A Review: Wetlands as Treasure of Earth by Providing Ecological Benefits, Threats to Wetlands and Conservation of Wetlands

Juhi Gajjar*, Dr. Hitesh Solanki²

¹Ph.D. Research Scholar, Department of Botany, Gujarat University, Ahmedabad, Gujarat, India
²Professor, Department of Botany, Gujarat University, Ahmedabad, Gujarat, India

ABSTRACT

Wetlands are very important as they provide valuable services to human and ecology. It protects the land from flood, erosion and soil degradation. It is very important for biodiversity, as shelter for migratory birds. Water of wetlands are used for irrigation and drinking purposes. It is very important to know the quality of water and soil. As wetlands have many threats due to human activities, access use of wetland products, irrigation and pollution. There are many projects for conservation of wetlands. It is necessary to take immediate action to protect wetlands.

Keywords: Wetlands, Water, Biodiversity, Conservation

I. INTRODUCTION

Wetlands are the areas of land that are either permanently or temporarily 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 has characteristics of a distinct ecosystem of the earth. Primarily, the factor that distinguishes wetlands from other land forms or other water bodies is the characteristic vegetation that is adapted to its unique soil condition (Abraham, 2015).

Ramsar Convention on Wetlands, which is an international treaty signed in 1971 for national action and international cooperation for the conservation and wise use of wetlands and their resources, defines Wetlands (Article 1.1) 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 meters”. Only 26 of these numerous wetlands have been designated as Ramsar sites (Ramsar, 2013).

Wetlands are of two basic types: natural and constructed wetlands. Natural wetlands are natural areas where water covers the soil, including swamps, marshes, fens, sloughs and bogs. Constructed wetlands are ecosystems similar to natural wetlands,
combining physical, chemical and biological processes (USEPA, 2000; Mitsch and Gosselink, 2007).

In terms of the proportion of the geographical area, in India Gujarat has the highest proportion (17.5%) and Mizoram has the lowest proportion (0.66%) of the area under wetlands. In terms of contribution of the total water spread area in country, highest during post monsoon was observed in the states of Gujarat (12.6%) and lowest in Sikkim and Tripura (0.1% each) (N. Bassi et al., 2014).

The global researches of wetlands mainly focus on ecology, biodiversity and conservation (Whitehouse et al., 2008), water quality improvement (USEPA, 2000), circulation of materials (biogeochemical cycle) (Raich and Schlesinger, 1992), and environmental restoration (Suding et al., 2004; Fink and Mitsch, 2007; Moreno et al., 2007).

II. RESULT AND DISCUSSION

One of the first widely used classification systems, devised by (Cowardin et al., 1995), was associated to its hydrological, ecological and geological aspects, such as: marine (coastal wetlands including rock shores and coral reefs, estuarine (including deltas, tidal marshes and mangrove swamps), lacustarine (lakes), riverine (along rivers and streams), palustarine (‘marshy’- marshes, swamps and bogs) (Wetlands of Gujarat Book).

Wetlands are often considered as nature based solutions that can provide a multitude of services of great social, economic and environmental value to humankind. Changes in land use, water use and climate can all impact wetland functions and services (Thorslund et al., 2017).

In the past 100 years, vast areas of wetlands have disappeared, but programs have been initiated to restore and create wetlands to compensate for this loss was described by (Mitsch et al., 1998; Verhoeven, 2014). According to N. Bassi et al., (2014) Wetlands provide numerous ecological goods and services but are under tremendous stress due to rapid urbanization, industrialization and agricultural intensification, manifested by the shrinkage I their areal extent and decline in the hydrological, economic and ecological functions they perform. Wetlands are subjected to anthropogenic pressures, including land use changes in the catchment, pollution from industries and households, encroachments, tourism and over exploitation of their natural resources.

Peterson and Baldwin (2004) showed that flooding significantly decreased plant biodiversity in a freshwater wetland, but Brock et al., (1999) argued that when flooding regime are managed correctly in terms of depth and duration of flood, the number of habit typed increases, in turn positively affecting species richness. Allen-Diaz et al., (2004) reported that in tropical and sub-tropical wetlands the aquatic plants act as bio filter, as they intake large amount of organic as well as inorganic nutrients from the eutrophic water bodies enriched pollutant through various dynamic processes, e.g. water cycle, nutrient cycle and food chain, therefore known as ‘Kidney of the Landscape’ or ‘Biological Super Market’ by the experts or the areas where the soil is saturated with water are crucial incubators known for the high species diversity.

Golez and Kyuma (1997) has observed that oxidation of pyrite can lead to severe acidification of soil, negatively impacting the environment by potential heavy metal release, on the other side Lamers et al.,(2012) if the sediment contains high amounts of iron-bound phosphorus, alternating water regimes can affect ecosystem development by including P mobilization.

Acharya and Adak (2009) had reported that the wetland water are used for irrigation, industry,
thermal power plant, potable supply and fish production under natural eco-system. Livelihoods of people are secured he explained by the example of 30,000 people is dependent on public at lake for their survival. At Chilika Lake 9000 fishing vessels are active throughout the day and night.

Seshamani *et al.*, (1994) reported that one of the finest tools of modern science is the use of remote sensing and GIS in delineating the area, discharge arte, water volume, ground water recharge, soil loss calculation as well as deposition in reservoir, pollution distribution etc. Fish farming, migratory bird movement and water transport or tourism can also be managed in an effective and efficient way using GPS systems. Marshy land and other swampy forest land area, tree coverage, timber-volume, forest fire etc., other important spatio-temporal variability in the wetland forest can be successfully delineated using remote sensing and GIS.

**A. Ecological Importance**

Costanza *et al.*, (1997) was investigated that wetlands are most valuable biomes on our planer providing ecosystem services such as nutrient cycle, soil formation and wastewater treatment.

Climate change and large-scale land-user changes (Seneviratne *et al.*, 2006) affect large-scale water fluxes and balances. These changes should therefore also be expected to affect wetland functions and associated ecosystem services.

Balasubramanian and Selvaraj (2003) had reported tanks are also very important from the ecological perspective as they help conserve soil, water and biodiversity. According to Raje *et al.*, (2013) had given some of the nature-based engineered solutions already used in urban planning and water management (e.g. green roofs, bio-infiltration rain gardens, vegetation in street canyons) have demonstrated to be more efficient, cost-effective, adaptable, multi-purpose and long-lasting than the so-called ‘grey infrastructure’ alternatives.

**B. Threat to wetland ecosystem**

As per Smakhtin *et al.*, (2004) most of the rivers basins in southern and western India are experiencing environmental water scarcity, which means the discharge in these basins has already been reduced by water withdrawals to such levels that the amount of water left in the basin is less than that required by the freshwater dependent ecosystems.

A study found that out of 629 water bodies identified in the National Capital Territory (NCT) of Delhi, as many as 232 can’t be revived on account of large scale encroachments. Similarly, between 1973 and 2007, Greater Bengaluru Region lost 66 wetlands with a water spreads area of around 1100 ha due to urban sprawl (Ramachandra and Kumar, 2008).

Studies reveal the removal of water bodies had led to the decline in water table. Water table has declined to 300 m from 28 m over a period of 20 years after the reclamation of lake with its catchment for commercial activities. In additional, groundwater table in intensely urbanized area such as Whitefield, etc. has now dropped to 400m to 500m (Ramachandra *et al.*, 2012)

Jiang *et al.*, (2015) had reported wetland degradation caused reduction of wetland area, water pollution, environmental degradation, and biodiversity loss among other issues. At the same time, these studies allowed that increased urbanization and agricultural activities are the reasons for wetland degradation.

**C. Conservation of wetlands**

In the past 100 years, vast areas of wetlands have disappeared, but programs have been initiated to restore and create wetlands for compensate for this loss (e.g. Mitsch *et al.*, 1998; (Verhoeven, 2014). Although most created wetlands have been designed
for wastewater treatment (Vymazal, 2011), they can also be designed to increase the ecological value of the ecosystems itself (e.g. Weller et al., 2007).

In order to support the implementation of innovative nature-based solutions in environmental management and land use planning, valuation becomes essential; Valuation can refer to monetisation (assessing a monetary value) or to an estimation of worth or importance (Fontaine et al., 2014).

III. REFERENCES

[1] Abraham, S. (2015). The relevance of wetland conservation in Kerala. International Journal of Fauna and Biological Studies, 2(3), 01-05.
[2] Acharya Somen, Adak Tarun, (2009). Wetland management for sustainable development. Journal of soil and water conservation, vol.8, No.4, 25-29.
[3] Allen-Diaz, B., R. D. Jackson, K. W. Tate, and L. G. Oates. (2004). California Agriculture 58(3): 144-148.
[4] Balasubramanian, R., & Selvaraj, K. N. (2003). Poverty, private property and common pool resource management: The case of irrigation tanks in south India. SANDEE, Kathmandu, NP.
[5] Brock, M.A., Smith, R.G.B., Jarman, P.J., 1999. Drain it dam it: alteration of water regime in shallow wetlands on the New England Tableland of New South Wales, Australia. Wetlands Ecol. Manage. 7, 37-46.
[6] Costanza, R., d’Arge, R., De Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O’Neill, R.V., Paruelo, J., Raskin, R.G., Sutton, P., Van den Bert, M., 1997. The value of the world’s ecosystem services and natural capital. Nature 387, 253-260.
[7] Cowardin, L. M., & Golet, F. C. (1995). US Fish and Wildlife Service 1979 wetland classification: A review. Classification and inventory of the world’s wetlands, 139-152.
[8] Fink, D.F., Mitsch, W.J., 2007. Hydrology and nutrient biogeochemistry in a created river diversion oxbow wetland. Ecol. Eng. 30 (2), 93–102.
[9] Fontaine, C. M., Dendoncker, N., De Vreese, R., Jacquemin, I., Marek, A., Van Herzele, A., & Francois, L. (2014). Towards participatory integrated valuation and modelling of ecosystem services under land-use change. Journal of Land Use Science, 9(3), 278-303.
[10] Golez, N.V., Kyuma, K., (1997). Influence of pyrite oxidation and soil acidification on some essential nutrient elements. Aquacult. Eng. 16, 107–124.
[11] Jiang, T.-T., Pan, J.-F., Pu, X.-M., Wang, B., Pan, J.-I., 2015. Current status of coastal wetlands in China: degradation, restoration, and future management, Estuar. Coast Shelf Sci. 164, 265–275.
[12] Lamers, L.P.M., van Diggelen, J.M.H., Op den Camp, H.J.M., Visser, E.J.W., Lucassen, E.C.H.E.T., Vile, M.A., Jetten, M.S.M., Smolders, A.J.P., Roelofs, J.G.M., 2012. Microbial transformations of nitrogen, sulfur and iron dictate vegetation composition in wetlands: a review. Front. Microbiol. 3, 1–12.
[13] Mitsch, W. J., Wu, X., Nairn, R. W., Weihe, P. E., Wang, N., Deal, R., & Boucher, C. E. (1998). Creating and restoring wetlands. BioScience, 48(12), 1019-1030.
[14] Mitsch, W.J., Gosselink, J.G., (2007). Wetlands, 4th ed. John Wiley & Sons, Inc., New York, USA.
[15] Mitsch, W.J., Zhang, L., Stefanik, K.C., Nahlik, A.M., Anderson, C.J., Bernal, B., Hernandez, M., Song, K., (1998). Creating wetlands: primary succession, water quality changes, and self-design over 15 years. Bioscience 62, 237–250.
[16] Moreno, D., Pedrocchi, C., Comin, F.A., Garcia, M., Cabezas, A., (2007). Creating wetlands for the improvement of water quality and landscape restoration in semi-arid zones degraded by intensive agricultural use. Ecol. Eng. 30 (2), 103–111.
[17] N Bassi, MD Kumar, A Sharma, P Saradhi, (2014). Status of wetlands in India: A review of extent, ecosystem benefits, threats and management
strategies. *Journal of Hydrology: Regional Studies* 2(1), 1-19.

[18] Peterson, J. E., & Baldwin, A. H. (2004). Seedling emergence from seed banks of tidal freshwater wetlands: response to inundation and sedimentation. *Aquatic Botany*, 78(3), 243-254.

[19] Preston, E.M., Bedford, B.L., (1988). Evaluating cumulative effects on wetland functions: a conceptual overview and generic framework. Environ. Manag. 12,565–583.

[20] Raich, J.W., Schlesinger, W.H., (1992). The global carbon-dioxide flux in soil respiration and its relationship to vegetation and climate. *Tellus Ser. B-Chem. Phys. Meteorol.* 44 (2), 81–99.

[21] Raje, S., Kertesz, R., Maccarone, K., Seltzer, K., Siminari, M., Simms, P., Wood, B., Sansalone, J., (2013). Green infrastructure design for pavement systems subject to rainfall–runoff loadings. *Transp. Res. Rec.* 2358, 79–87.

[22] Ramachandra, T.V., Kumar, U., (2008). Wetlands of greater Bangalore, India: automatic delineation through pattern classifiers. *Electr. Green J.* 1 (26), 1–22.

[23] Ramsar Convention Secretariat (2013). The Ramsar Convention Manual: A guide to the Convention on Wetlands (Ramsar, Iran, 1971). 6th ed. *Ramsar Convention Secretariat*, Gland, Switzerland.

[24] Senéviratne, S.I., Lüthi, D., Litschi, M., Schär, C., (2006). Land–atmosphere coupling and climate change in Europe. *Nature* 443, 205–209.

[25] Seshamani R, Alex T K and Jain Y K. 1994. An airborne sensor for primary productivity and related parameters of coastal waters and large water bodies. *International Journal of Remote Sensing* 15: 1101—1108.

[26] Smakhtin, V., Revenga, C., & Döll, P. (2004). A pilot global assessment of environmental water requirements and scarcity. *Water International*, 29(3), 307-317.

[27] Suding, K.N., Gross, K.L., Houseman, G.R., 2004. Alternative states and positive feedbacks in restoration ecology. *Trends Ecol. Evol.* 19 (1), 46–53.

[28] Thorslund Josefin (2017), Wetlands as large-scale nature-based solutions: Status and challenges for research, engineering and management. *Ecological Engineering* 108 (2017) 489–497.

[29] USEPA, (2000). Constructed Wetlands Treatment of Municipal Wastewater. United States (US) Environmental Protection Agency (EPA), Office of Research and Development, Cincinnati, OH, USA.

[30] Verhoeven, J. T. (2014). Wetlands in Europe: perspectives for restoration of a lost paradise. *Ecological Engineering*, 66, 6–9.

[31] Verhoeven, J.T.A., Arheimer, B., Yin, C., Hefting, M.M., (2006). Regional and global concerns over wetlands and water quality. *Trends Ecol. Evol.* 21, 96–103.

[32] Vymazal, J. (2011). Constructed wetlands for wastewater treatment: five decades of experience. *Environmental science & technology*, 45(1), 61-69.

[33] Whigham, D. F., Jacobs, A. D., Weller, D. E., Jordan, T. E., Kentula, M. E., Jensen, S. F., & Stevens, D. L. (2007). Combining HGM and EMAP procedures to assess wetlands at the watershed scale—status of flats and non-tidal riverine wetlands in the Nanticoke River watershed, Delaware and Maryland (USA). *Wetlands*, 27(3), 462–478.

[34] Whitehouse, N. J., Langdon, P. G., Bustin, R., & Galsworthy, S. (2008). Fossil insects and ecosystem dynamics in wetlands: implications for biodiversity and conservation. *Biodiversity and conservation*, 17(9), 2055-2078.

Cite this article as: Juhi Gajjar, Dr. Hitesh Solanki, "A Review: Wetlands as Treasure of Earth by Providing Ecological Benefits, Threats to Wetlands and Conservation of Wetlands", International Journal of Scientific Research in Science and Technology (IJSRST), Online ISSN : 2395-602X, Print ISSN : 2395-6011, Volume 8 Issue 2, pp. 136-140, March-April 2021. Available at doi: https://doi.org/10.32628/IJSRST218227 Journal URL : https://ijsrst.com/IJSRST218227