

CONSERVATION PRIORITIZATION AND PLANNING OF FOREST LAND: A RECIPROCAL APPROACH BY MEASURING FOREST DISTURBANCE USING GEOSPATIAL TECHNOLOGY

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INTRODUCTION

Natural resources, especially forestlands playing a critical role in the economic, social, and cultural development (Alberti *et al.*, 2003; DeFries, 2012). Forestlands are biologically rich and diverse ecosystems, significantly supporting in the stabilization of climate and carbon sinks (Houghton *et al.*, 2015). Most of the forestlands in India designated as protected forests. However, they are not free from various degrees of human interference. Therefore, it is essential to study landscape elements for their status, interactions, and importance. Forest disturbance (FD), a discrete event that modifies landscape, ecosystems, community and population structure along the passage of time (White and Pickett, 1985). The FD leads to processes like fragmentation, migration, local and regional extinction (Li and Reynolds, 1994; Roy and Behra, 2002; Bahamondez and Thompson, 2016). Forestlands are also experiencing temporary or permanent deterioration in their density/structure of vegetation cover and species composition (FAO, 2007). Of which, forest fragmentation is one of the key processes, that converts contiguous native forests into a set of small and isolated patches (Haila, 1999; Munguía-Rosas and Montiel, 2014).

The majority of disturbed and fragmented forests are the consequences of human interventions. The practices include forest clearance for agricultural production, regular or unsustainable logging practices (Houghton, 2005; FAO, 2007; Olagunju, 2015) and infrastructure development such as road networks and construction of dams. Also, the establishment of mines, industries, urbanization and other related entities played a major role in forest fragmentation and biodiversity loss. Hence, the quantification of FD and rate of forest fragmentation is essential. Spatial modeling is being widely used in the mapping of FD and involved as one of the key components in the procedures of forest conservation. Disturbed forestlands can be managed by adopting the efficient and sustainable forest management processes, such as regeneration of local or regional species (Roy and Tomar, 2000; Tamb *et al.*, 2011; Sharma *et al.*, 2016). For example, bamboo potentiality and its sustainability towards biomass enhancement have been discussed (Pathak *et al.*, 2015; Kumar and Kumari, 2010). Moreover, remote sensing and GIS techniques widely used in the assessment of forest disturbance, development of forest fragmentation and prioritization maps for the conservation of forests (Roy and Tomar, 2000; Martínez Ramos *et al.*, 2016;). Several studies are taken up on forest disturbance, geospatial modeling and in the construction of conservation prioritization maps (Pressey and Bottrill, 2008; Nackoney and Williams, 2012).

Remote sensing and GIS techniques are widely used in modeling and monitoring of forest lands and other non-forest areas (Boori *et al.*, 2015; Ahmad and Goparaju, 2016 a, b; Ahmad *et al.*, 2017 a, b) and for natural resource mapping for suitability/vulnerability assessment (Boori and Amaro *et al.*, 2010 and Qayum *et al.*, 2015).

ABSTRACT

Conservation of forestlands in West Singhbhum District of, Jharkhand State, is increasingly important because of enhanced pressure and deforestation. The present study was attempted to generate an accurate and reliable conservation prioritization map for restoration/management activities by analyzing spatiotemporal patterns of landuse and land cover (LULC) change occurred in the part of Porahat forest division over the past three decades (1975 - 2015). Patterns of forest disturbance and the level of fragmentation were geospatially analyzed on the distance from roads, settlements, topography (slope, aspect, elevation). The results revealed that the forest cover was decreased from 60.5% (59,616 ha) in 1975 to 52% (51,257 ha) during 2015. However, there was an increase in non-forest and water bodies by 8.1% (8,045 ha) and 0.49% (314 ha), respectively compared to 1975 statistics. The prioritized conservation map was generated with an accuracy of 82 percent employing the GIS modeling. It was observed that about 22% of existing forest lands was highly disturbed. These disturbed patches need special attention/prioritization for conservation and management. The generated spatial pattern of conservation prioritization map of this study can be utilized in the regeneration of natural species and the sustainable development of forest lands.

KEY WORDS

Prioritization
Forest disturbance
Spatial modelling
Land use planning

Received : 00.00.2016

Revised : 00.00.2017

Accepted : 00.00.2017

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