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**WETLANDS: SIGNIFICANCE, THREATS AND THEIR CONSERVATION WITH SPECIAL REFERENCE TO UJANI RESERVOIR, MAHARASHTRA, INDIA**

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**ABSTRACT:**

The Ujani reservoir is one of the largest reservoir in Maharashtra after Koyna (Satara) and Jayakwadi (Aurangabad). It is located in Madha Tehsil of Solapur District and popularly called as ‘*Yashwant Sagar*’. The Ujani reservoir is constructed on Bhima River and famous for wetland avifaunal diversity as well as identified under national wetland conservation programme. Wetlands are defined as the transitional zone between terrestrial and aquatic ecosystem where the land is covered by shallow water, seasonally or permanently. Wetlands are the most productive ecosystem on the earth and serves as number of important functions by providing multiple benefits to humans and wildlife viz. erosion control, flood water storage, ground water recharge, water purification, recreation and economic benefits etc. Wetlands are constantly under serious threats of loss and destruction owing to anthropogenic activities. In the present study, fifteen wetlands sites (abbreviated as S1 to S15) distributed among terminal Bhima river basin and Ujani reservoir were surveyed from November, 2015 to September, 2017. It was found that, most of these wetlands are affected by various threats viz. unplanned irrigation practices, siltation, weed invasion, fishing, unplanned tourism, agricultural expansion, livestock grazing and washing, sand mining, fuel wood collection and pollution.

**KEYWORDS:** Anthropogenic activities; Bhima River; Ecosystem; Ujani reservoir; Wetland.

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**1. INTRODUCTION:**

All the global ecosystems are the marked biological entities that nurse the biosphere and are characterized by a wide range of functions viz. nutrient cycling, water circulation and exchange, biogeochemical cycles, primary production, waste absorption and detoxification etc. The conservation plan and sustainable management of ecosystem are the vital key components to achieve ecologically sound, economically viable and socially acceptable developmental goals. The conservation of ecosystem has become a challenging task in order to face increasing anthropogenic pressure due to unplanned activities (**Ramchandra et.al., 2007**). Land cover transformations in large extent resulted in the increased cases of human-animal conflicts, transformation of perennial streams to seasonal streams and greatly affected the livelihood of dependent population with the

diminished biological and economic productivities (**Berkres and Davidson- Hunt, 2006**). In order to ensure sustainability of natural resources, with biophysical, economic and socio-cultural information forms the basis to overcome restrictions in decision-making process. Sustainable approach in terms of landscape planning, aims for stability in ecological, physical and social systems by maintaining the equity in sustainability of natural resources between the generations (**Ramchandra et.al., 2007**).

Wetlands are defined as the transitional zone between terrestrial and aquatic ecosystem where the land is covered by shallow water, seasonally or permanently. The wetland share characteristics of both aquatic and terrestrial environments yet cannot be classified distinctly either aquatic or terrestrial. Wetlands are described as the “Kidneys of Landscape” as they perform vital role in the hydrological and chemical cycles and as “Biological supermarkets”, as they accommodate vast biodiversity with innumerable food webs (**Mitsch and Gosselink, 1993**), because of these characteristics wetlands are considered as earth’s most productive ecosystem. Wetland serves as number of important functions and provides multiple benefits to humans and wildlife viz. erosion control, flood water storage, ground water recharge, water purification, recreation and economic benefits etc.

Wetlands are constantly under serious threats of loss and destruction owing to anthropogenic activities. In current scenario less than 50% wetlands remains in India and goes on vanishing at a rate of 2-3% every year. Prior to 1980s wetlands were mainly converted to agricultural lands, and since from 1980s over 80% of wetland losses are due to non-agricultural activities (**Brown and Lant, 1999**).

In Maharashtra, Ujani, Jayakwadi and Nalganga wetlands were identified under national wetland conservation programme. Wetlands are one of the most precious resources of the world-wide ecosystem, as they support vast biological diversity and also serve innumerable services to environment (**Holland et.al., 1991**). The direct or indirect anthropogenic activities cause alterations and loss of wetland worldwide. Wetland ecosystem covers more than 9% (1,280 million hectares) of the earth’s land surface. It is estimated that, upto half of world’s original wetlands have been destroyed or degraded globally (**Paul et.al., 2010**).

Wetlands provide uncountable benefits to all the biotic factors on the globe. The ecosystem services provided by wetlands includes, Provisioning (Food, Fodder, Fuel, Water), regulating (regulation of bio-geochemical cycles), cultural (recreational, spiritual, asthetic), supporting (Soil, Biodiversity) etc. The organic production in wetlands reduces carbon dioxide and sequestered in plant or animal biomass, thus wetlands contributes to regulating climate change. The most productive role of wetlands is the regulation of water regimes.

## **2. MATERIAL AND METHODS:**

### **Study Area:**

Study area is located around Ujani reservoir, Ujani, Tahsil Madha, Dist Solapur, Maharashtra, India (**Fig. 1**). Sampling sites are distributed among three different districts Solapur, Ahmednagar and Pune are selected for study. Selected 15 sampling sites are dispersed around Ujani reservoir. The selection of sampling sites was made after miscellaneous survey of Ujani reservoir including terminal Bhima River basin. The threats to the Ujani reservoir including terminal Bhima River basin was assessed during the study period by direct observations on-site and enquiry made from local villagers, Fishermans and tourist guides by using questionnaire. The geographical locations of sampling sites were recorded during the survey by using GARMIN eTrex 20X with 240 X 320 display pixels GPS instrument (**Table:1**).

## **3. RESULTS AND DISCUSSION:**

The principal cause of loss and degradation of global wetland ecosystem is conversion of wetland to non-wetland areas due to anthropogenic activities, agricultural conversion, reclamation for development, excessive siltation and climate change. Various kinds of threats viz. excessive fishing, grazing and washing of livestock, fuel wood collection, water quality, siltation, weed invasion, agricultural expansion, pollution and sand mining were observed in and around the sampling sites during entire study period (**Fig. 2**). **Wolstencroft et.al., 1989**, reported that these were the major threats to the wetlands worldwide.

### 3.1. Unplanned Irrigation Practices:

The principal use of Bhima river basin and Ujani reservoir is to avail it for irrigation purpose. The water used for irrigation from this reservoir is without any planning and unheeding to aquatic life and affects standing water subject to rapid fluctuation in water level during summer season and results in great reduction in macrophyte vegetation and in invertebrates which cannot resist desiccation. As a result, shallow littoral areas of wetlands converted to zones of poor production (**Maitland, 1990**). The farmers raise multiple crops according to seasons like, sugarcane, Maize, Bajara, Wheat, Groundnut etc., but of them sugarcane is the dominant crop in the study area. Most of the wetlands are covered by pipelines. The sampling sites affected by unplanned irrigation practices are, Ajnuj-Devulgaon (S1), Pedgaon (S3), Baradgaon-Sudrik (S4), Khed-Shimpora (S5), Rajegaon-Bhigwan (S6), Khanota (S7), Kumbhargaon (S10) and Dalaj (S11).

### 3.2. Siltation:

Ujani reservoir is provided with huge catchment area including Bhima river as major source. During rainy season, the eroded soil from the catchment points gets deposited to the reservoir area. The mismanagement of inlet of the lake is the principal cause of it. Such siltation over many years becomes the cause of reduction of water holding capacity of the reservoir, reduction in depth of water and thereby provide smooth path to the invasion of weed patches. So, there is urgent need of desiltation, which will finally not only increase the irrigation potential of the reservoir but also leads to increase in aquatic diversity and use. Lowering of water depths in rivers and reservoirs due to siltation leads to eutrophication (**Vallenweider, 1968**). The factors like extent of nitrogen and phosphate loading, basin morphometry, retention rate and flushing rate accelerate the siltation problems and assist eutrophication (**Sagar, 1976**). The sampling sites where siltation issue was recorded are Pedgaon (S3), Baradgaon Sudrik (S4), Rajegaon-Bhigwan (S6), Diksal (S8), Kondhar Chincholi (S9), Kumbhargaon (S10), Parewadi (S13) and Shiral (S15).

### 3.3. Weed Invasion:

*Pistia stratiotes*, *Ipomoea* and common water hyacinth, *Eichhornia* are the major weeds observed in Bhima river basin and Ujani wetlands during winter and summer season. These weeds are responsible for deterioration of water quality and reduction in primary production and nutrient cycle (**Anand, 1999**), So proper eradication measures should be planned to remove these weeds. The sampling sites affected by the problem of weed invasion are Daund (S1), Ajnuj-Devulgaon (S2), Pedgaon (S3), Baradgaon Sudrik (S4), Khed Shimpora (S5), Rajegaon-Bhigwan (S6), Diksal (S8), Kondhar Chincholi (S9), Kumbhargaon (S10), Parewadi (S13) and Shiral (S15).

### 3.4. Fishing:

The Ujani reservoir is very famous fishery resource. Bhigwan is the famous fish market, exports fish to nearby major districts. Large number of professional Fishermans located around Ujani reservoir. There are about 26 fish species are found in Bhima river and Ujani reservoir, among them *Tilapia (Oreochromis mossambicus)* is

found dominant (**Kumbhar et.al., 2018**). Large sized fish (adults) are consumed or sold immediately, but smaller ones are dried and stored for future sale. Over-exploitation of aquaculture and fishery resources in inland fishery has negative impacts on bird life (**Thiyagesan and Nagarajan, 1995**). So, the over-exploitation of fishery resource of this reservoir should be prevented. The state fishery department should initiate immediate steps for the sustainable use of this reservoir in this regard. The fishing is very common activity recorded from all sampling sites from Bhima river and Ujani reservoir.

### 3.5. Unplanned Tourism:

Ujani backwater provides multiple wetlands which attract winter migrants in thousands. Two years continuous survey of sampling sites revealed that, Bhigwan (S6), Diksal (S8), Kondhar Chincholi (S9) and Kumbhargaon (S10) are the hotspots for aquatic birds where hundreds of tourists visited mostly during weekends. The local tourist organizations provide them breakfast, lunch, dinner as well as tent facilities during night. The tourist places located at the banks of Ujani reservoir are the best examples of unplanned tourism. Unplanned tourism has negative crash with the natural environment, including flora, fauna and ecology. It not only reduces the beauty of a place but also damages the local environment and biodiversity of that place.

### 3.6. Agricultural Expansion/ Encroachment:

The land owners nearby reservoir were found to have encroached the reservoir for farming. Such an agricultural expansion is a severe threat to Ujani reservoir and should be prevented as early as possible. Agricultural expansion converts reservoir area into sugarcane fields. Such wrong practices in the catchment area should be sorted out by forest, revenue and public works departments and by involving local *Grampanchayats* to convince the peoples regarding the environmental significance of the reservoir is the need of time. The sampling sites became the victims of encroachment are Baradgan Sudrik (S4), Khed Shimpora (S5), Rajegaon-Bhigwan (S6), Khanota (S7), Diksal (S8), Kondhar Chincholi (S9), Kumbhargaon (S10), Palasdeo (S12), Parewadi (S13), Chikhalthan No. 1 (S14) and and Shiral (S15).

### 3.7. Livestock Grazing and Washing:

The reservoir area is mostly used by surrounding villagers for grazing their domestic livestock especially during late winter and summer. This rigorous livestock grazing breaks the nutrient cycle of the lake. The trampling of livestock hardens the soil surface and reduces the aeration of the reservoir (**Meganathan, 2002**). Livestock grazing is the common issue at the sampling sites where wide wetland area is available. The faeces of livestock in water bodies resulted in dissolved oxygen stress which in turn results in increased biochemical oxygen demand and high ammonia concentrations responsible to kill the fish fauna of reservoir.

Washing of clothes and livestock directly in reservoir pollutes the water and the water acts as a detergent for aquatic birds. So livestock grazing and washing should be strictly prohibited in the reservoir area. The sampling sites affected by this particular issue are Baradgaon Sudrik (S4), Khed Shimpora (S5), Rajegaon-Bhigwan (S6), Khanota (S7), Diksal (S8), Kondhar Chincholi (S9), Kumbhargaon (S10), Palasdeo (S12), Parewadi (S13) and Chikhalthan No. 1 (S14).

### 3.8. Sand Mining:

Sand mining (also termed as mining of any riverine aggregates regardless of particle size) becoming a serious problem day by day. According to United Nations Environment Programme, (**UNEP, 2014**), it is estimated that, 32-50 billion tonnes of sand is extracted globally each year with increasing demands from

developing countries (Schandl et.al., 2016). The increased urbanization and construction of large scale infrastructure projects elevated demands of construction material. Sand mining activities are one of the many recognized pressures affecting riverine ecosystem, where the biodiversity is rapidly declining (World Wildlife Fund, 2018). Excessive instream sand mining results into river degradation lowers the stream bottom and leads to bank erosion as well as affects the adjoining groundwater system. The major impact of sand mining on aquatic biodiversity is habitat destruction due to large changes in channel morphology. Other impacts of sand mining include bed degradation, bed coarsening, lowered water tables near the streambed and channel instability. Sand mining generates noise pollution and due to this, aquatic birds reject about 1 to 1.5 Km. circumference area for feeding, resting, roosting, nesting etc. The five sampling sites under study are suffering from sand mining practices are Baradgaon Sudrik (S4), Khed Shimpora (S5), Rajegaon-Bhigwan (S6), Khanota (S7) and Dalaj (S11). The loss of wetland area is one of the associated cause of sand mining (Litwin et.al., 2013).

### 3.9. Fuel Wood Collection:

Fuel wood collection is the regular practice of some of the villagers at some sampling sites. The tree species observed at various sampling sites are Acacia, Neem and Rain-tree. Of them, Acacia is dominant tree located at the banks of river and reservoir and acts as resting and nesting site for most of the aquatic bird species. Protection of vegetation along the sites of the wetlands is necessary to retain water quality and accommodate faunal diversity (Dickson et.al., 1995). So, the vegetation at the Ujani reservoir must be provided with full attention and protection to prevent human disturbances and poaching. The nearby villagers from all the sampling sites depend directly and indirectly for fuel wood.

### 3.10. Pollution:

Sewage and agricultural runoff from surrounding villages and inorganic agricultural practices is one of the major threat to wetland as well as the faunal diversity of the reservoir as the banks of Bhima river and Ujani reservoir includes large area of agricultural land, where extensive use of chemical fertilizers and pesticides used for agricultural purpose in the catchment area of reservoir. Dumping of unwanted bottles, plastic covers, kitchen waste etc. were also noticed during the study period especially at holy place, Siddhatek and tourist places like Rajegaon-Bhigwan (S6), Diksal (S8), Kondhar Chincholi (S9) and Kumbhargaoon (S10). Such environmental pollutions cause severe damages to the water quality and thereby to wetland biodiversity (Austin, 1985; Kjetil Bevanger, 1998).

### RECOMMENDATION FOR MANAGEMENT:

The eco-friendly approach is needed in wetland management in order to achieve certain targets including management with the aim of conserving aquatic habitats. This will be possible only if we have integrated knowledge of hydrobiology, geology, agrology, invertebrate and vertebrate Zoology, angiospermic and non-angiospermic Botany etc. (Parson, 2002).

- A. Since the wetlands of Ujani already been declared as hotspots of avifaunal diversity, the reservoir must be protected; this will be effectively and easily achieved by strict implementation of laws and constant surveillance.
- B. Complete eradication of aquatic weeds, *Pistia* and *Ipomoea* should be done.
- C. Water quality and water level of the reservoir should be maintained to meet the needs of both agriculture and wildlife.

- D. Farmers should be aware about the negative impacts of chemical fertilizers, pesticides, over-irrigation etc.
- E. Desiltation of reservoir should be carried out regularly once in a year at the onset of monsoon season.
- F. The large open wetland areas are very near to Pune-Solapur highway, So, development of tourist places will become major source of economy for the local peoples through ecotourism.
- G. Cattle grazing at wetlands and cattle and cloth washing directly in reservoir water should be strictly prohibited.
- H. The awareness campaigns must be conduct for the local public to realize the importance of the reservoir with aquatic biota.
- I. Combined approach and social co-operation in order to fulfil needs of the dependents and forwarding to improve qualities of living surrounding this reservoir and increased facilities are recommended.

#### **4. CONCLUSION:**

Almost all the wetlands under study were affected by more or less number of threats, As far as pollution status of the reservoir is concerned, most of the wetlands are on the way of eutrophication; protection of such wetlands is the need of time. Strict implementation of laws and constant surveillance, Social awareness among villagers around Ujani reservoir about the sustainable use of such a great natural resource will be appropriate measure in this regard.

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**Table -1: GPS Locations of sampling sites**

<b>Code</b>	<b>Sampling Site</b>	<b>GPS Location</b>	<b>Code</b>	<b>Sampling Site</b>	<b>GPS Location</b>
<b>S-1</b>	Daund	N 18° 29' 4.26'' E 74° 34' 21.45''	<b>S-9</b>	Kondhar Chincholi	N 18° 17' 20.86'' E 74° 50' 11.49''
<b>S-2</b>	Ajnuj- Devulgaon	N 18° 29' 29.07'' E 74° 39' 59.51''	<b>S-10</b>	Kumbhargaon	N 18° 16' 6.29'' E 74° 48' 5.70''
<b>S-3</b>	Pedgaon	N 18° 30' 18.96'' E 74° 42' 33.46''	<b>S-11</b>	Dalaj	N 18° 14' 36.10'' E 74° 48' 6.28'
<b>S-4</b>	Baradgaon Sudrik	N 18° 24' 31.89'' E 74° 46' 56.50''	<b>S-12</b>	Palasdev	N 18° 14' 11.87'' E 74° 53' 15.87''
<b>S-5</b>	Khed- Shimpora	N 18° 22' 53.58'' E 74° 48' 41.10''	<b>S-13</b>	Parewadi - Pomalwadi	N 18° 16' 54.51'' E 74° 56' 47.21''
<b>S-6</b>	Rajegaon – Bhigwan	N 18° 20' 49.4'' E 74° 48' 19.07''	<b>S-14</b>	Chikhalthan No. 1	N 18° 14' 31.40'' E 75° 4' 23.25''
<b>S-7</b>	Khanota	N 18° 19' 17.07'' E 74° 49' 44.37''	<b>S-15</b>	Shiral	N 18° 3' 19.33'' E 75° 9' 8.78''
<b>S-8</b>	Diksal	N 18° 18' 49.38'' E 74° 47' 33.44''			



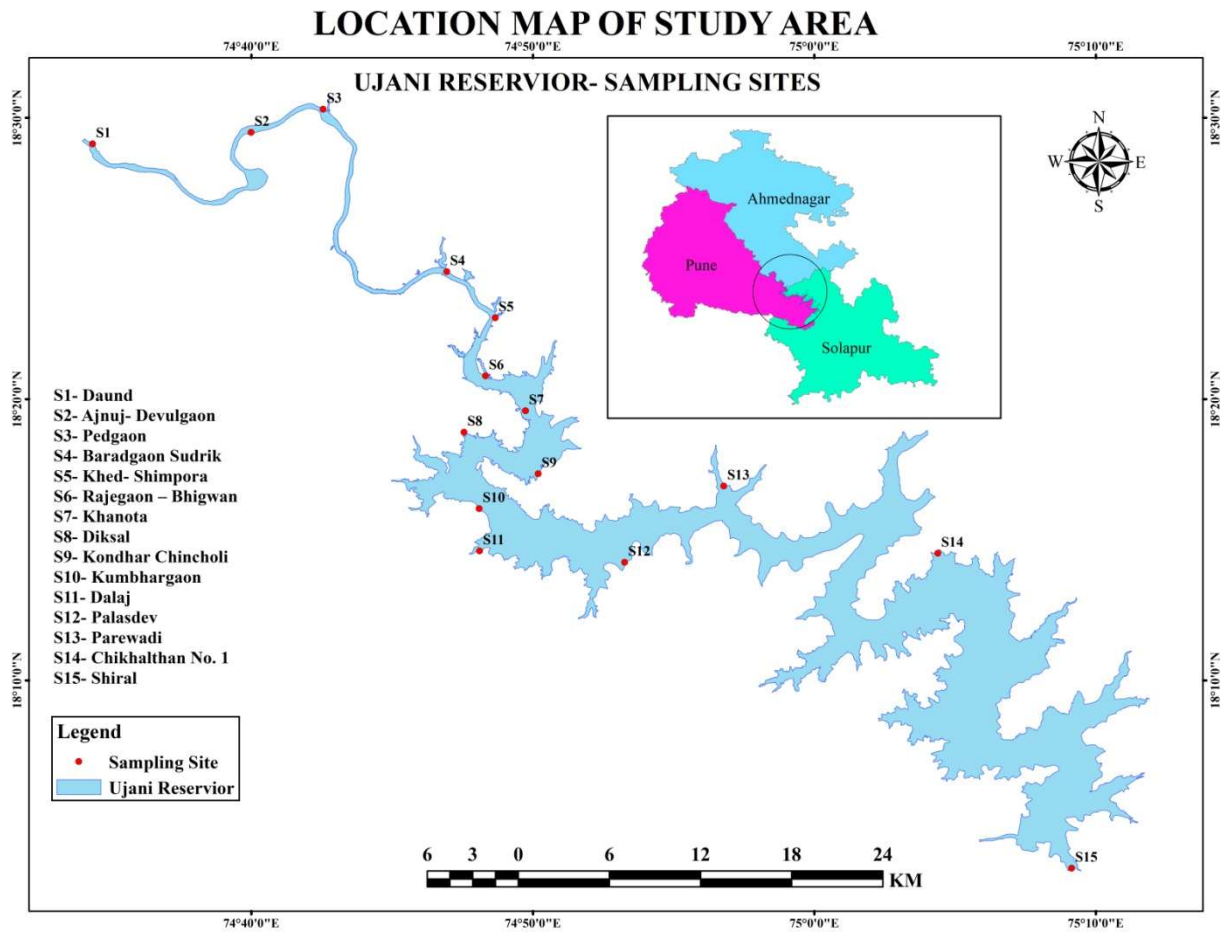
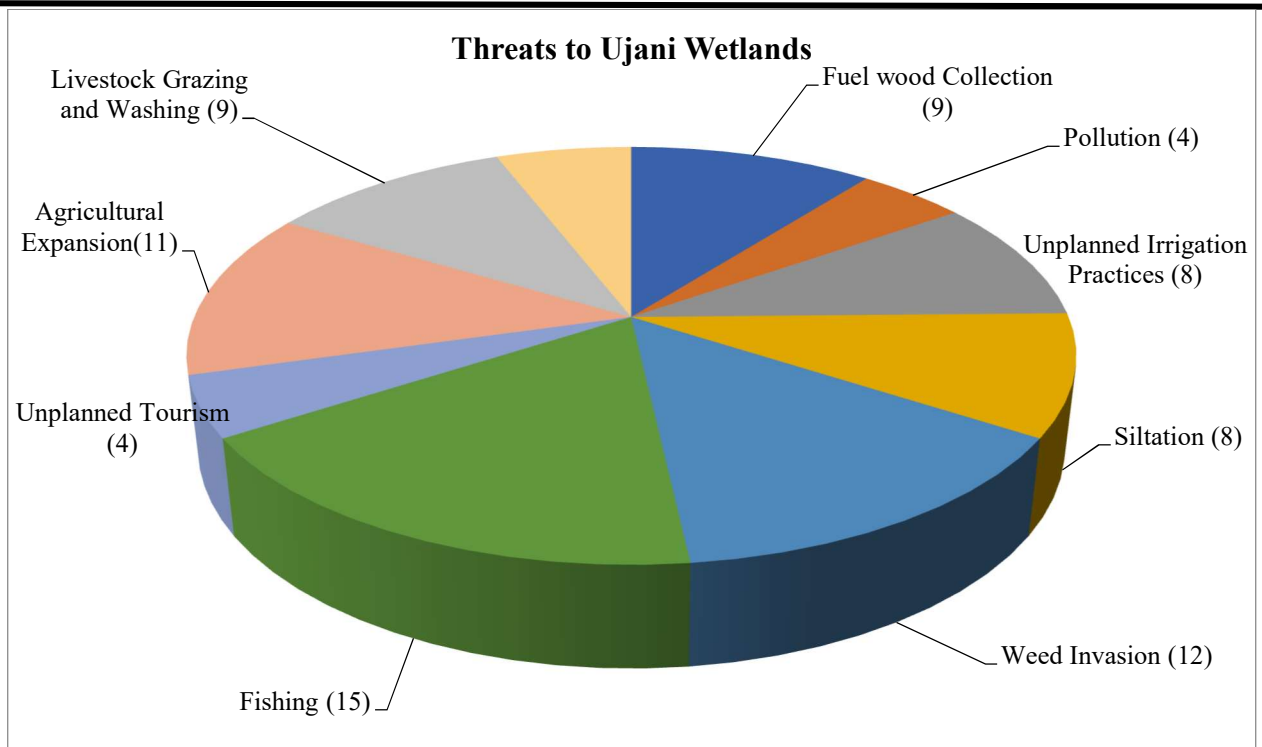


Fig. - 1: Study area showing sampling sites



**Fig. - 2:** Threats to Ujani wetlands (Figures in the bracket indicates number of sampling sites affected by a particular threat).