



Figure 1. Site A. Pool site is in foreground, run site is located behind sand bar.

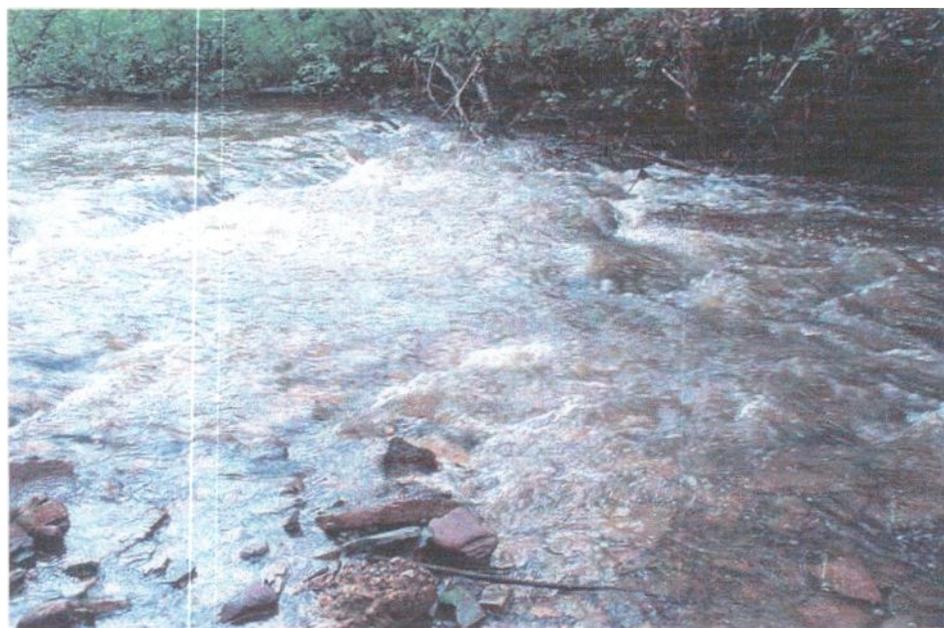


Figure 2. Site B Riffle

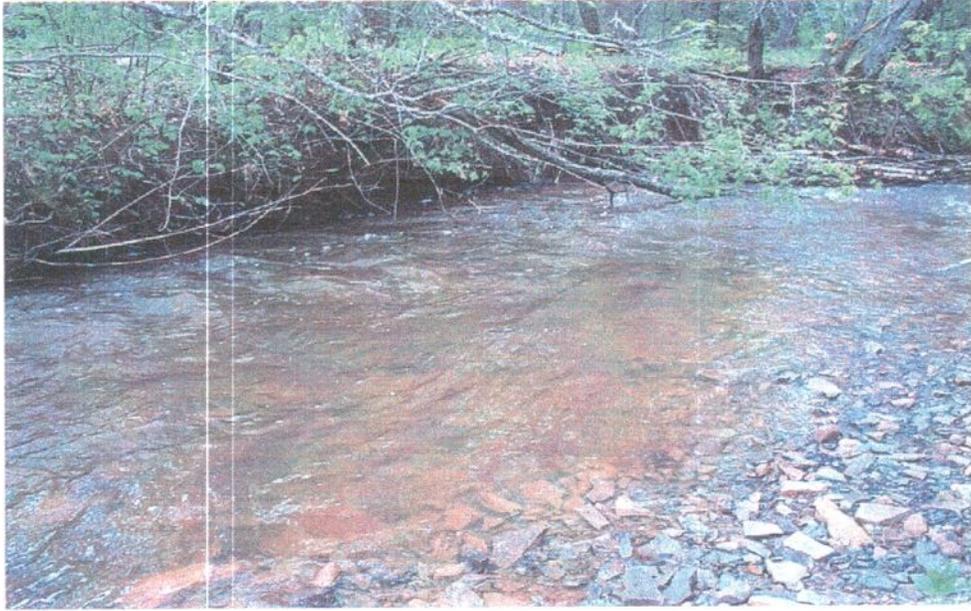


Figure 3. Site B Run

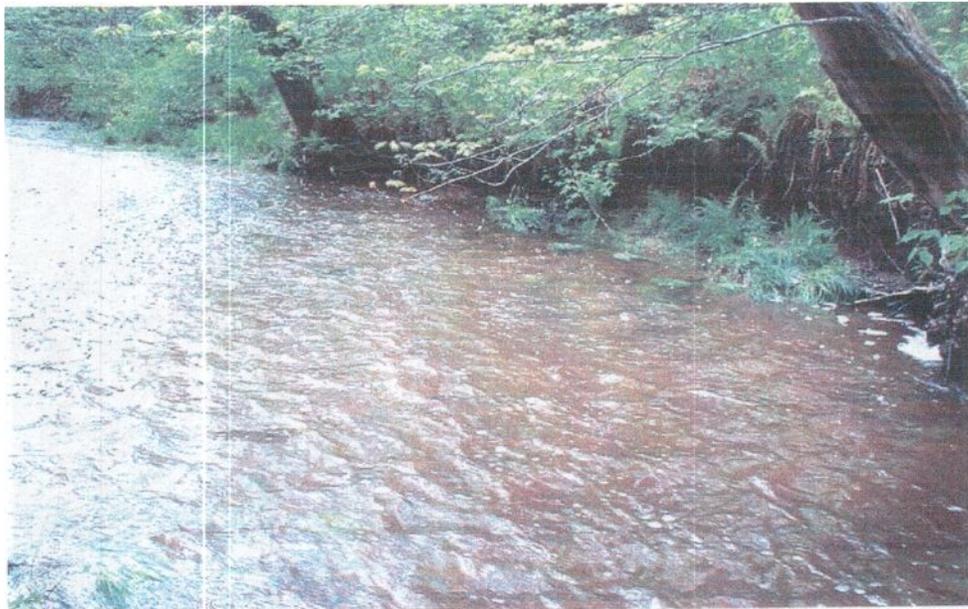


Figure 4. Site C Pool

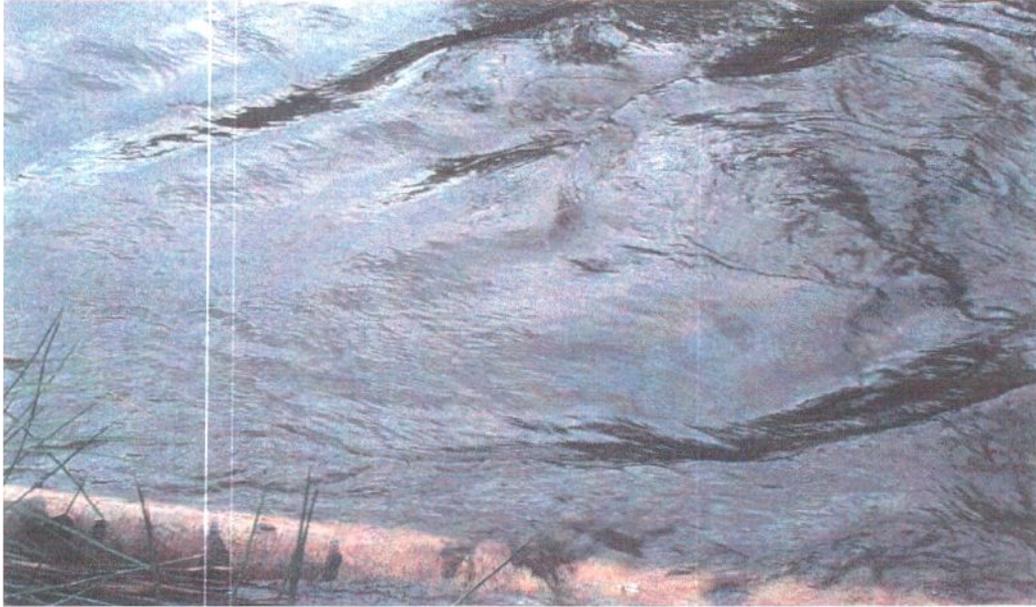


Figure 7. Site D Run

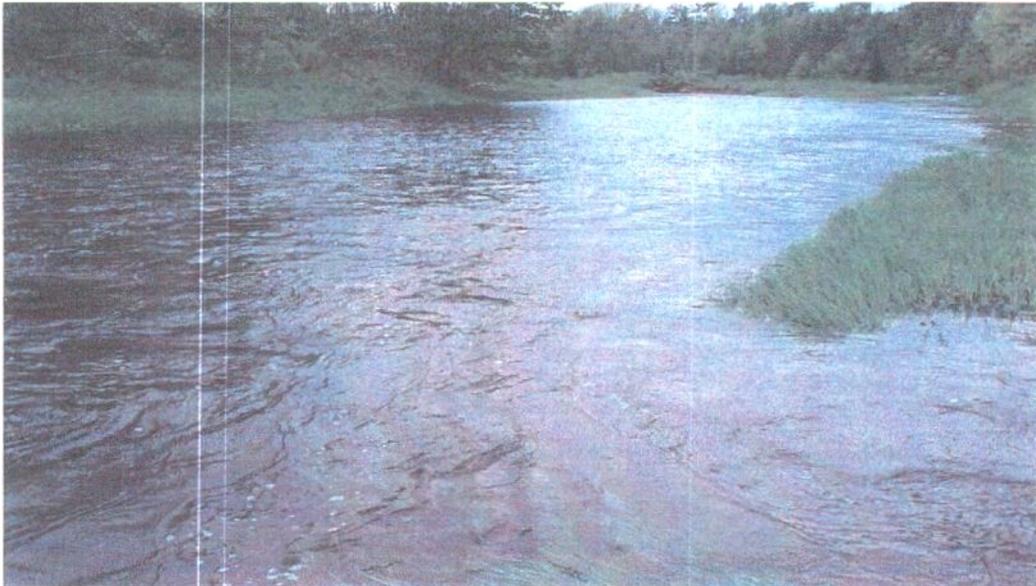


Figure 8. Site E Bear Brook and Middle River. Riffle site is located at right of picture.

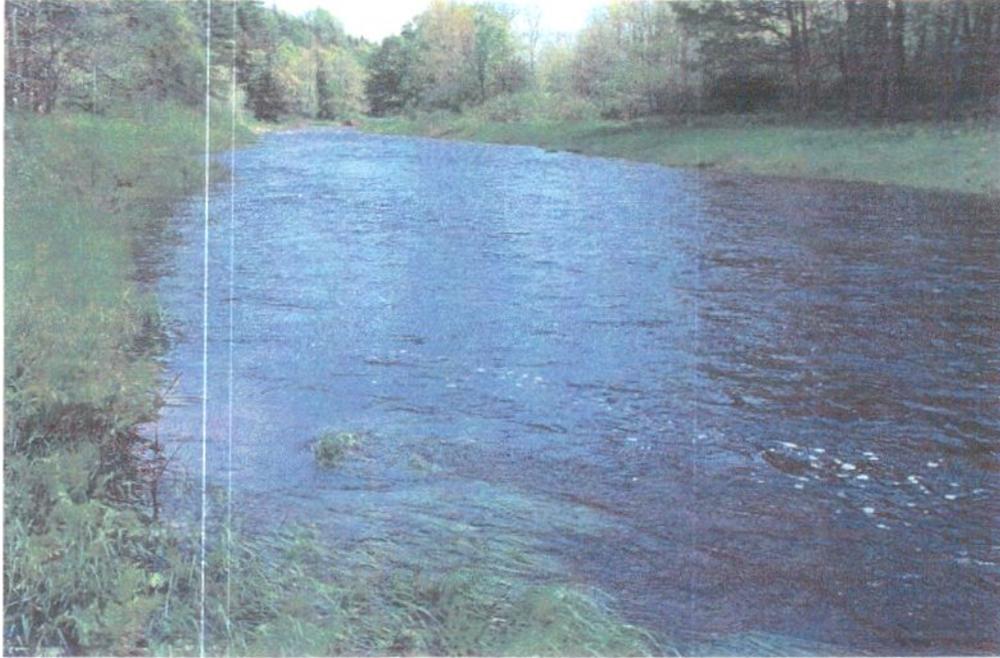


Figure 9. Site F Run Middle River. Site G was immediately downstream in similar habitat.

Bear Brook/Middle River Invertebrate Samples **September 24, 2001**

Overview

Mayfly nymphs, beetle larvae and chironomid larvae dominated all sites, including pools. Total abundance in Bear Brook is much higher than in previous spring and fall samples. Site A has been increasing in numbers and diversity and was very high in numbers of chironomid and caddis fly larvae, especially in the pool sample. Abundance at Site C (pool) was also much higher this time. The runs at Site E and F showed lower numbers than previously. Overall, numbers of invertebrates are much higher this time than in previous fall samples.

Species diversity is similar to previous sampling periods. Pool sites continue to be low in productivity, while run and riffle sites are much higher and similar to each other. Mayfly nymphs and chironomid larvae dominate the samples, with the exception of Site A (riffle) which had unusually high numbers of caddis flies. Alderflies, beetle larvae, and stonefly nymphs are present in small numbers. Diversity at the downstream site on Middle River is much higher than previously, as are total numbers. Site E (run) had a much lower diversity this time than in the past.

Site A (Bear Brook), Site C (pool) and Site G (Middle River) show the greatest abundance of organisms. Diversity was highest at the three uppermost sites on Bear Brook. Sites E (run) and F are considerably lower in productivity (as measured by abundance and diversity) than previously. Site A appears to be the most productive site sampled, with high numbers of chironomids (pool) and caddis flies (riffle).

Bear Brook Invertebrate Monitoring

Species diversity and abundance are shown in Table 1 below.

Site A

All areas at this site are located downstream of the mine site immediately above a highway culvert. The area is a shallow open section of the brook dominated by a sandy/gravel or cobble bottom.

Pool- The pool site is a shallow sandy/gravel area just upstream of a small tributary. Typically, the habitat is poor and supports mostly chironomids and beetle larvae. This fall's sampling showed extremely large numbers of mayflies and chironomid larvae and one of the highest diversities within the study area. Chironomids represent one of the dominant species found in Bear Brook and Middle River, and mayflies were common throughout the upper reaches of Bear Brook during September.

Run- This site showed a lower abundance than the other areas at Site A. Species diversity was similar to all other areas. Chironomid larvae dominated the community, with fewer numbers of mayflies and caddis fly larvae than before.

Riffle- The bottom type at this riffle is cobble/rock. The site is generally populated by chironomids and mayflies, but showed very high numbers of the caddis fly, Hydropsychidae, which is unusual for the site. Abundance was highest here compared with all other areas and diversity was among the highest in Bear Brook.

Site B

Site B is a rocky section of Bear Brook located downstream of the Highway 289 bridge.

Riffle- Bottom type at this site is very similar to the pool bottom. Abundance is typically low here, but diversity is high. Chironomid larvae were dominant, with smaller numbers of caddis flies, mayflies and beetle larvae. Small numbers of Diptera (fly) larvae were present this year as in the past.

Pool- The bottom at this pool consisted of gravel and cobble. The area is shallow, with little cover. It is typically low in abundance. This year's sampling consisted of small numbers of chironomid larvae, caddis flies and beetle larvae.

Site C

Site C is located behind the mine and beyond the operation area. It is a deep, shaded area of the stream. The bottom type is cobble/gravel, with the exception of the pool, which is a mixture of sand and gravel.

Pool- This site is populated by chironomid larvae, which is typical for this site at this time. Species abundance and diversity is usually low at this site. Alderflies and beetle larvae, which have not been caught in the past, were captured during this fall's sampling. Diversity was higher this fall than in the past.

Run- This site was dominated by beetle larvae, which have been mostly absent in previous samples. Abundance is similar to the spring's sampling and is comparable to other areas on Bear Brook. The diversity is much higher this time and includes alderfly larvae and stonefly nymphs.

Site D

This site is located at a wide-open section of the brook behind the overburden site. Bottom type is typical of the brook (gravel/cobble).

Pool- This site is characterized by a large open pool with a gravel/rock bottom. Abundance and diversity are both low, which is typical for this site. Chironomid larvae are present in small numbers.

Site E

Riffle- This site is located at the confluence of Bear Brook and Middle River. It is an open area with a cobble/gravel bottom. Species abundance is usually low at this site by comparison with areas further upstream. Chironomids are dominant. These organisms are commonly found at this site, as well as throughout the study area.

Run- Bottom sediment at this site is sandy/gravel, usually with attached algal mats. The abundance and diversity of invertebrates have been similar to the run further upstream on Middle River. The area is atypical this time, in that both abundance and diversity are lower than previously. This site usually has a diverse population of caddis flies, mayflies, chironomids and other fly larvae, beetle larvae and gastropods.

Middle River Invertebrate Monitoring

Site F-

Run- This site is a deep, fast moving run located upstream of the mouth of Bear Brook. It is largely cobble with some gravel. This site is usually one of the most productive of the study area. While diversity remained high this time, numbers were much reduced and ranked one of the poorest of all areas studied.

Site G-

Run- This site is located below Bear Brook on Middle River. It is a sandy/gravel area with little cover. Species abundance and diversity, which vary considerably at this site, was one of the highest this fall (with the exception of Site A). It is still dominated by chironomid larvae, although caddis flies and mayflies were also present in significant numbers. Typically, stonefly and mayfly nymphs dominate this site.

TABLE 1. BENTHIC INVERTEBRATES, SEPTEMBER 2001
Abundance (Number per m³) and Diversity

Section	A	A	A	B	B	C	C	D	E	E	F	G
	Run	Riffle	Pool	Riffle	Pool	Pool	Run	Pool	Riffle	Run	Run	Run
Trichoptera												
Brachycentridae		11		11								
Hydroptilidae												
Hydropsychidae		2664		11							11	
Limnephilidae												
Polycentropodidae				11		11					11	
Sericostomatidae												
Unidentified	22			11	33	11					11	33
Pupae												
Ephemeroptera												
Baetidae												
Caenidae	22	11	488	44	11	67						89
<i>Ephemerella</i> sp												
Heptageniidae											11	11
Siphonuridae												
Unidentified			11	11		33		11			11	78
Diptera												
Chironomidae larvae	211	22	1754	122	22	278	11	22	233	122	11	189
Chironomidae pupae	22			33		11						
Chironomidae tubes												
Culicidae-adult												
Heleidae			11									
Simuliidae												
Tabanidae											22	
Tipulidae		22			11						11	
Unidentified				22								
Hemiptera												
Corixidae			11									
Plecoptera												
Nemouridae												
Perlidae		33					11					
Perlodidae												
Unidentified		44										
Coleoptera												
Dytiscidae	11			11		11			78	67		
Dytiscidae adult							11					
Elmid larvae		11		11	22	22	78					22
Elmid adult		11					33					
<i>Psephenus</i> sp.											11	22
Unidentified										11		
Odonata												
Aeshnidae						11	67					
Unidentified												
Megaloptera												
Corydalidae							56	11				
Sialidae						22						
Nematode												
Annelid												
Oligochaete		11					44					
Bivalve												
Gastropoda	11									11		
Total #/m³	299	2840	2275	298	99	477	311	44	311	211	110	444
Total taxon/stn	6	10	5	11	5	10	8	3	2	4	9	7

Bear Brook/Middle River Invertebrate Samples **June 2002**

Overview

Mayfly nymphs and chironomid larvae were the dominant species in Bear Brook while mayflies and stonefly nymphs were most common in Middle River samples. One Middle River station had an unusually high number of leeches. Blackfly larvae, annelids and beetle larvae were also found in significant numbers in Bear Brook. Total abundance in Bear Brook is similar to previous years, although Site D was much higher and Site A was lower. Abundance in the upstream station (F) on Middle River was considerably lower than other years but the downstream station (G) was similar.

Species diversity in the Bear Brook samples was similar to previous sampling periods, while Middle River was much lower. Pool sites diversity was similar to riffle and run sites. Mayfly nymphs and chironomid larvae dominate the samples. Annelids, beetle larvae, and fly larvae were present in small numbers. This would appear to be typical of the sites on Bear Brook. Diversity and species abundance in Bear Brook is consistent with previous years, however, a much lower diversity and different composition was noted in the upstream Middle River site (F) this year.

Sites D and E (Bear Brook) showed the greatest abundance and diversity of organisms. Site D was much more productive than in any other year, while Site A was lower in productivity (as measured by abundance and diversity) than in 2001, but similar to previous years. The upstream Middle River site (F), which is typically the most abundant site, was very low in productivity in 2002.

Bear Brook Invertebrate Monitoring

Species composition, abundance and diversity are shown on Table 1.

Site A

All areas at this site are located downstream of the mine site immediately above a highway culvert. The site is a shallow open section of the brook dominated by a gravel/cobble bottom. Both the run and riffle sites sampled this year contained larger-sized sediment than in previous years.

Pool- The pool site is a shallow muddy/gravel area just upstream of a small tributary. It is a typically poor habitat where a large number of Corixidae were found. This was the only site where these bugs were found.

Run- This area showed a much lower abundance than the previous year, but not atypical for this site. Diversity was also much lower than usual. Species composition usually consists of chironomid larvae and mayfly nymphs, but consisted only of beetle larvae this year.

Riffle- This site consisted of large cobble with gravel. Abundance at this site was similar to last year, but lower than earlier sampling periods. Species diversity was also lower. The area was populated mostly by chironomids, as in previous years.

Site B

Site B is a rocky section of Bear Brook located downstream of a highway bridge. Bottom type is sand/gravel or muddy/gravel.

Riffle- This area showed similar productivity to previous years. Species composition was slightly different, limited primarily to chironomids and beetle larvae. Bottom type was gravelly with fewer cobbles than in the past.

Pool- This shallow sandy-bottom area is typically low in productivity. Abundance and diversity of species was higher this year, exhibiting one of the highest levels of biomass and diversity in the study area. Chironomids and beetles (mostly adult) dominated the site.

Site C

Site C is located behind the mine and beyond the operation area. It is a deep, shaded area of the stream. The bottom type is cobble/gravel.

Run- Species abundance is usually low at this location. Mayfly and chironomids are usually found at this site, although species composition was limited to chironomid larvae this spring.

Site D

This site is located at a wide-open section of Bear Brook behind the overburden site. Bottom type is mainly gravel/cobble with some sand.

Pool- The pool site sampled this spring had a gravel bottom, consistent with the other locations at this site. Biomass was typical of Bear Brook in general, with stonefly nymphs and fly larvae dominating the community. This area was not sampled previously.

Run- This area has a sandy, gravel bottom. Species abundance was higher this year than 2001, but within the range of previous years. Caddisfly and chironomid larvae dominated this year, which is slightly different than in the past. Diversity was one of the highest of all Bear Brook sites.

Riffle- This area is characterized by a sandy/gravel bottom with little stream cover. It is typically one of the most productive locations throughout the brook and was the most productive site in 2002. Diversity this spring was extremely high for Bear Brook, and consisted of caddisflies, mayflies, and chironomid larvae. Smaller numbers of beetle larvae, stoneflies and fly larvae were also found.

Site E

This site is located at the confluence of Bear Brook and Middle River. It is an open area with a cobble/gravel bottom. Flow rates vary considerably.

Riffle- Species abundance was typical for this site and consisted of fly larvae, stonefly and mayfly nymphs. These organisms are found commonly at this site as well as throughout the study area. Diversity is typically high here and is one of the few sites where gastropods are found.

Run- Productivity at this location was atypically high in 2002 and exhibited a high diversity. The community was dominated by chironomid and beetle larvae, with smaller numbers of caddisfly larvae, stoneflies, mayflies, and dragonfly nymphs.

Middle River Invertebrate Monitoring

Site F-

Run- This site is a deep, fast moving run located upstream of the mouth of Bear Brook. It is largely cobble with some gravel. Although usually much more productive than any of the sites on Bear Brook, this spring, abundance was much lower. Caddisfly larvae, mayfly nymphs and fly larvae were present in low numbers. Abundance and diversity was similar to the downstream site (G).

Site G-

Run- This site is located below Bear Brook on Middle River. It is a sandy/gravel area with little cover and fast flow. Species abundance and diversity, which varies considerably at this site, was more typical of the sites on Bear Brook. Species composition consisted of caddisfly larvae and mayfly nymphs, which is similar to previous conditions.

**TABLE 2. BENTHIC INVERTEBRATES, JUNE 2002
Abundance (Number per m³) and Diversity**

Section	A	A	A	B	B	C	D	D	D	E	E	F	G
	Run	Riffle	Pool	Riffle	Pool	Run	Pool	Run	Riffle	Run	Riffle	Run	Run
Trichoptera													
Hydroptilidae													
Hydropsychidae									100	78	22		
Limnephilidae													
Psychomyiidae				11									
Sericostomatidae													
Unidentified									11		11		
Pupae							44	56					11
Cases					11					22		22	44
Ephemeroptera													
<i>Ephemerella</i> sp													
Heptageniidae									11	33			
<i>Paraleptophlebia</i> sp								11	11				
Siphonuridae/Baetidae									11				
<i>Tricorythodes</i>										33	11	11	33
Unidentified		11			11			11	155		22		
Diptera													
Ceratopognidae				11			11	11	11		11		
Chironomidae larvae		11		44	44	22	11	33	155	144	11		
Tanypodinae		11			22	11				33	22	11	
Chironomidae pupae		11							11				
Chironomidae tubes													
Rhagionidae											33		
Simuliidae larvae									200				
Simuliidae pupae									11				
Tabanidae						11							
Tipulidae			11										
Unidentified larvae										11			
Hemiptera													
Corixidae			111										
Plecoptera													
Chloroperlidae				11						44			
Chloro/Perlodidae									11				
Unidentified									11	44			
Coleoptera													
Dytiscidae larvae	56			33	22		11	11	22	11			
Dytiscidae adult		11											
Elmid larvae				11	67			11		111		11	
Elmid adult													
Haliplidae			11										
Hydrophilidae	11		11										
<i>Psephenus</i>										11			
Unidentified													
Odonata													
Gomphidae										11			22
Libellulidae													
Unidentified													
Hydracarina					11								
Nematode													
Annelid													
Oligochaeta										11	11	22	11
tubes	78												
Piscicolidae							11					67	
Gastropoda													
<i>Physa</i>											11		
Total #/m³	145	55	144	121	188	44	88	144	731	597	165	144	121
Total taxon/station	3	5	4	6	7	3	5	7	14	14	10	6	5

Bear Brook/Middle River Invertebrate Samples **December , 2002**

Overview

Stonefly nymphs and chironomid larvae dominated all sites, including pools. Total abundance in Bear Brook is lower than fall, 2001, but similar to previous years. Abundance Site B continues to be high. Pool sites are generally lower in numbers than the other types of habitat. The runs at Site E and F remained lower than average. Overall, numbers of invertebrates are much similar this time to previous fall sampling periods.

Species diversity is similar to previous sampling periods. Pool sites continue to be low in productivity, while run and riffle sites are much higher and similar to each other. Stonefly nymphs and chironomid larvae dominate the samples. Stoneflies were found at all sites and chironomids at all but two. Mayflies were also present in small numbers at most sites. Caddis flies, beetle larvae, and oligochaetes were present in small numbers. Diversity on Middle River is lower than in the past.

Site B shows the greatest abundance of organisms. Diversity was highest at Sites B and D and Middle River. Sites E (run) and F are lower in productivity (as measured by abundance and diversity) than previously. This is similar to last fall. Site B appears to be the most productive site sampled, with high numbers of stoneflies (riffle/run) and caddis flies (pool).

Bear Brook Invertebrate Monitoring

Species diversity and abundance is shown in Table 1 below.

Site A

All areas at this site are located downstream of the mine site immediately above a highway culvert. The area is a shallow open section of the brook dominated by a sandy/gravel or cobble bottom.

Pool- The pool site is a shallow sandy/gravel area just upstream of a small tributary. This site was not sampled in December 2002.

Run- This site showed a lower abundance than the other sites on Bear Brook. Species diversity was also low. Chironomid larvae and mayfly nymphs dominated the community, with fewer numbers of stonefly nymphs, dragonfly and alderfly larvae. Species diversity is slightly different than in the past, but this may be due to a later sampling period.

Riffle- The bottom type at this riffle is cobble/rock. The site was not sampled in December 2002.

Site B

Site B is a rocky section of Bear Brook located downstream of the Highway 289 bridge.

Riffle- Bottom type at this site is very similar to the pool bottom. Abundance is typically low here, but diversity is high. Abundance at this time was among the highest of all sites. Stonefly nymphs were dominant, with smaller numbers of chironomids, oligochaetes and beetle larvae. Chironomid larvae are typically dominant at this site.

Pool- The bottom at this pool consisted of gravel and cobble. The area is shallow, with little cover. It is typically low in abundance, but is higher in both abundance and diversity this time. Caddisfly larvae, mayfly nymphs, chironomid larvae and stonefly nymphs were present. Stoneflies were present in high numbers.

Run- The run at Site B was a gravel/cobble area. It typically has a high abundance of mayflies, stoneflies, and beetle larvae. During this winter's study, abundance of stoneflies was very high as was species diversity.

Site C

Site C is located behind the mine and beyond the operation area. It is a deep, shaded area of the stream. The bottom type is cobble/gravel, with the exception of the pool, which is a mixture of sand and gravel.

Pool- This site is populated by chironomid larvae, which is typical for this site and stonefly nymphs. Species abundance and diversity is usually low at this site and was low again during this sampling period.

Run- Stonefly nymphs were the only insect found at this site during December's sampling. Abundance was very low in December, as was diversity. It was much lower than in previous years.

Riffle- Chironomids, mayflies, stoneflies, and caddisfly larvae were found at this site. Annelids were notably absent. Abundance and species diversity is usually higher at this site than during this sampling period. It was not sampled in fall of 2001.

Site D

This site is located at a wide-open section of the brook behind the overburden site. Bottom type is typical of the brook (gravel/cobble).

Run- This site has a sandy, gravel bottom. Both abundance and diversity are generally lower than other areas of the brook, but were more typical of the other sites on Bear Brook during December. Large numbers of chironomid larvae were sampled, as well as fewer numbers of mayflies, stoneflies, beetle larvae and annelids.

Site E

Riffle- This site is located at the confluence of Bear Brook and Middle River. It is an open area with a cobble/gravel bottom. Species abundance is usually low at this site by comparison with areas further upstream. Chironomids are not found although these organisms are commonly found at this site, as well as throughout the study area. This site was dominated by stonefly nymphs during December 2002.

Run- Bottom sediment at this site is sandy/gravel, usually with attached algal mats. Abundance and diversity are lower similar to this time last year, and lower than in previous years. This site usually has a diverse population of caddis flies, mayflies, chironomids. Stoneflies were dominant this time with fewer numbers of the other species.

Pool- This site was sampled for the first time in December. It has a small population of mayfly nymphs and few chironomids, gastropods and oligochaetes. Numbers were very low compared to other sites on Bear Brook. Diversity was average for the stream.

Middle River Invertebrate Monitoring

Site F-

Run- This site is a deep, fast moving run located upstream of the mouth of Bear Brook. It is largely cobble with some gravel. This site is usually one of the most productive of the study area, but is much lower this December. While diversity remained high this time, numbers were much reduced and ranked one of the poorest of all areas studied. Stoneflies, oligochaetes and chironomids were dominant.

Site G-

Run- This site is located below Bear Brook on Middle River. It is a sandy/gravel area with little cover. Species abundance and diversity, which vary considerably at this site, was one of the lowest this fall. It is dominated by mayfly nymphs and chironomid larvae, although caddis flies and stoneflies were also present in smaller numbers. Typically, stonefly and mayfly nymphs dominate this site.

TABLE 1. BENTHIC INVERTEBRATES, December 2002
Abundance (Number per m³) and Diversity

Section	A	B	B	B	C	C	C	D	E	E	E	F	G
	Run	Riffle	Pool	Run	Run	Pool	Riffle	Run	Pool	Riffle	Run	Run	Run
Trichoptera													
Brachycentridae													22
<i>Glossoma</i>											11		
Hydropsychidae			11	11			44						
Limnephilidae													
Polycentropodidae			11										
Rhyacophilidae						11							
Unidentified						22	33						
Ephemeroptera													
Baetidae											22		
<i>Caenis</i>			67	11			11					11	
<i>Epeorus</i>											11		
Ephemerella									11		11		
Heptageniidae								11					111
Siphonuridae- <i>Ameletus</i>			11										
Unidentified	56		11	22		11			22			11	
Diptera													
Chironomidae larvae	56	22	455	33		67	89	377	33		11	22	67
Chironomidae pupae													
Chironomidae tubes													
Culicidae-adult													
Rhagionidae						11							
Simuliidae											11		
Tabanidae													
Tipulidae				11			22	33					11
Unidentified				11									
Hemiptera													
Unidentified		22											
Plecoptera													
Capniidae							11			56	22	11	11
Chloroperlidae/ Perlodidae	11		100	11									
Nemouridae		533		1110	33	44						22	
<i>Taeniopteryx</i>		222		44	11		11		11	11			
Unidentified							167	33		122	155	44	11
Coleoptera													
Dytiscidae													11
Elmid larvae			11	11									
Elmid adult								11					
<i>Halipus ?</i>			11										
Unidentified		22									11		
Odonata													
Cordulegaster								11					
Libellulidae	11												
Unidentified													
Megaloptera													
<i>Sialis</i>	11												
Nematode													
Annelid						22		11					
Oligochaete		11						11	11			255	11
Bivalve													
Gastropoda			11						11				
Hydrobiidae						11							
Total #/m³	145	832	699	1275	44	199	388	498	99	189	265	376	255
Total taxon/stn	5	6	10	10	2	8	6	8	6	3	9	7	8