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GIS BASED LAND USE CLASSIFICATION OF TAL CHHAPAR WETLAND

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Abstract
Tal Chhapar wetland is a heaven for desert species of Thar. Hardpans and underlying salt crystal rocks make Tal area to retain moisture for supporting grasses in the wetland. Catchment area of the wetland experiences agrarian society. Salt mining converts suitable land into waste lands. Grasses and tall trees provide habitat and food for local species of the ecosystem. Remotely sensed data makes a base for distinguishing land use categories and usage of land for many purposes in the wetland. Arc GIS software prepares maps and helpful in making inventories of wetlands in India.

Keywords: Hardpans, Habitat, Salt Mining, Waste land, GIS, Tal area

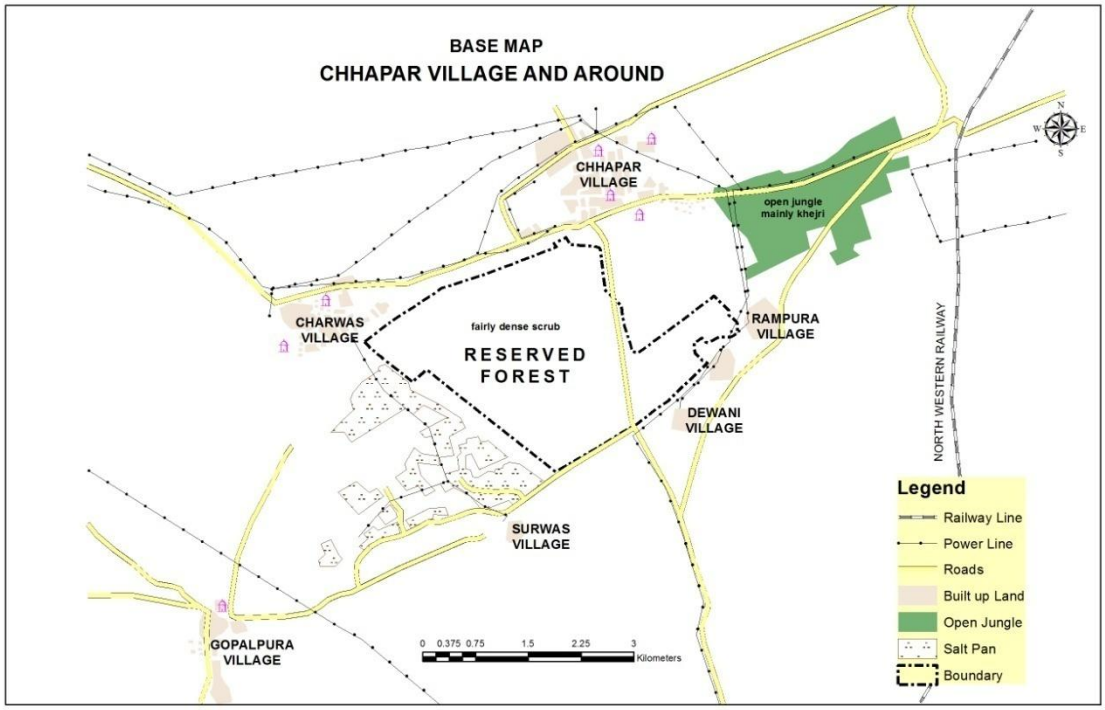
Introduction

Tal Chhapar wetland originated due to differences in geology, climate, and source of water in the western desert of Rajasthan. Tal Chhapar wetland falls in inland drainage system as it receives water from rainfall and a little from Gopalpura hills. Dry lands are characterized by high level of aridity with some variations. These wetlands reflect low rashes between precipitation and potential evapotranspiration. Existence of these wetlands is demarcated by locally positive surface water balances for a part of the year [1]. Scope and Aeolian activity determines hydrological nature of Tal Chhapar wetland in the Thar of Rajasthan. Topographic set up and antecedent soil moisture, fixture of soil enhances the rate of inundation than the infiltration capacity of the Tal soil. Two annual event of rainfall within a short period is responsible for the inundation of Tal area. Down flow of water through spill channels from Gopalpura hills, near Chadwas also contributes to maintain low level of soil moisture which to necessary for grass survival as well as for other wild life of the Tal Chhapar wetland [2].

Study Area: The Thar desert is home of various wetlands and sanctuaries in the state of Rajasthan. These wetlands are abode of migratory birds not only during winter season but also for summer season as some species of sparrows from Arabian desert make their presence in the peak summers of the year. Tal Chhapar wetland is a wildlife sanctuary located in Churu district between 27º 46' 83" N to 27º 48' 62" N and 74º 24' 73" E to 74º 27' 45". The Tal Chhapar wetland is a grassy area with parkland type vegetation provides habitat to big animals and an ideal sitting place for birds during night. Water retention is a result of gypsum based hardpans with underlying rocks of Malani groups and evaporation rate is always higher than the available moisture in the prevailing dry and scorching winds. Soils are alkaline in nature with high salt content in western parts of the wetland as a result of salt making plants. Gopalpura hills are source of flowing water during rainy season. Some water also receives through local pond area of Chhapar village, close to bus stand of the village. National Highway number 65 makes North Eastern boundary of the wetland while Bikaner – Sujangarh state highway cut the wetland in

two portions and checks free movement of reptiles, blackbucks, foxes, blue bulls and other small animals of wetland.

Objectives: The main focus of the research was to identify major categories of land uses and area under these land use categories in the Tal area of the wetland and its catchment area.



Salt mining in the western parts of Tal Chhapar sanctuary, a major cause for depletion of grasses and excess salt presence in soil allows only salt loving species to survive [3].

Various criteria are used by area specific types to select land for specific land use changes. Landscape factors and land use changes are shown to have different relationships for each land use category. Land use change can be better understood by examining the specific linkages between landscape and land use [4].

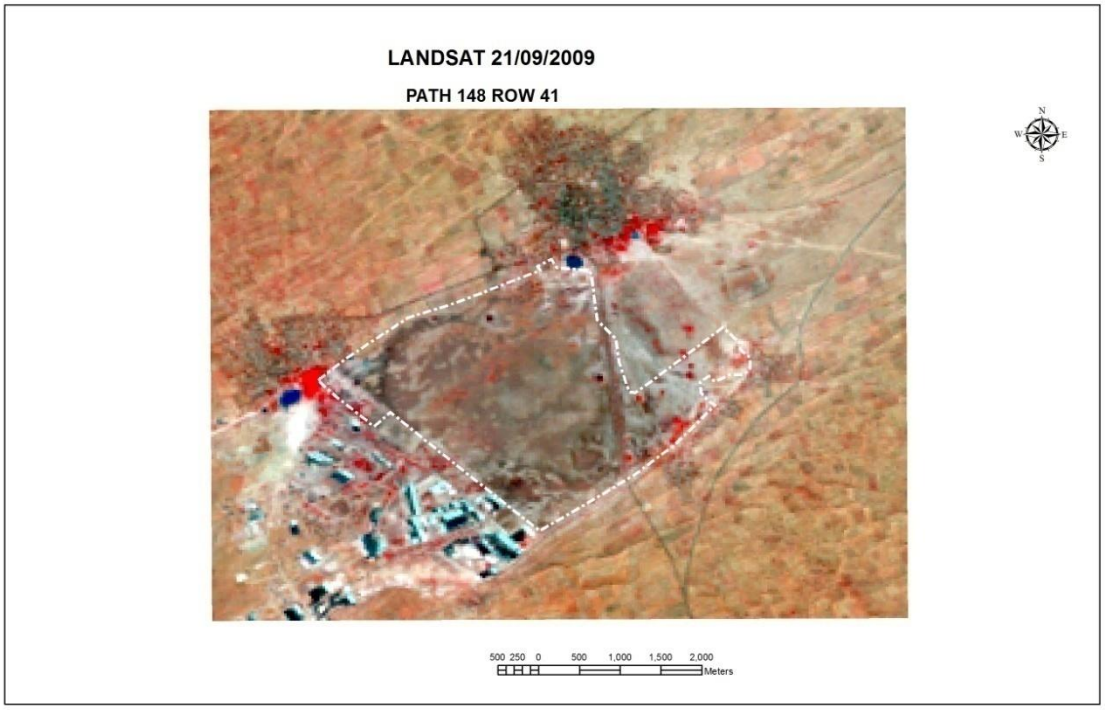
If we want to model the relationship between societal and economic shifts and changes in forest cover in an area seeing residential and recreational development alongside the abandonment of agricultural land, we need to model land-cover change as a function of land-use change. However, land-use and land-cover change are two distinct processes. Two transition probabilities, computed from Landsat imagery, are used to depict changes in forest cover. These transition probabilities are standardized to reflect changes over a decade. Land-use conditions and changes within sample sites are also taken into account [5].

There was a trend of fragmentation in the landscape indicators of three land use types: forest land, grassland, and water bodies. The dominant landscape in the research area went from forest land to grassland and back again [6].

Research Methodology:

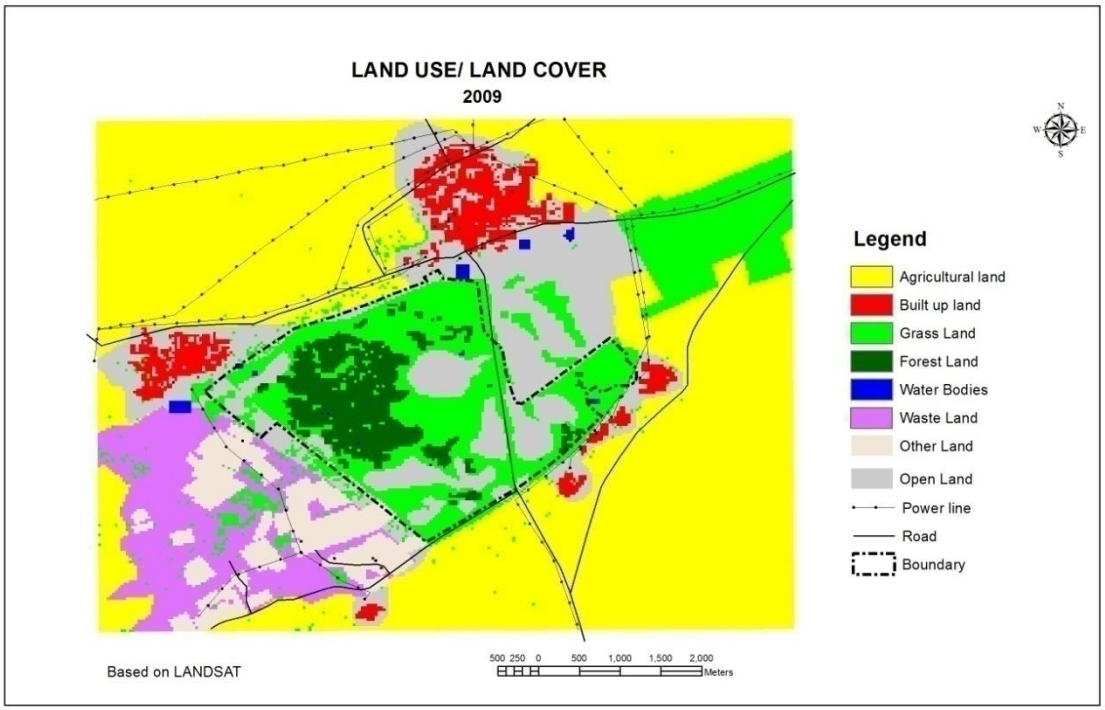
Downloaded on September 14, 2014, from http://glcfapp.glcf. umd.edu/data/landsat, is the 2009 satellite images. The land use categories were determined using satellite images captured on September 21, 2009. Satellites 148 and 41 in the imagery's path and row. The images had a spatial resolution of 30 meters. Toposheet G 43C/5, revised in 2011, obtained from the Survey of India offices in Jaipur for Tal Chhapar, was used to create the base maps of the research region. The Survey of India topographical sheets were scaled at 1:50,000, and the contour

interval of the Tal Chhapar toposheet was 20 meters. We utilized a Garmin GPS unit to pinpoint important features, like bodies of water, and to find the outside edges of the wetland boundaries. The study was also based on thematic maps that were relevant to geomorphology, land use, soil, etc.



Results and Discussion:

The land use pattern as classified from satellite imagery of 2009 shows eight major categories of land uses in the Tal Chhhapar wetland. Intensive agriculture land use category is dominant in the catchment area is a clear indication that most of population is earning their livelihood from agriculture related activities. Agriculture category covers 2355.70 hectare area in the catchment area that constitutes around 49.97% of the total area taken in the satellite imagery of 2009. Grasslands are determining factor of natural habitat in Tal Chhapar wetland. Mostly animals take shelter in the grasses during night to protect themselves from predators. Blackbucks find their natural habitat in this wetland. Grasslands contribute nearly 722.25 hectare area of the taken image of main Tal area of the wetland amounting 15.32% of the area. Forested area is third largest category of land use. This category includes Prosopis cineraria, Salvadora Species, Zizyphus Species (Ber), Capperis species (ker), Azadirachta species and Prosopis juliflora. These trees provide shelter to birds for habitat, nesting, perching, resting and for protection. This land use category covers 180.54 hectare land in the wetland area constituting around 3.83% of the main Tal area. Open land use category and other land use category constitute 701.64 hectare and 225.63 hectare area in the Tal area as well as in the catchment area of the wetland. Built up area comprises 182.16 hectare area in wetland with 3.86% of total area while water bodies available in 11.61 hectare covering around 0.26% of the main Tal area of wetland. But this category is very critical for sustaining major species of wetland area.



The wastelands add up to 334.91 hectares with 7.10% of the Tal Chhapar wetland. These wastelands are result of salt making plants presence in the western side of the Tal Chhapar wetland and obstruct rain water during monsoon season.

Land Use Pattern of Tal Chhapar Wetland

Sr. No.	Types of Land Use Category	(2009) Area in Hectare	Area in Percentage
1	Agricultural Land	2355.70	49.97%
2	Grassland	722.25	15.32%
3	Forested Land	180.54	3.83%
4	Open Land	701.64	14.88%
5	Other Land	225.63	4.78%
6	Built-Up Areas	182.16	3.86%
7	Water Bodies	11.61	0.26%
8	Waste Land	334.91	7.10%
9	Total	4714.44	100%

Conclusion: Water bodies are core areas of wetland and supporting main ecosystem in the Tal area. Grasslands and forested area are essential for habitat and food for animals and birds. Open lands provide basking patches for migratory birds. This is also hatching space for many birds

of wetland area. Other lands are home for lizards and other reptiles known for desert ecosystem of Thar. Salt mining is responsible for wasteland. Agricultural category indicates that agriculture is backbone of the residents in the catchment area. Remote sensing and GIS based data enable to identify and quantify the land use categories.

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