



# Water Quality Assessment of Tumaria Reservoir (Udham Singh Nagar)

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**Abstract** -Present study was carried out to examine the water quality assessment to Tumaria reservoir the observation of physico-chemical parameter of water such as water, temperature, transparency, TDS, PH, DO, alkalinity, chloride, turbidity, velocity. We are determine during study period in order to create the geographic thematic map on, annual variation of physical –chemical parameters. Physico-chemical study on this research paper has help in analyzing the water quality of reservoir in protecting manner to maintain the ecological balance.

**Key words** - Tumaria reservoir, Physical –chemical parameters, Water quality

**INTRODUCTION** - Uttarakhand came into existence as a 27<sup>th</sup> state of India on November, 2000. It is located between latitude 28<sup>o</sup> 40'- 31<sup>o</sup> 29' N and longitude 77<sup>o</sup> 35'- 81<sup>o</sup> 5' E. It covers about 53,483 km area and is inhabited by 8.5million (according to 2001 counting) people. It encompasses thirteen districts. Udham Singh Nagar is enriched with an aquatic ecosystem of various disciplines like rivers, streams, dams which have very rich flora and fauna. Udham Singh Nagar is famous for agriculture, irrigation in a synchronized pattern. Udham Singh Nagar district falls in the tarai region of Kumaun division the geographical area of the district is 3055 km. Water is one of the abundantly available substances in nature, that man has exploited more than any other resource for the sustenance of life .Water of good quality is required for living organisms and is the most important water resource. Unfortunately the am are polluted by in discriminated is postal of sewage, industrial wasteland human activities. The dams are always victims of the negative impacts of urbanization. Water quality provides current information about the concentration of various contaminants at a given place and time. Water quality parameters provide the basis for judging their suitability for their designated use and for improving existing conditions. The study different water parameters is very important for understanding of the metabolic events in aquatic

ecosystem. Water is one of the abundantly available substances in nature, that man has exploited more than any other resource for the sustenance of life. Good quality water is required for living organisms. Unfortunately, the reservoirs are polluted by the discriminated disposal of sewage, industrial waste and human activities. The dam is always one of the victims of the negative effects of urbanization. The study of different water parameters is very important for understanding the metabolic events in aquatic ecosystems. The parameters influence each other and also the sediment parameter, as well as the abundance and distribution of the flora and fauna. Therefore, it has become obligatory to analyze at least the important water parameter when ecological studies on dams are carried out such studies when done from time to time can indicate the favorable changes occurring in the ecosystem.

Tumaia reservoir is also called tumaria wetland (Bhattacharjee. 2014). Similarly it determines the physico-chemical and biological parameters of the water. Algae play an important role in the limnology and ecology of any aquatic ecosystem. The reservoir contains a rich biodiversity of aquatic organisms which play an important role in making the system viable. If the inter-relationship of organisms is in equilibrium, biological production will increase. To summarize, due to their involvement in the cycling of energy and matter in an ecosystem, the evaluation of phytoplankton population in terms of its diversity, density, biomass, spatial and temporal distribution, periodicity, productivity and population turnover, is vital in management of an ecosystem (Gupta & Dey, 2012). Phytoplankton not only serves as food for aquatic animals but also plays an important role in maintaining the biological balance and quality of water (Benarjee and Narasimha, 2013).

**STUDY AREA** - Tumaria reservoir is a large body of water that stretches for more than 10 km. It is attached to the Bhogpura reservoir. It is located between latitude  $98^{\circ} 53' N$  and  $29^{\circ} 23' N$  and it latter extends between longitudes  $78^{\circ} 45'$  and  $80^{\circ} 08' E$ . It is divided under the three zonal areas of these different cities situated near it, these zones are Ramnagar zone, Kashipur zone and Jaspur zone. On the north-east direction of the Tumaria reservoir Ramnagar city is situated, on its south-east direction, Kashipur is situated and on its south-east direction Jaspur is situated. Basically, we can say that Tumaria Reservoir is located in Jim Corbett National Park. The reservoir is part of the Dhela River. It's of multipurpose benefit - irrigation, fish production and Agriculture activities. The construction of the dam began in 1956 and it was completed in 1961. Climatically, it experiences a dry tropical monsoon, with an average annual rainfall of about 850mm concentrated in the months of July, August. The other seasons include summer (March to May). The Tumaria Dam main official building is at Kashipur, near the Jaspur bus stand and is named the irrigation, Department Office.

**METHODOLOGY** -This article deals with the details of the study area ,remote sensing GIS and its application for the discrimination of different physico-chemical parameters , seasonal variation of plankton , present status of fish fauna, demarcation of productive zone and site suitability for culture practice of selected reservoirs (Tumaria) in the Tarai region of Uttarakhand. The study was conducted for a period of three months from March to May 2021 metrologically. The whole study period can be classified as monsoon to pre-monsoon. The sampling points are depicted in the selected reservoirs. In the present study, physico-chemical parameters of water, biological estimation were carried out from 9.00 a.m. to 11.00 a.m. coinciding with the satellite overpass time in the monsoon.

**Estimation of physico-chemical parameters of water-** Physico–chemical parameters of water such as water temperature, pH, total dissolved solids (TDS), water transparency, conductivity, dissolved oxygen (DO), and free carbon dioxide (CO<sub>2</sub>) etc. were estimated on the spot whereas the rest of the water quality parameters such as total alkalinity, total hardness, nitrate, phosphate, silicate, chloride were estimated in a laboratory according to a standard method (Welch1948; APHA, AWWA and WPCF, 2005).

**Result-** The observations on physico-chemical parameters of water such as water temperature (°C), transparency (cm), TDS (mg), PH, and DO (mg/l), were determined during the study period. In order to create the geographic thematic map based on annual variation of physico- chemical parameters the whole water body was broadly classified into three zones such as riverine, transitional and lacustrine. The average of three months, physico–chemical parameters were incorporated into the masked image for individual parameters in order to make thematic maps that would show geographic variation in the physico-chemical parameters. Average of physico–chemical parameters at different stations and zones of the Tumaria reservoir. The results of the study are given below and summarized in table.

**Water temperature:** Water temperature is a decisive parameter of water that effects the growth and reproduction of organisms. According to the temperature of water the aquatic animals decide to migrate. The metabolic activities of aquatic animals and plant animals determine to temperature, though different organisms have different temperature ranges for best survival. The temperature of water is always influenced by the geography, climate and catchment area of the reservoir or any water body. The minimum temperature 25.11°C was recorded in April, while the maximum temperature was recorded at 26.47°C. The average data for water temperature is given in the table.

**Water transparency:** To less transparency water the sunlight is not able to reach deep into the bottom so the bottom plants, due to the shortage of sunlight, cannot photosynthesize promoting death. The values for individual observation for transparency of the Tumaria reservoir range from 66.79 to 134.24 in the month of the lowest and highest value recorded.

**Total dissolved solids -TDS** in drinking water can be due to sewage, chemical waste and agricultural waste and by the hardware used in supplying the water. The maximum TDS was 112.67 mg/l in April, and the lowest was 95.39 mg/l in March. The average data for total dissolved solids is given in table

**PH:** PH refer to the hydrogen ion concentration in water or in any solution. There are many factors that can cause variation in the reading of pH a water resource. The prime factor is the type of rock of bed through which the river is running. Granite rocks do not show any effect on pH the decomposition of organic material in water releases carbon –dioxide. Carbon dioxide reacts with water to form carbonic acid, which can lower the pH. A pH range of 6 to 8.5 was considered a medium productive reservoir; more than 8.5 was considered a highly productive reservoir; and less than 6 was considered a less productive reservoir (Jhingran, 1990, Sugunan, 1995). PH of water is a measurement of the acidity or alkalinity present in it. The minimum pH of 7.27 was recorded during April, and the maximum 8.2 pH of was recorded during March. The average data for pH is given in the table. 1

**Dissolved oxygen** - Dissolved oxygen is the portability indicator of water. It was influenced by the aquatic vegetation, plankton, temperature, and organic materials present in the water. Oxygen diffuses in water from the surrounding air. Aquatic plants produce a good amount of oxygen in water through photosynthesis. A high temperature range in water lowers the concentration of dissolved oxygen. The Maximum concentration of DO (9.9mg/l) recorded in the transitional zone during winter might be due to a high photosynthesis rate, algal biomass, and moderate temperature. An appropriate level of DO is necessary for the good health of humans and aquatic organisms. The maximum DO of 8.45mg/l was recorded during March, and the minimum of 6.87mg/l was recorded during May. The average pH data is given in the table.1

**Free carbon-dioxide-** Free carbon dioxide dissolved in water is the main source of carbon that comes from the skeleton of aquatic animals. CO<sub>2</sub> in water is a sure threat of photosynthesis by aquatic plants. A very high amount of carbon-dioxide may be lethal for aquatic organisms. It can increase the alkalinity of the river. The maximum CO<sub>2</sub> 5.1 mg/l during was recorded during April, and the minimum 2.39mg/l during May. High concentration of CO<sub>2</sub> (2.51mg/l) was recorded in lacustrine zone during monsoon, might be due to its incomplete utilization in photosynthetic activity because of cloudy weather. The average data of free carbon-dioxide is given in table

**Turbidity-** the turbidity of water was measured by a Jackson -Candle turbidity meter in terms of the Jackson turbidity unit. The values for individual observation for turbidity of tumaria reservoir ranged from 1.10 to 1.20 for the monthly lowest and highest value recorded. The average data for water turbidity is given in the table.

**Alkinity** --Alkalinity is thought to be a measure of productivity. Moyle (1946) noticed that most bodies of water with total alkalinity greater than 200 mg/l are highly productive Indicates that water has high biological activity the value for individual observation of the tumaria reservoir ranged from 161 to 112, for the monthly lowest and highest values recorded. The average data of water alkainity is given in the table

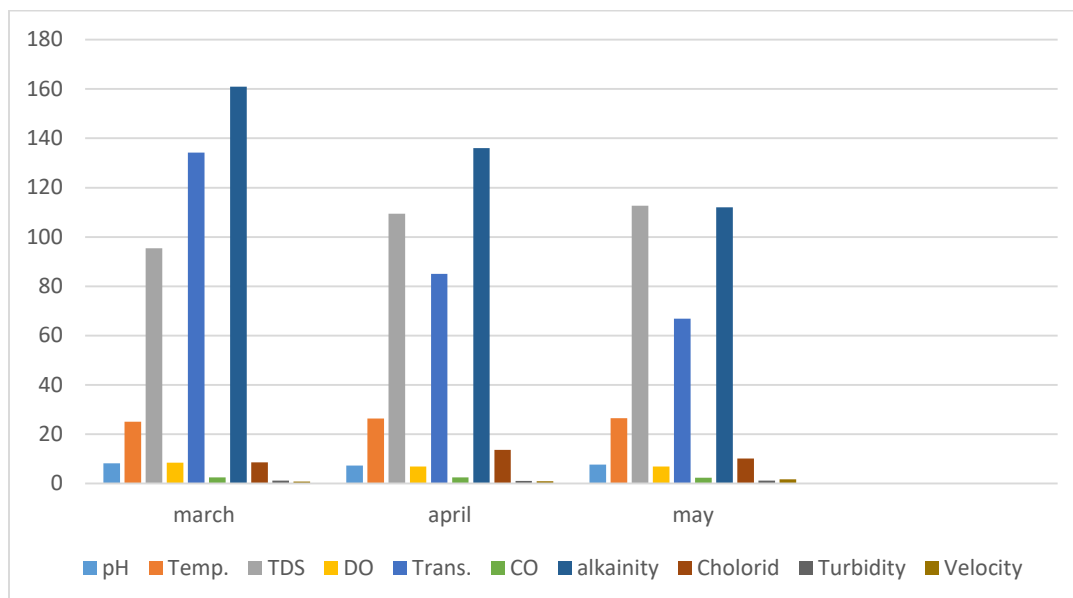
**Velocity** – the value for individual observation of the tumaria reservoir ranged from 1.64 to 0.79 for the monthly lowest and highest values recorded. The average data for water velocity is given in Table

**Chloride** - the value for individual observation of the tumaria reservoir ranged from 10.2 to 8.6 for the monthly lowest and highest values recorded. The average data of water chloride is given in table

**DISCUSSION-** Reservoirs in India are considered to be a growing resource with enormous potential for yield augmentation through culture based fisheries they constitute the single largest inland fishery resource, both in terms of size and production potential. The productivity of a reservoir depends on the water area, physico-chemical parameters of the water. This topic deals with the details of the study area's remote sensing GIS. And its application for the discrimination of different physico-chemical parameters presenting the status of fish fauna. Demarcation of productive zone and site suitability practices of selected Tumaria reservoir in Tarai region, Uttarakhand As the reservoir has different catchment areas and environmental conditions

**Table. 1- Physic- Chemical of parameters of Tumaria reservoir.**

Months /paramters	March	April	May
CO <sub>2</sub>	2.51	2.47	2.39
Alkalinity	161	136	112
Turbidity	1.12	1.10	1.20
Chloride	8.6	13.6	10.2
Velocity	0.79	0.90	1.64
pH	8.2	7.27	7.65
Temp.	25.11	26.41	26.47
TDS (mg/l)	95.39	109.48	112.67
DO(mg/l)	8.45	6.87	6.84
Trans.(cm)	134.24	85.03	66.79



**Fig;** Showing Physic- Chemical Parameters of Tumaria reservoir.

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