A STUDY ON EFFECTS OF AQUATIC VEGETATION ON MICROBIAL PROCESSES IN WETLANDS OF SURAJPUR LAKE

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Abstract

Surajpur Lake is that the well-known soil website in capital Region, Bharat better-known for its wealthy avifaunal and alternative aquatic variety. The present study was disbursed to guage the soil quality in several vegetation structures in Surajpur soil from March 2014 to Gregorian calendar month 2017. Soil Sampling was conducted in five totally different vegetation habitats within the study space by applying normal sampling protocols.

9 Physics and chemicals are selected for the complete analysis of six parameters. The total amount of soil moisture content 11.17 bulk 3.03%, bulk density of 1.19g 0.01g / ml, porocity 35.00 10. 5.10%, water retention capacity 35.00 in the total of the physical parameters of the soil samples are included. 3.86%, organic organic carbon 0.09% 0.05%, electric conductivity 276.42.88 dated 112.83 ds / m, pH value 9.98 42 0.42.

Among the substance parameters of soil samples, total nitrogen 286.76 1 42.41 mg / kg, accessible phosphorus(P) 338.50 8 32.75 mg / kg, potassium 2.85 to 0.39 mg / kg, calcium(Ca) level 10.87 ± 6 74 mg / kg, magnesium 10.57 ± 4.44 mg included. / Kg, iron 14.90 99 1.99 mg / kg, manganese 289.13.88 42.89 mg / kg, zinc 4.20 kg 0.45 mg / kg, chloride(Cl) 223.74 ± 62.65 mg / kg, sulphate(SO2?4) 150.22 ± 28.00 mg / kg and silica oxide(SiO2) 7.97 90 1.45 mg / kg.

Boron, copper(Cu) and molybdenum nutrients(mn) found in soil samples have been recorded <1 mg / kg and in this, the viable computation of bacteria has been recorded overall aggregate of 16,55,000.00 611,07,157.32 cfu / g. The results are indicated by those who are free of contamination and critical mineral nutrients are broadly spread in the soil and there is no organic waste on site as well. It is sufficient to supported a good biodiversity by the sun so that a complete food web can be prepared in Surajpur Wetland ecosystem.

Transect measurements, continuous observation, and synoptic surveys were wont to examine patterns in light-weight handiness, temperature, and dissolved element concentrations inside and out of doors emerging vegetation zones in Surajpur, state, a natural grassland hole soil. Water column light-weight handiness was but a pair of of close light-weight in emerging vegetated areas because of cover cowl, tiny floating plants (lemnids), and plant litter. Water temperatures and dissolved element concentrations were considerably lower and varied less diumally in vegetated areas.

3 environs zones can be known supported sample in vegetation and decomposed oxygen: (1) A region of compact emerging macrophytes providing vital submerged structure however with nearly or utterly hypoxia water, (2) Here, a transit area of macrophytes distributed with an additional emerging aerobic water provides less structure (3) An open water region with systematically aerobic water however with very little submerged structure.

Vegetation patterns are doubtless to regulate major aspects of soil biogeochemistry and biological process dynamics, and wetlands ought to be viewed as advanced mosaics of habitats with distinct structural and useful characteristics. In a grassland hole soil, diurnal element curve analyses were wont to verify water column chemical change and respiration in open water, shift, and emerging vegetation zones, whereas CH_4 flux because of diffusion and ebuiliation was measured at the air/water interface in these zones.

Dissolved O_2, temperature, light, dissolved CH_4, plant densities(pd), litter densities(ld) was calculated in transects from open water to emerging vegetation zones. Water column temperature, light-weight penetration, chemical change, and aerobic respiration rates were abundant larger in open water than in emerging vegetation zones. CH_4 concentrations within the water paragraph were abundant lower in open water than in emerging vegetation zones, however CH_4 flux rates were similar.

As a result, methanogenesis could be a comparatively additional necessary carbon pathway in emerging vegetation than in open water zones. An outline of the carbon budget of various zones suggests that the emerging zone generally has production in far more than consumption whereas the open water zone could have larger consumption than production.

Obviously, organic touch support the open water zone's consumption is because of production throughout previous years and probably to imports from the emerging vegetation region.

Keywords: *Surajpur Lake, emerging vegetation, region, methanogenesis diffusion etc.*

1. Introduction

Wetlands are referred as “biological supermarkets” because they support all life forms through extensive food webs and biodiversity (Mitsch and Gosselink, 1989). Through the ages, urban wetlands have been the lifeline of most cities in India. They provide multiple values for suburban and city dwellers (Castelle et al., 1994). The capacity of a functional urban wetland in flood control, aquatic life support and as pollution sink implies a greater degree of protection (Ramachandran, 2001). The essential minerals and organic matter present in the wetland surface are in the form of soil and soil quality is “the capacity of soil to function within ecosystem boundaries to sustain biological productivity, maintain environmental quality and promote plant and animal health” (Doran and Parkin, 1994). Soils are the unconsolidated mineral or organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.[1] Healthy soils are crucial for ensuring the continued growth of natural and managed vegetation, providing ecosystem services such as climate regulation and oxygen production. Soil quality assessments provide a better understanding and awareness that soil resources are truly living bodies with biological, chemical, and physical properties and processes performing essential ecosystem services (Karthick and Ramachandran, 2006). The future of our food security depends upon the attention we pay to soil health care and the conservation and efficient use of water (Swaminathan, 2005). Soil quality assessment plays a very important role in diagnosing the physical, chemical and biological properties of the soils by providing the conditions of available nutrients which indicates the fertility and productivity of the soils (Lungmuana and Colney, 2011). Soil sampling and testing provides an estimate of the capacity of the soil to supply adequate nutrients to meet the needs of growing vegetation.[2] Vegetation directly influences climate in several ways including through albedo and surface roughness and indirectly, vegetation contributes organic matter to the soil which affects albedo, adds insulation and increases water holding capacity and infiltration (Balling et al., 1998). Soil characteristics are necessary to gain a comprehensive knowledge about the functioning of the wetland ecosystem and association of vegetation structure. The Gangetic Plains in India form an important biogeographic zone characterized by fine alluvium and clay rich swamps, fertile soil and high water retention capacity. Around 400 species of angiosperms have been recorded from this bio geographic zone (Manral et al., 2013). The Upper Gangetic Plains (UGP) are scattered with several natural fresh water wetlands has the highest human density in India of 800-1200 people per km2 , which has thus resulted in high human impact on natural ecosystems (Manral et al., 2013). Surajpur Lake is one such wetland in urban surrounding in UGP.[3] Soil quality assessment started in late 1940s and it began in India in 1955-56. Soil testing is well recognized as a sound scientific tool to assess inherent power of soil to supply plant nutrients. Numerous studies are available on various aspects of soil assessment such as Bhattacharyya et al. (2013) reviewed the historical perspective, classification and recent advances of Soils of India; Ray et al. (2014) reported soil and land quality indicators of the Indo-Gangetic Plains of India; Singh et al. (2004) studied the soils of Uttar Pradesh for optimising land use; Yadav et al. (2013) investigated heavy metal status in soil and vegetables grown in urban area of Allahabad, Uttar Pradesh; Gowd et al., 2010 made an assessment of heavy metal contamination in soils at Jajmau (Kanpur) and Unnao industrial areas of the Ganga Plain, Uttar Pradesh; Yadav and Shukla (2015) assessed Heavy metal accumulation in wastewater flooded soil of Allahabad, Uttar Pradesh; Tiwari et al. (2014) made an appraisal of available sulphur and micronutrient status in southwest plain zone soils of Agra, Uttar Pradesh. However, very few studies have been available to assess the soil[4] and vegetation structure such as Pilania and Panchal (2014) assessed the soil-plant relationship in Little Rann of Kutch, Gujarat India; Raina and Gupta (2009) assessed the soil and vegetation studies in relation to parent material of Garhwal Himalayas, India and there is no such study available on soils and vegetation structure in UGP. Hence, the present study, has been done to study the physicochemical properties of soil in different vegetation structures of Surajpur wetland to arrive at certain conclusions[5] on the relationship of soil and vegetation aspects of the area and to suggest ways and means for its conservation. (Source: Nasim Ahmad Ansari1 and Jeet Ram - 2016)

2. Objective

In this study we are investigating the he spatial and temporal dynamics of the water column. Here we tell about living and dead emergence regarding the distribution of a natural prairie Pathol wetland and their internal areas.

From March 2014 to February 2017, In the current study, from March 2014 to February 2017, to assess the quality of soil in various vegetation structures in Surajpur Wetland.

3. Hypothesis

To effects of aquatic vegetation properties on microbial processes in wetlands of Surajpur Lake. A outline of the carbon budget of various zones suggests that the emerging zone generally has production in far more than consumption whereas the open water zone could have larger consumption than production. Organic touch support the open water zone's consumption is because of production throughout previous years and probably to imports from the emerging vegetation region.

4. Literature Review

Chaudhari, P.R., Ahire, D.V., Ahire, V.D., Chkravarty, M. and Maity, S. (2013) It seems quite probable that manipulation of plant species might be as important for the enhancement of desirable microbial functional groups as wetland type and is an area ripe for additional research.

Emergent macrophytes are likely to affect major aspects of carbon metabolism and biogeochemistry of wetlands. The transfer of oxygen to the rhizosphere via emergent macrophytes is one example.

Bhattacharyya, T., Pal, D.K., Mandal, C., Chandran, (2013) Nevertheless, it is clear that our current black box approach to TW design has allowed us to shift the internal TW environment to favor one functional group over another. Research confirms that manipulation of redox by use of different TW types—e.g. vertical flow, horizontal subsurface flow, forced aeration—can shift dominance between various microbial functional groups and affect performance.

APHA (2006) Redox condition is a manipulable parameter that can be used to optimize growth of a targeted functional group, therefore factors influencing the TW redox condition and its influence on organic carbon removal mechanisms are emphasized.

Bahuguna, Y.M., Gairola, S., Semwal, D.P., Uniyal, P.L. and Bhatt, A.B. (2012) The microbiology of treatment wetlands is the most important factor influencing the removal of pollutants in these systems. However, its complexity has forced scientists and engineers to largely ignore the underlying details of microbial processes and use a “black box” approach to the design and operation of these systems. Quite recent application of newer molecular and genetic microbial techniques to the study of TWs has opened a new era of treatment wetland research.

Correlli, D.L. (1998) In addition, macrophytes may affect many aspects of the physical and chemical characteristics of the water column (Ulehlova and Pribil 1978; Reddy 1981; Bican et al. 1986; Murkin et al. 1992; Hamilton et al. 1995). Aquatic plants can increase dissolved O, in the water column directly through photosynthesis and indirectly by providing substratum for periphytic algae.

Doran, J.W. and Parkin, T.B. (1994) They can also decrease dissolved Oi concentrations by shading the water column (which reduces photosynthesis and heat transfer), by their own respiration, by contributing organic matter and substratum for bacteria, as well as by disrupting gas transfers across the air/water interface. In some cases, these alterations of the physical environment reduce dissolved Oj concentrations to anaerobic levels.

Gowd, S.S., Reddy, M.R. and Govila, P.K. (2010) Three habitat zones were identified based on the distribution of vegetation and dissolved oxygen: (1) a zone of dense emergent macrophytes providing significant submerged structure but with nearly or completely anoxic water, (2) a transition zone of sparse emergent macrophytes providing less structure but with more aerobic water, and (3) an open water zone with consistently aerobic water but with little submerged structure. Water colimm light availability was as low as 2% of ambient light in emergent vegetated due to canopy cover, small floating plants (lemnids), and plant litter.

Fauzie, A.K., Khudsar, F.A. and Sreenivasa. (2015) At least three habitat zones have been identified in based on patterns in vegetation and dissolved oxygen: (I) an emergent macrophyte zone providing significant submerged structure but with nearly or completely anoxic water, (2) a transition zone of sparse emergent macrophytes providing less structure but with more aerobic water, and (3) an open water zone with consistently aerobic water but with little submerged structure. To further explore the consequences of these dynamics, this smdy used both Typha spp.-dominated natural and experimental wetland systems to examine patterns of aquatic aerobic carbon metabolism and methanogenesis among areas with different plant structure levels.

Agriculture wastewater has been widely managed using constructed wetland systems in different countries (Maddox and Kingsley, 1989; Hammer et al., 1993; Du Bowy and Reeves, 1994; Cronk, 1996; Sun et al., 1998; Kern and Idler, 1999; Knight et al., 2000; Newman et al., 2000; Nguyen, 2000; chaafsma et al., 2000; Koskiaho, 2003; Mantovi et al., 2003; Poach et al., 2003). CWs served as alternatives to conventional treatment options to eliminate/reduce contaminant and nutrient concentration in agricultural wastewaters (Cronk, 1996; Peterson, 1998: Geary and Moore, 1999; Knight et al., 2000; Borin et al., 2001; Hunt and Poach, 2001; Szogi and Hunt, 2001;

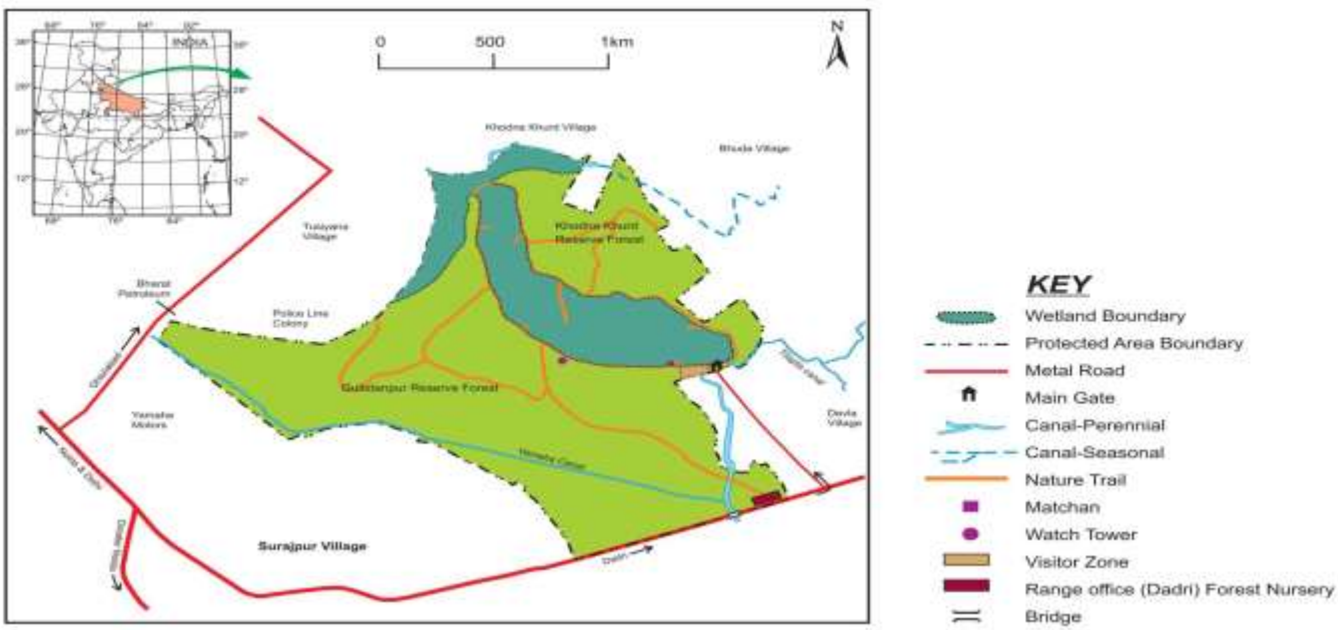
Braskerud, 2002). Several constructed wetlands have been studied for their capability to hold or alter nutrient inputs specifically from dairy and swine wastewaters. Further, many other dairy wetlands have been built in many states of the USA (Holmes et al., 1995, Chen et al., 1995, Kadlec and Knight, 1996). In Ireland, over a dozen dairy farms use integrated CW to handle farmyard waste water (Dunne et al., 2005).

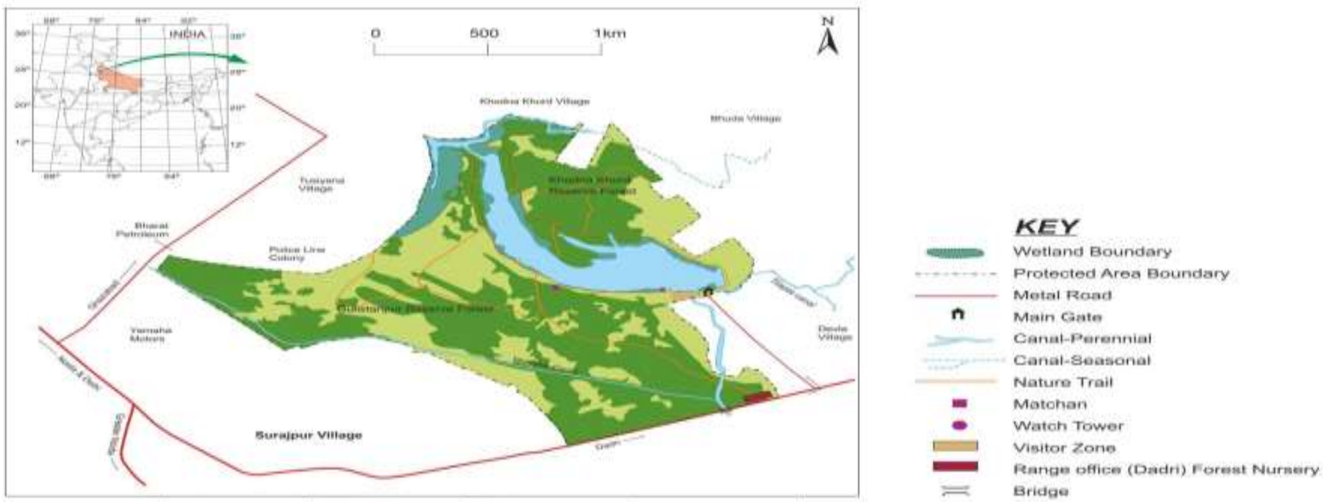
5. Research Methodology

5.1 Study area

Surajpur Wetland is located in the Gautam Budh Nagar district of Uttar Pradesh, which has a very splendid past and has its roots in Tretayuga (Ramayana period), because Risvan's father Vishnuji lived in this land, the birthplace of the sage Vishnu. In Dwapara Yuga (Mahabharata period) - Dankaur was the ashram of Dronacharya, where the Kauravas and Pandavas took their training in Astra and Shastra. Eklavya - Dronacharya's disciple was also from this place. In medieval India, Kasna was known as Keshav Garh. Gurjar community - His primary occupation was animal husbandry, which has always dominated the region.[6]

Surajpur falls in the Wetland Gangetic Plain biogeographic zone (Rodgers et al 2002). The study area is located near Surajpur village in Dadri Tehsil of District Gautam Budh Nagar under Greater Noida Industrial Development Authority, Uttar Pradesh. The region is located at an altitude of 184.7m msl at latitude 28 ° 31.425'N and longitude 77 ° 29.714 '. The wetland is located in Greater Noida city, 3 km from Uttar Pradesh and 26 km from Delhi (Figure 4.1). The study site is a reserved forest and covers an area of 308 hectares (3.08 Km^2), including 60 hectares (0.60 Km^2) of natural perennial wetlands (Fig. 5.1). Human settlements on the periphery of Wetland demarcated their borders. (Source: Nasim Ahmad Ansari1 and Jeet Ram - 2016)





Habitat	Wetland	Woodland	Grassland	Marshland
Area (Ha)	32	152	96	28
Percentage (%)	10.39	49.35	31.16	9.09

Figure 5.1: The study area. (Source: Nasim Ahmad Ansari1 and Jeet Ram - 2016)

5.2 Climate: Temperature, Rainfall and Humidity

The general climate is a tropical monsoon type with three distinct ecological seasons, depending on the general rainfall pattern and other climatic factors. Summer (March, April, May and June), Monsoon (July, August, September and October) and winter. The present study for data analysis describes November (December, January, and February).[7] Surajpur wetland is mainly rainfed. Other sources for water recharge are the catchment areas of the Hawala River which is connected to the Hindon River and the irrigation canal of Tilapata Minor, which is also coming from the Kulesra Bund Hindon River (Fig. 5.2) [8]. Rainfall data was sourced from the Meteorological Center, Indian Meteorological Department, Delhi. The southwest monsoon is the main source of rainfall. Pre-monsoon rainfall or thunder-shine occurs in the months of May and June. The study area receives most of its rainfall during the monsoon which is usually set[8] between late June to September every year. During the study period (January 2017 to December 2019), the average monthly rainfall in the study area ranges between 3.57 mm (December) and 288.47 mm (August). Generally, August (288.47 mm) and September (190.23 mm) were the rainiest months while December (3.57 mm)[9] and January (5.90 mm) were the driest months. The average annual rainfall was about 56.2 mm. There was a decrease in rainfall patterns during the study period (2017–2019). The maximum rainfall (90 mm) was recorded in the year 2017 while the lowest rainfall[10] (28 mm) was recorded in 2019. Surajpur Wetland is mainly rainfed. Other sources for water recharge are the catchment area of Havaliya Nallah which is connected to Hindon River and the irrigation canal of Tilapata Minor, which originates from Kulsra Bund, Hindon River[11]. The general climate is tropical monsoon type and the main source of rainfall is the southwest monsoon. The maximum rainfall ranges from 400–500 mm from July to October[12]. The catchment area is flooded with water during the monsoon and the flood zone spreads to 108ha. However, during summer the major part of Wetland remains dry and the flood area reaches 30-40 hectares.

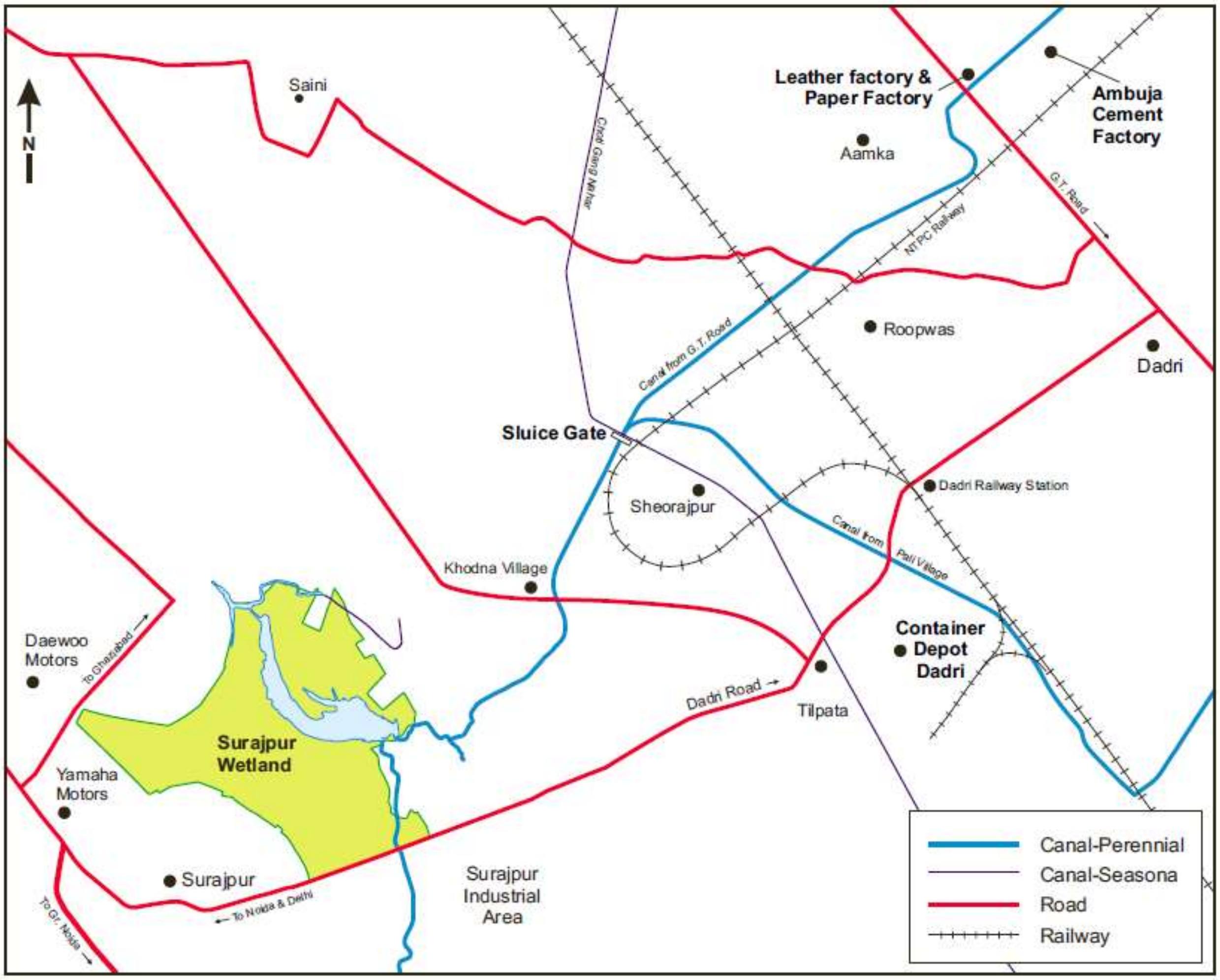


Figure 5.2: Drainage map of the study area. (Source: Nasim Ahmad Ansari1 and Jeet Ram - 2016)

The minimum and maximum temperatures are between 6.86 ° C and 41.69 ° C, and the highest temperatures were observed during June and the lowest during January.[13]

5.3 Habitat characterization

The various vegetation strass-tures of Surajpur Wetland are classified into four major habitats based on vegetation and soil type, woodland, grassland, wetland and marshland habitat (Fig. 5.1.). Soil quality was assessed in woodland and grasslands. These major habitat fur- therapies are divided into microbiots; Woodland includes Phoenix silvistris, Terminalia arjuna, Syzygium cumin and Prosopis juliflora;[14] Pastures are prominent with Saccharum sp., Vetiveria zizanioides and Desmo-Stachy bipinnin species; While wetlands include clear water with submerged aquatic vegetation of Ser-taphylum dimersum, Hydrilla verticillata, Vallis-neria spiralis; Eichhor-nea crassipes, Alternanthera philoxeroides, Ipomoea sp., Incidental aquatic vegetation of Typha angustata; And Phoenix Silvistris, Terminalia arjuna, swampy land with Szegium cumin vegetation-Ionian (Fig. 5.2). Habitat mosaics formed a variety of vegetation structures that serve as a good habitat for the various types of biodiversity present in the study area[15].

5.4 Soil quality assessment

The process of soil testing involves four steps, sampling, analysis, interpretation and recommendations (Kissel and Sonon, 2008). Com-posit soil samples were collected from the study area in December 2012 at 5 different locations of woodland (such as Terminalia arjun-TA, Syzygium coumin-SC, Phoenix Silvestris-PS, Prosopis julifora-PJ) and pasture (GR) Were collected from the habitats[16]. Packed in polyethylene bags and brought from the labor-atry for each analysis, a kilogram of sample 5 cm deep was collected using an auger and core after removing the top soil humus from each lona- tion. A total of 25 parameters selected for analysis, including soil visual, physical, and chemical prop- uteri, using standard methods of analysis of soil samples. Soil texture, water holding capacity, soil porosity, soil color, soil bulk density, chloride (Cl) and phosphorus (P) were analyzed after Gup-ta, (2004); Total

Czildahl nitrogen (TKN), sulfate (SO4), electrical conductivity (EC)[17] and moisture sor tent were analyzed following International Standards Organization methods (ISO, 2001); Heavy metals such as silica (SiO_2), copper (Cu), zinc (Zn), manganese (Mn), molybdenum (Mo), boron (B), sodium (Na), potassium (K), calcium (Ca), magnesium ( ) Mg), iron (Fe) analyzed after USEPA 3050B (USEPA, 1996); Total plate count (TPC) for microbial analysis of soil samples was analyzed after APHA[15. 23][Kaushalendra Kumar Jh, 2013]

Azolla pinnata (bhuri kai): Initially green but later brown leaves float on the surface of water; Creating an ap-pearance from a brown or distant red carpet (Fig. 5.3) that extends over the waterbody. The lateral roots with winged wings floating freely remain submerged in water; The stem is practically absent. The leaves are eaten by almost every duck (the northern shovel was fond of it)[23]. [Kaushalendra Kumar Jh, 2013]

Eichhornia crappiels (hyacinth): Floating and erect plants appear green mostly due to the major leaves; The column stem supports the beautiful purple inflorescence; Petiols are swollen bladder (Figure 5.3). Deeply growing roots are submerged in water. Purple Swamphen and Les Whistling –duck have been observed eating on the soft tissue of swollen petiole. This plant is grown as is generally regarded as a weed and sometimes ornamental plants.[23] [Kaushalendra Kumar Jh, 2013]

Jussiaea repens (Vanlong / Gahdi): floating plant com- mon along the margin of the aquatic body; Column stem with a pile of leaves when it comes to creeping colored stem base with water surface; The spongy white air roots grow at the nodes and remain submerged in water (Figure 5.3). The flowers are solitary, pale yellow or white. Both the roots and the stem are eaten by common cott, common teal, gadwal, ura-cyan vegans, northern pintails, northern shovelers, and purple swamen.[23] [Kaushalendra Kumar Jh, 2013]

Lemna purpusilla (Hari kai): Floating plant with mainly one or two to four or five small leaves and one root (Fig.5.3). The leaves are eaten by the northern Schweller and Mallard.

Pistia stratiotes (Pistia): The floating tufted plant is mainly composed of tufted leaves and has suspended roots without a stem. The tuft of the rippled leaves has a rosette appearance (Fig. 5.4). This plant is considered one of the most dangerous aquatic weeds, but common leaves are eaten by common cottonseed.[23] [Kaushalendra Kumar Jh, 2013]

Figure 5.3. Azola Pinnata, Jussia Repens and Echornia crappies **Source: (**https://link.springer.com/article/10.1007/s13201-016-0415-2) [Kaushalendra Kumar Jh, 2013]

Figure 5.4: *Lemna purpusilla*, *Pistia stratiotes*, *Wolffia arrhiza* and *Trapa natans.* **Source: (**https://link.springer.com/article/10.1007/s13201-016-0415-2) [Kaushalendra Kumar Jh, 2013]

5.5 Field survey

The study area was mainly classified into different habitats (i.e., grassland, woodland and wetland) based on different vegetation. The observation on Avifuna was done for a period of three years i.e. from January 2017 to December 2019. The data were collected on a fortnightly basis and a total of 80 surveys were conducted during the study period. Terrestrial habitats (woodland and grassland) were regularly surveyed by systematically walking fixed routes through the study area, while 10 vantage points were selected in 10 blocks of wetland, making easy calculation of birds in each block respectively for convenience. These vantage points were identified based on visibility and size of the blocks. The birds were mostly observed during the most active period of the day, that is, from 500–900 hours and 1800–2000 hours. Following Ali and Ripley (1972, 1983), bird status was classified as resident (R), winter migratory (WM), summer migratory (SM) and passed migratory (PM). The abundance status of recorded bird species was established based on the frequency of sighting following Kumar and Gupta (2009), such that 6 out of 12 visits were recorded 7–8 times out of 12 visits. Commonly recorded, abnormal was recorded 4–5 times out of 12 visits, and 0–4 times out of 12 visits.

Questionnaire Survey

In order to create a database of the Effects of Aquatic Vegetation on Microbial Processes in Wetlands of Surajpur Lake uses of the plants that were found in the study area, we prepared a questionnaire with some specific questions regarding the uses of the Aquatic Vegetation. The Surajpur villages present in the study area were covered. The Surajpur villages people and the Aquatic Vegetation men were questioned about the plants and their techniques, if any. This was used to gather idea about the types of plantation the area supported, according to the weather conditions.

Study site in the microbial processes in Wetlands of Surajpur Lake

The data about the weather conditions of the area and the plantation history of the area helped in finding out the mitigation measures that should be employed to prevent Aquatic Vegetation uses of aquatic vegetation on microbial processes in Wetlands of Surajpur Lake as much as possible.

Methods of data collection

Looking at the purpose of this study, researchers mainly depend on primary data as the source of data collection.

The primary data for the purpose of this study will be obtained through the questionnaire.

Secondary data is the name given to the data that is extracted from the already existing records and is used in addition to the purpose for which they were originally collected.

For the purpose of this study, secondary data will be a source and electronic source. (Such as government reports, internet, published research reports, etc.).

Types of Data

Various kinds of information collected on tribal and traditional communities can be categorized as under-

(a) Qualitative data

(b) Quantitative data

(c) Descriptive data

(d) Supportive data

Stationary
- Thesis ream
- Pen
- Pencil
- Sharpener
- Thread roll
- Measuring tape
- Pocket lens
- Stapler
- Cello tape roll

Observations

On reaching Surajpur Lake, rapport was established with one or two persons, preferably the chief and contact was then established with other members of the locality.

An excursion of the Surajpur Lake was undertaken to note the shelter patterns, farms, shrines *etc*. and observations were made. Enquiries were made on the plant material used in different artifacts seen and notes were taken.

Equipments

- Secateurs
- Digger
- Scissors
- String
- Plant press
- Blotting sheets and old news papers

Empty fertilizer bags

- Polythene bags of different sizes

6. Result & Discussions

The presence of vegetation in wetlands also distributes current velocities of water and reduces (Petecrave and Kalf; 1992; Somes et al., 1996). This creates a better condition for sedimentation of suspended solids, which serves to reduce the risk of erosion and re-suspension. Also increases the contact time between surface areas of vegetation in water and wetlands. Aqueous vegetation in wetlands stabilizes the soil surface in the land for macrophytes treatment which are important, as the dense root system of aquatic vegetation acts to inhibit the formation of erosion channels. This vertical flow that works in these systems is the presence of macrophytes and, coupled with an intermittent loading regime, will help prevent clogging of the medium (Bahlow and Wach, 1990). When aquatic vegetation moves to the surface, it helps to decompose the growth organic matter within the roots through a filter medium and prevent stagnation. Wetland is a thick biofilm located on a surface between the aquifer vegetation atmosphere and the wetland soil or water, which forms the atmosphere of the critical mantle between the aquatic vegetation in the wetland. Which are important gradients in various environmental parameters.[22] Air velocities near the surface of soil or water can be reduced compared to velocities over aquatic vegetation and this reduces re-suspension of aquatic vegetation and thereby improves the removal of suspended solids of aquatic vegetation by sedimentation. it happens. However, one drawback of the low wind velocity near the surface of the water is that it lowers the water column. Light is seen obstructing the production of algae in water below the vegetation cover.[21] This property is used in duckweed-based systems, as algae die and settle under a dense mantle of duckweed (Ngo, 1987). Another important effect of plants is the insulation that the cover provides during winter, especially in temperate regions (Smith et al., 1996). When standing litter is covered with ice, it provides a perfect insulation and helps keep the soil free from frost. The litter layer helps protect the soil from freezing during winter, but on the other hand, it also keeps the soil cool during the spring (Haslam, 1971a; Haslam, 1971b; Brix, 1994). In wetlands constructed with subaerial horizontal water flow, the flow of water in the bed through channels created through living and dead roots and rhizomes as well as through soil pores is intended to be largely subsurface. As roots and rhizomes grow they tend to discolor and loosen the soil. In addition, when roots and rhizomes die and rot, they can leave behind tubular pores and channels (macropores), which are thought by some to increase and stabilize the hydraulic conductivity of the soil (kikuth , 1981). The structure of macropro systems is dependent on plant species and growth conditions, and can be very effective in channeling water through the soil bed (Beavan and Jarman, 1982). Claims have been made that after a period of three years (three full-grown seasons), any soil will develop a hydraulic conductivity of 10–3 m sec – 1 and, once developed, stabilize and maintain the hydraulic conductivity itself Will keep (Kikuth, 1981).






The effect of wetlands and sludge mineralization beds built in vertical flow is also important for the development of aquatic vegetation and for combating impact clogging. The physical presence of stems driven by root growth and wind action makes the bed substrate permeable to water. Plants of aquatic vegetation submerged in the water column that provide a large surface area for the stems and leaves of macrophytes (Gumbricht, 1993a; Gumbricht, 1993b; Chappell and Golder, 1994). The tissues of aquatic vegetation are colonized by dense communities of photosynthetic algae as well as bacteria and protozoa. Similarly, roots and rhizomes buried in wetlands provide a substrate for the attached growth of microorganisms (Hoffman, 1986). Thus, biofilm is present on ground tissue both above and below macrophytes. These biofilms, as well as biofilms on all other submerged solid surfaces in the Wetland system, including dead macrophyte tissues, are responsible for most of the microbial processing that occurs in wetlands. It has been observed that aquatic flora[21] release oxygen from the roots into the rhizosphere and this release acts to influence the biochemical cycles in sediment through the effect on the redox state of sediments. Only a few aquatic flora produce rhizomes during the first growing season which is necessary to survive until the following spring. The aquatic vegetation produced in May usually survives 100% till September. After 5 months of growth a seedling root root and rhizome of 40–50 g can produce biomass and total rhizome length of several meters per plant, which is better yield than planted rhizome sections. The yield of seedling and roots is highest at a water level 5 cm above the bed surface. Transplanting of aquatic vegetation can be done by the end of July without any significant effect on final yield. Planting in August will yield lower final yield. Although young transplants cannot survive complete flooding (Weissner and Extame, 1993), once they have reached a height of 20 cm, they will be at their best when the water table is 5 cm above ground level will develop. Experience gained from Danish soil-based systems shows no effect on performance.[20] However, weeds spoil the appearance of the reed bed, and this can be particularly important in pilot schemes where a good visual impact is required to be made. The most effective method is to control the effect of aquatic vegetation on microbial processes. However, Phragmites do not tolerate excessive water depths, especially during early establishment. Macrophytes growing in constructed treatment wetlands have many properties in relation to treatment processes that make them an essential component of design. Influence of aquatic vegetation on microbial processes The most important effects of macrophytes in relation to wastewater treatment processes are the physical effects that enhance the tissues of aquatic vegetation (eg erosion control, filtration effects, provision of surface area for attached microorganisms). Metabolism of macrophytes (plant uptake, oxygen release, etc.)[19] works to the effect of aquatic vegetation on microbial processes to different extents depending on the design of treatment processes. Under the influence of aquatic vegetation, macrophytes have other site-specific valuable functions, such as providing suitable habitat for aquatic vegetation and giving the system an aesthetic. Effects of aquatic vegetation Macrophytes have a major role in wetlands. (Source: Nasim Ahmad Ansari1 and Jeet Ram - 2016)

Table 1.1: Shown different physical properties of soil samples in Surajpur Lake Wetland

Sr. No.	Physical Properties	Habitats					Mean
		GR	**PJ**	**PS**	**SC**	**TA**	
1	Color	Brown	Yellowish	Yellowish	Greyish	Yellowish	-
2	Soil texture	Silty Clay Loam	Silty Clay Loam	Silty Clay Loam	Silty Clay Loam	Silty Clay Loam	-
3	Soil moisture (%)	10.89	14.96	14.24	8.34	7.42	11.17 (±3.03)
4	Bulk density (gm/cm^3)	1.18	1.20	1.19	1.18	1.19	1.19 (±0.01)
5	Porosity (%)	31.00	39.00	27.00	40.00	38.00	35.00 (±5.10)
6	Water holding capacity (%)	35.30	31.00	32.80	31.00	35.30	35.00 (±3.86)
7	Electrical conductivity (ds/m)	271.00	115.10	459.00	314.00	223.00	276.42 (±112.83)
8	Soil pH	9.70	9.30	10.30	10.20	10.40	9.98 (±0.42)
9	Organic Carbon (%)	0.09	0.17	0.07	0.03	0.09	0.09 (±0.05)

Habitats: TA= Terminalia arjuna, SC= Syzygium cumini, PS= Phoenix sylvestris, PJ= Prosopis juliflora, GR= Grassland (Source: Nasim Ahmad Ansari1 and Jeet Ram - 2016)

Here we have taken 25 physicochemical parameters to study the representation of spatial variation in five different locations (habitats) in the area of the result obtained from the soil of Surajpur Wetland. Here we have displayed the results of analytical, visual and physical parameters in one table and the results of chemical parameters in another table. (Source: Nasim Ahmad Ansari1 and Jeet Ram - 2016)

Table 1.2: In this table various chemical properties of soil samples in Surajpur Wetland are shown.

Sr. No.	Chemical Properties	Habitats					Mean
		GR	**PJ**	**PS**	**SC**	**TA**	
1	Total Kjeldahl Nitrogen (mg/kg)	343.15	327.88	253.08	276.66	233.05	286.76 (±42.41)
2	Phosphorus (mg/kg)	342.55	373.69	304.08	374.24	297.94	338.50 (±32.75)
3	Potassium (mg/kg)	3.16	3.19	2.14	2.75	3.00	2.85 (±0.39)
4	Calcium (mg/kg)	3.91	9.89	20.75	3.65	16.08	10.86 (±6.73)
5	Magnesium (mg/kg)	11.82	12.11	17.45	5.66	5.78	10.56 (±4.43)
6	Iron (mg/kg)	13.31	12.53	16.07	18.08	14.53	14.90 (±1.99)

7	Manganese (mg/kg)	256.99	263.04	281.38	270.91	373.34	289.13 (±42.89)
8	Zinc (mg/kg)	4.29	4.87	3.74	4.43	3.65	4.20 (±0.45)
9	Chloride (mg/kg)	249.20	125.09	308.71	186.62	249.04	223.73 (±62.64)
10	Sulphate (mg/kg)	165.86	119.03	121.70	150.80	193.65	150.21 (±27.99)
11	Silica Oxide (mg/kg)	6.4	6.89	9.12	10.21	7.23	7.97 (±1.45)
12	Boron (mg/kg)	<1	<1	<1	<1	<1	-
13	Copper (mg/kg)	<1	<1	<1	<1	<1	-
14	Molybdenum (mg/kg)	<1	<1	<1	<1	<1	-
15	Sodium (mg/kg)	<1	<1	1.20	3.56	<1	2.38 (±1.18)
16	Total plate Count (cfu/g)	3200000.00	2800000.00	860000.00	740000.00	680000.00	1656000.00 (±1106157.31)

Habitats: TA= Terminalia arjuna, SC= Syzygium cumini, PS= Phoenix sylvestris, PJ= Prosopis juliflora, GR= Grassland(Source: Nasim Ahmad Ansari1 and Jeet Ram - 2016)

Boron, copper and molybdenum are considered essential micronutrients, which are found in very small amounts in soil. It is commonly observed in concentrations of less than 1 mg / kg (Rudnick and Gao, 2003). Some amount of boron is important in nutrients which are regulating other nutrients and it is also important in copper fertility growth. Molybdenum also helps in N metabolism in aquatic vegetation.[18] The soil sample of Surajpur Wetland has recorded B, Cu and Mo nutrients less than 1 mg / kg which is found in the soil of Central India. Sodium has a ubiquitous presence in soil and water and is widely taken up and used by aquatic vegetation. C4 has a very specific function of Na in a limited number of carbon dioxide concentrations of aquatic vegetation and thus for these aquatic flora The essential ones are called work functional nutrients ‟. The aquatic flora requires a very small amount of Na, but is an essential element for animals (Subbarao et al., 2003), and in the present study, Na found an overall mean of 2.38 ± 1.18 mg / kg. Maha-Jan and Belor, (2014) also reported similar results of Na ranges between 1.80 to 1.10 mg / kg in the soil of Nag-Chapra pond in Madhya Pradesh. Being at or near the top of the Surajpur Wetlands food chains, it provides indicators of aquatic bird habitat and a mosaic of habitat types within the Surajpur wetland helps colonize a wide range of specialist and generalist species.[17] Surajpur Wetlands is an important bird site in India. As the Surajpur Wetland site falls within the scope of the National Capital Region (NCRPB 2013), studies by the National Capital Region Planning Board can be used to develop the region as a green zone or wildlife zone. The study area serves to promote Surajpur Reserve as a good place for eco-tourism, as it is located on the outskirts of Delhi.

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