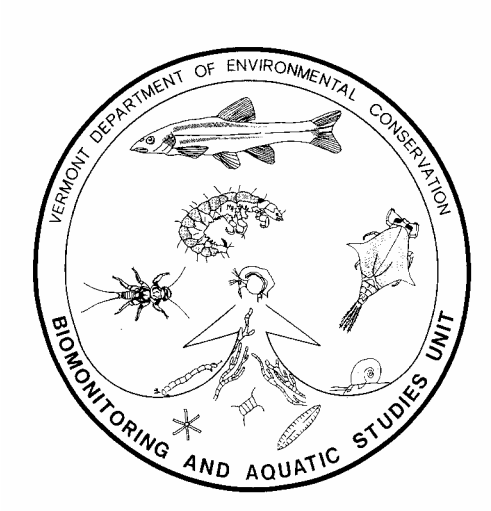
REPORT

Survey of the Shale and Cobble Zone Macroinvertebrate Community
1994



Prepared By:
Steven Fiske and Richard Levey
Vermont Agency of Natural Resources
Department of Environmental Conservation
Water Quality Division
Environmental Sciences Branch
Biomonitoring and Aquatic Studies Section
103 So. Main St. DEC Lab Building
Waterbury, Vermont 05671
(802) 244-4520

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Introduction:

Recently (July 1993), zebra mussels (*Dreissena polymorpha*) were discovered in Lake Champlain. Zebra mussels grow in dense colonies on lake and river bottoms, and can clog public and industrial water intake pipes, foul boat hulls and engines, cover beaches, and disrupt aquatic ecosystems. This study addresses the recommendations of the Vermont Zebra Mussel Study Committee (Vermont Agency of Natural Resources, 1994) to the Vermont General Assembly that:

> "The Vermont Department of Environmental Conservation Biomonitoring and Aquatic Studies Unit should initiate a survey of the shale and cobble littoral zone at selected sites in Lake Champlain during the summer of 1994 to assess the potential ecological consequences of zebra mussels on the lake bottom macroinvertebrate community."

Effects that zebra mussels will have on the benthic fauna in Lake Champlain are not clear. Initial sampling conducted by the Vermont DEC in 1993 indicates that the shale and cobble littoral zones of Lake Champlain, which are prime zebra-mussel habitat, are inhabited by the most diverse bottom-dwelling biological communities in the Lake. Heavy infestation of these areas by zebra mussels could drastically alter the species composition and diversity of these communities, resulting in as yet unknown ecological consequences. It is important to document the native species composition and diversity that presently exist in these areas in order to understand how zebra mussel colonization will alter the structure and function of these shale and cobble bottom macroinvertebrate communities and the higher food chain fish species that may depend on them.

In 1994, the Vermont Department of Environmental Conservation, in cooperation with the Lake Champlain Basin Program, initiated a monitoring program that would look at these shale/cobble communities and would track changes to those communities resulting from zebra mussel colonization. This report summarizes the results of monitoring activities conducted by the Vermont Department of Environmental Conservation for the Lake Champlain Basin Program during the summer of 1994.

Project Description:

Presently, there are no comprehensive data on the benthic fauna of the shale and cobble littoral areas. Baseline data on these communities of Lake Champlain are needed before the establishment of zebra mussels in order to document alterations resulting from the encroachment of zebra mussels onto these habitats. The goals of this monitoring program are to: **1) establish baseline benthic macroinvertebrate monitoring data in selected shale and cobble littoral habitats of Lake Champlain, and 2) monitor the changes that occur to the structure and function of that community, including colonization by zebra mussels, as the zebra mussel invasion of Lake Champlain progresses.**

Objectives:

1) Document the existing benthic macroinvertebrate composition, and the progressive colonization by adult zebra mussels, of shale and cobble littoral zones at selected sites representing different trophic zones in Lake Champlain. The establishment of these baseline parameters of macroinvertebrate community structure and function prior to zebra mussel colonization will allow a better understanding of the ecological consequences of zebra mussel colonization within the different trophic zones of Lake Champlain.

2) Document selected water quality parameters that are pertinent to zebra mussel requirements at all sites.

Study Design and Methods:

A primary objective of this study is to document, prior to the arrival of zebra mussels at the sampling sites (hopefully a period of three or more years), baseline measurements of community structure and function. Community measurements (biometrics) include density, taxa richness, EPT richness, Bio Index, and percent community composition by taxa and by functional feeding groups. These baseline data will be used to measure the natural spatial and temporal variation within sampling sites. The data will also be used to measure the differences in community structure and function across different trophic zones within the similar habitat type shale/cobble littoral zone. These data can then be used to help evaluate any biological changes occurring over time within different trophic zones of the lake as zebra mussels progressively colonize the Lake.

Sample Site Selection :

Sampling sites were selected to represent typical shale cobble zone habitat and areas within each lake water quality trophic segment as defined by Total Phosphorus (TP) concentrations from Lake Champlain Lay Monitoring data (**Table 1**). Substrate characterization was determined by habitat evaluation and trophic representation was determined using existing Lake Champlain monitoring information. Eight sites were sampled in the northern portion of Lake Champlain, within each of the four identified trophic zones (**Figure 1**). All sites were dominated by shale/cobble substrates and located at depths between 2.0 and 4.0 meters, based on the lake level at Burlington Harbor.

Table 1: Locations and Total Phosphorus Concentration Ranges of Shale/Cobble Zone Macroinvertebrate Sampling Sites in Lake Champlain.

SITE NAME	ID	Total-P ug/l P	Latitude	Longitude	Site ID #
Province Pt., Vt	PP	31-40	45 00 45	73 11 35	LC0930000002
Savage Point, Vt	SP	21-30	44 50 11	73 17 29	LC0960000001
Knight Point, Vt	KP	21-30	44 46 06	73 17 51	LC0860000002
Isle La Motte, Vt	ILM	16-20	44 54 20	73 20 38	LC0550000003
North Hero, Vt	NHS	16-20	44 51 04	73 16 03	LC0870000002
Ladd Point, Vt	LP	16-20	44 46 09	73 17 02	LC0850000003
Whites Beach, Vt	WB	11-15	44 37 15	73 19 50	LC0400000001
Allen Point, Vt	AP	11-15	44 35 43	73 18 17	LC0710000009

Sampling and Analysis Procedures:

Quantitative sampling of the benthic macroinvertebrate community was conducted at the eight sites between August 1 and 9, 1994, by use of SCUBA areal sampling methods. Five replicate one-quarter square meter samples were taken at each site.

All substrate within the one-quarter square meter quadrate was removed and placed into a large 500 micron mesh bag. The bag was then sealed and brought to the surface (boat/shore) for further processing. Each sample was then washed through a U.S. Standard No. 30 sieve (600um openings). The retained sediment, debris, and organisms were then placed into labeled jars and preserved with 75 percent ETOH.

Macroinvertebrate samples were processed at the Vermont DEC R.A.LaRosa Environmental Laboratory. Processing procedures followed Vermont DEC methods 4.6.1-.4 (Vermont DEC Field Methods Manual 1989). Samples were thoroughly rinsed with tap water through a U.S. Standard No. 30 sieve. The entire sample was then placed onto a large (12 x 18 inch) gridded shallow white tray. The material was covered with enough water to spread it evenly over the entire bottom of the tray. Using a 1.25X illuminated magnifier, all animals were systematically removed from the tray, and placed in divided petri dishes with 75 percent ETOH. The

animals were then sorted to major groups using a dissecting microscope and placed in labeled tightly capped bottles with 75 percent ETOH.

Macroinvertebrate identifications were made to the lowest possible taxonomic level, usually genus and species for most groups, with the exception of some minor taxa and the Oligocheata.

The **density** of macroinvertebrate animals at a site is reported as the number per square meter as determined by taking the average number of organisms per replicate and multiplying this mean number per replicate by four. The **Percent Composition of a Taxon** was calculated by dividing the mean density of a taxon by the mean density of all animals at a site.

Taxa richness is the number of distinct taxa found at a site. It is a simple measure of the macroinvertebrate community diversity. We have reported both the **mean taxa richness** (average number of taxa per replicate) and the **total taxa richness** (total number of taxa) found at a site.

The **EPT index** measures the mean number of distinct taxa per replicate within the orders *Ephemeroptera*, *Plecoptera*, and *Trichoptera* present at a site. The value summarizes taxa richness within the insect orders that are generally considered to be the most pollution sensitive. For the most part, in this survey the order *Plecoptera* is not represented with the exception of one species at one site. The *Coleoptera* were present at all sites and were represented by moderately sensitive species. Therefore, the **ECT index** was determined for each site as a possible substitute index for the EPT index. We also reported the total number of species from the Order *Trichoptera* at each site. The *Trichoptera* were represented by the most number of species within the sensitive taxa indices mentioned above, and seemed to differentiate between sites of differing trophic state.

The **Hilsenhoff biotic index (BI)** (Hilsenhoff 1987) is a measure of a community's tolerance toward "organic enrichment." It was developed by Hilsenhoff in 1977, and improved in his 1987 publication, to be applied in lotic studies of macroinvertebrate community impact assessments due to organic stream pollution. We have applied it here, with specific modifications made by Vermont DEC for the aquatic macroinvertebrate (including non Arthropod) fauna of Vermont, to see if it would distinguish lentic communities from areas of differing "Trophic State" in Lake Champlain. The BI is an integrating index which utilizes information concerning both the relative abundance and organic pollution tolerance of individual taxa to give an overall community level rating of the community's tolerance to enrichment. The Bio Index "1987" ranges from 0 to 10 with 0 being the least tolerant (oligotrophic) and 10 most tolerant (eutrophic) community type.

The **percent composition of the functional feeding groups** was determined for each site by replicate and reported as the mean for each site. The functional groups assigned to a taxa are as determined by Merritt and Cummins 1984 and as assigned by the Vermont DEC for non-insect taxa.

Water quality samples were collected at each site at the time of macroinvertebrate sample collection. The parameters measured (**Table 2**) are pertinent to zebra mussel requirements and include: **total alkalinity, calcium, pH, specific conductance, and temperature**. The samples were collected following Vermont DEC Field Methods Manual 1989 Section 2.2.1 (See **Table 2**).

Quality assurance/quality control:

Quality control procedures for chemical parameters followed the Quality Assurance Plan (section 11.0, Vermont DEC,1992). Biological samples were replicated in the field from all sites to determine within-site sampling variability (see section on Results and Discussion). All biological samples were checked for picking completeness by a second aquatic biologist. Taxonomic identifications were repeated by a second biologist on 5 percent of all samples. Retraining was employed where discrepancies occurred on some difficult taxa. Voucher specimens from Crustacea and Mollusca were verified by an outside expert, Dr.Douglas Smith, Zoology Dept, University of Massachussetts, Amhearst, MA.

Table 2: Summary of Chemical Water Quality Parameters

Parameter	Samples/site	Matrix	Reference	Unit Report
Dissolved Oxygen	1	water	3.1	mg/l
Alkalinity	1	water	2320B	mg/l
Calcium	1	water	7140	mg/l
pH	1	water	1.5.2,4	STD.un
Specific Conductance	1	water	1.6.2	µmho/cm
Temperature	1	water	1.1	C°

Results and Discussion:

The community biometrics for the eight shale/cobble sites are presented in **Table 3**. Mean density of macroinvertebrates ranged from a low of 822 m^2 at the Allen Point site, to a high of 4307 m^2 at the North Hero site. With five replicate 1/4 m^2 replicate samples collected at each site, the percent standard error of the mean (% SEM) for organism density and mean taxa richness ranged from 6 to 30 percent and 1 to 10 percent respectively (**Table 3**). With the exception of density estimates for White's Beach (SEM 30%) and North Hero (SEM 21 %), all variance estimates were within targeted ranges (20% SEM for density estimates and 10 percent SEM for mean taxa richness estimates) as determined by power analysis. Density was the most variable of the biometrics.

The total taxa richness for the eight sites ranged from 53 and 54 taxa at Knight Point and Allen Point respectively, to 75 taxa at the North Hero and Ladd Point sites. The mean taxa richness ranged from 29 taxa at Allen Point to 49 taxa at the North Hero site. The mesotrophic sites with total phosphorous (TP) in the range of 16 to 20 ug/l had the higher mean richness values with means from 41 to 49 taxa. All other sites had mean richness values from 29 to 36 taxa. The percent SEM for the mean taxa richness values was 10 percent or less for all the sites. With this precision, a 30% change in taxa richness will be measurable at most sites and a 50 percent change at all sites.

The EPT index values were lowest at the more eutrophic sites with Province Point recording the lowest EPT index at 2.8 taxa. The highest number of EPT's recorded was from the North Hero site at 13.6 taxa. The ECT index ranged from a high of 17.4 taxa, also at the North Hero site to a low of 3.6 taxa at Savage Point. The ECT index also identified the more eutrophic sites as being poor in sensitive taxa. The ratio of EPT/Richness values ranged from .30 to .08, with the two most eutrophic sites of Savage Point and Province Point having the lowest proportion of sensitive EPT taxa compared to the other sites. The number of Trichoptera taxa ranged from a low of 5 at the eutrophic Province Point site to a high of 17 at the mesotrophic North Hero site. In general the number of Trichoptera taxa also identified the two most eutrophic sites as being poor in taxa richness when compared to the other sites.

The Biotic Index ranged from 5.39 at oligotrophic Allen Point to 7.62 at the eutrophic Savage Point site. The Biotic Index in its present form did a good job of ranking the sites in order of perceived trophic state, with the exception of the Whites Beach site, which it placed near the meso-eutrophic Ladd Point Site. The data seem to indicate that near shore communities with a Biotic Index value less than 5.5 could be considered as oligotrophic, values between 5.5 and 6.5 as mesotrophic, and values greater than 6.5 as eutrophic.

Table 3: The macroinvertebrate community biometrics for eight shale/cobble zone sites in Northern Lake Champlain. Data represent mean values from five 1/4 square meter replicates. The percent standard error of the mean (%SEM) is given in parenthesis for the metrics Density and Richness.

Sites	White's Beach	Allen Point	Isle LaMotte	North Hero	Ladd Point	Knight Point	Savage Point	Province Point
Density/m^2 (%SEM)	2995 (30)	822 (18)	1982 (8)	4307 (21)	3204 (6)	3786 (12)	1721 (6)	1538 (19)
T-Richness	63	54	63	75	75	53	62	59
M-Richness (%SEM)	34.0 (10)	29.2 (9)	41.2 (6)	49.0 (4.4)	48.0 (1)	36.6 (5.5)	..32.2 (6)	35.0 (9.4)
EPT index	7.2	8.8	11.2	13.6	8.2	5.8	3.2	2.8
ECT index	9.2	12.2	16	17.4	11.0	8.4	3.6	4.4
EPT/Rich	.21	.30	.27	.28	.17	.16	.10	.08
Biotic Index	6.20	5.39	5.53	5.70	6.21	6.87	7.62	7.36
# TrichopTaxa	13	13	15	17	14	9	6	5

The Percent Composition of the major macroinvertebrates groups is presented in **Table 4**. A complete list of the benthic macroinvertebrates identified and the percent composition of each taxon making up more than 1 percent of the community abundance from the 8 cobble shale sites is provided in **Appendix A. Appendix B** lists by site and replicate the raw count data.

A total of 177 taxa of benthic macroinvertebrates were recognized, including 15 *Hirudinea*, 25 *Gastropoda*, 17 *Bivalvia*, 6 *Crustacea*, 7 *Ephemeroptera*, 29 *Trichoptera*, 37 *Chironomidae* and 12 *Coleoptera*.

Gastropods (snails) were a major component of the community accounting for more than 50 percent of the community composition at 5 of the 8 sites; values ranged from 12 percent at Savage Point, to 85 percent at Whites Beach. The most abundant and widespread species included the exotic Gastropod, *Bithynia tentaculata* occuring at all but one site, and comprising up to 69 percent of the community at the Whites Beach site. The Gastropod *Amnicola limosa* occurred at all sites, and comprised up to 33 percent of the community at the Province Point site. These two species are very similar in their niche requirements in terms of habitat and feeding. At sites where the exotic *B. tentaculata* is very abundant (>60%) *A. limosa* populations appear depressed at less than 2 percent, suggesting some direct competition between the two species.

The *Bivalvia* (mussels and clams) were represented at all sites and ranged from 3 percent at Whites Beach to 17 percent at Province Point. The abundance of the Bivalves *Elliptio complanata* and *Lampsilis radiata* was among the highest reported from northeastern lakes (Downing and Downing 1991).

The *Amphipoda* (scuds) were present at all sites and ranged from 1 to 6 percent of community composition at five sites to 10 to 12 percent at three sites. The *Isopoda* (sowbugs) were present at only 2 sites surveyed. They comprised 1 percent of the community at Knight Point and 60 percent at Savage Point.

The percent composition of the *Coleoptera* (beetles) ranged from 1 percent at four sites to 32 percent at the Isle La Motte site. The typically lotic beetle *Stenelmis spp* accounted for more than 28 percent of the community at the Isle La Motte site.

The percent composition of *Diptera* (flies) was relatively low (<7%) at all sites except Allen Point, where they represented 33 percent of the community. The family *Chironomidae* comprised 31 percent of the Diptera at this site.

The *Ephemeroptera* (mayflies) were found at seven of the eight sites surveyed. They were not represented at the Savage Point site. They were never very abundant and accounted for only 1 to 3 percent of the community at the other seven sites. The percent composition of *Trichoptera* (caddisflies) ranged from only 1 to 7 percent at five of the sites up to 13 to 14 percent at three sites.

Oligochaetes (worms) were present at all sites and accounted for only 2 percent of the community at five of the eight sites; Knight Point had the highest value at 7 percent.

It is worth noting that the 2.0 to 4.0 meter deep cobble/shale habitat that was surveyed can be considered as the "wave zone" of the lake. It is defined as that area along a lake shore which is subject to constant wave action so that fine sediments in the silt-clay range are not accumulated. Observations at sites surveyed indicate that the sites sampled are in the wave zone. As the degree of exposure of the substrate increases, typically lentic groups are replaced by more typically lotic forms (Barton & Hynes 1978). The taxa list presented in Appendix A has several taxa that are typically lotic; including the mayfly *Heptageniidae* ; the beetles *Stenelmis spp*, *Dubiraphia sp*, *Ectopria nervosa*, and *Psephenus herricki*, and the caddisflies; *Micrasema sp*, *Apatania sp*, *Psilotreta sp*, *Neophylax sp* *Cheumatopsyche sp*, and *Hydrosyche betteni*. These taxa emphasize the "lotic" nature of the wave zone that was sampled in this survey.

Table 4: The percent composition of the major macroinvertebrate groups from eight shale/cobble sites in Northern Lake Champlain.

Sites	White's Beach	Allen Point	Isle LaMotte	North Hero	Ladd Point	Knight Point	Savage Point	Province Point
COLEOPTERA	5	16	32	4	1	1	1	1
DIPTERA	2	33	1	2	6	1	7	6
EPHEMEROPTERA	1	3	1	1	1	1	0	1
TRICHOPTERA	1	13	14	7	14	6	3	1
OLIGOCHAETA	2	2	6	4	2	7	2	2
HIRUDINEA	1	1	3	1	1	4	1	1
AMPHIPODA	1	10	1	1	3	6	10	12
ISOPODA	0	0	0	0	0	1	60	0
BIVALVIA	3	5	12	5	6	14	4	17
GASTROPODA	85	15	31	73	65	61	12	52

Genus-level functional feeding group designations for most of the macroinvertebrates encountered were found in Merritt and Cummins 1984. **Table 5** presents the percent composition of the macroinvertebrate functional feeding groups from the eight sites surveyed.

Scrapers (non-filamentous algae grazers) accounted for more than 50 percent of the community at 6 of the 8 sites. The percent scrapers ranged from a low of 9 percent at Savage Point to a high of 89 percent at Whites Beach. The *Gastropods* accounted for the large scraper percent compositions at most of the sites, however the *Coleoptera* *Stenemelis spp* also a scraper comprised up to 28 percent of the scraping community at the Isle La Motte site.

Collector gatherers (deposit feeders) were generally the next most dominant in percent composition ranging from 6.2 percent at Whites Beach to 77 percent at Savage Point. *Isopods* and *Amphipods* were responsible for the high composition of collector gatherers at Savage Point. Allen Point was the only other site where this feeding group was dominant at 50.3 percent. The *Chironomidae* *Microtendipes sp* and *Pseudochironomous sp* contributed to the high collector gatherer composition along with the *Amphipoda* *Gammarus spp*, at Allen Point.

The percent composition of collector filterers (suspension feeders) was fairly evenly distributed at all sites, ranging in percent composition from 4.0 to 7 percent at five of the sites and 11 to 19 percent at the other three sites. Province Point had the highest composition at 19 percent. The *Bivalvia* was the leading contributor to this functional group, almost mimicking the total value for each site ranging from 3.0 to 17 percent.

The Shredder functional feeding group accounted for only 1 to 3 percent of the community. Shredders were represented by species from the *Trichoptera*, *Chironomidae* and *Coleoptera*.

Predators accounted for 1 to 5 percent of the community. Taxa in this functional feeding group were represented by numerous groups, including the *Chironomidae*, *Megaloptera*, *Coleoptera* and *Hirudinea.*

Large populations of zebra mussels affect the ecology of aquatic ecosystems by altering the flow of energy through the food web via their filter-feeding activity. In addition, theories that zebra mussels are facilitating energy transfer to the benthos through pseudo/fecal deposition can be examined by observing the changes that may occur in the functional feeding groups of macroinvertebrates.

If the Zebra mussels begin to shift the energy transfer toward the benthos in the form of pseudofeces, the above functional analysis of the dominant taxa at these sites would indicate that the collector/gatherer *Isopod, Amphipod,* and certain *Chironomidae* taxa will increase in dominance. The taxa within the functional groups scraper, collector/filterer, and shredder may decrease in dominance. These taxa are primarily represented by species in the Orders *Gastropoda*, *Coleoptera, Bivalvia,* and *Trichoptera.* Since the majority of species at all the sites are within these Orders, the overall taxa richness may decline at sites heavily infested with zebra mussels.

Table 5: The percent composition of macroinvertebrate functional feeding groups from eight shale/cobble sites in Northern Lake Champlain.

Sites	Whites Beach	Allen Point	Isle LaMotte	North Hero	Ladd Point	Knight Point	Savage Point	Province Point
Collector -Gatherer	6	50	14	8	10	17	77	22
Collector -Filterer	4	6	11	5	7	14	4	19
Predator	1	5	1	4	3	1	5	5
Shredder	1	1	2	1	3	3	1	3
Scraper	89	35	69	80	76	64	9	50

Table 6 presents the habitat characteristics of the shale/cobble sites. All sites were sampled at a depth of between 2.5 and 3.0 meters. The lake level at Burlington Harbor was 95.98 feet at the time of sampling . Cobble, shale, and gravel comprised at least 70 percent of the bottom substrate at all sites sampled. The percent composition of boulder ranged from 5 to 15 percent, and sand comprised 5 to 25 percent of the bottom substrate.

Krecker and Lancaster (1933), who studied the 0 to 6 foot depth zone of western Lake Erie, concluded that flat or angular rubble (slate) supported the most diverse and abundant populations of invertebrates since these substrates offer the greatest amount of stable, protected surface area of any of the substrates studied. The North Hero site was the only site in the study where angular shale was present and made up the boulder/cobble sized substrate. This may be in part why it was the site with the highest taxa richness in the study. The colonization of an area by zebra mussels may also create a more angular substrate with increased crevice spaces resulting in a greater abundance and diversity in the native community. Griffiths (1993) and Stewart and Haynes (1993) believed that changes to the physical habitat after the colonization of a sand and cobble reef area respectively was a major factor in the increased abundance and diversity of the macroinvertebrates in these areas.

Macrophytes observed at the sites covered from 5 to 35 percent of the bottom. *Vallisneria sp* (Wild Celery) was the most common macrophyte encountered, followed by *Heteranthera sp* (Waterstar Grass), *Najas flexilis* (Bushy Pondweed), *Myriophyllum sp* (Watermilfoil) and *Elodea sp* (Waterweed).

Periphyton observations shown in **Table 8** indicate that a diatom community was present at all sites except Province Point and Savage Point. At the Savage Point site, a thick covering of blue-green algae covered 90% of the substrate. At Whites Beach a green non-filamentous algae covered about 25 percent of the substrate. Some filamentous algae and floating benthic algae were noted at the other sites.

Table 6: Habitat characterization from eight shale/cobble sites in Northern Lake Champlain

% Substrate Composition	**White's Beach**	**Allen Point**	**Isle LaMotte**	**North Hero**	**Ladd Point**	**Knight Point**	**Savage Point**	**Province Point**
Bedrock	-	5	-	-	-	-	-	-
Boulder	-	15	-	-	5	5	-	10
Cobble	50	65	60	75*	40	45	50	50
Gravel	25	5	25	25	30	25	30	35
Sand	25	15	15	5	25	25	20	5
Silt	-	-	-	+	+	+	+	+
%Periphyton								
Filamentous	-	5	5	-	5	-	-	-
Blue Green	-	5	5	-	10	10	90	90
Diatom	+	+	+	+	+	+	-	-
Tight Green	25	-	-	-	-	-	-	-
% Macrophyte	15	35	30	15	20	35	10	20
Depth (m)	3.0	2.0	2.5	2.5	2.5	2.0	3.0	2.0

The water quality conditions appear to be suitable for the growth of zebra mussels in most areas of Lake Champlain. Zebra mussels can survive and reproduce within a pH range of 7.4 to 9.4, and Calcium concentrations of at least 12 mg/l (Vermont ANR 1994). The Calcium concentrations in Lake Champlain range from 12 to 27 mg/l (Neil Kammen Memo 1993). The water chemistry results from the 8 shale/cobble sites from this study are presented in **Table 7**. Calcium levels ranged from 12.9 mg/l (Allen Point) to 17.2 mg/l at the Isle La Motte site. The pH was also within zebra mussel requirements, ranging from 7.68 at the Isle La Motte site to 8.84 at Province Point. The alkalinity ranged from 36 to 46 mg/l and the conductance from 131 to 157 umho/cm.

Table 7: Summary of chemical water quality results

Sites	White's Beach	Allen Point	Isle LaMotte	North Hero	Ladd Point	Knight Point	Savage Point	Province Point
pH (STD.un)	8.24	8.25	7.68	8.10	8.28	7.83	7.74	8.84
Alkalinity mg/l	40	36	46	46	43	46	40	36
Conductance umho/cm	140	126	154	157	150	150	145	131
Calcium mg/l	13.3	12.9	17.2	16.5	16.3	17.0	15.4	13.7
Temperature C⁰	23.3	22.8	22.0	21.8	24.2	23.5	.23.0	22.5

Conclusions and Recommendations:

The cobble/shale macroinvertebrate survey has established a good baseline data set spanning the trophic ranges found within the northern part of Lake Champlain. A second years data will allow the temporal variability of these communities to be assessed. With the two years of baseline "zebra mussel free" data, community level structural and functional changes caused by the colonization of these areas by the zebra mussel will be possible. Two areas of analysis may be what species are at risk and how changes in the food web paths caused by the zebra mussel's presence are likely to occur.

The ability of the data to measure appropriate degrees of change in terms of community abundance and taxa richness will be achieved at most sites with the exception of the Whites Beach site. The Whites Beach site was also unusual in that it was highly dominated by another exotic the *Gastropod Bithnyia tentaculata*, and several Biometrics seem to indicate that it may not be a good representation of an oligotrophic littoral area of the lake. For these reasons the site will be either replaced by one located out in the open lake or if an appropriate area cannot be located the sampling effort will be put into the two or three sites that could use more replication. The data from two sites (Ladd Point and Savage Point) was very precise with very low percent SEM's for both density and richness. Only three or maybe four replicates will be necessary to measure 50 percent density or 30 percent richness changes at these sites. Again the sampling effort will be shifted to those sites where greater replication is needed.

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Appendix A: Percent Composition of all Benthic Macroinvertebrates from Lake Champlain Shale/Cobble Littoral Sites Sampled by VTDEC in August 1994.
(W.B.= Whites Beach, I.La = Isle La Motte, S.Pt. = Savage Point, K.Pt = Knight Point, L.Pt.= Ladd Point, A.Pt.= Allen Point, P.Pt.= Province Point, N.H.= North Hero School)

	W.B.	I.La	S.P.	K.P.	L.P.	A.P.	P.P.	N.H.S.	
Annelida									
Polychaeta									
Sabellidae									
Manayunkia speciosa	*<1*		*<1*	*<1*	*<1*		*1.6*		
Oligochaeta uid		*<1*							
Enchytraeidae uid		*<1*							
Lumbricidae uid		*<1*	*<1*	*1.3*	*<1*		*1.0*	*<1*	
Lumbriculidae uid	*<1*	*1.1*	*<1*			*<1*	*<1*		
Naididae uid			*<1*						
Tubificidae uid	*1.6*	*4.2*	*1.1*	*5.3*	*<1*	*1.7*	*<1*	*3.3*	
Hirudinea									
Erpobellidae uid				*<1*	*<1*				
Mooreobdella melanstoma						*<1*	*<1*	*<1*	
M. microstoma	*<1*								
M. sp.(imm)			*<1*	*<1*					
Glossiphonidae uid		*<1*	*<1*		*<1*			*<1*	
Alboglossiphonia heteroclita	*<1*	*<1*	*<1*	*<1*		*<1*			
Batracobdella phalera			*<1*	*<1*			*<1*	*<1*	
Boreobdella verrucata	*<1*								
Glossiphonia complanata	*<1*		*<1*	*<1*	*<1*		*<1*		
Helobdella elongata		*1.0*	*<1*	*<1*					
H. fusca		*<1*			*<1*	*<1*			
H. stagnalis					*<1*				
H. triseralis	*<1*		*<1*	*<1*	*<1*				
H. sp.(imm)			*2.9*						
Placobdella montifera			*<1*				*<1*		
Platyhelminthes									
Turbellaria									
Tricladida									
Planariidae									
Cura sp.				*<1*					
Dugesia sp.	*<1*		*<1*	*<1*	*1.9*	*2.2*	*<1*	*<1*	
D. triguria		*<1*							
Phagocata gracilis		*<1*							
P. sp.			*<1*						
Dendrocoelidae									
Procotyla fluviatilis				*<1*	*<1*		*<1*	*<1*	
Rhabdocoela uid	*<1*			*<1*			*2.2*	*<1*	
Gastropoda									
Gastropoda uid			*<1*	*<1*		*<1*	*<1*		
Amnicola limosa	*<1*	*6.0*	*4.1*	*6.0*	*6.3*	*7.3*	*33.0*	*1.8*	
Bithynia tentaculata	*69.0*	*11.1*	*1.2*	*32.0*	*36.1*	*1.0*	*3.1*	*60.7*	
Campeloma decisa							*<1*		
Ferrissia californica							*<1*		
F. sp.	*<1*		*<1*						
Fossaria obrussa grp									*<1*
Goniobasis livescens	*<1*					*<1*			
Gyralus deflectus	*2.0*	*<1*		*6.7*	*4.3*			*1.2*	
G. parvus	*<1*	*<1*	*1.3*	*<1*	*1.0*		*<1*	*<1*	

	W.B.	I.L.M.	S.P.	K.P.	L.P.	A.P.	P.P.	N.H.S.
Hydrobidae uid					*<1*			
Leptoxis carinata						*<1*		
Lymnaea stagnicola				*<1*				
Lyogyrus pupoidea			*<1*		*<1*			
Planorbidae uid		*<1*			*<1*		*<1*	
Helisoma trivolvis/companulata	*<1*	*<1*	*<1*	*3.1*	*1.7*		*5.7*	*<1*
Helisoma anceps				*<1*	*<1*		*<1*	*<1*
Promenetus exacuous	*1.1*	*<1*	*<1*	*1.9*			*1.7*	
Physa heterostropha	*2.4*	*1.9*	*1.6*	*1.4*	*4.9*	*4.5*		*3.6*
P. sp.							*3.9*	
Physella ancillaria					*<1*		*<1*	
Pyrgulopsis lustrica							*<1*	
Stagnicola catascopium	*8.7*	*9.7*		*7.0*		*<1*		*4.0*
Valvata tricarinata	*<1*	*<1*	*2.6*	*1.2*	*8.8*	*<1*	*3.9*	*<1*
Viviparus georgianus			*<1*					
Pelecypoda								
Bivalvia								
Pyganodon cataracta		*<1*						
Elliptio complanata	*<1*	*<1*	*1.2*	*1.2*	*<1*	*<1*	*2.4*	*<1*
Lampsilis radiata	*<1*	*<1*	*<1*	*<1*	*<1*	*2.4*	*<1*	*<1*
Musculium partumeium			*<1*	*<1*				
Pisidium adamsi	*<1*	*<1*						
P. amnicum		*<1*						
P. castertanum	*<1*	*3.4*	*<1*	*4.1*	*1.7*	*<1*	*4.0*	*<1*
P. compressum					*<1*			
P. ferrugineum								*<1*
P. henslowanum	*<1*	*1.3*		*5.9*				*<1*
P. nitidium								*<1*
P. sp.	*<1*	*2.7*	*1.3*	*<1*	*<1*	*<1*	*8.4*	*<1*
P. sp a		*<1*						
P. sp b		*<1*						
P. walkeri					*<1*		*<1*	*<1*
Sphaerium simule/corneum	*<1*	*2.1*		*2.0*	*1.0*	*<1*	*1.3*	*1.7*
S. sp.			*<1*					
Crustacea								
Amphipoda								
Gammarus fasciatus	*<1*	*<1*	*7.3*	*4.8*	*2.1*	*4.2*	*9.5*	*<1*
G. pseudolimnaeus					*<1*			
G. sp.	*<1*	*<1*	*2.56*	*<1*	*<1*	*5.5*	*1.8*	*<1*
Hyallela azteca			*<1*	*<1*	*<1*	*<1*	*<1*	
Isopoda								
Asellus racovitzai		*59.8*	*<1*					
Decapoda UID	*<1*							
Oronectes sp.							*<1*	*<1*
Ephemeroptera								
Baetidae imm.						*<1*		
Caenidae								
Caenis sp.	*<1*							*<1*
Ephemerellidae imm.						*<1*		
Eurylophella sp.							*<1*	
Ephemeridae								
Ephemera sp.	*<1*							
	W.B.	I.L.M.	S.P.	K.P.	L.P.	A.P.	P.P.	N.H.S.

Heptageniidae imm.						1.5	<1	
Stenacron interpunctatum	<1				<1	<1		<1
S. femoratum	<1	<1		<1	<1	<1		<1
Tricorythidae								
Tricorythodes sp.		<1						
Plecoptera								
Perlidae								
Acroneuria filicis							<1	
Trichoptera								
Brachycentridae								
Micrasema rusticum						<1		<1
M. sp.		<1			<1			
Helicopsychidae								
Helicopsyche borealis	<1	<1			<1	<1		2.0
Hydroptilidae								
Agraylea sp.				1.2	1.1			<1
Cheumatopsyche sp.						1.4		<1
Hydroptila sp.	<1	<1	<1	<1			<1	<1
Hydropsyche betteni						<1		
Oxyethira sp.				<1	<1			<1
Leptoceridae								
Ceraclea sp.	<1			<1		<1		<1
Mystacides sp.	<1	<1			<1			
Nectopsyche albida		1.5		2.0	1.4	<1	<1	<1
N. sp. <1								
Oectis avara		<1	<1					
O. sp.						<1	<1	<1
Setodes sp.	<1	<1		<1	<1			<1
Triaenodes aba					<1			
T. injusta					<1		<1	<1
T. tarda <1		<1	<1					
Limnephilidae								
Apatania sp. <1	2.5					<1		1.0
Psychoglypha sp.	<1							
Pychnopsyche sp.		<1		<1	<1			
Odontoceridae								
Psilotreta sp.	<1	<1				1.7		<1
Phryganeidae								
Phryganea sp.		<1	<1		<1	<1		<1
Ptilostomis sp.	<1							
Polycentropodidae								
Nyctiophylax sp.				<1			<1	
Phylocentropus sp.	<1		2.3					
Polycentropus cinereus						2.9		
P. sp.					<1			
Uenoidae								
Neophylax sp.	<1	5.9	<1	2.1	10.1	3.6		1.3
Diptera								
Chironomidae								
Ablabesmyia sp.	<1	<1	<1	<1	<1	<1		<1
Chironomus sp.		<1			<1			
Cladotanytarsus sp.	<1		<1		<1			
Cladopelma sp.			<1					
Clinotanypus sp.			<1					
Corynoneura sp.							<1	<1

	W.B.	I.L.M.	S.P.	K.P.	L.P.	A.P.	P.P.	N.H.S.

Cricotopus bisinctus							*1.3*	
C. sp.	*<1*		*<1*		*<1*		*1.2*	*<1*
Cryptochironomus sp.			*<1*					
Dicrotendipes neomodestus	*<1*		*3.4*		*2.4*	*<1*	*<1*	*<1*
Endochironomus sp.			*<1*		*<1*		*<1*	
Glyptotendipes sp.		*<1*		*<1*		*<1*		
Labrudinia sp.	*<1*					*<1*	*<1*	
Mallochohelea sp.	*<1*							
Micropsectra sp.			*<1*					
Microtendipes sp.	*<1*	*<1*		*<1*	*11.7*	*<1*	*<1*	
Orthocladiinae uid					*<1*			
Parachironomus sp.			*<1*	*<1*	*<1*		*<1*	*<1*
Pagastiella sp.			*<1*					
Paratanytarsus sp.		*<1*	*<1*	*<1*	*<1*		*<1*	*<1*
Phaenopsectra sp.		*<1*					*<1*	
Pseudochironomus sp.	*<1*	*<1*			*<1*	*20.0*	*<1*	*<1*
Procladius sp.	*<1*	*<1*	*<1*		*<1*			*<1*
Psectroclaudius sp.						*<1*	*<1*	
Paratendipes sp.					*<1*			
Polypedilum halterale	*<1*							
P. illionoense			*<1*				*<1*	
P. nubeculosum					*<1*			
P. scalaenum						*<1*		
Stenochironomus sp.	*<1*							
Symposiocladius sp.						*<1*		
Synorthocladius sp.							*<1*	*<1*
Thienemanniella sp.	*<1*		*<1*				*<1*	
Thienemannemyia sp.	*<1*	*<1*	*<1*		*<1*	*<1*		*<1*
Tanytarsus sp.			*<1*		*<1*			*<1*
Tribelos sp.	*<1*		*<1*		*<1*	*<1*		
Xenochironomus sp.			*<1*	*<1*	*<1*	*<1*	*<1*	
Ceratopogonidae								
Bezzia sp.			*<1*					
Culicoides sp.			*<1*	*<1*	*<1*		*<1*	*<1*
Empididae uid								*<1*
Odonata								
Coenagrionidae								
Argia sp.								*<1*
Enallagma sp.			*<1*					
Lepidoptera								
Lepidoptera uid	*<1*							
Petophila sp.						*<1*	*<1*	
Neuroptera								
Neuroptera uid	*<1*							
Megaloptera								
Nigronia sp.								*<1*
Sialis sp.	*<1*	*<1*	*<1*		*<1*	*<1*		*<1*

		W.B.	I.L.M.	S.P.	K.P.	L.P.	A.P.	P.P.	N.H.S.
Coleoptera									
Dryopidae uid									*<1*
Elmidae									
Dubiraphia quadrinotata						*<1*			
D. vittata		*<1*	*3.1*			*<1*	*<1*		*<1*
D. sp	*1.2*	*<1*			*<1*	*3.9*		*<1*	
Stenelmis bicarinata			*<1*		*<1*			*<1*	
S. crenata			*<1*				*<1*	*<1*	
S. quadrimaculata		*<1*	*3.0*		*<1*		*<1*		*<1*
S. sp.	*<1*	*24.5*	*<1*	*<1*	*<1*	*5.1*	*1.6*	*<1*	
Haliplidae									
Haliplus sp.			*<1*		*<1*	*<1*	*<1*		
Hydrophilidae uid					*<1*				
Berosus sp.					*<1*			*<1*	
Psephenidae									
Ectopria nervosa			*<1*			*<1*			*<1*
Psephenus herricki			*<1*				*6.3*	*<1*	*<1*
Hydracarina									
Hydracarina uid		*<1*	*<1*		*<1*	*<1*			*<1*

Appendix B: Raw Count Data (# per 1/4 sq meter) of Macroinvertebrate taxa from the eight Shale Cobble Sites on Lake Champlain 1994.

North Hero School site 1994

Order	Genera	Species	Count 1	Count 2	Count 3	Count 4	Count 5
COLEOPTERA	DRYOPIDAE	unid	1	0	0	0	0
	DUBIRAPHIA	sp	4	2	6	9	9
	DUBIRAPHIA	vittata	5	2	7	0	2
	STENELMIS	sp	19	6	30	20	16
	STENELMIS	quadrimaculata	2	1	4	0	0
	ECTOPRIA	nervosa	6	4	6	16	11
	PSEPHENUS	herricki	5	7	4	2	5
DIPTERA	CULICOIDES	sp	0	1	0	0	0
	ABLABESMYIA	sp	0	0	0	1	1
	CORYNONEURA	sp	0	0	1	0	1
	CRICOTOPUS	sp	0	3	5	0	0
	DICROTENDIPES	neomodestus	0	0	2	0	2
	MICROTENDIPES	sp	3	0	7	1	1
	PARACHIRONOMUS	sp	0	0	7	1	1
	PARATANYTARSUS	sp	4	1	8	1	4
	PHAENOPSECTRA	sp	1	0	0	0	0
	PROCLADIUS	sp	0	0	0	2	0
	PSEUDOCHIRONOMUS	sp	6	0	7	0	2
	SYNORTHOCLADIUS	sp	0	1	2	0	0
	TANYTARSUS	sp	0	1	0	0	0
	THIENEMANNEMYIA	sp	1	0	0	0	0
	EMPIDIDAE	unid	1	0	2	0	1
EPHEMEROPTERA	CAENIS	sp	0	1	0	0	0
	EURYLOPHELLA	sp	0	1	0	0	0
	STENACRON	interpunctatum	1	1	0	0	0
	STENONEMA	femoratum	1	3	15	0	5
TRICHOPTERA	MICRASEMA	rusticum	10	2	5	2	0
	HELICOPSYCHE	borealis	27	19	15	17	31
	CHEUMATOPSYCHE	sp	0	1	2	0	4
	AGRAYLEA	sp	0	0	1	1	1
	HYDROPTILA	sp	0	1	1	1	0
	OXYETHIRA	sp	0	0	2	1	0
TRICHOPTERA	CERACLEA	sp	0	0	0	0	1

Order	Genera	Species	Count 1	Count 2	Count 3	Count 4	Count 5
	NECTOPSYCHE	albida	0	1	0	3	1
	OECETIS	sp	3	2	7	1	0
	SETODES	sp	10	13	16	1	7
	TRIAENODES	injusta	0	0	2	0	2
	APATANIA	sp	13	13	23	2	7
	PSILOTRETA	sp	4	2	4	0	4
	PHRYGANEA	sp	0	0	0	0	3
	NYCTIOPHYLAX	sp	2	0	1	1	1
	POLYCENTROPUS	sp	5	3	17	1	3
	NEOPHYLAX	sp	15	10	34	2	13
PLECOPTERA	ACRONEURIA	filicis	1	0	0	0	0
ODONATA	ARGIA	sp	1	2	2	3	1
MEGALOPTERA	NIGRONIA	sp	1	1	0	0	0
	SIALIS	sp	7	0	6	2	1
AMPHIPODA	GAMMARUS	sp	9	2	8	0	1
	GAMMARUS	fasciatus	2	6	3	0	9
DECAPODA	ORONECTES	sp	0	0	1	0	0
GASTROPODA	AMNICOLA	limosa	19	11	17	10	41
	BITHYNIA	tentaculata	511	282	789	423	1267
	VALVATA	tricarinata	8	4	12	5	24
	FOSSARIA	obrussa grp	2	1	0	0	0
	STAGNICOLA	catascopium	33	32	59	29	64
	PHYSA	heterostropha	43	23	59	28	43
	GYRAULUS	parvus	2	3	1	3	9
	GYRAULUS	deflectus	11	6	12	10	29
	HELISOMA	anceps	0	0	0	0	3
	HELISOMA	trivolvis/companulata	0	3	4	2	5
BIVALVIA	PISIDIUM	sp	8	7	6	5	25
	PISIDIUM	casertanum	5	8	8	22	29
	PISIDIUM	henslowanum	0	0	0	1	1
	PISIDIUM	walkeri	0	0	1	0	2
	PISIDIUM	nitidium	3	0	1	0	1
	PISIDIUM	ferrugineum	0	0	0	1	1
	SPHAERIUM	simule/ corneum	21	15	13	21	22
BIVALVIA	ELLIPTIO	complanata	3	2	1	4	7

Order	Genera	Species	Count 1	Count 2	Count 3	Count 4	Count 5
	LAMPSILIS	radiata	8	5	6	7	2
TRICLADIDA	DUGESIA	sp	22	15	33	17	34
	PROCOTYLA	fluviatilis	0	0	3	0	3
RHABDOCOELA	UID		0	1	3	0	4
OLIGOCHAETA	TUBIFICIDAE	unid	30	28	59	25	40
	LUMBRICIDAE	UID	4	6	4	7	13
HIRUDINEA	GLOSSIPHONIIDAE	unid	0	0	2	0	2
	BATRACOBDELLA	phalera	1	0	1	1	0
	GLOSSIPHONIA	complanata	1	3	1	6	2
	HELOBDELLA	triseralis	0	0	0	1	1
	MOOREOBDELLA	melanostoma	1	1	0	0	1
HYDRACHNIDIA	UID		2	1	0	0	3

Allen Point site 1994

Order	Genera	Species	Count 1	Count 2	Count 3	Count 4	Count 5
COLEOPTERA	DUBIRAPHIA	sp	4	10	22	5	0
	DUBIRAPHIA	vittata	1	0	1	0	0
	STENELMIS	sp	6	18	14	7	8
	STENELMIS	crenata	1	0	0	0	1
	STENELMIS	quadrimaculata	0	0	0	0	2
	PSEPHENUS	herricki	10	10	23	10	12
	HALIPLUS	sp	0	2	3	0	0
DIPTERA	ABLABESMYIA	sp	0	2	0	0	0
	DICROTENDIPES	neomodestus	0	0	1	0	0
	LABRUNDINIA	sp	1	0	0	0	1
	MICROTENDIPES	sp	22	26	27	27	19
	POLYPEDILUM	scalaenum	0	0	0	1	0
	PSECTROCLADIUS	sp	0	0	1	0	0
	PSEUDOCHIRONOMUS	sp	8	52	50	36	60
	THIENEMANNEMYIA	sp	0	0	1	0	0
	TRIBELOS	sp	0	0	1	0	0
	XENOCHIRONOMUS	sp	0	0	1	0	0
	SYMPOSIOCLADIUS	sp	0	0	0	1	0
EPHEMEROPTERA	BAETIDAE	imm	0	0	0	0	1
	EPHEMERELLIDAE	imm	0	0	1	0	0
	HEPTAGENIIDAE	imm	3	0	5	0	8
	STENACRON	interpunctatum	0	0	0	0	1
	STENONEMA	femoratum	2	0	2	5	2
TRICHOPTERA	MICRASEMA	rusticum	0	0	3	0	0
	HELICOPSYCHE	borealis	0	0	0	5	5
	CHEUMATOPSYCHE	sp	2	5	1	3	4
	HYDROPSYCHE	betteni	0	1	1	0	0
	CERACLEA	sp	2	0	0	0	1
	NECTOPSYCHE	albida	0	0	4	0	0
	OECETIS	sp	2	0	2	1	0
	TRIAENODES	aba	0	0	1	0	0
	APATANIA	sp	1	1	5	0	1
	PSILOTRETA	sp	2	1	2	2	11
	PHRYGANEA	sp	0	0	1	0	0
	POLYCENTROPUS	cinereus	2	5	9	2	12

Order	Genera	Species	Count 1	Count 2	Count 3	Count 4	Count 5
	NEOPHYLAX	sp	6	18	6	5	2
MEGALOPTERA	SIALIS	sp	0	1	0	1	0
LEPIDOPTERA	PETROPHILA	sp	0	1	1	0	1
AMPHIPODA	GAMMARUS	sp	0	2	53	0	2
	GAMMARUS	fasciatus	24	9	2	6	3
	HYALLELA	azteca	1	0	0	0	0
GASTROPODA	UNID		1	0	0	0	2
	AMNICOLA	limosa	8	12	30	6	19
	BITHYNIA	tentaculata	2	1	6	2	0
	GONIOBASIS	livescens	0	4	1	0	1
	LEPTOXIS	carinata	0	0	0	0	1
	VALVATA	tricarinata	0	2	0	0	0
	STAGNICOLA	catascopium	0	0	1	3	4
	PHYSA	heterostropha	11	4	20	6	6
BIVALVIA	PISIDIUM	sp	0	2	4	0	0
	PISIDIUM	casertanum	1	0	5	0	1
	SPHAERIUM	simule/corneum	0	0	1	0	1
	ELLIPTIO	complanata	1	3	3	0	1
	LAMPSILIS	radiata	3	9	3	4	6
TRICLADIDA	DUGESIA	sp	0	3	2	1	3
OLIGOCHAETA	TUBIFICIDAE	unid	1	7	10	0	0
	LUMBRICULIDAE	unid	2	5	1	0	0
HIRUDINEA	GLOSSIPHONIA	complanata	3	1	2	1	0
	HELOBDELLA	fusca	0	2	0	0	0
	HELOBDELLA	stagnalis	0	0	0	0	1

Isle LaMotte site 1994

Order	Genera	Species	Count 1	Count 2	Count 3	Count 4	Count 5
COLEOPTERA	DUBIRAPHIA	sp	8	4	32	11	22
	DUBIRAPHIA	vittata	0	6	2	2	1
	STENELMIS	sp	102	101	142	160	103
	STENELMIS	bicarinata	1	0	1	1	0
	STENELMIS	crenata	0	1	0	0	0
	STENELMIS	quadrimaculata	13	7	16	26	13
	ECTOPRIA	nervosa	1	2	3	0	5
	PSEPHENUS	herricki	0	2	3	0	1
	HALIPLUS	sp	1	1	0	0	5
DIPTERA	ABLABESMYIA	sp	0	2	1	0	1
	CHIRONOMUS	sp	1	0	0	0	0
	PARATANYTARSUS	sp	0	0	0	1	1
	PROCLADIUS	sp	0	0	1	0	0
	PSEUDOCHIRONOMUS	sp	0	0	0	1	0
	THIENEMANNEMYIA	sp	0	1	0	0	0
EPHEMEROPTERA	STENONEMA	femoratum	1	1	0	5	0
	TRICORYTHODES	sp	1	2	0	0	0
TRICHOPTERA	MICRASEMA	sp	1	2	1	1	0
	HELICOPSYCHE	borealis	3	2	3	2	8
	AGRAYLEA	sp	0	1	0	0	0
	HYDROPTILA	sp	0	0	2	1	2
	MYSTACIDES	sp	1	2	0	1	0
	NECTOPSYCHE	albida	6	9	11	5	7
	OECETIS	avara	1	1	0	0	0
	SETODES	sp	6	3	3	3	2
	TRIAENODES	tarda	2	0	0	0	1
	APATANIA	sp	16	11	3	6	27
	PYCNOPSYCHE	sp	1	0	2	1	2
	PSILOTRETA	sp	5	4	3	5	1
	PHRYGANEA	sp	0	0	0	0	1
	POLYCENTROPUS	sp	0	0	0	0	1
	NEOPHYLAX	sp	17	25	25	54	26
MEGALOPTERA	SIALIS	sp	0	0	0	0	1
AMPHIPODA	GAMMARUS	sp	0	0	4	0	0
	GAMMARUS	fasciatus	8	5	3	0	1

Order	Genera	Species	Count 1	Count 2	Count 3	Count 4	Count 5
GASTROPODA	AMNICOLA	limosa	30	15	22	10	74
GASTROPODA	BITHYNIA	tentaculata	82	53	60	33	47
	VALVATA	tricarinata	4	1	0	0	8
	STAGNICOLA	catascopium	40	39	44	43	76
	PHYSA	heterostropha	12	8	8	7	14
	PLANORBIDAE	unid	1	0	0	0	0
	GYRAULUS	parvus	2	3	0	0	3
	GYRAULUS	deflectus	6	8	0	2	7
	HELISOMA	sp	4	2	1	0	1
	PROMENETUS	exacuous	0	1	0	1	2
BIVALVIA	PISIDIUM	sp	2	17	6	0	44
	PISIDIUM	casertanum	5	37	17	8	19
	PISIDIUM	henslowanum	7	7	7	6	7
	PISIDIUM	amnicum	0	2	1	0	2
	PISIDIUM	adamsi	1	2	2	0	3
	PISIDIUM	sp a	0	0	1	0	1
	PISIDIUM	sp b	0	0	0	0	1
	SPHAERIUM	simule	6	22	9	4	12
	PYGANODON	cataracta	0	1	0	0	0
	ELLIPTIO	complanata	2	8	3	2	5
	LAMPSILIS	radiata	3	3	1	3	1
TRICLADIDA	DUGESIA	triguria	5	4	1	3	8
	PHAGOCATA	gracilis	1	0	0	0	0
OLIGOCHAETA	UNID		0	2	0	0	0
	TUBIFICIDAE	unid	20	29	8	13	36
	LUMBRICULIDAE	unid	0	6	0	2	0
	ENCHYTRAEIDAE	unid	4	1	0	0	0
	LUMBRICIDAE	UID	3	9	8	4	4
HIRUDINEA	GLOSSIPHONIIDAE	unid	1	5	0	0	3
	ALBOGLOSSIPHONIA	heteroclita	0	0	1	0	0
	GLOSSIPHONIA	complanata	3	2	5	2	3
	HELOBDELLA	elongata	0	2	0	0	24
	HELOBDELLA	triseralis	2	2	3	1	1
	MOOREOBDELLA	sp	4	1	0	2	4
HYDRACHNIDIA	UID		0	1	0	0	1

Knight Point site 1994

Order	Genera	Species	Count 1	Count 2	Count 3	Count 4	Count 5
COLEOPTERA	STENELMIS	sp	8	3	11	3	5
	STENELMIS	bicarinata	0	0	1	0	1
	STENELMIS	quadrimaculata	1	3	3	0	3
	HALIPLUS	sp	1	0	0	0	0
	BEROSUS	sp	2	5	2	2	1
DIPTERA	CULICOIDES	sp	0	1	0	0	0
	ABLABESMYIA	sp	0	0	1	0	0
	PARACHIRONOMUS	sp	0	0	4	0	0
	PARATANYTARSUS	sp	0	0	1	0	0
	XENOCHIRONOMUS	sp	1	0	0	0	0
EPHEMEROPTERA	STENONEMA	femoratum	1	0	0	0	0
TRICHOPTERA	AGRAYLEA	sp	20	7	15	9	7
	HYDROPTILA	sp	2	0	0	0	0
	OXYETHIRA	sp	1	1	3	2	1
	CERACLEA	sp	0	0	0	0	1
	NECTOPSYCHE	albida	27	11	24	20	17
	SETODES	sp	2	0	0	0	0
	PYCNOPSYCHE	sp	3	3	4	1	0
	POLYCENTROPUS	sp	0	0	0	0	2
	NEOPHYLAX	sp	31	14	33	9	16
AMPHIPODA	GAMMARUS	sp	7	0	12	6	7
	GAMMARUS	fasciatus	47	50	38	57	37
	HYALLELA	azteca	0	0	2	1	3
ISOPODA	ASELLUS	racovitzai	1	0	4	0	0
GASTROPODA	UNID		9	1	0	1	0
	AMNICOLA	limosa	90	64	49	46	35
	BITHYNIA	tentaculata	472	306	298	231	211
	VALVATA	tricarinata	21	6	20	5	8
	LYMNAEA	stagnicola	0	0	1	0	0
	STAGNICOLA	catascopium	72	59	91	43	69
	PHYSA	heterostropha	24	6	16	7	16
	GYRAULUS	parvus	4	3	15	0	6
	GYRAULUS	deflectus	94	43	73	52	58
	HELISOMA	anceps	0	3	3	3	3
	HELISOMA	trivolvis/companulata	27	50	33	12	26

Order	Genera	Species	Count 1	Count 2	Count 3	Count 4	Count 5
	PROMENETUS	exacuous	17	12	28	4	31
BIVALVIA	MUSCULIUM	partumeium	0	4	0	0	0
	PISIDIUM	sp	140	30	57	29	24
	PISIDIUM	casertanum	87	30	25	25	27
	PISIDIUM	henslowanum	16	12	0	0	0
	SPHAERIUM	simule/corneum	19	31	9	21	17
	ELLIPTIO	complanata	14	10	13	10	10
	LAMPSILIS	radiata	3	1	6	1	1
TRICLADIDA	DUGESIA	sp	1	2	3	1	4
	PHAGOCATA	sp	2	0	3	0	0
	PROCOTYLA	fluviatilis	1	2	1	1	2
RHABDOCOELA	UID		9	3	6	0	2
POLYCHEATA	MANAYUNKIA	speciosa	2	1	1	0	0
OLIGOCHAETA	TUBIFICIDAE	unid	12	14	18	190	17
	LUMBRICIDAE	UID	10	10	18	10	14
HIRUDINEA	ALBOGLOSSIPHONIA	heteroclita	1	2	0	1	1
	BATRACOBDELLA	phalera	0	1	0	0	0
	GLOSSIPHONIA	complanata	2	2	0	1	0
	HELOBDELLA	sp	45	11	18	40	26
	HELOBDELLA	elongata	1	2	2	1	3
	HELOBDELLA	triseralis	7	5	8	6	9
	ERPOBDELLIDAE	unid	2	1	1	0	0
HYDRACHNIDIA	UID		2	1	0	0	0

Ladd Point site 1994

Order	Genera	Species	Count 1	Count 2	Count 3	Count 4	Count 5
COLEOPTERA	DUBIRAPHIA	sp	3	0	3	2	0
	DUBIRAPHIA	quadrinotata	0	1	0	0	0
	DUBIRAPHIA	vittata	0	1	0	0	0
	STENELMIS	sp	1	0	0	2	0
	ECTOPRIA	nervosa	0	3	2	6	0
	HALIPLUS	sp	1	1	0	0	3
	HYDROPHILIDAE	unid	0	0	1	0	0
DIPTERA	CULICOIDES	sp	0	0	1	0	1
	ORTHOCLADIINAE	unid	4	9	1	0	0
	ABLABESMYIA	sp	4	6	3	2	1
	CHIRONOMUS	sp	0	0	0	1	0
	CLADOTANYTARSUS	sp	6	1	0	1	1
	CRICOTOPUS	sp	0	2	0	7	2
	DICROTENDIPES	neomodestus	13	22	25	26	13
	ENDOCHIRONOMUS	sp	1	1	2	1	0
	GLYPTOTENDIPES	sp	1	0	0	0	0
	MICROTENDIPES	sp	0	0	0	0	1
	PARACHIRONOMUS	sp	3	8	1	3	4
	PARATANYTARSUS	sp	1	1	0	1	2
	PARATENDIPES	sp	0	0	0	1	0
	POLYPEDILUM	nubeculosum	6	0	2	4	4
	PROCLADIUS	sp	4	0	4	3	0
	PSEUDOCHIRONOMUS	sp	2	2	2	3	0
	TANYTARSUS	sp	6	8	4	3	3
	THIENEMANNEMYIA	sp	1	0	1	0	0
	TRIBELOS	sp	2	0	0	0	0
	XENOCHIRONOMUS	sp	0	0	0	1	0
EPHEMEROPTERA	STENACRON	interpunctatum	0	0	0	1	0
	STENONEMA	femoratum	0	3	0	0	4
TRICHOPTERA	MICRASEMA	sp	1	0	1	0	0
	HELICOPSYCHE	borealis	0	0	1	0	0
	AGRAYLEA	sp	5	8	11	10	12
	OXYETHIRA	sp	0	1	0	2	1
	MYSTACIDES	sp	2	4	0	1	0
	NECTOPSYCHE	albida	16	15	8	8	10

Order	Genera	Species	Count 1	Count 2	Count 3	Count 4	Count 5
	SETODES	sp	0	0	0	1	1
TRICHOPTERA	TRIAENODES	injusta	0	0	0	0	1
	TRIAENODES	tarda	3	0	0	2	2
	PYCNOPSYCHE	sp	0	0	1	0	0
	PHRYGANEA	sp	0	0	0	0	2
	NYCTIOPHYLAX	sp	0	0	0	0	2
	POLYCENTROPUS	sp	7	5	4	6	6
	NEOPHYLAX	sp	66	89	70	121	62
MEGALOPTERA	SIALIS	sp	3	2	2	3	2
AMPHIPODA	GAMMARUS	sp	10	0	8	0	3
	GAMMARUS	fasciatus	8	47	20	0	10
	GAMMARUS	pseudolimnaeus	1	0	0	0	0
	HYALLELA	azteca	3	0	2	0	1
GASTROPODA	HYDROBIIDAE	unid	1	1	0	0	0
	AMNICOLA	limosa	45	23	90	64	32
	LYOGYRUS	pupoidea	0	1	1	0	0
	BITHYNIA	tentaculata	275	290	343	223	318
	VALVATA	tricarinata	59	98	87	63	47
	PHYSA	heterostropha	40	38	53	42	24
	PHYSELLA	ancillaria	0	0	1	0	0
	PLANORBIDAE	unid	1	1	0	0	1
	GYRAULUS	parvus	7	2	7	23	3
	GYRAULUS	deflectus	29	39	63	13	30
	HELISOMA	anceps	5	0	3	11	4
	HELISOMA	trivolvis/companulata	8	10	22	14	23
	PROMENETUS	exacuous	4	6	8	7	9
BIVALVIA	PISIDIUM	sp	18	9	20	13	19
	PISIDIUM	casertanum	12	8	38	6	13
	PISIDIUM	walkeri	0	0	2	0	0
	PISIDIUM	compressum	0	0	4	1	1
	SPHAERIUM	simule/corneum	9	2	15	7	8
	ELLIPTIO	complanata	3	5	7	3	9
	LAMPSILIS	radiata	1	4	1	1	2
TRICLADIDA	DUGESIA	sp	3	3	2	3	3
	CURA	sp	3	3	0	0	1
	PROCOTYLA	fluviatilis	0	1	0	1	3

Order	Genera	Species	Count 1	Count 2	Count 3	Count 4	Count 5
POLYCHEATA	MANAYUNKIA	speciosa	2	8	4	6	0
OLIGOCHAETA	TUBIFICIDAE	unid	3	11	7	8	8
OLIGOCHAETA	LUMBRICIDAE	UID	2	5	6	5	12
HIRUDINEA	GLOSSIPHONIIDAE	unid	1	0	12	2	18
	ALBOGLOSSIPHONIA	heteroclita	0	0	1	1	0
	GLOSSIPHONIA	complanata	2	2	0	1	1
	HELOBDELLA	fusca	0	3	3	0	1
	HELOBDELLA	triseralis	2	1	0	2	0
	ERPOBDELLIDAE	unid	0	3	0	0	0
HYDRACHNIDIA	UID		0	1	0	1	1

Province Point site 1994

Order	Genera	Species	Count 1	Count 2	Count 3	Count 4	Count 5
COLEOPTERA	STENELMIS	sp	0	1	1	0	1
	STENELMIS	bicarinata	0	1	0	1	1
	STENELMIS	crenata	0	1	0	1	0
	PSEPHENUS	herricki	1	0	0	0	0
	BEROSUS	sp	0	0	1	0	0
DIPTERA	CULICOIDES	sp	5	0	1	0	0
	CORYNONEURA	sp	0	0	1	1	0
	CRICOTOPUS	sp	10	2	7	1	4
	CRICOTOPUS	bisinctus	10	2	8	1	5
	DICROTENDIPES	neomodestus	3	0	0	0	2
	ENDOCHIRONOMUS	sp	1	0	0	0	0
	GLYPTOTENDIPES	sp	0	0	1	0	0
	LABRUNDINIA	sp	1	0	0	0	1
	MICROTENDIPES	sp	0	0	0	0	1
	PARACHIRONOMUS	sp	10	2	1	1	1
	PARATANYTARSUS	sp	6	3	2	0	2
	POLYPEDILUM	illionoense	1	0	0	0	0
	PSECTROCLADIUS	sp	1	0	0	0	0
	PSEUDOCHIRONOMUS	sp	0	0	2	0	0
	SYNORTHOCLADIUS	sp	1	0	0	0	0
	THIENEMANNIELLA	sp	3	0	0	2	0
	XENOCHIRONOMUS	sp	1	0	1	1	1
EPHEMEROPTERA	HEPTAGENIIDAE	imm	16	0	2	0	0
TRICHOPTERA	HYDROPTILA	sp	0	2	2	0	0
	NECTOPSYCHE	albida	5	2	0	0	1
	OECETIS	sp	4	2	0	1	0
	TRIAENODES	injusta	1	0	0	1	0
	POLYCENTROPUS	sp	0	1	1	0	0
LEPIDOPTERA	PETROPHILA	sp	1	0	0	0	0
AMPHIPODA	GAMMARUS	sp	9	4	8	10	5
	GAMMARUS	fasciatus	67	9	36	47	25
	HYALLELA	azteca	3	0	3	4	0
DECAPODA	ORONECTES	sp	1	0	0	0	0
GASTROPODA	UNID		0	0	0	0	1
	AMNICOLA	limosa	196	46	156	118	120

Order	Genera	Species	Count 1	Count 2	Count 3	Count 4	Count 5
	PYRGULOPSIS	lustrica	0	1	0	0	0
GASTROPODA	VALVATA	tricarinata	11	5	10	3	46
	CAMPELOMA	decisa	0	0	1	0	0
	FERRISSIA	parrallelis	34	8	4	10	4
	PHYSA	sp	26	6	16	14	13
	PHYSELLA	ancillaria	1	0	0	0	1
	PLANORBIDAE	unid	1	0	0	0	0
	GYRAULUS	parvus	10	1	0	4	2
	HELISOMA	anceps	2	0	2	0	1
	HELISOMA	trivolvis/companulata	35	16	19	25	16
	PROMENETUS	exacuous	14	0	6	5	8
BIVALVIA	PISIDIUM	sp	32	6	28	47	50
	PISIDIUM	casertanum	19	5	16	16	22
	PISIDIUM	walkeri	1	0	1	0	0
	SPHAERIUM	simule/corneum	9	1	2	10	3
	ELLIPTIO	complanata	9	11	10	8	10
	LAMPSILIS	radiata	6	1	4	2	6
TRICLADIDA	DUGESIA	sp	17	11	4	3	3
	PROCOTYLA	fluviatilis	3	0	4	2	6
RHABDOCOELA	UID		19	2	12	2	9
POLYCHEATA	MANAYUNKIA	speciosa	2	8	3	7	11
OLIGOCHAETA	TUBIFICIDAE	unid	3	0	2	1	2
	LUMBRICULIDAE	unid	5	1	3	0	0
	LUMBRICIDAE	UID	7	0	5	3	5
HIRUDINEA	ALBOGLOSSIPHONIA	heteroclita	3	0	0	0	0
HIRUDINEA	BATRACOBDELLA	phalera	1	1	1	1	1
	HELOBDELLA	triseralis	0	0	1	0	0
	PLACOBDELLA	montifera	0	0	1	1	0
	MOOREOBDELLA	melanostoma	0	0	1	0	1

Savage Point site 1994

Order	Genera	Species	Count 1	Count 2	Count 3	Count 4	Count 5
COLEOPTERA	STENELMIS	sp	0	1	0	1	0
DIPTERA	BEZZIA	sp	1	1	1	0	0
	CULICOIDES	sp	0	1	0	0	0
	ABLABESMYIA	sp	1	1	5	1	2
	CLADOTANYTARSUS	sp	1	2	0	1	1
	CLINOTANYPUS	sp	0	1	0	0	0
	CLADOPELMA	sp	1	0	3	0	0
	CRICOTOPUS	sp	0	3	9	0	5
	CRYPTOCHIRONOMUS	sp	1	0	1	0	0
	DICROTENDIPES	neomodestus	14	14	27	6	14
	ENDOCHIRONOMUS	sp	1	0	0	0	0
	GLYPTOTENDIPES	sp	0	3	0	0	0
	MICROTENDIPES	sp	0	0	1	0	1
	PARACHIRONOMUS	sp	0	0	1	0	0
	PARATANYTARSUS	sp	1	3	0	0	2
	PHAENOPSECTRA	sp	2	0	0	1	0
	POLYPEDILUM	illionoense	2	0	0	0	0
	PROCLADIUS	sp	1	1	7	0	1
	TANYTARSUS	sp	0	0	2	0	2
	THIENEMANNIELLA	sp	0	0	1	0	0
	THIENEMANNEMYIA	sp	0	1	2	0	0
	TRIBELOS	sp	0	0	0	1	0
	XENOCHIRONOMUS	sp	0	1	1	0	1
	MICROPSECTRA	sp	1	0	0	0	0
	PAGASTIELLA	sp	0	0	1	0	0
TRICHOPTERA	HYDROPTILA	sp	0	1	0	0	2
	OECETIS	avara	0	0	0	1	1
	PHRYGANEA	sp	0	0	0	1	1
	PHYLOCENTROPUS	sp	1	3	1	0	0
	POLYCENTROPUS	sp	5	5	15	1	25
	NEOPHYLAX	sp	1	1	0	0	0
ODONATA	ENALLAGMA	sp	0	0	2	0	0
MEGALOPTERA	SIALIS	sp	0	0	0	1	0
AMPHIPODA	GAMMARUS	sp	10	21	10	7	7

Order	Genera	Species	Count 1	Count 2	Count 3	Count 4	Count 5
	GAMMARUS	fasciatus	15	27	50	38	27
	HYALLELA	azteca	2	0	2	0	1
ISOPODA	ASELLUS	racovitzai	204	240	271	288	285
GASTROPODA	UNID		0	4	1	0	0
	AMNICOLA	limosa	12	24	9	15	29
	LYOGYRUS	pupoidea	0	0	1	0	0
	BITHYNIA	tentaculata	4	8	1	6	7
	VALVATA	tricarinata	2	16	8	16	15
	VIVIPARUS	georgianus	2	4	3	0	1
	FERRISSIA	sp	1	0	0	0	0
	PHYSA	heterostropha	3	7	10	11	5
	GYRAULUS	parvus	3	3	5	6	11
	HELISOMA	trivolvis/companulata	0	1	0	1	3
BIVALVIA	MUSCULIUM	partumeium	0	0	0	1	0
	PISIDIUM	sp	12	7	0	0	9
	PISIDIUM	casertanum	2	4	1	6	3
	SPHAERIUM	imm	1	0	0	0	0
	ELLIPTIO	complanata	3	8	7	6	3
	LAMPSILIS	radiata	1	2	4	2	1
TRICLADIDA	DUGESIA	sp	14	0	5	0	1
POLYCHEATA	MANAYUNKIA	speciosa	3	0	0	1	2
OLIGOCHAETA	NAIDIDAE	unid	0	0	2	0	0
	TUBIFICIDAE	unid	5	5	5	6	4
	LUMBRICULIDAE	unid	0	1	0	0	3
	LUMBRICIDAE	UID	2	0	0	0	2
HIRUDINEA	GLOSSIPHONIIDAE	unid	2	0	0	2	0
	ALBOGLOSSIPHONIA	heteroclita	0	0	0	0	1
	BATRACOBDELLA	phalera	1	0	0	1	0
	HELOBDELLA	elongata	0	0	1	0	0
	HELOBDELLA	fusca	0	0	2	0	0
	PLACOBDELLA	montifera	0	0	1	0	0
	MOOREOBDELLA	sp	1	0	0	1	1

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Order	Genera	Species	Count 1	Count 2	Count 3	Count 4	Count 5
COLEOPTERA	DUBIRAPHIA	sp	3	2	12	15	10
	DUBIRAPHIA	vittata	0	1	1	0	0
	STENELMIS	sp	13	22	7	38	30
	STENELMIS	quadrimaculata	1	1	2	9	5
DIPTERA	MALLOCHOHELEA	sp	0	0	0	1	0
	ABLABESMYIA	sp	1	1	1	1	1
	CLADOTANYTARSUS	sp	0	0	0	2	2
	CRICOTOPUS	sp	0	0	0	0	1
	DICROTENDIPES	neomodestus	0	0	2	0	3
	LABRUNDINIA	sp	0	0	0	1	0
	MICROTENDIPES	sp	2	3	4	4	0
	POLYPEDILUM	halterale	0	0	1	0	1
	PROCLADIUS	sp	0	0	1	1	0
	PSEUDOCHIRONOMUS	sp	0	1	4	3	8
	STENOCHIRONOMUS	sp	0	0	0	0	0
	THIENEMANNIELLA	sp	0	0	0	0	1
	THIENEMANNEMYIA	sp	0	0	0	0	1
	TRIBELOS	sp	0	2	5	1	2
EPHEMEROPTERA	CAENIS	sp	1	0	1	1	1
	EPHEMERA	sp	1	0	1	0	0
	STENACRON	interpunctatum	1	0	0	1	1
	STENONEMA	femoratum	1	0	2	1	1
TRICHOPTERA	HELICOPSYCHE	borealis	0	0	1	1	0
	HYDROPTILA	sp	2	0	0	2	3
	CERACLEA	sp	0	0	1	1	0
	MYSTACIDES	sp	0	0	0	2	0
	NECTOPSYCHE	sp	0	0	3	0	0
	SETODES	sp	2	0	1	10	1
	TRIAENODES	tarda	0	0	0	0	0
	APATANIA	sp	1	0	0	0	0
	PSYCHOGLYPHA	sp	0	0	0	0	0
	PSILOTRETA	sp	0	0	0	0	1
	PTILOSTOMIS	sp	0	0	0	1	1
	PHYLOCENTROPUS	sp	0	0	3	2	2
	NEOPHYLAX	sp	0	2	1	2	0

Order	Genera	Species	Count 1	Count 2	Count 3	Count 4	Count 5
MEGALOPTERA	SIALIS	sp	0	0	2	4	1
LEPIDOPTERA	UNID		0	0	0	0	0
AMPHIPODA	GAMMARUS	sp	1	0	0	0	0
	GAMMARUS	fasciatus	0	0	3	3	3
DECAPODA	UNID		0	0	0	0	1
GASTROPODA	AMNICOLA	limosa	2	0	8	3	3
	BITHYNIA	tentaculata	44	144	1051	715	1051
	GONIOBASIS	livescens	1	0	0	0	0
	VALVATA	tricarinata	0	0	1	0	0
	FERRISSIA	sp	0	0	0	1	0
	STAGNICOLA	catascopium	54	49	54	78	92
	PHYSA	heterostropha	11	11	17	14	32
	GYRAULUS	parvus	4	0	6	7	20
	GYRAULUS	deflectus	7	6	24	25	25
	HELISOMA	trivolvis/companulata	1	0	0	0	11
	PROMENETUS	exacuous	2	1	3	21	26
BIVALVIA	PISIDIUM	sp	1	1	3	6	9
	PISIDIUM	casertanum	0	0	8	11	6
	PISIDIUM	henslowanum	0	0	1	0	0
	PISIDIUM	adamsi	0	0	0	0	1
	SPHAERIUM	simule/corneum	1	1	6	4	10
	ELLIPTIO	complanata	7	3	3	4	15
	LAMPSILIS	radiata	0	0	1	1	4
TRICLADIDA	DUGESIA	sp	1	3	0	4	3
RHABDOCOELA	UID		1	0	0	0	0
POLYCHEATA	MANAYUNKIA	speciosa	0	0	1	3	0
OLIGOCHAETA	TUBIFICIDAE	unid	2	17	22	20	10
	LUMBRICULIDAE	unid	0	3	5	5	3
HIRUDINEA	BOREOBDELLA	verrucata	0	4	1	7	3
	MOOREOBDELLA	microstoma	1	1	1	0	2
NEUROPTERA	UID		0	0	0	1	0
HYDRACHNIDIA	UID		2	0	0	1	0