

FOREST ECO-SYSTEM CHANGES IMPACTING WILDLIFE AND HUMANS

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Abstract

Forest is an important resource of eco-system for any country. Forest lands, all over, are under severe stress to be diverted for non-forest purposes. Change in ecology, especially involving forest degradation will have serious implications on both humans and wildlife. One such dangerous ill effect of ecological change is conflict between man and animals for space and food. In villages adjoining forest fringes, wild animals, especially elephants coming out of their natural habitat in search of food and thus resulting in conflict between man and elephants in form of animals raiding agricultural fields has become a regular menace. As there is damage and loss of life and property on either side, so both humans and elephants are on the losing side of this conflict. Major reasons for this clash could be shrinking of forest cover, degradation of forest grazing patches etc. The recent technology of remote sensing and GIS is very much useful for analyzing the change in forest cover over period of time. An attempt has been made in this paper to study the change in forest cover in Sakaleshpura Taluk of Hassan District -Karnataka, over the past two decades, from 1990 till 2015, which possibly could be one of major reasons for clashes between man and elephant.

Keywords: Forest Cover, Degradation, Man-Elephant Conflict, Landsat Imagery

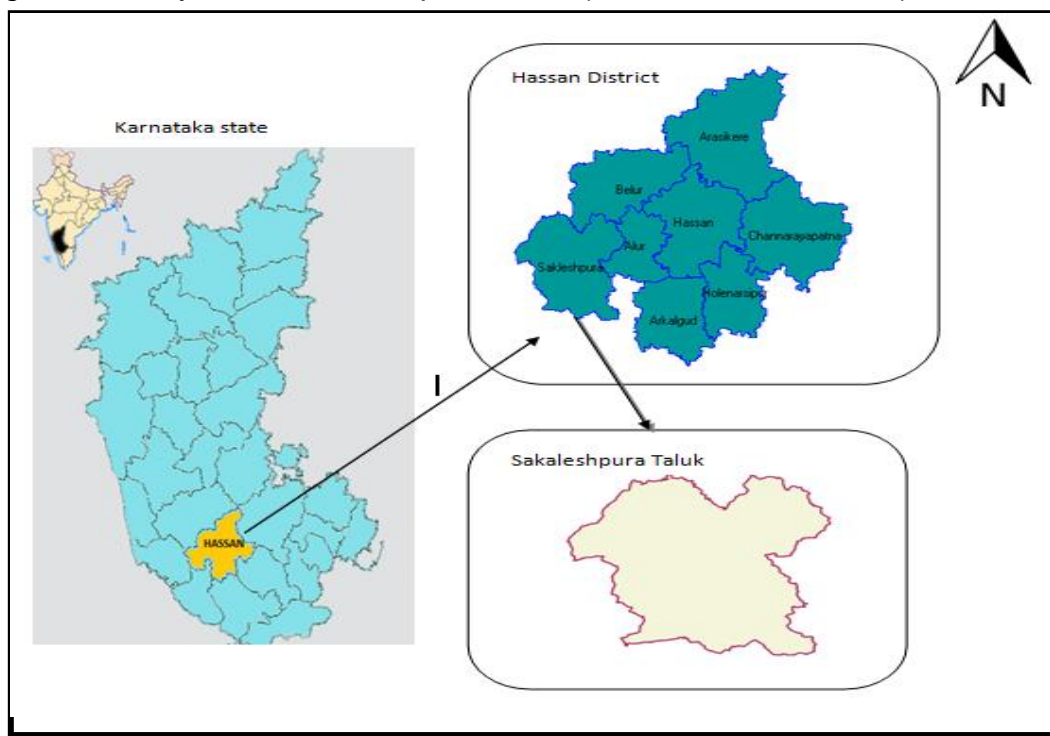
Introduction

Forest change, over period of time will indicate the demand for forest land to be diverted for various other purposes which will have significant environmental impacts and disturbances on forest ecosystems. Degradation of forest land and conversion of forests for various human needs like agriculture; habitation etc is a challenging environmental problem. Expansion of urban areas has infringed upon forest space leading to drastic reduction of forest patches. Clashes between human and wild animals for food and space are most spoken topic about in the recent past. Increasing human population and reduction of forest cover has resulted in serious conflict between human and animal particularly in areas where forest are fragmented. Serious implication of these clashes is loss of property and life on both the sides, which is alarming. Most severe among all is conflict between human and elephants, which results in both loss to life and property.

Karnataka has nearly 38,284 Km² of forests including 74.94% of reserve forest, 10.27% protected forest. Karnataka is home to nearly 6000 wild elephants, nearly 15% of India's Elephants. Majority of this elephant population is concentrated in the protected and reserve forests of southern part of the State, within the Mysore Elephant Reserve spread over 6,463 sq. km. Karnataka faces a very serious problem of elephant-human conflicts, relatively speaking, and thus greater challenges in formulating and executing an appropriate conservation paradigm. Elephants follow ancient migratory route to move from one patch of forest to another, which has now been replaced by agricultural, coffee/tea estates or habitation resulting in fragmentation of forests and leading to man-elephant conflict. As per reports from Karnataka forest department around 35-40 elephants get killed annually due to

conflict reasons and nearly equal number of people are also killed in this conflict, apart from loss to crops which are destroyed when these mammals raid the agricultural fields for food. Remote Sensing and GIS is very frequently used for mapping and classification of natural resources. Spatial extent of area can be reliably acquired and analysed by technique of remote sensing. Temporal data helps in analyzing change occurrence over the period of time. Change detection is performed by comparing satellite imagery on different dates. Analysis of multi date satellite images also depends upon the capability of user to identify temporal changes. Analysis of forest and other ecosystems at different spatial scales can be performed by using this technology. Availability of high-spatial and high-spectral resolution imagery is an added advantage in the remotely sensed data. Analysis of change detection helps in understanding changed land use patterns over period of time which can be studied to draw inferences. An attempt has been made in this paper to study the change in forest cover and map the conflict zones in Sakaleshpura Taluk of Hassan District -Karnataka, over the past two decades which could be one of major reasons for clashes between man and elephant which has increased many folds in the past decade.

Figure 1. Study Area: Sakaleshpura Taluk (12.94° N and 75.78° E)



Sakaleshpura taluk in Hassan district was chosen as study (Figure 1). Elevation of area is 949meters, with 60% humidity and average temperature of Sakaleshpura is 24° . Reports of conflicts between humans and elephants are very frequent in Sakaleshpura. Also the elephant task force in its report submitted to honourable high court of Karnataka has classified Sakaleshpura area as Elephant- Human co-existence zone. Hence, for co-existence it is vital that fragmented forest patches have to be connected and an elephant corridor has to be created to mitigate the crisis.

Sakaleshpura is situated in Hassan District, and is located at 12.97° N, 75.78°E. It is surrounded by Belur and Alur Taluks. Western Ghats Mountains extend in the western edge of taluk while rest of district is in Deccan plateau. Kempuhole and Kumaradhara are two major rivers that originate in Sakaleshpura taluk and flow westwards to join Arabian Sea. Bisle Reserve forest and region around in Sakaleshpura is listed as one among 18 most diverse spots in the world in terms of flora and fauna. Coffee/tea estates are of late, are seeing large scale cultivation. Pepper, Ginger, Paddy, banana are major crops in Sakaleshpura. As of 2011 Census, Sakaleshpura has population of 23,532.

Materials

Landsat data acquired from United States Geological Survey (USGS) for the year 1990 and 2015 are used in present study. Images (cloud free) of year December - 1990 with Path-145, Row -51 of Landsat 5 (Thematic Mapper) and cloud free data of November-2015 with Path-145, Row - 51 of OLI-TIR (Operational Land Images Thermal Infrared) Sensors is used for the present study. Besides the satellite data, topographic maps 48o12, 48o16, 48p09, 48p10, 48p13, 48p14 of 1:50,000 scales were used for geo-referencing.

Secondary data regarding conflict zones was collected from forest department and ground visit was carried out. Details of villages which elephants raid for crops were also collected from forest department.

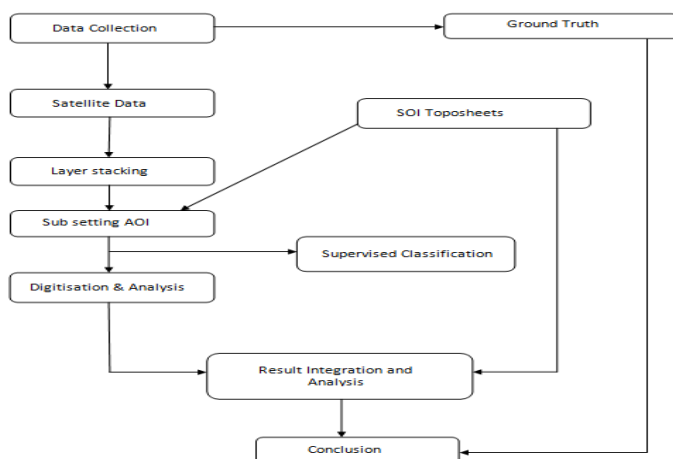


Table 1. Flow chart indicating the methodology

Methodology

Acquired data was layer stacked with Blue, red, green, and IR bands. It was geo referenced with Survey of India maps and vector file (Shape file) of study area was generated. The vector file was verified with KRSAC (Karnataka State Remote Sensing Application Centre) shape file. The schematic flow diagram of the methodology adopted presented in Table 1. Supervised classification was done on subset raster files, both 1990 and 2016 data. Training sets were given to classify the image into 5 classes, i.e. Forest, Agriculture, Built-up, Fallow and water body. Training sets was given to individual imagery. Maximum likelihood parameter is applied for decision rules. Accuracy assessment is done on both classified files, it is nearly 78.26% accurate and Kappa Co-efficient is above 0.7%

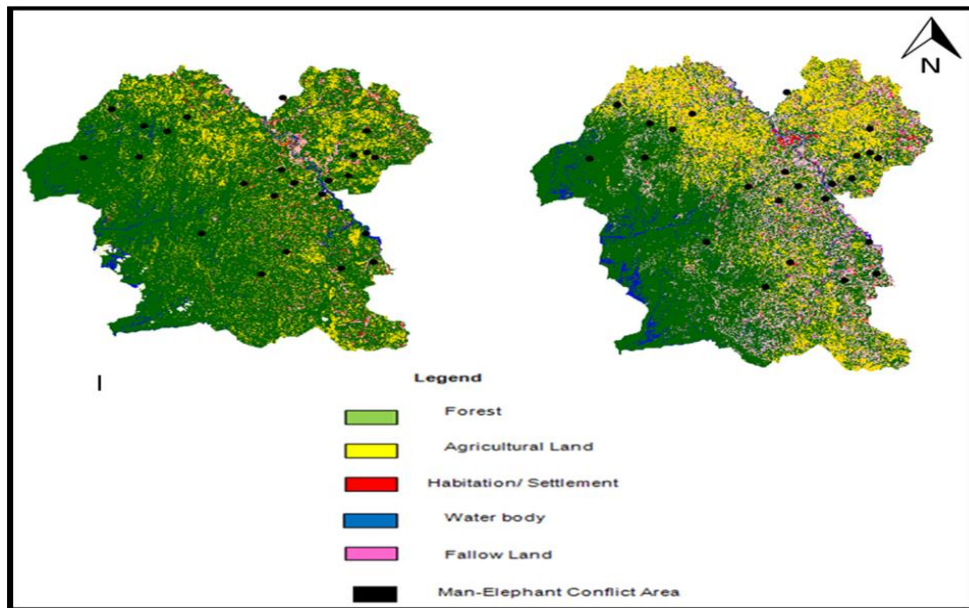


Figure 2. Supervised Classified Images both 1990 and 2015 with conflict zones

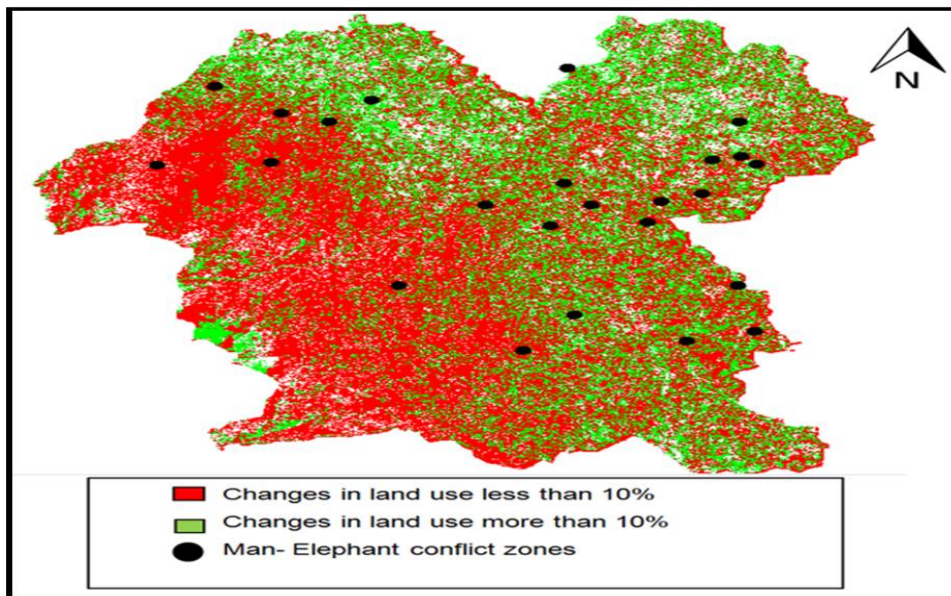


Figure 3. Change in land use

Result and Discussions

Figure 4 highlights changes in land use over past 25 years. Area in red represents changes in land use less than 10%, whereas area in green colour represents change in land use more than 10%. Land use change analysis shows there is significant reduction in forest

cover over the past 25 years, and forest lands have been majorly converted into agricultural lands in Sakaleshpura taluk. There is clear indication that forest cover has decreased. Overlaying conflict zones on classified data, it can be inferred that conflict zones fall in the areas where change in land use has changed more than 10%, as compared to areas where change in land use is less than 10%. This indicates loss of forest as they are converted into agricultural land. Loss of forest cover means loss of both food and space for animals.

Elephants follow ancient migratory routes from generations and pass on same route to their next generations. Since ancient routes have been now replaced by agricultural and coffee cultivation their migratory routes are obstructed, which leads to conflict between man and elephants. Another significant reason for conflict could be population of elephants itself. Forest department having given strong protection to elephants, they have seen increase in their numbers; however space for them has been shrinking. This can also be one of the reasons for conflict. As vegetation cover has reduced, leading to shortage of food, the elephants come out of their natural habitat in search of food and water thus leading to this dangerous conflict.

Man – Wild conflict issues for food and space are happening from time immemorial, however the problem is becoming very severe in the recent times. Though Sakaleshpura is only one of such place where the conflict is of serious, there are many other places in state where human – elephant conflict is of very severe in nature. The satellite image clearly shows reduction in forest cover over the past 2 decades, and elephant migratory routes being occupied by humans for various purposes. As result the animals are left with no choice but to fight with humans for space and food. Also for farmer, it is a huge economic loss when an elephant tramples his crops. It is loss on both the sides. Since crops grown in Sakaleshpura majorly consists of banana and paddy which entice elephants to raid them, so measures of reducing crop raiding like digging elephant proof trenches, solar fencing, etc should be taken to reduce loss on farmer as he invests both money and hard work in raising crops which he cannot let go to crop raiding elephants. Also, as per report submitted by elephant task force to high court of Karnataka, Sakaleshpura region comes under coexistence zone. Hence efforts must be done to reduce these skirmishes which occur almost on regular basis by restoring ancient elephant route which is now replaced with human needs. Further study can be taken to identify corridors where forest stretch could be made continuous so that elephants can move without any hindrance. This also would reduce conflict with man for food and space.

References

- Chilar J.**, 2000., Land cover mapping of large areas from satellites: status and research priorities. *International Journal of Remote Sensing*, 21(6-7): 1093–1114
- Kachhwala T.S.**, 1985., Temporal monitoring of forest land for change detection and forest cover mapping through satellite remote sensing. In: *Proceedings of the 6th Asian Conf. On Remote Sensing*. Hyderabad, pp 77–83.
- Ramkumar K. et al**, 2014., Human and Elephant (*Elephas maximus*) deaths due to conflict in Coimbatore Forest Division, Tamil Nadu, India. ZOO's PRINT, Volume XXIX, Number 8 August 2014.
- Shivani Agarwal et al**, 2010., Forest Change analysis of Jim Corbett National Park, Uttarakhand: A remote sensing and GIS approach. 11th ESRI India User Conference 2010.
- Report of the Karnataka** Elephant Task Force Submitted to the High Court of Karnataka September 2012.