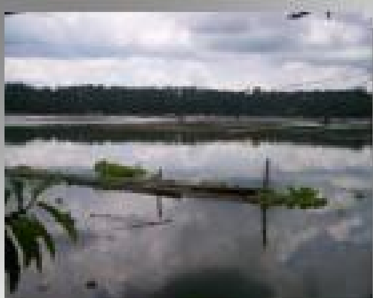
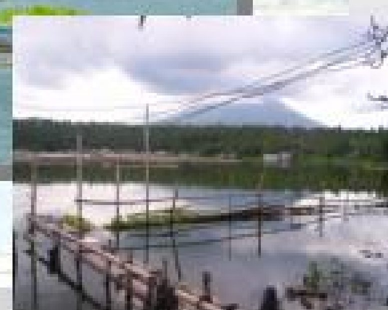
Water Quality Report on

BUNOT LAKE





LAGUNA LAKE DEVELOPMENT AUTHORITY

Environmental Quality Management Division

WATER QUALITY REPORT ON
BUNOT LAKE
1996 – 2005

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BUNOT LAKE

LAKE FEATURES

Bunot Lake has a surface area of 30.5 hectares (305,000 sq. m.) with a maximum depth of 23 meters. It is circular in shape. It is 4.5 km away from the city proper.

As of July 2006, there are 183 fish pen and fish cage operators occupying an area of 93,433 sq. m. equivalent to 30.6 % of the lake area.

WATER QUALITY MONITORING PROGRAM

The Laguna Lake Development Authority (LLDA), by virtue of RA 4850, as amended, has the primary responsibility to promote the development of the Laguna de Bay region, while providing for environmental management and control, preservation of the quality of life and ecological systems, and the prevention of undue ecological disturbance, deterioration and pollution.

The LLDA has been conducting regular water quality monitoring with the following objectives:

- To accurately assess the suitability of the lake for all its present and intended beneficial uses;

- To evaluate the impacts of development activities on the lake's water quality that will serve as important criteria for environmental planning and management.

Routine monitoring programs conducted by LLDA include the Laguna de Bay and its tributaries as well as the Seven Lakes of San Pablo City and Tadlac Lake in Los Banos.

One water quality monitoring station was established for Bunot Lake. During the conduct of the sampling activity, water temperature and dissolved oxygen concentration are measured at the surface and at 2,3,4,5,6,10,15, and 20 meters depth. A gallon of composite water from surface to 5-meter depth is also collected for chemical analysis. The chemical parameters analyzed at the laboratory include pH, total suspended solids (TSS), total dissolved solids (TDS), turbidity, chloride, nitrate, ammonia, inorganic phosphate, biochemical oxygen demand (BOD) and chemical oxygen demand (COD). Zooplankton sample is collected by passing five pails of surface lakewater through a 35-micron mesh-sized plankton net. Zooplankton sample is preserved in a 10% formalin solution. On the other hand, phytoplankton sample is taken from a gallon of composite sample, placed in small plastic container and preserved with Lugol's solution. Water transparency is likewise measured and all the physical observations including weather condition are noted and recorded.

At present, monitoring is conducted during the first (January, February, March) and last quarters (October, November and December) and in June and September.

EVALUATION OF RESULTS

Although monitoring of Bunot Lake was conducted since the 1980s, some problems were encountered, such as equipment breakdown, power interruptions and lack of chemicals such that analyses of some parameters were not completed.

This report presents the water quality monitoring data from 1996 to 2005 since this period represented a more complete set of data. Data for 2001 was incomplete due to the laboratory repair at that time, hence, were not included in the statistical analysis.

Monthly data and annual averages are presented in Table 1. The variations of key parameters for the past ten years from 1996 to 2005 are depicted in the figures using a three-year moving trend analysis based on annual means.

Assessment of the water quality was based on the criteria for key parameters for Class C Waters as provided in the DENR Administrative Order No. 34.

Table 1. Water Quality Monitoring Data of Bunot Lake from 1996 to 2005

	pH	COD	BOD	NH3	NO3	IPO4	TDS	TSS	Cl
DATE	**units**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
1996									
31-Jan-96	7.3	48	7	0.0130	2.3230	1.5000	202	33	15
12-Feb-96	7.3	52	6	1.7730	0.0990	1.2350	221	40	15
20-Mar-96	7.8	40	13	0.8830	0.4270	1.2620	239	47	15
19-Jun-96	7.4	268	7	1.7080	0.0020	0.9190	215	127	19
04-Sep-96	7.4	32	5	0.2540	0.0880	0.6080	209	3	11
05-Nov-96	7.3	88	5	0.6410	0.0440	0.6270	172	93	11
16-Dec-96	7.6	8	4	0.6850	0.0610	0.8840	205	30	15
Average:	7.4	77	7	0.8510	0.4349	1.0050	209	53	14
Std. Dev.	0.2	88	3	0.6728	0.8444	0.3383	20	42	3
1997									
27-Jan-97	7.0	88	34	0.5717	0.0692	1.1156	242	34	15
03-Feb-97	6.8	26	6	0.2671	0.0645	1.3026	214	12	15
06-Mar-97	7.3	56	6	0.4299	0.0221	1.0328	184	5	15
27-May-97	7.0	*	6	0.5808	0.0071	0.6430	322	15	10
14-Jul-97	6.9	32	10	1.6510	0.0170	0.9090	152	9	15
28-Oct-97	7.5	24	5	0.1632	0.0042	0.5279	190	2	11
24-Nov-97	7.4	28	8	0.5935	0.0132	0.6016	210	14	11
04-Dec-97	7.3	28	8	0.5101	0.0020	0.6581	200	3	12
Average:	7.2	40	10	0.5959	0.0249	0.8488	214	12	13
Std. Dev.	0.3	24	10	0.4542	0.0267	0.2822	51	10	2
1998									
08-Jan-98	6.9	40	20	2.5864	0.0925	1.2452	190	11	26
16-Feb-98	7.3	44	5	0.8538	0.3870	0.1361	205	2	30
18-Mar-98	8.0	32	5	0.0108	0.0123	0.1177	224	4	22
21-May-98	7.0	44	7	0.9360	0.0028	1.1245	207	7	15
13-Jul-98	6.8	12	11	2.0300	0.0110	1.3250	235	3	22
07-Sep-98	7.1	64	9	0.4190	0.0060	0.5800	207	2	15
14-Oct-98	6.9	40	8	0.9170	0.0060	0.6380	190	13	19
11-Nov-98	7.0	20	16	0.5887	0.0060	0.5294	220	8	4
01-Dec-98	6.5	24	18	1.6800	<0.0020	1.0120	201	4	7
Average:	7.1	36	11	1.1135	0.0655	0.7453	209	6	18
Std. Dev.	0.4	16	6	0.8247	0.1333	0.4543	15	4	8

0 Noncompliance with DAO 34 Water Quality Criteria Class C WAters

DATE	pH units	COD mg/L	BOD mg/L	NH3 mg/L	NO3 mg/L	IPO4 mg/L	TDS mg/L	TSS mg/L	Cl mg/L
1999									
26-Jan-99	6.8	520	36	4.2570	0.0250	1.9760	136	408	11
22-Feb-99	6.7	152	9	*	*	1.5400	210	128	7
18-Mar-99	7.8	42	9	0.5642	0.2080	1.2400	193	7	7
17-May-99	6.9	30	5	0.6381	0.0218	1.1390	179	27	7
19-Jul-99	6.8	32	7	3.6980	0.0202	1.2950	191	5	7
14-Sep-99	6.8	22	30	2.216	0.002	1.1600	191	1	11
14-Oct-99	6.4	676	6	2.6832	0.0171	1.6260	187	146	11
22-Nov-99	6.6	64	5	2.2208	0.0218	1.0524	196	24	11
06-Dec-99	6.6	20	6	3.5324	0.0346	1.0275	215	1	15
Average:	6.8	173	13	2.4762	0.0438	1.3395	189	83	10
Std. Dev.	0.4	247	12	1.3622	0.0670	0.3145	23	134	3
2000									
19-Jan-00	6.6	40	15	2.5487	0.0684	1.258	214	13	11
09-Feb-00	6.8	44	7	2.3825	0.0247	1.8598	239	3	15
08-Mar-00	7	48	4	2.7456	0.1361	1.4314	206	47	7
10-May-00	6.7	16	8	1.4420	0.0092	1.5172	231	14	7
24-Jul-00	6.9	12	7	1.3552	0.0057	1.4372	202	6	11
13-Sep-00	6.7	30	10	0.8944	0.0484	1.1938	211	13	11
05-Oct-00	6.6	32	11	0.211	0.0020	0.9402	192	27	7
08-Nov-00	6.8	34	13	1.1788	0.0774	1.2546	206	6	7
06-Dec-00	6.8	20	10	2.128	0.0015	0.9648	186	31	15
Average:	6.8	31	9	1.6540	0.0415	1.3174	210	18	10
Std. Dev.	0.1	13	3	0.8490	0.0458	0.2852	17	14	3
2002									
29-Jan-02	7.0	112	5	6.8148	0.0417	1.798	218	2	7
13-Feb-02	7.2	22	19	6.2897	0.0598	1.0669	230	7	9
13-Mar-02	7.0	60	8	5.7404	0.5955	1.6208	234	44	9
6-Jun-02	6.9	24	9	4.6299	0.0298	1.4017	223	9	11
17-Sep-02	6.8	40	10	2.2232	0.2401	1.4137	191	9	15
9-Oct-02	6.7	52	14	2.8581	0.0258	1.6626	171	39	15
9-Oct-02	6.7	52	14	2.8581	0.0258	1.6626	171	39	15
19-Nov-02	7.2	32	3	0.5188	0.0218	0.7835	221	15	15
11-Dec-02	7.3	16	9	1.9632	0.0774	0.882	194	3	15
Average:	7.0	46	10	3.7662	0.1242	1.3658	206	19	12
Std. Dev:	0.2	29	5	2.183	0.190	0.370	25	17	3
2003									
15-Jan-03	7.2	2	8	2.091	0.001	0.8543	204	7	11
12-Feb-03	6.8	75	11	6.2879	0.0317	1.5852	201	55	7
18-Mar-03	7.3	35	10	1.773	0.1871	1.4635	224	10	9
17-Jun-03	6.8	27	10	2.3384	0.1563	1.246	218	6	7
10-Sep-03	6.8	47		9.6856	0.1172	1.5858	196	16	19
15-Oct-03	6.7	43	16	3.007	0.0705	1.0496	197	26	15
12-Nov-03	6.5	2		3.4023	0.2336	0.4996	199	8	26
10-Dec-03	7	44	8	2.0427	0.001	0.737	191	17	33
Average:	6.9	34	11	3.8285	0.0998	1.1276	204	18	16
Std. Dev:	0.3	24	3	2.774	0.088	0.410	11	16	10

0 Noncompliance with DAO 34 Water Quality Criteria
Class C WAters

DATE	pH units	COD mg/L	BOD mg/L	NH3 mg/L	NO3 mg/L	IPO4 mg/L	TDS mg/L	TSS mg/L	CI mg/L
2004									
14-Jan-04	6.9	234	13	4.6312	0.0793	2.679	506	4	45
11-Feb-04	6.8	93	8	1.69	0.2608	1.3951	158	76	41
10-Mar-04	6.6	38	6	2.4128	0.6671	1.1794	213	8	22
16-Jun-04	6.6	76	1	3.9486	0.0593	2.7333	173	295	18
15-Sep-04	6.6	11	14	5.8225	0.1996	2.0859	203	2	19
13-Oct-04	6.7	34	14	6.9996	0.0759	2.054	176	46	15
18-Nov-04	6.6	27	13	8.3342	0.0556	1.3605	182	20	19
9-Dec-04	6.5	51	11	4.5264	0.0023	1.7888	220	35	11
Average:	6.7	71	10	4.7957	0.1750	1.9095	229	61	24
Std. Dev:	0.1	71	5	2.222	0.216	0.590	114	98	12
2005									
12-Jan-05	7	154	15	2.1793	0.2102	0.6921	887	324	33
16-Feb-05	6.5	31	10	5.071	0.0639	1.4358	196	9	11
9-Mar-05	6.5	38	12	4.2739	0.0372	1.2081	190	28	11
15-Jun-05	6.9	42	14	0.3751	0.041	1.3874	183	19	11
13-Sep-05	6.7	31	18	3.02	0.0123	1.1654	166	0.5	11
19-Oct-05	7.2	27	9	0.798	0.02	0.6488	170	5	15
16-Nov-o5	6.8	8	14	3.068	0.1272	0.9	208	2	7
14-Dec-05	6.7	43	14	3.8024	0.0139	1.662	185	18	8
Average:	6.8	47	13	2.8235	0.0657	1.1375	273	51	13
Std. Dev:	0.2	45	3	1.635	0.069	0.364	248	111	8

0 Noncompliance with DAO 34 Water Quality Criteria
Class C WAters

pH

pH is not a pollutant but rather a convenient measure of the hydrogen ion or hydroxyl ion concentrations in solution.

The pH of water may influence the species composition of an aquatic environment and affect the availability of nutrients and relative toxicity of many trace elements.

For Class "A" and Class "C" waters, the permissible pH range is 6.5 to 8.5, based on DAO 34.

Annual averages in Bunot Lake satisfactorily met the allowable pH (Table 1). However, the following graph shows that pH exhibited a decreasing trend. This is indicative of the increasing organic wastes in the lake.

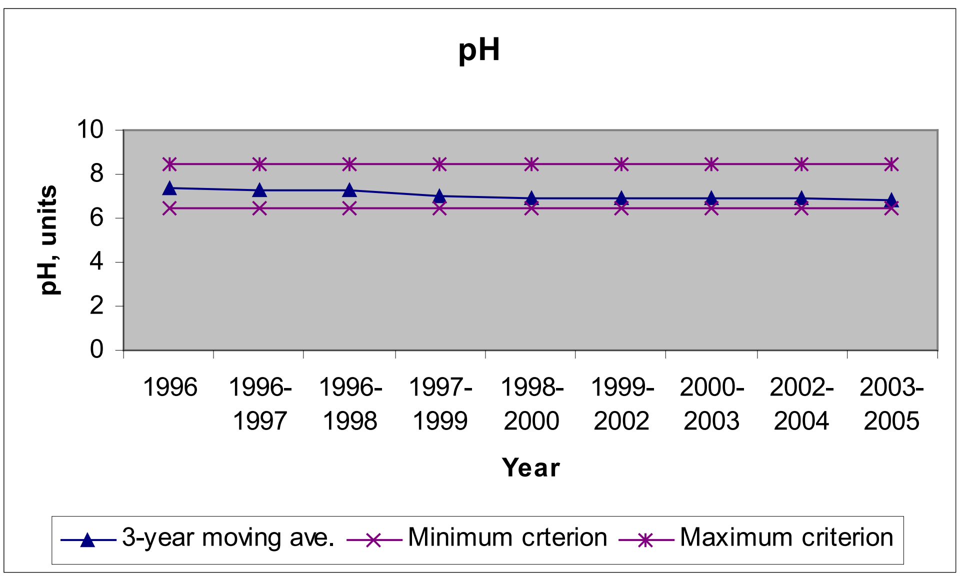

Figure 1. Three-year trend of pH values in Bunot Lake

Nitrate (NO3)

Nitrate is the principal form of combined nitrogen found in natural waters. Nitrogen compounds come from chemical fertilizers from cultivated lands and drainage from livestock feed-lots, as well as domestic and industrial waters.

In surface waters, nitrate is a common nutrient taken up by plant and converted into cell protein. Since nitrates stimulate plant growth, aquatic organisms (such as algae) flourish in the presence of nitrates and excessive amounts of nitrate may result in the prolific growth of aquatic plants.

The Class "C" water quality criterion for nitrate is set at 10 mg/L in lakes, reservoirs and similarly impounded water.

The nitrate values in Bunot Lake were way below the set criterion. Based on the graph, there was an abrupt decrease from 1996 to 1999, and afterwards a slight increase.

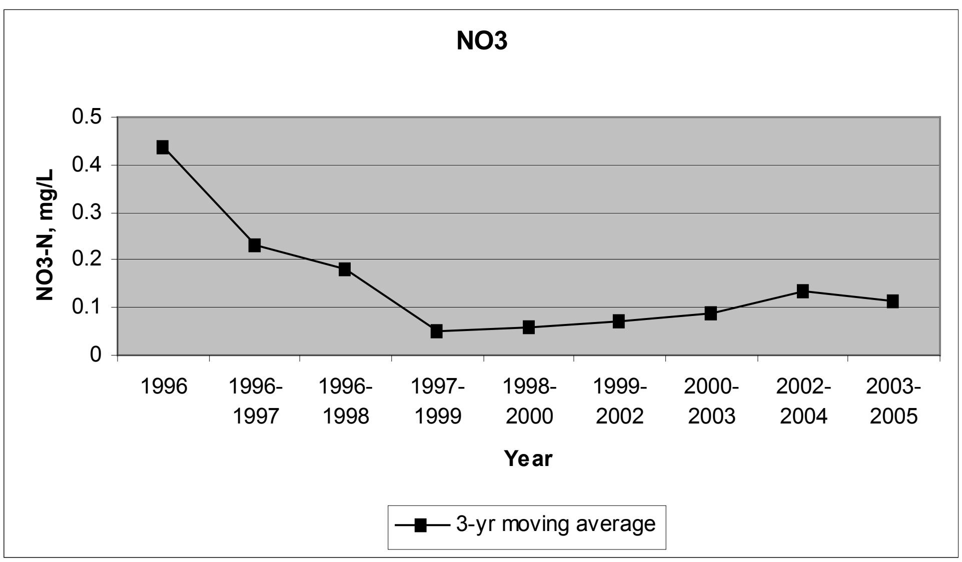

Figure 2. Three-year trend of nitrate levels in Bunot Lake

Ammonia (NH3)

Ammonia occurs naturally in water bodies arising from the breakdown of nitrogenous organic and inorganic matter in soil and water, excretion by biota, reduction of the nitrogen gas in water by micro-organisms and from gas exchange with the atmosphere. It is also discharged into water bodies by some industrial processes and also as a component of municipal or community waste. At certain pH levels, high concentrations of ammonia are toxic to aquatic life and therefore, detrimental to the ecological balance of water bodies.

Unpolluted waters contain small amounts of ammonia and ammonia compounds, usually $<$0.1 mg/L as nitrogen. Total ammonia concentrations measured in surface waters are typically $<$0.2mg/L N but may reach 2 to 3 mg/L N. Higher concentrations could be an indication of organic pollution such as domestic sewage, industrial waste and fertilizer run-off. Natural seasonal fluctuations also occur as a result of the death and decay of aquatic organisms, particularly phytoplankton and bacteria in nutritionally rich waters. High ammonia concentrations may also be found in the bottom waters of lakes which have become anoxic.

Bunot Lake had high concentrations of ammonia and showed an increasing trend. This is a proof of the worsening organic pollution in the lake.

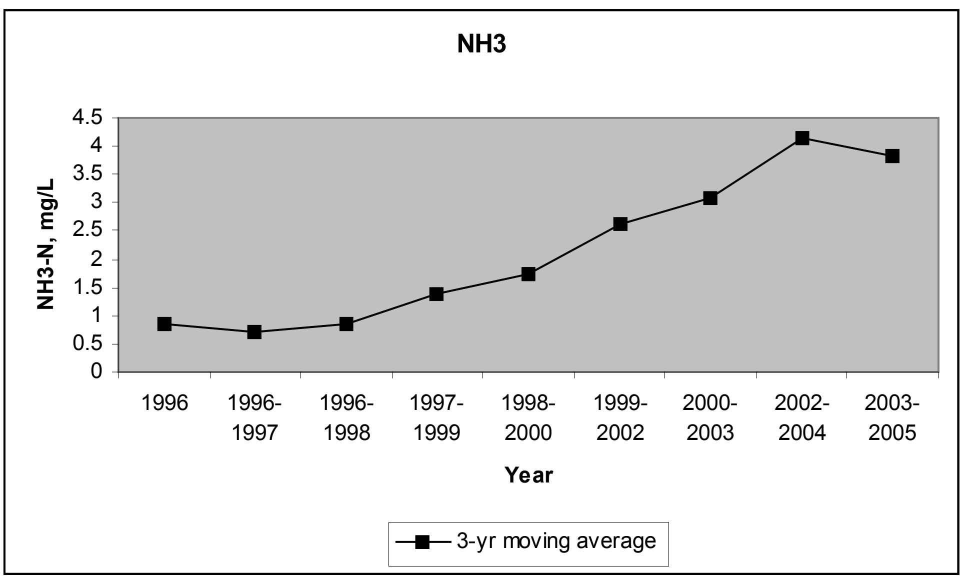

Figure 3. Three-year trend of ammonia levels in Bunot Lake

Inorganic Phosphate (IPO4)

Inorganic phosphate may occur in surface water as a result of leaching from minerals or ores in natural processes of degradation of organic matter, and as an element of municipal sewage and industrial effluents.

The discharge of excessive amount of phosphates to streams or lakes may result in an over-abundance of algae. Upon decay, dead algae compete for the dissolved oxygen endangering fish life and giving off unpleasant odor.

For Class "C" waters, the allowable phosphate concentration is set at 0.4 mg/L. When applied to lakes and reservoir, the phosphate concentration should not exceed an average of 0.05 mg/L nor a maximum of 0.1 mg/L.

Phosphate concentrations in Bunot Lake were way above the set criterion for Class C waters and exhibited an increasing trend.

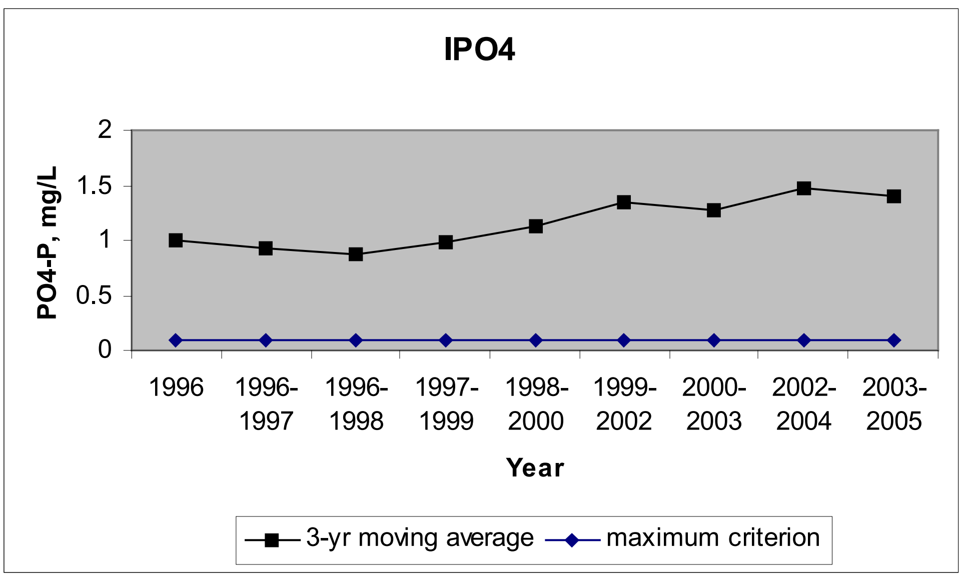

Figure 4. Three-year trend of phosphate levels in Bunot Lake

Total Dissolved Solids (TDS)

Total dissolved solids (TDS) is an index of the amount of dissolved substances in water. High concentrations of TDS limit the suitability of water as a drinking source and for irrigation. High surface run-off and overland flow contribute dissolved materials to receiving bodies of water. Significant contributions to the TDS loads are antrhropogenic in the form of municipal and industrial effluents and agricultural run-off.

Annual average for TDS in Bunot Lake was almost steady except for an abrupt increase in 2005.

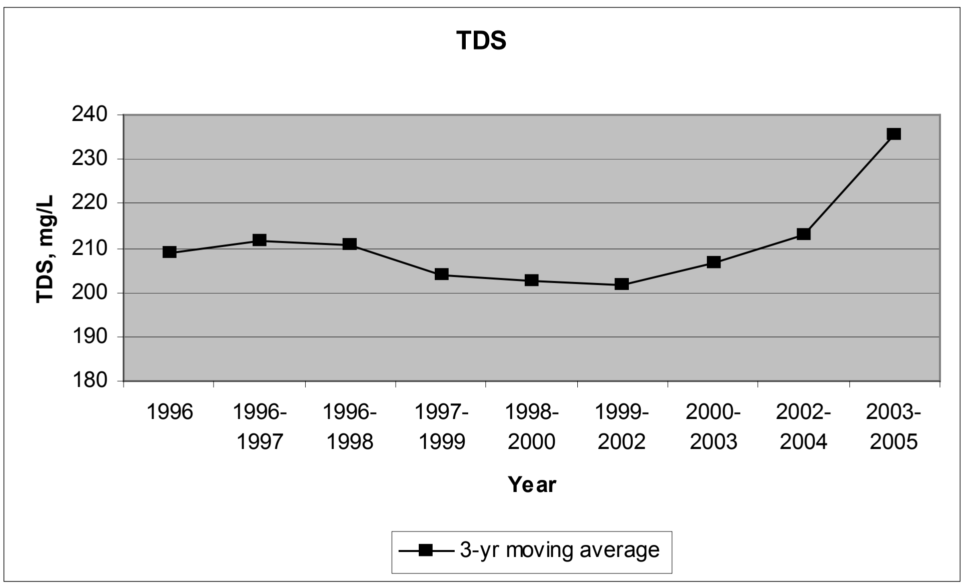

Figure 5. Three-year trend of TDS levels in Bunot Lake

Total Suspended Solids (TSS)

The type and concentration of suspended matter controls the turbidity and transparency of the water. Suspended matter consists of silt, clay, fine particles of organic and inorganic matter, soluble organic compounds, plankton and other microscopic organisms.

TSS values for Bunot Lake fluctuated over the ten-year monitoring period.

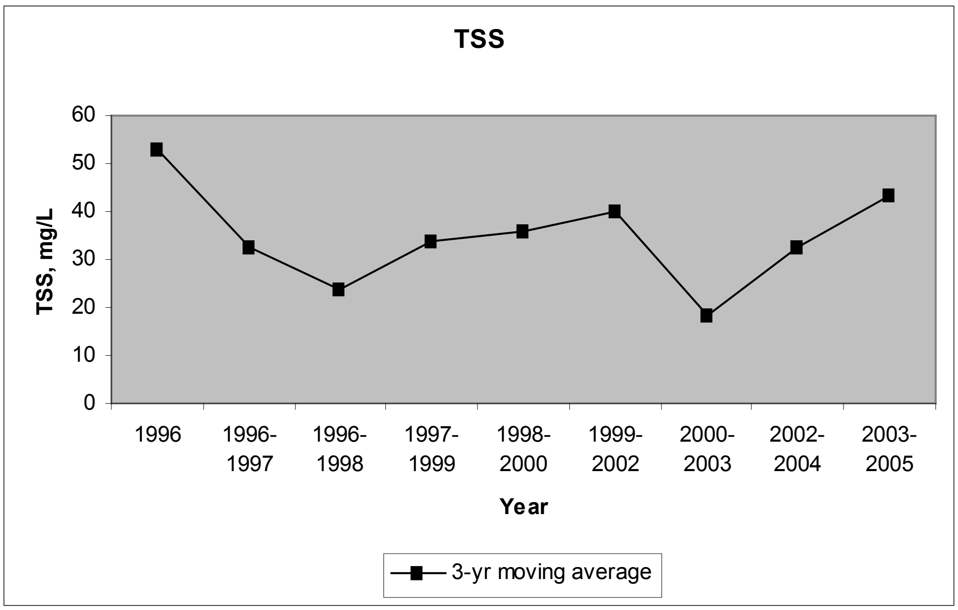

Figure 6. Three-year trend of TSS levels in Bunot Lake

Chloride

Chloride is a major inorganic anion that occurs in variable concentrations in natural waters.

Chlorides may be found in sulphatic and calcareous deposits. The weathering and leaching of sedimentary rocks and soils release chlorides to water. The disinfection of domestic sewage and industrial processes that use chlorine in bleaching operations or to control organisms growing in cooling systems may produce residual chlorine concentrations, which are subsequently transformed to chlorides. Household cleanser is another common source of chloride.

Chloride concentrations in Bunot Lake remained low being a freshwater lake.

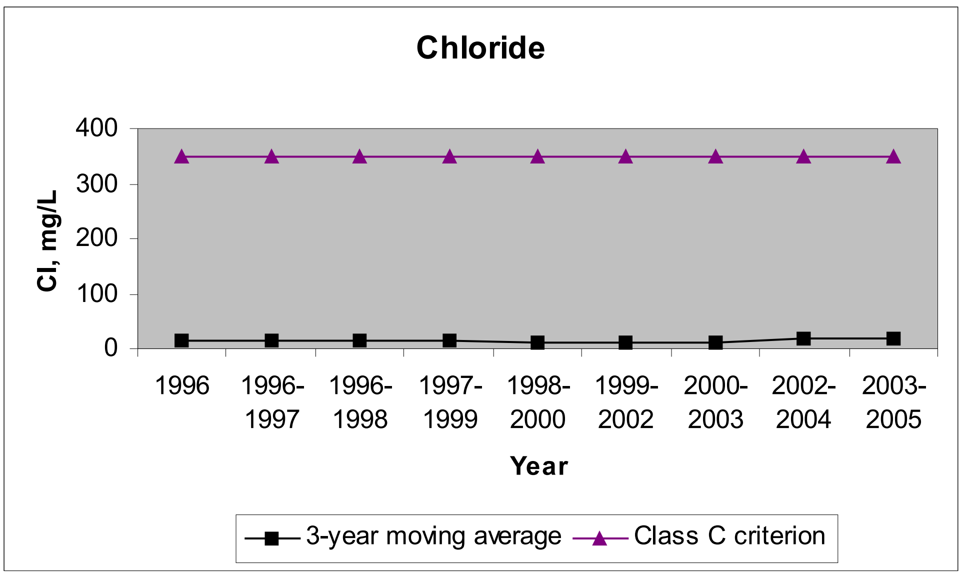

Figure 7. Three-year trend of chloride levels in Bunot Lake

Biochemical Oxygen Demand (BOD)

Biochemical Oxygen Demand (BOD) is a measure of the amount of biodegradable organic matter found in water. Bacteria utilize organic matter in their respiration and remove oxygen from the water.

High BOD load could lead to dissolved oxygen depletion which will be fatal to living organisms in the water.

There were several occasions of high BOD values in Bunot Lake (Table 1) such that the annual averages exceeded the Class C criterion in 1998, 1999, 2003 and 2005.

The high BOD trend is illustrated in the next figure.

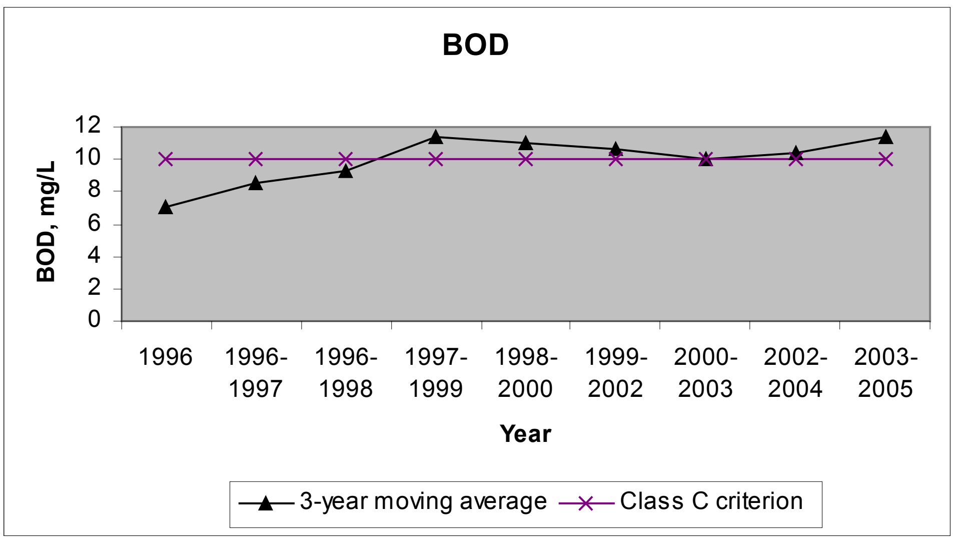

Figure 8. Three-year trend for BOD levels in Bunot Lake

Chemical Oxygen Demand (COD)

COD is a measure of oxidizable substances, both organic and inorganic, found in the water.

The COD test can be used to estimate the BOD load and is a faster and easier method to use.

The highest annual average for COD at 173 mg/L was taken in 1999 while the lowest annual average at 31 mg/L was noted in 2000.

From Figure 9, the COD had a decreasing trend from 1996 to 1998, increased in 1999 and almost uniform up to 2002, decreased in 2003 and again increased in 2004 and 2005.

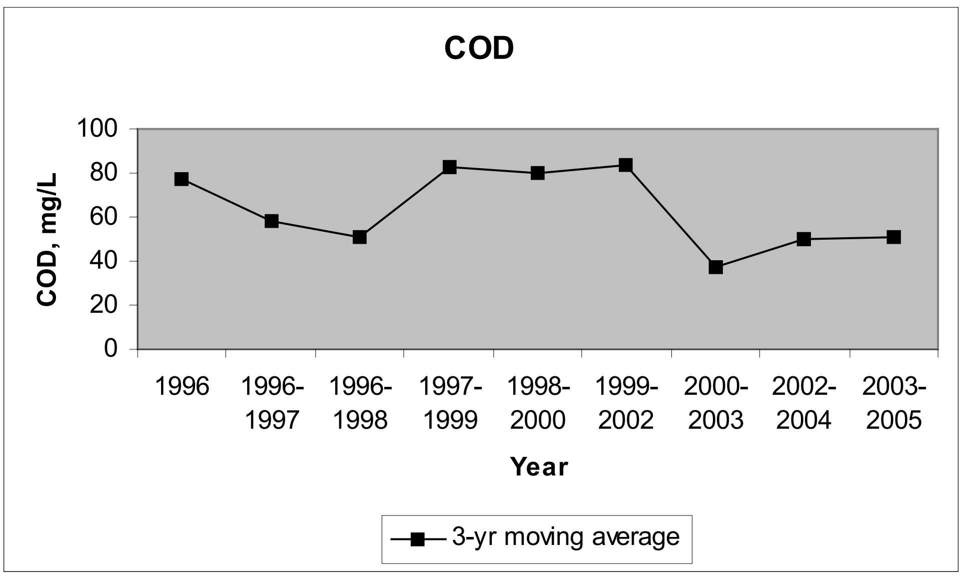

Figure 9. Three-year trend of COD levels in Bunot Lake

Dissolved Oxygen (DO)

Oxygen is one of the gases that is found in natural surface waters. The oxygen dissolved in water maybe derived from either the atmosphere or from photosynthesis by aquatic plants (phytoplankton). Ample amount of dissolved oxygen is essential to the fish and other aquatic organisms for growth and survival. Insufficient DO in surface waters may contribute to an unfavorable environment for aquatic life and the absence of DO may give rise to odoriferous products of anaerobic decomposition or may cause fish death due to suffocation.

The dissolved oxygen limit for Class A and Class C waters is set at 5 mg/L.

Dissolved oxygen (DO) values at different depths were averaged on a monthly basis as shown in Table 2 and Figure 10.

From the next table and graph, it can be seen that the required DO was basically met only at the surface of the lake waters. The set DO was met up to 2 meters depth only in March and December.

Table 2. Monthly average of DO at different depths (1996-2005)

Depth	**D.O. (mg/L)**									
	Jan	*Feb*	*Mar*	*May*	*Jun*	*Jul*	*Sep*	*Oct*	*Nov*	*Dec*
0	7.1	5.5	7.9	6.7	7.6	6.2	6.1	5.8	6.4	6.3
2	4.6	4.3	6.2	3.9	4.9	4.4	4.1	4.6	4.7	5.7
4	3.4	3.5	3.9	2.9	3.1	3.3	3.3	4.0	3.5	4.7
6	3.0	3.0	3.7	2.5	2.9	3.1	3.0	3.5	3.2	4.2
10	2.8	2.9	3.1	2.9	2.8	2.9	2.7	3.0	3.1	3.6
15	2.6	2.8	3.0	2.4	2.4	2.6	2.7	2.8	2.6	3.3
20	1.8	2.5	2.5	2.3	2.8	2.3	2.4	2.3	3.1	2.6

0 Compliance to DAO 34 Water Quality Criterion
Class C Waters

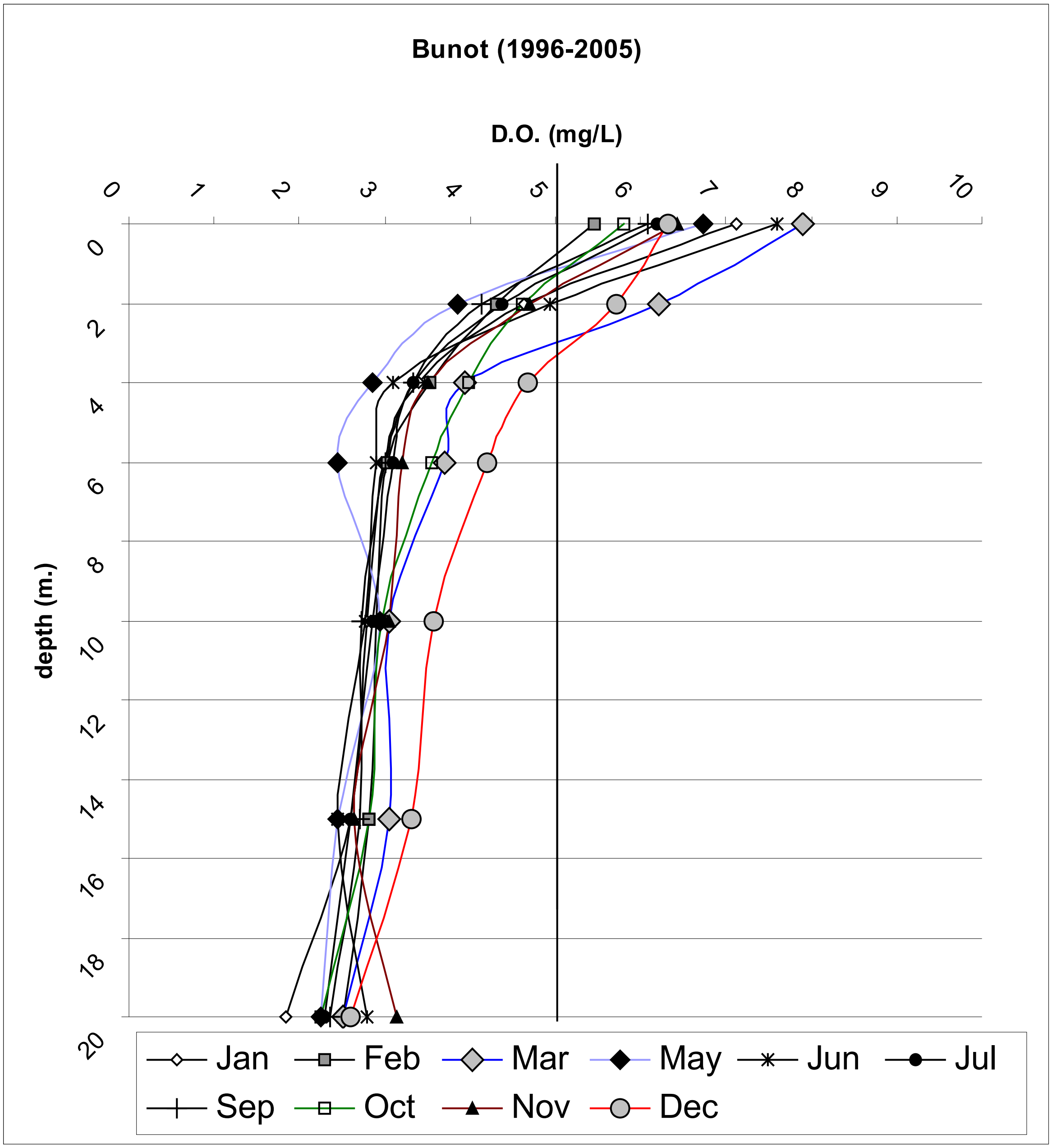

Figure 10. Monthly DO average at different depths

Phytoplankton

Bunot lake is the second most diversified among the seven lakes of San Pablo. About 32 genera of algae were recorded in Bunot lake. The algal composition represent 4 groups namely Cyanophyta (bluegreen algae), Chlorophyta (green algae), Bacillariophyta (diatom) and Pyrrophyta (dinoflagellate).

The highest annual average was observed in 1999 with values of 7789 cells/ml. During this period *Crucigenia sp*., (green algae) contributed about 96.49% of the total algal counts. Again it reappeared in 2002 and 2005 contributing about 89.34% and 60.63%, respectively. *Microcystis sp*., a bluegreen algae, showed an increase in counts in 2000 contributing about 91.96% of the total population. Its presence was also observed all throughout in 2001. Bluegreen (Cyanophyta) and green algae (Chlorophyta) dominated mostly the genera identified.

Based on the 1996 – 2005 data, an increase in counts occurred in 1999, 2002 and 2005. There was no trend on the algal counts of Bunot lake.

In order of their abundance the different genera present were *Microcystis sp., Crucigenia sp., Melosira sp., Coelastrum sp., Glenodinium sp., Schroederia sp., Hormidium sp. Nitzschia sp*., etc. Other species identified were of minimal counts.

Table 3. Phytoplankton Counts by Group, 1996 - 2005

	Bluegreen	Green	Diatoms	Dinoflagellates	Total
1996	190	570	869	17	1645
1997	1452	1300	77	44	2874
1998	3851	1887	71	22	5832
1999	602	6329	709	149	7789
2000	5526	1173	481	100	7280
2001	2030	1319	184	35	3568
2002	2259	4462	159	32	6913
2003	476	2329	229	56	3091
2004	274	3267	1376	11	4927
2005	784	4940	1430	64	7219

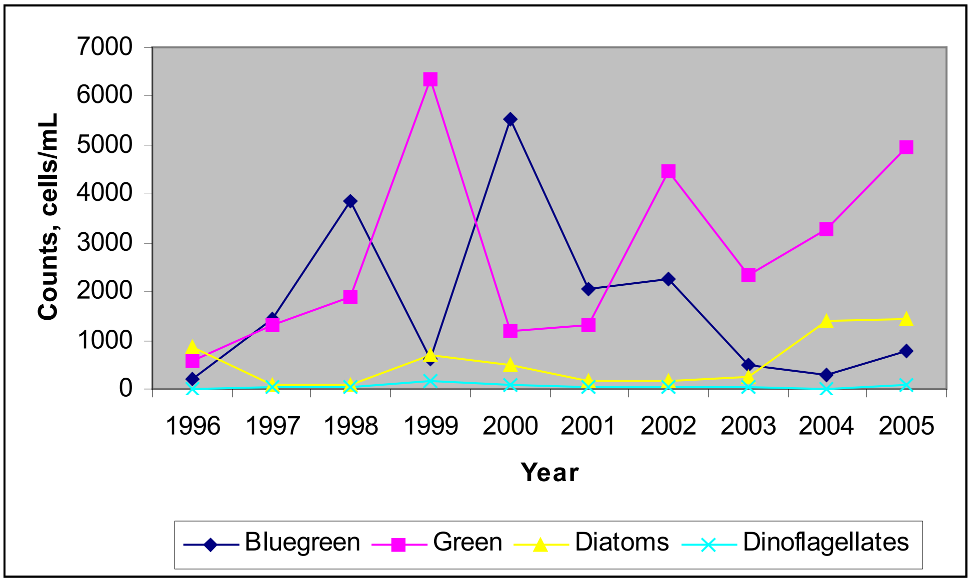

Figure 11. Phytoplankton Counts by Group

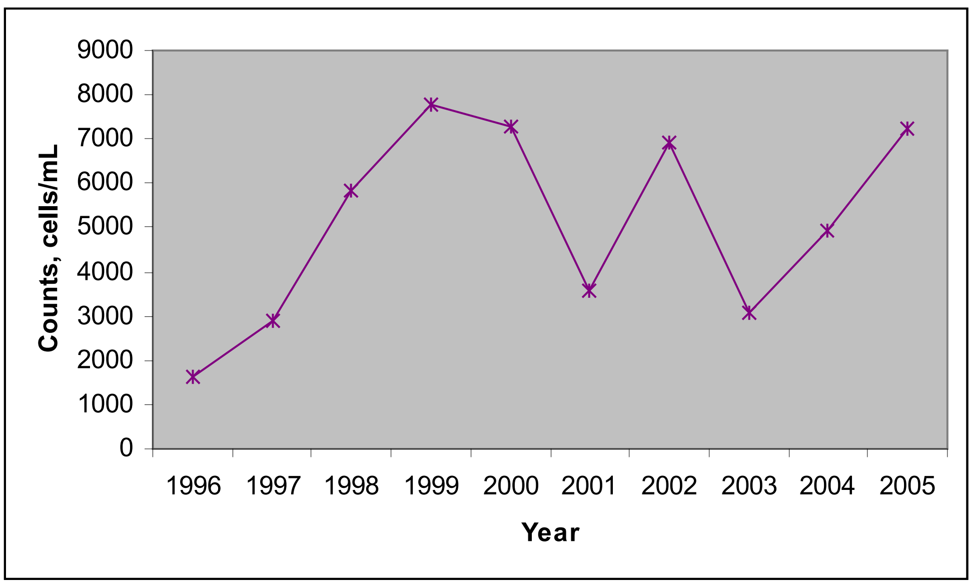

Figure 12. Total Phytoplankton Counts

Zooplankton

The second trophic level in the food chain of Bunot Lake is being occupied by the zooplankton. These animals utilize the phytoplankton (algae) as food.

Twenty (20) species were identified from 1997-2005. The zooplankton identified belonged to three (3) major groups namely Rotifera, Cladocera and Copepoda. Among the 20 species identified, 14 species were rotifers; 3 species each for the cladoceran and copepoda group. Juveniles of copepods known as copepodids and nauplius apparently were seen in almost all samples analyzed. They were just counted and included in the list since at this stage there is no taxonomic basis for species identification.

For the years 1998, 2003, 2004 and 2005, copepoda predominated while in 1997, 1999 up to 2002, rotifers were the dominant species. Cladocerans remained consistently low in number all throughout the study period.

The annual averages ranged from 3 to 47 ind./L. The highest count of 373 ind./L was recorded in 2005. The second highest was in 2000 at 316 ind./L. Zero counts were recorded during the study period at different months except in 2001.

Figure 13 presents the percentage contribution of the different zooplankton groups from 1997-2005.

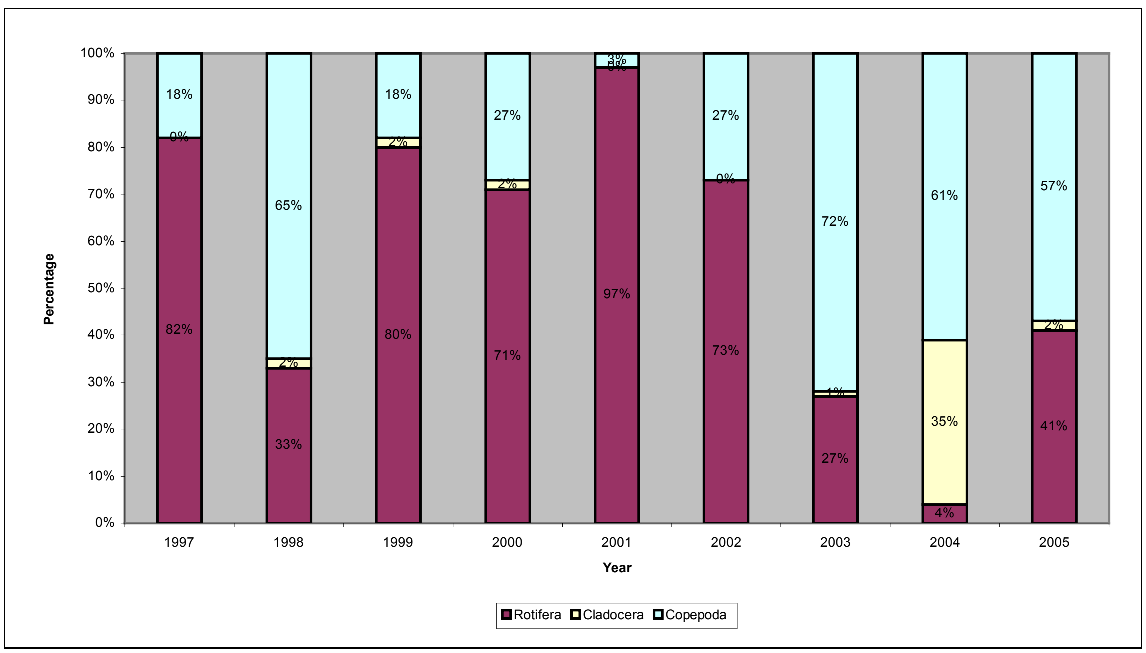

Figure 13. Percentage of Zooplankton by Group

The zooplankton community in Bunot Lake in 1997 to 2005 consisted of the following:

Phylum: Rotifera

Rotifera

Lecane ungulata
Keratella sp.
Brachionus forficula
Brachionus angularis
Brachionus calyciflorus
Brachionus falcatus
Brachionus urceolaris
Asplanchna
Synchaeta
Brachionus sp.
Hexarthra fennica
Filinia opoliensis
Filinia longiseta
Trichocerca sp.

Phylum : Arthropoda
Class : Crustacea

Cladocera

Bosmina longirostris
Diaphanosoma excisum
Ceriodaphnia cornuta

Copepoda

Thermocyclops crassus
Mesocyclops sp.
Diaptomus sp.

Nauplius stage
Copepodid stage

Chlorophyll "a"

The green pigment chlorophyll is present in most photosynthetic organisms and provides an indirect measure of algal biomass and an indication of the trophic status of a water body.

Water bodies with low levels of nutrients have low levels of chlorophyll (< 2 μg/L) whereas waters with high nutrient contents have high levels of chlorophyll (5 to 140 μg/L).

The highest monthly Chlorophyll "a" in Bunot Lake was recorded in February 2005 at 156 μg/L while the lowest was in May 2000 at 2 μg/L. The highest annual average was measured in 1997 at 64 μg/L and the lowest was registered in 1999 at 22 μg/L. Based on the annual average, Chlorophyll "a" of Bunot Lake are still within the eutrophic level. (Eutrophication of Lakes in China, 1990.)

An increasing trend in Chlorophyll "a" was observed from 2003 to 2005.

Figure 14. Annual average of Chlorophyll "a"

CONCLUSIONS AND RECOMMENDATIONS

Bunot Lake is the most critical in terms of water quality among the seven lakes of San Pablo City.

Annual averages for BOD had exceeded the Class C criterion for a number of years already. Adequate DO was available only at the surface of the lake.

Ammonia and phosphate exhibited increasing trend, which is an indication of the worsening organic pollution in the lake.

Bunot Lake is already congested with fish pens/ fish cages with more than 30 % being occupied by these structures. There is a need to immediately implement a reduction scheme of aquaculture structures to the allowed limit of 10 % of the total area as provided in RA 8550, the Fisheries Code of the Philippines.

It would be best if all aquaculture activities be stopped temporarily to give the lake a rest and have time to recover.

Wastes from the nearby residential area as well as wastes from backyard piggeries are discharged without proper treatment into the lake causing the deterioration of the lake's water quality. Measures must also be implemented to address these issues.

Meantime, LLDA programs such as lake seeding and water hyacinth harvesting will continue to be undertaken.

To characterize the quality of the lake in terms of health aspects, total coliform and fecal coliform counts have already been included in the water quality monitoring program of the LLDA starting 2006.

This report is intended to help the LLDA, the Local Government Units, the FARMCs, the NGOs and other stakeholders to formulate and implement appropriate environmental programs for Bunot Lake.