Aquatic Life Use Support Attainment
of a tributary of Joiner Brook – 2010

Prepared by the Monitoring Assessment and Planning Section
Water Quality Division
Department of Environmental Conservation

Impairment:
The unnamed tributary to Joiner Brook drains a small totally forested area south of Bolton Valley Ski Resort in Bolton. The tributary is approximately 1.3 miles in length and has a beginning elevation of 840 feet and an ending elevation of 2,200 feet. The tributary empties to Joiner Brook at a point approximately 1.5 river miles upstream of its confluence with eth Winooski River. Logging activities conducted in the mid 1990s caused extensive sedimentation of the tributary leading to a macroinvertebrate assessment of "*poor*" and "*fair"* at RM 0.1 and 0.4 respectively. As a result the tributary was listed as impaired and included on the 303d list, part A as failing Aquatic Life Support (ALS). Towards the end of the logging operation, AMPs were put in place to remediate the problem. Currently there is no logging within the drainage. The most recent macroinvertebrate data indicates compliance with Class B Water Quality Standards.

Table 1. Sample site location information for the unnamed tributary to Joiner Brook.

River mile from mouth (RM)	Town	Site Lat./Long.	Drainage area (km^2)	Elevation (ft.)
0.1	Bolton	44.38994/72.87306	1.7	840
0.4		44.39167/72.86667	1.1	1300

Biological Assessment:
The macroinvertebrate community assessments of 1997 were rated *poor* and *fair* for RM 0.4 and RM 0.1 respectively. Metrics that scored poorly were community density, and EPT, and total richness (Table 2). Habitat evaluations showed very high levels of embeddedness (>75%) due to sand, presumably deposited from logged areas – primarily eroding logging roads. Sand, measuring up to 10 inches in depth, covered many areas of the streambed. Chemistry parameters collected in 1997 showed no conditions that would limit the health of the aquatic biota (Table 4).

Subsequent sampling conducted between 2000 and 2008 showed improved conditions for macroinvertebrates. Silt ratings went from 1(poor) to 4 (very good) between 1997 and 2006-8 at both sites. Per cent sand in the substrate while not measured in 1997 was 0 at RM 0.1 in 2008 and 8 and 1 % at RM 0.4 in 2000 and 2006 respectively (Table 3).

The most recent assessments (RM 0.4 in 2006 and RM 0.1 in 2008) indicated compliance with Class B WQS. The total density of the assemblage at RM 0.4 was slightly below the Class B criterion of 300. All other

metrics complied with the class criteria. A visit to the tributary in 2009 revealed that certain portions of the streambed at RM 0.1 were dry, indicating that this stream may be intermittent during some years. This condition could lead to failure of one or more macroinvertebrate metric criteria and be unrelated to water or habitat quality factors. At 1.1km², the site drainage area is clearly small enough to become dry during some years. Given the level of attainment of the other population metrics at RM 0.4 in 2006 and the small difference between the assessed density and the Class Std, (286 vs 300) the final assessment is that this site is in compliance with the Class B ALS.

Recommendations: Following the employment of AMPs and eventually the cessation of logging activity in the watershed, the macroinvertebrate community as assessed in 2006 and 2008 met Class B WQS

Figure 1. Map of sampling sites in the Joiner Brook tributary.

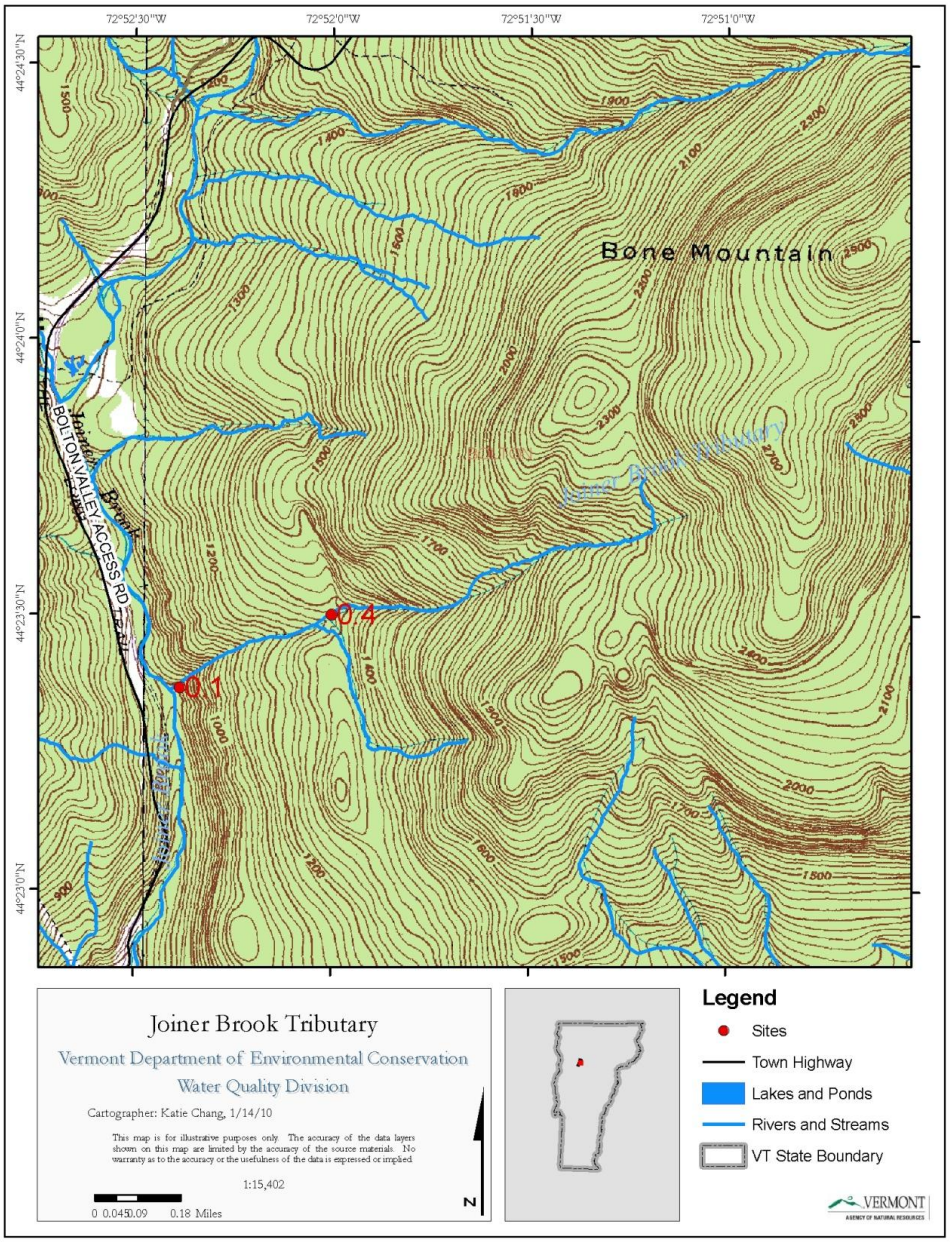

Table 2. Macroinvertebrate metrics for the unnamed tributary of Joiner Brook, 1997-2008.

Site (RM)	Date	Assessment	Density	Richness	EPT	PMA-O	BI	Oligochaeta %	EPT/EPT&C	PPCS-F
0.1	10/20/1997	Fair	208	34	15	59.8	4.02	7.2	0.59	0.44
	10/25/2008	Good-Fair	729	38	23	72.7	1.67	12.3	0.75	0.57
0.4	10/20/1997	Poor	160	33	14	62.9	2.87	3.8	0.54	0.47
	10/5/2000	Fair	257	35	16	63.5	2.86	0.4	0.60	0.52
	9/11/2006	Good-Fair	286	33	17.5	60.8	1.84	0.4	0.74	0.46

Tabl;e 3. Substrate composition from pebble count method.

Site (RM)	Date	Ledge%	Boulder%	Cobble%	Coarse Gravel%	Gravel%	Sand%	Silt%	Clay%	Embeddedness (1 poor-5 exc)
0.1	10/20/1997									1
	10/25/2008	0	22	32	31	15	0	0	0	4
0.4	10/20/1997									1
	10/5/2000	13	27	25	20	8	8	0	0	3
	9/11/2006	0	16	30	35	18	1	0	0	4

Table 4 .Water chemistry parameters for Joiner Brook tributary

Site (RM)	Date	Time	Water Temp °C	pH stnd. units	Alk mg/L	Cond. umhos	Color Pt Co Units	DO mg/L	DO%	Turb. NTU	TSS. mg/L	TP ug/L	TDP ug/L	Total N mg/L	Total NOX mg/L
0.1	10/20/1997		6.5	7.05											
	10/25/2008	1400	4.6	6.80	2.9	22	12.5	12.03	95	0.4		<5	5.23	0.1	<0.05
0.4	10/20/1997		6.5	6.75											
	10/5/2000		8.0	6.12	3.9	29	25								
	9/11/2006	1215	11.9	6.51	3.2	20.6	25			<0.2		<5	<5	0.2	0.1

Table 4. Continued

Site RM	Date	Diss. Ca mg/L	Diss. Mg mg/L	Tot. MG	Diss. Na mg/L	Diss. K mg/L	Tot. K Mg/L	Tot. Na mg/L	Tot.. Al ug/L	Total Hardness	Total Hardness from totals	TCL mg/L	TSO_4
0.1	10/20/1997												
	10/25/2008	2.35		0.57								< 2	4.7
0.4	10/20/1997												
	10/5/2000												
	9/11/2006	2.6	0.5		0.4	0.1	0.42	0.52		8.3	8.3	<2	4

River Mile	Date	Diss. As ug/L	Total As ug/L	Diss. Cd ug/L	Tot. Cd ug/L	Total Cd ug/L	Diss. Cr ug/L	Total Cr ug/L	Diss. Cu ug/L	Total Cu ug/L	Diss. Fe ug/L	Total Fe ug/L	Diss. Pb ug/L	Tot. Pb ug/L	Diss. Ni ug/L	Tot. Ni ug/l	Diss. Mn ug/L	Diss. Zn ug/L	Tot. Zn ug/L
0.1	10/20/1997																		
	10/25/2008																		<50
0.4	10/20/1997		<1		<1			<5	<10			<50		<1		<5	<5		
	10/5/2000																		
	9/11/2006	<1		<1			<5		<10		<50		<5		<5		<5	<10	