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Human induced environmental causes and degradation of Bhindawas wetland in semi arid area of Haryana

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Abstract
The intense relationship of human with wetlands is as old as humanity itself. Large scale conversion of wetland areas into agricultural fields began with rice cultivation in monsoonal lands. There are certain factors which operate at every wetland site with different pace and alter wet areas in the world. Human induces pressure on natural resources and degrades them rapidly. Human carries exotic species putting pressure on native species and alter natural environment. Water bodies faces severe conversion into other land types meant for business and commercial activities. Fires also find their origin in human to heat their homes and for cooking purposes. Climate change, global warming, acid rain, deforestation and extinction of species are sole work of human since civilization.

Keywords: Natural Resources, Forest fires, Invasive species, Degradation, Conservation.

Introduction

Bhindawas wetland is slowly degenerate towards its biological death due to neglect, apathy and lack of funds. Almost 50% to 60% of water body is virtually killed by the weed, water hyacinth. There has been almost no management intervention due to political pressure, social structure of the surrounding villages and shortage of funds. There problem for community participation in management and problem of soils nearby. The mega water body, which should have been teeming with thousands of water birds and waders, both resident and migrant, now presents a shining but depressing carpet of water hyacinth, the obnoxious water weed that repels the birds like mosquito repellent. No bird would like to get entangled with large greenish maze of roots, stems and leaves.

Study Area

The Bhindawas wetland is designated as bird sanctuary and falls into Eco- sensitive zone, notified by Ministry of Environment and Forest. This wetland is spreads over 1016.94 acres located between 28º 32' 47" N to 28º31' 57" N latitude and between 76º 31' 54" E to 76º 34' 10" E longitude in the Jhajjar district in Haryana. It is a fresh water wetland which is drained through canal. The peripheral embankments are man – made. Both wetlands fall into semi-arid climatic region. These wetland areas are being used by migratory birds and resident birds and animals. The local people also get benefited from these wetlands.

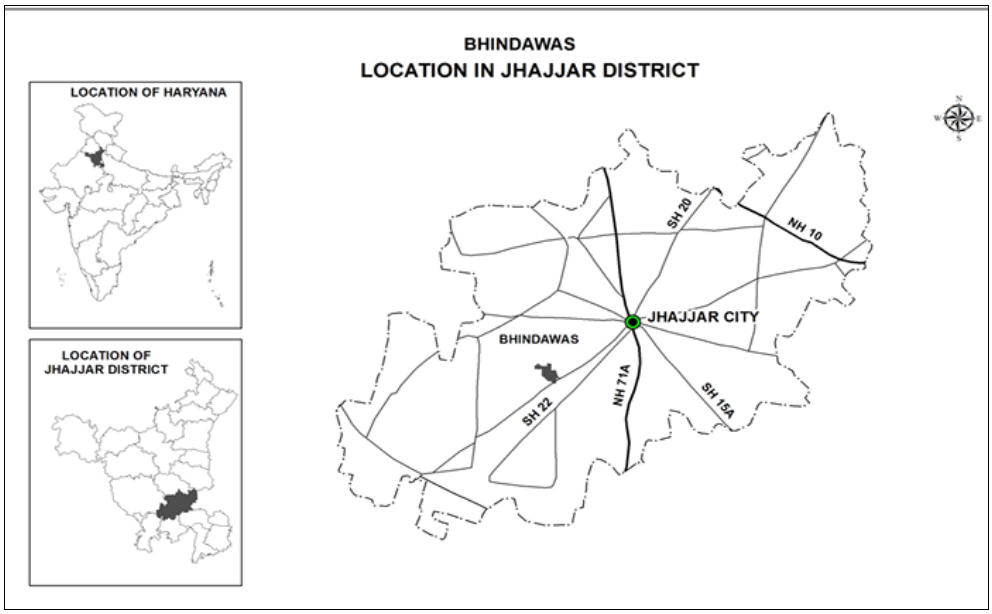

Fig 1. Location of Bhindawas Wetland

Bhindawas wetland is an excellent water body and ideal bird sanctuary constructed in 1972 by acquiring land of 12 villages to store excessive flood water of drain no. 8 and to release water from Jawahar Lal Nehru canal at the time of power failure with an area of 1016.94 acres. The slope of Bhindawas wetland is from West to East as water of JLN canal flows from western side to eastern side and fall into Yamuna river system through drain no. 8. Constructed wetland to store escaped water of JLN canal through an escape channel.

Objective: Analysis of Bhindawas wetland is carried out, in order to understand the role of direct and indirect factors affecting the wetland area.

Hypothesis: Human induced pressure and accessibility degrades Bhindawas wetland area.

Research Methodology

Primary Sources: The primary information on wetland areas and dependency of local people was gathered through interviews and field observations in the wetland areas. The ground investigations were carried out to minimize the errors of secondary data. The endeavor was made to include the interaction with the officials of Ministry of Environment and Forests, forest and wildlife staffs of wetland. Officials of irrigation and public health department were also consulted. A questionnaire was prepared to interact with local people to assess their role of operating factors in the wetland and its catchment area. The questionnaires were filled up by respondents and persons who were not literate, were assisted by their known persons.

Secondary Sources: The first image, depicting the year 2000, was obtained from the same source and accessed on 14/09/2014. The second image, depicting the year 2009, was obtained from the same source and accessed on 24/09/2014. The dimensions of the Bhindawas wetland area were 147 by 40 on the satellite's path. Thirty meters is the maximum spatial resolution of the pictures. In order to create the base maps of the research area, the Survey of India offices in Chandigarh used toposheets with the numbers 43W/6 and H43W/10, which were modified in 2004–2005, to coincide with the escape channel for Bhindawas. The study was based on the following sources: The Survey of India topographical sheets with a scale of 1:50,000, toposheets with a contour interval of 10 meters for the Bhindawas, and thematic maps of geomorphology, land use, soil, etc.

The environmental induced pressure has centric role in degradation of Bhindawas Wetland. There are nine major macrophytes species found in Bhindawas Wetland. These exotic as well as invasive species impedes hydrological, biochemical and ecological functions of Bhindawas wetland. Sediments from Jawahar Lal Nehru Canal enhanced sedimentation process in the lake area, thus reduced water storage capacity of main lake Drain number 8 which carried domestic and sewage material, pollutes wetland near its outlet.

Flooding: The water embankment channel from Jawahar Lal Nehru Canal drains into Bhindawas wetland which is made to release extra water of rainfall, particularly in flood like situation in the region. Bhindawas wetland works as a detention basin to store flood water. The embankment channel drains into wetland Chhadwana and Redhuwas side (west side of wetland). Excess water of wetland falls into drain number 8 towards Belochpura and Shahjahanpur villages. During monsoon and flooding the Forest Department with the assistance of Irrigation Department releases water into open spaces of wetland in South – Eastern side (Nawada and Kanwah villages) as well as towards Chadwana – Koelpuri and Belochpura village in Northern –West side. Construction of embankment around Bhindawas wetland helps in confining the flood water flows within wetland area. Floods effects Bhindawas wetland positively as well as negatively. At the time of flood, the wetland areas receive excess nutrient particulates [1]. Flood water is responsible for sedimentation of the wetland which reduces the water storage capacity of the lake [2]. The anthropogenic alteration of canal-flow regimes is a key driver of compositional shifts in Bhindawas wetland from native to introduced riparian plant species particularly Water hyacinth instead of contributing to preserve local ecosystem. Basically, water hyacinth is a product of Jawahar Lal Nehru canal which feeds water to wetland area and to drain out flood water during monsoon period. Flooding cause harm to some plant species while boost up faunal life especially hydrophytes.

Drought: There is direct relationship between droughts and overall health of wetlands throughout the world. Duration and intensity of droughts effect species richness, seedling growth and survival in the wetland area but different species display different tolerance to drought. There is lesser effect of drought on Bhindawas wetland as it gets regular water supply. Drought season affects only those faunal species those grows on embankments, Northern West and South-Eastern open spaces. But these species have good survival rate whenever these species of plants, grass and shrubs gets moisture, they regenerate themselves. Drought directly put pressure on fodder of Indian Gazelle/Chinkara (Gazella bennettii) and Blue bull (Boselaphus tragocamelus) as well as their habitat in Bhindawas wetland. These animals move out of sanctuary for grazing and many times fall prey to desert fox as well as local dogs.

Fire: There have been reports of natural fires in wetland areas all over the globe [3]. The frequency and intensity of fires, the quantity of organic materials or peat, and the soil moisture conditions all have a role in how wetlands are impacted by fires. Litter mineralization can be changed by fires, which can also increase biodiversity and structural variety [4]. Half of India's forest acreage is fire-prone, according to a research titled "Forest Fires in India" issued by the World Wide Fund for Nature (WWF)-India. The percentage varies from 33% in some regions to 90% in others. Severe flames are supposedly more common in around 6% of the population. Annual financial damages resulting from fires are expected to be over Rs. 4,400 million, according to the report [5]. The catchment areas of Bhindawas wetland have long been aware of the benefits of ash as a fertilizer, and farmers light the fires as a cheap means to clear land for crops. Small birds and reptiles that seek shelter in the catchment region are killed when fires consume vegetation close to embankments. Clearing arable land with fires is now illegal in Haryana, according to the state government. Fire danger is greatest in the regions bordering Chhadwana, Bilochpura, and Shnajhanpur. One important component of fire occurrences is land usage. The diversity of plant life and the degree to which animals enjoy eating it are both altered by fires [6].

Sedimentation: The dynamics of wetland sediments are crucial to the proper functioning of wetlands. The creation and evolution of the system and distinct habitat types in Bhindawas wetland are dictated by the flow and deposition of silt. Any wetland's water quality and biodiversity are determined by sediments. A wetland's hydrology and surface water dynamics are inextricably linked to sedimentation. Rates of sediment deposition inside a wetland can vary greatly due to the substantial mobility and redistribution of sediments that occurs within many wetlands [7]. There are two main categories of sediments: (a) allochthonous, which are mostly mineral-based, and (b) autochthonous, which are mostly biogenic or chemical-based. Sediment characteristics and regime are thus heavily influenced by the hydrometeorological, geological, pedological, vegetation, and land use features of a wetland's catchment. Higher surface roughness, shallower water, and lower velocities associated with overland flow determine sediment deposition. The outside borders of the Bhindawas wetland have lower sedimentation rates than the area near the embankment channel, where water and silt pour into the depression of the wetland. As it moves out of the wetland and into drain number 8, water hyacinth slows the sedimentation flow that is heading toward the settlement of Belochpura. The water from Bhindawas wetland improves the water quality of drain number 8, which contains harmful pollutants. Because the Jawahar Lal Nehru canal carries material from rivers in the Himalayas, the particles are extremely tiny. The northern and western regions of the marsh have minimal sediment accumulation. The dynamics of sediments can be altered by human activities, whether in a wetland itself or in its contributing region. Sea level rise or fall could be caused by changes in the land use of the catchment area. Bhindawas wetland received more sediment as a large portion of the catchment area was turned from uncultivable to arable land. When sediments are disturbed, as they are when animals graze, crops are farmed, forests are cut down, buildings are built, or excavations are dug, re-suspension happens [8].

Dry land salinity: The accumulation of salts in surface soil and groundwater in non-irrigated regions is known as dry land salinity. Salts occur naturally in India's semi-arid and arid regions, but when there is too much salt, it damages the soil, native plants, biodiversity, agriculture, and water quality. This condition is known as dry land salinity. Dry land salinity is caused by a variety of biophysical causes. One of these is a history of high salt generation and storage caused by geology and climate. Another is the current arid environment and generally flat topography, which both contribute to salt accumulation and concentration in certain places [9]. All around the terrain, you can see wildly different combinations and distributions of these elements. Important factors that determine the salinity hazard and risk for a particular landscape include climate, catchment shape, hydrogeology, soils, and land use. What causes the level of groundwater to rise is when more water is pumped into the system (recharge) than is pumped out (discharge). As a result of the extensive use of irrigation water and the overflow of reservoirs and canals, the salinity level has risen in the northern, eastern, and parts surrounding the Bhindawas wetland, with the exception of the Chhadwana-Koelpuri belt. Many places near Nawada, Kanwah, Fatehpuri, Shanjahanpur, Bilocpura, and Redhuwas have seen a dramatic shift in their water balance as a consequence of static groundwater levels, the substitution of water-intensive agricultural crops for subsistence farming, and the prevalence of monoculture practices. Salinization is so ongoing and could even worsen. Salinity can have an effect on many different ecosystems, including those on land and water, as well as on agricultural crops and pastures, water sources, and infrastructure like roads and buildings. Reestablishing a balance between water inputs and outputs and lowering groundwater levels are necessary for dry land salinity management.

Invasive Species: Generally speaking, ecosystem processes are what keep human existence on Earth going, but more specifically, ecosystem services are the advantages that natural ecosystems give to human society. People all throughout the globe are concerned about the effects of invasive species on the services provided by ecosystems. The value of a wetland's ecosystem is directly related to its resistance to incursions. There are four distinct types of services identified by the Millennium Ecosystem Assessment (2005) [10]. Products sourced from ecosystems are what provisioning services are all about. Services that regulate ecological processes are known as regulatory services. Cultural services, on the other hand, are intangible benefits. Finally, supporting services, which occur on huge temporal scales but are essential for the preservation of other services, are overcharged indirectly. Invasive plant and animal species pose a threat to many wetland ecosystem types and organisms, altering community dynamics and ecological processes [10]. Invasive species represent a hazard to native biodiversity when they are brought into an area outside of their natural habitat, whether intentionally or unintentionally [11]. After habitat loss, exotic invasive species are the number two concern when it comes to protecting biodiversity, according to the Convention on Biological Diversity. Additionally, water hyacinth and other alien plant species are known to cause habitat damage in Indian wetlands [12]. There is a wide variety of taxonomic groupings represented by the exotic invasive species found in wetlands. These include trees, mollusks, herbaceous macrophytes, fish, amphibians, and mammals. Eichhornia crassipes, Salvinia molesta, Mimosa pigra, Lythrum salicaria, and Melaleuca quinquenervis are some of the invasive plant species that have invaded Indian wetlands [13]. Mysis rellicta, Carcinus maenas, and Dreissaena polymorpha are invertebrates that have made a name for themselves in the world of environmental impact. As a whole, biodiversity declines because invasive species are more competitive than the native species they displace. Water hyacinth has been able to successfully colonize water bodies all throughout the world, thanks in large part to stable lentic environments. The natural flora and fauna of the Bhindawas wetland are under grave threat from the invasive water hyacinth. As a free-floating aquatic weed (FAW), it altered the physiochemical conditions beneath it, which had a significant impact on biodiversity. Many communities coexist in a single location because to the relative importance of variables including water level, rainfall timing and duration, and nutrient condition. The richness and composition of the faunal population are both affected by shifts in the plant community, which in turn trigger a chain reaction of additional biotic changes via mechanisms such as interactions within food webs. In the

Bhindawas wetland, you won't find any invasive species of fish, amphibians, or reptiles. Agricultural, industrial, and human health-related ecosystem services are severely and quantitatively impacted by invasive species, and the effects are usually negative. All of these things have an effect on the transportation of food, water, and fiber, on pollination, on the regulation of diseases and pests, on the fertility of soil, and on the cycling of nutrients and water. Whether in riparian or upland regions, invasive species are significantly affecting cultural services including aesthetic values, recreation, and tourism, the effects of which have not yet been completely measured [14]. The maintenance and improvement of numerous ecological services are jeopardized by declining biodiversity and extinctions caused by invasive species.

One estimate suggests that 500 billion metric tons of carbon would be released into the atmosphere if all the peat lands on Earth were destroyed [15]. If such peat lands are drained, or if warming climates shift soil processes towards aerobic decomposition, then we can expect significant climatic consequences [16]. Recently commissioned Indira Gandhi Super Thermal Power Plant (IGSTPP) at Khanpur adding carbon dioxides to the atmosphere and it will certainly hit the bird population particularly migratory birds in the Bhindawas wetland area. Falling of ash and other suspended particulates further degrade biota of Bhindawas wetland. Rice production in the catchment area of Bhindawas wetland is due to rise in water table as this wetland receives regular water supply from escape channel of JLN canal. Rice paddies are major source of methane around Bhindawas wetland.

Conclusion

Past atmospheric data, paleoclimatic changes and environmental conditions indicates that changes in vegetation and climate, the impacts of human cultures upon vegetation, and natural processes such as succession in wetlands. Human and environment induced factors are responsible for degradation of Bhindawas wetland main area as well as its catchment area. Over utilization of water during summer season and release of water from paddy fields during monsoon period causes mixing of wetland water with outside water, pollutes water and put pressure on water loving species of birds, fishes etc. Monitoring of conservational measures which fetch financial availability to the wetland to maintain positive status of wetland is necessary. Regulatory bodies must implement their guidelines and adopt strict policy to conserve this dynamic wetland.

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