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Spatial temporal land use pattern of Tal Chhapar wetland of Churu district

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Abstract
Remote Sensing and GIS has become a dominant tool to monitor land use pattern of any area in a giver time. The Arc GIS was used to detect variations in land use pattern of Tal Chhapar Wetland of Churu district of Rajasthan. There are eight types of land uses for the entire study period. Main usage is agriculture in the catchment area of the wetland while grassland covers most of Tal area. Water bodies, a crucial category has been decreased from 2000 to 2009 but raw and open pond areas replaced by semi concrete made ponds under tree canopy. Leaf liters pollute water bodies and reduce amount of drinkable water. Built up area is also growing up due to population pressure and other activates in the catchment area. GIS based mapping extensively acknowledged to maintain status of land usages in the study of wetlands.

Keywords: Remote sensing, arid, land usage, Tal chhapar, grasslands

Introduction

Inherently valuable, wetlands are one-of-a-kind environments on our planet. Wetlands are areas where water is either permanently present, such as during rainstorms or surface leaks, or it is temporarily available, such as during droughts. Located in Rajasthan's Thar desert, Tal Chhapar is a palustrine marsh.

Wafar and Wafar (2003) [5] published in the book Wetland Biodiversity and Sustainable Management Beyond that, wetland ecosystems give a status report on India's wetlands, showcasing the variety and output of these ecosystems. While discussing management concerns, they drill down into topics like gene prospecting, intellectual property rights, bio-safety, capacity building in taxonomy ecosystem analysis, and the role of national and international conventions in protecting this endangered ecosystem. The goal is to collect data and information that can be used to plan these wetland areas wisely. The bio-geo elements necessary for wetland ecosystems to function, and to draw attention to the ecological and economic value of these ecosystems in relation to India's coastlines. The importance of indigenous knowledge systems in protecting and managing these fragile ecosystems is also mentioned in the book. In an era when policymakers and researchers alike might benefit greatly from debating the merits of economic development vs. the protection of natural ewetland ecosystems.

Douglas *et al*. (2005) [2] Researched that aim to explain the wetland environment in semi-arid locations have gained a lot of attention, and the evidence that is available backs this up. It is also well-known that these wetlands are currently and soon to be facing significant challenges due to the enormous shift that has taken place within them. The resources are there, and newer methods of management have made an effort to include locals and be more open about who gets what when deciding on management strategies and research goals. Wetlands are important habitats for a wide variety of plant and animal species, but protecting them from the growing threats posed by both
established and new forces is no easy task. Future management is expected to benefit from a deeper ecological understanding of the processes that sustain the food webs in the wetlands.

Kitti and Forbes (2006) [3] have thought about how grazing affects the composition, distribution, and yield of plants on both the micro and macro scales, as well as in the short and long term. The composition of plants is greatly affected by grazing. In addition to raising soil temperatures, it can influence the mineral makeup of plant species, the pace of nutrient mineralization, and primary output. The springtime patterns of movement and habitat usage of migrating wild herds show that these animals take full advantage of the "green wave" caused by the fast-progressing plant phenology. The semi-domestic herds, on the other hand, are mostly limited to certain countries and districts.

K. Navatha, Chiranjibi Pattanaik and C. Sudhakar Reddy (2011) [4] investigated the Sirohi district in Rajasthan using remote sensing data, found 189 wetlands that covered 2.2% of the district's territory in the Luni river basin, and attempted to analyze the data. During the research period, seasonal lakes were the most numerous, followed by seasonal ponds. After a 12-year break, seasonal ponds and lakes saw the greatest amount of wetland loss. From 1992 to 2005, the number of wetlands declined from 189 to 134. Anthropogenic pressure or rainfall deficiency might be at blame.

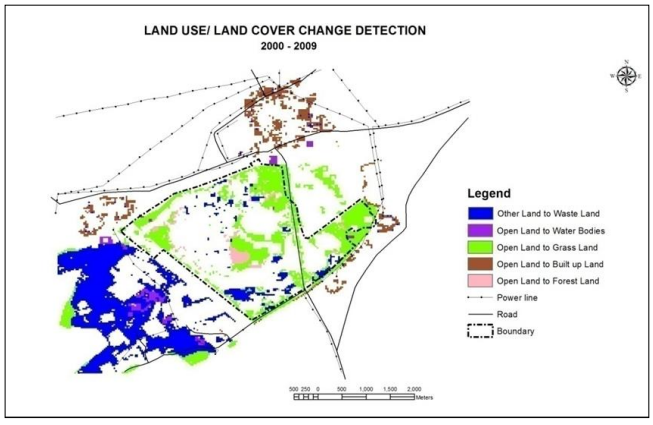
Chari and Abbasi (2007) [1] give detailed information of the South Indian Wetlands, which are among the country's most significant bird refuges, in great detail. In addition to serving as a significant water source and cultural landmark, the watershed of Wetland Lake provides for the fishing, grazing, and reed harvesting needs of the local population. However, due to rising population pressure in the lake watershed, this utilization is currently expanding at a rapid pace. The once sustainable use of South Indian Wetlands is now threatened with exploitation and eventually over-exploitation unless this trend is stopped. Instead of focusing on human interaction with wetlands and the consequences it

may bring, we should evaluate the detrimental impacts of socioeconomic variables on wetlands.

Study Area: Located on the edge of the Great Indian Desert, the Tal Chhapar wetland is a wildlife sanctuary in the Churu district. Its coordinates are 27º 46' 83" N to 27º 48' 62" N and 74º 24' 73" E to 74º 27' 45" E. The characteristic Savana biome is present in this nearly level wetland, which is dotted with shallow, low-lying sections. There are 719 hectares of Tal Chhapar wetland. Indian black bucks thrive in this rain-drained marsh. For the sake of safeguarding wildlife and avian populations, the Tal Chhapar was designated as a "Reserved Area" in 1962. The nearly treeless, salty-flat terrain of Tal Chhapar sanctuary is home to more than 1,576 black bucks. Black bucks and other reptiles, especially black spiny lizards, call this area home. Migratory species, such as Siberian cranes, and smaller birds, including those from the Arabian plains and the Central Asian Highlands, make this area their home during the winter months. Grasslands predominate in the sanctuary region, interspersed with a scattering of trees like Prosopis cineraria, Salvadora, Zizyphus, Capperis, Azadirachta, and others.

Objective: The main objective of the research is to assess change in land use pattern of Tal Chhapar wetland in the arid region of Rajasthan. This is also under consideration for land use categories which altered due to various causes during research period.

Material and Methods: On September 13, 2014, the satellite images for the year 2000 were downloaded from the website http://glcfapp.glcf. umd.edu/data/landsat. On September 14, 2014, the second picture for the year 2009 was downloaded from the same source. The changes in the land use pattern were detected using satellite imagery taken on October 22, 2000, and September 21, 2009. The Tal Chhapar wetland as seen from the path and rows of satellites 148 and 41. The pictures have a spatial resolution of 30 meters. The research area's base maps were created using toposheet G 43C/5, which was revised in 2011 and retrieved from the Survey of India headquarters in Jaipur for Tal Chhapar. Additional thematic maps of geomorphology, land use, soil, etc., as well as the Survey of India topographical sheets with a scale of 1:50,000 and a contour interval of 20 meters in the Toposheet of Tal Chhapar, formed the basis of the study. Additional secondary sources of information include reports and press releases from the Indian ministries of environment and forests and earth sciences, as well as publications and documents from the Rajasthan government concerning wetlands and environmental issues.



Land Use Classification

The Food and Agricultural Organization adopted various parameters to classify land uses categories. All India Soil and Land Use Survey Organization has classified land into eight categories since 1960. There are eight types of land use categories found in Tal Chhapar wetland, main Tal area and catchment areas. Table 1.0 shows all eight categories of land uses with values of covering areas in and around the wetland areas for the years 2000 and 2009 respectively.

Table 1: Land Use Pattern of Tal Chhapar Wetland

Sr. No.	Types of Land Use Category	(2000) Area in Hectare	(2009) Area in Hectare
1	Agricultural Land	2486.97	2355.70
2	Grassland	592.74	722.25
3	Forested Land	148.59	180.54
4	Open Land	846.18	701.64
5	Other Land	529.29	225.63
6	Built-Up Areas	77.85	182.16
7	Water Bodies	32.82	11.61
8	Waste Land	0.00	334.91
9	Total	4714.44	4714.44

Result and Discussion

The study analaysed various categories of land uses and compared with each category from the year 2000 to 2009. There is no change in the usage of agricultural land category in the catchment area of Tal Chhapar wetland, it remains almost same as it was during the year of 2000. Grasslands increased from 592.74 hectare to 722.25 hectare showing the positive increase of 2.74. Forested land as well as built up areas covers 180.54 hectares than 148.59 hectares as it was in the year of 2000. Area under built up categories has been increased from 77.85 hectares to 182.16 hectares during the research period. Wastelands have drastically expanded around the wetland areas particularly in the western direction of wetland due to salt mining and chocking of natural flow of water during rainy season. Open land and other land categories show decreasing trend during the research period and converted into wasteland as well as into grasslands. Ponds and seasonal water channels facing encroachments by liters of trees and soil slope movement by animals of wetlands. Water bodies further reduced from 32.82 to 11.61, manifesting a negative trend falls at 0.25% from 0.69% in the year of 2000.

Table 2: Change in Land Use Pattern in Percentage

Sr. No	Types of Land Use Category	2000	2009	Change
	Agricultural Land	52.75%	49.97%	- 2.78
	Grassland	12.58%	15.32%	+ 2.74
	Forested Land	3.15%	3.83%	+ 0.68
	Open Land	17.95%	14.88%	- 3.07
	Other Land	11.22%	4.78%	- 6.44
	Built-Up Areas	1.66%	3.86%	+ 2.2
	Water Bodies	0.69%	0.26%	- 0.43
	Waste Land	00	7.10%	+7.10
	Total	100%	100%	

Conclusion

The study used remotely sensed data and distinguished different categories of land uses with the help of Arc GIS software to detect change in various land uses categories during the research period in Tal Chhapar wetland area and its catchment area. Agricultural land use category remains the dominant category during the both years of the research.

This trend shows the engagement of people in the agriculture and its allied categories. Forest staff worked hard to regenerate the grasses in the open patches of the wetland area and enhanced area under this category as tall grasses provide shelters to blackbucks and other wildlife. Salt mining and soil erosion is responsible for conversing open lands and other lands into wastelands in the study area. Hence, conservation measures are required to manage Tal Chhapar wetland. More water availability should be provided in newly created ponds in the Tal area during peak summer season.

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