



# International Journal of Fauna and Biological Studies

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International  
Journal of  
Fauna And  
Biological  
Studies

ISSN 2347-2677

IJFBS 2015; 2 (3):01-05

Received: 11-02-2015

Accepted: 05-03-2015

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## The relevance of wetland conservation in Kerala

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### Abstract

Wetlands cover approximately 5%-8% of the global land area. These are important part of the ecosystem and are among the most threatened of all environmental resources. Wetlands directly and indirectly support millions of people in providing services. Human activities in wetlands may cause alterations of wetlands. Changes in wetland areas may significantly affect ecosystem processes. Land use changes such as increased urbanization play a pivotal role in environmental and ecological changes. Kerala has the largest proportion of land area under wetlands among all the states of India. Compared to other states of the country, wetlands in Kerala and hills are under threat because of developmental activities. Wetlands are being reclaimed with soil extracted from leveling of hillocks. These indiscriminate activities will have a serious negative impact on the entire ecological system

**Keywords:** Wetlands, Environmental resources, Human activities, Land use changes, Urbanization, Developmental activities, Ecological system.

### 1. Introduction

Wetlands cover approximately 5%-8% of the global land area. These are important part of the ecosystem and are among the most threatened of all environmental resources. Wetlands are one of the most productive ecosystems and play crucial role in hydrological cycle. Wetland ecosystems are associated with a diverse and complex array of direct and indirect uses depending on the type of wetlands, soil and water characteristics, and associated biotic influences. Direct uses include water supply source and harvesting of wetland products such as fish and plant resources. Indirect benefits are derived from environmental functions such as floodwater retention, groundwater recharge/discharge, climate mitigation, and nutrient abatement.

Human activities in wetlands may cause alterations of wetlands. Changes in wetland areas may significantly affect ecosystem processes. Concerns about changes in the size and quality of many of the world's wetland systems have been growing because an increasing number of wetlands are being converted to agricultural or urban uses or are being affected by natural factors like drought. Land use changes such as increased urbanization play a pivotal role in environmental and ecological changes.

### What are wetlands?

Wetlands are defined as areas of land that are either temporarily or permanently covered by water exhibit enormous diversity according to their genesis, geographical location, water regime and chemistry. A wetland is a land area that is saturated with water, either permanently or seasonally, such that it takes on the characteristics of a distinct ecosystem. Primarily, the factor that distinguishes wetlands from other land forms or water bodies is the characteristic vegetation that is adapted to its unique soil conditions.

Ramsar Convention, defines wetlands as "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres". United States Environmental Protection Agency (EPA) or Wetlands Reserve Program describes wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

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2<sup>nd</sup> February each year is World Wetlands Day, marking the date of the adoption of the Convention on Wetlands on 2 February 1971 in the Iranian city of Ramsar. This is an international date with a different theme and message on a relevant subject set each year by the Ramsar Secretariat. In recognition of the important interrelationship between farming and wetlands, the theme for World Wetlands Day 2014 is ‘Wetlands and agriculture: partners for growth’.

### **Types of wetlands**

#### **Natural wetlands**

- ❖ Marine (coastal wetlands including coastal lagoons, rocky shores, and coral reefs);
- ❖ Estuarine (including deltas, tidal marshes, and mangrove swamps);
- ❖ Lacustrine (wetlands associated with lakes);
- ❖ Riverine (wetlands along rivers and streams); and
- ❖ Palustrine (meaning “marshy” - marshes, swamps and bogs).

#### **Artificial wetlands**

- ❖ Aquaculture
- ❖ Agriculture
- ❖ Salt Exploitation
- ❖ Urban/ Industrial
- ❖ Water Storage Areas

#### **Marshes**

- ❖ Tidal
- ❖ Nontidal
- ❖ Wet Meadows
- ❖ Prairie Potholes
- ❖ Vernal Pools
- ❖ Playa Lakes

#### **Swamps**

- ❖ Forested Swamps
- ❖ Bottomland Hardwoods
- ❖ Shrub Swamps
- ❖ Mangrove Swamps

#### **Bogs**

- ❖ Northern bogs
- ❖ Pocosins

#### **Fens**

### **Functions of wetlands**

Utility wise, wetlands directly and indirectly support millions of people in providing services such as storm and flood control, clean water supply, food, fiber and raw materials, scenic beauty, educational and recreational benefits.

Wetlands are important because of so many reasons:

#### **The Role of Wetlands in an Ecosystem**

Wetlands prevent flooding by holding water much like a sponge. By doing so, wetlands help to keep river levels normal and filter and purify the surface water. Wetlands accept water during storms and whenever water levels are high. When water levels are low, wetlands slowly release water. Wetlands also release vegetative matter into rivers, which helps feed fish in the rivers. Wetlands help to counter balance the human effect on rivers by rejuvenating them and surrounding ecosystems. Many animals that live in other habitats use

wetlands for migration or reproduction. While wetlands are truly unique, they must not be thought of as isolated and independent habitat. To the contrary, wetlands are vital to the health of all other biomes and to wildlife and humans everywhere. Unlike most other habitats, wetlands directly improve other ecosystems. Because of its many cleansing benefits, wetlands have been compared to kidneys.

#### **Flood and drought control**

Wetlands can play a role in reducing the frequency and intensity of floods by acting as natural buffers, soaking up and storing a significant amount of flood water. One of the most valuable benefits of wetlands is their ability to store flood water. Wetlands absorb heavy rain, releasing water gradually so flooding is reduced. Downstream water flows and ground water levels are also maintained during periods of low rainfall. Wetlands help stabilize shorelines and riverbanks. They soak up rain and snowmelt as they occur and slowly release this water in drier seasons. Wetlands act as temporary storage basins, reduce erosion and limit the destruction caused by severe floods.

#### **Healthy lakes, rivers and streams**

Wetlands act as a filter for the water of lakes, rivers and streams. The vegetations in the wetlands remove phosphates and other plant nutrients from surrounding soil. This reduces the growth of aquatic weeds and algae, which can choke a waterway by stealing the oxygen that plants and animals need to, survive.

#### **Drinking water quality**

Wetlands improve water quality in nearby rivers and streams and thus have considerable value as filters for future drinking water.

#### **Ground water recharge and discharge**

Wetlands may have an important influence on the recharge or discharge of groundwater. Groundwater recharge refers to the movement of surface water down through the soil into the zone in which permeable rocks and overlying soil are saturated. Groundwater discharge, in contrast, refers to the movement of groundwater out into the soil surface. Although poorly understood, it appears that most wetlands are groundwater discharge or through flow areas. Wetland areas where groundwater is discharging are often referred to as seepage wetlands because they are places where the water seeps slowly out into the soil surface.

#### **Pollution filtration**

Wetlands improve the water we drink and the air we breathe. Wetlands are capable of filtering pollutants such as sewage, fertilizer run off composed of nitrogen and phosphorus and heavy metals from industrial waste.

#### **Water purification**

Wetlands are natural filters, helping to purify water by trapping pollutants. A wetland’s natural filtration process can remove excess nutrients in the water. The water leaving a wetland is often purer than the water which enters the wetland. Wetlands are able to purify water effectively.

#### **Biodiversity**

Wetlands are usually places where there is much plant growth because of the abundance of water and nutrients in the soil.

The plants, in turn, provide food and shelter for animals. There are many different plants and animals that depend on wetlands, and without the habitat that wetlands provide, they would not be able to survive. Wetlands provide a temporary or permanent habitat to a wealth of species of plants, fish and wildlife. Wetlands are homes to much wildlife. Many species of wildlife rely on wetlands provide mammals, plants, amphibians reptiles, birds and fish with food, habitat, breeding grounds and shelter.

**Livestock grazing**

Wetlands, especially temporarily and seasonally waterlogged areas, may provide very valuable grazing-lands for domestic and wild grazers.

**Recreation**

Wetlands are pleasant places for recreational activities. They may provide a place of natural beauty. Wetlands offer many recreational opportunities including boating, fishing, swimming, bird watching, white baiting and hunting.

**Erosion Control**

Rivers deposit a lot of sediment into the ocean. The sediment is from top soil that has been eroded and washed away. As a result, they counter the erosive forces of moving water along lakes and rivers, and in rolling agricultural landscapes. Erosion control efforts in aquatic areas often include the planting of wetlands plants.

**How do our land-use activities affect wetlands?**

The manner in which we use wetlands and the scale on which we do so determines the extent of our impact. Uses which provide good economic returns are not necessarily sustainable. Land-use activities often affect how a wetland functions and what benefits it provides to society. In many cases, the effects are negative, such as when a wetland is disturbed in order to plant crops, the wetland’s function of trapping sediment and holding the soil is reduced. This reduces the benefits that society receives from the wetland in purifying water and controlling erosion.

**Study Area**

Kerala is located on the southernmost tip of India and embraces the coast of Arabian Sea on the west and is bounded by the Western Ghats in the east extending from 8017’ and

120 48’ north latitude and 740 51’ and 77020’ east longitude. Kerala also encloses Mahe, Pondicherry’s coastal exclave. With 14 districts and other cities the total area of Kerala is 38, 916 sq km. This South Indian state stretches from north to south along the coast line of 580 kms with an approximate breadth of 35 to 120 km.

Though small in size, Kerala is a land affluent in water sources. 44 rivers drain the land, of which 41 are west flowing and 3 flow east. Apart from these 44 rivers, their tributaries and distributaries and a countless number of streams and rivulets crisscross the land making it green and fertile and also serves as inland waterways. Major wetland types in the Kerala are rivers, lagoons & reservoirs, beaches, ponds, waterlogged area, ponds/tanks.

Major rivers include Pampa, Periyar, Achankovil, Manimala, Bharathapuzha, Chalakudy, Valapattanam, Kallayi, Meenachil, Muvattupuzha, Mogral.

Beside these rivers, Kerala is bestowed with a number of lakes and backwater lagoon which add to the beauty of the land. The important wetlands of Kerala are Ashtamudi Lake, Vembanad Lake and Sasthamkotta Lake. Vembanad Backwater Lake is the largest in the state while Sasthamkotta lake is the largest natural fresh water lake. The other important backwaters are Anjengo, Veli, Edava, Kadinamkulam, Nadayara, Kayamkulam, Paravoor, Kowai and Chotwa.

Kerala has the finest beaches like Kovalam, Shanghumugham, Varkala, Cherai, Fort Cochin, Kappad, and Bekal. Reservoirs are the major wetlands that form the source of hydroelectricity. Major reservoirs include Neyyar, Peppara, Kallar, Kakki, Idukki, and Walayar.

Ashtamudi Wetland Sasthamkotta Lake, Vembanad-Kol Wetland are three Ramsar sites in Kerala, Other than these wetlands, Parambikulam Dam, Periyar Lake, Kaway Lagoon, Kumbalangi kayal, Malampuzha Reservoir, Kuttappuzha kayal, Vayalar lake, Kayamkulam Kayal, and Peechi Dam Reservoir are some of the important wetland sites.

**Area estimates of wetlands of Kerala**

Total wetland area estimated in Kerala is 160590 ha. The major wetland types are River/ Stream (65162 ha), lagoons (38442 ha) reservoirs 26167 ha and waterlogged (20305 ha).The following table explains the area estimates of wetlands in Kerala.

Area estimates of wetlands in Kerala. (In ha)

Wetland category	Number of wetlands	Total wetland area	Percentage of wetland area	Open water	
				Post monsoon area	Pre monsoon area
<b>Inland waterways-Natural</b>					
Lakes/ponds	3	2643	1.65	2259	2125
Riverine wetlands	18	410	0.26	410	410
Water logged	922	20305	12.65	11495	7771
River/streams	172	65162	40.58	61853	60338
<b>Inland wetlands- manmade</b>					
Reservoirs/Barrages	39	26167	16.29	24583	23421
Tanks/ponds	439	2435	1.52	1466	530
Total inland	1593	117122	72.93	102066	94595
<b>Coastal wetlands- Natural</b>					
Lagoons	39	38442	23.94	36819	35796
Creeks	19	80	0.05	77	77
Sand/Beach	111	2354	1.47	0	0
Sub total	1762	157998	98.39	138962	130468
Wetland( <2.25 ha)mainly tanks	2592	2592	1.61	-	-
<b>Total</b>	<b>4354</b>	<b>160590</b>	<b>100</b>	<b>138962</b>	<b>130468</b>

Area under Aquatic vegetation	13364	8925
Area under turbidity		
Low	102026	94722
Medium	36501	35119
High	435	627

Source: National Wetland Atlas: Kerala

Analysis of wetland status in terms of open water and aquatic vegetation showed that around 88 and 83% of wetland area is

under open water category during post monsoon and pre monsoon respectively. Aquatic vegetation occupies around 8 and 6% of wetland area during post and pre monsoon respectively.

#### District wise wetland area

The following table shows District wise distribution of wetlands in Kerala:

District	Geographical area (sq.km.)	Wetland area(ha)	Percentage of total wetland area	Percentage of district geographic area
Kasargode	1961	7561	4.71	3.86
Kannur	2997	10870	6.77	3.63
Wayanad	2132	3866	2.41	1.81
Kozhikode	3345	7690	4.79	3.28
Malappuram	3548	9511	5.92	2.68
Palakkad	4480	11892	7.41	2.65
Thrissur	3032	13285	8.27	4.38
Ernakulam	2408	25065	15.61	10.41
Idukki	4998	10655	6.63	2.13
Kottayam	2204	9523	5.93	4.32
Alappuzha	1256	26079	16.24	20.76
Pathanamthitta	2731	4948	3.08	1.81
Kollam	2579	13703	8.53	5.31
Thiruvananthapuram	2192	5942	3.70	2.71
<b>Total</b>	<b>38863</b>	<b>160590</b>	<b>100</b>	

Source: National Wetland Atlas: Kerala

District wise distribution of wetlands showed that 4 districts can be called as wetland rich. Alappuzha has highest concentration with 26079 ha area under wetland. This is mainly due to the location of famous Vembanad Kol wetland. The other three districts are Ernakulam (250655 ha) Kollam (13703 ha) and Thrissur (13285 ha). Wayanad district has the lowest area under wetland (3866 ha).

#### Importance of wetland conservation in Kerala

The total geographical area of the State is 3886287 ha. The total wetland area in Kerala is 160590 ha. Kerala has the largest proportion of land area under wetlands among all the states of India. Compared to other states of the country, wetlands in Kerala and hills are under threat because of developmental activities. Wetlands are being reclaimed with soil extracted from leveling of hillocks. The indiscriminate activities will have a serious negative impact on the entire ecological system. It has become a common phenomenon in Kerala in the past few years and many educated people continue to believe that hills and wetlands are wastelands.

The wetlands in Kerala are currently subjected to acute pressure of rapid developmental activities. Most of the government sponsored projects especially in urban areas are finding space in wetland areas for which large scale reclamation is going on. Unauthorized encroachment of wetland areas for non-wetland purposes are still continuing in the State especially areas adjacent to low land paddy fields, mangrove areas and other backwater areas. Initially most of the encroachments are for agriculture purposes; later these areas were reclaimed and used for various other purposes. The unscientific land use and agricultural practices along with forest clearing in uplands and in wetland areas exert major pressure on wetlands leading to soil erosion. This causes siltation leading to vertical shrinkage and related problems like salinity intrusion, ecosystem change and biodiversity loss. The

eroded soil contain large amount of nutrients which causes eutrophication. Utilization of low lands for purposes other than the originally envisaged, like paddy lands for vegetable cultivation, aquaculture, etc., are common practice in many places, which lead to the change in the ecosystem Reclamation of the private owned low land areas for construction purposes, for industries, etc., are common activities in many places. In addition to this, some areas are excavated for clay and soil for making country bricks. The wetland loss due to various anthropogenic activities has been responsible for bringing to the verge of extinction of countless species of medicinal and economically important plants and animals.

Hills and wetlands are two important water storing systems that play an important role in maintaining the hydrological cycle of the tropical and subtropical regions. In hills, water will be usually preserved in higher elevations either in the soil/ weathered horizons or sedimentary layers. The gradient helps in groundwater flow. During summer, rivers and lakes will be fed by the stored water in the hills and hillocks. Hence, hills are called 'Thannir kudangal (water pots)' and wetlands as 'Thanneer thadangal (water reservoirs)'. Scientists often refer to wetlands as the "kidneys" of the earth and forests as the "lungs" of the earth. These two systems are works as unique ecosystems providing habitats for several rare plants and animals of ecological and economic importance. Therefore, demolition/ leveling of hills and reclamation of wetlands means destruction of our hydrological cycle that sustains life and greenery of the Earth.

#### Conclusion

Kerala is well known for its wetlands. These wetlands provided livelihood to the residents in the area in the forms of agricultural produce, fish, fuel, fiber, fodder, and a host of other day-to-day necessities. As long as human intervention remained minimal, the ecosystem, through its all-

encompassing balancing nature, was self-cleansing. But the development demands that determine the choice of the paths upset the natural harmony. Infrastructure development in the form of roads, railways, and other lines of communication fragmented the contiguity of the wetlands, and destroyed extensive tracts of coastal vegetation thereby upsetting the entire complex ecology. Kerala Conservation of Paddy Land and Wetland Act, 2008: An Act to conserve the paddy land and wetland and to restrict the conversion or reclamation thereof, in order to promote growth in the agricultural sector and to sustain the ecological system, in the State of Kerala, exists in Kerala. But the conversion of paddy lands and wetlands are going on in the state. Effort should be made to protect the precious hills, hillocks and wetlands. Their destruction if not controlled will have serious environmental consequences. Conserving wetlands as shields against scarcity of water, floods, environmental pollution, and distress of micro-climatic vagaries is therefore very important.

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