

## Phosphorus Problem in the Eutrophic Lake Maryut

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### S u m m a r y

The phosphorus content in Lake Maryut increased about 128 times in the last 13 years. Signs of eutrophication are clear. The annual phosphorus loading was calculated and found to be 15.6 mg/l year, which is very high.

Lake Maryut, situated to the south of Alexandria receives untreated sewage and industrial wastes in its main basin.

The results given in the present investigation show a remarkable phosphorus content in Lake Maryut compared with other Egyptian Lakes. Also a comparison of the present results with those of previous investigations reveals that the phosphorus content began to increase in the last few years at a very high rate.

Wahby (1961) gave a phosphate concentration for Lake Maryut water between 0.00 and 5.60  $\mu\text{g-at/L}$  while Aleem and Samaan (1969) published the results of analysis carried out in 1962 for the same lake and gave a phosphate concentration between 0.00 & 3.50  $\mu\text{g-at/L}$ , with an average of 0.25  $\mu\text{g-at/L}$ . In the present investigation the average phosphate content in the lake was 32  $\mu\text{g-at/L}$ , i.e. between 1961 & 1974 the phosphate content increased 128 times as a result of the continuous untreated sewage and industrial wastes discharge.

To calculate the phosphorus load reaching Lake Maryut, we find two sources of pollution, the first is the domestic sewage and the second are the industrial wastes.

Phosphorus loading from domestic sewage: If we take the population density in the area surrounding Lake Maryut as equal to 275,000 inhabitants, the amount of phosphorus discharged into the lake proper from domestic sewage per day is equal to:

$$275,000 \times 1.4 = 0.38 \text{ ton/cd.}$$

During one year it is equal to 136.8 ton.

Phosphorus loading from industrial wastes: Lake Maryut receives, through Qalaa Drain the effluents of many industries.

The annual average phosphorus content in Qalaa drain waters amounted to 1.61 mg/L, so, the quantity of phosphorus discharged into the lake through Qalaa drain, amounts to:

$$\text{Drain discharge } 200.159 \times 10^6 \text{ m}^3 \times 1.61 = 322.3$$

ton/year. The total quantity of phosphorus introduced to the lake proper from domestic sewage plus industrial waste is equal to 459.1 ton/year.

This value is a function of the surface area and the mean depth of the lake, so each square meter of the surface area receives  $15.6 \text{ mg/m}^2/\text{year}$ . Considering the average depth of the lake is one meter, the annual loading would be 15.6 mg/L/year, which is higher than any quantity mentioned by Vollenweider (1968) in reviewing the eutrophic lakes of Europe and North America.

#### REFERENCES

1. Aleem, A.A. and A.A. Saman (1969). Productivity of Lake Maryut. Part I. Int. Rev. ges. Hydrobiol., 54, 3: 313-355.
2. Vollenweider, R.A. (1968). The scientific basis of Lake & Stream eutrophication. Tech. Rep. G.E.C.D. Paris, 1-182.

3. Wahby, S.D. (1961). Chemistry of Lake Maryut. Alex. Inst. Hydrobiol. Notes and Memoires, 65, 25 pp.

#### DISCUSSION

##### Questions and comments:

1. Did you consider the autochthonous phosphorus i.e. phosphorus liberated from the lake itself? (S. Massoud, Egypt)
  - No, the phosphorus load reaching the lake from outer sources was calculated.
2. What is the maximum concentration of phosphorus you have found? I found much higher concentrations in samples collected in 1969 from the lake i.e. some years before your study. Your results should be higher than mine. (S. Massoud, Egypt)
  - The maximum phosphorus concentration I have found is 145  $\mu\text{g-at/l}$ . The difference between our results is due to the amount of fresh water introduced, mostly illegal, into the lake.

