L-Lake Macroinvertebrate Community (U)

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Introduction

To characterize the present benthic macroinvertebrate community of L Lake, Regions 5 and 7 of the reservoir were sampled in September 1995 at the same locations sampled in 1988 and 1989 during the L-Lake monitoring program. The macroinvertebrate community of 1995 is compared to that of 1988 and 1989.

Methods

In September 1995, a total of 72 macroinvertebrate grab samples were collected from 4 transects in Region 5 and 4 transects in Region 7 (Figure 1). Along each transect, three replicate samples of substrate were collected at water depths of 1 meter, 2 meters, and 4 meters using a petite ponar dredge measuring 14.5 centimeters by 16.9 centimeters (5.7 inches by 6.6 inches; 0.02451 cubic meters [0.9 cubic feet]). Samples were placed in a tub with a small amount of water, stirred to break apart clumps of sediment, and then sieved through a 0.5-millimeter (0.02-inch) mesh sieve bucket. Once sieved, each sample was placed in a labeled 1-liter plastic bottle, preserved with 10% formalin containing rose bengal stain, and returned to the laboratory for processing. In the laboratory, each sample was rinsed through a U.S. Standard No. 30 sieve to remove excess formalin and stain. The macroinvertebrates were sorted from the remaining debris using a stereomicroscope, identified to the lowest practical taxon (usually genus), and enumerated. Quality control checks were performed on 10% of the samples in order to ensure a sorting efficiency of greater than 90%. After the organisms were enumerated, they were separated into functional feeding groups following Merritt and Cummins (1984) procedure, dried at 105 °C (221°F), weighed to the nearest milligram, and then ashed at 550 °C (1022°F). Ash-free dry weight was determined by weighing the remaining ash to the nearest milligram and determining the difference between the dry weight and ash weight.

Results

Dominant Taxa

Sixty-seven macroinvertebrate taxa were collected from L Lake during the 1995 sampling effort (Table 1). The most dominant taxa in most samples were oligochaetes (32.8-69.7%) and the amphipod, *Hyalella azteca* (5.6-30.9%; Tables 2 and 3). Other taxa that comprised at least 5% of the organisms in one or more replicates included the chironomid, *Cladotanytarsus* sp.; the bivalves, *Corbicula fluminea* and *Sphaerium* sp.; the caddisflies, *Polycentropus* sp. and *Glyptotendipes paripes;* nematode worms; the flatworm, *Dugesia tigrina*; and the phantom midge, *Chaoborus punctipennis. Chaoborus punctipennis* and *Glyptotendipes* sp. were abundant in samples collected at 4 meters, but were collected infrequently at the shallower sampling locations. Conversely, the relative abundance of oligochaetes decreased with increasing depth (Tables 2 and 3).

Community Structure

The mean number of taxa collected per replicate sample ranged from 12.58 to 16.83 (Tables 2 and 3). Taxa richness in Regions 5 and 7 was similar.

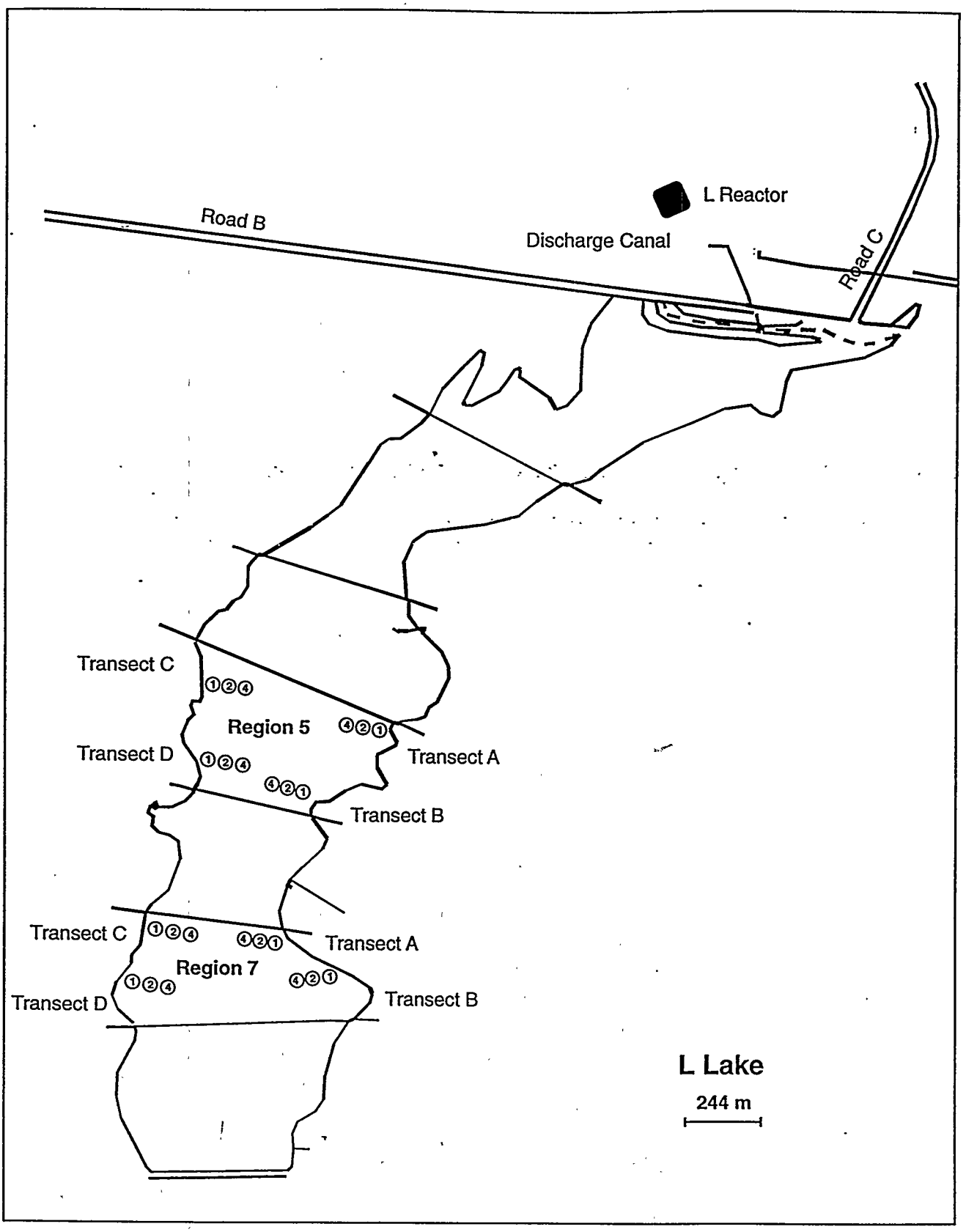

Figure 1. Macroinvertebrate sampling locations in L Lake. September 1995.

Table 1. Benthic macroinvertebrate taxa in L Lake. September 1995.

Taxon	Region 5 depths (m)			Region 7 depths (m)		
	1	2	4	1	2	4
Platyhelminthes						
Tricladidia						
Dugesia tigrina	x	x	x			
Microturbellaria						
Nemertea						
Nematoda		x				
Annelida						
Oligochaeta	x	x	x	x	x	x
Hirudinea						
Mooreobdella tetragon						
Batracobdella sp.						
Helobdella sp.						
Placobdella sp.						
Arthropoda						
Amphipoda						
Hyalella azteca	x	x	x	x	x	x
Acari						
Hydracarina						
Hexapoda						
Ephemeroptera						
Callibaetis sp.						
Caenis sp.						
Hexagenia sp.						
Odonata						
Argia sp.						
Enallagma sp.						
Ischnura sp.						
Epicordulia sp.						
Epitheca sp.						
Aphylla williamsoni						
Gomphus sp.						
Celithemis sp.						
Lepidoptera						
Parapoynx sp.						
Trichoptera						
Orthotrichia sp.						
Oxyethira sp.						
Oecetis sp.						
Neureclipsis sp.						
Phylocentropus sp.						
Polycentropus|sp.					x	
Coleoptera						
Haliplus sp.						
Peltodytes sp.						
Hygrotus farctus						

x = Taxa that comprised at least 5% of the organisms collected in one or more replicate samples.

Table 1 (continued) Benthic macroinvertebrate taxa in L Lake. September 1995.

Taxon	Region 5 depths (m)			Region 7 depths (m)		
	1	2	4	1	2	4
Diptera						
Ceratopogonidae						
Palpomyia sp.						
Chaboridae						
Chaoborus sp.			x			x
Chironomidae						
Chironomini						
Chironomus sp.						
Cryptochironomus spp.						
Cryptotendipes sp.						
Dicrotendipes spp.						
Endochironomus sp.						
Glyptotendipes paripes			x			x
Glyptotendipes sp.						
Microchironomus nigrovittatus						
Nilothauma babiyi						
Parachironomus spp.						
Paracladopelma sp.						
Polypedilum spp.						
Stictochironomus sp.						
Orthocladiinae						
Corynoneura sp.						
Cricotopus sp.						
Nanocladius spp.						
Psectrocladius sp.						
Thienemanniella sp.						
Pseudochironomini						
Pseudochironomus sp.						
Tanypodinae						
Ablabesmyia sp.						
Coelotanypus sp.						
Djalmabatista pulcher						
Labrundinia sp.						
Larsia sp.						
Procladius sp.						
Tanytarsini						
Cladotanytarsus spp.	x	x	x	x		x
Tanytarsus spp.						
Mollusca						
Bivalvia						
Corbicula sp.	x	x	x	x	x	x
Sphaerium sp.				x		
Gastropoda						
Ferrissia sp.						
Physella sp.						
Planorbidae						

x = Taxa that comprised at least 5% of the organisms collected in one or more replicate samples.

Table 2. Summary of L-Lake ponar sample data: mean values for Region 5 at 1-, 2-, and 4-meter depths. September 1995.

Samples	Depth (m) 1	2	4
General descriptions			
Taxa richness	24.50	21.75	20.50
Mean number/m^2	18825.65	15524.28	8622.33
Number of replicates	3	3	3
Mean number taxa/replicate	16.75	13.67	13.83
Biomass (g/m^2)	51.63	80.52	10.79
Percent relative abundance-major taxa (number)			
Turbellaria	4.19	5.46	2.83
Nemertea	0.81	0.10	0.00
Nematoda	1.38	6.94	1.13
Annelida-Oligochaeta	69.70	40.27	33.67
Annelida-Hirudinea	0.45	0.22	0.78
Amphipoda	5.57	30.94	22.68
Hydracarina	0.90	0.38	0.05
Ephemeroptera	0.05	0.10	0.03
Odonata	0.73	0.17	0.07
Lepidoptera	0.03	0.00	0.00
Trichoptera	0.82	1.23	0.48
Coleoptera	0.00	0.00	0.00
Diptera-Ch. Chironomini	0.80	0.81	17.57
Diptera-Ch. Orthocladiinae	0.09	0.06	0.25
Diptera-Ch. Pseudochironomini	0.15	0.04	0.00
Diptera-Ch. Tanypodinae	1.30	0.64	1.83
Diptera-Ch. Tanytarsini	5.56	4.69	5.32
Diptera-other	0.34	1.54	10.04
Mollusca-Bivalvia	6.37	6.13	3.21
Mollusca-Gastropoda	0.74	0.26	0.05
Total	**100.00**	**100.00**	**100.00**
Percent relative abundance-functional feeding group (number)			
Collector-filterers	6.85	6.95	3.34
Collector-gatherers	88.63	89.03	82.32
Herbivores	0.24	0.08	0.00
Predators	3.54	3.67	14.29
Scrapers	0.74	0.26	0.05
Shredders	0.00	0.00	0.00
Total	**100.00**	**100.00**	**100.00**
Percent relative abundance-functional feeding group (biomass)			
Collector-filterers	87.32	97.60	90.38
Collector-gatherers	8.05	1.68	7.94
Herbivores	0.01	0.00	0.00
Predators	4.15	0.63	1.45
Scrapers	0.47	0.09	0.23
Shredders	0.00	0.00	0.00
Total	**100.00**	**100.00**	**100.00**

Table 2 (continued). Summary of L-Lake ponar sample data: mean values for Region 5 at 1-, 2-,

Samples	Depth (m) 1	2	4
Mean percent relative abundance of dominant taxa (>5% in one or more samples)			
Nematoda	1.38	6.94	1.13
Dugesia tigrina	3.31	4.30	2.58
Oligochaeta	69.70	40.27	33.67
Hyalella azteca	5.57	30.94	22.68
Chaoborus sp.	0.00	1.16	9.28
Cladotanytarsus sp.	4.94	4.44	4.72
Glyptotendipes paripes	0.00	0.14	14.17
Corbicula sp.	6.37	6.05	3.10

In general, fewer taxa were collected as water depth increased. Densities of organisms were somewhat higher in Region 5 (8622 to 18,826 organisms per square meter [m^2]) than in Region 7 (7184 to 11,628 organisms/m^2). In both regions, densities decreased with increasing depth. Macroinvertebrate standing crop (biomass) was also considerably higher in Region 5 at the 1-meter and 2-meter depths (51.6 grams [g]/m^2 and 80.5 g/m^2, respectively) than in Region 7 (12.2 and 27.4 g/m^2, respectively), but the biomass of samples collected at a depth of 4 meters in Region 7 (16.6 g/m^2) was somewhat higher than that at 4 meters in Region 5 (10.8 g/m^2).

Community Function

Collector-gatherers were by far the most abundant functional feeding group collected in Regions 5 and 7 of L Lake, comprising 73.4-89.4% of the organisms collected (Tables 2 and 3). Most of the collector-gatherers were worms, amphipods, or chironomids.

Collector-filterers accounted for 3.3-7.5% of the organisms collected from the ponar grab samples and were almost all bivalves. Predators accounted for 14.3% and 20.8% of the organisms collected from 4-meter depths, but less than 4% of the organisms collected from 1- and 2-meter depths. The phantom midge, *Chaoborus punctipennis*, which is a predator that resides in the deep-water sediments and rises at night to feed in the water column, was the dominant predator in the 4-meter samples. The remaining functional feeding groups (herbivores, scrapers, and shredders) each accounted for less than 2% of the organisms collected.

With respect to functional group biomass, collector-filterers were dominant, accounting for 66.2-97.6% of the biomass at a sampling location. The relatively large size of filter-feeding bivalves accounted for the large filterers-feeder biomass. In Region 7, collector-gatherer biomass was higher (13.2-22.7%) than in Region 5 (1.7-8.0%). The remaining functional feeding groups each accounted for less than 5% of the total biomass at a sampling location.

Changes in the Macroinvertebrate Community of L Lake Since 1988 and 1989

The taxonomic composition of the L-Lake macroinvertebrate community has changed considerably since the macroinvertebrate community was last sampled in the late 1980s. The relative abundance of Chironomini midges has declined substantially, while amphipods, oligochaetes, Tanytarsini midges, Turbellaria, bivalves (primarily *Corbicula fluminea*), and the phantom midge, *Chaoborus punctipennis*, have increased in abun-

Table 3. Summary of L-Lake ponar sample data: mean values for Region 7 at 1-, 2-, and 4-meter depths. September 1995.

Samples	Depth (m) 1	2	4
General descriptions			
Taxa richness	27.25	22.25	20.00
Mean number/m^2	11627.91	7510.54	7184.14
Number of replicates	3	3	3
Mean number taxa/replicate	16.83	12.58	12.67
Biomass (g/m^2)	12.18	27.38	16.61
Percent relative abundance-major taxa (number)			
Turbellaria	1.79	0.69	2.87
Nemertea	0.27	0.00	0.00
Nematoda	1.97	5.71	4.41
Annelida-Oligochaeta	56.70	44.69	32.77
Annelida-Hirudinea	0.30	0.46	0.52
Amphipoda	20.55	28.99	23.82
Hydracarina	0.06	0.42	0.06
Ephemeroptera	0.07	0.17	0.09
Odonata	1.57	0.38	0.14
Lepidoptera	0.00	0.00	0.00
Trichoptera	1.17	2.30	0.59
Coleoptera	0.10	0.00	0.00
Diptera-Ch. Chironomini	1.23	3.37	5.38
Diptera-Ch. Orthocladiinae	0.80	0.36	0.13
Diptera-Ch. Pseudochironomini	2.11	0.35	0.04
Diptera-Ch. Tanypodinae	2.71	0.66	1.38
Diptera-Ch. Tanytarsini	2.33	3.08	4.19
Diptera-other	0.58	0.90	18.32
Mollusca-Bivalvia	4.18	5.83	4.79
Mollusca-Gastropoda	1.52	1.63	0.51
Total	**100.00**	**100.00**	**100.00**
Percent relative abundance-functional feeding group (number)			
Collector-filterers	5.17	7.46	5.22
Collector-gatherers	89.40	87.35	73.42
Herbivores	0.20	0.58	0.04
Predators	3.72	2.98	20.81
Scrapers	1.52	1.63	0.51
Shredders	0.00	0.00	0.00
Total	**100.00**	**100.00**	**100.00**
Percent relative abundance-functional feeding group (biomass)			
Collector-filterers	66.18	68.10	83.19
Collector-gatherers	22.67	20.71	13.23
Herbivores	0.05	0.69	0.02
Predators	8.24	3.09	2.83
Scrapers	2.86	7.40	0.74
Shredders	0.00	0.00	0.00
Total	**100.00**	**100.00**	**100.00**

Table 3 (continued). Summary of L-Lake ponar sample data: mean values for Region 7 at 1-, 2-, and 4-meter depths. September 1995.

Samples	Depth (m)		
	1	2	4
Mean percent relative abundance of dominant taxa (>5% in one or more samples)			
Nematoda	1.97	5.71	4.41
Dugesia tigrina	1.68	0.69	2.60
Oligochaeta	56.70	44.69	32.77
Hyalella azteca	20.55	28.99	23.82
Polycentropus sp.	1.00	1.56	0.44
Chaoborus sp.	0.06	0.05	17.76
Cladotanytarsus sp.	3.02	2.55	4.03
Glyptotendipes paripes	0.43	1.02	3.57
Corbicula sp.	2.72	4.85	3.76
Sphaerium sp.	1.46	0.97	1.02

dance. Amphipods exhibited the greatest increase in relative abundance. In 1988 and 1989, amphipods accounted for less than 1% of the macroinvertebrates collected at all locations except Region 7, 2-meter depth, where they were locally abundant and comprised 18.57% of the organisms collected (unpublished data). However, in 1995, amphipods were abundant at all sampling locations, comprising 5.57-30.94% of the benthic fauna.

The shift in the structure of the macroinvertebrate community is due, at least in part, to the development of beds of aquatic macrophytes in L Lake as the reservoir matured. L Lake was filled in October 1985. In 1988 and 1989, L Lake supported a still relatively immature ecosystem that was undergoing rapid succession. By 1995, the reservoir was 10 years old and had sufficient time to develop a more mature ecosystem with some early successional species replaced by other species as the ecosystem became more stable.

In 1988 and 1989, macroinvertebrate densities were highest in the samples collected from the 2-meter depth of Region 5 (22,593 organisms/m^2 in 1988 and 22,907 organisms/m^2 in 1989; Table 4). Densities at 2 meters in Region 7 were substantially lower, averaging 13,873 organisms/m^2 in 1988 and 11,270 organisms/m^2 in 1989. In contrast, in the samples collected at a depth of 4 meters, densities were somewhat higher in Region 7 (7378 and 8598 organisms/m^2 in 1988 and 1989, respectively) than in Region 5 (5346 and 4244 organisms/m^2 in 1988 and 1989, respectively). In both regions and in both years, macroinvertebrate densities were substantially higher at a depth of 2 meters than at 4 meters.

Macroinvertebrate densities in 1995, collected from a depth of 2 meters in both Region 5 (15,524 organisms/m^2) and Region 7 (7510 organism/m^2), were substantially lower than densities at the same locations in 1988 and 1989. However, densities at the 4-meter depth were fairly similar among years. In new reservoirs, secondary production is often high during the first several years, but tends to decline as the reservoir ecosystems mature (Paterson and Fernando 1970; Voshell and Simmons 1984). Thus, the higher densities observed at 2-meter depths during the early years of L Lake's development probably are related to the early successional stage of the reservoir.

Conclusions

The species composition of L Lake's macroinvertebrate community has changed con-

Table 4. L-Lake ponar sample data from Regions 5 and 7. 1988 and 1989.

Year	1988	1988	1988	1988	1989	1989	1989	1989
Region	5	5	7	7	5	5	7	7
Depth (meters)	2	4	2	4	2	4	2	4
Percent relative abundance								
Turbellaria	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nematoda	1.55	9.16	1.14	1.81	1.76	0.76	0.58	0.00
Annelida-Oligochaeta	14.62	18.56	12.22	15.94	7.79	41.51	41.19	33.11
Annelida- Hirudinea	0.05	0.00	0.00	0.00	0.04	0.00	0.00	0.00
Amphipoda	0.00	0.00	0.00	0.00	0.54	0.00	18.57	0.00
Hydracarina	0.05	0.00	0.04	0.00	0.04	0.00	0.00	0.00
Ephemeroptera	0.00	0.16	0.59	0.00	0.70	0.00	0.15	0.00
Odonata	0.00	0.00	0.00	0.00	0.23	0.00	0.54	0.00
Trichoptera	0.05	0.00	0.20	0.00	0.24	0.00	0.30	0.00
Coleoptera	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00
Homoptera	0.00	0.00	0.00	0.00	0.04	0.00	0.05	0.00
Diptera-Ch. Chironomini	81.46	65.72	81.41	71.50	82.58	31.64	22.13	43.15
Diptera-Ch. Orthocladiinae	0.03	0.00	0.04	0.00	0.07	0.00	0.05	0.00
Diptera-Ch. Pseudochironomini	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diptera-Ch. Tanypodinae	0.24	1.78	1.25	4.35	1.93	6.64	2.86	1.00
Diptera-Ch. Tanytarsini	0.00	3.15	0.19	0.62	0.21	2.91	1.37	0.55
Diptera- Ceratopogonidae	0.42	0.31	0.76	0.00	0.47	1.21	0.48	0.60
Diptera- Chaoborus	0.00	0.75	0.00	5.28	0.00	10.21	1.01	20.11
Diptera-Other	0.21	0.45	1.87	0.52	2.49	0.56	1.06	0.52
Mollusca-Bivalvia	1.23	0.00	0.28	0.00	0.80	4.59	2.41	0.97
Mollusca-Gastropoda	0.00	0.00	0.04	0.00	0.07	0.00	0.00	0.00
Density (number/m^2)	22,593.40	5,345.70	13,872.90	7,378.40	22,906.90	4,243.80	11,270.20	8,598.50

siderably since 1988-1989, due primarily to maturation of the reservoir ecosystem. L Lake contains a reasonably diverse macroinvertebrate community that is capable of supporting higher trophic levels, including a diverse assemblage of fish species. The L-Lake macroinvertebrate community is similar to those of many other southeastern reservoirs, and there is no indication that the macroinvertebrate community is perturbed by chemical or physical stressors.

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