sustains the web of aquatic life in the White River and its tributaries, is threatened and impaired because sedimentation and temperature increases top the list of potential or actual problems. Pathogens are affecting swimming as a use for 28 miles and are a threat to this use for 41 miles. The source of the bacteria used to indicate presence of pathogens is not known in most locations. Aesthetics are only partially supported for 33 miles and are threatened on 82 miles.

Table I. Designated Use Support Status for Rivers and Streams

Use	Miles fully supported	Miles with threats	Miles partially supported	Miles not supported
Overall	319.6	104.7	33.0	0
Aquatic biota/habitat	320.5	103.8	33.0	0
Swimming	388.3	41.0	28.0	0
Secondary contact recreation	433.3	24.0	0	0
Aesthetics	342.3	82.0	33.0	0
Drinking water	456.7	0.6	0	0
Agriculture water supply	456.7	0.6	0	0
Fish consumption	0	457.3	0	0

Causes and Sources of Impairment or Threats to Water Quality or Aquatic Life

The greatest cause of partial or non-support of one or more of the designated uses of Vermont's waters in the White River watershed is sedimentation (siltation), which is also the most significant cause of impairment to rivers and streams statewide. As shown in the Table II below, sedimentation has an impact on at least 33 miles of Basin 9 waters and it threatens over 100 more miles. The sources of these sediments include the top sources listed in Table III: streambank de-stabilization (often first through loss of riparian vegetation), agriculture, and, likely, road maintenance and runoff.

Pathogens are the second greatest impact and third greatest threat to a designated use in the watershed - the use in this case being contact recreation or swimming.

Nutrients are the third greatest impact and threat to the White River and its tributaries and the source of the nutrients is primarily agricultural land runoff especially where there are no bufferstrips. Nutrients enter surface waters either as part of organic material that gets to surface waters, are dissolved in surface runoff or are attached to soil particles or sediment that reach streams and rivers.

Turbidity and then physical habitat alterations are next on the list of top causes of impact although these are not quite as widespread as the problems discussed above. Turbidity has been identified as a problem on 16 ½ miles and physical habitat alterations are a problem on 16 miles and threaten another 21 identified miles.

Thermal modification or increased water temperature is the sixth greatest impact but second greatest threat, in terms of river miles affected, to aquatic biota and habitat in the watershed. An increase in water temperatures results primarily from the loss of riparian vegetation that, when intact, shades the river and streams keeping water temperatures in a range to which the fish and aquatic organisms have adapted. Warmer water can also be a consequence of stormwater runoff from paved areas or occur in portions of the river where channel instability or instream activity have resulted in wider, shallower waters and fewer pools and riffles.

Table II. Causes of Impairments or Threats to Water Quality

Code	Cause	High Impact (miles)	Moderate or Slight impact (miles)	Total Impact (miles)	Threats (miles)
1100	Siltation	16.0	17.0	33.0	102.3
1700	Pathogens	---	26.5	26.5	39.0
900	Nutrients	---	26.5	26.5	18.5
2500	Turbidity	1.5	15.0	16.5	0
1600	Physical habitat alterations	1.0	15.0	16.0	21.0
1400	Thermal modifications	---	9.5	9.5	75.0
2600	Exotic species	---	---	---	24.0
500	Metals	---	---	---	8.0
1000	pH	---	---	---	7.5
300	Priority organics	---	---	---	0.6

As mentioned in the discussion on causes of impacts and threats, the top three sources of impacts or threats to water quality and aquatic habitat are streambank de-stabilization, removal of riparian vegetation, and agricultural-related activities. These are related sources in the White River watershed because land as pasture or in hay or corn often results in loss of riparian vegetation and then in many areas, the resulting streambank de-stabilization. However, some of the streambank instability is a result of greater systemwide channel instability not just a result of the lack of woody vegetation and its root systems - channel instability ranks as the fourth greatest documented impact or threat although it will likely rank higher once more geomorphic assessment is completed in this watershed.

Road maintenance and runoff is known to affect only 4 miles, but is listed as threatening many miles (59) of river and stream. It is likely that roads and road maintenance activities are resulting in sedimentation, buffer vegetation loss, and thermal modifications, however, the contributions from this source have not been quantified or documented.

Table III. Sources of River Water Quality Problems or Threats

Code	Source	High impact (miles)	Moderate or Slight (miles)	Total Impact (miles)	Threats (miles)
7700	Streambank de-stabilization	26.5	---	26.5	58.2
7600	Removal of riparian vegetation	---	26.5	26.5	49.0
1000	Agriculture	---	26.5	26.5	48.0
7550	Channel Instability	0	15.0	15.0	12.0
8300	Road maintenance and runoff	---	4.0	4.0	59.1
7100	Channelization	1.0	---	1.0	---
7200	Dredging	1.0	---	1.0	---
7800	Drainage/filling of wetlands	---	1.0	1.0	---
9000	Unknown source	---	---	---	12.5
8100	Atmospheric deposition	---	---	---	7.5
3200	Land development	---	---	---	5.0

Lake and Pond Water Quality and Aquatic Habitat Impacts and Threats

The White River Basin has relatively few lakes. Only four of Vermont's 17 major river basins contain fewer lake and pond acres. There are 39 lakes and ponds in the White River Basin, comprising 501 acres. Four hundred-eighteen of these acres are considered 'significant' waters and are tracked in Vermont DEC's Lake Assessment Database (though 34 of these acres remain unassessed for certain uses). Of these 418 acres, 253 are monitored, while 165 acres are evaluated.*

Designated Use Support Status

Overall, there are 89 lake acres in Basin 9 which only partially support one or more uses, and no acres on which one or more uses are precluded. There are 295 assessed lake and pond acres in Basin 9 that support all designated uses. Table IV contains the lake acres where designated uses are supported, threatened, or not fully supported.

Table IV. Designated Use Support for Lakes in the White River Basin.

Use	Acres Fully Supporting Uses	Supporting Acres with Uses Threatened	Acres Partially Supporting Uses	Acres Not Supporting Uses	Acres Not Assessed
Overall Uses	167	128	89	0	34
Aesthetics	200	184	0	0	34
Aquatic Life Use Support	167	131	86	0	34
Agricultural Water Supply	0	0	0	0	418
Drinking Water Supply	0	0	0	0	52
Fish Consumption	394	0	0	0	27
Filtered Water Supply	0	0	0	0	418
Industrial Water Supply	0	0	0	0	418
Secondary Contact Uses	202	182	0	0	34
Swimming Uses	200	184	0	0	34

The principal cause of impairment to lakes in the White River Basin is water level fluctuation, which impairs aquatic life uses on one lake as discussed below. Critically low pH of two ponds impairs 2 lake acres, and threatens an additional 30. Siltation is noted as a threat to uses for 91 acres, though some reassessment of these threatened acres is warranted. The risks associated with potential infestation by exotic species (primarily Eurasian watermilfoil, but also zebra mussels) threaten 70 lake acres. Table V provides an accounting of the causes of impacts to lakes in this basin.

*Monitored data are from in-lake sampling whereas evaluated data are from observed conditions, modelled results, or the professional opinion of a biologist or other scientist.

Table V. Causes of Impacts to Lakes in the White River Basin.

Cause of impact	Acreage by Magnitude of Impact			Total Acres Not Fully Supporting	Total Acres Threatened
	High	Moderate	Minor		
0900 Nutrients					43
1000 pH	2			2	30
1100 Siltation					91
1500 Flow alteration	84			84	3
2200 Noxious aquatic plants – Native					15
2210 Noxious aquatic plants – Algae					40
2300 Filling and Draining					3
2600 Exotic Species					70

The major sources of these impairments are hydromodification, which affects 84 acres, and atmospheric deposition which impairs 2 critically acid sensitive acres and threatens 30 acres. Road maintenance is noted as a potential source of threats for 99 acres, and recreational boating is noted as the principal source of threats related to exotic species infestations. Table VI summarizes the sources of impairments to designated uses in the White River Basin.

Table VI. Sources of impacts to lakes in the White River Basin.

Source of Impact	Acreage by Magnitude of Impact			Total Acres Not Fully Supporting	Total Acres Threatened
	High	Moderate	Minor		
1000 AGRICULTURE					15
4000 URBAN RUNOFF/STORM SEWERS					15
4300 Other Urban Runoff					15
4600 Erosion and Sedimentation					3
7000 HYDROMODIFICATION	84			84	3
7400 Flow Regulation/Modification	84			84	3
7600 Removal of Riparian Vegetation					2
7900 MARINAS AND RECREATIONAL BOATING					70
7910 In-Water releases					70
8100 ATMOSPHERIC DEPOSITION	5			5	27
8300 HIGHWAY MAINTENANCE AND RUNOFF					99
8530 INTERNAL NUTRIENT CYCLING (LAKES)					25
8600 NATURAL SOURCES	2		3	5	10
9070 VT-UNSPECIFIED NONPOINT SOURCE					28

To provide background information on individual lakes in this basin, a summary of overall use support by individual lake is provided in Table VII. Nine lakes in the basin are considered monitored, meaning that new water quality data are available from within the past five years. The following paragraphs describe the most important impacts and threats to specific White River Basin lakes.

Table VII. Overall Use Support by Individual Lake with the White River Basin

Lake Name	Lake Area (ac)	Last Assessed (YYYYMM)	Assessment Type	Acres in Full Support	Acres Partially Supporting	Acres Not Supporting
ANSEL	2	200009	Evaluated	2	0	0
BEAVER MEADOWS	3	200009	Evaluated	3	0	0
CHAMPAGNE	3	200009	Monitored	3	0	0
COLTON	27	200009	Monitored	27	0	0
CRESCENT	20	200009	Evaluated	20	0	0
HANCOCK MT;	14	200009	Evaluated	14	0	0
HOLDENS	10	200009	Evaluated	10	0	0
KEYSER;	7	200009	Evaluated	7	0	0
KINGS	4	200009	Evaluated	4	0	0
LAMSON	24	200009	Evaluated	24	0	0
MCINTOSH	23	200009	Monitored	23	0	0
MITCHELL	28	200009	Monitored	28	0	0
MUD (BRAINT)	10	200009	Evaluated	10	0	0
NORTH (BRKFLD)	24	200009	Monitored	24	0	0
NORTH (CHITDN)	3	200009	Evaluated	3	0	0
PICKLES	17	200009	Evaluated	17	0	0
RANDOLPH-N;	10	200009	Evaluated	0	0	0
ROOD	23	200009	Monitored	23	0	0
ROXBURY FLAT;	13	200009	Evaluated	0	0	0
ROYALTON HILL;	11	200009	Evaluated	0	0	0
SILVER (BARNRD)	84	200009	Monitored	0	84	0
SKYLIGHT	2	200002	Evaluated	0	2	0
SOUTH (BRKFLD)	16	200009	Monitored	16	0	0
STAPLES	15	200009	Evaluated	15	0	0
SUNSET (BRKFLD)	25	200009	Monitored	25	0	0

North Pond, Chittenden:
This 3 acre pond located near the spine of the Green Mountains is threatened by acid deposition due to its low alkalinity of 3.7 mg/l. This is largely natural, a manifestation of this pond's high elevation and geological setting. Atmospheric deposition of acid-inducing pollutants such as nitrous oxide and sulfur dioxide exacerbates the acidification potential in this lake.

Silver Lake, Barnard:

This 84 acre lake is considered threatened by eutrophication due to nutrients and sedimentation, which are attributed to cumulative development within the Silver Lake watershed. It is noteworthy that the Silver Lake Association, a group of citizens with a strong interest in improving the lake's water quality, has been instrumental in reducing sediment and nutrient runoff from roads in the watershed, and is active in monitoring long-term water quality indicators. Water levels on this lake are manipulated by the dam which is owned by Vermont DEC. Consistent with a 1968 Water Resources Board rule, the lake is drawn down by 1.5 feet during winter. Due to this annual drawdown, Silver Lake only partially supports aquatic life uses.

Skylight Pond, Ripton:

This tiny 2 acre pond, located near the spine of the Green Mountains only partially supports aquatic life uses due to extreme acid sensitivity. The lake's alkalinity has been measured at 0.3 mg/l. This is partially natural, a manifestation of this pond's high elevation and geological setting, but atmospheric deposition of acid-inducing pollutants such as nitrous oxides and sulfur dioxide exacerbates acidification in this lake.

Sunset Pond, Brookfield:

This 25 acre lake exhibits a water quality condition known as meromixis, whereby the lake does not fully mix, or turn over, as most Vermont lakes do every spring and fall. This condition is most often found in lakes which are quite deep relative to their surface area, meaning that they have a steep-sided, almost conical configuration. Meromixis, or the lack of mixing, means that the deeper layers of the water column remain perpetually oxygen starved. A result of this condition is that the underlying sediments often release previously accumulated nutrients. Over time, concentrations of nutrients and other dissolved compounds build to such a degree, and rise sufficiently high in the water column, that they become available to algae, which can in turn bloom. On at least two occasions in the past 5 years, blooms of the nuisance cyanobacteria (blue-green algae) *Oscillatoria rubescens* have been observed on Sunset Pond. The swimming use is considered threatened on this pond. Norwich University research studies have found a relatively high rate of sediment movement through Sunset pond over time. The degree to which this sediment affects the lake's meromixis is unknown.

Selected Activities or Projects in the White River Watershed

White River Partnership Monitoring Program

The White River Partnership has coordinated and implemented a watershed monitoring program in the 2001 and 2002 sampling seasons. Temperature, *E. coli*, conductivity and turbidity were sampled at 23 sites along the White River mainstem as well as on the three branches and several other tributaries. Samples were taken weekly by over 30 volunteer monitors.

Watershed Geomorphic Assessments

Geomorphic assessments have been done on the Third Branch, First Branch, and between Stockbridge and Bethel on the mainstem of the White River. The Third Branch was assessed by a team of professionals led by staff from the Natural Resources Conservation Service. A report summarizing their findings and results was produced in February 2001.

The Agency's Geology and Water Quality Divisions and the Partnership has expanded the fieldwork done by USDA to include fluvial geomorphological information on all of the 43 tributaries of the Third Branch. This work, which is in progress, may be used to produce the following:

- a map of hazard areas including flood and erosion hazard areas; and
- a specific plan for channel protection, management, and restoration along the Third Branch.

A hazard map would identify areas of high risk for bank failure and erosion during flooding. With these maps, towns can clearly identify areas where development may be an unadvisable investment. The Vermont Geologic Survey plans to work with towns to produce a hazard map for the Third Branch of the White River Basin.

In spring 2002, citizen volunteers were trained to do Phase II geomorphic assessments. The volunteers assessed the First Branch and the mainstem between Stockbridge and Bethel in summer 2002.

River Stabilization and Buffer Re-establishment Projects

There has been much river and stream channel and corridor restoration work in the watershed since the 1997 water quality and aquatic habitat assessment report was written. A large restoration project took place on the Third Branch of the White River above and below the footbridge at Randolph Recreation Park. Eroding banks were stabilized, the river was narrowed and pools created to re-establish fish habitat, and trees and shrubs were planted along the banks.

Another large project with a number of partners took place in Granville. "Natural channel design" techniques were employed on this upper section of the White River resulting in a stable section of river through the village of Granville and downstream. Buffers and access to a floodplain were re-established for this portion of river.

Summary

The White River and its tributaries are important waters for both aquatic life and habitat as well as for people's use and enjoyment of its fishery, swimming holes, boating runs, and aesthetic. The mainstem is a unique river in that it is the only free flowing river of its size in the state. This free-flowing characteristic should be protected. The White River is also a working river providing an opportunity for meeting agricultural water needs, assimilating wastewater, and transporting stormwater.

The major threats and impacts to the White River system include: siltation from eroding streambanks, road runoff and other adjacent land uses, which fills in portions of the stream bed affecting macroinvertebrate and fish habitat; riparian vegetation removal that results in water temperature increases, bank instability, loss of the buffer filtration function, and habitat effects (instream and riparian); and diminished physical habitat for a healthy, self-sustaining fishery and other life due to channel instability as well as to the sediment inputs mentioned above. Past instream disruptions such as gravel mining and dredging following flood events as well as watershed land use history set off the instability seen in parts of the watershed today. The White River system is in a state of adjustment and recovery from extensive gravel removal in years past but affecting that recovery are the new sources of sediment filling in riffles and pools and altering channel capacity and dynamics.

Addressing the two major causes of water quality and aquatic habitat impairment in the White River watershed is difficult because of the widespread nature of the problem, however, a low technology, relatively straightforward means of addressing both siltation, temperature, and many nutrient impacts exists in the action of protecting and restoring riparian corridor vegetation. Channel stabilization and instream habitat restoration often involves a more intensive effort in terms of financial and technical resources. Many watershed citizens along with the White River Partnership, U.S. Forest Service, U.S. Fish and Wildlife Service, Natural Resources Conservation Service and Vermont Departments of Environmental Conservation and Fish & Wildlife, however, are involved in projects addressing the need for streambank stabilization, channel stabilization and riparian vegetation re-establishment. Many watershed citizens also have a new appreciation of, and connection to, the watershed in which they live and work and it is that connection that provides the longterm protection the watershed will need in the face of change.

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Appendix A

White River Floodplain Communities

Vermont Floodplain Forest Inventory Master List
Nongame and Natural Heritage Program, 1997

WHITE RIVER WATERSHED

Site #	Town	Quad.	Site/Location	Priority	Description	Source	Aerial Recon.	Site Visit 1997
1 White	Hartford	4307263	Centerville Floodplain	M	40 acres of young floodplain forest between railroad tracks and river; some shrubby, some open water	NWI, CIR	Y	Y
2 White	Hartford	4307264	White River Floodplain at Dimick Brook	M-H	5 acre floodplain forest in apparent undisturbed condition at mouth of Dimick Brook; upstream end of forest extends under I-89; upland buffer generally intact	NWI, CIR	Y	Y
3 White	Hartford	4307264	West Hartford Floodplain	M	10-12 acres of floodplain forest on point bars and mid-channel island; nice rock outcrops along shoreline	NWI, CIR	Y	Y
4 White	Sharon	4307274	White River WMA Floodplain	H	45 acres of high quality floodplain forest on both sides of river over 1.5 mile stretch; forest is dominated by silver maple and cottonwood	NWI, CIR	Y	Y
5 White	Royalton	4307275	South Royalton Floodplain	H	40 acres of floodplain forest on both banks of river and on two islands; some adjacent ag. land; southern area is young forest	NWI, CIR	Y	Y
6 White	Royalton	4307275	Royalton Floodplain	M	15 acres of floodplain forest on point bars and islands; roads and residential development adjacent	NWI, CIR	Y	Y
7 White	Royalton	4307275	North Royalton Floodplain	M	25 acres of floodplain forest in small, narrow bands along edge of river and on a 10 acre mid-channel island; ag. fields, roads, and residential development abut the riverside remnants	NWI, CIR	Y	N
8 White	Bethel	4307276	Bethel Confluence Floodplain	M	12 acres of floodplain forest in narrow strip on north side of river with railroad tracks adjacent, and on west side of Third Branch at base of steep slope; both area young forest of boxelder	NWI, CIR	Y	Y
9 White	Bethel	4307276	Lower Third Branch Floodplain	H	25 acres of floodplain forest on both sides of river; nice riverine complex with larger units of forest 6-8 acres	NWI, CIR	Y	Y
Note: There are extensive areas (200 + acres) of nearly continuous floodplain forest along the Third Branch White River from its confluence with Gilead Brook upstream to above Randolph village. This stretch is best considered one site although it extends for nearly 5.5 miles. Some forests appear young. As a corridor, this may be a very important site. For convenience in reporting, it is separated into subsites 10 White through 15 White.								
10 White	Bethel	4307286	Bethel Bends Floodplain	H	20 acres of floodplain forest associated with several oxbows; some adjacent ag. fields, one unit with intact upland buffer	NWI, CIR	Y	Y
11 White	Bethel/ Randolph	4307286	Third Branch Townline Floodplain	H	35 acres of floodplain forest on meanders and oxbows; some of meanders have resulted in abandonment of adjacent ag. land; several areas with steep, forested upland buffers	NWI, CIR	Y	Y
12&13 White	Randolph	4307286	Golf Course Floodplain	M	55 acres of floodplain forest on meanders and oxbows; ag. land and golf course adjacent, separating most areas from the upland buffer; largest forested unit 12 acres	NWI, CIR	Y	Y

14 White	Randolph	4307286	Third Branch Floodplain at Ayers Brook	L	10 acres of shrubby floodplain forest just upstream of Randolph village; some conifer component	NWI, CIR	Y	N
15 White	Randolph	4307286	Randolph Village Floodplain	H	80 acres of floodplain forest from confluence with Ayes Brook upstream to Braintree town line; several areas with intact forests and upland buffers are 20+ acres; provides a corridor through Randolph village	NWI, CIR	Y	Y
15.5 White	Braintree	4307286	East of Campground Floodplain	L	less than 5 acres of floodplain forest; intact upland buffer of mature forest	aerial recon.	Y	N
16 White	Braintree	4307286	Third Branch at Rifford Brook South	M	15 acres of low and high terrace floodplain forest; old river channel on north side; intact uplland buffer; much of floodplain and terrace has been recently logged	NWI, CIR	Y	Y
17 White	Braintree	4307286	West Braintree Floodplain	M	9 acres of floodplain forest on upper portion of Third Branch; two small units on east side have intact upland buffers, but all areas are yougn forest	NWI, CIR	Y	N
18 White	Bethel	4307276	White River Fish Hatchery Floodplain	L	8-10 acres of floodplain forest in narrow band along river	NWI, CIR	N	N
19 White	Bethel	4307276	Townline Floodplain	L	8 acres of young floodplain forest just north of Stockbridge town line	NWI, CIR	N	N
20 White	Stockbridg	4307276	Gaysville Floodplain	M	20 acres of young floodplain forest with high water channels and extensive gravel bars	NWI, CIR	N	Y
21 White	Rochester	4307277	Talcville Floodplain	L	6 acres of young floodplain forest with disturbance from farm road and ag. field within the floodplain	NWI, CIR	N	N
22 White	Rochester	4307277	West Branch White River Floodplain	M	7-8 acres of young floodplain forest and more mature high terrace forest on meander of lower West Branch; intact upland buffer, but small ag. field upstream	NWI, CIR	N	Y
23 White	Rochester	4307277	Thunder Head South Floodplain	L	20 acres of shrubby floodplain forest with one acre interior pool	NWI, CIR	N	N

This list of floodplain forest sites has been generated based on information gathered by the Vermont Nongame and Natural Heritage Program during initial reconnaissance and during detailed site surveys conducted during the summer and fall of 1997. Sites on private property were only visited with specific landowner approval. More detailed information on individual sites is available from the Vermont Nongame and Natural Heritage Program; contact Eric Sorenson by phone (802-241-3714) or e-mail (esorenson@fpr.anr.state.vt.us). This project was funded by a U.S. E.P.A. State Wetlands Protection Grant.

Appendix B

Population and Housing Data

Table B.1. Population of White River Watershed Towns

Town	1970	1980	1970-80 increase	1990	1980-90 increase	2000	1990-00 increase
Brookfield*	606	959	58.2%	1089	13.6%	1222	12.2%
Chelsea	983	1091	11.0%	1166	6.9%	1240	6.4%
Washington*	667	855	28.2%	937	9.6%	1047	11.7%
Roxbury*	354	452	27.7%	575	27.2%	576	0.2%
Granville*	255	288	12.9%	309	7.3%	303	-1.9%
Braintree	751	1065	41.8%	1174	10.0%	1194	1.7%
Randolph	3882	4689	20.8%	4764	1.6%	4853	1.9%
Tunbridge*	791	925	16.9%	1154	24.8%	1309	13.4%
Hancock*	283	334	18.0%	340	1.8%	382	12.4%
Rochester	884	1054	19.2%	1181	12.0%	1171	-0.8%
Bethel	1347	1715	27.3%	1866	8.8%	1968	5.5%
Royalton	1399	2100	50.1%	2389	13.8%	2603	9.0%
Sharon*	541	828	53.0%	1211	46.2%	1411	16.5%
Pittsfield	249	396	59.0%	389	-1.8%	427	9.8%
Stockbridge	389	508	30.6%	618	21.7%	674	9.1%
Barnard*	569	790	38.8%	872	10.4%	958	9.9%
Pomfret*	620	856	38.1%	874	2.1%	979	12.0%
Hartford*	6477	7963	22.9%	9404	18.1%	10385	10.4%
Chittenden*	646	927	43.5%	1102	18.9%	1182	7.3%
Watershed	21,693	27,795	28.1%	31,414	13.0%	33,884	7.3%

* towns, the majority of which are in the watershed. The other towns are completely within the watershed.

Table B.2. Housing Units of White River Watershed Towns

Town	1980 housing units	1990 housing units	1980-90 increase	2000 housing units	1990-2000 increase
Brookfield*	457	565	23.6%	602	6.5%
Chelsea	510	610	19.6%	657	7.7%
Washington*	384	447	16.4%	528	18.1%
Roxbury*	229	335	46.3%	362	8.1%
Granville*	201	210	4.5%	218	3.8%
Braintree	507	570	12.4%	567	-0.5%
Randolph	1669	1830	9.6%	1905	4.1%
Tunbridge*	499	655	31.3%	679	3.7%
Hancock*	198	201	1.5%	214	6.5%
Rochester	662	737	11.3%	768	4.2%
Bethel	823	888	7.9%	956	7.7%
Royalton	975	1161	19.1%	1281	10.3%
Sharon*	413	578	40.0%	663	14.7%
Pittsfield	298	401	34.6%	393	2.0%
Stockbridge	413	488	18.2%	528	8.2%
Barnard*	555	607	9.4%	629	3.6%
Pomfret*	404	490	21.3%	535	9.2%
Hartford*	3483	5026	44.3%	5502	9.5%
Chittenden*	449	538	19.8%	585	8.7%
Watershed	13,129	16,337	24.4%	17,572	7.6%

* towns, the majority of which are in the watershed. The other towns are completely within the watershed.

Appendix C

Macroinvertebrate Sampling Sites 1992 - 2001

Table C.1. Macroinvertebrate Sampling Sites on the White River 1992 - 2001

Wbid	Name	Town	Mile Point	Date	Assessment
VT09-01	White River	Hartford	1.9	09/92	Excellent
VT09-01	White River	Sharon	14.0	10/97	Good
VT09-01	White River	Sharon	14.0	10/98	Fair
VT09-01	White River	Sharon	14.0	09/99	Good
VT09-01	White River	Sharon	14.0	09/01	Good
VT09-02	White River	Bethel	26.9	09/01	Good-Fair
VT09-02	White River	Stockbridge	32.4	10/93	Excellent
VT09-02	White River	Stockbridge	32.4	10/94	Excellent
VT09-02	White River	Stockbridge	32.4	9/95	Excellent
VT09-02	White River	Stockbridge	32.4	9/96	Excellent
VT09-02	White River	Rochester	43.7	09/01	VG-Good
VT09-04	First Branch	Tunbridge	6.6	09/01	VG-Good
VT09-04	First Branch	Chelsea	15.1	09/92	Very Good
VT09-04	First Branch	Chelsea	15.1	09/01	VG-Good
VT09-04	First Branch	Chelsea	16.8	09/01	VG-Good
VT09-04	First Branch	Chelsea	21.0	09/01	Excellent
VT09-04	Cram Brook	Chelsea	0.7	09/01	VG-Good
VT09-04	Jenkins Brook	Chelsea	0.3	09/01	Excellent
VT09-05	Second Branch	Royalton	0.1	09/01	Very Good
VT09-05	Second Branch	Randolph	18.0	09/01	Very Good
VT09-05	Kingsbury Brook	Randolph	0.5	09/01	Fair
VT09-05	Blaisdell Brook	Randolph	1.6	09/01	Very Good
VT09-05	Snows Brook	Randolph	0.7	9/97	Good
VT09-05	Snows Brook	Randolph	0.7	09/01	Good
VT09-05	Third Branch	Randolph	8.5	09/01	Good
VT09-06	Third Branch	Randolph	9.5	8/93	Good
VT09-06	Third Branch	Randolph	9.5	09/01	Good

Wbid	Name	Town	Mile Point	Date	Assessment
VT09-06	Third Branch	Randolph	9.9	08/93	VG-Excellent
VT09-06	Third Branch	Randolph	10.2	08/93	VG-Excellent
VT09-06	Third Branch	Randolph	12.7	09/97	VG-Excellent
VT09-06	Third Branch	Braintree	18.1	09/93	Excellent
VT09-06	Gilead Brook	Bethel	2.0	09/01	Excellent
VT09-06	Smith Brook	Randolph	0.1	09/01	Poor
VT09-06	Ayers Brook	Randolph	0.3	09/97	VG-Good
VT09-06	Ayers Brook	Randolph	0.3	09/01	Good
VT09-06	Ayers Brook	Randolph	4.5	09/01	Fair-Good
VT09-06	Adams Brook	Randolph	1.5	09/97	Fair
VT09-06	Adams Brook	Randolph	1.5	09/01	Good
VT09-06	Spear Brook	Randolph	0.1	09/97	Fair
VT09-06	Spear Brook	Randolph	0.1	09/01	Good
VT09-06	Spear Brook	Randolph	1.1	09/97	Good
VT09-06	Cold Brook	Brookfield	1.1	10/01	Fair-Poor
VT09-06	Open Meadow Brook	Brookfield	0.2	09/01	Excellent-VG
VT09-07	Stony Brook	Stockbridge	1.9	09/01	Very Good
VT09-07	Perkins Brook	Stockbridge	0.1	09/01	Excellent-VG
VT09-07	West Branch Tweed	Pittsfield	1.4	10/00	Very Good
VT09-07	West Branch Tweed	Pittsfield	1.4	09/01	Excellent
VT09-07	West Branch White	Rochester	0.5	11/00	Excellent
VT09-07	Bingo Brook	Rochester	1.3	10/99	Very Good
VT09-07	Bingo Brook	Rochester	1.3	09/00	Excellent
VT09-07	Bingo Brook	Rochester	1.3	09/01	Excellent-VG
VT09-07	Smith Brook	Goshen	1.3	09/97	Excellent
VT09-07	Smith Brook	Goshen	1.3	09/98	Excellent
VT09-07	Smith Brook	Goshen	1.3	09/99	Excellent
VT09-07	Smith Brook	Goshen	1.3	10/99	Excellent

Wbid	Name	Town	Mile Point	Date	Assessment
VT09-07	Smith Brook	Goshen	1.3	09/00	Excellent
VT09-07	Smith Brook	Goshen	1.3	09/01	Very Good
VT09-07	Horrid Brook	Goshen	0.1	09/97	Excellent
VT09-07	Marsh Brook	Rochester	0.1	09/01	Very Good
VT09-07	Howe Brook	Hancock	0.3	09/99	Fair
VT09-07	Howe Brook	Hancock	0.3	09/00	Good
VT09-07	Howe Brook	Hancock	0.3	09/01	Excellent-VG

Appendix D

Dams in the White River Watershed

Appendix D
Dams Assessed in the White River Basin

State ID	Dam Name	Town	Condition	Type/Material	Construction Date		Purposes		Remarks
					Current	Original Dam on Site	Original	Current	
White River Basin									
11.01	Silver Lake	Barnard	Intact/good	RE/RECN	1968	1860	HP	R	foundations downstream
11.06	unnamed	Barnard	Beaver dam	n/a	U	U	U	U	
11.96	unnamed	Barnard	Intact/good	RE/RE	U	U	R	R	private pond
11.97	Stone Cottage	Barnard	Intact/good	RE/RE	1980	1980	R	R	private pond
11.98	Sayer Woods	Barnard	Intact/good	RE/RE	c. 1975	U	R	R	private pond
21.01	Bethel Mills	Bethel	Intact/good	PG/CN	1941	c. 1780	HP	HE	
21.02	Ansel Pond	Bethel	Intact/good	RE/RE	1969	U	R	R	
21.03	Hyde	Bethel	Intact/poor	PG/CN	c.1900	U	HP	NU	mill building in poor condition remains
21.04	Bethel-4	Bethel	Full breach	U	U	U	U	NU	nothing remains at site
21.07	Kellog	Bethel	Full breach	U	U	U	U	U	nothing remains at site
21.97	Unnamed	Bethel	Part breach	PG/STMS	c. 1940	c. 1940	HE	NU	owner interested in removal
21.98	Unnamed	Bethel	Intact/good	RE/RE	c. 1940	1940 & 1960	I	R	nothing remains of former use
21.99	Unnamed	Bethel	Intact/good	RE/RE	U	U	R	R	private pond
25.01	Unnamed	Braintree	Full breach	U	U	U	U	NU	nothing at site
25.02	Bass	Braintree	Full breach	U	U	U	H	NU	foundations at site
25.03	Wain	Braintree	Intact/good	RE/RE	c. 1970	c. 1970	R	R	private pond
25.04	Delaney	Braintree	Intact/good	RE/RE	c. 1970	c. 1970	R	R	private pond
25.05	Braintree-5	Braintree	Intact/good	RE/RE	1985	c. 1940	R	NU	private pond
25.06	Unnamed	Braintree	Intact/good	RE/RE	U	U	R	R	camp pond
25.99	Unnamed	Braintree	Intact/good	RE/RE	c. 1970	c. 1970	R	R	private pond
32.02	North Pond (upper)	Brookfield	Beaver dam	n/a	U	U	U	U	beaver dam built up on man-made dam
32.03	North Pond (lower)	Brookfield	Part breach	PG/STMS	U	U	U	U	beaver dam built up on man-made dam
32.04	Sunset Lake	Brookfield	Intact/good	RE/RESTMS	U	1850	HP	R	much of dam original, with some repairs
32.05	Holdens Pond	Brookfield	Intact/good	RE/STMSCN	1998 (rep)	1932	HE	R	some remnants of former use
32.07	Brookfield-7	Brookfield	Intact/poor	RE/RE	U	U	U	U	
32.08	Chase	Brookfield	Intact/good	RE/RE	c. 1980	U	U	A	

State ID	Dam Name	Town	Condition	Type/Material	Construction Date		Purposes		Remarks
					Current	Original Dam on Site	Original	Current	
32.09	Sunset Brook	Brookfield	Part breach	PG/STMS	c. 1858	c. 1858	HP	U	beaver dam built up on man-made dam
32.10	Unnamed	Brookfield	Intact/good	RE/RE	U	U	R	R	private pond
32.11	unnamed	Brookfield	Part breach	PG/STMS	c. 1850	c. 1850	HP	NU	
32.12	Brookfield-12	Brookfield	Intact/good	RE/RE	U	U	R	R	private pond
32.13	unnamed	Brookfield	Intact/good	RE/RE	U	U	R	R	private pond
47.01	Chelsea Mill	Chelsea	Full breach	U	n/a	c. 1820	HP	NU	mill building remains c. 1940
47.02	Keyser	Chelsea	Intact/good	RE/RE	1963	1963	R	R	private pond
47.03	Whitney	Chelsea	Full breach	PG/STMSCN	U	U	HP	U	abutments
47.04	Lyons Mill	Chelsea	Full breach	U	U	U	U	NU	nothing found at site
47.05	Reed Mill	Chelsea	Part breach	PG/STMSRE	U	1788	HP	NU	marker on site
47.06	Jones Pond	Chelsea	Part breach	n/a	U	U	U	U	beaver dam constructed in breach
47.07	unnamed	Chelsea	Full breach	U	U	U	U	U	nothing remains
47.08	Lonely Dell	Chelsea	Intact/good	RE/RE	c. 1980	U	U	R	private pond
92.01	Camp Killooleet	Hancock	Intact/good	RE/RETC	1980	1912	R	R	many original camp buildings remain
92.02	Camp Killooleet Diversion	Hancock	Intact/fair	PG/CN	1912	1912	R	R	
94.09	Hartford Woolen Co.	Hartford	Full breach	U	U	U	U	U	concrete remnant
94.10	Podunk Brook	Hartford	Full breach	PG/STMS	U	U	U	U	some remnants
157.01	Freeman	Pomfret	Intact/good	RE/RE	1962	1962	R	R	private pond
157.03	McCord	Pomfret	Intact/good	RE/RE	1962	1962	R	NU	private pond
157.04	unnamed	Pomfret	Intact/good	RE/RECN	U	U	AS	AS	private pond
157.05	unnamed	Pomfret	Intact/poor	RE/REST	U	U	U	U	
157.98	unnamed	Pomfret	Intact/good	RE/RE	U	U	U	R	private pond
162.01	Harvey	Randolph	Intact/good	RE/RE	U	U	R	R	private pond
162.02	Gulf Road	Randolph	Intact/good	PG/CN	1980	c. 1860	HP	W	nothing remains of former use
162.03	Lake Champagne	Randolph	Intact/good	RE/RE	U	U	R	R	private campground
162.04	North Randolph	Randolph	Part breach	PG/ST	U	U	U	U	
162.05	Sargent, Osgood and Roundy	Randolph	Full breach	U	U	U	U	U	nothing found at site
162.07	Randolph-7	Randolph	Full breach	U	U	U	HP	NU	powerhouse/gears
162.08	Playground	Randolph	Full breach	U	U	U	U	U	nothing remains
162.09	unnamed	Randolph	Intact/good	RE/RE	1960	1960	R	R	complex of ponds
162.99	Harvey 2	Randolph	Intact/good	RE/RE	U	U	R	R	private pond
168.01	Rochester	Rochester	Full breach	U	U	U	U	U	timber remnants, hydropower use

State ID	Dam Name	Town	Condition	Type/Material	Construction Date		Purposes		Remarks
					Current	Original Dam on Site	Original	Current	
									assumed
168.02	Eller	Rochester	Part breach	PG/ST	U	U	R	R	diversion to private pond
168.03	Kings Pond	Rochester	Intact/good	RE/RE	c. 1985	c. 1985	R	R	private pond
171.01	unnamed	Royalton	Full breach	U	U	U	HE	NU	few remnants
171.02	McIntosh Pond	Royalton	Intact/good	RE/RE	1964	1964	R	R	public pond
171.03	Eaton (upper)	Royalton	Part breach	PG/CN	U	1776	HP	NU	could be significant
171.04	Eaton (lower)	Royalton	Intact/poor	PG/CN	U	1776	HP	NU	could be significant
171.05	Royalton-5	Royalton	Full breach	PG/CN	U	U	HP	NU	
171.06	South Royalton	Royalton	Full breach	U	U	U	U	U	nothing remains
171.07	Clark	Royalton	Intact/good	RE/RE	U	U	U	AS	private pond
171.08	Lake Casper	Royalton	Intact/good	RE/RE	1973 (rep)	1880	W	W	much of dam original, some repairs
171.09	Lake John	Royalton	Intact/good	RE/RE	1962 (rep)	1900	W	W	much of dam original, some repairs
171.10	unnamed	Royalton	Intact/poor	RE/RE	c. 1950	c. 1950	W	NU	private pond
171.98	unnamed	Royalton	Intact/good	RE/RE	U	U	R	R	private pond
171.99	unnamed	Royalton	Intact/good	RE/RE	U	U	U	U	private pond
184.01	Standing Pond	Sharon	Intact/good	PG/CN	1930	1930	R	R	semi-public pond
184.03	Crescent Lake	Sharon	Intact/good	RE/RECN	1940	1920	HP	R	semi-public lake
184.04	Lake Mitchell	Sharon	Intact/good	PG/CNRE	1890	1950	R	R	trout pond since 1890
184.05	Johnson Real Estate	Sharon	Intact/good	RE/RE	c. 1960	c. 1960	R	R	private pond
184.06	Baribeau	Sharon	Intact/good	RE/RE	U	U	R	R	private pond
184.07	Day Farm Pond Upper	Sharon	Full breach	RE/RECN	U	U	AS	NU	
184.08	Sharon Power Co	Sharon	Full breach	PG/CN	U	U	HE	NU	large concrete remnants in river
184.09	Sharon	Sharon	Full breach	U	U	U	U	NU	nothing remains
184.10	Wright	Sharon	Full breach	U	U	U	U	NU	some foundations
184.12	unnamed	Sharon	Intact/fair	RE/RECN	c. 1970	c. 1970	HE	R	waterwheel, gears
184.13	Day Farm Pond Middle	Sharon	Full breach	RE/RECN	U	U	AS	NU	
184.14	Day Farm Pond Lower	Sharon	Full breach	RE/RECN	U	U	AS	NU	
184.98	unnamed	Sharon	Intact/good	RE/RECN	U	U	AS	NU	private pond
184.99	unnamed	Sharon	Intact/good	RE/RE	U	U	AS	NU	private pond
188.01	Sherburne-1	Killington	Intact/good	RE/RECN	1990	1950	I	R	private pond, no remnants of former use
188.02	Sherburne-2	Killington	Full breach	RE/RE	U	U	R	NU	

State ID	Dam Name	Town	Condition	Type/Material	Construction Date		Purposes		Remarks
					Current	Original Dam on Site	Original	Current	
188.03	Colton Pond	Killington	Intact/good	RE/RE	1963	1963	R	R	public pond
198.01	Barrows	Stockbridge	Full breach	U	U	U	U	U	nothing remains
200.02	Kratky	Stafford	Intact/good	RE/RE	1965	1965	R	R	private pond
200.09	Day-Bruorton	Stafford	Intact/fair	RE/RECN	1929	1929	R	R	private pond
211.01	Tunbridge Trout Pond	Tunbridge	Intact/good	RE/RE	1925	1925	R	R	private camp pond
211.02	Hayward and Noble	Tunbridge	Intact/fair	PG/CN	1928	c. 1830	HP	NU	
211.03	Grants Mill	Tunbridge	Part breach	PG/CN	U	U	HP	NU	significant remnants
211.04	South Tunbridge	Tunbridge	Full breach	PG/CN	U	U	U	NU	abutments
211.06	Farnham Bros.	Tunbridge	Part breach	PG/CN	U	U	HP	NU	significant remnants
211.07	Orton	Tunbridge	Full breach	U	U	U	U	NU	nothing remains
211.08	unnamed	Tunbridge	Intact/good	RE/RE	U	U	R	R	private pond
225.05	Washington-5	Washington	Intact/poor	RE/RE	U	U	R	NU	private pond
244.04	Goyette	Williamstown	Intact/good	RE/RE	U	U	R	R	private pond
244.05	Staples Pond	Williamstown	Beaver dam	n/a	U	U	U	U	
244.06	Rood Pond	Williamstown	Intact/good	RE/RECN	1986	U	R	R	public pond
244.12	unnamed	Williamstown	Full breach	U	U	U	U	NU	nothing remains

State ID numbers in bold indicate possible cultural significance.

Codes

Type/Material:
- CN – Concrete
- PG – Gravity
- RE – Earthfill
- STMS – Stone Masonry
- TC – Timber Crib
- U – Unknown

Construction Date:
- U – Unknown

Purposes:
- AS – Agricultural/Stock
- HE – Hydroelectric
- HP – Hydropower
- I – Ice Pond
- NU – Not in use
- R – Recreation
- U – Unknown
- W – Water Supply

Appendix E

Infrared Photo Analysis done for

1997 White River Basin Assessment Report

Buffer Zones of the White River Corridor

The presence or absence of a minimum bufferstrip in the White River riparian corridor was analyzed using the 1992-1994 infrared photographs. Each shoreline along the approximately 53 mile long mainstem was examined and buffers of greater than or equal to 50 feet were distinguished from buffers that were less than 50 feet to nonexistent. This information was then transferred from the infrared photos onto paper maps. The length of the segments with buffers greater than or equal to 50 feet and the segments with buffers less than 50 feet were measured and summed for each of three different mainstem segments and then for the whole mainstem. Percentages of the banks with 50 foot plus buffers and with less than 50 foot buffers were generated. (See Table I below).

Table I. Buffer Vegetation on the White River mainstem

Widths of the White River Shoreline Buffer				
	Left Bank		Right Bank	
Mainstem Waterbody i.d.	>=50 ft.	<50 ft.	>=50 ft.	<50 ft.
VT09-07: headwaters to West Branch	54%	46%	49%	51%
VT09-02: West Branch down to Third Branch	43%	57%	40%	60%
VT09-01: Third Branch down to mouth	29%	71%	74%	26%
Total mainstem	40%	60%	57%	43%

Overall, along the left bank, approximately 60% of the shore length had a bufferstrip of natural vegetation that was less than 50 feet wide and thus only 40% of this shore's length had a bufferstrip at least 50 feet wide or wider. The right bank was somewhat better protected with 57% having a bufferstrip 50 feet or wider and 43% of the shore length having a bufferstrip less than 50 feet wide. These estimates show that the loss of riparian vegetation along the White River mainstem is substantial and is a significant threat to, if not already having an impact on, the water quality and aquatic habitat of the river. Riparian vegetation removal along the White River is the result of a number of land use activities including agriculture, road placement and maintenance, and development.

Appendix F

Individual River Waterbody Reports

for the White River Watershed

Lower White River Main Stem
Assessment Report

Waterbody No: VT09-01 **Assessment Year:** 2002

River Length (mi.): 26 **Date Last Updated:** 11/19/2002

Description: Main Stem - Mouth to Confluence with Third Branch

Location Identifiers

ANR Enforcement District: 3 **NRCS District:** 10

Fish and Wildlife District: 4 **Regional Planning Commission:** TWO

Assessment Information

Monitored (mi.): 26.0

Evaluated (mi.): 0.0

Water Quality Limited?

On 303(d) List? N

Monitored for Toxics? Y

Assessment Types

Information from local residents

Land use information and location of sources

Occurrence of conditions judged to cause impairment

RBP III or equivalent benthos surveys

Bacteria water column sampling by quality-assured volunteer progr

Aquatic Contamination

None detected

Toxics Testing

Organics in water column

Metals in water column

Other inorganics in water column

Waste Management Zone - Miles: **Description:** Bethel WWTF to confluence with Second Branch

Assessment Comments

THREATENED MILES

White River: 21.0 - upstream from mouth to First Branch - threats to aesthetics, aquatic habitat, contact recreation, ag. water supply and drinking water supply due to sedimentation, thermal modifications, pathogens, wide and shallow channel, metals, toxic substances, some turbidity from removal of streambank vegetation, streambank and cropland erosion, tributary streams instability, highway maintenance, and closed, unlined landfill. c(500,900,1100,1400,1600) s(1000,6300,7550,7600,7700,8300)

COMMENTS

Macroinvertebrate sampling at rivermile 1.9 in 1992 found the community in excellent health; at rivermile 14.0, the community was in good health in 1997, in fair conditon in 1998, and in good condition in 1999 and 2000; at rivermile 21.8, the community was in excellent to very good condition in 1992 and in very good health in 2001. (2002)

Water samples from seven sites were taken in this waterbody stretch in 2001 and 2002 by White River Partnership volunteers to test for E. coli. None of the sites had a geometric mean of the samples that was greater than 126 colonies per 100 ml although a number of the sites had a geometric mean greater than 77. At mainstem rivermile (rm) 1.0, no single samples were above 235 (EPA maximum allowable density for a single sample for a designated beach area) in 2001 and only 1 sample was above 235 in 2002. At rm 6.4 (Dimick Brook), no single samples were above 235 in 2001 and 4 samples were above this threshold in

Lower White River Main Stem **VT09-01**

2002. At rm 8.4 (Mill Brook), no single samples were above 235 in 2001 and only one sample was above this in 2002. At rm 13.0 (Sharon), no single samples were above 235 in 2001 and 3 samples were above this limit in 2002. At rm 18.7 (First Branch), no single samples were above 235 in 2001 and 3 samples were above in 2002. At rm 22.8 (Royalton), there were no samples above 235 in 2001 and 2 samples above 235 in 2002. At rm 25.2 (Bethel below Tx), there was one sample above 235 in 2001 and 3 samples above 235 in 2002.

The White River Partnership also monitored temperature in 2001. Following are some highlights of their results. At rm 6.4, there were 4 days in a row when the water temperatures were at or above 77F in August. Several days on either side of those four had temperatures above 77F for 20 to 22 of the hourly readings. At rivermile 8.4, there were 2 full days in July and 7 full days in August when the temperatures (recorded each hour) were above 77F. At rivermile 13.0, there was 1 day in July and 4 days in August when the temperatures were above 77F for all 24 hours. At rm 22.8, 3 days in August had temperatures above 77F for 20 to 21 hours of the day.

The Bethel/Royalton landfill, from which groundwater flows to the White River and Second Branch, was capped in October 1993. Earlier groundwater sampling (1980 and 1981, 1990 and 1991) had shown exceedances of iron and manganese and organic compounds. Exceedances of groundwater enforcement standards of arsenic, iron, manganese, benzene and vinyl chlkorine in shallow, groundwater well. Monitoring will continue twice a year. (1997)

The Quechee Mobil site (#890310), which was on the Hazardous Waste list of sites with surface water impacts, apparently does not have surface water impacts. It is three quarters of a mile from the White River and is a low priority.

The Johnson & Dix site (#890437), which is also on the above-mentioned list, is high priority and remediation has begun. Two underground storage tanks were removed in 1989. A petroleum plume exists on the central portion of this site, which was though to be a threat to the river. Based on groundwater sampling though concerns were diminished. The consultants responsible for sampling haven't done it for a year or so now and need to be contacted again. (1997)

Observations made by two anglers, who have known the White River for over 20 years each, include the following. Since the state put an end to gravel mining, the river has started to recover - gravel bars are forming and the channel stabilizing. However, habitat is still lacking and one of the anglers felt that land use practices upstream including removal of riparian vegetation, construction, roads, some agriculture are resulting in the loss of pools and riffles (or pools and riffles inability to re-establish post-gravelling) and warmer temperatures. Fewer and fewer wild trout are being found (reproduction is down) and hatchery fish dominate.

The Royalton WWTF is in compliance with all permit requirements and has been in the recent past. Previous assessment comments mentioned nutrient enrichment (periphyton growth) below the plant but the source of the enrichment is not necessarily straightforward.

An analysis of the vegetation present along this section of the White River mainstem using the infrared photos found that on the northern or eastern river edge, approximately 29% of the shoreline had a buffer 50 feet or greater and 71% of the shoreline had a buffer less than 50 feet. On the southern or western river edge, approximately 74% of the shoreline had a buffer 50 feet or greater and 26% of the shoreline had a buffer less than 50 feet.

INFORMATION SOURCES

White River Partnership - E. coli sampling on White River and tributaries in 2001 and 2002.

Vermont DEC Water Quality Division Biological and Aquatic Studies Section data - macroinvertebrate sampling results at 3 sites from 1992 to 2001.

Water Quality Division infrared photo collection

Bryan Harrington and Solid Waste section reports/files, Vt DEC Waste Management Division - provided information on the Bethel/Royalton landfill (1994 & 1997)

Richard Spiese and Hazardous Materials section reports/files, Vt DEC Waste Management Division - provided information on Quechee Mobil (#890310) and Johnson & Dix (#890437) sites. (1997)

Peter Desmeules, Angler and Environmental Attorney - made observations on the health of the White River especially since gravel mining has stopped (but with a 20 year perspective) (1997)

Bob Scaronski, owner of a fly tackle business - discussed changes to the White River and especially the declining wild trout population. (1997)

NOTE:

Should temperatures be so high again in this segment of the river then partial support of aquatic habitat

Lower White River Main Stem **VT09-01**

should be used versus threatened status.

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	5.0	21.0	0.0	0.0	0.0
20	Aquatic biota/habitat	5.0	21.0	0.0	0.0	0.0
21	Fish consumption	0.0	26.0	0.0	0.0	0.0
42	Contact recreation	5.0	21.0	0.0	0.0	0.0
44	Noncontact recreation	26.0	0.0	0.0	0.0	0.0
50	Drinking water supply	25.5	0.5	0.0	0.0	0.0
62	Aesthetics	5.0	21.0	0.0	0.0	0.0
72	Agriculture water supply	25.5	0.5	0.0	0.0	0.0

Impairment Cause	Magnitude	Size (mi.)
Priority organics	T	0.50
Metals	T	0.50
Siltation	T	21.00
Thermal modifications	T	21.00
Other habitat alterations	T	21.00
Pathogens	T	21.00

Impairment Source	Magnitude	Size (mi.)
Agriculture	T	21.00
Highway/road/bridge runoff	T	21.00
Landfills	T	0.50
Channel instability	T	12.00
Removal of riparian vegetation	T	21.00
Streambank modification/destabilization	T	21.00

Permit No.	Point or Nonpoint Source Description	Receiving Water
VT0100048	WWTF - Bethel	
VT0020711	White River National Fish Hatchery	
VT0100854	Royalton WWTF 0.07mgd	
VT0101010	CSO - Hartford WRJ Bridge Street	
	Bethel Landfill (Unlined) - Royalton	
1-0675	Clifford Inc - sw	White River
1-0735	White River Landing - sw	White River
1-1183	Town of Hartford - 2 sw	White River

Middle White River Main Stem
Assessment Report

Waterbody No: VT09-02 **Assessment Year:** 2002

River Length (mi.): 24 **Date Last Updated:** 11/19/2002

Description: Main Stem - Confluence of Third Branch to West Branch

Location Identifiers

ANR Enforcement District: 3 **NRCS District:** 10

Fish and Wildlife District: 4 **Regional Planning Commission:** TWO

Assessment Information

Monitored (mi.): 24.0

Evaluated (mi.): 0.0

Assessment Types

Land use information and location of sources

Biological Monitoring

Water Quality Limited?

On 303(d) List? N

Monitored for Toxics? N

Aquatic Contamination

None detected

Toxics Testing

Waste Management Zone - Miles: **Description:**

Assessment Comments

THREATENED MILES

White River mainstem: 24.0 - whole length from confluence of Third Branch to confluence of West Branch - threats to aquatic biota/habitat, secondary contact recreation (fishing), and aesthetics due to sediments, thermal modification, Japanese knotweed, from removal of riparian vegetation, road runoff and maintenance, and and possibly nutrients and toxics from a golf course on the river with little to no buffer, and agricultural land uses with little to no buffer (these causes need further assessment) . c(1100,1400,2600) s(4500,7600)

COMMENTS

Macroinvertebrate sampling at mainstem rivermile 26.9 (above Locust Creek confluence) found the community in good-fair condition in 2001; at rivermile 32.4 (below confluence of Tweed River), the community was in excellent condition in 1993, 1994, 1995 and 1996; and at rivermile 43.7, the community was in very good-good condition in 2001. (2002)

White River Partnership E. coli sampling from 2001 at 5 sites in this stretch of the White River found no sites with a geometric mean of the samples at 126 per 100 ml or greater. On one date at one site, the single sample was greater than 235 in 2001. In 2002, there were also no sites with geometric mean of the samples at or above 126. Sample values greater than 235 were found twice on different dates and at different sites. (2002)

Middle White River Main Stem **VT09-02**

White River Partnership temperature monitoring in 2001 at mainstem rivermile 27.8 (Locust Creek confluence) revealed 3 days in August when temperatures were at or above 77F for 14 to 16 hours and there were 5 full days when the temperatures were above 72F. Temperatures at rm 33.4 (Stockbridge School) were at or above 77F for 11 to 14 hours for 3 days in August and on these 3 days the temperatures were above 72F for the full 24 hours. At rm 44.8 (West Branch confluence), the temperatures were better with no recordings at or above 77F and no full days above 72F.

An analysis of the vegetation present along the whole White River mainstem using infrared photos found that on the northern or eastern river edge approximately 43% of the shoreline had a buffer 50 feet or greater and 57% had a buffer less than 50 feet. On the southern or western river edge, approximately 40% of the shoreline had a buffer 50 feet or greater and 60% had a buffer less than 50 feet. (1997)

INFORMATION SOURCES

Vermont DEC Water Quality Division Biomonitoring Section - data from macroinvertebrate sampling between 1993 and 2001 at 6 sites.

White River Partnership monitoring program - data from sampling for E. coli in 2001 and 2002 and temperature in 2001.

Jerry McArdle & Cathy Kashanski, Vt. DEC Water Quality Division - noted the lack of buffers, proximity of roads to the river, erosion along roadsides near the river, extensive patches of Japanese knotweed on the banks, and a golf course, pasture and cropland near river without buffers during separate investigations (1997).

Water Quality Division infrared photo collection

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	0.0	24.0	0.0	0.0	0.0
20	Aquatic biota/habitat	0.0	24.0	0.0	0.0	0.0
21	Fish consumption	0.0	24.0	0.0	0.0	0.0
42	Contact recreation	24.0	0.0	0.0	0.0	0.0
44	Noncontact recreation	0.0	24.0	0.0	0.0	0.0
50	Drinking water supply	24.0	0.0	0.0	0.0	0.0
62	Aesthetics	0.0	24.0	0.0	0.0	0.0
72	Agriculture water supply	24.0	0.0	0.0	0.0	0.0

Impairment Cause	Magnitude	Size (mi.)
Siltation	T	24.00
Thermal modifications	T	24.00
Exotic species	T	24.00

Impairment Source	Magnitude	Size (mi.)
Highway/road/bridge runoff	T	15.00
Removal of riparian vegetation	T	12.00

Permit No.	Point or Nonpoint Source Description	Receiving Water
3-1141	White River Fish Hatchery wastewater	White River

Minor Tributaries - Lower White R. mainstem

Assessment Report

Waterbody No: VT09-03 **Assessment Year:** 2002

River Length (mi.): 54.5 **Date Last Updated:** 11/19/2002

Description: Minor tributaries on the lower White River mainstem including Jericho, Dimick, Podunk, Tigertown, Mill, Mitchell, High Pole, Quation, Fay, Whitewater, Broad and Sewall brooks.

Location Identifiers

ANR Enforcement District: 3 **NRCS District:** 10

Fish and Wildlife District: 4 **Regional Planning Commission:** TWO

Assessment Information

Monitored (mi.): 0.0

Evaluated (mi.): 54.5

Assessment Types

Surveys of fish and game biologists or other professionals

Land use information and location of sources

Water Quality Limited?

On 303(d) List? N

Monitored for Toxics? N

Aquatic Contamination

Toxics Testing

Waste Management Zone - Miles: **Description:**

Assessment Comments

THREATENED MILES

Jericho Brook.: 1.5 - mouth upstream for 1.5 miles along Jericho Road - threats to aquatic biota/habitat due to turbidity and siltation from slumping banks. c(1100,2500) s(7700)

Mill Brook: 12.5 - threats to aquatic biota/habitat from sedimentation. c(1100), s(9000).

Broad Brook: 1.0 - threats to aquatic biota/habitat due to sedimentation from bank slumping into brook. c(1100), s(7700)

COMMENTS

Roads cross Mill Brook at least twelve times along its length and the points of crossing could be one of the sources of sediment to the brook.

INFORMATION SOURCES

John Claussen, Vt Dept of Fish & Wildlife - noted that Mill Brook is a major spawning stream threatened by the above disturbances (1994). The culvert that had precluded passage of fish has been fixed. The wild and rainbow trout populations are diminished though and John doesn't know why (1997).

Cathy Kashanski, Vt DEC Water Quality Division - noted slumping banks on Broad Brook (1994).

Kevin Kaija, NRCS - noted impairment on Jericho Brook (1994).

Minor Tributaries - Lower White R. mainstem **VT09-03**

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	39.5	15.0	0.0	0.0	0.0
20	Aquatic biota/habitat	39.5	15.0	0.0	0.0	0.0
21	Fish consumption	0.0	54.5	0.0	0.0	0.0
42	Contact recreation	54.5	0.0	0.0	0.0	0.0
44	Noncontact recreation	54.5	0.0	0.0	0.0	0.0
50	Drinking water supply	54.5	0.0	0.0	0.0	0.0
62	Aesthetics	52.0	2.5	0.0	0.0	0.0
72	Agriculture water supply	54.5	0.0	0.0	0.0	0.0

Impairment Cause	Magnitude	Size (mi.)
Siltation	T	15.00
Turbidity	H	1.50

Impairment Source	Magnitude	Size (mi.)
Streambank modification/destabilization	T	2.50
Unknown source	T	12.50

Permit No.	Point or Nonpoint Source Description	Receiving Water
1-0751	Peter Robes - sw	Trib White River
1-0794	Sharon Elementary School - sw	Quation Brook
1-0978	Vermont Law School - 2 sw	Trib White River
1-1072	Vermont Castings - sw	Trib White River
1-0140	James E Paul - sw	Whitewater Brook
1-0677	Welch's Hardware - 2 sw	Trib White River

First Branch - White River

Assessment Report

Waterbody No: VT09-04 **Assessment Year:** 2002

River Length (mi.): 61.9 **Date Last Updated:** 11/19/2002

Description: The First Branch from its mouth to the headwaters and tributaries including Russell Brook, Farnham Branch, and Goodwin Hill, Dickerman, Cram, Jenkins, Jail, Hart Hollow. and Jones Pond brooks.

Location Identifiers

ANR Enforcement District: 3 **NRCS District:** 10

Fish and Wildlife District: 4 **Regional Planning Commission:** TWO

Assessment Information

Monitored (mi.): 15.5

Evaluated (mi.): 46.4

Water Quality Limited?

On 303(d) List? N

Monitored for Toxics? Y

Assessment Types

Surveys of fish and game biologists or other professionals

Chemical/physical monitoring

Biological Monitoring

Aquatic Contamination

Toxics Testing

Organics in water column

Waste Management Zone - Miles: **Description:**

Assessment Comments

THREATENED MILES

First Branch White River: 15.5 - from mouth upstream to Chelsea Village - threats to aquatic habitat, and aesthetics from elevated water temperatures, sediments, pathogens and nutrients from loss of vegetated bufferstrips, streambank erosion, possible cropland erosion, road runoff and unknown sources at this time. c(900,1100,1400,1700) s(1000,4500,7600,7700)

Cram Brook: 1.6 - from mouth upstream - threats to aquatic habitat and biota due to sediments from road maintenance practices. c(1100) s(4500)

COMMENTS

There was macroinvertebrate sampling on the First Branch, Cram Brook, and Jenkins Brook in fall 2001and the community integrity and health was: at rivermile 6.6 - very good to good; at rivermile 15.1 and 16.8 - very good to good; and at rivermile 21.0 - excellent. Cram Brook was sampled at rivermile 0.7 in 2001 and in very good to good condition and Jenkins Brook was sampled at rivermile 0.3 also in 2001 and the community was in excellent condition.

Some sources of bacteria and thus likely nutrients and pathogens get to the First Branch based on results from two summers of lay monitor sampling done by White River Partnership volunteers. Rivermile 5.9 (Cilley Bridge) in Tunbridge had 9 of 12 samples greater than 77 E. coli/100 ml with 3 of the 12 greater than 235 E. in 2001. The geometric mean of the samples was 126. In 2002, 10 of 12 samples at this site were

First Branch - White River **VT09-04**

greater than 77 and 5 of 12 were greater than 235. The geometric mean was 234. Rivermile 15.2 (Recreation Park) in Chelsea had 9 of 12 samples greater than 77 and 6 of 12 greater than 235 in 2001. The geometric mean of the samples was 184. In 2002, 8 of 9 samples were greater than 77 and 4 of 9 were greater than 235. The geometric was 214. Further field assessment needs to be done to locate potential sources and then perhaps target E. coli sampling to narrow down the location of elevated numbers.

The White River Partnership monitored temperatures in the First Branch of the White River at Chelsea Recreation Park, rm 15.2, in 2001. There were 3 days in August when the temperatures were at or above 77F for 6 to 8 hours but no full days at that temperature or full days over 72F. The maximum temperature reached above 72F on 30 days that season but dropped down again before too long.

Jones Pond Brook had been listed as not supporting fishing (SCR) due to the complete absence of fish (see 1994 info below) and was put on the 303(d) list. Since that survey that found no fish, the stream was surveyed by the Dept of Fish and Wildlife in 1996 and 1997. During both of these surveys, multiple year classes of brook trout were found as well as a low number of blacknose dace. DEC also surveyed the stream and found no obvious reason or source for the absence of fish and noted the presence of non-game fish in the brook in fall 2000. The brook is not large enough for a full fish community assessment.

Elevated water temperatures and some sediment from Chelsea downstream to the mouth on the First Branch were noted by a fishery biologist in 1994. Dickerman, Bicknell, Crams, Jenkins, Jail, and Hart Hollow Brooks were all in excellent condition after shocking the brooks. Populations were better than in 1953 when last shocked. Jones Pond Brook had NO fish, however, for unknown reasons (1995) (but see above paragraph).

INFORMATION SOURCES

White River Partnership monitoring program - data on E. coli at 2 sites on the First Branch in 2001 and 2002 and temperature data in 2001

Steve Fiske, Vermont DEC Water Quality Division Biological and Aquatic Studies Section - macroinvertebrate sampling results (2002)

Cathy Kashanski, Vermont DEC Water Quality Division - noted ditching and top of bank scraping as part of gravel road maintenance causing sediment runoff to Cram Brook (2000)

John Claussen, Vermont Dept of Fish & Wildlife - information from fish population sampling in 1994 and 1996.

Richard Spiese, Vt DEC Waste Management Division - noted that the VOCs that had been found in surface water samples from the Campbell's Garage oil waste spill were no longer detected after the treatment system was installed (1997).

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	46.4	15.5	0.0	0.0	0.0
20	Aquatic biota/habitat	44.8	17.1	0.0	0.0	0.0
21	Fish consumption	0.0	61.9	0.0	0.0	0.0
42	Contact recreation	46.4	15.5	0.0	0.0	0.0
44	Noncontact recreation	61.9	0.0	0.0	0.0	0.0
50	Drinking water supply	61.9	0.0	0.0	0.0	0.0
62	Aesthetics	46.4	15.5	0.0	0.0	0.0
72	Agriculture water supply	61.9	0.0	0.0	0.0	0.0

Impairment Cause	Magnitude	Size (mi.)
Nutrients	T	15.50
Siltation	T	17.10
Thermal modifications	T	15.50
Pathogens	T	15.50

Impairment Source	Magnitude	Size (mi.)
Agriculture	T	15.50
Highway/road/bridge runoff	T	17.10
Removal of riparian vegetation	T	15.50

First Branch - White River		**VT09-04**
Streambank modification/destabilization	T	15.50

Permit No.	**Point or Nonpoint Source Description**	**Receiving Water**
VT0100943	Chelsea WWTF 0.055mgd	
	Tunbridge Landfill	
1-0902	Valley Day Care	First Branch

Second Branch - White River

Assessment Report

Waterbody No: VT09-05 **Assessment Year:** 2002

River Length (mi.): 50.5 **Date Last Updated:** 11/19/2002

Description: The Second Branch from its mouth to the headwaters and tributaries including Kingsbury, Peak, Penny, Osgood, Blaisdell, Halfway, Snows, and Sunset Brooks

Location Identifiers

ANR Enforcement District: 3 **NRCS District:** 10

Fish and Wildlife District: 4 **Regional Planning Commission:** TWO

Assessment Information

Monitored (mi.): 25.5

Evaluated (mi.): 25.0

Water Quality Limited?

On 303(d) List? N

Monitored for Toxics? N

Assessment Types

Surveys of fish and game biologists or other professionals

Land use information and location of sources

RBP III or equivalent benthos surveys

Bacteria water column sampling by quality-assured volunteer progr

Aquatic Contamination

Toxics Testing

Waste Management Zone - Miles: **Description:**

Assessment Comments

PARTIAL SUPPORT MILES

Second Branch: 17.0 - from East Brookfield downstream to 1.0 mile before junction at White River - partial support of aquatic biota and habitat, aesthetics and contact recreation due to sediments, nutrients, and pathogens from riparian buffer removal, streambank erosion, agricultural land runoff as well as scattered areas with road runoff. Source of elevated E. coli numbers not yet known. c(900,1100,1700), s(1000,4500,7600,7700)

THREATENED MILES

Snows Brook: 1.0 - from mouth upstream one mile - threats to aquatic biota/habitat due to siltation from poor gravel road maintenance and streambank erosion. c(1100) s(7700,8300)

Kingsbury Brook: 0.5 - from mouth upstream - threats to aquatic biota/habitat likely due to loss of riparian vegetation (open above stream) and nutrients from agricultural land uses. c(900, 1400) s(7700)

COMMENTS

Macroinvertebrate sampling occurred on the Second Branch, Kingsbury Brook, Blaisdell Brook, and Snows Brook in fall 2001. At rivermile 0.1 and rivermile 18.0 on the Second Branch, the macroinvertebrate community was very good. On Kingsbury Brook at rivermile 0.5 in 2001(functional group - 33% algae shredding Chironomids, relatively high BI, the macroinvertebrate community was in fair condition. On

Second Branch - White River **VT09-05**

Blaisdell Brook at rivermile 1.6, the macroinvertebrate community was in very good condition and on Snows Brook at rivermile 0.7, it was in good condition in both 1997 and 2001. (2002)

The White River Partnership lay monitoring program volunteers sampled for E. coli at two sites on the Second Branch in 2001 and 2002. In 2001, samples from the Dugout Road (rivermile 9.8) were above the E.coli standard of 77 for 11 of 11 samples and above the EPA E. coli single sample threshold of 235 for 6 of the 11 samples. The geometric mean of samples at this sites was 442. In 2002, samples from the Dugout Road site were above 77 for 9 of 9 samples and above 235 for 7 of the 9 samples. The geometric mean is 324. In 2001, samples from the East Hill Road site (rivermile 21.9) were above 77 for 9 of 10 samples and above 235 for 5 of the 10 samples. The geometric mean was 247. In 2002, the samples from the East Hill road site were above 77 for 7 of 7 samples and above 235 for 2 of the 7 samples. The geometric mean of these samples is 158.

Field observations in 1996 included that the headwater section of the Second Branch looked good but threats or impacts from nutrients and sediments from streambank erosion, road runoff, agricultural land use exist downstream. Siltation and heavy algae growth on rocks were two common observations. Threats to Snows Brook were also noted. Jerry also looked at Sunset Brook, Peak Brook, Penny Brook, Osgood Brook with no obvious problems or imminent threats noted.

INFORMATION SOURCES

Steve Fiske, Vermont DEC Water Quality Division Biomonitoring and Aquatic Studies Section - data and anaylsis of macroinvertebrate sampling sites (2002)

White River Partnership lay monitoring program volunteers - E. coli sampling results from 2001 and 2002.

John Claussen, Vt Dept of Fish & Wildlife - noted agriculture related runoff and streambank erosion on Second Branch (1994,1996).

Stan Corneille, Vt DEC Waste Management Division - Wheatley Farm (#941693) hazardous waste site about 1000 feet from the Second Branch. Site for Unifirst waste disposal. Solvents or fuel detected in monitoring wells (PCEs, tetrachlorethene). Remedial investigation/feasibility analysis completed and remedy selected.

Jerry McArdle, Vermont DEC Water Quality Division - field surveys in 1996

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	32.0	1.5	17.0	0.0	0.0
20	Aquatic biota/habitat	32.0	1.5	17.0	0.0	0.0
21	Fish consumption	0.0	50.5	0.0	0.0	0.0
42	Contact recreation	33.5	0.0	17.0	0.0	0.0
44	Noncontact recreation	50.5	0.0	0.0	0.0	0.0
50	Drinking water supply	50.5	0.0	0.0	0.0	0.0
62	Aesthetics	33.5	0.0	17.0	0.0	0.0
72	Agriculture water supply	50.5	0.0	0.0	0.0	0.0

Impairment Cause	Magnitude	Size (mi.)
Nutrients	S	17.00
Siltation	M	17.00
Siltation	T	1.00
Pathogens	M	17.00
Nutrients	T	0.50
Thermal modifications	T	0.50

Impairment Source	Magnitude	Size (mi.)
Agriculture	M	17.00
Highway/road/bridge runoff	M	4.00
Highway/road/bridge runoff	T	1.00
Removal of riparian vegetation	M	17.00
Streambank modification/destabilization	H	17.00

Second Branch - White River		**VT09-05**
Streambank modification/destabilization	T	0.50

Permit No.	Point or Nonpoint Source Description	Receiving Water
1-1131	Vermont AOT bridge Route 14 - sw	Second Branch
1-1193	Lucky's Trailer Sales - 2 sw	Second Branch
1-0240	Race's General Store -sw	Second Branch

Third Branch - White River

Assessment Report

Waterbody No: VT09-06 **Assessment Year:** 2002

River Length (mi.): 95 **Date Last Updated:** 11/19/2002

Description: Mouth to headwaters and tributaries including Ayers Brook and all its tributaries

Location Identifiers

ANR Enforcement District: 3 **NRCS District:** 10

Fish and Wildlife District: 4 **Regional Planning Commission:** TWO

Assessment Information

Monitored (mi.): 15.0

Evaluated (mi.): 80.0

Water Quality Limited On 303(d) List? Y

Monitored for Toxics? Y

Aquatic Contamination

Assessment Type

Surveys of fish and game biologists or other professionals

Land use information and location of sources

RBP III or equivalent benthos surveys

Visual observation, may quantify some parameters, single season,

Bacteria water column sampling by quality-assured volunteer prog

Toxics Testing

Organics in water column

Waste Management Zone - Miles 1.20 **Description** from Randolph WWTF down to Smith Brook

Assessment Comments

PARTIAL SUPPORT MILES

Third Branch of White River: 9.5 - Ayers Brook down to Bethel - partial support of aquatic biota/habitat, aesthetics and contact recreation due to sedimentation, turbidity, nutrients, thermal modifications, and pathogens due to severe streambank erosion, stormwater runoff, ag. land erosion and runoff, livestock watering instream, former gravel mining, and riparian vegetation loss. c(900,1100,1400,1600,1700,2500) s(1000,7550,7600,7700)

Ayers Brook: 5.5 - Randolph upstream to Snowsville (East Braintree) - partial support of aquatic biota/habitat and aesthetics due to sedimentation and turbidity from removal of riparian vegetation and streambank erosion. c(1100,1600,2500) s(7550,7600,7700)

Batchelder Brook: 1.0 - partial support of aquatic biota and aesthetics due to siltation and physical alterations from beaver dam removal, stream channelization, and dredging by the Agency of Transportation. c(1100,1600) s(7100,7200,7800)

THREATENED MILES

Third Branch of White River: 2.5 - below Roxbury Fish Hatchery - threats to aesthetics and swimming from nutrient enrichment due to fish hatchery. c(900) s(1700)

Ayers Brook: 0.1 - near Wright-Bessette property hazardous waste site (below Braintree/Randolph town

Third Branch - White River **VT09-06**

line and a subset of the length above) - threats to aquatic biota, ag water supply and drinking water supply due to improperly applied/disposed dry cleaners sludge. c(300) s(6600)

COMMENTS

Between the last assessment and this current one Adams Brook was put on the impaired water list and may soon be off. It was in fair biological condition in 1997 but good biological condition in 2001. A number of good management practices have been put into place to address the road runoff and ag land issues responsible for the impairment thus the brook was not added above.

Fish surveys were done on Flint Brook above and below the fish hatchery water withdrawal point as well as on 2 other similar and nearby streams in order to assess whether the water withdrawal was affecting the aquatic community. "Definitive impacts to wild brook trout populations from the fint Brook withdrawal could not be identified within the limited scope of this study. Brook trout population measures from 2001 in Flint Brook below the water withdrawal were similar to upstream and nearby control streams." (Quotes from a memo from Rich Kirn, district fisheries biologist on October 30, 2001)

The White River Partnership lay monitors sampled E. coli at 3 locations on the Third Branch in 2001 and 2002; 1 location on Adams Brook in 2001 and 2002; and 1 location on Ayers Brook in 2002. In 2001, the Golf Course bridge site at rivermile (rm) 9.3 had a geometric mean of 202 which is greater than the Vermont standard as well as the EPA standard (126) for swimming areas. The sites above and below this site were below the standard of 77. In 2002, again the Golf Course bridge site was above both standards, however the Stock Farm Road site (rm 4.3) also had a geometric mean above 77 but not above 126. The Adams Brook site had a geometric mean of 83 in 2001 (n=11) and of 224 in 2002 (n=9). The Ayers Brook site had a geometric mean of 158 (n=8) in 2002.

The White River Partnership also did temperature monitoring on the Third Branch in summer 2001 with continuous water temperature recording from June 13 until October 10, 2001. At the Stock Farm Road site (rm 4.3) the temperature was above 77 F for 9 hours on 8/5, 10 hours on 8/6, 11 hours on 8/7, 17 hours on 8/8, 17 hours on 8/9, 17 hours on 8/10 and 7 hours on 8/11 - a selection of results from the hottest week. At the Adams Brook site, the temperatures were above 77F for 5 hours on 8/6, 5 hours on 8/7, 8 hours on 8/8, 8 hours on 8/9.

Macroinvertebrate sampling was done by Vermont DEC at 7 sites on the Third Branch although only one site has more than one year of sampling data. The site at rivermile 9.5 which is located above the confluence with Ayers Brook but below the Randolph WWTF was fair-good in 7/89, good in 10/89, good in 8/93, good in 9/2001. (2002) Biomonitoring data on four sites sampled in 1993 (milepoints 9.5, 9.9, 10.2, 18.1) showed full support based on macroinvertebrate communities: community assessments from good to very good to excellent as one goes upstream. Site 9.5 data indicated a threat to aquatic biota due to nutrient enrichment. (1996)

A study was done by the USDA Natural Resources Conservation Service in 1997. Results of the study include a classification of both the Third Branch and Ayers Brook using 2 classification systems as well as a sediment budget for the Third Branch above and below Randolph. In the three reaches, from 66 to 80 percent of the sediment came from streambank erosion due to either removal of riparian vegetation or instability from earlier gravel mining or both. In the report's words: "Most of the sediment in the Third Branch system appears to be from streambank erosion in Ayers Brook and from streambank erosion downstream of Randolph. Most of this sediment is due to erosion of high banks or banks that are not protected with woody vegetation. The high banks occur where the stream flows through glacial lake sediments or where it has migrated across the valley floor into higher terraces or into the valley wall itself. The lack of woody vegetation typeically occurs where the valley floor is cropped.. The bank erosion in the lower reaches of the Third Branch may be due, in part, to the historic gravel mining that was stopped in 1986."

When the sewer and stormwater systems were separated in Randolph downtown (about 25 acres of paved area) directly to the Third Branch with no treatment. There is a 4 foot pipe above the Route 12 bridge and a smaller one below. Warm water, oil and grease, heavy metals in the runoff from the downtown are all discharged to the river. (1996)

INFORMATION SOURCES

White River Partnership - E. coli data from 2001 and 2002, temperature data from 2001.

White River Watershed Assessment: Third Branch Stream Classification, February 2001. Prepared for the White River Partnership by the USDA Natural Resources Conservation Service

Rich Kirn, Vermont Dept of Fish & Wildlife - memo re evaluation of trout populations below Flint Brook

Third Branch - White River **VT09-06**

water withdrawal (2001)

John Claussen, Vt Dept of Fish & Wildlife - partial support of Third Branch from Bethel to Ayers Brook due to nutrients, sediments, thermal impacts still valid (from 94 assessment). John also noted a threat to the river from the two new pipes that discharge stormwater directly to the Third Branch with no treatment. The rainbow trout population is diminished from Roxbury to Randolph. There is extensive beaver activity in this stretch. (1996).

Dan Koloski, NRCS - noted heavy sediment load in Third Branch due to severe streambank erosion (1994).

Stan Corneille, Vt. DEC Waste Management Division - noted that groundwater samples from the Wright-Bessette site still show significant levels of tetrachloroethylene. No surface water samples have shown problems, but groundwater flows toward Ayers Brook (1994). More groundwater monitoring wells are being put in to find out how far away from the site groundwater is contaminated. Surface water (Howard Hill Brook) was sampled in July 1997 by Johnson Company. No results as of this record update. The State will take over sampling after this year. (1997).

Dennis Borchardt, George Aiken RC&D - noted that eroding streambanks are a significant problem between Bethel and Randolph resulting in loss of fish habitat (1996).

Steve Fiske, Vt DEC Water Quality Division - biomonitoring data on four sites sampled in 1993 (milepoints 9.5,9.9,10.2,18.1) showed full support based on macroinvertebrate communities. Site 9.5 data indicated a threat to aquatic biota due to nutrient enrichment.

Jerry McArdle, Vt DEC Water Quality Division - noted horse pasture with little or no buffer on Third Branch just upstream of Batcheldor Brook: a large gravel operation just above the confluence of Riford Brook; and eroding streambanks from confluence of Ayers Brook down to Bethel. (1997).

Use No	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	76.5	2.5	16.0	0.0	0.0
20	Aquatic biota/habitat	79.0	0.0	16.0	0.0	0.0
21	Fish consumption	0.0	95.0	0.0	0.0	0.0
42	Contact recreation	82.0	2.0	11.0	0.0	0.0
44	Noncontact recreation	95.0	0.0	0.0	0.0	0.0
50	Drinking water supply	94.9	0.1	0.0	0.0	0.0
62	Aesthetics	76.5	2.5	16.0	0.0	0.0
72	Agriculture water supply	94.9	0.1	0.0	0.0	0.0

Impairment Cause	Magnitude	Size (mi.)
Priority organics	T	0.10
Nutrients	M	9.50
Nutrients	T	2.50
Siltation	H	16.00
Siltation	T	5.50
Thermal modifications	M	9.50
Other habitat alterations	H	1.00
Other habitat alterations	M	15.00
Pathogens	S	9.50
Turbidity	M	15.00

Impairment Sourc	Magnitude	Size (mi.)
Agriculture	M	9.50
Aquaculture	T	2.50
Hazardous waste	T	0.10
Channelization	H	1.00
Dredging	H	1.00
Channel instability	M	15.00

Third Branch - White River		**VT09-06**
Removal of riparian vegetation	M	9.50
Streambank modification/destabilization	H	9.50
Streambank modification/destabilization	T	5.50
Drainage/filling of wetlands	M	1.00

Permit No.	**Point or Nonpoint Source Description**	**Receiving Water**
VT0100285	Randolph WWTF 0.40mgd	
3-0362	Fish Hatchery - Roxbury - VT DF&W	
	Bethel Mills Hydropower Dam - Private	
1-0495	Patten Corp NE - sw	Trib Bull Run
1-0535	Exit 4 Development Corp - sw	Trib Adams Brook
1-0856	Randolph Marketplace - sw	Smith Brook
1-1150	Vt Pure Springs - 3 sw	Trib Adams Brook
1-1369	Central Vt Shopping Ctr - 4 sw	Smith Brook

Upper White River Watershed

Assessment Report

Waterbody No: VT09-07 **Assessment Year:** 2002

River Length (mi.): 145.4 **Date Last Updated:** 10/1/2002

Description: Mainstem from confluence of West Branch to headwaters and tributaries including Tweed River, Locust Creek, Stonly Brook, West Branch White River and West Branch Tweed River. Bingo Brook. Hancock Branch.

Location Identifiers

ANR Enforcement District: 3 **NRCS District:** 10

Fish and Wildlife District: 4 **Regional Planning Commission:** TWO

Assessment Information

Monitored (mi.): 10.5

Evaluated (mi.): 134.9

Assessment Types

Surveys of fish and game biologists or other professionals

RBP III or equivalent benthos surveys

Water Quality Limited?

On 303(d) List? N

Monitored for Toxics? N

Aquatic Contamination

Toxics Testing

Waste Management Zone - Miles: **Description:**

Assessment Comments

THREATENED MILES

White River: 9.0 - from Alder Meadow Brook confluence down to West Branch confluence - threats to aquatic biota/habitat and water clarity due to sedimentation, turbidity, and thermal changes from agricultural land uses, streambank erosion, and removal or riparian vegetation. c(1100,1400) s(1000,7700)

White River: 3.5 - from confluence with Alder Meadow Brook to headwaters and

Clark Brook: 2.0 - from mouth to headwaters - both streams have threats to aquatic biota/habitat due to acidity and metals from acid deposition. c(500,1000) s(8100)

Hancock Branch: 2.0 - from Texas Br. confluence to headwaters - threats to aquatic biota/habitat, and water clarity due to sedimentation, turbidity, metals and acidity from atmospheric deposition, and streambank erosion. c(500,1000,1100) s(7700,8100)

Tweed River: 2.5 - upstream from confluence with White River to Pittsfield Village - threats to aquatic biota, water clarity and contact recreation from sedimentation, thermal changes and potentially pathogens from land development (primarily residential), road maintenance and agricultural land uses. c(1100,1400,1700) s(1000,3200,4500)

Hancock Branch: 0.2 (chosen to represent scattered areas of erosion noted by White R. Citizen Monitoring Program) - threats to aquatic biota/ habitat due to sedimentation from natural and human-caused streamside erosion. c(1100), s(7700,8600)

Bingo Brook: 0.5 (chosen to represent scattered erosion areas noted by White R. Citizen Monitoring

Program) - threats to aquatic biota/habitat due to sedimentation from streambank erosion. c(1100), s(7700)

Locust Creek: 2.0 - from the Royalton town line to the confluence with the Silver Lake drainage - threats to aquatic biota/habitat due to sedimentation from erosion at 5-10 sites within the two mile stretch. c(1100) s(7700)

South Branch Tweed River: 2.5 - upstream from Townsend Brook confluence - threats to aquatic biota/habitat and aesthetics from sedimentation and thermal changes due to residential development, road runoff, instream ponds on the tribs. c(1100,1400) s(3200,4500,7350)

COMMENTS

Macroinvertebrate sampling on Stony Brook, Perkins Brook, West Branch Tweed River, West Branch White River, Bingo Brook, Smith Brook and Howe Brook in 1999, 2000, or 2001. The macroinvertebrate community was very good at rivermile 1.9 on Stony Brook in 2001; very good at rivermile 1.4 on the West Branch Tweed River in 2000 and excellent in 2001; excellent at rivermile 0.5 on the West Branch White River in 2000; very good at rivermile 1.3 on Bingo Brook in 1999, excellent in 2000 and excellent - very good in 2001; excellent at rivermile 1.3 on Smith Brook in 1997, 1998, 1999, 2000, and very good in 2001; and fair at rivermile 0.3 on Howe Brook in 1999, good in 2001, and excellent-very good in 2001.

The White River Partnership did temperature monitoring at mainstem rm 54.2 (just above Hancock Branch confluence) and mainstem rm 61.1 (Clark Brook confluence) in 2001. At rm 54.2, there were 5 hours on 8/7, 6 hours on 8/8 and 6 hours on 8/9 when the water temperatures were at or above 77F. The maximum temperature for the day exceeded 72F on 38 days but there were no full days (24 period) when the temperatures exceeded 72F as happened on the lower parts of the White River. At rm 61.1, the temperatures stayed substantially cooler with maximum daily temperatures never surpassing 70F.

Site investigation done in June 1989 at Weyerhauser Corporation hazardous waste site. Nothing found in surface water and no groundwater samples taken. (1994) EPA did a site investigation in 1994. Not much found in groundwater - no risk and no further remedial action planned. Site closed. (1997)

Review of the infrared photographs for the White River mainstem from the headwaters to the confluence of the West Branch found that 54% of the northern or eastern shoreline had a buffer of vegetation greater or equal to 50 feet and 46% had a buffer less than 50 feet. Of the southern or western shoreline, 49% had a buffer of vegetation 50 feet or greater and 51% of the length had a buffer less than 50 feet.

Macroinvertebrate community data for Austin Brook and Bear Wallow Brook sampled in 1994, 1995, and 1996 showed full support for aquatic biota.

INFORMATION SOURCES

White River Citizen Monitoring Program Final Report, October 31, 1989. 25 miles of streams were walked to identify current or potential water quality problems - erosion sites noted.

Vt. DEC Hazardous Materials files.

John Claussen - Vt. F&W District Fisheries Manager - noted that all tribs are uniformly excellent for fishing and provide trout spawning and juvenile Atlantic Salmon habitat. However, in several tribs, notably the Tweed River, trout populations have declined significantly and salmon fry production have declined over the past 20 years to unknown causes.

Dan Koloski - SCS - noted the erosion on Locust Creek

Water Quality Division infrared photograph collection (1997)

Steve Fiske, Vt DEC Water Quality Division - macroinvertebrate biomonitoring data (1997)

Jim Kellogg, Vt DEC Water Quality Division - noted that the streams threatened by acid precipitation haven't been monitored recently "but based on precipitation pH levels, there is no reason to assume any improvement." (1997)

Jerry McArdle, Vt DEC Water Quality Division - noted "fuzzy" rocks and the threats from residential development, road runoff to the South Branch Tweed River.

Bob Burt, GMNF - there is a Clark Brook III timber sale but it is a winter only logging sale. If there are mid-winter thaws then the operations are stopped. They have regular timber sale administration on all their logging jobs - checks on the operation about once a week. Steve Roy looks at the brooks for the Environmental Assessment that is done on each timber sale and then monitors the brooks. (No reason for Clark Brook or the upper White River to be singled out for threatened status, CRK). (1997)

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	120.2	25.2	0.0	0.0	0.0

Upper White River Watershed **VT09-07**

20	Aquatic biota/habitat	120.2	25.2	0.0	0.0	0.0
21	Fish consumption	0.0	145.4	0.0	0.0	0.0
42	Contact recreation	142.9	2.5	0.0	0.0	0.0
44	Noncontact recreation	145.4	0.0	0.0	0.0	0.0
50	Drinking water supply	145.4	0.0	0.0	0.0	0.0
62	Aesthetics	128.9	16.5	0.0	0.0	0.0
72	Agriculture water supply	145.4	0.0	0.0	0.0	0.0

Impairment Cause	Magnitude	Size (mi.)
Metals	T	7.50
pH	T	7.50
Siltation	T	18.70
Thermal modifications	T	14.00
Pathogens	T	2.50

Impairment Source	Magnitude	Size (mi.)
Agriculture	T	11.50
Land development	T	5.00
Highway/road/bridge runoff	T	5.00
Upstream impoundment	T	2.50
Streambank modification/destabilization	T	13.70
Atmospheric deposition	T	7.50

Permit No.	Point or Nonpoint Source Description	Receiving Water
	Rochester Septics 1,2,3 - indirects	
1-0638	Weyerhauser Co. - sw	Trib White River
1-0673	Collins Construction - sw	Tweed River
1-0887	B & S Roy - 2 sw	Tweed River