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Assessment of Water Quality Parameters: A Review

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ABSTRACT

Water is the most important in shaping the land and regulating the climate. It is one of the most important compounds that profoundly influence life. The quality of water usually described according to its physical, chemical and biological characteristics. Rapid industrialization and indiscriminate use of chemical fertilizers and pesticides in agriculture are causing heavy and varied pollution in aquatic environment leading to deterioration of water quality and depletion of aquatic biota. Due to use of contaminated water, human population suffers from water borne diseases. It is therefore necessary to check the water quality at regular interval of time. Parameters that may be tested include temperature, pH, turbidity, salinity, nitrates and phosphates. An assessment of the aquatic macro invertebrates can also provide an indication of water quality.

Keywords: Alkalinity, Dissolved Oxygen (D.O.), Eutrophication, Biochemical Oxygen Demand (BOD), Water Quality Index (WQI)

I.INTRODUCTION

India is facing a serious problem of natural resource scarcity, especially that of water in view of population growth and economic development. Most of fresh waterbodies all over the world are getting polluted, thus decreasing the potability of water. All life is depend on water and exists in nature in many forms like ocean, river, lake, clouds, rain, snow and fog etc. A lake is a large body of water surrounded by land, inhabited by various aquatic life forms, for all practical purpose, pure water is considered to that which has low dissolved or suspended solids and obnoxious gases as well low in biological life.

Of all the water quality issues facing lakes everywhere, eutrophication is of greatconcern. Eutrophication is a term used to describe the aging of a lake, resulting due to the accumulation of nutrients, sediments, silt and organic matter in the lake from the surrounding watershed. The role of vegetation and sediments as sources and sink ofnutrients has been demonstrated. It describes the biological reaction of aquatic systems to nutrient enrichment, the eventual consequence of which is the development of primary production to nuisance proportions. The main cause is excessively adding of phosphorus and nitrogen resulting in high algal biomass, dominance by cyanobacteria and loss of macrophytes.

II. LITERATURE REVIEW

B. N. Tandel, Dr. J. Macwan, C. K. Soni [1] have studied, the water quality index is a single number that expresses the quality of water by integrating the water quality variables. Its purpose is to provide a simple and concise method for expressing the waterquality for different usage. The present work deals with the monitoring of variation of seasonal water quality index of some strategically selected surface water bodies. The index improves the comprehension of general water quality issues, communicates water quality status and illustrates the need for and the effectiveness of protective practices. It is found that in all cases the change in WQI value follow a similar trend throughout the study period. The lake water is found of good quality (WQI - 67.7 to 78.5) during both seasons. However, it is found that water quality of lake deteriorates slightly from winter to summer season on account of the increase in microbial activity as well as increase in pollutants concentration due to water evaporation.

P. J. Puri , M. K. N. Yenkie, et al [2] have studied water quality index (WQI) has been calculated for different surface water resources especially lakes, in Nagpur city, Maharashtra (India), for the session January to December 2008; comprising of three seasons, summer, winter and rainy season. Sampling points were selected on the basis oftheir importance. Water quality index was calculated using water quality index calculator given by National Sanitation Foundation (NSF) information system.

T. M. Heidtke, A. M. Asce and W. C. Sonzogni [3] have studied, results from a study of water quality planning and management alternatives for the Great Lakes are used toidentify cost-effective pollution control strategies. Mathematical models and other systemsanalysis techniques are applied to estimate pollutional loadings, specific water quality problem areas, costs and pollutant reductions offered through alternative management strategies. A determination of how these alternatives may be expected to achieve water quality objectives for the Great Lakes is made. Data from a diversity of Great Lakes research efforts are compiled, integrated, and used to project local and lake wide water quality conditions over the next twenty years. A set of management tools, including a near shore water quality index and a series of environmental quality maps, are developed to promote communication and interpretation of Great Lakes water quality data among technical and nontechnical interests. Findings from the study support a staged approach to pollution control, whereby the most cost effective programs are implemented and their results assessed before more expensive control measures are undertaken.

A water quality index (WQI) developed by the Canadian Council of Ministers of the Environment (CCME) was applied to Hebbal lake of Mysore, Karnataka State, India, to study its impact on aquatic life, livestock and to know whether it is suitable for recreation, irrigation and drinking. The index of the lake is rated as poor with respect to drinking, recreation and livestock, marginal with respect to Aquatic life and excellent for irrigation purpose. The overall water quality is rated as poor. The water quality is almost always endangered or deteriorated and the conditions often deviate from natural levels. Anabaena and Microcystis aeruginosa form blooms, Phacus pleuronectes is also recorded and the lake water is unsuitable to protect aquatic life. Incidence of Fish kill occurred in 2011 due to contamination of water explained by Dr. M. K. Mahesh, B. R. Sushmitha, H. R. Uma[4].

V. Pradhan, M. Mohsin, B. H. Gaikwad [5] have studied, water quality of Chilika Lakewas determined during the month of January 2012. It was observed that all the parameters are above permissible limit except at the sample site S2. The results are discussed in the light of findings of other workers.

Y.B. Shaiksh , P.R.Bhosale, Nagargoje [6]has explained, Physical, chemical, ionic, biological studies were conducted at (Maharashtra State, India). It is positioned on south east corner of Maharashtra. Nagzari dam is situated at Nagzari village of Kinwat quality of Nagzari dam. Water is to determine the nutrient status of the water with reference to drinking water quality as well as irrigational purpose. Also observe the seasonal variations of selected water parameters and identify the pollution sources dam. The physical and chemical parameters were analyzed as per APHA revealed that there were fewer variations in the physicochemical, ionic, heavy metals analysis of the present water quality parameters undertaken and results received through the entire one year of study showed that the status of water quality is quite normal and within the permissible limit as mentioned with ISI.

S. Hussaina, V. Maneb, et al. [7] have studied, In the present work we are reported the Physico chemical properties like pH, conductivity, Turbidity, TDS, DO, fluoride, chloride,Sodium, Sulphate, etc. and the values are compared for treated and untreated water samples. The samples were collected from treatment plant of Ahmedpur, Dist Latur. The values changes apparently after the treatment of water.

M. Pejaver and M. Gurav[8] have explained, the two lakes namely Kalwa and Jail lakeof Thane city are eutrophicated and hence the study were done to find the quality of water for the period of 6 months for

various physico-chemical parameters to study the pollution status of the lakes. The Jail lake is found to be relatively more organically polluted and greater degree of eutrophication the Kalwa lake. Among water quality parameters, a positive correlation was found between chlorophyll and temperature, suspended solids, pH, dissolved oxygen (not with chlorophyll c), Co2 (only with chlorophyll C). A negative correlation was seen between Chlorophyll and light penetration. The Chlorophyll a and b showed negative correlation with Co2 silicates and Phosphates.

R. M. Khan, M. J. Jadhav, I. R. Ustad [9] have explained, in order to understand the water quality of Triveni Lake, Physico-chemical parameters were studied and analyzed for the period of one year i.e. December 2010 to November 2011. Variousphysicochemical parameters, such as water temperature, air temperature, pH, humidity, conductivity, free Co2, total solid, dissolved oxygen, Total alkalinity, Total hardness, caco3, ca++, mg++ were studied. The results revealed that there was significant seasonal variation in some physicochemical parameters and most of the parameters were innormal range and indicated better quality of lake water.

R. W. Gaikwad, V. V. Sasane [10] has explained, the present work is aimed at assessing the water quality of the groundwater in and around Lonar Lake. Water quality has been determined by collecting groundwater samples and subjecting the samples to a comprehensive physiochemical analysis. For assessing water quality, pH, total hardness, calcium, magnesium, bicarbonate, chloride, nitrate, sulphate, total dissolved solids, iron, manganese and fluorides have been considered. The higher values has been found to be mainly for Iron, Total hardness, chloride, fluoride, calcium and magnesium, many literature shown that groundwater quality in Lonar Taluka has been badly affected by nitrate contamination. The analysis reveals that the groundwater of the area needs some degree of treatment before consumption, and it also needs to be protected from the perilsof contamination. Many different options are now in progress for treatment of water locally.

III. WATER QUALITY PAARMETERS

1. pH.

The pH scale commonly ranges from 0 to 14. The scale is not linear but rather it is logarithmic. For example, a solution with a pH of 6 is ten times more acidic than a solution with a pH of 7. Pure water is said to be neutral, with a pH of 7. Water with a pH below 7.0 is considered acidic while water with pH greater than 7.0 is considered basic or alkaline.

2. Conductivity

Conductivity is a numerical expression of an aqueous solution's capacity to carry an electric current. This ability depends on the presence of ions, their total concentration, mobility, valence and relative concentrations, and on the temperature of the liquid. Solutions of most inorganic acids, bases, and salts are relatively good conductors. In contrast, the conductivity of distilled water is less than 1 µmhos/cm.

3. Alkalinity

Alkalinity is the sum total of components in the water that tend to elevate the pH to the alkaline side of neutrality. It is measured by titration with standardized acid to a pH value of 4.5 and is expressed commonly as milligrams per liter as calcium carbonate (mg/L as CaCO3). Alkalinity is a measure of the buffering capacity (ability to resist changes in pH) of the water, and since pH has a direct effect on organisms as well as an indirect effect on the toxicity of certain other pollutants in the water, the buffering capacity is important to water quality.

4. Dissolved Oxygen

D.O. is the dissolved gaseous form of oxygen. It is essential for respiration of fish and other aquatic organisms. D.O. enters water by diffusion from the atmosphere and as a by- product of photosynthesis by algae and plants. The concentration of D.O. in epilimnetic waters continually equilibrates with the concentration of atmospheric oxygen to maintain 100% D.O. saturation. Excessive algae growth can over-saturate (greater than 100% saturation) the water with D.O. when the rate of photosynthesis is greater than the rate of oxygen diffusion to the atmosphere.

5. Light Transmision

This measurement uses a light meter (photocell) to determine the rate at which light transmission is diminished in the upper portion of the lake's water column. Another important light transmission measurement is determination of the 1% light level. The 1% light level is the water depth to which one percent of the surface light penetrates. The 1% light level is considered the lower limit of algal growth in lakes and this area and above is referred to as the euphotic zone.

6. Phosphorus

Phosphorus is an essential plant nutrient and most often controls aquatic plant (algae andmacrophyte) growth in freshwater. It is found in fertilizers, human and animal wastes, and yard waste. There is no atmospheric (vapor) form of phosphorus. Because there are few natural sources of phosphorus and the lack of an atmospheric cycle, phosphorus is often a limiting nutrient in aquatic systems.

7. Nitrogen

Nitrogen is an essential plant nutrient found in fertilizers, human and animal wastes, yard waste, and the air. About 80% of the atmosphere is nitrogen gas. Nitrogen gas diffuses into water where it can be "fixed" (converted) by blue-green algae to ammonia for algal use. Nitrogen can also enter lakes and streams as inorganic nitrogen andammonia.

Physiochemcal Prameters of Lake Water in India.Table-1

Sr.No.	Parameters	BIS Specification
1	Alkalinity	200 mg/L max
2	Fluoride	1 mg/L max
3	Chloride	250 mg/L max
4	Phosphate	Not mentioned
5	Sulphate	200 mg/L max
6	Ca H	75 mg/L max
7	Mg H	30 mg/L
8	TDS	500 mg/L max
9	Silica	Not mentioned
10	NO3	50 g/L

The WQI ranges have been defined as:

- 90-100 : Excellent
- 70-90 : Good
- 50-70 : Medium
- 25-50 : Bad
- 0-25 : Very Bad

By this way it defines water quality

III. Conclusion

The seasonal values of WQI indicate that during summer season, lake water is more affectedthan during winter. This could be due to the fact that the microbial activity get reduced due to low temperature, thereby keeping DO level at a very satisfactory range during entire winter season.

Water quality is dependent on the type of the pollutant added and the nature of self- purification of water.

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