

Agency of Natural Resources
Department of Environmental Conservation

Water Quality Division
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MEMORANDUM

To: The Record

From: Steve Fiske, Brian Duffy

Date: 3/15/2004

Subject: West River release macroinvertebrate assessment

The West River in Jamaica, VT is the site of a biannual whitewater dam release from Ball Mountain Reservoir. The dam began operation in 1961 and is owned and operated by the Army Corps of Engineers with the sole purpose of flood control. The first release occurs in the last full weekend in April and second occurs in the third full weekend in September. In 2003, as part of its ambient biological monitoring program, the VTDEC sampled aquatic macroinvertebrates on the West River (WR) station 26.0 before and after the Ball Mountain Dam whitewater release to assess the potential biological effects. The station is located 2.8 miles below the dam. Data collected show minor impacts resulting from the whitewater release, but it is insufficient to warrant any change in release schedule.

Table 1 gives the location of the station with the approximate location illustrated in **Figure 1**. The site is considered medium high gradient (MHG) based on its drainage area, elevation, and riffle habitat. Macroinvertebrate Kick Net samples were collected and processed using VTDEC standard operating procedures. Habitat observations and measurements were taken as well.

Table 1. Location of macroinvertebrate sampling station on the West River. Also included are drainage area and elevation.

Location	Station	Town	D.A. km ²	Elevation ft	Description
West River	26.0	Jamaica	464	680	Located just above the USGS Gage station below the Ball Mt. Dam. Above "salmon hole" in Jamaica State Park.

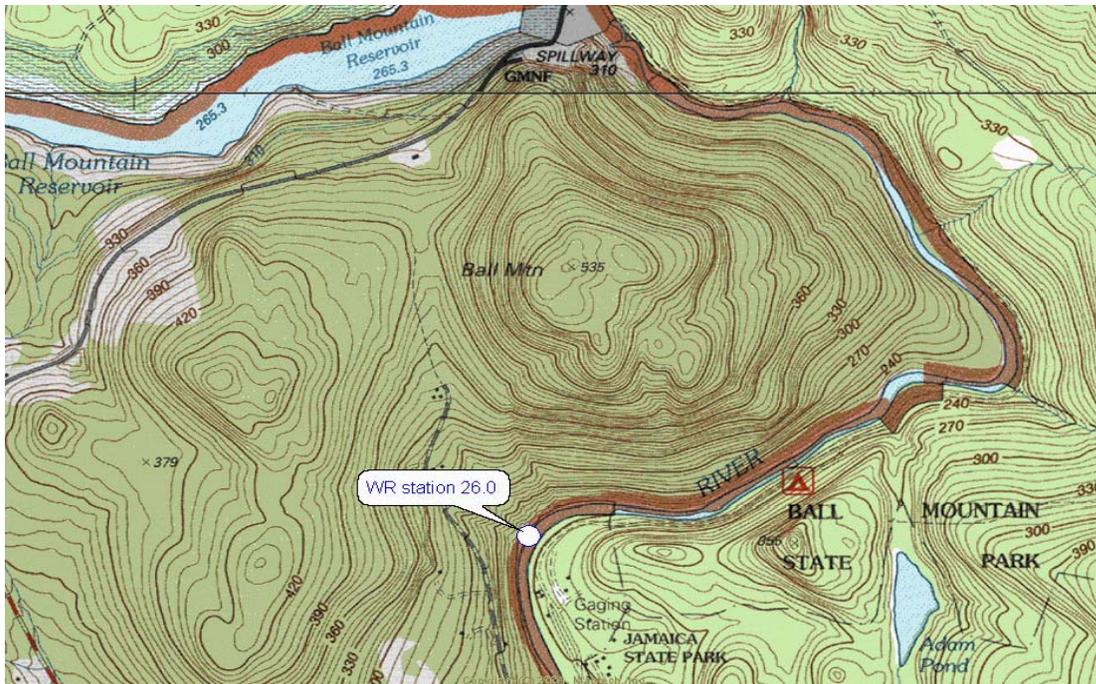


Figure 1. Approximate location of macroinvertebrate sampling station 26.0 on the West River

Sampling events used to assess the biological condition of WR took place on September 17th and October 8th, 2003 with the whitewater dam release occurring over September 20-21. Two additional unscheduled releases due to rain occurred between sampling events, the second of which peaked at over 2000 ft³/s. **Figure 2** shows the flow levels of the West River as measured at the USGS gage station between the macroinvertebrate sampling events.

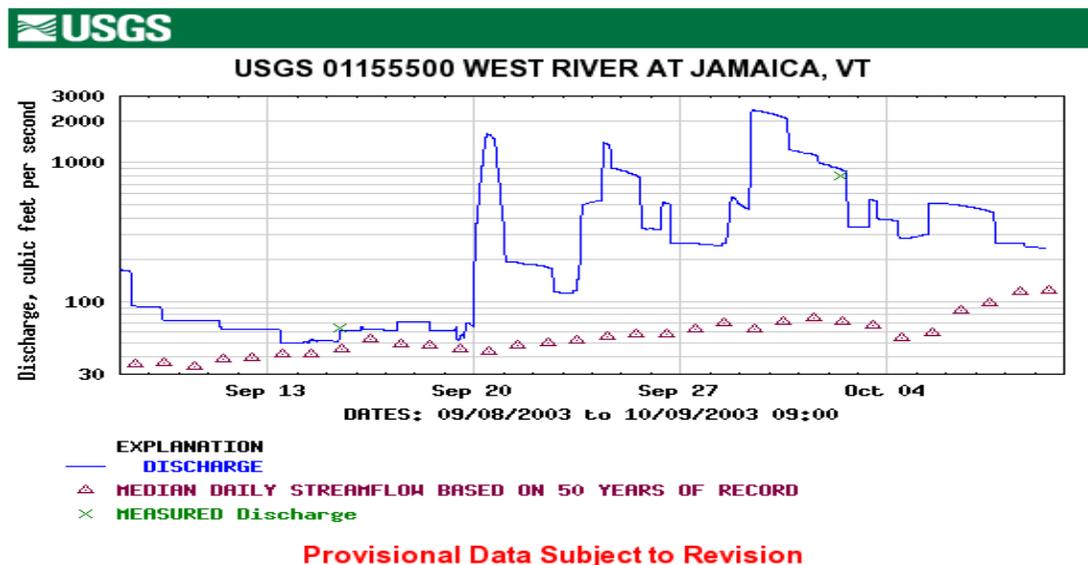


Figure 2: Flow in cubic ft/sec at the USGS gage station near the macroinvertebrate sampling reach

Table 2 presents the macroinvertebrate community metrics used to evaluate the biological integrity of the WR reach. Eight metrics are used to measure the community structural and functional attributes using the Vermont Biocriteria Guidance Thresholds for MHG wadeable streams and the community is assigned an assessment rating. Any impact that the whitewater release had upon the biota was not significant enough to affect the overall community assessment. Neither was there any statistical difference when using the t-test between individual metrics before and after the release

Table 2. Macroinvertebrate community metrics from West River station 26.0. Data represent the mean values form 3 samples. The VT WQS Class “A1” threshold values are shown at the bottom.

Location	Station	Date	Density	Richness	Ept	Ept /Ept&C	BI	PMA -O	PPCS -F	Oligochaeta %	Assessment
West River	26.0	17-Sep-03	1653	51.3	33.0	0.95	3.39	79	0.61	0.4	Exc
West River	26.0	8-Oct-03	1341	47.6	28.0	0.93	3.09	74	0.67	0.7	Exc
Class "A1" Thresholds MHG			>500	>43	>24	>0.65	<3.5	>65	>0.5	<2	

None of the biometrics used to determine the biological integrity of the macroinvertebrate community were significantly altered by the high flows. There were some significant changes in the make up of the community. **Table 3** shows some of the statistically significant alterations that took place between sampling events. *Isonychia sp.* are large, collector-filterer mayflies. They are able to swim but spend much time filtering in the current with brush-like legs. Increased flows would make it more difficult for large, filtering individuals to maintain themselves on the substrate. The collector-filterer functional feeding group, to which *Isonychia sp.* belongs, was depressed as well. High flows present stressful conditions for free-living animals and those that construct fixed retreats. The scraper functional feeding group consequently increased with a decrease in collector-filterer composition.

Table 3. Statistically significant alterations to the macroinvertebrate community of West River station 26.0 between sampling events.

		<i>Isonychia sp.</i>		Coll. Filterer		Scraper		
Rep		17-Sep-03	8-Oct-03	17-Sep-03	8-Oct-03	17-Sep-03	8-Oct-03	
# Individuals	1	332	92	39	29	14	18	
	2	376	120	42	25	10	21	
	3	440	84	51	26	15	26	
	Mean	382.7	98.7	44.2	26.7	12.8	21.9	
	SD	54.3	18.9	6.3	2.1	2.8	3.9	
	%SEM	8.2	11.0	8.2	4.5	12.6	10.2	
			P = 0.001			P = 0.01		
						P = .03		

With generally low profiles and the ability to cling to substrate and find refugia, macroinvertebrates in moving water habitats have adapted to high flow conditions. According to pebble count data collected, WR 26.0 consists 69 % of boulder and cobble substrate, providing ample microhabitat and refugia for macroinvertebrates to avoid strong currents. Boulders and cobble are more stable than small substrate and will not as become dislodged as readily. It is possible that the release would have a stronger impact on the macroinvertebrate community closer to the source of the release where fluctuations would be more abrupt. The river winds considerably in the 2.3 miles between the dam and sampling station.

Scheduled whitewater releases in September have not surpassed mean daily averages of 1100 ft³/s in seven of eight years prior to sampling. Even the unscheduled release that peaked at over 2000 ft³/s after the first sampling event had only minor biological impacts. Data do not imply any long-term detrimental effects on the macroinvertebrate community at site WR 26.0 resulting from September whitewater release from Ball Mountain Dam. Greater frequency and larger volume releases may lead to increasing impacts but present operation of the dam sustains an excellent macroinvertebrate community.