

Nash Stream ATV Trail Surface Water Resource Evaluation

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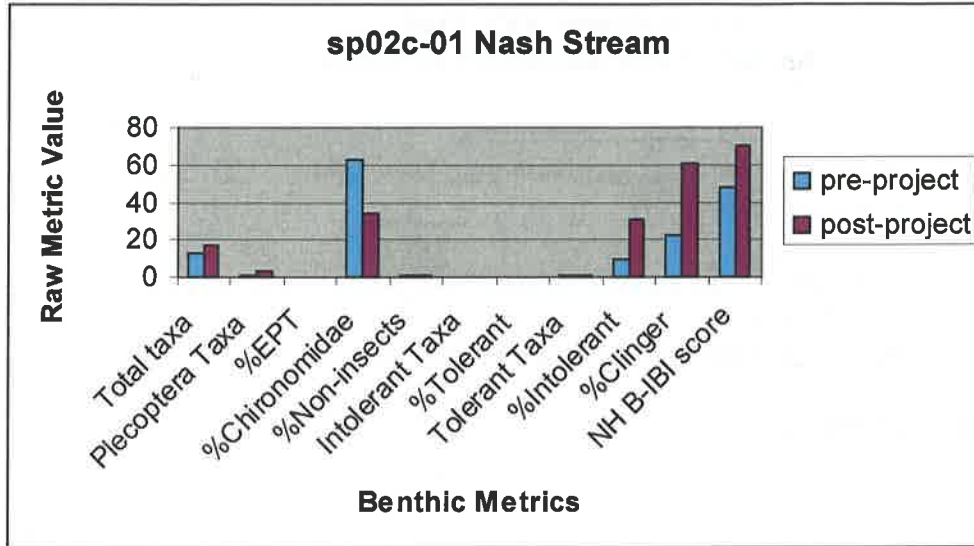
Introduction

In spring 2002 DRED approached DES about conducting an evaluation of the surface waters associated with the planned development of an ATV trail in the Nash Stream State Forest. The evaluation was to include measures of basic water chemistry parameters, namely conductivity and turbidity, as well as an investigation of the fish and macroinvertebrate communities. Samples were to be collected at 2 first order tributaries adjacent to the planned ATV trail, a single site in Nash Stream downstream from the project area, and a single unimpacted stream (Long Mountain Brook) outside the project area for comparison purposes. Sampling events occurred pre- and post-project to determine the extent of the potential impacts associated with trail development and use.

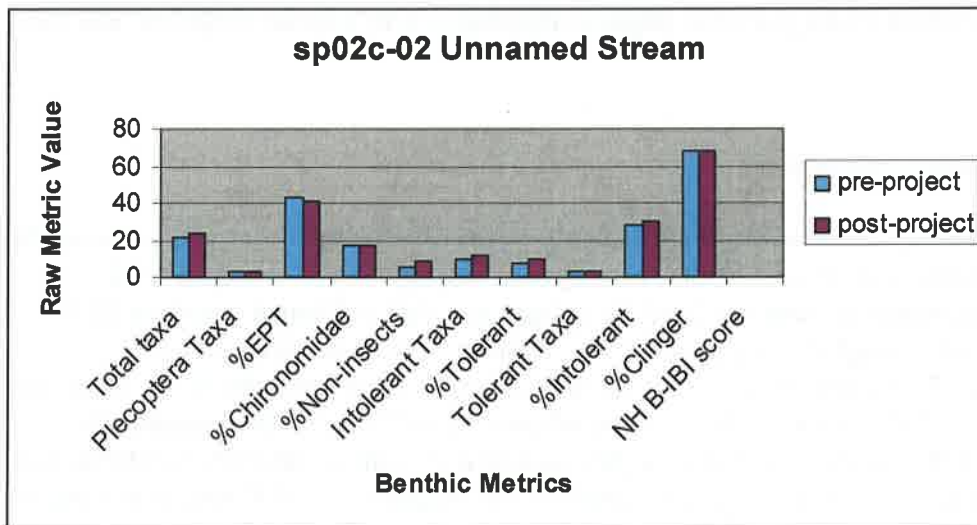
Findings

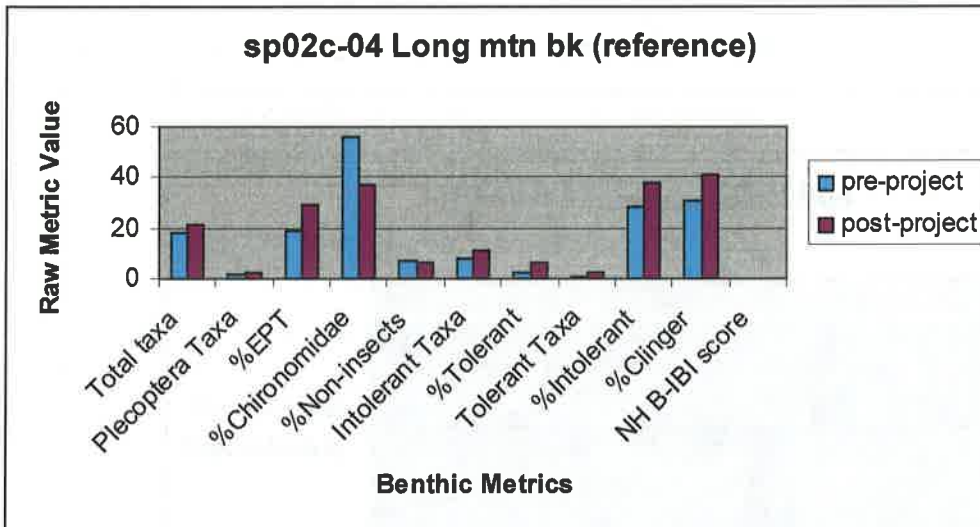
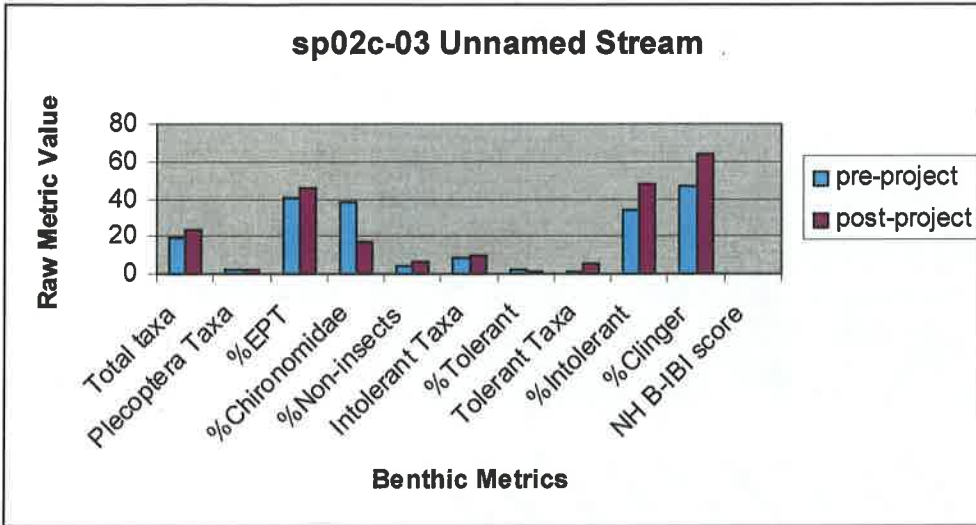
Benthic Macroinvertebrates

A total of 8 benthic macroinvertebrate samples were collected at 4 sites and analyzed for overall community condition. At the Nash Stream site (sp02c-01) standard DES biomonitoring protocols were used and the subsequent data evaluated based on DES' benthic index of biological integrity (B-IBI). Results from these samples were conclusive and demonstrated no ATV trail related impacts. In 2002 the B-IBI score was just 48.2 (out of 100), yet in 2004 the score rebounded to 70.9. While dramatically different, the differences indicated an improvement in overall community condition and were assumed to be a result of natural variation and exclusive of ATV trail development (See chart below from graphical display of results).

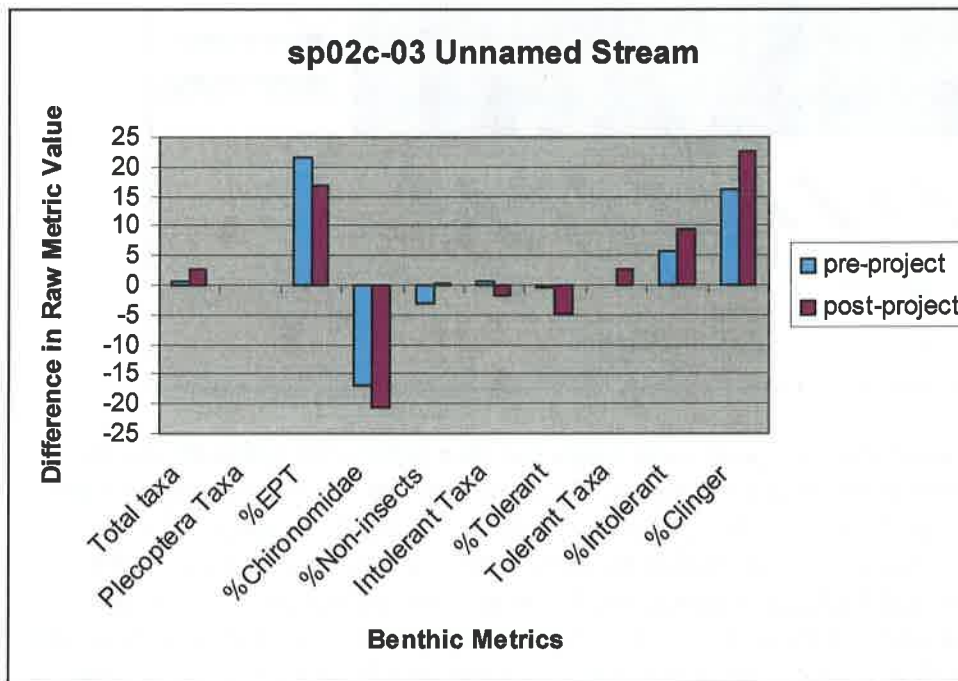
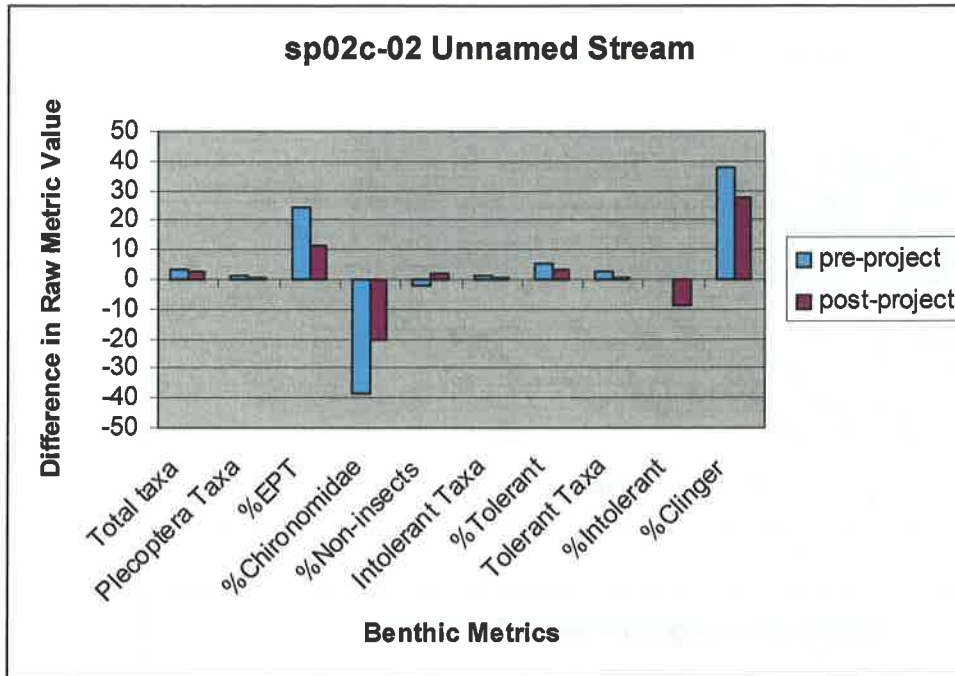


Benthic macroinvertebrates from the 3 remaining sites were collected using alternative methods (kicknets rather than rock baskets) therefore the application of DES' B-IBI was not possible. Instead individual "metrics" were compared to evaluate community condition before and after trail construction and to a single reference sites. Individual metric values were similar before and after trail construction for all sites (See charts below for individual raw metric values for each site).





An additional comparison of potentially impacted sites (sp02c-02, sp02c-03) to the reference site (sp02c-04) was also made to determine the extent of deviation between potentially impacted sites and the reference condition. While both sp02c-02 and 03 showed a moderated level of deviation from the reference condition for the %EPT, %chironomidae, and %clinger metrics, the differences were consistent before and after the construction of the ATV trail. These results further confirm the lack of a detectable impact associated with the construction and use of the trail from 2002 and 2004 (See charts below for graphical display of differences between potentially impacted sites and the reference site).



Fish

Fish sampling efforts were completed in summer 2002 at 4 sites (sp02c-01, 02, 03, 04) using backpack electrofishing techniques through a 150m stream reach. All fish captured were identified, enumerated, and returned to the stream. Potentially impacted sites (sp02c-02, 03) were dominated by Eastern brook trout and slimy sculpin. Young-of-year Eastern brook trout were also found in great abundance at each of these sites as evidence of successful natural reproduction. A similar fish community was found at the reference site (Long Mountain Brook, sp02c-04) with the addition Longnose dace. In Nash Stream, stream fish were dominated by Longnose dace and slimy sculpin. Naturally produced

Eastern brook trout were not captured from the Nash Stream site. These results provide a baseline should additional sampling be required in the future. With the exception of the Nash Stream site, our results indicate that high quality resident fish communities at all sites given their natural characteristics. The absence of naturally produced Eastern brook trout at the Nash Stream site may be due to several factors but was beyond the scope of this investigation (See table below for summary of fish data).

Site	Stream Name	Species Abundance					
		CWS	SS	LND	BND	EBT	BT
sp02c-01	Nash Stream	1	29	14	3	1	1
sp02c-02	Unnamed		5			95	
sp02c-03	Unnamed		8			43	
sp02c-04	Long Mtn. Bk.		51	11		27	

Fish Species Abbreviations	
CWS	Common White Sucker
SS	Slimy Sculpin
LND	Longnose Dace
BND	Blacknose Dace
EBT	Eastern Brook Trout
BT	Brown Trout

Sample Collection 02 Jul 31

Water Quality

Surface water quality measurements were made during 4 sampling events from 2002 through 2003. Two dry weather sampling event were completed on 02 sept 23 and 03 Jul 14 to establish baseline conditions. Two wet weather events were completed on 03 Oct 2 and 03 Nov 4. Specific conductance and turbidity estimates were taken from 6 sites during each sampling event. Three (02c-04DRED, 02c-01DRED, 02c-04) of the 6 sites served as reference, while the remaining 3 (02c-03DRED, 02c-02DRED, 02c-01) were sampled to evaluate the potential impacts related to construction and use of the ATV trail. For the dry weather events, little to no difference was observed between the reference and potentially impacted sites. Specific conductance levels generally ranged from 32 to 45 umhos and are representative of unimpacted streams from this area of New Hampshire. Similar specific conductance levels were observed in areas sampled upstream and downstream of the ATV trail at the potentially impacted sites. Turbidity levels were low and in most cases <1 NTU for all samples collected during dry weather events (See table below for summary of dry weather event samples).

DRY WEATHER EVENT SAMPLES				
Site	Date	Location	Specific Conductance (umhos)	Turbidity (NTU)
sp02c-04DRED	9/23/2002	Above	34	<1
		Below	34.9	<1
sp02c-03DRED	9/23/2002	Above	34	<1
		Below	34.9	<1
sp02c-02DRED	9/23/2002	Above	45.1	1.5
		Below	39.4	1
sp02c-01DRED	9/23/2002	Above	40.2	1.4
		Below	39.7	1.4
sp02c-04	9/23/2002	Above*	32.1	<1
		Below	n/a	n/a
sp02c-01	9/23/2002	Above	n/a	n/a
		Below**	37.9	<1

DRY WEATHER EVENT SAMPLES				
Site	Date	Location	Specific Conductance (umhos)	Turbidity (NTU)
sp02c-04DRED	7/14/2003	Above	25.4	<1
		Below	26.2	<1
sp02c-03DRED	7/14/2003	Above	36.2	<1
		Below	36.6	<1
sp02c-02DRED	7/14/2003	Above	37.5	<1
		Below	37.5	<1
sp02c-01DRED	7/14/2003	Above	42.7	<1
		Below	42.4	<1
sp02c-04	7/14/2003	Above*	26.3	<1
		Below	n/a	n/a
sp02c-01	7/14/2003	Above	n/a	n/a
		Below**	33	<1

Wet weather event samples were collected in time series at 30 minute, 1 hour, and 2 hours intervals on 03 Oct 2 following rainfall events. A single sample was collected 1 hour post rainfall on 03 Nov 4. The results demonstrated static specific conductance and turbidity levels across the time series and little difference between all sites. Specific conductance levels ranged from 18 to 45 umhos while turbidity levels were, with one exception all below 1 NTU (See table below for summary of wet weather event samples).

WET WEATHER EVENT SAMPLES

Site	Date	20 minutes		1 hour		2 hours	
		Specific Conductance (umhos)	Turbidity (NTU)	Specific Conductance (umhos)	Turbidity (NTU)	Specific Conductance (umhos)	Turbidity (NTU)
02c-01DRED	10/2/03	45	<1	42.3	<1	42.4	<1
02c-02DRED	10/2/03	37.9	1.8	37.8	<1	37.6	<1
02c-03DRED	10/2/03	34.5	<1	34.5	<1	34.5	<1
02c-04DRED	10/2/03	25.9	<1	24.8	<1	25.1	<1
02c-01	10/2/03	----	----	----	----	31.2	<1
02c-04	10/2/03	----	----	----	----	26.2	<1
02c-01DRED	11/4/2003	----	----	24	<1	----	----
02c-02DRED	11/4/2003	----	----	23.1	<1	----	----
02c-03DRED	11/4/2003	----	----	21.5	<1	----	----
02c-04DRED	11/4/2003	----	----	18.1	<1	----	----
02c-01	11/4/2003	----	----	22.3	<1	----	----
02c-04	11/4/2003	----	----	20.7	<1	----	----

Conclusions

The data collected from 2002 – 2004 provide a basic evaluation of the surface water and biological community conditions in streams adjacent to and downstream of the ATV trail in the Nash Stream State Forest. Based on the data collected during the period of sampling no detectable impacts were observed that could be related to trail construction and use. Biological data indicated, in most cases, macroinvertebrate and fish communities consistent with those from high quality streams from this region of New Hampshire. A low B-IBI score observed from the Nash Stream site in 2002 was attributed to natural variation rather than current activities in the State Forest. Follow up sampling in 2004 at this same site confirmed this conclusion as the B-IBI score rebounded to an acceptable level. Fish data collected in 2002 provided a baseline documentation of the resident fish species found in the 2 tributaries adjacent to the trail and at 1 site in Nash Stream downstream of the project limits. With the exception of the Nash Stream site, the data compared favorably with the reference site outside of the project area. Fish communities were dominated by cold water species including Eastern brook trout and slimy sculpin. The Nash Stream site was found to be lacking a naturally reproducing population of Eastern brook trout. However, this finding is believed to be a result of several factors beyond the scope of this study and exclusive of the ATV trail.

Water quality data collected before, during, and after trail construction provided no evidence of detectable impacts related to the trail. Specific conductance levels during dry and wet weather periods were consistent with unimpacted streams from this area of the state. Similarly, turbidity levels, in most cases, were near or below detectable levels (1 NTU) and showed no impacts related to trail construction or use.

Although there were no observed impacts either to the biological communities or surface water parameters measured during the period of study, these findings do not preclude the

potential for future impacts. It is strongly recommended that periodic site investigations and maintenance be performed on the ATV trail and at intersections with surface water courses in order to minimize water quality impacts. Best management practices should be continuously employed to reduce potential erosional impacts associated with trail use and reduce to possibility of accidental releases of harmful chemicals from ATVs into the surface water resources of the Nash Stream State Forest.