ISSN 1946-7664. MCFNS 2018
Vol. 10, Issue 1, pp. 31–31
Mathematical and Computational Forestry & Natural-Resource Sciences

AVAILABLE ONLINE AT HTTP://MCFNS.COM

Submitted: Mar. 5, 2018
Accepted: Mar. 30, 2018
Published: Mar. 30, 2018
Last Correction: Mar. 30, 2018

OBJECT-BASED FOREST COVER CHANGE MAPPING USING REMOTE SENSING IN NURISTAN PROVINCE, AFGHANISTAN

(POSTER RESEARCH SUMMARY)

Shogufa Popal

Dep. of Global Agr. Sciences; Grad. School of Agr. & Life Sciences; The University of Tokyo, Tokyo, Japan

Abstract. In Afghanistan, deforestation and forest degradation are significant environmental issues, which have not been intensively studied. The goal of this research is to investigate forest cover type changes in six districts of Nuristan Province, over the past three decades, using object-based classification of Landsat imagery. The specific objectives of this study are: i. ascertaining the current status of the forest land cover; ii. mapping forest cover types in 1998, 2008, and 2016; and iii. detecting forest cover type changes between 1998–2008 and 2008–2016. The Landsat imagines have been acquired from United States Geological Survey (USGS) for the years of 1998, 2008, and 2016, to produce new sets of land cover type maps for the years 1998, 2008 and 2016, and forest cover type change maps for the periods 1998–2008 and 2008–2016, based on the use of a consistent set of methods and datasets, using TNTmips Pro 2016 and eCognition Developer 9.0 software, for the six considered districts of Nuristan Province.

The land cover maps are used to depict the land cover areas and transitions within each year. Using object-based classification approach, the forest cover change maps illustrated the extent of deforestation and forest gains, together with the land and forest cover dynamics, between two time periods of 1998–2008 and 2008–2016. This approach is used in order to estimate the forest losses and gains, produce accurate and stable classification results, and reduce the year-to-year inconsistencies, through the use of adequate numbers of training sample points.

The research methodology consists of: i. preprocessing of Landsat images using TNTmips; ii. object-based image classification using eCognition Developer 9.0; iii. mapping land and forest cover change; and iv. quantifying land cover dynamics together with forest cover losses and gains. Altogether, 13 main classes are assigned in the land cover maps with the help of hyperspectral SPOT-7 images and Google and Bing maps, whereas 3 additional change classes are added in the forest cover change maps: i forest loss; ii. forest gain; and iii. seasonal snow cover.

Overall, the time series land cover mapping (1998, 2008, 2016) revealed that the dense broad-leaved forests have decreased (164.89 km^2) between 1998 and 2016, whereas the sparse broad-leaved forest areas increased gradually within the same period. The increase (134.95 km^2) in the area of sparse broad-leaved forests during the study period is primarily attributed to a shift from dense broad-leaved forests to sparse broad-leaved forests, which can be defined as "forest degradation". Furthermore, between 1998 and 2008, a large area of sparse broad-leaved forests have also been degraded and converted to other vegetation classes, which are not considered as forests. On the other hand, the district-based forest comparisons showed that Nurgeram district contained the highest amount of the forests (48.9% in 1998, 43.92% in 2008, and 45.24% in 2016), whereas, Parun district contained the lowest coverage of the forests (12.25% in 1998, 9.86% in 2008, and 11.07% in 2016) within the study area.

The results illustrated on the forest cover-change maps don't reveal any excessive deforestation (7.26 km^2) in the study area between 1998 and 2016. The forest loss was 5.92 km^2 in 1998–2008 change map, whereas forest gains were only 0.31 km^2. Forest losses were decreased (1.34 km^2) in 2008-2016 change map with increase in forest area (1.24 km^2). Although the deforestation is insignificant, the results show that the forests have been continuously degrading during the study period, converting from dense broad-leaved forest to sparse, and from sparse to other vegetation areas. The overall accuracy in the study is over 91%.

Keywords: GIS; Landsat; Forest cover; Object-based classification; Cover type mapping; Deforestation; Forest degradation; Land change tracking;

Popal (*2018*) (MCFNS 10(1):31–31). Manuscript Editor: MCFNS Editor