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RESEARCH ARTICLE OPEN ACCESS

Resources Management Issues and Eco-Sustain Prospects of Keoladeo National Park, Bharatpur Using Geospatial Technology

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ABSTRACT
Environmental degradation is the deterioration of the environment through depletion of resources such as air, water and soil; the destruction of ecosystems and the extinction of wildlife. It is defined as any change or disturbance to the environment perceived to be deleterious or undesirable. Keoladeo National Park (KNP), Bharatpur, Rajasthan is a wetland of international importance designated under the Ramsar Convention as well as a World Heritage Site (UNESCO). It is situated at the confluence of Gambhir and Banganga rivers. Keoladeo is the only known wintering area of the highly endangered western population of the Siberian Crane. These features make the park very lucrative to visitors both from India and overseas. The study is based on the topics and proper and timely assessment of topics with current scenario: - as historical analysis of the information in view of the changing climate over time and anthropogenic pressures, increased frequency of droughts, prolonged water scarcity, micro watersheds (desertification control etc.), restricted flow of water in the catchment area, differential inflow of agrochemicals to wetlands in the catchment. Generally we use a methodology to get the best results of the study and a proper planning for the resources which are scattered unqualified. Here we use the historical method, questionnaire and random sampling methods. Evaluation is the part of development and it should be time bound process or in regular intervals. The major aim of the present exercise was to make a situation analysis and review of the scientific studies undertaken in and around the KNP, explore the research gaps, and plan futuristic strategy. This included, reviewing the present scenario in and around the KNP, revisiting the completed scientific investigation on KNP and its catchment, collecting and collating the findings of published and unpublished documents, and analyzing the data for examining decadal changes in several ecological variables.
Keywords: deterioration, highly endangered, anthropogenic pressure, futuristic strategy.

I. STATEMENT ABOUT THE PROBLEM

Keoladeo National Park offers excellent opportunities for understanding nature. Live resource materials for visitors to learn about the different habitats associated with the life forms and to become aware of the environmental status and dwindling habitats for the wildlife are the strengths of KNP. For conservation to be achieved a sound understanding of the National Park is required and a comprehensive study aims at the same. Realizing the importance of correct interpretation for achieving long-term conservation many Indian or foreign institutions and agencies like- UNESCO, WWF- India, have developed Interpretation Programmes and studies keeping in view the exclusive requirements of the park. In this pursuit a feasibility study for the effectiveness of the park was also conducted based on the results of which the previous studies were developed.

The study is based on judging the economic and social importance of Keoladeo national park on Bharatpur city region and today's need of its conservation of biodiversity, flora and fauna, and based on need to be retained as a natural habitat for the migratory birds and so called foreign creatures which has come to this wetland with their fix summer shelter place and nesting destination. The need of a topic is to study the decline nature of KNP and its surrounded area, growing pollution, increasing urbanization nearby area, excessive population and decreasing wet area, uncertain rainfall and lack of proper action plan for real reconstruction of its ecological environment.

The Tools of Geospatial Technology

1. Remote Sensing
2. GIS(Geographic Information System)
3. GPS(Global Positioning System)
4. Numerical Cartography
5. Information based management system

Remote sensing is the science and art of obtaining information about as object, area or phenomenon through as analysis of the data acquired by a device which is not in contact with object, area or phenomenon under investigation. In the present context, the definition of Remote Sensing is restricted to mean the process of acquiring information about any object without physically

contacting it in any way regardless of whether the observer is immediately adjacent to the object or millions of miles away it is further required that such sensing may be achieved in the absence of any matter in the intervening space between the object and the observer. Acknowledge of land use/land cover is important for many planning and management activities and is considered as essential element for modeling and understanding the earth as a system. Land cover maps are presently being development from local to National to global scale. The use of panchromatic, medium scale aerial Photography to map land use has been as accepted practice since the 1940s. More recently, small scale photographs and satellite images have been utilized for land use and land cover mapping. The term landcover relates to the types of feature presents on the surface of the earth. Fields, lake, trees and concrete highway are all example of landcover types. The term landuse relates of human activity or economic function associate with a specific piece of Land. For an Example, a piece of land on the fringe of an urban area may be used for single-family housing, depending on the level of mapping details. Its land use could be described as urban use, or single-family residential use. The same tract of land would have a land cover consisting of roots, pavement, grass and trees. It would be important to know that use of this land is for single-family development. For a hydrologic study of rainfall – runoff characteristic, it would be important to know the amount and the distribution of Roofs, pavement, grass and trees in the tract. This knowledge of both landuse and landcover can be important for land planning and management activities.

Land use/land cover information should be presented on separate maps and not intermixed as in the USGS classification system. From a practical standpoint, however, it is offer most efficient to mix the two systems when remote sensing data from the principal data source for such mapping activities. Which land cover information can be directly interpreted from appropriate remote sensing images? Information about human activity on the land (Land use) cannot always be inferred directly from land cover? As an Example, extensive recreational activates covering large tract of land are not particularly amenable to interpretation from aerial photographs or satellite images. For instance, is a common and pervasive recreations use occurring on land that would classified as some type of forest, range, and wetland or agriculture land during either a ground survey or Image interpretation. These addition information sources are needed to supplement the land cover data. Supplemental information is also necessary for determining the use of such land as parks, commercial building, or water conservation districts that may have land use coincident with administrative boundaries not usually identifiable on Remote Sensor Images. Recognizing that some information cannot be derived from Remote Sensing Data, the USGS system is based on Categories that can be seasonably interpreted from aerial or Space Imagery.

Objectives

1. The objective of the present study is to map the landuse/ landcover pattern of *Keoladeo National Park, Bharatpur (Rajasthan)* with the help of Erdas 9.1 for image georeferencing and ArcGIS 9.2 for onscreen digitization in Shape file along with statistical analysis of LU/LC categories.
2. To assess the impact of forest area on society and infrastructure and to help preserve ecosystems and natural areas (usually already within protected areas) with a high tourism potential and ensure communal ownership and to evaluate the status of employment.
3. To prepare a bibliography of existing information on research activities of Keoladeo National Park and summarize all past and ongoing research in the Keoladeo National Park and to identify gaps or new areas for research.

Shape File and steps to create in ARC MAP 9.2 software- It is a tool for data storage in the form of shape file (.shp). It have many tools for storage the data such as- 1 point 2 polyline 3 polygon 4 multipatch 5 multipoint

- First open Arc map and double click on Arc catalog on main menu bar
- Select a desired folder, right click on there, select a new shape file and feature types.
- Feature type may be point, polyline, polygon, multipatch, multipoint

Arc Map

1. Click Arc Map
2. Click the start button on the Window taskbar.
3. Point to Programs.
4. Point to Arc GIS.

Location & Introduction of study area

Keoladeo national park is situated between (27°7'06" N – 27°12'02" N latitude and 77°29'05' E – 77°33'09" E longitude) with an elevation of 572 m amsl. It is 2 km South-east of Bharatpur city, 38 km South-west of Mathura and 50 km West of Agra and 180 km from Delhi in Bharatpur district of Rajasthan . A masonry around the border separates the park the surrounding agriculture fields. There are about 15 villages around the park. The KNP is part of that Indo Gangetic plain with elevations ranging from 173-176 meters above sea level. The area is semi-arid with an average rainfall of 500-700 mm, though rainfall can vary greatly from year to year. The KNP has exceptionally high biodiversity. The Park contains 100 species of plants, about 50 species of fish, seven species of turtles, five lizard species, and thirteen snake species. The KNP is also rightly known as a "bird paradise" with over 354 species. Birds from Siberia and Europe come here in the winter. The Siberian crane (Grus leucogeranus) commonly known as "snow wreath" or "lily of birds", visits this Park. In fact, this is the only reported wintering ground of the Siberian crane in the Subcontinent. However, their numbers in the KNP recently declined from 2300 to almost none during the last two decades. In February 1996, four Siberian cranes re-appeared after two years of absence, much to the relief of the conservation community.

The area of KNP is about 29 sq. m. it is a low-lying depression with a gentle slope towards the center forming a depression. The total wetland area is about 6 sq. km. this is a main submersible area of the park. The average elevation of the area is about 174 meter. The submersible area has divided into various unequal compartments by means of dykes. Occasionally some ditches fo varying sizes occur in the rest of the area. A metaled road, which is now closed to traffic, passes directly through the park. Soil at KNP is thick alluvium, overlying pebble path and some clay formation. The periodic inundation dominant the area. Patches of saline soil are common in the terrestrial area. Bharatpur experience extremes of climatic conditions as the annual temperature varies from 21° C to 50 °C. Bharatpur receives most of its precipitation from southwest monsoon, which usually sets in towards the end of June or early July and extends up to September, at times to even October. The annual average rainfall ranged varied from different year. The climate is hot in the summer, hot humid in monsoon, cold and foggy in the winter. Hot dry weather dust storms, low humidity and scanty drizzles of only a few millimeter characterize the pre-monsoon season in Bharatpur.

Methodology and Data used Satellite data and secondary data

For delineation and mapping of land use land cover, multitemporal orthorectified IRS LISS-IV (5.8m) path and row 202-59 and date 19 Jan.

2012 and Cartosat PAN (2.5) path and row 528-272 and date 27 Jan. 2012 have been used.

In the form secondary data, Survey of India (SOI) topographic sheets were used. These topographic sheets on 1: 50,000 scales are used for identification of the base feature. The toposheets falling in the study area, the area of KNP is covered in toposheet No. 54E/8 and 54E/12.

Basically, five software were used for this research viz; (a) ArcView 3.2a – this was used for displaying and subsequent processing and enhancement of the image. It was also used for the carving out of Ilorin region from the whole Kwara State imagery using both the admin and local government maps. (b) ArcGIS – This was also used to compliment the display and processing of the Data. (c) Erdas Imagine 9.1for subset and Georeference (d) Microsoft word – was used basically for the presentation of the research. (e) Microsoft Excel was used in producing the bar graph. Database is a collection of interrelated information, usually stored on some form of mass storage system. A GIS database includes data about the position and the attribute of geographical feature that have been coded as point, line, areas and pixels.

Steps

- Georeference of data**.**
- Generation of FCC (False Color Composite)**.**
- Onscreen generation. Digitization of image.
- Computation and analysis of various vegetation indices.
- Statistical analysis and report.

Image interpretation and interpretation Key

Image interpretation is defined as the 'art of examining image for the purpose of identifying object or surface feature and judging their significance'. Interpreter studies the remotely sensed data and attempts through logical process in detecting and identifying, classifying, measuring and evaluating the significance of spatial relationship. The image interpretation key provides a critical reference base for advanced interpretation. It helps the interpreter in evaluating the information in an organized and consistent manner.

The image interpretation key consists interpretation elements viz., Tone, Texture, Size, Shape, Association, Pattern, etc. The interpretation key has been used as per the guide line given in the manual.

Land use Land cover Interpretation and Classification

1. Using the interpretation key prepared, land use land cover class has been delineated by using onscreen interpretation procedure.
2. Relevant satellite image(s) has been displayed on the computer screen at 1:5000 scale.
3. The grid has been used for each of the scene 5'x5' tiles as control grid.

During the interpretation of Land use Land cover of Keoladeo National Park, Bharatpur (RAJASTHAN) following categories were observed in the study area.

- **Dense forest:** comprised of mitragyna parvifolia along with Acacia nilotica or zizipus mauritiana, the under growth showed the presence of kirganelia reticulate and capparis sepiaria. The low grass cover had cynodon dactylon.
- **Open forest:** open or scattered forest includes thorny scrub with Mitragyna parvifolia as under growth with low cynodon dactylon grass cover.
- **Grassland:** scattered vetiveria zizanioides cover the area with Desmostachya bipinnata from in the low stratum.
- **Grassland with scattered trees:** Low grassland with scattered tree also presence stray and scattered trees and shrubs. The ground substratum support low grass.
- **Open water:** This comprise of mostly free floating and suspended aquatics.
- **Settlements:** In this category mostly constructed areas like guest house, temple, canteen etc. are include.
- **Wetland:** There are mainly water logged areas with aquatic vegetation etc.


Dense forest


Open water

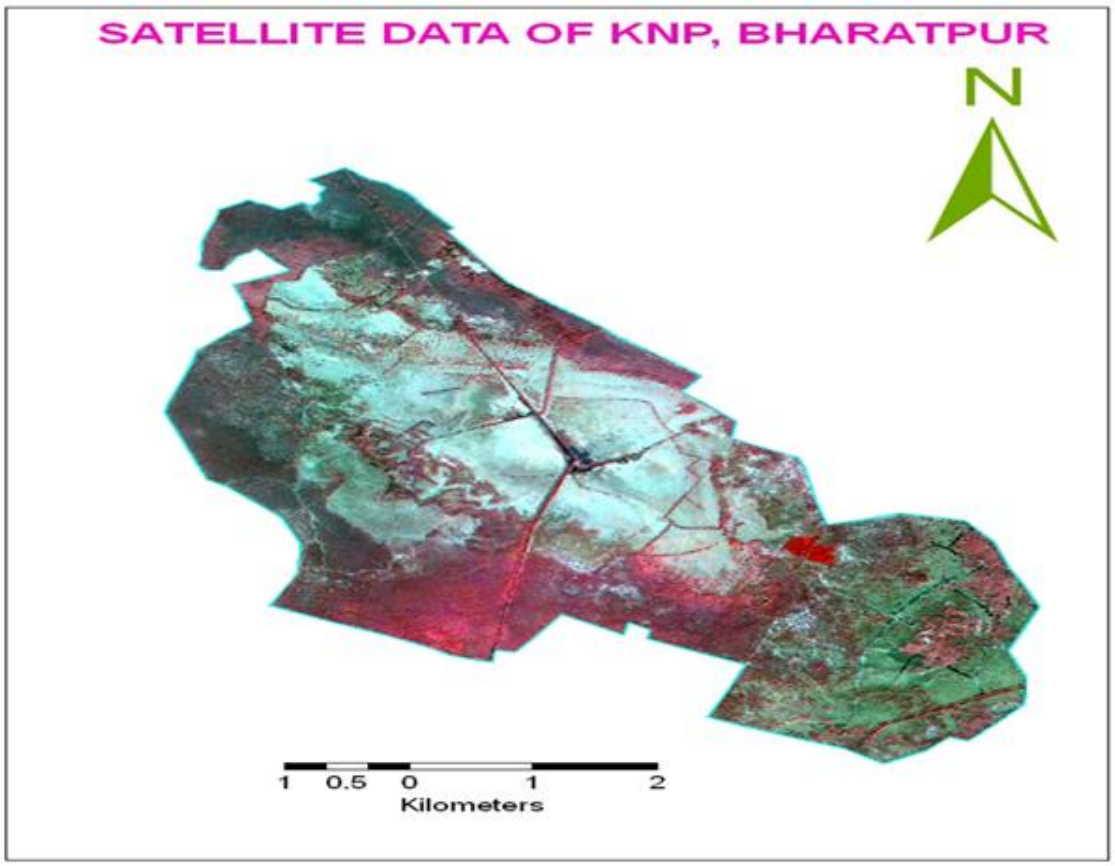

Wetland

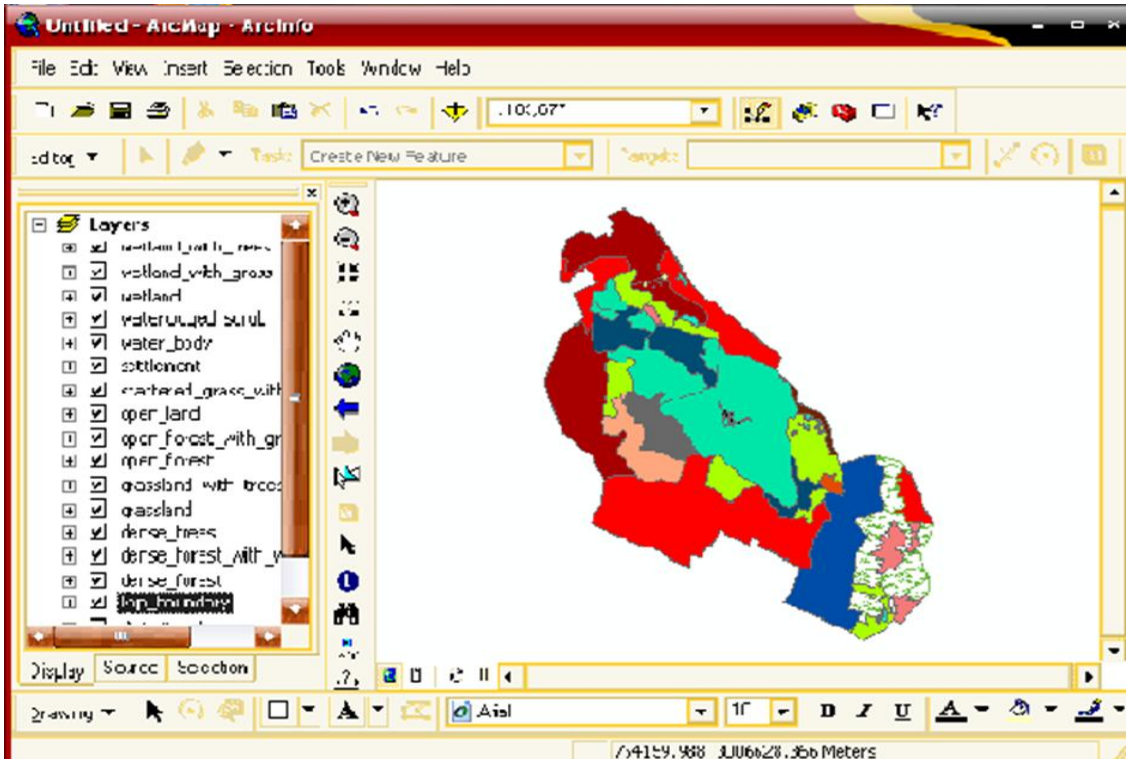

Scattered forest


Guest houses


Grassland

(Different type Categories shown in the image)



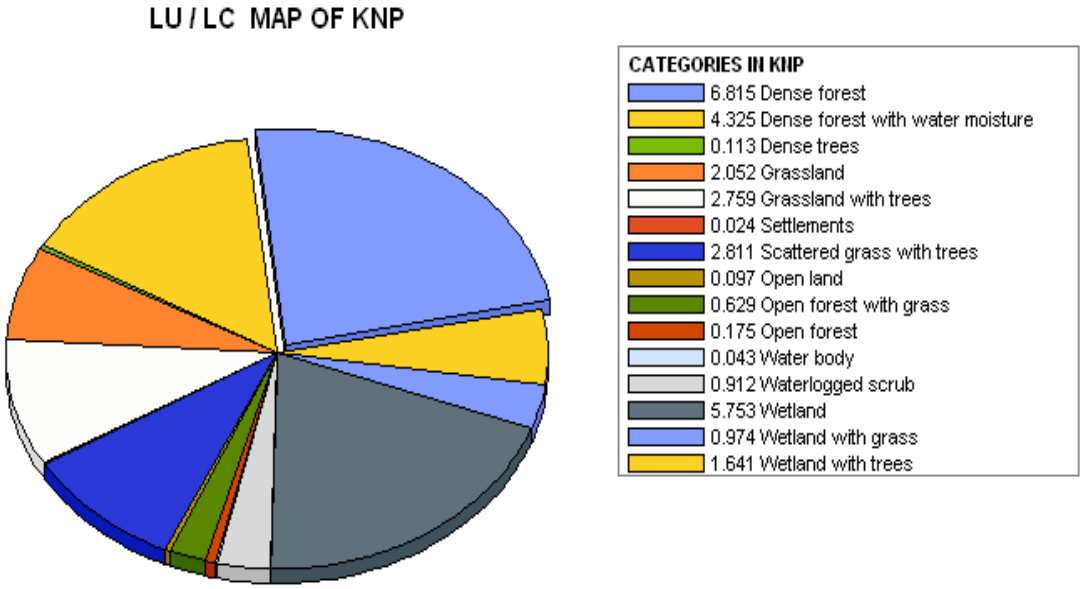


On screen image interpretation
Result, Discussion and Conclusion

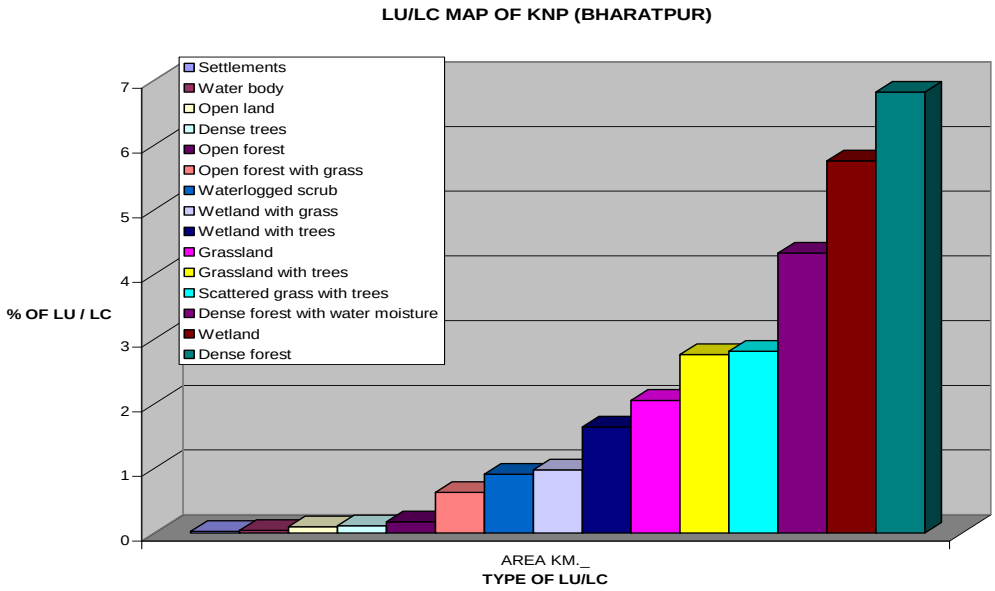
The landuse /landcover map generated while interpreting the satellite image has 15 classes. The area falling in each category is given below -

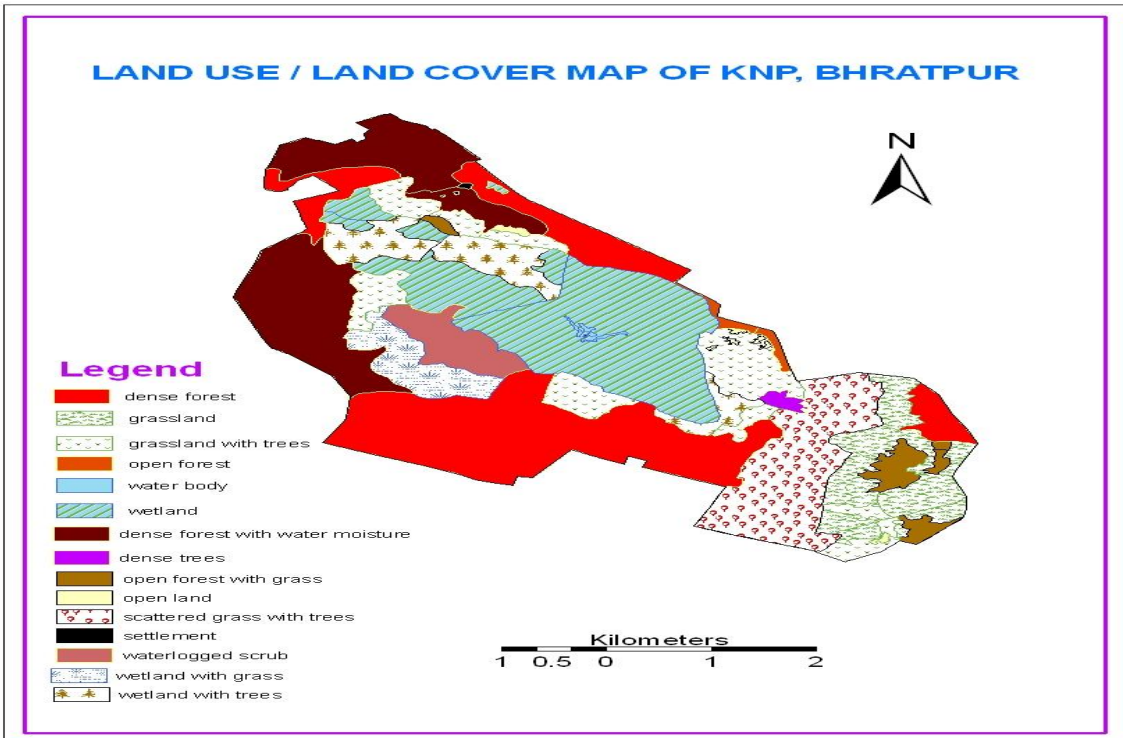
Categories	**Area sq.km.**	**Area in %**
Settlements	0.02	0.08
Water body	0.04	0.14
Open land	0.09	0.33
Dense trees	0.11	0.39
Open forest	0.17	0.60
Open forest with grass	0.62	2.15
Waterlogged scrub	0.91	3.13
Wetland with grass	0.97	3.34
Wetland with trees	1.64	5.63
Grassland	2.05	7.04
Grassland with trees	2.75	9.47
Scattered grass with trees	2.81	9.65
Dense forest with water moisture	4.32	14.85
Wetland	5.75	19.75
Dense forest	6.81	23.40
Total	**29.12**	**100**

LU/ LC Category area in sq.km. & %
Graphical Representation (Pie Chart) of Landuse/ Landcover of Keoladeo National Park, Bharatpur (Rajasthan)



Bar Chart of LU / LC





II. CONCLUSION

Keoladeo National Park (KNP) popularly known as Bharatpur Ghana Bird Sanctuary is not only a bird paradise but is one of the best waterfowl reserves in the world for both resident as well as migratory birds. The Indian wetland is unique for being include under both the Ramsar and World Heritage Convention. KNP is one of the three place in the world, known to harbor wintering Siberian cranes (Grus leucogeranus). RS and GIS technique have emerged as a powerful tool for mapping and monitoring the natural resources. Its capabilities for mapping and monitoring seasonal changes and for habitat evaluation of wildlife have been already established. The present study was carried out to study the distribution pattern of selected LandUse/Land Cover and mapping and monitoring KNP's main features and an evaluation of selected features. Hence we can manage the resources which are scattered and unmeasured in the surroundings of park region and with this we can suitably perfect in eco-sustain condition for the inhabitants.

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