



1. Kusum Lata

2. N.K. Mishra

## Ground Water Quality Of Blue Bird Wetland, Hisar (Haryana)

Research Scholar of Dept. of Environmental sciences, Shri JJT University, Jhunjhunu, (Rajasthan) India

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**Abstract:** *As an effort in this approach, India has produced the National Wetland Atlas. Blue Bird Lake in Hisar is a wetland habitat, lake, and leisure spot for local birds and rare migratory species. The Fisheries Department of the State Government of Haryana offers commercial fishing leases on the lake. The Hisar District is the most western and central part of the Indian state of Haryana. The district has around 3983.00 square kilometers of land. km. The district is located between the latitudes of 28°53'45" and 29°49'15" North, and the longitudes of 75°13'15" and 76°18'15" East. Blue Bird Lake is a lake, habitat, and exercise place for migratory birds in the Hisar district of Haryana. Contrary to the purported effect of urbanization, bare land in the rural surroundings has greater temperature than the city centre. This is true even if there is a distinct difference between average land surface temperature for built up and non-built up region, grazing land and sandy waste. Since the market often only assigns monetary values to tangible products and services, it is difficult for the average person to conceptualize how much money should be paid for the ecological benefits provided by a wetland. Wetlands provide several important services, like flood prevention, biodiversity preservation, water purification, etc., yet these benefits are not being directly compensated.*

**Key Words:** : Ecological, Wetland, Blue Bird Lake, Ground Water, temperature, grazing land, sandy waste.

It is becoming more and more apparent that the Earth is experiencing severe environmental issues, including the rapid depletion of natural resources and the prospect of extinction for many ecosystems. Scientists, urban planners, sociologists, politicians, and economics all express grave worries about the need to protect the world's natural resources. Insufficient scientific information on our natural resources is one of the most common obstacles to decision making. The data are sometimes scant or unconvincing, and seldom presented as a geographic database (map), leaving them vulnerable to criticism. Accordingly, the focus of every nation right now is on creating a reliable geographic database of their natural resources using clear scientific methodologies. As an effort in this approach, India has produced the National Wetland Atlas. Blue Bird Lake in Hisar is a wetland habitat, lake, and leisure spot for local birds and rare migratory species. Commercial fishing rights on the lake are leased out by the Haryana government's Fisheries Department.

**LITERATURE REVIEW-** Chrobak, Grzegorz. et. al. (2021) Lake ecosystems' ecological health was assessed again. The ecological assessment process was modeled after the expert evaluation procedure using the supervised kernel Support Vector Machine method on a reduced-dimensional dataset. Because of the explanatory power of latent variables, we can now show not just how things were graded but also where they fall under certain categories. In the future, informative evaluation potential should be treated as an accompanying assessment parameter since it was raised by the depiction of the findings in decreased dimensionality without affecting the size of the classes.

Im R-Y, et.al. (2020) examined inland wetlands in South Korea to determine the effect of topography on habitat quality. According to the findings, "an evaluation of national scale inventory, encompassing wetland kinds and conditions, is urgently necessary to comprehend the full picture of imperiled wetlands, including where they are and how they look like." Each form of inland wetland (brackish wetland was included) in South Korea was categorized into one of four prominent topographic types (riverine, lake, mountain, and human-made), and the relative influence of land cover categories on wetland conditions were also categorized. The majority of the land area (71,3 %) was



made up of riverine wetlands. The percentage of riverine wetlands in a well-conserved state (i.e., a "A" level) was the greatest (23.8%), followed by mountain wetlands (22.1%). While a larger percentage of grasses was associated with a better condition score, an increase in bareland area had a detrimental effect on wetland quality. According to the data, "Wetlands situated near wetland protected areas likely to be in better condition compared to distant places." SUNIL KUMAR et.al (2019) Land is the most important and essential resource for city expansion, and how it is used and covered has a direct impact on how that expansion takes place. Rapid urbanization in Haryana has changed the state's natural environment significantly. Though Hisar is experiencing significant urbanization, the region has received very little academic attention. The current study demonstrates a drastic shift in land use, with the percentage of land devoted to urbanization increasing from 3.7% in 1991 to 5.0% in 2001 and 6.2% in 2011. Contrary to the purported effect of urbanization, bare land in the rural surroundings has greater temperature than the city centre. This is true even if there is a distinct difference between average land surface temperature for built up and non-built up region, grazing land and sandy waste. This is in contrast to the fact that during the dry pre-monsoon summer in rural areas, the limited plant cover causes less cooling to occur via evaporation. However, in the current research region, which is situated in a semi-arid climate, the green parks and plantation in the city contribute to lower mean temperature due to high rates of evapotranspiration and provide a "oasis effect." Normalized Difference Vegetation Index and Normalized Difference Built-up Index both showed a significant negative and positive connection with temperature in a regression study (Pearson's r: between -0.79 and -0.87 and between 0.79 and 0.84, respectively). In the time period between 2011 and 2021, predicted land usage increases by 1.3%, indicating an increase in built-up area. In order to reduce the heat's impact, the authors of this research propose a number of measures, including increased urban planting and a restriction on overgrazing.

Kumar, Ravinder (2018) eleven physico-chemical characteristics were used to determine each lake's water quality index in the research titled "Assessment of Water Quality Status of Lakes in Haryana, India." This study evaluated the water quality of three lakes in Haryana: TikkarTaal, Karan Lake, and Brahma Sarovar. When compared to ICMR/BIS norms, four indicators (DO, BOD, Iron, and EC) were determined to be excessive. Each lake scored very low on the WQI, indicating that its water quality is now very bad. Every lake in this research has a water quality index (WQI) more than 100, indicating that the water is inappropriate for human consumption, outdoor swimming, or any other human usage. Human indifference, pollution from human and animal interventions, religious rites, and unguided tourist activities were shown to be the primary causes of water quality decline.

Yohannes, Yihdego, John A. Webb (2017) Lake Buninjon in Victoria, Australia served as a case study for the study, titled "Assessment of Wetland Hydrological Dynamics in a Modified Catchment Basin." This research set out to isolate the effects of climate, river regime, and lake hydrological properties on lake water levels and salinity, leaving only the discrepancy, for the effect of the non-climatic/catchment modification in the past, and its model reveals that surface inflow is the most sensitive variable. To evaluate its response to natural/anthropogenic stress and decision choices for its ecological, social, scientific value, and mitigation measures to safeguard the wetland biodiversity in a catchment basin, the approach, along with the analysis and interpretation, may be of interest to the broader community.

**METHODOLOGY- Study Area-** The Hisar District is the most western and central part of the Indian state of Haryana. The district has around 3983.00 square kilometers of land. km. The district is located between the latitudes of 28°53'45" and 29°49'15" North, and the longitudes of 75°13'15" and 76°18'15" East. About 2811 hectares of marsh are included within the district. Tanks/ponds and waterlogged areas contribute to around 59% of the total wetland area. It's an alluvial plain in the Indian subcontinent and Southeast Asia. Natural drainage is nonexistent in the area, thus a system of canals and artificial drains is used instead.

**Blue Bird Lake- (29°10'46"N 75°43'??E)-** Blue Bird Lake is a lake, habitat, and exercise place for



migratory birds in the Hisar district of Haryana. Located in Hisar, it serves as a place for leisure and relaxation. Located on National Highway 10 (NH10) in Hisar, Haryana, India, it is convenient to the Hisar Airport. Deer Park and ShatavarVatika Herbal Park are both within driving distance. The Government of Haryana's Department of Forest oversees both of these locations as well. Out of the entire 10,000 species of birds in the globe, over 1,800 migrate annually, with almost 370 making the journey to India as a result of the changing seasons.

**Sampling Sites-** Three stations are selected for monitoring and frequent sampling of water in order to conduct a systematic field research after a thorough reconnaissance of the region has been conducted. These locations are selected due to the high level of human contact and the anthropogenic activities that take place inside the lake. Stations are labeled as S1 (lake's primary entrance), S2 (lake's geographic center), and S3 (lake's southernmost tip) (inlet of the lake).

**Data Analysis-** The study of Blue Bird Lake's aquatic ecosystem is crucial for evaluating the lake's ecological state. The aquatic environment is influenced by a wide range of external variables. Alterations in water quality owing to anthropogenic pollution of wetland water are accounted for in the research. It's possible that the varying wetland water quality is due to the water quality of the wetland's incoming water. Changes in the quality of water are caused in large part by natural factors like rainfall and river water, as well as seasonal and temporal factors. Between July 2021, the researcher followed protocol and collected water samples from three different places.

#### **Water Quality of Blue Bird Wetland and Ground Water**

##### **Analysis and Findings (July 2021)**

**The physical and chemical parameters of the samples taken in July 2021 are listed in Table 1.**

**Physical Properties-** The pH of the samples collected from Sites I through III showed a range of 6.4 to 7.4, with a Mean and Standard Deviation of 6.84 0.28. Every location had crystal-clear water. Surface water temperatures ranged from 34.6 degrees Celsius to 35.4 degrees Celsius, with Mean and S. D. of 35.0°C ± 0.26 °C.

The electrical conductivity ranged from 250 mho/cm to 381 mho/cm, with a mean and standard deviation. by 324 mho 48 cm. Water samples had turbidities ranging from 7.0 to 60.0 NTU, with the mean and standard deviation given. of 25.0 ± 16.6 NTU. The mean and standard deviation for the TSS (Total Suspended Solids) concentration in the samples ranged from 18.6 to 45.5 mg/l. of 34.67 ± 23.1 mg/l. TDS (Total Dissolved Solids) ranged from 164 to 251 mg/l, with Mean and S.D. falling somewhere in the middle. D. of 213 ± 31.0 mg/l.

**Chemical Properties-** Total alkalinity values with Mean and S.D. were between 74 and 81 mg/l. D. of 77 ± 18 mg/l. Mean and standard deviation for Cl<sup>-</sup>, HCO<sub>3</sub><sup>-</sup>, and SO<sub>4</sub><sup>2-</sup> anions were 9, 12, and 27, 62 mg/L, respectively. D. correspondingly 14 4.5 mg/l, 93 22 mg/l, and 43 10.2 mg/l.

Zero locations yielded carbonate results. The Mean and Standard Deviation (SD) for the cation concentrations Ca<sup>2+</sup>, Mg<sup>2+</sup>, K<sup>+</sup>, and Na<sup>+</sup> were 15.0 to 17.0 mg/l, 4.0 to 12.0 mg/l, 2.0 to 8.0 mg/l, and 18.0 to 56.0 mg/l, respectively. D. with corresponding values of 16.0 2.0 mg/l, 8.40 2.80 mg/l, 6.0 2.0 mg/l, and 32.0 11.1 mg/l.

The samples had mean and standard deviation values (M and S) of 54.0 and 99.0 mg/l for total hardness. D. of 75.0 ± 16.0 mg/l. DO (Dissolved oxygen) values varied from 2.80 to 6.20 mg/l, with the highest value being recorded near the entrance. The samples had acidities between 2.5 and 10.0 mg/l, with Mean and S. D. of 7.50 ± 2.30 mg/l.

Phosphate values varied from 0.70 to 0.99 mg/l, with the mean and standard deviation falling somewhere in the middle. D. Phosphate dietary intake was measured to be 0.84 0.11 mg/l. Nitrate levels per milligram of protein varied from 0 to 0.742. We calculated the mean and the standard deviation. D. Nitrate concentration was calculated to be 0.320 0.244 mg/mL. Ammonia was not detected in any of the water samples.

**Heavy Metals-** With Mean and S.D., the Iron content varied between 38.70 and 132.20 g/l. D. of 88.80 + 31.10 g/l. Zinc values, including Mean and S.D., spread out between 16.05 to 64.7 g/l. D. of 31.40 ± 14.30 g/l.

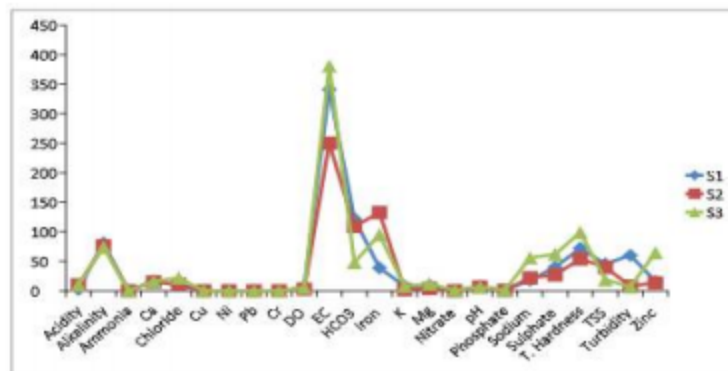




Besides Cd, Cr, and Ni, no other heavy metals were detected in the samples.

**Table 1 Physico-chemical analysis of water samples of Blue Bird wetland in July 2021**

| S. No | Parameters              | S1    | S2    | S3    | Mean ± S.D (Range)           |
|-------|-------------------------|-------|-------|-------|------------------------------|
|       | Acidity (mg/l)          | 2.5   | 10.0  | 10.0  | 7.50 ± 2.30 (2.50 to 10.0)   |
|       | Alkalinity (mg/l)       | 81    | 76    | 74    | 77.0 ± 18.0 (74 to 81)       |
|       | Ammonia (mg/l)          | -     | -     | -     | -                            |
|       | Ca                      | 17    | 15    | 16    | 16.0 ± 2.0 (15 to 17)        |
|       | Chloride (mg/l)         | 9     | 11    | 22    | 14 ± 4.5 (9.0 to 22.0)       |
|       | Colour                  | Clear | Clear | Clear | -                            |
|       | Cr                      | 0     | 0     | 0     | 0                            |
|       | Cu                      | 0     | 0     | 0     | 0                            |
|       | DO (mg/l)               | 6.2   | 2.8   | 5.4   | 4.80 ± 1.3 (2.8 to 6.2)      |
|       | EC (u mho/cm)           | 341   | 250   | 381   | 324 ± 48.0 (250 to 381)      |
|       | HCO <sub>3</sub> (mg/l) | 122   | 109   | 48    | 93 ± 22 (48 to 122)          |
|       | Iron (Lig/l)            | 38.76 | 132.5 | 95.14 | 88.8±31.1 (38.76 to 132.5)   |
|       | K <sup>+</sup> (mg/l)   | 08    | 02    | 08    | 6.0 ± 2.0 (2 to 8)           |
|       | Mg                      | 9.2   | 04    | 12    | 8.4 ± 2.8 (4 to 12)          |
|       | Ni                      | 0     | 0     | 0     | 0                            |
|       | Nitrate (mg/l)          | 0.220 | 0.0   | 0.742 | 0.320 ± 0.244 (0.0 to 0.742) |
|       | Pb                      | 0     | 0     | 0     | 0                            |
|       | Ph                      | 7.4   | 6.62  | 6.50  | 6.84 ± 0.28 (6.5 to 7.4)     |
|       | Phosphate (mg/l)        | 0.70  | 0.83  | 0.99  | 0.84±0.11 (0.70 to 0.99)     |
|       | Sodium (mg/l)           | 18    | 22    | 56    | 32 ± 11.1 (18-56)            |
|       | Sulphate (mg/l)         | 40    | 27    | 62    | 43.0 ± 10.20 (27 to 62)      |
|       | T. Hardness             | 72    | 54    | 99    | 75 ± 16 (54 to 99)           |
|       | TSS (mg/l)              | 45.5  | 39.9  | 18.6  | 34.67 ± 23.1 (18.6 to 45.5)  |
|       | Turbidity (NTU)         | 60    | 8     | 7     | 25 ± 16.6 (7 to 60)          |
|       | Zinc                    | 16.05 | 13.45 | 64.7  | 31.4 ± 14.3 (16.05 to 64.7)  |





**Economic Value of Blue Bird Lake wetland-** The importance of establishing a precedent that recognizes the monetary value of wetlands cannot be overstated. It also aids in the distribution of funds for conservation-related projects. In addition, it may help people give thought to the worth of wetland systems and become involved in a wide range of efforts.

Since the market often only assigns monetary values to tangible products and services, it is difficult for the average person to conceptualize how much money should be paid for the ecological benefits provided by a wetland. Services provided by wetlands, such as mitigating flood risk, preserving biodiversity, and purifying water, are not currently being paid for by consumers. However, recent evidence suggests that these advantages have monetary worth and should be included into decision-making.

A questionnaire was part of this investigation. The study was carried out by means of a questionnaire to which local people answered. The exercise was supposed to help you figure out how many resources your target wetland had. One hundred homes were surveyed for this study. Utilizing a market pricing methodology, we were able to assess the wetland area's resources and calculate its monetary value. The following information, gleaned from the data analysis, is listed in table 4.54.

\* Irrigation: No direct irrigation is done using water from the marsh. However, the wetland is irrigated indirectly from the channel next to it, where water is drawn from both the marsh and an inflow water channel from the Sunder branch of the Western Yamuna canal. There are a total of 79 Tube-wells on the inlet channel, which draws water from these two channels, and 24 Tube-wells on the neighboring channel. One Tube well irrigates roughly 50 acres each year, and the market value of that service is about Rs. 500, according to the estimate. The daily economic value of the irrigated water from these canals is assessed to be 693 and 3950 rupees.

\* According to the results of the survey, around 65 people gather almost 10 kg of fuel wood every day. The majority of those who gathered wood for fuel were members of the socially and economically disadvantaged SC group. Fuel wood cost Rs 12 per kilogram on the open market. In all, the cost of firewood every day amounted to Rs 7800.

\* Animal fodder: local women harvest grasses for use as livestock food. Approximately 90 women, on average, carry around 15 Kg of feed daily, according to the study analysis. The feed has a selling price of Rs 5/Kg on the market. More than a hundred animals also use the area as a grazing ground. Blue Bird Lake wetland region provides animal feed to the local economy to the tune of roughly Rs. 8000 /day.

\* People from the surrounding villages do manual labor in the marsh area as part of numerous government programmes, such as the Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA) and the Haryana Forest Department's plan to clear the weed. The daily worth of all labor was Rs. 9,000.

Table 2 Classification of total economic value for wetlands

| Use Value/Benefits   |   | Non-Use Value/Benefits              |
|--|---|-------------------------------------|
| Direct Use/Benefits  | Indirect Use/Benefits   | Existence Benefits                  |
| Recreational value:<br>It include:<br>Boating<br>Picnic<br>Flora and Fauna<br>Scenery<br>Walking | Flood control<br>GW recharge<br>Eco-system support<br>Erosion control | Culture<br>biodiversity<br>Heritage |
| Commercial<br>Fuel wood<br>Agriculture<br>Berries  |   |                                     |



**Table 3 Economic Valuation of Blue Bird Lake Wetland Hisar**

| Wetland            | Direct Use/Value                                       |                   |
|--------------------|--|-------------------|
|                    | Use  | Amount in Rs./day |
| Blue Bird Lake     | Irrigation from the BB lake                            | No value          |
|                    | From adjacent Channels                                 |                   |
|                    | From Inlet channels                                    | 700               |
|                    | Woods for fuel and other purposes                      |                   |
|                    | Animal Fodder  | 3950              |
|                    | Labour from govt. schemes like MNREGA and Forest Dept. | 7800              |
|                    |  | 8000              |
|                    |  | 9000              |
| <b>Total Value</b> |  | <b>24800/-</b>    |

**CONCLUSION-** Hisar tehsil's urban development and the consequences of this trend have seldom been examined, despite the fact that it has been experiencing significant population increase and urbanization. Using satellite photos from 1991, 2001, and 2011, this research attempts to analyze the spatial-temporal pattern of LULC change in order to estimate land use in 2021 and assess the influence of land-use dynamics on the region's thermal environment. The birds that spend the winter flying south are a gift to all of humanity.

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