

Assessing impact of multiple fires on a tropical peat swamp forest using high and very high-resolution satellite images

ABSTRACT

Tropical peat swamp forests, found mainly in Southeast Asia, have been threatened by recurring El Niño fires. Repeated burnings form a complex and heterogeneous landscape comprising a mosaic of burned patches of different fire frequencies, requiring fine-scale assessment to understand their impact. We examined the impact of the El Niño fires of 1998 and 2003 on a tropical peat swamp forest in northern Borneo, with the combined use of high and very high-resolution satellite images. Object-based and pixel-based classifications were compared to classify a QuickBird image. Burned patches of different fire frequencies were derived based on unsupervised classification of the principal components of multitemporal Normalized Difference Water Index (NDWI) data. The results show that the object-based classification was more accurate than the pixel-based classification for generating a detailed land cover map. Fire frequency had a severe impact on the number of burned patches and the residual forest cover. Larger patch area retained more residual forest cover for the burned patches. Forest structure of burned-twice patches was more severely altered compared to burned-once patches. Two burned-once patches had a relatively promising recovery potential by natural regeneration due to higher residual forest cover, a vast number of large trees, and aboveground biomass. Except for the largest patch, rehabilitation seemed inevitable for burned-twice patches. This approach can be applied to assess the impact of multiple fires on other forest types for better post-fire forest management.