

STUDY ON WATER QUALITY AND ENCROACHMENT STATUS OF NAGADAHA, LALITPUR

Sunil Thapa

Central Department of Environmental Science, Tribhuvan University, Kirtipur

E-mail:sunilthapa01@gmail.com

ABSTRACT

The area of Nagadaha Lake is decreasing, eutrophication is increasing. Thus this study was carried out between October and December 2008 to see the existing environmental condition of the lake. The water quality variables obtained were analyzed. All the variables analyzed were fluctuated significantly in various sites, since very little was known about the characteristics, so changing in quality is not known. It could be concluded from physico-chemical characteristics that the lake is in ecologically acceptable condition. The measurement of lake depth was done through depth sounding method. i.e. pre-measured heavy rope was lowered from a boat's side and bathymetric map was prepared. The depth of the lake varies from 0.30m to 3.60 m. The area of the lake as given by aerial photograph was determined to be 3.07 ha, while that from various literatures is 2.65 ha to 5 ha; on the other hand from present study the area was assessed as 2.67 ha. With the help of the area obtained from various sources, encroachment status was determined.

Key words: Nagadaha-, water quality, eutrophication, bathymetric map, encroachment etc.

INTRODUCTION

Wetlands are among the most productive ecosystems in the world. They are very important in terms of ecological, economic, cultural and recreational values and provide critical habitat for many species of flora and fauna. The freshwater environment can be divided into two groups; lotic water and lentic water environment. In Nepal wetland occupy about 5% area of the country (IUCN Nepal 1997). Like other ecosystem pond ecosystem is also composed of abiotic and biotic components. Any spontaneous or induced alteration in any of these components brings about changes in the whole ecosystem, sometimes sufficiently detectable and the other times insufficient to be perceived.

Brehm (1953) was the first to study the benthic fauna of the Kalipokhari pond in eastern Nepal. Hynes (1960) studied mayfly distribution as a wide quality index. Loffer (1969) made an extensive limnological study of 24 high-altitude lakes in the Mt. Everest region. Amataya (1979) studied 8 reported littoral fauna of Taudaha Lake. CEDA (1989) tested water samples from

different localities in Kathmandu. CEDA study found that all samples were contaminated with faecal materials. High concentration of phosphate in inlet water must be the major nutrient feeding at Nagdaha Lake. The lake was recorded at an area of 52 ropani in 2021 B.S (www.ngoforum.net)

Nagdaha is the jewel of Kathmandu valley. On one hand it has become the home of different floral and faunal species and on the other hand it is the main cultural and religious sites for many local people. This is the major source of water for local people. But, in the recent time the area of Nagdaha Lake area is decreasing, eutrophication is increasing, thus there is urgent need to find out its cause so that the probable scientific solution can be applied for the preservation of the lake. Thus this study is intended to be carried out on the context to see what the existing environmental condition of the lake. The purpose of present investigation is to know the status of lake, alert the concerned authorities to the importance of lake and to demonstrate physico-chemical status of lake.

STUDY AREA

Nagdaha Lake is situated at about 5 km South from Patan Bazar. It is located in Dapakhel VDC of Latitpur District within latitude $27^{\circ} 37' 53''$ and longitude of $85^{\circ} 19' 97''$. It is a natural lake with butterfly shape covering an area of 2.65 Ha. It has great socio-economic and environmental and religious value. This has great importance in Nag Panchami and Rishi Panchami. The lake is of such great environmental and cultural importance but is getting degraded day by day.



Fig. Nagdaha Lake (Source: Google Earth)

METHODS

Water Quality

For the analysis of physico-chemical parameter, three sites were selected. Sites were visited before starting the main study. The three sites chosen were at the extreme edges of Nagdaha situated just opposite to each other, i.e. inlet and outlet, one of the sites was on the south-eastern corner. The water sample was collected from the surface of the lake by using a polythene bottle, date, time and site of collection were recorded. The water sample was carried to the laboratory of Central Department of Environmental Science, T.U. Kirtipur. All the parameters were analyzed in same day following the standard methods for analyzing water and waste water pollution studies (APHA, 20th edition, 1998) and chemical and biological methods for water pollution studies (Trivedy and Goel 1986).

Encroachment Status of the Lake

The area of lake in different past time was determined from the maps such as aerial photo (1979), topographic map (1996) and literatures. The rate of decrement of the lake area in those time interval was estimated. From the maps and field visit, the site/shore of maximum encroachment was identified. In addition, the local people were interviewed for the possible causes of encroachment.

Bathymetric Map

A bathymetric map is a map of the bottom of a body of water, noting the depth contours. The depth of different locations of the lake was determined and plotted on the outline map of the lake to prepare the bathymetric map of the lake. The measurement of lake depth was done through depth sounding. i.e pre-measured heavy rope was lowered over a boat's side and the depth noted.

RESULT AND DISCUSSION

Water Quality Analysis

Parameter \ Site	Site 1	Site 2	Site 3
Temperature	18 °c	18 °c	18.5 °c
pH	6.3	6.5	6.7
Conductivity	161µs/cm	164µs/cm	71µs/cm
Chloride	22.72 mg/L	25.56 mg/L	26.98 mg/L
Free CO₂	52.8 mg/L	66 mg/L	55 mg/L
DO	4.45 mg/L	3.65 mg/L	4.86 mg/L
Alkalinity (mg/L as CaCO₃)	55.5	56.25	583
Total Hardness (mg/L as CaCO₃)	50	46	48
Nitrate	0.15 mg/L	0.1 mg/L	0.12
Phosphate	0.69 mg/L	0.75 mg/L	0.7 mg/L
BOD	0.5 mg/L	0.5 mg/L	0.8 mg/L
Ammonia	2.5 mg/L	2.8 mg/L	1.9 mg/L

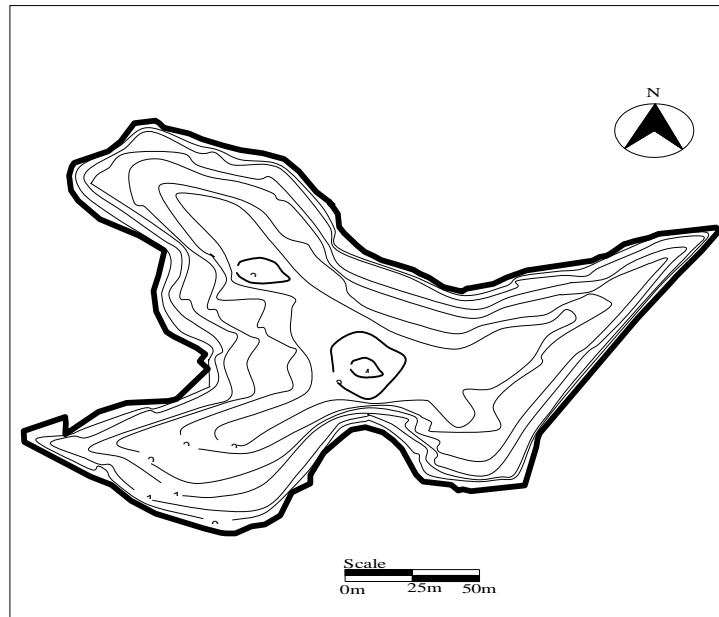
It could be concluded from physico-chemical characteristics that the reservoir is in ecologically acceptable condition. Trophic status of lake was found to be hypereutrophic based on PO₄-P. The main remaining threat to water quality of surface water is eutrophication leading to increased plant productivity, either in water column or on the substratum. Eutrophication affects a considerable proportion of the water state and is the main threat to these systems.

Encroachment Status of the Lake

The area of the lake as given by aerial photograph was determined to be 3.07 ha, while that from various literatures is 2.65 h; on the other hand from present study the area was assessed as 2.67 ha. In comparison aerial photograph the area of the lake is decreased by 0.4 ha.

Bathymetric Map

The depth of different locations of the lake was determined and then bathymetric map of the lake was drawn. The depth of the lake varied from 0.30 m to 3.60 m.



Area of Lake = 2.67 ha, Shoreline = 957 m

Fig: Bathymetric map of Nagadaha drawn from depth distribution data

CONCLUSION

The water quality variables obtained were analyzed. Due to population pressure the lake is polluted and the water quality is deteriorating. The major threats to Nagadaha have been identified as human encroachment, agricultural runoff, siltation and pollution by human activities. Because of adjoining agricultural practice and other ongoing commercial activities like construction of restaurants, recreation sites the actual area of the lake is being encroached. Lake is the major source of water for local people. So the lake should be preserved for the sustainable development of the local people, and the country as a whole.

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