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Vegetation Cover Change in Ella Sepa Using Prefire-Postfire NDVI Supported by Supervised Land-Use Classification and NASA Fire Data

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Abstract

Vegetation cover in the Central Highlands of Sri Lanka, particularly in fire-prone areas such as Ella in the Uva Province, is increasingly vulnerable to disturbance. This study assessed vegetation cover change in the Ella Special Environmental Protection Area (SEPA), identified under the Ella Development Plan 2021-2030. Vegetation change was analysed using a prefire-postfire approach with the Normalised Difference Vegetation Index (NDVI) and supervised land-use classification, supported by NASA FIRMS VIIRS Active Fire Data to identify fire-affected areas. NDVI values were derived from 30 m Landsat 8/9 OLI/TIRS Level 2 imagery for prefire conditions in December 2024 and postfire conditions in February 2025. NDVI layers were reclassified into three vegetation classes: non-vegetated, sparse, and moderate, and change detection analysis quantified vegetation loss. Supervised land-use classification validated spatial patterns of change. Results showed that non-vegetated areas increased by 85 ha, from 1.7% to 21.3% of the landscape, largely aligning with active fire detections near Ella Rock and Ella Rock viewpoint. Fire occurrence appears linked to anthropogenic ignition sources, facilitated by human access along the Ella-Wellawaya main road and secondary roads near tourist areas, and further exacerbated by the high flammability of pine-grassland mosaics and dry seasonal conditions. The SEPA core has limited settlements, while the surrounding areas are moderately populated, with a population density of ~400 persons/km^2 in the Ella Divisional Secretariat, potentially elevating fire risk along accessible forest edges. Moderate vegetation patches were more resilient, likely due to topographic sheltering and reduced fire intensity. The study demonstrates that integrating NDVI, supervised classification, and active fire data is effective for monitoring vegetation dynamics, supporting conservation, and guiding fire risk mitigation.

Keywords: *Ella, NDVI, NASA fire data, Supervised land-use classification, Vegetation change*