Basin 11

West, Williams & Saxtons Rivers Assessment Report

Agency of Natural Resources
Department of Environmental Conservation
Water Quality Division
November 2001

Contents

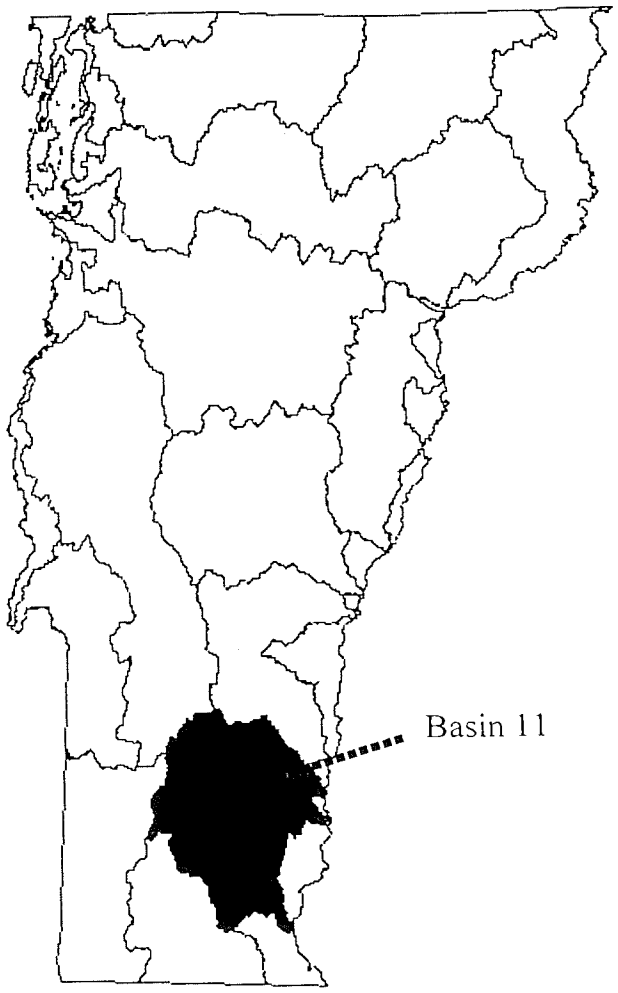
Basin 11 - The West, Williams, and Saxtons Rivers Watersheds

The Basin 11 planning unit includes three watersheds: the West, Williams, and Saxtons Rivers watersheds. Basin 11 is located in the southeastern corner of Vermont and drains the eastern slope of the Green Mountains. It covers approximately 395,520 acres. The rivers and their tributaries flow down from the mountains through the foothills and across the Vermont Piedmont to the Connecticut River Valley where they join the Connecticut River. The Williams River joins the Connecticut River in Rockingham, the Saxtons River joins the Connecticut River in Bellows Falls, and the West River joins it in Brattleboro.

The West, Williams, and Saxton's River Basins are characterized by having relatively few lakes. There are 49 lakes and ponds in the three basins, comprising 1,030 known acres.

Most of Basin 11 lies within Windham County although portions are also within Windsor and Bennington Counties and a very small portion is in Rutland County. The basin is part of the Southern Green Mountain biophysical region of Vermont.

Figure 1. Location of Basin 11 in Vermont.



The West River and its Watershed

General Description of the Watershed

The mainstem of the West River originates in the south part of Mount Holly, 2,400 feet above sea level. It flows generally south through the towns of Weston and Londonderry then southeasterly through Jamaica, Townshend, Newfane, Dummerston, and Brattleboro where it meets the Connecticut River. The length of the mainstem is 46 miles and the river drains a watershed that is 423 square miles.

The uppermost section of the West River flows through forested then partially forested and partially open country. It has a stony bottom with extensive gravel bars in some places and is considered good trout and salmon habitat. The first major tributary, Greendale Brook, enters a mile and a half above Weston. The slope of the West is around 80-100 feet/mile near Greendale Brook and there is a bouldery cascade at Zion Chapel just above their confluence. The valley flattens about one half mile below Greendale Brook, and the slope decreases to 10-20 feet/mile. Near Weston, there is a small mill dam with a backwater about one half mile long.

Just below Weston, the river steepens, turns away from the road, and enters a wooded ravine. It remains in this ravine for the next three miles and includes a nice whitewater stretch in the spring.

Three miles below Weston, Route 100 crosses the West River at a small settlement called the Island, where a sharp bend in the river was formerly cut by a short canal used to feed a mill. Below the Island, the river flows through rough meadows and thickets for two miles, before flowing under a side road bridge and entering the backwater of the Williams Dam at Londonderry.

Below the dam and just west of Londonderry, Utley Brook enters the West River and increases the drainage area by about 75%. Utley Brook is 10 miles long. After the Utley Brook confluence, the West River turns south and parallels Route 100 for 1.5 miles. It then flows over a set of ledges just before going under Route 100 and over another set of ledges after the road bridge. Flood Brook enters right below these ledges contributing another 11 square miles of drainage area.

Moderately heavy whitewater continues for a quarter mile below the ledges. The stream then enters a swampy flat area, much of which was formerly in the backwater of a dam at South Londonderry. For about three quarters of a mile the stream is away from the road and there are alder thickets along the banks. It then returns to the road and passes under the Route 100 bridge in the middle of South Londonderry.

Below this bridge, the river has roads and houses on each side. It steepens again and about a half mile below the bridge, it goes over a set of three ledges dropping a total of 15 to 20 feet in 50 yards.

The West River is medium-sized, averaging 50-70 feet wide, where it leaves the paved road in South Londonderry. It has a small floodplain bordered by steep hills to the west and the gentler lower slopes of Glebe Mountain to the east. The shores were formerly cleared for farming but are now reverting to woods. The channel has a moderate (20 feet per mile) slope and mild Class II rapids. The stream appears "broad and sunny and handsome", and it becomes apparent that the West is becoming a big river.

About a mile below the confluence of Lowell Lake stream, the floodplain narrows and the river begins to steepen, reaching 40 feet per mile at the confluence with the Winhall River. The Winhall River, 16 miles long, flows into the West River from the west. This large tributary drains a 62 square mile forested watershed that is largely higher elevation land.

At the confluence of the West and Winhall Rivers is the former Winhall Station, where a legendary West River train crew once waited for a neighbor's hen to lay the twelfth egg so that she could send a dozen to Brattleboro. It is now the lower end of the Ball Mountain Camp Grounds, which extend up the Winhall River. Depending on the time of the year the backwater from the Ball Mountain Dam may extend up to or beyond Winhall Station. The river continues in a southerly direction below Winhall Station with the valley narrowing substantially in the mile before the river flows into the Ball Mountain impoundment. The winter pool at Ball Mountain is 25 feet and the summer pool is 65 feet. For the April whitewater release, the pool is raised from winter level as flows allow. For the September release, the summer pool is dumped.

From Ball Mountain Dam to the bridge at Jamaica, the West River flows in a narrow, steep, wooded ravine. The river is fairly deep and rocky and the riparian corridor is largely undeveloped. Below the Jamaica bridge, Ball Mountain Brook enters the West River, the river widens, and the whitewater is less intense than upstream. There is a large island with channels on each side, the greater flow on the eastern branch.

The rapids end near the Route 100 bridge in East Jamaica. Wardsboro Brook enters the West River from the west just below the bridge. Wardsboro Brook is a 12 mile long stream that drains a 37 square mile watershed. Below Wardsboro Brook, the river widens and enters a flat basin that is part of the backwater for Townshend Dam in the spring. The river winds and braids through this basin until it meets the permanent pool of the Townshend Reservoir. The permanent pool is approximately a mile long.

From the Townshend Dam to Newfane, the river flows southwesterly through a relatively wide valley where the river has a quarter to half mile floodplain. Below Newfane, the river narrows and steepens. At Williamsville Station, the Rock River enters from the east.

The headwaters of the Rock River are located in Dover. From its headwaters, the Rock flows east into South Newfane where it is joined by the Marlboro Branch. From this confluence, the Rock continues running east to Williamsville where it is joined by Baker Brook. From here, the Rock continues east to connect with the West River. The Rock River itself is12 miles long and drains a 60 square mile watershed.

Just downstream of the Rock River, the West River sweeps to the east for about a mile and then flows generally southeasterly again. From Williamsville Station to the mouth, the riparian corridor is more developed. Route 30 runs along the bank for the last 8 miles. This lower section of the river is fairly wide with a number of bedrock exposures, wooded banks coming down to the channel, and nice hills adjacent to the river. One mile above the mouth is a wetland area called Retreat Meadows, a backwater created by the Vernon Dam on the Connecticut River that has become a large marsh.

The West River watershed is a forested watershed (86%) with only a small portion of the land in agricultural use (3%). Surface water (5%) and transportation uses (4%) comprise even more of the watershed area than agriculture. Wetlands and developed land cover only 1% each of the watershed area according to the 1991-1993 satellite photograph analysis that is the source of these numbers.

Recreational Uses of the West River Watershed Rivers and Streams

Swimming

As noted in the 1989 *Upper West River Basin Water Quality Management Plan*, swimming occurs throughout the West River watershed in deep river or stream pools and in ponds and "wherever there is easy access to an inviting pool, someone is likely to take a plunge from time to time." The plan lists and maps 25 river or stream swimming sites including sites on the reservoirs and 17 pond sites in the upper West River watershed. In addition, there are 17 other swimming holes in the West River watershed described in the 1992 Vermont Swimming Hole Study. Some of the listed and described swimming holes are well-known sites such as Hamilton Falls on Cobb Brook, Pikes Falls on North Branch Ball Mountain Brook, the Dumplings and Salmon Hole on the West River, Indian Love Call on the Rock River, Winhall Brook campground swim beach and Townshend Reservoir swim beach, but there are numerous other locally known and enjoyed sites throughout the watershed.

Boating

The West River is well-known for canoeing and kayaking and especially for the spring and fall Ball Mountain Dam whitewater releases. There are a number of challenging and pretty boating runs on both the West River mainstem and its tributaries. The stretches described and/or mapped in the 1987 *Whitewater Rivers of Vermont* publication or the 1988 *Guide for Evaluating the Outstanding Rivers and Streams of Vermont* include: the stretches on the West River mainstem from Weston to Londonderry, Londonderry to Ball Mountain Dam backwater, below Ball Mountain Dam to the Route 100 bridge, below Townshend Dam to the Connecticut River as well as the Winhall River from Kendall Road to the West River, and Wardsboro Brook from Wardsboro to Jamaica.

Figure 1. Map of the West River from its headwaters to below Ball Mountain Dam

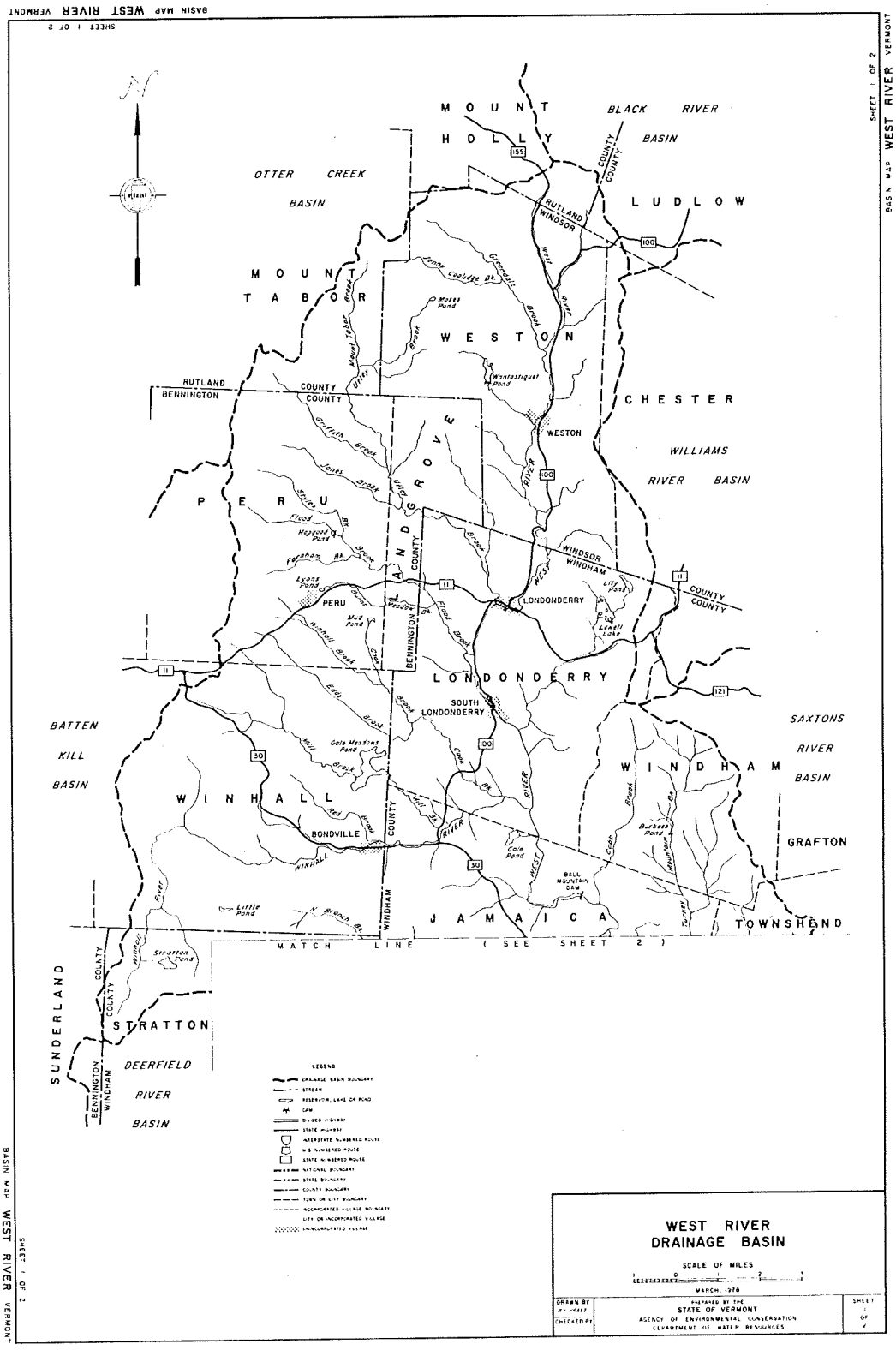
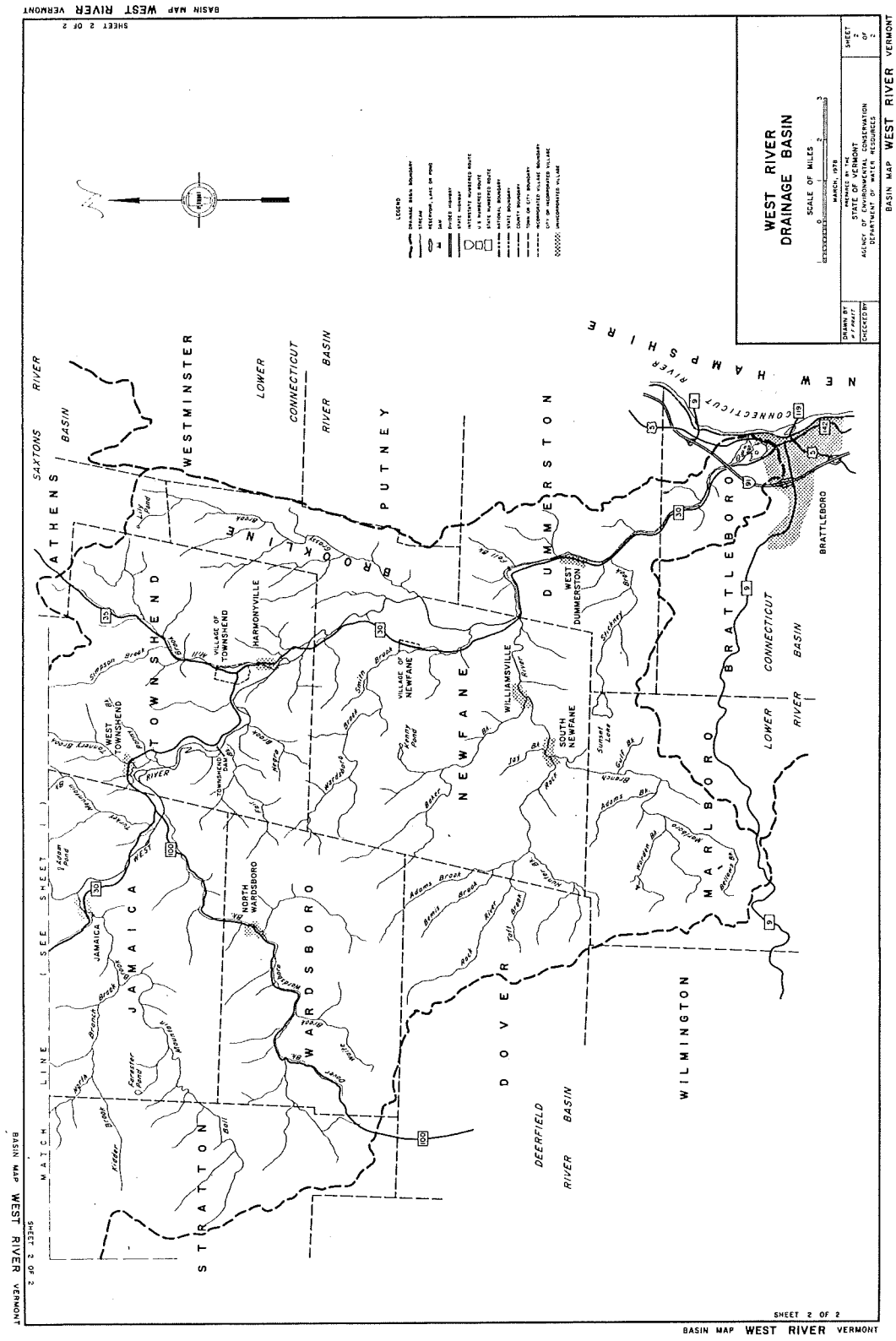


Figure 2. Map of the West River from below Ball Mountain Dam to the Connecticut River



Fishing

Angling occurs throughout the West River watershed. Some highly used areas include the lakes, Townshend reservoir and the West River mainstem between Ball Mountain Dam and Townshend Reservoir. Yearling trout are stocked in a portion of the watershed for "put and take" fishing where the water temperatures are warm in summer and wild trout populations are low or nonexistent. The 1989 *Upper West River Basin Water Quality Management Plan* includes a map of some of the areas more intensively use for fishing.

Other Riverine Values and Features in the West River Watershed

Waterfalls, cascades and other natural features

Four stream sites with waterfalls or cascades in the West River watershed are described in the 1985 *Waterfalls, Cascades and Gorges* report. These include Jelly Mill Falls on Stickney Brook in Dummerston, Hamilton Falls on Cobb Brook in Jamaica, Rock River Cascades on the Rock River in Dover, and Pikes Falls on the North Branch Ball Mountain Brook in Jamaica. A number of other sites with gorges, waterfalls, pools, rare species, or other water-related natural features are listed and mapped in the 1989 Upper West River Basin Water Quality Management Plan.

Class A and Outstanding Resource Waters

There are three Class A designations and one Outstanding Resource Water designation in the West River watershed. Kidder Brook and its tributaries were reclassified from Class B to Class A in 1989. The Water Resources Board determined that Kidder Brook "is in an essentially pristine condition, has high quality waters, sustains a naturally viable brook trout fishery and makes an important contribution to preserving the water quality, fishery, and recreational uses and values downstream including at Pikes Falls.." In 1991, the stretch of the Winhall River from 2500 feet elevation downstream about 7.4 miles (the point where the river crossed the boundary of Green Mountain National Forest land) was reclassified from B to A also per petition of a citizen's group. Also in 1991, the Water Resources Board reclassified Cobb Brook from Class B to A based in part on the finding that "there are only approximately 50 pristine-like streams of similar length in the entire State of Vermont. The Brook is of a higher value than most of those streams and is relatively unique in that nutrients and sediments in excess of those attributable to natural conditions are essentially absent."

In 1991, a 4000 foot long stretch of the North Branch Ball Mountain Brook that includes Pike's Falls was designated Outstanding Resource Waters for the waters' "natural, recreational and scenic values."

Threatened and endangered species and significant natural communities

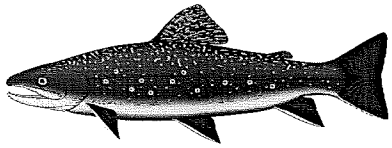
A 1996 inventory of rare freshwater mussels, tiger beetles, northeastern bulrush, and significant natural communities was conducted by staff in the Agency of Natural Resources Nongame and Natural Heritage Program along the West River primarily at the Army Corps of Engineers Ball Mountain and Townshend Dam project areas. Three rare invertebrate species were found either in the West River or on its shores. The cobblestone tiger beetle was reported for the first time from the West River as a result of this inventory. Both the brook floater mussel (*Alasmidonta varicosa*) and the eastern pearlshell mussel (*Margaritifera margaritifera*) were found at a site between the dams and then at several other locations on the mid-West River.

Another 1996 inventory was done at the Ball Mountain and Townshend Dam Project Areas: a survey for vernal pools and rare or protected reptiles and amphibians was done by Jim Andrews of Middlebury College. The survey was conducted over 21 days from April until November 1996 using a variety of reptile and amphibian survey methods. Nineteen species of reptile and amphibian were located in the areas searched: six salamander species, seven frog or toad species, three turtle species, and three snake species. Thirty-three locations of vernal pools or areas that serve as amphibian breeding sites were identified and mapped. Seven of the thirty-three sites are considered "classic" vernal pools being natural, temporary pools in forested areas with no inlet or outlet.

A report done for the Vermont Nongame and Natural Heritage Program in July 1996 summarized the results of an ecological inventory of the wetland natural communities in the West River Watershed. The following two paragraphs are taken almost directly from the report.

> Given the geology and the rugged topography of the watershed, it is not surprising that the wetlands of this area can be characterized as small and acidic (or at least not limy). The riverine wetlands along the West River, especially those associated with relatively high-gradient streams, are of particular significance in the state. The floodplain forests along the West River differ from floodplain forests in most other areas of Vermont in that they contain sycamore. Also unique to the West River and nearby sections of the Connecticut River is the presence of big bluestem and dwarf sand cherry in the rivershore grassland community. Furthermore, the examples of river cobble shore community along the West River are some of the most outstanding in the state. Five rare plants are associated with this community in several locations along the West River.

Wetlands resulting from beaver impoundments, so-called "beaver meadows" are by far the most numerous wetland type. These beaver meadows are shallow emergent marshes in the Nongame and Natural Heritage Program natural communities classification. Because these beaver meadows are most commonly found in a series along a slack stretch of stream they can add up to be wetlands of significant size. An impressive example of such a series is described for the Winhall River Headwater Beaver flowage site in Stratton. Although functionally very important as wetlands, beaver meadows are so common in Vermont that they rarely register as significant on a state level. However, the northeastern bulrush, a federally-listed species is restricted in Vermont to beaver wetlands in the southeastern portion of the state. This sedge species is apparently dependent upon the fluctuating water levels that these wetlands provide.



Fisheries resources in the West River watershed

The uppermost portion and smaller tributaries of the West River watershed support healthy populations of wild brook trout, and in some cases wild brown trout. However, high summer water temperatures limit trout populations in the lower mainstem and larger tributaries. Atlantic salmon can survive in significantly warmer water than trout and thus, salmon do well in most of this watershed from upland tributaries to the lower mainstem. The one exception is the West River below Townshend Dam where temperature conditions are marginal even for salmon in most years. A variety of non-game fish species occur throughout the watershed.

High water temperatures are a result of large portions of the watershed lacking adequate riparian buffers resulting in lack of shade. Roads are built on or close to river banks and there is additional commercial, residential, and agricultural development near streams. This situation is exacerbated on the West River by the presence of four mainstem dams which result in significant additional warming. The lower two dams, which are operated by the U.S. Army Corps of Engineers (the Corps) for flood control, cause substantial additional habitat impact from flow fluctuations, reservoir fluctuations, and sediment releases. However, with the above exceptions, physical habitat is generally in good shape in this watershed with only some localized exceptions.

Atlantic salmon fry are stocked annually into streams in the West River watershed as part of the program to restore salmon to the Connecticut River basin. Salmon were extirpated from the basin in 1798 when a dam was built across the mainstem of the Connecticut River in Turners Falls, Massachusetts. Salmon have been stocked in the West River since 1981. Initially, stocking was small scale and experimental, however, since the mid-1990s, annual fry stocking has been at or near desired stocking levels. In 2000, 1,080,000 fry were stocked in the West River. Annual electrofishing assessments throughout the watershed have shown generally good survival and growth of stocked salmon. Most salmon spend two years in freshwater before migrating to the ocean as smolts.

Currently, most adult salmon returning from the ocean are trapped at the Holyoke Dam in Massachusetts for broodstock. However, since the mid-1980s about ten percent of the salmon have been released to continue upstream and spawn naturally. Beginning in 1998, most of the released salmon have been radiotagged which has allowed monitoring of their movements. It is likely that adult salmon have been present in the West River almost annually since 1985, but monitoring was limited to snorkeling surveys and other incidental reports. Nine radiotagged salmon entered the West River in 1998, two in 1999, and two in 2000. Spawning was confirmed by the detection of six redds in the West River mainstem in Townshend and Newfane in 1998. One of the 1999 West River salmon, a 19-pound, 37-inch female, spent that drought summer in the upper portion of Ball Mountain Brook where it is assumed to have spawned with mature male parr in the fall.

A salmon trap and truck facility is operated by the Corps at Townshend Dam for the purpose of providing salmon passage in the West River basin. Traditional fish ladders are not feasible at the flood control dams because of their large size and often nearly empty pools. Currently, salmon are trapped and transported above Townshend Dam for release. As run sizes increase, salmon will also be transported above Ball Mountain, Londonderry, and Weston Dams for release. Without this facility, all four mainstem dams would be complete barriers to upstream fish migration. This facility was destroyed by flooding in 1998 and was not operational for salmon passage that year. All salmon that entered the West River in 1998 were likely migrating to areas above Townshend Dam because they all reached the dam and spent considerable time there. The facility was repaired in 1999 and upgraded in 2001. The Corps maintains the winter pool of 25 feet at Ball Mountain during the spring migration season to facilitate passage of smolts downstream through this bottom discharge reservoir. Radiotagging studies have indicated good smolt passage at moderate to high flows, but no evaluation has been done at lower flows. Water storage for whitewater releases and flood control can result in significant delay and mortality to smolts. Passage through Townshend Dam is much easier because it is a top-spill operation. The Corps has installed stop logs at the base of the dam to provide a pool for smolts to safely land in. Weston and Londonderry Dams are not thought to be major impediments to smolt migration but some minor improvements might be needed in the future to maximize smolt survival.

Lakes in the West River Watershed with Special Significance or Features

Vermont DEC's Lake Protection Classification System is one 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 very rare, threatened, and/or endangered species. The following lakes are significant in these respects:

Ball Mountain Reservoir, Jamaica: The steep-sided nature of the valley along this reservoir creates an interesting shoreline, which includes boulders, small cliffs, and waterfalls.

Cole Pond, Jamaica: Cole Pond supports a population of the rare pondweed *Potamogeton bicupulatus*.

Gale Meadows Pond, Londonderry: This pond has a population of the rare milfoil *Myriophyllum humile.*

Lily Pond, Londonderry: This small scenic pond supports the rare *P. bicupulatus*, and the rare *M. humile*.

Lowell Lake, Londonderry: Lowell Lake supports three noteworthy aquatic plants: the rare *P. bicupulatus*; the rare *M. humile;* and the rare bladderwort *Utricularia purpurea.* Lowell Lake also has a particularly diverse assemblage of aquatic plants, as well as several undeveloped islands.

Stratton Pond, Stratton: Stratton Pond is a wilderness lake, with access by foot only. The primary access is via the Appalachian Trail, which runs adjacent to the pond.

Sunset Lake, Marlboro: Sunset Lake is an ultra-oligotrophic lake, meaning it supports extremely high water quality as related to nutrients. The lake has a very scenic lake bottom, and supports both the rare *P. bicupulatus*, and the rare *Isoetes tuckermanii.*

Activities or Projects in the West River Watershed

Stratton Area Citizens Committee

In 1984, volunteers in the northern part of the West River watershed founded an organization to monitor the impacts of resort development on water quality and aquatic habitat and to advocate for adequate protection of the water resources in this portion of the watershed. This citizen group was responsible for achieving Class A status for Kidder Brook and for getting the designation of Pike's Falls as an Outstanding Resource Water. The group remains active in water quality monitoring as part of the West River Watch Program and in water quality remediation planning and implementation at Stratton Mountain Resort.

Stratton Mountain Resort Water Quality Remediation Plan

Stratton Mountain Resort is in the third year of implementing a largescale water quality remediation plan that involves monitoring, re-establishment of woody plants along streams, evaluation and remediation of sediment problem locations, streambank stabilization, stormwater control, limestone treatments at iron seeps, culvert removals, and other activities to improve water quality in streams on Stratton Mountain Resort land. Monitoring conducted in the year 2000 represents the second year of three years of background monitoring. Nutrients, metals, and temperature were monitored. Event-based monitoring measured turbidity and biomonitoring and/or sediment assessments were done at 27 monitoring stations. A description of the work done in the year 2000 is summarized in an annual performance report done by Pioneer Environmental Associates for the Stratton Corporation. The goal of the remediation plan is to restore Styles Brook and Tributary #1 of the North Branch Ball Mountain Brook, which are listed as impaired. The plan is to have the waters meet water quality standards by 2005.

West River Watershed Alliance

A newly incorporated organization, the West River Watershed Alliance (WRWA), now exists in the West River watershed and is planning its work. First as the West River Steering Committee and then as the unincorporated West River Watershed Alliance, a number of meetings, forums, and discussions were held throughout the watershed to bring together those interested in the watershed; issues and concerns were identified and discussed; and finally an action list and plan for the watershed was created. Many organizations and individuals came together in this process. Specific work began as a result of the comprehensive *West River Watershed Action Plan* including a Rock River riparian inventory, formation of the not-for-profit WRWA, and submittal of a grant to hire a watershed coordinator.

West River Tributaries Erosion and Stability Assessment

In 1997, the Windham Regional Commision with assistance from partners conducted a physical assessment of the Rock River, Winhall River, and Ball Mountain Brook determining their likely valley and stream types using maps, watershed characteristics including soils and land use/land cover, and erosion hotspots based on field investigations. The erosion sites were evaluated as to the priority for stabilization work. Three of the sites identified on the Rock River are addressed by the project described below.

Bonnyvale Environmental Education Center Watershed Projects

Bonnyvale Environmental Education Center (BEEC) has coordinated the West River Watch Program since 1994 although the program has been operating in some form since 1985. Over the years, BEEC has increased the number of sites monitored, added or removed parameters measured as appropriate, and developed a reader-friendly report summarizing the data and results of the season's sampling. In the year 2000, 23 volunteers monitored 37 sites throughout the watershed and provided data on E. coli levels, temperature, pH and phosphorus.

Bonnyvale Environmental Education Center has also completed the three nonpoint source control 319 restoration projects on the Rock River. Restoration work was completed at the Williamsville site at the old Grist Mill swim hole on the Rock River in spring 2001. Since the planting of willow wattles and live stakes, growth success has been noted despite the sandy soil conditions. In June, a streamside biosurvey was conducted above and below the second and third 319 project sites to verify water quality conditions prior to the in-stream construction work. Chemical parameters were measured, macroinvertebrates sampled, and a physical survey of the area was conducted. In mid July 2001, the US Fish and Wildlife Service and the USDA Natural Resource Conservation District completed their in-stream work at the project sites. On August 16 and 17, 2001, partnering with the USF&WS and the local NRCS, BEEC conducted streambank restoration work at the two in-stream projects on the Rock River in South Newfane. Over the two work days, a total of 18 people cut and stripped hundreds of willow branches and bundled them into wattles. At both project sites, wattles were placed in shallow trenches and covered. Live willow stakes were planted in the dirt areas of the riprap and on the beach area of the project sites.

BEEC received recognition for its work in the local newspaper and at the 55th annual Natural Resource Conservation District Annual Meeting in October 2001.

The Williams River and its Watershed

General Description of the Watershed

The Williams River originates on the eastern edge of the southern Green Mountains and flows easterly then southeasterly through the Southern Vermont Piedmont before joining the Connecticut River at Herricks Cove. The Williams River has a stream length of 25 miles and drains an area of 117 square miles. Much of the basin is rugged, hilly land with steep slopes and poor drainage.

The Williams River headwater streams come off the slopes of Terrible Mountain and other nearby mountains to form the Williams River mainstem. The river flows easterly through Andover and into the southern portion of Ludlow where Wheaton Brook, Lovejoy Brook, and Bear Brook join in. It continues its easterly flow into Chester and is confined to a relatively narrow valley until it turns south-southeast. At that point it flows in a broader valley down the length of the town of Chester. In the village of Chester, the Middle Branch of the Williams River joins the Williams River mainstem.

The Middle Branch originates in Windham and flows north for a ways before flowing east through Andover and Chester into the Williams River. Lymans Brook, Andover Branch, and South Branch are all tributaries to the Middle Branch. The Middle Branch is 13 miles in length and drains a watershed of 47 square miles.

From Chester village, the Williams River continues its southeasterly flow into the town of Rockingham where it flows through Bartonsville, over the Brockway Mills dam, and through a narrow valley before flowing out into Herricks Cove at the Connecticut River.

The Williams River watershed is also a predominately forested watershed (82% of the total area), however a slightly higher percentage of the watershed is in agriculture (4%) or covered by water (6%) than for the West River. Transportation uses cover 4% of the land area, developed land other than transportation covers another 2%. Areas identified as wetland cover another 1% of the watershed area.

Recreational Uses of the Williams River Watershed Rivers and Streams

Boating

There are three whitewater boating stretches in the Williams River watershed described in the 1992 *Whitewater Rivers of Vermont* report. One boating run is a five mile stretch of the Williams River from five miles above Chester down to Chester. This reach is judged to be primarily Class II whitewater at medium water and at least half Class III whitewater at high water levels and has been described as demanding and pushy.

The other two boating stretches are both on the Williams River mainstem with one stretch from Gassetts to Chester and the other from Chester to Brockway Mills. The uppermost stretch has only mild whitewater as the stream at this point has a small watershed and moderate slope. For the approximately seven mile stretch from Chester down, the Williams is a medium-sized stream with mostly quickwater, scattered Class II rapids, and one Class IV drop.

Swimming

The Williams River is relatively shallow in the summer and there are few known swimming holes. The river was not explored during the 1991 Vermont Swimming Hole Study although two sites are listed but not described in the study's report. One of the sites is Rainbow Rocks and the other is Brockway Mills both in Rockingham. Rainbow Rocks are ledges with a deep hole below. The Brockway Mills site is an 80-foot gorge with pools, potholes, and small cascades. The gorge is described in the Vermont DEC publication *Waterfalls, Cascades and Gorges of Vermont* although the investigators describe the site before hydro development there. No new sites were noted in summer 1999 during the river water quality assessment field surveys.

Other Riverine Values and Features in the Williams River Watershed

Fishery resource

The upper portions of the mainstem Williams and Middle Branch, as well as most of the smaller tributaries support healthy populations of wild brook trout, and in some cases, wild brown trout. However, high summer water temperatures limit trout populations in the lower mainstem Williams and Middle Branch. Hatchery trout are stocked in the mainstem and the Middle Branch on a put and take basis to provide fishing where wild trout populations are low. Because of their higher tolerance for warm temperatures Atlantic salmon do well throughout the watershed. A variety of non-game fish species occur throughout the watershed.

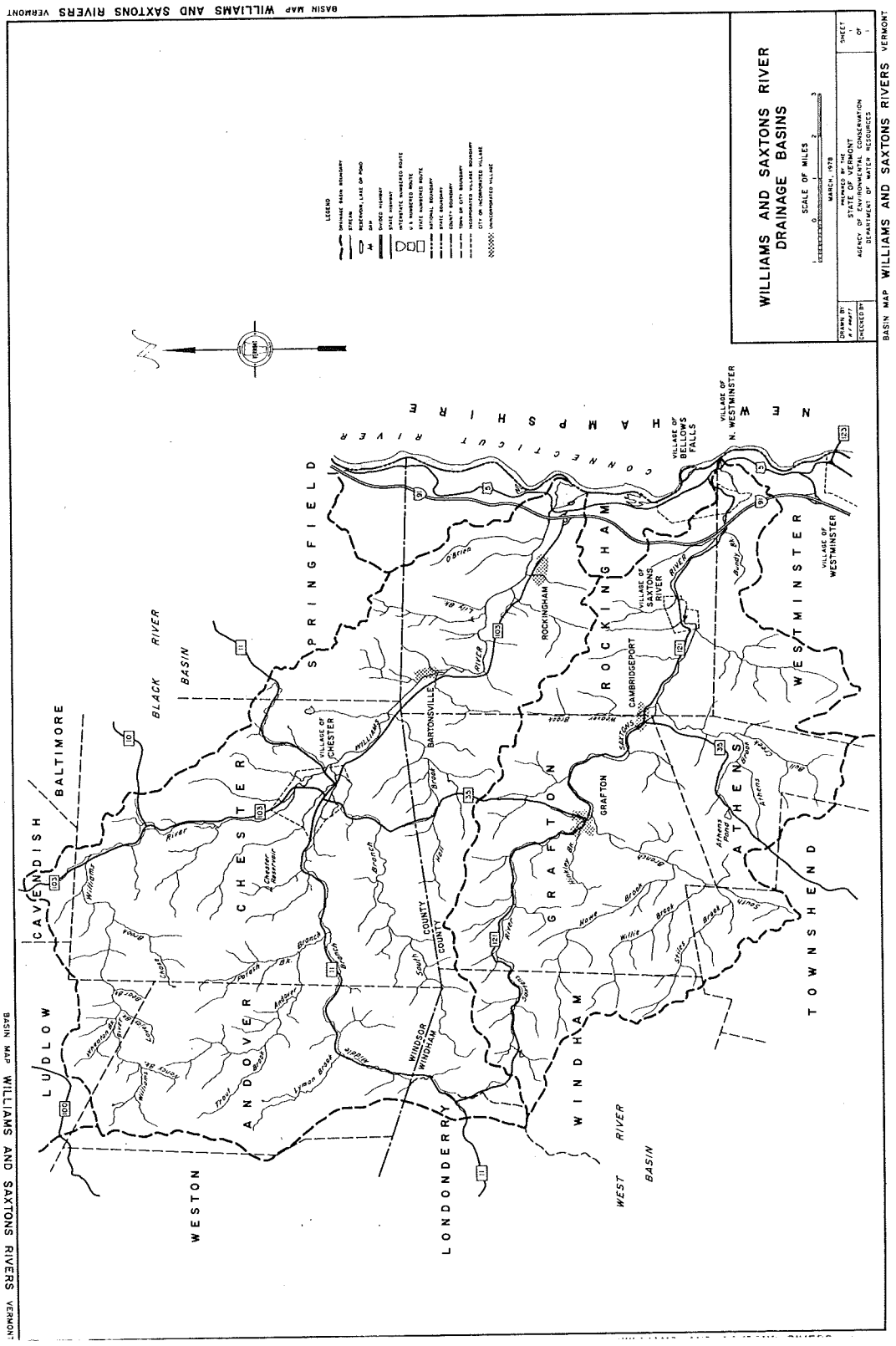
Salmon have been stocked in the Williams River since 1993. One adult salmon entered the Williams River in 1999. In 2000, 268,000 fry were stocked in the Williams watershed. The Williams River is currently impassable to upstream migrating salmon at Brockways Mills dam and falls. Historical passage status is uncertain, although it is likely that this series of small falls could be negotiated by salmon at certain flows. A bypass facility for smolts will be required when the new hydroelectric facility is constructed. An upstream fish ladder may be required in the future. There is excellent spawning, rearing, and holding habitat from the dam to the Connecticut River. See the discussion in the West River section for more details on Atlantic salmon restoration.

Threatened & endangered species and significant natural communities

There are 17 occurrences of plant species that are of statewide importance in the Williams River watershed. Most of these plants are found in wetlands associated with the river. The two bird species of importance are also found along the river. There are four occurrences of natural communities: three shallow emergent marsh communities and one riverside outcrop community. All of these significant natural communities are part of the river ecosystem.

Shallow Emergent Marsh by Libby Davidson in Wetland, Woodland, Wildland, 2000

Figure 3. Map of the Williams and Saxtons Rivers Watersheds



The Saxtons River and its Watershed

General Description of the Watershed

The Saxtons River rises on the eastern slopes of the southern Green Mountains in the town of Windham and flows southeasterly across the Vermont Piedmont to the Connecticut River. Its length is 20 miles draining an area of 78 square miles with a total drop of approximately 1800 feet. The basin is characterized by narrow steep gorges cut through rugged hilly uplands with outcropping bedrock and poor drainage.

The Saxtons River originates in an extensive wetland complex in the Lawrence Four Corners area in Windham from which it begins its easterly flow. Many headwater tributaries from the hills and mountains of the east part of Windham and the western part of Grafton flow northerly and southerly through narrow, forested valleys to join the Saxtons River. The Saxtons continues an easterly flow through Houghtonville where 1.5 miles downstream, the river turns south and flows in a somewhat wider valley to Grafton village.

In Grafton, the South Branch joins the Saxtons River from the south. The South Branch is six miles long and drains a watershed that is 20.3 square miles.

From Grafton village and the South Branch confluence, the river flows northeasterly then southeasterly around the base of Kidder Hill then continues southeasterly to the village of Saxtons River. Weaver Brook, Bull Creek, and Leach Brook all contribute to the river's flow in this stretch. From the village of Saxtons River, the river continues its southeasterly journey until North Westminster where it bends back on itself, flows over Twin Falls then continues in a northeast direction for a little more than a mile before emptying into the Connecticut River.

Deciduous, coniferous, and mixed forests comprise the dominant land cover type in the Saxtons River watershed covering approximately 82% of the watershed area. Surface water covers the next largest area of the watershed at 8%. Transportation uses cover 4% of the watershed, agricultural activities (hay, pasture, row crops) cover another 3%, wetland covers less than 2% and developed land, not including transportation, covers approximately 1%.

Recreational Uses of the Saxtons River Watershed Rivers and Streams

Boating

The only identified boating reach on the Saxtons River is an 8-mile stretch from Grafton to Saxtons River. It is popular with local kayakers and experienced open boat paddlers. It can be run after snowmelt and rain events. At medium water, it is mostly Class II whitewater.

Swimming

The Saxtons River does not have a large number of identified swimming holes or bathing areas. On the lower Saxtons River just above the Route 5 bridge in Bellows Falls is the area called Saxtons River Falls. There are rocks and a sandy beach for sitting and sunbathing and ledges for jumping. It gets good local use. At the mouth of the river is a sandy area that appears to be used as a picnic or gathering spot. The vacant land at the mouth which is a dirt turn-around has good potential for a park. Another popular local swimming and gathering site is Twin Falls upstream in Westminster that has a nice pool, the falls, and ledges.

Other Riverine Values and Features in the Saxtons River Watershed

Fishery resource

The upper mainstem Saxtons above Houghtonville and most of the tributaries support healthy populations of wild brook trout and, in some cases, wild brown trout. However, high summer water temperatures limit trout populations in the lower mainstem Saxtons River. Hatchery trout are stocked in the Saxtons mainstem on a put-and-take basis to provide fishing where wild trout populations are low. Because of their higher tolerance for warm temperatures, Atlantic salmon do well throughout the watershed. A variety of non-game fish species occur throughout the watershed.

Salmon have been stocked in the Saxtons River since 1988. One adult salmon entered the Saxtons River in 1998 and two in 1999. In 2000, 202,000 fry were stocked in the Saxtons River. Twin Falls on the lower Saxtons River is a barrier to upstream salmon migration at most flows, but it may be passable at certain flows. It is near the upper limit for salmon leaping ability of 10-12 feet. It presents no problem to outmigrating smolts. No other significant barriers to salmon migration occur in the watershed. Salmon have been documented passing the remnant dam and natural falls at Route 5. See the discussion in the West River section for more details on Atlantic salmon restoration.

Threatened & endangered species and significant natural communities

In the Saxtons River watershed, there are four occurrences of plant species, two occurrences of birds, and two significant natural communities of statewide importance. One of the natural communities is a river cobble shore and the other is a sugar maple - ostrich fern riverine floodplain forest.

Basin 11 River and Stream Assessment Summary

Designated Use Support Status for Rivers

For each river use or value that is assessed, the miles of river or stream fully supported, threatened, partially supported or not supported are determined. For example, river miles that are fully supported for aquatic biota have macroinvertebrate and fish communities in good to excellent health and good physical habitat. River miles that are fully supported for swimming have no known high levels of *E. coli*, a bacteria that is used as an indicator for pathogens. Table 1 gives the miles in each support category for seven uses or values: aquatic biota and/or habitat, contact recreation (swimming, tubing), secondary contact recreation (boating, fishing), aesthetics, drinking water supply, agricultural water supply and fish consumption. The use called "overall" reflects the miles for which one or more of the uses are not supported, partially supported, or threatened or for which all uses are fully supported. The fish consumption use is not factored into the "overall" category because all miles of river and stream are at least threatened for fish consumption due to a statewide fish consumption advisory. If taken into account in "overall," this status would mask the extent of other threats. There are 431.8 river miles total assessed for this basin.

Table 1. Use Support Status of Basin 11 Rivers and Streams

Use	Miles of full support	Miles threatened	Miles of partial support	Miles of non-support	Miles not assessed
Overall	235.4	72.2	120.5	3.7	0
Aquatic biota/habitat	235.4	82.7	110.0	3.7	0
Contact recreation	364.3	51.0	14.0	2.5	0
Secondary contact recreation	291.8	22.6	114.9	2.5	0
Aesthetics	320.0	70.0	39.3	2.5	0
Drinking water supply	46.9	0.1	0	2.5	382.3
Agricultural water supply	15.9	0.1	0	2.5	413.3
Fish consumption	0	431.8	0	0	0

The designated use most affected by pollution or undesirable conditions is secondary contact recreation (fishing and the fishery) with aquatic habitat/biota closely following in terms of miles having impacts. Water temperature data showed that a number of stretches in all three watersheds of the basin had high temperatures that affect the health and sustainability of the fishery and its habitat. Sedimentation and physical habitat alterations also affected the aquatic habitat and its inhabitants.

Aesthetics is the third most affected designated use. The loss of riparian vegetation, physical alterations to the channel, streambank erosion and the resulting sedimentation all have an impact on, or threaten, aesthetics.

There were not as many miles where contact recreation was not in full support. Impacts to this use are listed where *E. coli* data indicate potential pathogen problems or where physical alteration to the river or stream diminished the opportunity for swimming.

The miles of full support, threatened, partial support, and non-support for each use for each river segment or tributary watershed (waterbody) are given in tables in the individual waterbody reports in Appendix E. A narrative is also given in these individual reports that explains the causes and sources responsible for the lack of full support or the threats.

Causes and Sources of River Impacts and Threats

Causes are the pollutants or conditions that threaten or have an impact on the aquatic biota, the aquatic habitat, swimming, fishing, the fishery, boating, drinking water supply, fish consumption or other "uses" of the river or stream. The top causes of riverine water quality or aquatic habitat problems in Basin 11 are listed in Table 2 below along with the miles of river or stream that they affect. These are discussed in more detail below.

Table 2. Causes of River Impacts and Threats in Basin 11

Cause or pollutant	Miles of high impact	Miles with moderate impact	Total miles of impact	Miles threatened
Thermal modification	76.2	30.8	107.0	36.0
Sedimentation	3.0	54.8	57.8	97.0
Physical habitat alteration	0	44.3	44.3	39.5
Flow alteration	21.9	12.0	33.9	12.5
Nutrients	0.5	10.5	11.0	13.5
pH	0	8.4	8.4	0
Pathogens	0	7.0	7.0	17.0
Metals	0.5	0	0.5	8.6

Sources are the land uses, human activities, or occurrence of conditions responsible for the causes named above and that are the origin of the impacts on river or stream water quality or aquatic habitat. Table 3 lists the primary sources of river and stream impacts and threats in the basin.

Table 3. Sources of River Impacts and Threats in Basin 11

Source	Miles of high impact	Miles with moderate impacts	Total miles of impact	Miles threatened
Riparian vegetation removal	26.5	69.0	95.5	36.0
Streambank destabilization	0.5	44.8	45.3	65.5
Flow regulation/modification	33.9	1.3	35.2	18.0
Channelization	7.0	14.5	21.5	33.3
Road/bridge runoff	0	20.8	20.8	57.0
Upstream impoundment	20.4	0	20.4	6.0
Land development	2.5	14.5	17.0	37.0
Agricultural activities	0	12.5	12.5	8.0
Recreational activities	1.0	10.0	11.0	6.5

The cause of most river or stream miles with impacts is thermal modification or water temperatures that are too high to fully support a coldwater fishery. Removal of the riparian trees and shrubs, which is the source affecting the most river miles, results in these higher temperatures. Dams and the resulting impoundment of water also results in higher downstream water temperatures. Much of the Williams River and West River as well as the lower half of the Saxtons River have high temperatures in the summer, which have an impact on the coldwater fishery.

Sedimentation is the second greatest cause of impacts to the rivers and streams in this basin. It is also the largest threat to aquatic habitat, biota, and other uses of these waters. Sources of sediment include streambank erosion, land development and road runoff among others.

Physical habitat alterations are a result of flow regulation, channelization/instream modification, road and bridge work, and channel instability. Other pollutants or conditions affecting the rivers or streams in this basin include flow alteration primarily from the two Army Corps of Engineers flood control dams, nutrients primarily from agricultural land activities, low pH as a result of acid rain and pathogens possibly from failed septic systems.

Basin 11 Lakes and Ponds Assessment Summary

Use Support Status of Basin 11 Lakes and Ponds

Overall, there are 360 lake acres in the basin that only partially support one or more uses, and 21 acres where one or more uses are precluded. All designated uses are fully supported on 624 assessed lake and pond acres. Table 4 provides an accounting of lake acres where designated uses are supported, threatened, or not fully supported.

Table 4. Designated use support for lakes in Basin 11

Use	Acres Fully Supporting Uses	Supporting Acres with Uses Threatened	Acres Partially Supporting Uses	Acres Not Supporting Uses	Acres Not Assessed
Overall Uses	88	536	360	21	0
Aesthetics	746	66	193	0	0
Aquatic Life Use Support	88	543	353	21	0
Agricultural Water Supply	0	0	0	0	1005
Drinking Water Supply	101	0	0	0	0
Fish Consumption	1005	0	0	0	0
Filtered Water Supply	101	0	0	0	904
Industrial Water Supply	0	0	0	0	1005
Secondary Contact Uses	939	66	0	0	0
Swimming Uses	939	66	0	0	0

A summary of overall use support by individual lake provides useful information (Table 5). It is noteworthy that the forested land cover and calcium-poor bedrock geology characteristic of these three watersheds results in surface waters that are naturally susceptible to acidification, owing to low acid buffering capacity. This condition means that in some lakes, precipitation of acid-forming sulfates and nitrates has either chronically, or even critically acidified the waters, thereby impairing aquatic communities.

Table 5. Overall use support by individual lake, for lakes within Basin 11

Lake Name	Lake Area (ac)	Last Assessed (YYYYMM)	Assessment Type	Acres Fully Supporting	Threatened Acres	Acres Partially Supporting	Acres Not Supporting
ADAM	7	200103	Evaluated	7	7	0	0
ANDOVER;	11	200103	Evaluated	11	0	0	0
ATHENS	21	200103	Monitored	21	21	0	0
BAILEYS MILLS;	10	200103	Evaluated	10	0	0	0
BALL MOUNTAIN	85	200103	Monitored	0	0	85	0
BURBEE	50	200103	Evaluated	50	50	0	0
CHESTER	5	200103	Evaluated	5	0	0	0
COLE	41	200103	Monitored	41	41	0	0
EAST TWIN	3	200103	Evaluated	3	0	0	0
FLOOD;	1	200103	Evaluated	1	0	0	0
FORESTER	9	200103	Monitored	0	0	0	9
GALE MEADOWS	195	200103	Monitored	195	195	0	0
HAPGOOD	7	200103	Evaluated	0	0	7	0
KENNY	26	200103	Evaluated	26	26	0	0
LANDGROVE;	14	200103	Evaluated	14	0	0	0
LILY (ATHENS)	12	200103	Evaluated	12	12	0	0
LILY (LONDRY)	21	200103	Monitored	21	21	0	0
LITTLE (WINHLL)	18	200103	Evaluated	0	0	18	0
LOWELL	109	200103	Monitored	109	109	0	0
MOSES	12	200103	Evaluated	0	0	0	12
MUD (PERU)	10	200103	Evaluated	10	10	0	0
SIMPSONVILLE;	12	200103	Evaluated	12	0	0	0
STRATTON	46	200103	Monitored	0	0	46	0
SUNSET (MARLBR)	96	200103	Monitored	0	0	96	0
TELEPHONE;	15	200103	Evaluated	15	0	0	0
TOWNSHEND	108	200103	Monitored	0	0	108	0
WANTASTIQUET	44	200103	Monitored	44	44	0	0
WEST TWIN	1	200103	Evaluated	1	0	0	0
WINHALL;	16	200103	Evaluated	16	0	0	0

; indicates an unnamed lake that has been given an unofficial name by DEC for database purposes

Causes and Sources of Threats and Impacts to Basin 11 Lakes and Ponds

The two principal causes of impairment to 193 acres in these watersheds, flow alteration and siltation, are both related to operation of two flood control reservoirs, which affects aquatic life uses. The critically low pH exhibited by several ponds impairs aquatic life uses on 181 lake acres. An additional 533 acres are threatened by acidification due to their low buffering capacity, which renders lakes susceptible to episodic low pH events. Table 6 provides an accounting of the causes of impacts and threats to lakes in these watersheds.

Table 6. Causes of impacts and threats to lakes in Basin 11

Cause of Impact	Acreage by Magnitude of Impact			Total Acres Not Fully Supporting	Total Acres Threatened
0900 Nutrients	0	0	0	0	10
1000 pH	181	0	0	181	533
1100 Siltation	85	108	0	193	41
1200 Organic enrichment - DO	0	0	0	0	15
1300 Salinity - TDS - chlorides	0	0	0	0	9
1500 Flow alteration	193	0	0	193	7
2200 Noxious aquatic plants - Native	0	0	0	0	25

The most important source of impairment to lakes in the West, Williams, and Saxtons Rivers watersheds is hydromodification, which impairs 193 lake acres due to habitat modification and partial loss of aquatic life uses. Shoreline destabilization, related to flow modification, impairs 85 acres on one flood control reservoir. Atmospheric deposition has critically acidified 181 lake acres, and presently threatens an additional 533 acres. Some of these acid-threatened waterbodies may also exhibit natural sensitivity to acidification, which explains the 533 threatened acres attributable to natural sources. Finally, general land development, road runoff, construction, and associated shoreline destabilization threatens 50 lake acres. Table 7 contains the sources of impairment and threats to lakes in Basin 11.

Table 7. Sources of impacts to lakes in Basin 11.

Source of Impact	Acreage by Magnitude of Impact			Total Acres Not Fully Supporting	Total Acres Threatened
	High	Moderate	Minor		
3000 CONSTRUCTION	0	0	0	0	41
3200 Land Development	0	0	0	0	41
7400 Flow Regulation/Modification	193	0	0	193	7
7550 HABITAT MODIFICATION	0	85	0	85	0
7600 Removal of Riparian Vegetation	0	85	0	85	0
7700 Streambank Destabilization	0	85	0	85	41
8100 ATMOSPHERIC DEPOSITION	181	0	0	181	533
8300 HIGHWAY MAINTENANCE/ RUNOFF	0	0	0	0	9
8600 NATURAL SOURCES	9	96	76	181	533

The following paragraphs describe the impacts and major threats to specific lakes, ponds, or reservoirs in the West, Williams, or Saxtons Rivers watersheds.

Ball Mountain Reservoir, Jamaica: This is one of two flood control reservoirs built and operated by the US Army Corps of Engineers along the West River. The operational regime of the reservoir is such that the water level fluctuates widely. The severity of these fluctuations precludes the establishment of a stable littoral community. Indeed, the reservoir's littoral zone is characterized by barren stone, with alder the only visible

vascular plant above or below the water's surface. Vermont Agency of Natural Resources DEC and DF&W are advocating elimination of the pool.

Burbee Pond, Windham: This 50 acre pond is threatened by acidic precipitation due to its low acid buffering capacity.

Cole Pond, Jamaica: This 41 acre pond is threatened by acidic precipitation due to its low acid buffering capacity. Rapid development of the lakeshore and watershed also threatens the quality of the lake water, which could impact not only biological communities, but also aesthetics, swimming, and boating enjoyment as well. Interestingly, available data show that the acid buffering capacity of the lake has increased, coincident with development. This alkalization, which is likely attributable to inputs of terrigenous material, may actually lessen threats posed by acidification over the near term.

Forester Pond, Jamaica: This 9 acre pond is critically acidified, and thus cannot support a stable aquatic community. VTDEC data also show a clear trend of rising chloride concentrations in the water, which may be attributable to road salt runoff from the adjacent town road. The potential impacts of this change in water chemistry are presently unclear.

Gale Meadows Pond, Londonderry: This 195 acre pond is threatened by acidic precipitation due to its low acid buffering capacity.

Little Pond, Winhall: This 18 acre pond experiences episodic acidification due to acid precipitation, which impedes the establishment of a stable aquatic community.

Lowell Lake, Londonderry: This 109 acre lake is threatened by acidic precipitation due to its low acid buffering capacity. In addition aquatic biota are also considered threatened in 15 of the lake acres due to low hypolimnetic dissolved oxygen, and swimming and boating uses are threatened on 15 acres due to heavy growth of the rare bladderwort *Utricularia purpurea*.

Moses, Weston: This 12 acre pond experiences episodic acidification due to acid precipitation, which impedes the establishment of a stable aquatic community.

Stratton Pond, Stratton: This 46 acre lake experiences chronic acidification due to acid precipitation, which impedes the establishment of a stable aquatic community. Moreover, based on several visits, it is apparent that the lake water is far too clear and green in hue for an episodically acidic lake. Despite being in an identical setting as other Lye Brook Wilderness lakes, this is the only lake in the Wilderness which is not naturally dystrophic. Trophic data show strong algal stimulation given the relatively moderate total phosphorus concentrations at the pond, and in the summer, the bottom-most waters become depleted of dissolved oxygen and enriched with hydrogen sulfide. Stratton Pond's phytoplankton community only barely meets biological reference

conditions for acidic small lakes. This is because plankton community density is quite high relative to the reference conditions, even if other biological measurements are within acceptable limits. It is reasonable to hypothesize that the pond has experienced significant nutrient inputs at some prior date, from which it is presently recovering.

Sunset Lake, Marlboro: This 96 acre lake experiences episodic acidification due to acid precipitation, which impedes the establishment of a stable aquatic community.

Townshend Reservoir, Townshend: This is the second Corps-operated flood control reservoir. Extreme water level fluctuations are understood to impede the establishment of a stable aquatic community. Further assessment of the severity of the situation is warranted, as some of the readily available data from this reservoir are outdated.

Basin 11 Lakes and Ponds in Need of Further Assessment

There are only three lakes and ponds in Basin 11 identified as being in need of further assessment at this time. There are also six small ponds for which DEC has limited information, but for which there is little reason to expect water quality problems. These latter ponds would make good candidates for assessment by citizens in conjunction with basin planning and assessment activities, pending public interest. A summary of information from the VTDEC Lake Assessment database is provided below for the three lakes needing assessment. Finally, there are numerous very small ponds (less than 10 acres in size) in the basin for which VTDEC has little or no information. The public accessibility of all of these smaller lakes is unknown.

Hapgood Pond, Peru: Hapgood Pond is located in the Green Mountain National Forest, and supports swimming and boating uses for a small day-use recreational area. The pond is drained annually by the U.S. Forest Service, for the purpose of reducing aquatic plant growth. The length of time that the pond is drained and the degree to which this drawdown impairs aquatic life uses is unknown.

Mud Pond, Peru: Conflicting information exists regarding this pond. It has been identified by some as having excessive native plant growth which may threaten aquatic life, aesthetics, swimming, and boating uses. However, a rich plant community is natural for many shallow small lakes. The degree to which the plant community in this pond threatens uses should be evaluated.

Townshend Reservoir: Limited information is available for this reservoir and VTDEC has no recent water chemistry data from the reservoir. An assessment of Townshend Reservoir water quality and use support status is thus warranted.

303(d) Listed Waters in Basin 11

There are five river or stream segments and five lakes or ponds on Vermont's Year 2000 List of Impaired Surface Waters (the 303(d) list) (Table 8 below). These are waters of the basin where Vermont DEC has sound monitoring data to identify the impairment and its cause(s). There are a number of other river and stream stretches in the basin that do not fully support one or more "uses" of the waters (aquatic biota or habitat, fishing, swimming, aesthetics), but the protocol to document the impairments is not yet developed (channel instability/physical habitat impairments); the impact is known from modelling (flow); or the information is based on observations of problem conditions but there is no instream monitoring (extensive algae, turbidity from observed runoff), as examples. New segments may be added during the 2002 listing process.

Table 8. 303(d) Listed Waters in Basin 11

Waterbody id	Segment	Pollutant	Problem
VT11-08L01	Sunset Lake	pH	Sensitive to acidification (episodic)
VT11-10	West River - below Ball Mtn dam to Townshed dam	sediment	Major sediment releases from Ball Mtn dam impaired the fishery and habitat
VT11-15	Ball Mountain Brook- above North Branch confluence	pH	Fishery critically impacted from acidification
VT11-15	North Branch Ball Mountain Brook - golf course pond to Kidder Brook	manganese	Releases of reduced manganese from the pond sediment coated rocks but stream recovery is underway
VT11-15	Styles Brook	sediment	Development and hydrologic alterations of the watershed causing embeddedness and impairing aquatic community and habitat
VT11-15	Tributary #1 North Branch Ball Mountain Brook	sediment	Development, erosion, polluted runoff impairing aquatic community and habitat
VT11-15L01	Forester Pond	pH	Critically acidified (chronic)
VT11-15L02	Little Pond	pH	Sensitive to acidification (episodic)
VT11-16L01	Stratton Pond	pH	Sensitive to acidification (episodic)
VT11-18L06	Moses	pH	Critically acidified (chronic)

References for Basin 11

1) An Ecological Inventory of the Wetlands of the West River Watershed, Vermont, 1996. Brett Engstrom and Elizabeth Thompson for the Vermont Agency of Natural Resources (ANR), Department of Fish and Wildlife, Nongame and Natural Heritage Program.

2) How Clean is the Saxtons River? A Report on the Saxtons River Project: A Citizen Water Quality Monitoring Program at BEEC, 1999. Frances Doyle, Bonnyvale Environmental Education Center.

3) A Guide for Evaluating the Outstanding Rivers and Streams of Vermont: Part II Exemplary Streams in the West River Basin, 1988. Jerry Jenkins for the Vermont Department of Environmental Conservation (DEC).

4) Rare Freshwater Mussels and Significant Natural Communities at Ball Mountain and Townshend Lakes, 1997. Prepared for the U.S. Army Corps of Engineers New England Division by Mark Ferguson, Eric Sorenson and Robert Popp, Vermont ANR, Department of Fish and Wildlife, Nongame and Natural Heritage Program, Waterbury, Vermont.

5) State of Vermont Year 2000 List of Waters: Part A - List of Impaired Surface Waters, July 2000. Prepared for EPA by Vermont DEC, Water Quality Division.

6) A Survey of the Ball Mountain and Townshend Dam Project Areas for Vernal Pools and Rare or Protected Reptiles and Amphibians (Draft Report), 1997. Prepared for the U.S. Army Corps of Engineers New England Division by Jim Andrews, Middlebury College, Middlebury, Vermont.

7) Upper West River Basin Water Quality Management Plan, 1989, Vermont ANR DEC, Water Quality Division, Waterbury, Vermont.

8) Vermont Swimming Hole Study, 1992, Jerry Jenkins, Deborah Benjamin, and Jane Dorney for Vermont DEC, Water Quality Division.

9) Water Quality Remediation Plan 2000 Annual Performance Report. Prepared for the Stratton Corporation by Pioneer Environmental Associates.

10) Waterfalls, Cascades and Gorges of Vermont, 1985. Jerry Jenkins & Peter Zika for the Vermont Department of Environmental Conservation and Department of Forests, Parks and Recreation.

11) The West River Watch Project Report 1997, 1998, 1999, 2000. Frances Doyle, Bonnyvale Environmental Education Center, Brattleboro, Vermont.

12) West River Tributaries Nonpoint Source Pollution Stream Assessment Report, January 1998. Windham Regional Commission.

13) Whitewater Rivers of Vermont, 1989. Jerry Jenkins for Vermont DEC.

Table A.1. Land Use and Land Cover in the West River Watershed[1]

Land Use[2]	Acres	% of Total
Forested	230,431	86
Agriculture	7,579	3
Surface Water	13,064	5
Transportation	10,236	4
Wetlands	3,946	1
Developed Land[3]	3,107	1
Total:	268,363	100

Table A.2. Land Use and Land Cover in the Williams River Watershed[1]

Land Use[2]	Acres	% of Total
Forested	61,081	82
Agriculture	3,018	4
Surface Water	4,674	6
Transportation	3,219	4
Wetlands	967	1
Developed Land[3]	1,857	2
Total:	74,816	99

Table A.3. Land Use and Land Cover in the Saxtons River Watershed[1]

Land Use[2]	Acres	% of Total
Forested	40,780	82
Agriculture	1,699	3
Surface Water	4,149	8
Transportation	1,806	4
Wetlands	802	2
Developed Land[3]	609	1
Total:	49,845	100

1 Vermont Land Cover Classification Project, 1997 (based on satellite photographs from 1991 - 1993).

2 Does not include "brush or transitional land" or "barren land"

3 Developed land = residential, commercial, industrial but not transportation, which is listed separately

Table B.1. Basin 11 River or Stream Macroinvertebrate Sampling Sites 1992 - 1999

WBID	River or Stream	Town	Mile-point	Date	Assessment
VT11-01	Williams River	Rockingham	3.0	9/92	excellent
VT11-03	South Branch Williams River	Chester	1.3	10/93	excellent
VT11-05	Saxtons River	Rockingham	4.5	10/93	good
VT11-05	Saxtons River	Rockingham	6.2	10/93	excellent
VT11-05	Saxtons River	Rockingham	6.2	10/94	excellent
VT11-05	Saxtons River	Rockingham	6.2	10/95	excellent
VT11-07	West River	Dummerston	6.2	10/92	good
VT11-07	West River	Dummerston	6.2	10/94	excellent
VT11-07	West River	Dummerston	6.2	10/95	good
VT11-09	Rock River	Newfane	1.5	10/93	excellent
VT11-13	Turkey Mountain Brook	Townshend	1.0	10/92	excellent
VT11-13	Cobb Brook	Jamaica	0.9	10/94	excellent
VT11-13	Cobb Brook	Jamaica	0.9	10/95	excellent
VT11-13	Cobb Brook	Windham	1.9	10/95	excellent
VT11-13	Cobb Brook	Windham	1.9	10/97	good
VT11-13	Cobb Brook	Windham	2.6	10/94	excellent
VT11-15	North Branch Ball Mountain Brook	Stratton	2.2	10/92	excellent
VT11-15	North Branch Ball Mountain Brook	Stratton	2.2	9/98	good
VT11-15	North Branch Ball Mountain Brook	Stratton	3.9	10/97	good
VT11-15	North Branch Ball Mountain Brook	Stratton	3.9	9/98	good
VT11-15	North Branch Ball Mountain Brook	Stratton	4.3	9/98	excellent
VT11-15	North Branch Ball Mountain Brook	Stratton	4.8	6/98	poor

WBID	River or Stream	Town	Mile-point	Date	Assessment
VT11-15	Kidder Brook	Stratton	0.9	10/92	good
VT11-15	Sunbowl Brook	Stratton	0.3	10/92	excellent
VT11-15	Sunbowl Brook	Stratton	0.3	10/93	good
VT11-15	Sunbowl Brook	Stratton	0.3	10/94	good
VT11-15	Braser Brook	Stratton	0.7	10/92	excellent
VT11-15	Braser Brook	Stratton	0.7	10/93	good
VT11-15	Styles Brook	Stratton	0.8	10/93	fair
VT11-15	Styles Brook	Stratton	0.8	10/94	fair
VT11-15	Styles Brook	Stratton	0.8	9/98	fair
VT11-15	Stratton Pond Trib 1	Winhall	0.2	10/97	poor
VT11-15	Stratton Pond Trib 2	Winhall	0.1	10/97	good
VT11-16	Winhall River	Winhall	6.3	10/97	excellent
VT11-16	Winhall River	Winhall	7.1	9/96	excellent
VT11-16	Winhall River	Winhall	8.1	10/92	excellent
VT11-16	Winhall River	Winhall	8.1	9/94	excellent
VT11-16	Winhall River	Winhall	8.1	9/95	excellent
VT11-16	Winhall River	Winhall	8.1	9/96	excellent

Table C.1. Population Growth in the West River Watershed

Town	Population				Percent Change		
	1970	1980	1990	2000	1970-80	1980-90	1990-00
Brattleboro	12,239	11,886	12,241	12,005	-2.9	3.0	-1.9
Brookline*	180	310	403	467	72.2	30.0	15.9
Dover	555	666	994	1,410	20.0	49.2	41.8
Dummerston*	1,295	1,574	1,863	1,915	21.5	18.4	2.8
Jamaica*	590	681	754	946	15.4	10.7	25.5
Landgrove*	104	121	134	144	16.3	10.7	10.0
Londonderry	1,037	1,510	1,506	1,709	45.6	-0.3	13.5
Marlboro	592	695	924	978	17.4	32.9	5.8
Newfane*	900	1,129	1,555	1,680	25.4	37.7	8.0
Peru	243	312	324	416	28.4	3.8	28.4
Stratton	104	122	121	136	17.3	-0.8	12.4
Townshend	668	849	1,019	1,149	27.1	20.0	12.8
Wardsboro*	391	505	654	854	29.2	29.5	30.6
Weston*	507	627	488	630	23.7	-22.2	29.1
Windham	174	223	251	328	28.2	12.6	30.1
Winhall	281	327	482	702	16.4	47.4	45.6
Watershed	19,860	21,537	23,713	25,469	8.4	10.1	7.4

* The town is wholly within the watershed. For towns not marked a substantial portion of the town's land area is within the watershed.

Table C.2. Population Growth in the Williams River Watershed*

Town	Population				Percent Change		
	1970	1980	1990	2000	1970-80	1980-90	1990-00
Andover	239	350	373	496	46.4	6.6	33.0
Chester	2,371	2,791	2,832	3,044	17.7	1.5	7.5
Grafton	465	604	602	649	29.9	-0.3	7.8
Rockingham	5,501	5,538	5,484	5,309	0.7	-1.0	-3.2
Watershed	8,576	9,283	9,291	9,498	8.2	0	2.2

Table C.3. Population Growth in the Saxtons River Watershed*

Town	Population				Percent Change		
	1970	1980	1990	2000	1970-80	1980-90	1990-00
Athens	159	250	313	340	57.2	25.2	8.6
Grafton	465	604	602	649	29.9	-0.3	7.8
Rockingham	5,501	5,538	5,484	5,309	0.7	-1.0	-3.2
Westminster	1,875	2,493	3,026	3,210	33.0	21.4	6.1
Windham	174	223	251	328	28.2	12.6	30.1
Watershed	8,174	9,108	9,676	9,836	11.4	6.2	1.7

* No towns are wholly within the watershed.

Table D.1. Dams of the West River Watershed

Dam Name	Stream	Town	Status	Use	Built	Re-built	State ID
Townshend	West River	Townshend	In Service	CR	1961		209.01
Wantastiquet Lake	West River-TR	Weston	In Service	R	1880	1990	237.01
Weston Mill	West River	Weston	In Service	P		1979	237.02
Williams	West River	Londonderry	In Service	O	1900		115.01
Ball Mountain	West River	Jamaica	In Service	RC	1961		105.01
Lowell Lake	West River-TR	Londonderry	In Service	R	1850	1981	115.02
Magic Mountain	West Brook-TR	Londonderry		R	1968		115.05
Thomson	West River-OS	Londonderry			1993		115.06
Gale Meadows	Mill Brook	Londonderry	In Service	R	1965		115.07
Burbee Pond	Turkey Mountain Brook	Windham	In Service	R	1900		247.01
Cole	Ball Mountain Brook	Stratton			1979		201.01
Mahoney Pond	Winhall River-OS	Winhall	In Service	R	1997		249.06
Gulf Brook Reservoir	Gulf Brook	Stratton	In Service	O	1975		201.03
Stiles Brook Reservoir	Gulf Brook	Stratton	In Service		1961		201.04
Hidden Lake	Marlboro Branch-TR	Marlboro	In Service	R	1850	1955	122.03
Kenny Pond	Baker Brook-TR	Newfane	In Service	R	1900		139.01
Hapgood Pond	Flood Brook	Peru	In Service	R	1939	1980	152.01
Lyons Pond	Burnt Meadow Brook	Peru					152.02
Farnum	Farnum Brook	Peru	In Service	R	1973		152.03
Lords Prayer Pond	Mill Brook-OS	Peru	In Serivce		1966		152.04
Newman	Burnt Meadow Brook	Peru	In Service	R	1981		152.05
Bromley Snow Pond	Mill Brook-TR	Peru	In Service	O	1984		152.06

Hapgood Pond Dike	Flood Brook-TR	Peru	In Service	R	1939	1980	152.07
Strattonwald	Red Brook	Winhall	In Service	R	1977		249-01
Stratton Mountain Lake	North Branch Brook	Winhall	In Service	R	1977		249.02
Maud	Bromley Brook	Winhall	In Service				249.03
Gale Meadows Dike	Eddy Brook-TR	Winhall	In Service	R	1965		249.05
Sunset Lake	Stickney Brook	Brattleboro	In Service	S	1930	1974	122.01
Manley	Worden Brook-TR	Marlboro			1956		122.02

Table D.2. Dams of the Williams River Watershed

Dam Name	Stream	Town	Status	Use	Built	Re-built	State ID
Brockway Mills	Williams River	Rockingham	In Service	H		1988	169.08
Trask	Williams River-TR	Rockingham					169.03
Upper Chester Reservoir	Williams River-TR	Chester	Not In Use	O	1915	1971	48.01
Lower Chester Reservoir	Williams River-TR	Chester	Breached	S	1890		48.02
Tomasso	Williams River-TR	Chester			1983		48.05

Table D. 3. Dams of the Saxtons River Watershed

Dam Name	Stream	Town	Status	Use	Built	Re-built	State ID
Lawrence Four Corners	Saxtons River	Windham					247.02
Cambridgeport	Weaver Brook	Rockingham	Breached				169.01
Holbrook	Weaver Brook	Grafton	In Service	R	1978		83.01
Athens Pond	Athens Brook-TR	Athens					6.01

Lower Williams River
Assessment Report

Waterbody No: VT11-01 **Assessment Year:** 2001

River Length (mi.): 10.5 **Date Last Updated:** 8/13/2001

Description: Main Stem - Mouth to Confluence of Middle Branch

Location Identifiers

ANR Enforcement District: 2 **NRCS District:** 8

Fish and Wildlife District: 1 **Regional Planning Commission:** WIN

Assessment Information

Monitored (mi.): 10.5

Evaluated (mi.): 0.0

Water Quality Limited?

On 303(d) List? N

Monitored for Toxics? N

Aquatic Contamination

Assessment Types

Surveys of fish and game biologists or other professionals

Occurrence of conditions judged to cause impairment

Non-fixed station chemical/physical monitoring-conventional polluta

Fish surveys

Toxics Testing

Waste Management Zone - Miles: 1.00 **Description:** below Chester WWTF outfall

Assessment Comments

PARTIAL SUPPORT MILES

Williams River: 10.5 - mouth upstream to Middle Branch confluence - partial support of secondary contact recreation (fishing), aesthetics, aquatic habitat due to nutrients, sediments, and temperature stress from riparian encroachment of developed lands, roads, agricultural land uses. c(900,1100,1400) s(1000,7600,7700)

THREATENED MILES

Williams River: 10.5 (same miles as above) - threats to aquatic biota and contact recreation due to the same causes and sources as above. c(900,1100,1400,1700,2500) s(1100,7600,7700)

COMMENTS

Temperature data collected from June 30 until November 19, 1999 showed very high temperatures in the lower Williams River through much of the summer season. On 8 days, temperatures reached over 80 F at the monitoring site and on an additional 22 days, the temperatures were above 75 F. The highest temperature recorded that season was 85.2 F on July 6, 1999.

The EPA survey of the lower Connecticut River done in 1999 noted that at the confluence of the Williams River with the Connecticut there is "heavy eutrophication" and that eutrophic water is flowing from the

Lower Williams River **VT11-01**

Williams River into the Connecticut.

A field survey of the Williams River in July and August 1999 resulted in the following observations: the water clarity was bad at the mouth with the water color a blackish-green, sediment and/or algae was noted on the channel bottom in all locations checked, water clarity varied from poor to greenish but never clear.

Brockways Mills hydro dam is currently being rehabilitated to produce hydroelectric power again (SR Hydropower stopped operations in 1996 and the license was transferred to Christopher and Eileen Kruger in 1999). The new licensees are installing a new turbine, installing a downstream fish passage facility, and redesigning and installing a new trashrack among other work. The operation of this project is expected to be much better than the previous operation, which did not meet license requirements.

Chester WWTF generally has been operated well over the past few years with only infrequent and small effluent limit violations.

INFORMATION SOURCES

Jay McMenemy, Vermont Dept of Fish & Wildlife - temp data on the lower Williams, also noted there is fish survey data (2001)

Vermont DEC Water Quality Division hydrology files - information on status of Brockway Mills. (2001)

Vermont DEC Wastewater Management Division compliance files - information on Chester WWTF operation (2001)

Pollution Reconnaissance Report for the Mt. Ascutney Region of the Connecticut River, September 1999. A Report by the U.S. EPA Office of Environmental Measurement & Evaluation.

Jerry McArdle, Vermont DEC Water Quality Division - field observations of the lower Williams, summer 1999.

Steve Fiske & Rich Langdon - DEC Ambient Biomonitoring Network - got a 1992 community assessment of "excellent" for macroinvertebrates and one of "good" for the fish community. No recent monitoring.

Tim Blake - Vt. DEC Water Resources Investigator - noted naturally occurring streambank sloughs and complaints of algae below Chester WWTF (1988 and 1990 respectively)

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	0.0	0.0	10.5	0.0	0.0
20	Aquatic biota/habitat	0.0	10.5	0.0	0.0	0.0
21	Fish consumption	0.0	10.5	0.0	0.0	0.0
42	Contact recreation	0.0	10.5	0.0	0.0	0.0
44	Noncontact recreation	0.0	0.0	10.5	0.0	0.0
50	Drinking water supply	0.0	0.0	0.0	0.0	10.5
62	Aesthetics	0.0	0.0	10.5	0.0	0.0
72	Agriculture water supply	0.0	0.0	0.0	0.0	10.5
82	Industry water supply	0.0	0.0	0.0	0.0	10.5

Impairment Cause	Magnitude	Size (mi.)
Nutrients	M	10.50
Siltation	M	10.50
Thermal modifications	M	10.50

Impairment Source	Magnitude	Size (mi.)
Agriculture	M	10.50
Removal of riparian vegetation	M	10.50
Streambank modification/destabilization	M	10.50

Permit No.	Point or Nonpoint Source Description	Receiving Water
VT0100081	Chester WWTF 0.175mgd	Williams River
	Brockways Mill Hydro - Hydropower Dam	

Minor Tribs - Lower Williams

Assessment Report

Waterbody No: VT11-02 **Assessment Year:** 2001

River Length (mi.): 8 **Date Last Updated:** 6/18/2001

Description: Minor tributaries draining into the Lower Williams River including Hall and O'Brien Brooks

Location Identifiers

ANR Enforcement District: 2 **NRCS District:** 8

Fish and Wildlife District: 1 **Regional Planning Commission:** WIN

Assessment Information

Monitored (mi.): 0.0

Evaluated (mi.): 8.0

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

Hall Brook: 1.0 - lower Halls Brook in close proximity to road - threats to aquatic biota/habitat due to siltation and thermal modification from riparian encroachment, road construction and maintenance. c(1100,1400), s(7600,7700,8300)

COMMENTS

Gravel road runoff to Halls Brook seems likely and road maintenance activities could affect Halls Brook given the narrow buffers between the road and stream (5 to 20 feet) in a number of locations. Algae noted on channel substrate. Water temperatures 17 to 17.5 C. (Field observations August 1999)

Biomonitoring and habitat assessment on these and other tributaries adjacent to gravel roads is needed. There are many threats from gravel road maintenance and runoff (road turnouts to brooks, small or no buffers, road bank erosion) but impacts or not need to be documented.

Hall Brook has wild brook and brown trout.

INFORMATION SOURCES

Jay McMenemy, Vermont Department of Fish & Wildlife - noted wild brook and brown trout in Hall Brook. (2001)

Minor Tribs - Lower Williams **VT11-02**

Ken Cox, Vermont Department of Fish & Wildlife - noted threats from riparian encroachment and road work. (1994)

Jerry McArdle, Vermont DEC Water Quality Division - field observations in August 1999 on Hall's Brook.

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	7.0	1.0	0.0	0.0	0.0
20	Aquatic biota/habitat	7.0	1.0	0.0	0.0	0.0
21	Fish consumption	0.0	8.0	0.0	0.0	0.0
42	Contact recreation	8.0	0.0	0.0	0.0	0.0
44	Noncontact recreation	7.0	1.0	0.0	0.0	0.0
50	Drinking water supply	0.0	0.0	0.0	0.0	8.0
62	Aesthetics	8.0	0.0	0.0	0.0	0.0
72	Agriculture water supply	0.0	0.0	0.0	0.0	8.0
82	Industry water supply	0.0	0.0	0.0	0.0	8.0

Impairment Cause	Magnitude	Size (mi.)
Siltation	T	1.00
Thermal modifications	T	1.00

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

Middle Branch - Williams River

Assessment Report

Waterbody No: VT11-03 **Assessment Year:** 2001

River Length (mi.): 35 **Date Last Updated:** 8/13/2001

Description: Middle Branch mouth to headwaters and tributaries including Andover Branch, Potash Brook, Trout Brook, Lyman Brook

Location Identifiers

ANR Enforcement District: 2 **NRCS District:** 9

Fish and Wildlife District: 1 **Regional Planning Commission:** SOW

Assessment Information

Monitored (mi.): 10.5

Evaluated (mi.): 24.5

Water Quality Limited?

On 303(d) List? N

Monitored for Toxics? Y

Assessment Types

Surveys of fish and game biologists or other professionals

Land use information and location of sources

Fish surveys

Aquatic Contamination

None detected

Toxics Testing

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

Assessment Comments

PARTIAL SUPPORT MILES

Middle Branch Williams River: 10.5 - upstream from confluence with Williams River to county line - partial support of aquatic habitat and fishery due to thermal modification from loss of riparian vegetation (from roads and development) and some stormwater runoff (Chester village) (1.4 mi). c(1400) s(4000,7600)

THREATENED MILES

South Branch Williams River: 3.0 - upstream from confluence with Middle Branch - threats to aquatic biota/habitat, aesthetics, fishing, and contact recreation (swimming) due to sedimentation, nutrients, and pathogens from gravel road and ditches maintenance and runoff, agricultural land uses (esp. manure field storage) and streambank erosion. c(900,1100,1700) s(1000,4500,7700)

Potash Brook: 2.0 - threats to aquatic biota/habitat due to sedimentation and thermal modification from riparian zone encroachment by residential development and gravel roads. c(1100,1400) s(4500,7600)

Chester Reservoir outlet stream: 0.5 - threats to aquatic biota/habitat and aesthetics due to iron. c(500) s(9000)

COMMENTS

There are two hazardous waste sites that were of concern to the Middle Branch of the Williams River in

Middle Branch - Williams River **VT11-03**

the past - Chester Tire (87-176) and Scott Hinkley site (87-041). High concentrations of petroleum constituents had been found in the Middle Branch in May 1988 from the Chester Tire company. A soil vent treatment system was put into place in 1988 and treatment was ongoing at the Chester Tire Center. Levels of organics in the groundwater decreased and no free product was left onsite. The site is now closed and "site remediation complete." The Scott Hinkley site had a collection trench and sump installed for treatment. Annual sampling occurred for many years in wells along the stream (trib to Middle Branch) which were downgradient of the trench. The constituents found in the wells were not high - the trench seemed to be collecting most of the contaminants - and they declined in the samples over the years. These wells are no longer sampled as hazardous waste staff feel they are not really a problem. At the "hottest" location on the site - upgradient of the trench - the latest sample from August 2000 had .026 mg/liter BTEX.

The Department of Fish & Wildlife has sampled the Middle Branch of the Williams River at two sites annually since 1993. The lower portion of the Middle Branch supports wild brook trout and brown trout in low numbers. Water temperatures are high due to impacts to the riparian zone from roads and development. The Department also has annual fish data on the South Branch Williams River since 1993. The have found moderate wild populations of brook and brown trout and good salmon survival.

Field observations made at nine points along the Middle Branch Williams River in July 1999 noted that the stream overall was not in bad condition - there were the common and ubiquitous problems of some encroachment into the riparian corridor, small spots of streambank erosion - but there were buffers of some width along portions of the river, water clarity was good, there was observed a little siltation, a little algae. In Chester, on a rainy day there was a pipe discharging foamy water to the river - a stormwater pipe is suspected.

A field survey on the Andover Branch of the Williams River also in July 1999 turned up a direct discharge of brown water coming from a lumber company spraying its log piles. The owner, after being shown the runoff problem from the logyard, hired a consultant and immediately implemented suggestions. Water quality samples were taken above and below the logyard in the stream plus from a seep at the bank's toe below the logyard and in a pooled area of water in the yard. The spray hoses in the 2000 season were re-directed so none of the water sprayed went onto the vegetated bank of the stream. In addition an earth berm was constructed, seeded and mulched. The only negative result is the invasion of Japanese knotweed on the berm and down the bank where it was disturbed when the berm was constructed.

The Andover Branch above the Trout Brook confluence in Andover flows through a campground which has no buffer on one side of the stream. The channel substrate is covered with algae below the campground but the source of nutrient inputs was not obvious. A pond drains to the brook through a culvert on the campground site. The wastewater certificate of compliance for the campground is from 1977 - there are not checks on the operation of such facilities unless there is a complaint or the owner comes in for a change or enlargement and the site is looked at again. The site will be checked by the district office.

Potash Brook and the South Branch was also visited in July and August 1999. A gravel road runs right along Potash Brook and some of the houses were next to the stream with little to no buffer. The South Branch has threats from gravel roads (both runoff from the road surface and unstable, raw ditches), loss of riparian buffers because of road locations, and horse pastures.

Chester Reservoir outlet stream is iron stained from iron coming in from a part of the dam and from a culvert from a gravel pit.

Lyman Brook subwatershed has large, expensive, house development in its watershed.

Trout Brook subwatershed has gravel roads and scattered homes but is primarily a forested watershed. Twenty to fifty foot buffers were present at the observation points.

INFORMATION SOURCES

Sandra Conant, Vermont DEC Permit Specialist - information on permits for Horseshoe Acres campground on the Andover Branch Williams River (2001)

Jerry McArdle, Vermont DEC Water Quality Division - field surveys in summer 1999 including follow-up to Plumb Lumber situation in Andover (a file and consultant report exists) (2001)

Richard Spiese, Vermont DEC Waste Management Division - information on Scott Hinkley hazardous waste site (87-041) near Middle Branch based on historical knowledge of the sampling and a June 15, 2001 report on sampling results (2001)

Middle Branch - Williams River **VT11-03**

Vt. DEC Waste Management Division hazardous waste files 1998 - information on Chester Tire and Scott Hinkley sites

Don & Nina Huffer - Consulting Foresters - noted natural streambank erosion and poor animal waste practices along South Branch; no evidence of impairments; area is prone to flooding (1988)

Ken Cox - District Fisheries Manager - noted threats to upper & middle areas of Middle Branch of Williams (1988)

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	19.0	5.5	10.5	0.0	0.0
20	Aquatic biota/habitat	19.0	5.5	10.5	0.0	0.0
21	Fish consumption	0.0	35.0	0.0	0.0	0.0
42	Contact recreation	32.0	3.0	0.0	0.0	0.0
44	Noncontact recreation	21.5	3.0	10.5	0.0	0.0
50	Drinking water supply	0.0	0.0	0.0	0.0	35.0
62	Aesthetics	31.5	3.5	0.0	0.0	0.0
72	Agriculture water supply	0.0	0.0	0.0	0.0	35.0
82	Industry water supply	0.0	0.0	0.0	0.0	35.0

Impairment Cause	Magnitude	Size (mi.)
Metals	T	0.50
Siltation	T	5.00
Thermal modifications	H	10.50
Thermal modifications	T	2.00
Other habitat alterations	T	3.00
Pathogens	T	3.00

Impairment Source	Magnitude	Size (mi.)
Agriculture	T	3.00
Urban/developed land runoff	M	1.40
Highway/road/bridge runoff	T	5.00
Removal of riparian vegetation	H	10.50
Removal of riparian vegetation	T	2.00
Streambank modification/destabilization	T	3.00

Permit No.	Point or Nonpoint Source Description	Receiving Water
1-0972	Shady Grove Subdivision - SW	Middle Branch Williams R
1-1049	Vermont Agency of Transportation - SW	Middle Branch Williams R
1-1083	Pleasantbrook Housing Assoc - SW	Middle Branch Williams R

Upper Williams River
Assessment Report

Waterbody No: VT11-04 **Assessment Year:** 2001

River Length (mi.): 21.9 **Date Last Updated:** 7/30/2001

Description: Upper Williams River from the confluence of Middle Branch to the headwaters and tributaries including Chase, Lovejoy, and Wheaton Brooks

Location Identifiers

ANR Enforcement District: 2 **NRCS District:** 9

Fish and Wildlife District: 1 **Regional Planning Commission:** SOW

Assessment Information

Monitored (mi.): 14.5

Evaluated (mi.): 7.4

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

Fish surveys

Aquatic Contamination

None detected

Toxics Testing

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

Assessment Comments

PARTIAL SUPPORT

Williams River: 7.5 - upstream from Chester Village to approximately the route 103/Smokeshire junction - partial support of the fishery and aquatic habitat due to temperature modification from a loss of riparian vegetation and road encroachment into riparian zone and threats due to sedimentation from streambank erosion. c(1100,1400), s(7600,7700,8300,8600)

THREATENED MILES

Lovejoy Brook: 1.0 - threats to aquatic habitat and aesthetics due to sedimentation and habitat alterations due to gravel road runoff and ditching/maintenance activities. c(1100,1600) s(4500)

COMMENTS

The Vermont Department of Fish & Wildlife has sampled one site on the upper Williams River annually since 1993 and has seen temperature problems. Above the junction of Smokeshire Road and route 103, the Williams River has wild brown trout and brook trout and more brook trout as you go further upstream. Below the junction down to Chester, however, there are few wild trout.

INFORMATION SOURCES

Upper Williams River **VT11-04**

Jay McMenemy, Vermont Dept of Fish & Wildlife - temperature problems, fishery response. (2001)

Jerry McArdle, Vermont DEC Water Quality Division - field reconnaisance of Williams River in July and August 1999.

Cathy Kashanski, Vermont DEC Water Quality Division - field reconnaisance of Williams River in July 2001.

Ken Cox, Vermont Dept of Fish & Wildlife - noted partial support of CWA fisheries goal. (1988)

Don & Nina Huffer, Consulting Foresters - noted turbid conditions due to streambank erosion and road runoff into Williams (1988)

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	13.4	1.0	7.5	0.0	0.0
20	Aquatic biota/habitat	13.4	1.0	7.5	0.0	0.0
21	Fish consumption	0.0	21.9	0.0	0.0	0.0
42	Contact recreation	21.9	0.0	0.0	0.0	0.0
44	Noncontact recreation	13.4	1.0	7.5	0.0	0.0
50	Drinking water supply	0.0	0.0	0.0	0.0	21.9
62	Aesthetics	20.9	1.0	0.0	0.0	0.0
72	Agriculture water supply	0.0	0.0	0.0	0.0	21.9
82	Industry water supply	0.0	0.0	0.0	0.0	21.9

Impairment Cause	Magnitude	Size (mi.)
Siltation	T	8.50
Thermal modifications	H	7.50

Impairment Source	Magnitude	Size (mi.)
Highway/road/bridge runoff	M	7.50
Highway/road/bridge runoff	T	1.00
Removal of riparian vegetation	H	7.50
Streambank modification/destabilization	T	7.50

Permit No.	Point or Nonpoint Source Description	Receiving Water
VT0020249 /	Mine Water TF - Holden Br/Luzenac Am.Inc	

Lower Saxtons River
Assessment Report

Waterbody No: VT11-05 **Assessment Year:** 2001

River Length (mi.): 29 **Date Last Updated:** 8/13/2001

Description: Mouth to confluence of South Branch and tributaries including Bundy Brook, Bull Creek, Weaver Brook

Location Identifiers

ANR Enforcement District: 2 **NRCS District:** 8

Fish and Wildlife District: 1 **Regional Planning Commission:** WIN

Assessment Information

Monitored (mi.): 12.8

Evaluated (mi.): 16.2

Water Quality Limited?

On 303(d) List? N

Monitored for Toxics? N

Assessment Types

Surveys of fish and game biologists or other professionals

Non-fixed station chemical/physical monitoring-conventional polluta

Fish surveys

Chem/physical monitoring data by quality-assured volunteer progra

Aquatic Contamination

Toxics Testing

Waste Management Zone - Miles: 1.00 **Description:** below Saxtons River WWTF outfall

Assessment Comments

PARTIAL SUPPORT MILES

Saxtons River: 12.8 - from confluence of South Branch down - partial support of aquatic habitat, secondary contact recreation and aesthetics due to high temperatures, sedimentation, and habitat alterations from erosion, loss of riparian vegetation/ riparian encroachment, channel modification. c(1100,1400,1600) s(7100,7600,7700)

THREATENED MILES

Bull Creek: 2.0 - from Athens Village to Saxtons River - threats to aesthetics and clarity, aquatic biota/habitat, contact and secondary contact recreation from sedimentation, turbidity, temperature, pathogens, and habitat modification caused by removal of riparian vegetation, streambank erosion, and agricultural land uses. c(1100,1400,1600,1700) s(1000,7600,7700)

Athens Brook: 2.0 - from Athens Pond to confluence with Bull Creek - threats to water clarity, aquatic biota/habitat, contact and secondary contact recreation from sedimentation, turbidity, and pathogens caused by land development, agricultural land uses, and streambank erosion. c(1100,1600,1700) s(1000,3200,7700)

Signal Hill Brook: unknown - below Vermont Academy emergency water supply withdrawal point - threats to aquatic biota/habitat due to possible lack of minimum flow below water withdrawal.

Lower Saxtons River **VT11-05**

COMMENTS

Fish surveys have been done at two sites on the Saxtons River since the late 1980's by the Vermont Department of Fish & Wildlife. One site sampled is below Grafton village but above Grafton/Rockingham town line and the other site sampled is below Saxtons River village - fish sampling finds virtually no wild trout (perhaps one or two wild trout have been found in a sample ever). The University of Massachusetts has done temperature sampling for two summers (1998 & ?) at the Grafton fish sampling location. Temperatures are routinely above 80 F on a hot summer afternoon at the site.

The water temperature results from three years of BEEC monitoring on the Saxtons River indicate that high temperatures are stressing aquatic life in some years. In 1998, eight sites were sampled once a month from May through November. In May, the range of water temperature was 11 to 13C; in June, the range was 15 to 18C; in July, it was 18 to 21C; in August, 19 to 21C; in September, 19 to 21C; in October, it was 17 to 19C; and in November 3 to 5C. In 1999, eleven sites were sample including two new sites in the upper Saxtons River (VT11-06). The range of water temperatures in June 1999 were 15 to 20 C; in July , it was 11 to 20 C; in August, it was 10 to 17C; in September, it was 18 to 22 C; in October, 7 to 9 C; and in November 6 to 8 C. Temperatures recorded in late August (23rd & 31st) by Vermont DEC were similar to those recorded by BEEC in August and September. In the 2000 sampling season, BEEC measured temperatures from 4 to 10C in May, 12 to 16C in June, 10 to 18 C in July, 15 to 17 C in August, 10 to 14 C in September, 4 to 6 C in October, and 4 to 7 C in November.

Vermont Academy (#5303) emergency water supply is still Signal Hill Brook. There is an impoundment on the brook. (2001)

Japanese knotweed is a serious threat to the riparian zone and river protection on the Saxtons River. It has colonized wherever there is disturbed soil and provides no filtration function, no habitat, no shading. (2001)

Saxtons River fire station and Grafton highway department are right on the Saxtons River and grading or plowing work had resulted in some sand, gravel and other material going down the bank and into the river. Bank and riparian vegetation has been destroyed or damaged and Japanese knotweed is coming up where there have been the disturbances. The situations are to be remedied. (2001)

INFORMATION SOURCES

Jay McMenemy and Ken Cox, Vermont Dept of Fish & Wildlife - information about threats and impacts to fishery and habitat in 2001 and 1990/1988 respectively.

Saxtons River Watch: A Citizen Science Water Quality Monitoring Program, reports for 1998, 1999, 2000 by Frances Doyle, Bonnyvale Environmental Education Center

Jerry McArdle and Cathy Kashanski, Vermont DEC Water Quality Division - field observations in 1999 and 2001.

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	12.2	4.0	12.8	0.0	0.0
20	Aquatic biota/habitat	12.2	4.0	12.8	0.0	0.0
21	Fish consumption	0.0	29.0	0.0	0.0	0.0
42	Contact recreation	25.0	4.0	0.0	0.0	0.0
44	Noncontact recreation	12.2	4.0	12.8	0.0	0.0
50	Drinking water supply	0.0	0.0	0.0	0.0	29.0
62	Aesthetics	12.2	4.0	12.8	0.0	0.0
72	Agriculture water supply	0.0	0.0	0.0	0.0	29.0
82	Industry water supply	0.0	0.0	0.0	0.0	29.0

Impairment Cause	Magnitude	Size (mi.)
Siltation	M	12.80
Siltation	T	4.00
Thermal modifications	M	12.80
Thermal modifications	T	2.00

Lower Saxtons River		**VT11-05**
Other habitat alterations	M	12.80
Other habitat alterations	T	4.00

Impairment Source	**Magnitude**	**Size (mi.)**
Agriculture	M	2.00
Agriculture	T	2.00
Land development	T	2.00
Channelization	T	12.80
Removal of riparian vegetation	M	12.80
Removal of riparian vegetation	T	2.00
Streambank modification/destabilization	M	12.80
Streambank modification/destabilization	T	4.00

Permit No.	**Point or Nonpoint Source Description**	**Receiving Water**
VT0100609	Saxtons River WWTF 0.105mgd	
9-005	Dairy Processing - Grafton Cheese	

Upper Saxtons River
Assessment Report

Waterbody No: VT11-06 **Assessment Year:** 2001

River Length (mi.): 31 **Date Last Updated:** 8/13/2001

Description: Confluence of South Branch to headwaters and tributaries including South Branch,

---

Location Identifiers

ANR Enforcement District: 2 **NRCS District:** 8

Fish and Wildlife District: 1 **Regional Planning Commission:** WIN

Assessment Information

Monitored (mi.): 7.5

Evaluated (mi.): 23.5

Assessment Types

Surveys of fish and game biologists or other professionals

Chem/physical monitoring data by quality-assured volunteer progra

Water Quality Limited?

On 303(d) List? N

Monitored for Toxics? N

Aquatic Contamination

Toxics Testing

Waste Management Zone - Miles: 1.00 **Description:**

Assessment Comments

MILES THREATENED

Saxtons River: 7.5 - confluence of South Branch to headwaters (especially from Grafton village almost to Houghtonville) - threats to aesthetics and aquatic habitat/biota due to sedimentation, turbidity, temperature stress from streambank erosion, road runoff, loss of riparian vegetation and channel modification. c(1100,1400,1600) s(7100,7700,8300)

COMMENTS

The monitoring data for the upper Saxtons River obtained by Bonnyvale Environmental Education Center (BEEC) in 2000 included temperature, pH and E. coli values. The two sites in this stretch were sampled once a month from May through November. The results indicated that water quality as measured by these three parameters was good. The temperatures ranged from a low of 4 C in the headwaters in October and November to a high of 15 C in August. There were a few pH values on the low end of the range (6.4 and 6.5 in August and October in the headwaters) but most values were up in the 6.5 to 8.5 range as required by the WQ Standards. There were only two exceedances of E. coli values at the upper Saxtons River sites - 1 exceedance (220/ml) in the headwaters in August and 1 exceedance (160/ml) in Grafton in November.

BEEC also sampled the upper Saxtons River in 1999. The same two sites as above were sampled once a month from June to November. Temperature and E. coli were sampled each time. Temperatures were in a

Upper Saxtons River **VT11-06**

range healthy for trout and other aquatic life for most of the season and there were no E. coli standards violations.

Field observations in August 1999 included threats from road maintenance and runoff and small buffers but overall water quality appearing in good condition with some sedimentation noted. Temperatures taken at two locations on August 12 were 18.5 and 18 C (mid-day).

The Vermont Department of Fish & Wildlife has fish population data from the South Branch. There are moderate populations of wild brook and brown trout and there is good salmon survival.

INFORMATION SOURCES

Ken Cox & Jay McMenemy, Vermont Dept. of Fish & Wildlife - info on threats, fishery status (1990, 2001)

Saxtons River Watch: A Citizen Science Water Quality Monitoring Program, reports for 1999 and 2000 by Frances Doyle, Bonnyvale Environmental Education Center.

Jerry McArdle, Vermont DEC Water Quality Division - field survey of upper Saxtons River, August 1999.

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	23.5	7.5	0.0	0.0	0.0
20	Aquatic biota/habitat	23.5	7.5	0.0	0.0	0.0
21	Fish consumption	0.0	31.0	0.0	0.0	0.0
42	Contact recreation	31.0	0.0	0.0	0.0	0.0
44	Noncontact recreation	31.0	0.0	0.0	0.0	0.0
50	Drinking water supply	0.0	0.0	0.0	0.0	31.0
62	Aesthetics	23.5	7.5	0.0	0.0	0.0
72	Agriculture water supply	0.0	0.0	0.0	0.0	31.0
82	Industry water supply	0.0	0.0	0.0	0.0	31.0

Impairment Cause	Magnitude	Size (mi.)
Siltation	T	7.50
Thermal modifications	T	7.50

Impairment Source	Magnitude	Size (mi.)
Highway/road/bridge runoff	T	7.50
Channelization	T	7.50
Streambank modification/destabilization	T	7.50

Permit No.	Point or Nonpoint Source Description	Receiving Water
9-0070	Old Tavern at Grafton - Indirect	Saxtons River

Lower West River
Assessment Report

Waterbody No: VT11-07 **Assessment Year:** 2001

River Length (mi.): 12 **Date Last Updated:** 8/13/2001

Description: Main Stem - Mouth to confluence with Grassy Brook

Location Identifiers

ANR Enforcement District: 2 **NRCS District:** 8

Fish and Wildlife District: 1 **Regional Planning Commission:** WIN

Assessment Information

Monitored (mi.): 12.0

Evaluated (mi.): 0.0

Water Quality Limited?

On 303(d) List? N

Monitored for Toxics? N.

Assessment Types

Surveys of fish and game biologists or other professionals

Occurrence of conditions judged to cause impairment

Biological Monitoring

Chem/physical monitoring data by quality-assured volunteer progra

Aquatic Contamination

None detected

Toxics Testing

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

Assessment Comments

PARTIAL SUPPORT MILES

West River: 12.0 - mouth to Grassy Brook confluence - partial support of secondary contact recreation (fishing) and aquatic habitat due to high summer temperatures and flow modification from loss of riparian vegetation, Townshend dam, and wide, shallow river channel. c(1400) s(7000,7400,7600)

THREATENED MILES

West River: 12.0 (same miles as above) - threats to aquatic biota, aesthetics, and swimming due to sedimentation, thermal and flow modifications and pathogens from land development, streambank erosion, road runoff, river flow fluctuations, and impoundment de-silting. c(1100,1400,1500,1600) s(3200,7410,7700,8300)

COMMENTS

River Watch has monitored 7 sites on the lower West River in at least 1997, 1998, 1999, and 2000. In July 2000, 4 of the 7 temperature measurements were 20 C or above; in October 2000, 3 of the 7 measurements were 20 C or above. In June 1999, 6 of the 7 temperature measurements were at or above 20 C; in July, all 7 temperature measurements were at or above 25 C!; in August, all were at or above 20 C. In July and August 1998 and in June, July and August 1997, temperature measurements were also high

Lower West River **VT11-07**

for a cold water fishery. E. coli and pH were also monitored at these 7 sites. There are some violations of these parameters but the results are not consistent. All the sampling results are contained in reports produced by the Bonnyvale Environmental Education Center (see below).

Macroinvertebrate sampling occurred at a site at milepoint 6.2 in 1994 and 1995. The macroinvertebrate community integrity was excellent and good respectively.

A rare mussell species (Alasmidonta varicosa) is located in waterbody.

Operations at the Vernon hydroelectric dam on the Connecticut River have an impact on Retreat Meadows of the West River as a result of the severe drawdowns at the dam.

INFORMATION SOURCES

Jay McMenemy, Vermont Dept of Fish & Wildlife - confirmed sources of habitat impacts on West River and the operations problems at Ball Mountain and Townshend dams (2001)

Jeff Cueto and Brian Fitzgerald, Vermont DEC Water Quality Division - information on the effects of Townshend, Ball Mountain and Vernon dams on the West River (2001)

The West River Watch Project Report 2000,1999, 1998, 1977, Frances Doyle, Bonnyvale Environmental Education Center. (2001)

Vermont DEC Biomonitoring and Aquatic Studies Section (BASS) - macroinvertebrate sampling data and evaluation. (2001)

Rick White, Dept of Forests and Parks, memo 9/24/97 - checked the West River several times in the summer 1997 and observed no problems from logging. Logging as a threat was removed. (1997)

Mark Rosenthal - U.S. ACOE - noted turbidity downstream of Townsend Dam to Ct. River from de-silting operations.

A Chemical Survey of the West River Drainage Basin Vermont DEC June 1983 - sampling revealed pH levels acceptable

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	0.0	0.0	12.0	0.0	0.0
20	Aquatic biota/habitat	0.0	0.0	12.0	0.0	0.0
21	Fish consumption	0.0	12.0	0.0	0.0	0.0
42	Contact recreation	0.0	12.0	0.0	0.0	0.0
44	Noncontact recreation	0.0	0.0	12.0	0.0	0.0
50	Drinking water supply	0.0	0.0	0.0	0.0	12.0
62	Aesthetics	0.0	12.0	0.0	0.0	0.0
72	Agriculture water supply	0.0	0.0	0.0	0.0	12.0
82	Industry water supply	0.0	0.0	0.0	0.0	12.0

Impairment Cause	Magnitude	Size (mi.)
Siltation	T	12.00
Thermal modifications	H	12.00
Thermal modifications	T	12.00
Flow alterations	M	12.00
Other habitat alterations	T	12.00

Impairment Source	Magnitude	Size (mi.)
Land development	T	12.00
Highway/road/bridge runoff	T	12.00
Flow regulation/modification	H	12.00
Flow regulation/modification	T	12.00
Removal of riparian vegetation	M	12.00
Streambank modification/destabilization	T	12.00

Lower West River **VT11-07**

Permit No.	Point or Nonpoint Source Description	Receiving Water
9-0238	Maple Valley Ski Area - Indirect	West River

Minor Tribs - Lower West River

Assessment Report

Waterbody No: VT11-08 **Assessment Year:** 2001

River Length (mi.): 18.5 **Date Last Updated:** 8/14/2001

Description: Tributaries draining into the Lower West River including Stickney Brook and Smith Brook

Location Identifiers

ANR Enforcement District: 2 **NRCS District:** 8

Fish and Wildlife District: 1 **Regional Planning Commission:** WIN

Assessment Information

Monitored (mi.): 11.1

Evaluated (mi.): 7.4

Water Quality Limited?

On 303(d) List? N

Monitored for Toxics? Y

Aquatic Contamination

Assessment Types

Surveys of fish and game biologists or other professionals

Chemical/physical monitoring

Chem/physical monitoring data by quality-assured volunteer progra

Toxics Testing

Organics in water column

Metals in water column

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

Assessment Comments

NON-SUPPORT MILES

Stickney Brook: 2.5 - confluence with West River upstream 2.5 miles - non-support of aquatic biota/habitat, aesthetics, swimming, boating, and water supplies due to flow alteration or no flow at all caused by water withdrawal (Brattleboro water supply). c(1500) s(7430)

THREATENED MILES

Bruce Brook: 0.1 - threats to drinking water supply, agricultural water supply and aquatic life from "leaky" landfill. Sampling found high metals in groundwater wells fairly close to the stream, however, surface water samples do not show high level currently recently (earlier surface water samples had high metals and benzene). c(300,500) s(6300)

Smith Brook: 8.5 - threats to aquatic biota from sedimentation and erosion from road turnouts, road sand and gravel right near brook, lack of riparian vegetation. c(1100), s(4500,7600)

COMMENTS

Bonnyvale Environmental Education Center (BEEC) sampled Stickney Brook at one location over the last four years (1997 through 2000) and Smith Brook at two locations over the last two years (1999 through 2000). Parameters sampled include E. coli, temperature, pH (1997-1999), and phosphorus at select

locations in 2000.

Temperature sampling by BEEC at the one site on Stickney Brook from 1997 to 2000 and two sites on Smith Brook in 1999 and 2000 show temperatures that overall support a coldwater fishery. In 2000, summertime samples on Stickney Brook ranged from 12 C to 17 C and in 1999, from 15 C to 17 C. In 2000, summertime samples on Smith Brook ranged from 11 C to 15 C and in 1999, from 15 C to 20 C.

E. coli sampling also done by BEEC did not reveal any concerns about possible pathogens over the four seasons of sampling, 1997 through 2000, on Stickney Brook. There was one sample in October 2000 on the brook that had 390 E. coli per 100 ml but other than that all samples were below 77 E. coli per 100 ml. On the two Smith Brook sites, which have been sampled only in 1999 and 2000, there was only one exceedance of the 77 E. coli per ml at site 13A (80 E. coli) over the two seasons of sampling and two exceedances of the standard at site 13B (110 and 220 E. coli/ml).

Vermont Department of Fish & Wildlife has fish data from Smith Brook at two sites. Wild brook and brown trout are found throughout the brook though more are found upstream. There is also good salmon survival in this watershed. Department staff also noted that wild trout are in Stickney Brook just from the West River and also above the water supply reservoir so flow amounts and fluctuations are the issue not temperature in this situation.

There is ongoing monitoring at Newfane Landfill (20 years post-closure which was 1993).

INFORMATION SOURCES

Bryan Harrington, Vermont DEC Waste Management Division, Solid Waste Section - noted current lack of metals in Bruce Brook due to the landfill but also noted high levels in groundwater samples taken near the stream, threat is a good category. (2001)

Jay McMenemy, Vermont Dept of Fish & Wildlife - info on trout populations in Stickney Brook and Smith Brook. (2001)

Cathy Kashanski, Vermont DEC Water Quality Division - noted over 2 dozen direct gravel road turnouts to Smith Brook, August 2001.

Ken Cox, Vermont Dept of Fish & Wildlife - noted threats to Wardsboro Brook, noted non-support in Stickney Brook because of low-no water. (19)

The West River Watch Project Reports 1997 - 2000. Bonnyvale Environmental Education Center.

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	7.4	8.6	0.0	2.5	0.0
20	Aquatic biota/habitat	7.4	8.6	0.0	2.5	0.0
21	Fish consumption	0.0	18.5	0.0	0.0	0.0
42	Contact recreation	16.0	0.0	0.0	2.5	0.0
44	Noncontact recreation	16.0	0.0	0.0	2.5	0.0
50	Drinking water supply	15.9	0.1	0.0	2.5	0.0
62	Aesthetics	16.0	0.0	0.0	2.5	0.0
72	Agriculture water supply	15.9	0.1	0.0	2.5	0.0
82	Industry water supply	0.0	0.0	0.0	2.5	16.0

Impairment Cause	Magnitude	Size (mi.)
Priority organics	T	0.10
Metals	T	0.10
Siltation	T	8.50
Flow alterations	H	2.50

Impairment Source	Magnitude	Size (mi.)
Highway/road/bridge runoff	T	8.50
Landfills	T	0.10
Flow mod.- water supply water withdrawal	H	2.50

Minor Tribs - Lower West River		**VT11-08**
Removal of riparian vegetation	T	8.50

Permit No.	**Point or Nonpoint Source Description**	**Receiving Water**
	Newfane Landfill	Bruce Brook

Rock River

Assessment Report

Waterbody No: VT11-09 **Assessment Year:** 2001

River Length (mi.): 26.5 **Date Last Updated:** 8/27/2001

Description: Mouth to headwaters and tributaries including Baker Brook, Marlboro Branch, Hunter Brook, Adams Brook

Location Identifiers

ANR Enforcement District: 2 **NRCS District:** 8

Fish and Wildlife District: 1 **Regional Planning Commission:** WIN

Assessment Information

Monitored (mi.): 7.5

Evaluated (mi.): 19.0

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

Occurrence of conditions judged to cause impairment

Fish surveys

Chem/physical monitoring data by quality-assured volunteer progra

Aquatic Contamination

None detected

Toxics Testing

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

Assessment Comments

PARTIAL SUPPORT MILES

Rock River: 7.5 - from confluence of Adams Brook to West River - partial support of aquatic habitat and secondary contact recreation, threats to aesthetics and swimming primarily from sedimentation, temperature modification, and habitat alteration along with some thermal modifications due to flood 'repair' channelization, streambank erosion, land development, loss of riparian vegetation, lack of a riparian zone. c(1100,1400,1600) s(3200,7100,7600,7700,8300)

COMMENTS

In 1997, the Windham Regional Commission conducted a physical assessment of the Rock River determining its likely valley and stream type using maps, watershed characteristics, and erosion hotspots in the field. Seven areas of eroding bank on the Rock mainstem and one site on Hunter Brook, a tributary, were visited and evaluated. Mass wasting down into the channel and erosion from steep, exposed banks are affecting the river.

The Vermont Dept of Fish & Wildlife has sampled for fish on the Rock River annually since 1987. Four sites are sampled on the mainstem plus two sites on Marlboro Branch and one each on Hunter and Baker Brooks. The temperatures are generally too high for trout on the Rock River segment described above. The department has a lot of spot temperature readings. Temperatures are in the low 80's on a hot, sunny,

Rock River **VT11-09**

summer day.

Temperature data from West River Watch monitoring from 1997 and 1999 show temperatures reaching levels in July and/or August (depending on the year) that could affect trout health. Temperature data from 1998 and 2000 sampling showed temperatures more favorable for a coldwater fishery. E. coli in the Rock River have been below standards in almost all samples and thus indicate no cause for concern.

A Rock River riparian vegetation inventory has been done - maps and results have yet to be received.

INFORMATION SOURCES

Jay McMenemy, Vemont Dept of Fish & Wildlife - information on temperature impacts to trout (2001)

West River Watch Project reports for 1997, 1998, 1999, and 2000. Frances Doyle, Bonnyvale Environmental Education Center - data on temperature, E. coli, pH. (2000)

West River Tributaries Non-Point Source Pollution Stream Assessment Report, January 1998. Windham Regional Commission. (2000)

Jay McMenemy, Vt. F&W Fisheries Biologist - noted damage to waterbody during flood of 1973 & 1976 and following clean-up/repair work particularly from Brookside to South Newfane. (1988)

Alan Confalone & Drew Adams - USDA/SCS - noted heavy use for recreation purposes and salmon stocking, also dam restoration for salmon fishery in Williamsville. (1988)

Chemical Survey of West River Drainage, June 1983, Vermont DEC - pH values for upper Rock and Marlboro Branch do not suggest atmospheric deposition related problem.

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	19.0	0.0	7.5	0.0	0.0
20	Aquatic biota/habitat	19.0	0.0	7.5	0.0	0.0
21	Fish consumption	0.0	26.5	0.0	0.0	0.0
42	Contact recreation	19.0	7.5	0.0	0.0	0.0
44	Noncontact recreation	19.0	0.0	7.5	0.0	0.0
50	Drinking water supply	0.0	0.0	0.0	0.0	26.5
62	Aesthetics	19.0	7.5	0.0	0.0	0.0
72	Agriculture water supply	0.0	0.0	0.0	0.0	26.5
82	Industry water supply	0.0	0.0	0.0	0.0	26.5

Impairment Cause	Magnitude	Size (mi.)
Siltation	M	7.50
Thermal modifications	H	7.50
Other habitat alterations	M	7.50

Impairment Source	Magnitude	Size (mi.)
Land development	M	7.50
Channelization	M	7.50
Removal of riparian vegetation	H	7.50
Streambank modification/destabilization	M	7.50

Mid-West River
Assessment Report

Waterbody No: VT11-10 **Assessment Year:** 2001

River Length (mi.): 21 **Date Last Updated:** 8/14/2001

Description: Main Stem - Confluence of Grassy Brook To Confluence of Winhall River

Location Identifiers

ANR Enforcement District: 2 **NRCS District:** 8

Fish and Wildlife District: 1 **Regional Planning Commission:** WIN

Assessment Information

Monitored (mi.): 17.1

Evaluated (mi.): 3.9

Water Quality Limited?

On 303(d) List? Y

Monitored for Toxics? N

Assessment Types

Surveys of fish and game biologists or other professionals

Land use information and location of sources

Occurrence of conditions judged to cause impairment

Non-fixed station chemical/physical monitoring-conventional polluta

Chem/physical monitoring data by quality-assured volunteer progra

Aquatic Contamination

None detected

Toxics Testing

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

Assessment Comments

PARTIAL SUPPORT MILES

West River: 10.0 - from Ball Mountain Dam down to Townsend Dam - partial support of aquatic biota/habitat and secondary contact recreation due to high temperatures, sedimentation, and severe fluctuating flows from poor operation of Ball Mountain dam gates. c(1400,1500,1600) s(7350,7400,8700)

West River: 7.1 - from Townshend Dam down to Grassy Brook confluence - partial support of aquatic habitat and fishing due to high temperatures and flow modifications from Townshend dam operation, impoundment warming waters. c(1400,1500) s(7350,7400,7600)

COMMENTS

The 1989 Upper West River Basin Water Quality Management Plan includes a lot of information on the watershed from the West River headwaters to the Townshend Dam. There are inventories of swimming holes, high fishing use areas, boating stretches, and natural features. There are also discussions of water use conflicts as well as existing and potential pollution sources and activities that would have an impact on water quality and aquatic habitat.

Over the years, fluctuating flows have been a major problem Ball Mountain Dam. Flow fluctuations, reservoir fluctuations, and sediment releases have caused habitat impacts over the years. In 1993 and

Mid-West River **VT11-10**

1995, there was severe siltation from two Ball Mountain Reservoir releases of silt, which covered miles of aquatic habitat downstream of the dam. Operations at Townshend dam are also problematic: beach maintenance drawdowns, outlet inspections and maintenance, debris removal, and whitewater releases.

Vermont Dept of Fish & Wildlife has temperature data for this stretch of the West River showing it is too hot for trout as well as juvenile salmon below Townshend Dam and too hot from Ball Mountain Dam to Townshend Dam for trout. There is thermograph data from 2000, older thermograph readings, and spot temperature data. There is also fish data from the West River in Jamaica, which show very low trout populations and poor survival of salmon fry, although good densities of older salmon presumably from migration from areas without the flow fluctuations.

Bonnyvale Environmental Education Center (BEEC) sampled four sites on the mid West River over the last four years. The sites on this stretch include: 13-Newfane Swim Hole, 14-State Forest Road, 16-Scott Bridge, and 17-Townshend Reservoir Swim Beach.

Temperature samples from the three riverine sites (13,14,16) in 2000 were 14 - 16 C in June; 17 - 19 C in July; 15 - 16 C in August; 15 - 16 C in September; and 16 - 20 C in October. At the Townshend Reservoir Swim Beach, the temperature sample in July 2000 was 24 C and in October 2000 was 23 C. In 1999, the temperatures at the three riverine sites were 18 - 21 C in June; 23 - 26 C in July; 22 - 23 C in August; and 9 - 10 C in September. At the Townshend Reservoir Swim Area, the temperature was 24 C in June, 27 C in July, 24 C in August, and 10 C in September of 1999. In 1998, the June temperatures at the three riverine sites were 13 - 15 C; the July temperatures were 19 - 22 C; the August temperatures were 21 - 24 C; and the September temperature (only available at site 16) was 18 C. At the Townshend Reservoir Swim Area, the temperature was 15 C in June, 25 C in July, 25 C in August, and 19 C in September. In 1997, the June temperatures at the three riverine sites were 20 - 23 C; the July temperatures were 20 - 23 C; the August temperatures were 19 - 22 C; and the September temperatures were 13 - 18 C.

The results from the BEEC E. coli sampling do not show any serious or consistent bacteria violations in this stretch of the West River. In the 2000 sampling season, seven samples were collected at each of the three mid-West River sites and the E. coli count was above the standard (77 per 100 ml) only twice - at site 13 in July (290 per ml) and at site 16 in July (90 per ml). In 1999, five samples were collected at each of the three sites. In September all three sites had high numbers of E. coli as did most of the mainstem sites but other than that the numbers were low. In the 1998 sampling season, seven samples were again collected at the same three sites. There were E. coli counts above standard at site 16 in May and June and at sites 13 and 14 in June. In 1997, six samples were collected at the three sites and site 13 had values above standard in July, August, and September although they were not high numbers.

There are 2 species of "State importance" in the waterbody - Brook Floater Mussell (Alasmidonta heterdon) and E.River Pearl Mussell (Margaritifera margaritifera)

INFORMATION SOURCES

West River Watch Project Report 1997 to 2000. Frances Doyle, Bonnyvale Environmental Education Center - temperature, E. coli, pH data for the West River and tributaries. (2001)

Rick White, Vt Dept of Forests and Parks - checked on the logging threats we had listed. Rick travels this section of the West River often and has seen no problems this past summer (1997).

Jay McMenemy - Vt. F&W district fisheries biologist - noted 3 miles of severe impact and other stretch of moderate impact from accidental drawdown at Ball Mountain Dam. (1994)

Ken Cox, Vermont Dept of Fish & Wildlife - noted the low and fluctuating flows and their impacts (1990)

Upper West River Basin Water Quality Management Plan, February 1989. Vermont DEC.

Mark Rosenthal - US Army COE - noted sedimentation within 2 reservoirs. Ball Mountain less than Townsend, cited erosion from logging, land development, and unpaved roads plus natural factors. Temperature problems - 25% of time over standard. (1988)

1987 Habitat Evaluation Program, US Army COE - suitability of West River for salmon restoration based on physical & chemical sampling.

Limited Water Quality monitoring 11/84 - 12/87 - some elevated fecal coliform counts.

A Chemical Survey of the West River Drainage. Vermont DEC June 1983. - one station in waterbody indicated suitable pH for trout & salmon populations.

Mid-West River **VT11-10**

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	3.9	0.0	17.1	0.0	0.0
20	Aquatic biota/habitat	3.9	0.0	17.1	0.0	0.0
21	Fish consumption	0.0	21.0	0.0	0.0	0.0
42	Contact recreation	21.0	0.0	0.0	0.0	0.0
44	Noncontact recreation	3.9	0.0	17.1	0.0	0.0
50	Drinking water supply	0.0	0.0	0.0	0.0	21.0
62	Aesthetics	21.0	0.0	0.0	0.0	0.0
72	Agriculture water supply	0.0	0.0	0.0	0.0	21.0
82	Industry water supply	0.0	0.0	0.0	0.0	21.0

Impairment Cause	Magnitude	Size (mi.)
Siltation	M	10.00
Thermal modifications	H	17.10
Flow alterations	H	17.10
Other habitat alterations	M	10.00

Impairment Source	Magnitude	Size (mi.)
Upstream impoundment	H	7.10
Flow regulation/modification	H	17.10
Removal of riparian vegetation	M	7.10
Recreational activities	M	10.00

Permit No.	Point or Nonpoint Source Description	Receiving Water
9-0152	Grace Cottage Hospital - Indirect	West River
	Ball Mountain Dam - Flood Control	West River
	Townsend Dam - Flood Control	West River

Grassy Brook
Assessment Report

Waterbody No: VT11-11 **Assessment Year:** 2001

River Length (mi.): 22.5 **Date Last Updated:** 8/13/2001

Description: Mouth to headwaters and tributaries

Location Identifiers

ANR Enforcement District: 2 **NRCS District:** 8

Fish and Wildlife District: 1 **Regional Planning Commission:** WIN

Assessment Information

Monitored (mi.): 0.0

Evaluated (mi.): 22.5

Assessment Types

Surveys of fish and game biologists or other professionals

Chem/physical monitoring data by quality-assured volunteer progra

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

COMMENTS

One site on Grassy Brook has been sampled for various parameters by West River Watch volunteers over the past four years 1997 - 2000. E. coli data do not indicate ongoing pathogen or bacteria problems although concerns were raised earlier in the assessment process about septic system location and functioning. In 2000, the Grassy Brook site was sampled seven times (once per month May through November) and there was one high count of 420 colonies per ml following a night of rain. In 1999, there was also only one sample with a high value (350+), which occurred in September following a lot of rain associated with hurricane Floyd. In 1998 and 1997, there was again one sample out of seven and six respectively at site 12 that was above standard.

Temperature data were also collected at the one site on Grassy Brook. The temperatures recorded once per month over the 6 or 7 months in 1997, 1998, 1999, and 2000 are relatively cool and appear suitable for a healthy coldwater fishery.

Grassy Brook has the typical, ubiquitous but not imminent-problem water quality threats from land development, road runoff, ag land uses. The threatened status was removed until further assessment or monitoring can clarify conditions.

Grassy Brook **VT11-11**

Vermont Department of fish & Wildlife has fish data for Grassy Brook. They have found a good brook trout population in the headwaters and moderate to low populations of wild brown and brook trout populations otherwise. There is fair salmon survival.

We have no information currently about the many tributaries that come down off the hills and mountains into Grassy Brook. Fourteen miles of this waterbody represent the tributaries.

INFORMATION SOURCES

West River Watch Reports 1997 - 2000. Frances Doyle, Bonnyvale Environmental Education Center.

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	22.5	0.0	0.0	0.0	0.0
20	Aquatic biota/habitat	22.5	0.0	0.0	0.0	0.0
21	Fish consumption	0.0	22.5	0.0	0.0	0.0
42	Contact recreation	22.5	0.0	0.0	0.0	0.0
44	Noncontact recreation	22.5	0.0	0.0	0.0	0.0
50	Drinking water supply	0.0	0.0	0.0	0.0	22.5
62	Aesthetics	22.5	0.0	0.0	0.0	0.0
72	Agriculture water supply	0.0	0.0	0.0	0.0	22.5
82	Industry water supply	0.0	0.0	0.0	0.0	22.5

Permit No.	Point or Nonpoint Source Description	Receiving Water
	none	

Minor Tribs - Mid-West River

Assessment Report

Waterbody No: VT11-12 **Assessment Year:** 2001

River Length (mi.): 18.5 **Date Last Updated:** 8/14/2001

Description: Minor tributaries to the Mid- West River including Mill Brook, Simpson Brook, Tannery Brook, Fair Brook

Location Identifiers

ANR Enforcement District: 2 **NRCS District:** 8

Fish and Wildlife District: 1 **Regional Planning Commission:** WIN

Assessment Information

Monitored (mi.): 0.0

Evaluated (mi.): 18.5

Assessment Types

Land use information and location of sources

Chem/physical monitoring data by quality-assured volunteer progra

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

COMMENTS

One site on Mill Brook was sampled for several parameters by Bonnyvale Environmental Education Center volunteers over the last four years, 1997 through 2000. In 2000, E. coli was sampled once a month May through November and the count was above standard in June (130 colonies per 100 ml) and in July (190 colonies). There was rain the night before both sampling events. In 1999, E. coli was sampled once per month in June, July, August, September and November and the E. coli count was above standard in June (150 colonies) and in August (120 colonies). In 1998, E. coli was sampled once per month from May through November and E. coli at site 15 on Mill Brook was above standard only in June (120 colonies), which was a very rainy, wet month. In 1997, E. coli was sampled once per month from June through November and there were no counts above the standard.

Temperature data were also collected at the one site on Mill Brook. The temperatures recorded once per month over the 5 to 7 months in 1997, 1998, 1999, and 2000 are relatively cool and appear suitable for a healthy coldwater fishery.

Mill Brook is a great brook and brown trout stream plus a good salmon stream. Fair Brook has brook trout and salmon. Tannery Brook has brook trout. No recent data on Simpson Brook but it likely has brook trout as well.

Minor Tribs - Mid-West River **VT11-12**

More information is needed on the tributaries in this subwatershed - Tannery Brook, Fair Brook, Simpson Brook, Negro Brook, and others.

INFORMATION SOURCES

Jay McMenemy, Vermont Dept of Fish & Wildlife - status of brooks and fishery in this waterbody (2001)

West River Watch Project Reports 1997 - 2000, Frances Doyle, Bonnyvale Environmental Education Center.

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	18.5	0.0	0.0	0.0	0.0
20	Aquatic biota/habitat	18.5	0.0	0.0	0.0	0.0
21	Fish consumption	0.0	18.5	0.0	0.0	0.0
42	Contact recreation	18.5	0.0	0.0	0.0	0.0
44	Noncontact recreation	18.5	0.0	0.0	0.0	0.0
50	Drinking water supply	0.0	0.0	0.0	0.0	18.5
62	Aesthetics	18.5	0.0	0.0	0.0	0.0
72	Agriculture water supply	0.0	0.0	0.0	0.0	18.5
82	Industry water supply	0.0	0.0	0.0	0.0	18.5

Permit No.	Point or Nonpoint Source Description	Receiving Water
	Janos Tech - Indirect Discharge	Mill Brook
9-0069	Leland & Gray UHS - Indirect discharge	Mill Brook
9-0032	Bromley Mountain -Indirect discharge	UT Mill Brook

Cobb & Turkey Mountain Brooks

Assessment Report

Waterbody No: VT11-13 **Assessment Year:** 2001

River Length (mi.): 17 **Date Last Updated:** 8/1/2001

Description: Cobb Brook and Turkey Mountain Brook from their mouths to their headwaters and tributaries

Location Identifiers

ANR Enforcement District: 2 **NRCS District:** 8

Fish and Wildlife District: 1 **Regional Planning Commission:** WIN

Assessment Information

Monitored (mi.): 8.0

Evaluated (mi.): 9.0

Assessment Types

Surveys of fish and game biologists or other professionals

Chem/physical monitoring data by quality-assured volunteer progra

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

Turkey Mountain Brook: 9.0 - threats to aquatic biota/habitat and secondary contact recreation due to sedimentation and turbidity from road runoff, encroaching development. c(1100) s(3200,4500)

COMMENTS

Cobb Brook and its tributaries beginning at an elevation of 2500 feet and continuing downstream to its confluence with the West River were classified from Class B to Class A to be mananged as naturally occurs. The brook has pristine-like water quality supporting a diverse aquatic community. Hamilton Falls is among the state's highest naturally occurring waterfalls. The brook supports a naturally reproducing brook trout popula- tion. The watershed includes black bear reproduction habitat.

The most recent macroinvertebrate sampling occurred on Cobb Brook in 1994, 1995, and 1997. The results were: 1994 at milepoint 0.9 - excellent and 1995 at 0.9 - excellent; 1995 at milepoint 1.9 - excellent and 1997 at 1.9 - good; and 1994 at milepoint 2.6 - excellent.

Bonnyvale Environmental Education Center volunteers sampled several parameters at one site on Turkey Mountain Brook from 1997 to 2000. In 2000, water temperatures recorded from May to September ranged

Cobb & Turkey Mountain Brooks **VT11-13**

from 10 C (May) to 21 C (July). In 1999, the water temperatures recorded didn't get as high: the range from June through September was 10 C (September) to 19 C (July). In 1998, the range of temperatures was lower from May to September - from 10 C (May) to 16 C (August). 1997 was similar with a June to September range of 13 C (September) to 16 C (July and August).

In 2000, the E. coli data from BEEC sampling once a month May through November showed two violations of standards with 250 colonies per 100 ml in June and 200 colonies in July. It had rained in the night before each of these sampling events that showed violations. In 1999, there was only one violation of the standard - 270 colonies per 100 ml in July. In 1998, there was also only one violation - 140 colonies per 100 ml in June. In 1997, there were no violations of the E. coli standard during the times sampled.

Complete information on the sampling results from the BEEC monitoring projects are given in the reports named below.

Wild brook and brown trout and salmon are in Turkey Mountain Brook.

INFORMATION SOURCES

Vermont DEC Water Quality Division BASS data and evaluation of data (2001)

West River Watch Project reports 1997 - 2000. Frances Doyle, Bonnyvale Environmental Education Center. (2001)

Ken Cox, Vermont Dept of Fish & Wildlife - threats to Turkey Mountain Brook (1990)

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	8.0	9.0	0.0	0.0	0.0
20	Aquatic biota/habitat	8.0	9.0	0.0	0.0	0.0
21	Fish consumption	0.0	17.0	0.0	0.0	0.0
42	Contact recreation	17.0	0.0	0.0	0.0	0.0
44	Noncontact recreation	8.0	9.0	0.0	0.0	0.0
50	Drinking water supply	0.0	0.0	0.0	0.0	17.0
62	Aesthetics	17.0	0.0	0.0	0.0	0.0
72	Agriculture water supply	0.0	0.0	0.0	0.0	17.0
82	Industry water supply	0.0	0.0	0.0	0.0	17.0

Impairment Cause	Magnitude	Size (mi.)
Siltation	T	9.00

Impairment Source	Magnitude	Size (mi.)
Land development	T	9.00
Highway/road/bridge runoff	T	9.00

Permit No.	Point or Nonpoint Source Description	Receiving Water
	none	

Wardsboro Branch
Assessment Report

Waterbody No: VT11-14 **Assessment Year:** 2001

River Length (mi.): 34.8 **Date Last Updated:** 8/14/2001

Description: Mouth to headwaters and tributaries including Pike Hollow, Dover, Waite brooks and South Branch

Location Identifiers

ANR Enforcement District: 2 **NRCS District:** 8

Fish and Wildlife District: 1 **Regional Planning Commission:** WIN

Assessment Information

Monitored (mi.): 12.0

Evaluated (mi.): 22.8

Water Quality Limited?

On 303(d) List? N

Monitored for Toxics? N

Assessment Types

Surveys of fish and game biologists or other professionals

Fish surveys

Chem/physical monitoring data by quality-assured volunteer progra

Aquatic Contamination

None detected

Toxics Testing

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

Assessment Comments

PARTIAL SUPPORT MILES

Wardsboro Brook: 7.0 - from West Wardsboro to confluence with West River - partial support of aquatic habitat & biota, swimming and aesthetics due to physical habitat alterations, sedimentation, turbidity, and temperature stress from streambank erosion, flood repair efforts, road runoff, land development, and channelization. c(1100,1400,1600) s(3200,7100,7600,7700,8300)

COMMENTS

The Department of Fish & Wildlife has fish survey data from two sites from 1987 to the present. They also have data on Pike Hollow Brook, Waite Brook, and South Branch since the early 1990's. The temperature data are mostly spot data. Downstream from West Wardsboro on Wardsboro Branch, there are some salmon but few trout because of the temperatures. Above West Wardsboro, the stream is cooler and there are salmon and brook trout and some brown trout.

Bonnyvale Environmental Education Center (BEEC) volunteers sampled several parameters once a month generally May through November from 1997 to 2000. In 2000, the temperatures sampled on Wardsboro Brook were 25 C in July and 13 C in October. Unfortunately, there were no measurements in May, June, August, and September. In 1999, there were no measurements in June or July but in August the temperature was 15 C and in September 11 C. In 1998, the temperature was 8 C in May, 12 C in June, no

Wardsboro Branch **VT11-14**

measurement in July, 19 C in August, 14 C in September. In 1997, the temperature was 18 C in June, 19 C in July, 20 C in August and 15 C in September.

E. coli and pH were also measured as part of the BEEC sampling program. The numbers did not indicate any serious issues with respect to either pH or pathogens with the samples taken once per month.

INFORMATION SOURCES

Jay McMenemy, Vermont Departmen of Fish & Wildlife - noted streambank erosion and road runoff problems (1994) and fisheries status based on fish population surveys (2001)

West River Watch Project reports 1997 - 2000. Frances Doyle, Bonnyvale Environmental Education Center.

Ken Cox, Vermont Dept of Fish & Wildlife - noted that above causes and sources are having an impact on Wardsboro Brook

Jay McMenemy, Vermont Dept Fish & Wildlife - noted streambank erosion and road runoff problems

Fisheries Status in Relation to Acidity in Selected Vermont Streams, Vermont DEC July 1985

Upper West River Water Quality Management Plan, Vermont DEC January 1987 - sited fishery impact along Wardsboro Brook from bulldozing & widening after flooding of 1970s, increased temp and sedimentation from development along with loss of of riparian vegetation.

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	27.8	0.0	7.0	0.0	0.0
20	Aquatic biota/habitat	27.8	0.0	7.0	0.0	0.0
21	Fish consumption	0.0	34.8	0.0	0.0	0.0
42	Contact recreation	27.8	0.0	7.0	0.0	0.0
44	Noncontact recreation	27.8	0.0	7.0	0.0	0.0
50	Drinking water supply	0.0	0.0	0.0	0.0	34.8
62	Aesthetics	27.8	0.0	7.0	0.0	0.0
72	Agriculture water supply	0.0	0.0	0.0	0.0	34.8
82	Industry water supply	0.0	0.0	0.0	0.0	34.8

Impairment Cause	Magnitude	Size (mi.)
Siltation	M	7.00
Thermal modifications	M	7.00
Other habitat alterations	M	7.00

Impairment Source	Magnitude	Size (mi.)
Land development	M	7.00
Highway/road/bridge runoff	M	7.00
Channelization	M	7.00
Removal of riparian vegetation	M	7.00
Streambank modification/destabilization	M	7.00

Permit No.	Point or Nonpoint Source Description	Receiving Water
	none	

Ball Mountain Brook
Assessment Report

Waterbody No: VT11-15 **Assessment Year:** 2001

River Length (mi.): 27.5 **Date Last Updated:** 9/25/2001

Description: Mouth to headwaters and tributaries including North Branch Ball Mountain Brook and Kidder Brook

Location Identifiers

ANR Enforcement District: 2 **NRCS District:** 8

Fish and Wildlife District: 1 **Regional Planning Commission:** WIN

Assessment Information

Monitored (mi.): 27.5

Evaluated (mi.): 0.0

Water Quality Limited?

On 303(d) List? Y

Monitored for Toxics? N

Aquatic Contamination

Assessment Types

Surveys of fish and game biologists or other professionals

RBP III or equivalent benthos surveys

Chem/physical monitoring data by quality-assured volunteer progra

Toxics Testing

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

Assessment Comments

NON-SUPPORT MILES

Tributary #1 to Stratton golf course pond: 0.5 - upstream from pond - non-support of aquatic biota due to nutrient enrichment, iron leachate, siltation/sedimentation and hydrology changes from stormwater runoff. Also sloughing banks and lack of riparian vegetation. c(500,900,1100) s(3200,4000,7600,7700,8700)

PARTIAL SUPPORT MILES

Styles Brook: 2.0 - upstream from mouth - partial support of aesthetics and aquatic biota/habitat due to sedimentation from land development activities, parking lots, streambank erosion and watershed hydrology changes.
c(1100) s(3200,4000,7000,7700)

Ball Mountain Brook: 8.4 - North Branch Brook confluence to headwaters - partial support of aquatic biota/habitat (fish) and secondary contact recreation due to low pH from atmospheric deposition. c(1000) s(8100)

Tributary #2 to Stratton golf course pond: 0.5 - partial support of aquatic biota/habitat due to siltation/sedimentation and temperature increases from stormwater runoff, onstream pond and lack of riparian vegetation. c(1100,1400) s(4000,7600,8700)

Ball Mountain Brook **VT11-15**

THREATENED MILES

North Branch Brook: 6.5 - from 0.5 miles below Stratton golf course pond to mouth - threats to contact recreation, aquatic biota/habitat, and aesthetics from sediments, nutrients, temperature increases, flow alteration, pathogens due to land development, wastewater disposal, removal of riparian vegetation, streambank erosion, potential watershed hydrology changes. c(900,1100,1400,1500,1700) s(4000,6200,7000,7600,7700,8700)

Ball Mountain Brook: 13.0 - mouth to headwaters (including Forester Pond drainage & including stretch in PS above) - threats to aquatic biota/habitat, secondary contact recreation and aesthetics due to turbidity/sedimentation from flooding and flood repair work, streambank erosion, and road runoff. c(1100,1600) s(4500,7100,7600,7700,8650)

COMMENTS

Bonnyvale Environmental Education Center volunteers sampled E. coli and temperature at two sites on Ball Mountain Brook from 1997 through 2000. pH was sampled from 1997 to 1999. The E. coli results from sampling May through November 2000, June through November 1999 and May through November 1998, revealed no bacteria or pathogen problems. The 1997 E. coli samples taken once per month from June through November had high values (350 colonies per 100 ml) for four of the six months.

Pioneer Environmental Associates, LLC sampled a number of the tributaries to the North Branch Ball Mountain Brook for Stratton Mountain Corporation in 1999 and 2000. There is a 2000 Annual Performance Report that documents the results of their sampling including macroinvertebrate sampling, water chemistry sampling, and stream walks/field documentation. The outcomes for their biomonitoring are: site MP4 on Tributary 2 to golf course pond failed Class B(2-3) thresholds in 1999 and 2000; site MP9 on Tributary 1 to golf course pond failed Class B(2-3) thresholds in 1999 and 2000; site MP12 on the so-called East Branch of Tributary 1 failed Class B(2-3) thresholds in 1999 and 2000; site MP14 on Styles Brook failed Class B(2-3) thresholds in 1999 but the data were indeterminate in 2000; site MP15 on Styles Brook by the golf school had data that were indeterminate in both 1999 and 2000; MP24, MP26, and MP28 on the North Branch all passed at Class B(2-3) thresholds and mostly passed B1 or A1 thresholds; MP16 on Brazer's Brook passed Class B(2-3) in 1999 but failed in 2000. Based on these most recent data, the North Branch half mile in the non-support category were removed and the Tributary 2 half mile in threats was moved to partial support.

Vermont DEC assessed Styles Brook in 1994 and then again in Sept 1998 - the biological integrity of the macroinvertebrate community was fair in both years. The community is low in density, richness and EPT richness and Oligocheates form a significant component (28%). Brook trout were the only fish species present with low numbers but not abnormal. There is a high percentage of sand in the substrate, which is also coated with a fine clay/silt material. (1999)

A thorough discussion of the data on the two tributary streams that enter the Stratton golf course pond is included in the November 7, 1997 memorandum by Vermont DEC biologists mentioned below. In brief, the biological integrity of tributary #1 is poor and the community metrics indicate that the community is being impaired by habitat degradation from nutrient enrichment and siltation/sedimentation. EPT richness and density are both low and pollution tolerant taxa dominate. Tributary #2 is not as degraded as #1 but the macroinvertebrate community composition is changed from what it should be for a stream this size and at this elevation. The stream is considered moderately enriched and the dominant taxa is a snail, which is highly unusual in this type of stream.

A major silt discharge from Stratton golf course pond occurred in June 1996.

The threats to Kidder Brook (2.5 miles) that have been in this database since 1988 were removed. The current proposed master plan for Stratton "specifically rules out real estate development in the Class A Kidder Brook watershed" (SACC) so the threats from ski area expansion and land development are not threats at this time. (1998)

A study conducted by the Windham Regional Commission in the West River Basin included evaluation of twelve erosion sites on Ball Mountain Brook and one of seven major slide sites on the North Branch. The 12 sites were all located between the Ball Mountain Brook's confluence with the West River to the 2nd bridge on Pikes Falls Road. The North Branch site was a 100 foot high eroded bank with the soils 90% exposed. Sloughing and wasting are occurring on this section of bank. The other six slides were not specifically described. (1998 and 2001)

Ball Mountain Brook above the confluence with the North Branch is affected by acidification. "The fish community in this reach is quite depauperate in comparison with other acidic streams in the area (e.g.

Ball Mountain Brook **VT11-15**

Winhall River). Only two fish species are routinely observed in Ball Mountain Brook.. wild brook trout and juvenile stocked Atlantic salmon. No slimy sculpins, blacknose dace, creek chubs, etc."

INFORMATION SOURCES

Stratton Mountain Resort Master Plan Water Quality Remediation Plan 2000 Annual Performance Report, May 17, 2001.

Steve Fiske, Vt. DEC Water Quality Division Biomonitoring Section - data on unnamed tributaries 1 & 2 to golf course pond, North Branch Brook and Styles Brook. Also November 7, 1997 memo on unnamed tributaries to Stratton golf course pond.

How Clean is the West River?, Bonnyvale Environmental Education Center, 1998. Results of the West River Watch Project June - November 1997 - had E. coli, temperature and pH data for the West River and tributaries.

Stratton Area Citizens Committee, April 1998 letter to Rick Hopkins with comments on the draft 1998 303(d) list - provided comment on Kidder Brook above plus summary of concerns that corroborate other information gathered for assessment.

West River Tributaries Nonpoint Source Pollution Stream Assessment Report, January 1998, Windham Regional Commission.

Ken Cox & Jay McMenemy, Vermont Dept of Fish & Wildlife - fish community information, acidification impacts on Ball Mountain Brook (1998)

NOTE

North Branch Ball Mountain Brook - from the confluence of Kidder Brook to a point below Pikes Falls where an unnamed tributary enters from the Winhall Municipal Forest - 4000 feet made an Outstanding Resource Water (ORW) due to fish habitat, geologic feature, scenic area and recreational value.

Kidder Brook watershed is a Class A watershed (1989 Board decision).

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	5.0	11.1	10.9	0.5	0.0
20	Aquatic biota/habitat	5.0	11.1	10.9	0.5	0.0
21	Fish consumption	0.0	27.5	0.0	0.0	0.0
42	Contact recreation	21.0	6.5	0.0	0.0	0.0
44	Noncontact recreation	14.5	4.6	8.4	0.0	0.0
50	Drinking water supply	0.0	0.0	0.0	0.0	27.5
62	Aesthetics	6.0	19.5	2.0	0.0	0.0
72	Agriculture water supply	0.0	0.0	0.0	0.0	27.5
82	Industry water supply	0.0	0.0	0.0	0.0	27.5

Impairment Cause	Magnitude	Size (mi.)
Metals	H	0.50
Nutrients	H	0.50
Nutrients	T	6.00
pH	M	8.40
Siltation	H	3.00
Siltation	T	19.50
Thermal modifications	M	0.50
Thermal modifications	T	6.50
Flow alterations	T	6.50
Other habitat alterations	T	13.00
Pathogens	T	6.50

Ball Mountain Brook **VT11-15**

Impairment Source	Magnitude	Size (mi.)
Land development	H	2.50
Land development	T	6.50
Urban/developed land runoff	H	3.00
Urban/developed land runoff	T	6.50
Highway/road/bridge runoff	T	13.00
Wastewater (WWTFs)	T	6.50
Channelization	T	13.00
Removal of riparian vegetation	H	1.00
Removal of riparian vegetation	T	19.50
Streambank modification/destabilization	H	0.50
Streambank modification/destabilization	T	19.50
Floods	T	13.00
Recreational activities	H	1.00
Recreational activities	T	6.50

Permit No.	Point or Nonpoint Source Description	Receiving Water
9-0019	Stratton Corporation.- Indirect	North Branch Ball Mtn Brook
9-0170	Piper Ridge Condos - Indirect	North Branch Ball Mtn Brook
9-0171	Piper Ridge Condos - Indirect	North Branch Ball Mtn Brook
9-0211	Birch Hill Apts - Indirect	North Branch Ball Mtn Brook
9-0212	Birch Hill Apts - Indirect	North Branch Ball Mtn Brook
9-0215	Birch Hill Apts - Indirect	North Branch Ball Mtn Brook
1-0539	Stratton Corporation - SW	Trib Kidder Brook
1-1107	Stratton Corporation - SW	Braziers & Styles Brooks
1-1256	Stratton Corporation - SW	North Branch Ball Mtn Brook
1-1336	Stratton Corporation - SW	Trib North Branch & Trib Styles
1-1340	Stratton Mountain School - SW	Trib Styles Brook
1-1362	Stratton Corporation - SW	North Branch Ball Mtn Brook
1-1366	Stratton Dev Corporation - SW	Braziers Brook
1-1412	Stratton Dev Corporation - SW	Styles Brook

Winhall River
Assessment Report

Waterbody No: VT11-16 **Assessment Year:** 2001

River Length (mi.): 49.1 **Date Last Updated:** 8/15/2001

Description: Mouth to headwaters and tributaries including Cook Brook, Mill Brook, and Red Brook

Location Identifiers

ANR Enforcement District: 2 **NRCS District:** 8

Fish and Wildlife District: 1 **Regional Planning Commission:** WIN

Assessment Information

Monitored (mi.): 13.3

Evaluated (mi.): 35.8

Water Quality Limited?

On 303(d) List? N

Monitored for Toxics? N

Assessment Types

Surveys of fish and game biologists or other professionals

Occurrence of conditions judged to cause impairment

Fish surveys

Aquatic Contamination

Toxics Testing

Waste Management Zone - Miles: 0.00 **Description:**

Assessment Comments

NON-SUPPORT MILES

Tributary to Mill Brook: 0.7 - from elevation 1840 feet downstream - non-support of aquatic habitat due to flow alteration from a snowmaking water withdrawal. c(1500) s(7420)

PARTIAL SUPPORT MILES

Tributary to Mill Brook: 1.5 - from confluence with Mill Brook upstream to point where non-support ends above - partial support of aquatic biota/habitat due to flow alteration from a snowmaking water withdrawal. c(1500) s(7420)

Mill Brook: 1.6 - from tributary noted above downstream 1.6 miles - partial support of aquatic biota/habitat due to flow alteration from a snowmaking water withdrawal. c(1500) s(7420)

Winhall River: 2.0 - from IPco Bridge to Bondville - partial support of aquatic habitat/biota, secondary contact recreation and aesthetics from sedimentation, thermal modifications, and habitat alterations due to streambank destabilization and some flood repair channelization. c(1100,1400,1600) s(7700,7100)

Winhall River: 5.0 - from Bondville to mouth at West River - partial support of aquatic biota/habitat, secondary contact recreation and aesthetics due to sedimentation, thermal modifications, habitat alteration from channelization, lack of riparian zone, road runoff and streambank erosion. c(1100,1400,1600) s(4500, 7100,7600,7700)

Winhall River **VT11-16**

Cook Brook: 1.3 - below Route 100 to mouth - partial support of aquatic habitat, fishery, fishing due to high temperatures from beaver flowages, town swimming pool diversion, loss of riparian vegetation and roads. C(1400) s(4500,7400,7600,8400)

THREATENED MILES

Winhall River: 8.0 - headwaters to trib below IP Co. bridge - threats to aquatic biota due to low pH, low aklalinity, high Al., and darker color from atmospheric deposition and low geologic buffering capabilities. c(500) s(8100)

Winhall River: 3.5 - from junction of Lye Brook Trail and Appalachian Trail downstream (overlaps with 8 miles above) - threats to aquatic biota from sedimentation caused by unstable and eroding banks. c(1100) s(7700)

Mill Brook: 1.5 - from Gale Meadows Pond to Winhall River - threats to aquatic habitat/biota from flow modifications of upstream impoundment. c(1500) s(7400)

COMMENTS

The Winhall River has been sampled by the Dept of Fish & Wildlife at two sites (usually) since the early 1980's. The Winhall River below the IP bridge is hot and there are very few trout. Below Bondville, there are no trout due to the temperatures, channelization, lack of riparian vegetation. Spot temperature sampling is done when Fish & Wildlife is electrofishing. The biologists also did a habitat survey one summer and got the water temperature every 1000 feet on the surveyed stretch. Cook Brook has also been sampled since 1987 and is hot below Route 100 due to beaver flowages, town swimming pool diversion, loss of riparian vegetation and roads.

Winhall River - beginning at an elevation of 2500 feet and continuing downstream approximately 7.4 miles to the point at which the river crosses the current boundary of the Green Mountain National Forest - reclassified from Class B to Class A to be managed as "waters as naturally occurs."

The Winhall River was part of a 604b project that looked at major erosion spots on several tributaries to the West River done by the Windham Regional Commission in 1997. The project report describes six erosion sites, evaluates their soils and condition, and recommmends action or not.

Sampling at ABN stations 7.1 and 8.1 miles in 1996 found full support of macroinvertebrate community. Results from station 6.3 in 1997 also led to an "excellent" community assessment.

INFORMATION SOURCES

Jay McMenemy, Vermont Dept of Fish & Wildlife - noted pretty much the same problems as reported earlier (temperature, habitat alterations, lack of riparian zone) affecting coldwater fishery to different degrees (2001)

West River Tributaries Nonpoint Source Pollution Stream Assessment Report, January 1998. Windham Regional Commission.

Vermont DEC Water Quality Division, Biological and Aquatic Studies Section - macroinvertebrate sampling results. (1998)

Use Attainment for Streams affected by Snowmaking Water Withdrawals in Vermont, David Bottamini for Vt ANR DEC Water Quality Division, 1996 - info on snowmaking water withdrawal for Bromley. (1998)

Fisheries Status in Relation to Acidity in Selected Vermont Steams, Vt.DEC July 1985 - Winhall River extremely sensitive to acid rain; suspect pH shock during spring runoff could occur due to high Al., low pH, and low alkalinity.

Upper West River Basin Water Quality Management Plan, January 1987. Vermont DEC

Stephan Syz, Vt.DEC Water Resource Planner - noted rare & threatened clam (Eastern River Pearl Mussel) threatened by fluctuating flows from F&W managed impoundment - Gale Meadows Pond (1988)

Jay McMenemy, Vermont Dept of Fish & Wildlife - noted sedimentation, habitat changes and thermal modifications along mid-section of Winhall R. from streambank erosion and dechannelization (1988)

Darlene Palola, Stratton Area Concerned Citizens - noted streambank erosion along river (1988)

West River Citizen Monitoring Program. Stream inventory found 11 areas of unstable and eroding banks in a 3.5 miles stretch along the Winhall River.

Winhall River **VT11-16**

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	27.5	9.5	11.4	0.7	0.0
20	Aquatic biota/habitat	27.5	9.5	11.4	0.7	0.0
21	Fish consumption	0.0	49.1	0.0	0.0	0.0
42	Contact recreation	49.1	0.0	0.0	0.0	0.0
44	Noncontact recreation	40.8	0.0	8.3	0.0	0.0
50	Drinking water supply	0.0	0.0	0.0	0.0	49.1
62	Aesthetics	42.1	0.0	7.0	0.0	0.0
72	Agriculture water supply	0.0	0.0	0.0	0.0	49.1
82	Industry water supply	0.0	0.0	0.0	0.0	49.1

Impairment Cause	Magnitude	Size (mi.)
Metals	T	8.00
Siltation	M	7.00
Siltation	T	7.00
Thermal modifications	H	8.30
Thermal modifications	T	2.00
Flow alterations	H	2.30
Flow alterations	T	1.50
Other habitat alterations	M	7.00

Impairment Source	Magnitude	Size (mi.)
Highway/road/bridge runoff	M	6.30
Channelization	H	7.00
Upstream impoundment	T	1.50
Flow regulation/modification	M	1.30
Flow regulation/modification	T	1.50
Flow mod.- snowmaking water withdrawal	H	2.30
Removal of riparian vegetation	M	6.30
Streambank modification/destabilization	M	7.00
Streambank modification/destabilization	T	3.50
Atmospheric deposition	T	8.00
Natural sources	M	1.30

Permit No.	Point or Nonpoint Source Description	Receiving Water
9-0019	Stratton Mtn. Corp. - Indirect Discharge	Winhall River
9-0047	Stratton Mtn Corp-Indirect-Spray Disposa	Trib Winhall River
9-0078	Winhall Acres - Indirect	Red Brook
9-0090	Bear Creek Inn - Indirect	Trib Winhall River
9-0213	Birch Hill Apts - Indirect	Winhall River
9-0214	Birch Hill Apts - Indirect	Winhall River
9-0220	Leisure Lodge Condos - Indirect	Winhall River
1-0834	Stark Farm Properties - SW	Trib Winhall River
1-0894	Factory Point National Bank - SW	Red & Mill Brooks
1-1058	Hurst and Ellis - SW	Mill Brook
1-1128	Wilber Rice - SW	Trib Winhall river

Upper West River
Assessment Report

Waterbody No: VT11-17 **Assessment Year:** 2001

River Length (mi.): 18 **Date Last Updated:** 8/15/2001

Description: Main Stem - Confluence of Winhall River to Headwaters

---

Location Identifiers

ANR Enforcement District: 2 **NRCS District:** 8

Fish and Wildlife District: 1 **Regional Planning Commission:** WIN

Assessment Information

Monitored (mi.): 7.0

Evaluated (mi.): 11.0

Water Quality Limited?

On 303(d) List? N

Monitored for Toxics? N

Assessment Types

Surveys of fish and game biologists or other professionals

Fish surveys

Chem/physical monitoring data by quality-assured volunteer progra

Aquatic Contamination

None detected

Toxics Testing

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

Assessment Comments

PARTIAL SUPPORT MILES

West River: 13.3 - from Winhall River confluence upstream to top of Weston dam impoundment (includes approximately 4000 feet of streambank cleared as part of development of a large estate) - partial support of aquatic habitat and fishery/fishing due to high temperatures from loss of riparian vegetation and impoundments of two dams. c(1400) s(7350,7600)

West River: 5.0 - approximately 2 miles above Weston/Londonderry town line to 3 miles below (this is a subset of the 13.3 miles listed above) - partial support of swimming due to pathogen contributions from possible septic system discharges. c(1700) s(6500)

West River: 2.0 - approximately 1 mile above South Londonderry to 1 mile below (this is also a subset of the 13.3 miles above)- partial support of contact recreation due to pathogens from possible septic system discharges . c(1700) s(6500)

COMMENTS

Bonnyvale Environmental Education Center (BEEC) sampling in 2000 found high levels of E. coli at the four sites (27,28,29,30) in this stretch of river in June and July. In June, the number of E. coli per 100 ml were from 210 to 520 at the four sites and in July, were from 420 to 960 E. coli per 100 ml. Both of the sampling days in those months followed showers or rains the night before. In 1999, the E. coli results at

Upper West River **VT11-17**

these same four sites were also elevated: 150 E. coli per 100 ml at all sites in June; from 50 to over 350 E. coli per 100 ml in July; all sites over 350 E. coli per 100 ml in August; and from 40 to 210 E. coli per 100 ml in September. In 1998 and 1997, the E. coli levels at the four sites were also frequently above or well above the current 77 E. coli per 100 ml standard.

Temperature sampling done by BEEC found temperatures reaching 25 C at sites 27, 28, and 29 and 24 C at site 30 in July 2000. In 1999, sites 27, 28, and 30 reached 19 C on the June 7 sample date and site 29 was at 20 C. On the July 19, 1999 sample date, the temperatures ranged from 22 C up to 24.5 C from sites 30 to 27 respectively. In 1998, temperatures in August at the four upper West River sites were at or above 20 C. See BEEC annual reports for the numbers, field observations, and discussion.

The stretches above are hot with almost no trout present. Riparian vegetation losses and the dams in Weston and Londonderry are the major causes of the warm temperatures.

One species of threatened mussell, E. River Pearl Mussell, located in this waterbody.

INFORMATION SOURCES

Jay McMenemy, Vermont Department of Fish & Wildlife - info on temperature impacts on trout fishery (2001)

West River Watch Project annual reports 1996 - 2000. Frances Doyles, Bonnyvale Environmental Education Center - E. coli, temperature, pH and other data and information.

West River Watch Program - sampled four times in the summer of 1993. On all occasions they found E. coli bacteria in numbers exceeding standards above and below the village of South Londonderry.

Upper West River Basin Water Quality Management Plan, Vermont DEC January 1987 - noted elevated fecal coliform at, above, and below Weston, Londonderry, and South Londonderry. Some direct discharges found during planning study. Segment not prime trout stream due to high temperatures.

Vt. Natural Heritage Program 1/88

Ken Cox - Vt. F&W fisheries biologist - noted impacts from bank erosion and vegetation clearing for development of "estate"..

Fred Nicholson - Vt. DEC stream alterations engineer - also noted streambank vegetation clearing and resulting thermal problems/loss of aquatic habitat.

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	4.7	0.0	13.3	0.0	0.0
20	Aquatic biota/habitat	4.7	0.0	13.3	0.0	0.0
21	Fish consumption	0.0	18.0	0.0	0.0	0.0
42	Contact recreation	11.0	0.0	7.0	0.0	0.0
44	Noncontact recreation	4.7	0.0	13.3	0.0	0.0
50	Drinking water supply	0.0	0.0	0.0	0.0	18.0
62	Aesthetics	18.0	0.0	0.0	0.0	0.0
72	Agriculture water supply	0.0	0.0	0.0	0.0	18.0
82	Industry water supply	0.0	0.0	0.0	0.0	18.0

Impairment Cause	Magnitude	Size (mi.)
Thermal modifications	H	13.30
Pathogens	M	7.00

Impairment Source	Magnitude	Size (mi.)
Onsite wastewater systems (septic tanks)	M	5.00
Removal of riparian vegetation	M	13.30
Upstream impoundment	H	13.30

Upper West River **VT11-17**

Permit No.	Point or Nonpoint Source Description	Receiving Water
9-0072	Londonderry Ventures - Indirect	West River
9-0166	Cool Edge Laundry - Indirect	West River

Minor Tribs - Upper West

Assessment Report

Waterbody No: VT11-18 **Assessment Year:** 2001

River Length (mi.): 31 **Date Last Updated:** 8/28/2001

Description: Tributaries draining to Upper West River including Utley Brook, Flood Brook, Thompsonburg Brook, Greendale Brook, Griffith Brook

Location Identifiers

ANR Enforcement District: 2 **NRCS District:** 8

Fish and Wildlife District: 1 **Regional Planning Commission:** WIN

Assessment Information

Monitored (mi.): 17.0

Evaluated (mi.): 14.0

Assessment Types

Surveys of fish and game biologists or other professionals

Fish 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

Thompsonburg Brook: 4.5 - from mouth to Lowell Lake - threats to contact recreation, aquatic biota, and water clarity due to sedimentation, nutrient enrichment, flow impedence structures, and pathogens from land development, inadequate/failed sewage disposal systems, and instream impoundments. c(900,1100,1500,1600,1700) s(3200,6200,6500,7400,8800)

Utley Brook: 3.0 - upstream from mouth - threats to contact recreation, water clarity, and aquatic biota/habitat from increases in sedimentation, turbidity, nutrient enrichment, and pathogens from land development, allegedly failed septic systems, and agricultural land uses. c(900,1100,1400,1600,1700) s(1000,3200,6500,7600)

Utley Brook: 6.0 - from junction of Griffith Brook upstream - threats to aquatic biota and water clarity due to sedimentation from eroding banks. c(1100) s(7700)

Greendale Brook: 1.5 - upstream from confluence of Jenny Coolidge Brook- threats to aquatic biota and water clarity due to sedimentation from eroding banks. c(1100), s(7700)

COMMENTS

"Because of extensive land use practices over the past century or so, not all physical habitat features are in the best shape [on the tributaries in the Upper West watershed on GMNF land. For example, most

streams lack sufficient amounts of pool habitat and cover. Essentially channels have widened, riparian areas contribute little amounts of large woody debris to help create this type of habitat. To address these limitations, GMNF has implemented projects that place large trees and root wads into the channel to create pools, add cover and habitat complexity, increase the amount of spawning gravel etc. [They] have done this type of work in Greendale, Griffith & Jones Brooks with good success."

The Vermont Department of Fish & Wildlife has fish data on Utley, Greendale, and Thompsonburg brooks. Lower Utley has very few trout but good salmon. Thompsonburg has some brown trout and salmon. Hapgood Pond is drained annually and the drawdown probably provides an annual source of sediment to the brook. In addition, there is likely warming of the brook due to the pond. It would be good to sample (fish, macroinvertebrate, and/or temp) on this brook.

INFORMATION SOURCES

Jay McMenemy, Vermont Department of Fish & Wildlife - department data and information on upper West tribs (2001)

West River Citizen Monitoring Program 1989. Stream inventory areas threatened by siltation on Greendale, Utley and Griffith Brooks.

Steve Roy, USFS fisheries biologist - said the threat to Griffith Brook reported in past assessments was from a Forest Service road washout that has been take care of. The threat to Griffith Brook was removed. He did a fish survey on Jenny Coolidge Brook on 9/15/97 and observed no problems or threats so the partial support status of that brook was removed also. (1997) Also provided update on general conditions of brooks and habitat restoration work they have done (2001).

Upper West River Water Quality Mgmt. Plan - Vt/ DEC 1987

Fishery Status in Relation to Acidity in Selected Vt. Streams. Vt DEC 1985

Ken Cox - Vt. F&W fisheries biologist.

Use No.	Use Description	Fully	Threat	Partial Support	Non Support	Not Assessed
01	Overall	16.0	15.0	0.0	0.0	0.0
20	Aquatic biota/habitat	16.0	15.0	0.0	0.0	0.0
21	Fish consumption	0.0	31.0	0.0	0.0	0.0
42	Contact recreation	23.5	7.5	0.0	0.0	0.0
44	Noncontact recreation	31.0	0.0	0.0	0.0	0.0
50	Drinking water supply	31.0	0.0	0.0	0.0	0.0
62	Aesthetics	16.0	15.0	0.0	0.0	0.0
72	Agriculture water supply	0.0	0.0	0.0	0.0	31.0
82	Industry water supply	0.0	0.0	0.0	0.0	31.0

Impairment Cause	Magnitude	Size (mi.)
Nutrients	T	7.50
Siltation	T	15.00
Flow alterations	T	4.50
Other habitat alterations	T	7.50
Pathogens	T	7.50
Thermal modifications	T	3.00

Impairment Source	Magnitude	Size (mi.)
Agriculture	T	3.00
Land development	T	7.50
Wastewater (WWTFs)	T	4.50
Onsite wastewater systems (septic tanks)	T	7.50
Upstream impoundment	T	4.50
Flow regulation/modification	T	4.50
Streambank modification/destabilization	T	7.50

Minor Tribs - Upper West		**VT11-18**
Removal of riparian vegetation	T	3.00

Permit No.	Point or Nonpoint Source Description	Receiving Water
1-0350	Granma Frisby's - Industrial - CW	Lowell Brook
9-0005	Magic Mountain - Indirect	Thompsonburg Brook
9-0046	Flood Brook Union School - Indirect	UT Flood Brook