Spatial priority setting for conservation planning in an oil palm plantation landscape in Central Kalimantan

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Introduction

As the Global demand for sustainably produced vegetable oil increases, many oil palm plantations have committed themselves to the principles and criteria of the Roundtable of Sustainable Palm Oil, which means that members must introduce environmentally sustainable and socially responsible production practices. The operationalisation of these principles and criteria pose a big challenge to many companies, because it involves managing High Conservation Value areas, streams and biodiversity. An essential prerequisite to effective management of conservation and biodiversity assets is access to baseline data that is consistently recorded in a systematic manner.

Effective and systematic conservation management in an oil palm plantation requires a long list of activities that cannot possibly be undertaken at the same time. (Wilson et al., 2011). Spatial allocation and priority setting is essential to maximise management of natural resources and to realise actions such as expansion of reserve networks, allocation of habitat restoration and ensuring effective monitoring and protection of conservation areas (Moilanen, 2012; Azhar, 2013). Spatial conservation prioritisation includes developing models of conservation value, data processing, spatial prioritisation analysis and interpretation of results for conservation action (Lehtomaki, 2013). In this study we try to explore the stages of spatial prioritisation in the broader oil palm plantation landscape towards improvement of the estate conservation systems and natural resource management.

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Methods

This study took place in 5010 Ha of "Conservation Areas" within United Plantations' oil palm estate concession PT Surya Sawit Sejati, Central Kalimantan (111°49'8.1"E, 2°33'57.7"S). Most of the conservation area consist of secondary forest remnant along major rivers.

Data collection took place from January 2012 to July 2014 with three primary objectives: species recording, threat identification and law enforcement. The data collection was undertaken by four of the company's full-time rangers that operate from two patrol stations. GPS tracks and point data were recorded systematically and uploaded into the Spatial Monitoring and Reporting Tools (SMART) database each month. Camera trapping was conducted in December 2012 and December 2013 and the results uploaded into the SMART system.

Data pre – processing was undertaken for all layers used for spatial analysis, including extracting data from SMART, editing, validating and converting to suitable formats. For the spatial prioritisation analysis we used weighted overlay analysis to set five priority themes; threats record, species record, road distance, river distance and settlement area (Fig. 1). Threat and species record was analysed using density as a measure of the value of a particular conservation area. Buffer analysis for roads, main rivers and settlement areas were conducted with a four kilometre buffer setting. The ranked of the highest priority was based on the usage and importance. A weighted overlay model was used to determine a priority area and a knowledge based weight assignment was carried out for each thematic layer and integrated and analysed using ESRI's ArcGIS Desktop™ 10. Since the model only accepts

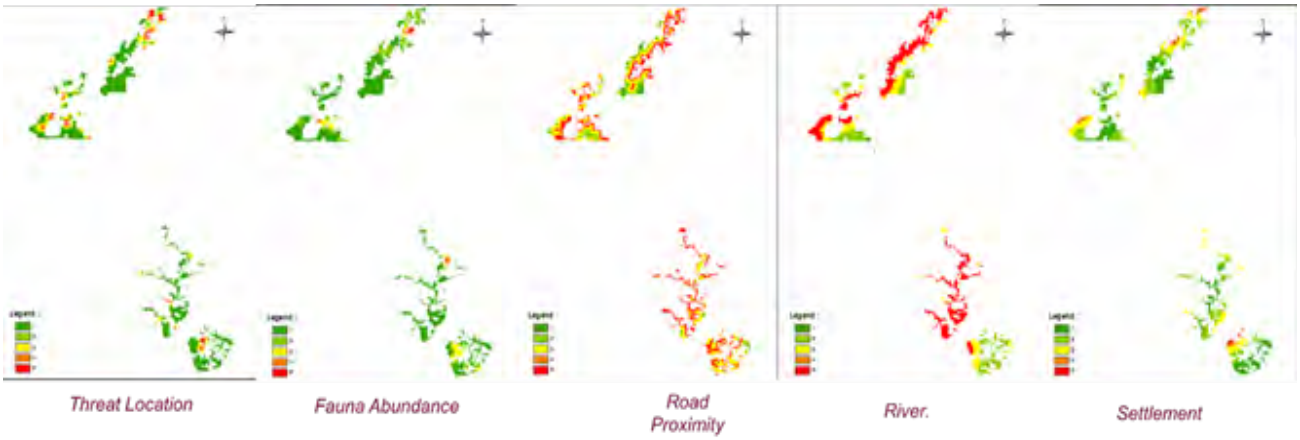

Figure 1. For the weighted overlay analysis five priority themes were identified; threats record, species record, road distance, river distance and settlement area. The highest ranking value suggests that managers should afford it the highest priority.

the integer raster as input, the continuous rasters were reclassified as integers (Selvalakshmi et al., 2013). For the interpretation of the weighted modelling priorities we categorised conservation areas as Least Concern, Critical, and Very Critical.

Results and discussion

The results of priority setting for conservation area are shown in the figure 2. This illustrates the results of the overlays of each priority theme. The "Very Critical" areas measures 1485ha or 24.3% of the total conservation areas, and their status is typical due to a high level of human disturbance, ether due to infrastructure development or land disputes.

The weighted overlay analysis is a useful tool for identifying "best" areas for conservation, degree protection needed (e.g. security post guard, intensive patrol), and targeting area for habitat maintenance or restoration. Whereas the areas of "Least Concern" remain important areas and regular patrols needed, this study suggests that there are "Very Critical" and "Critical" areas where more regular and effective patrolling may be needed. To advance the system further the analysis must be undertaken using actual overlay values and not only weighted values.

Spatial analyses and priority setting offers the potential to improve efficiency of conservation activities. Oil palm plantations with large conservation areas can benefit from a similar approach to create a dynamic and interactive method for identifying changes in the "priority zones". Various threats, such as drought, human settlement and access to respective conservation areas fluctuate and require adjustments to the management intervention too.

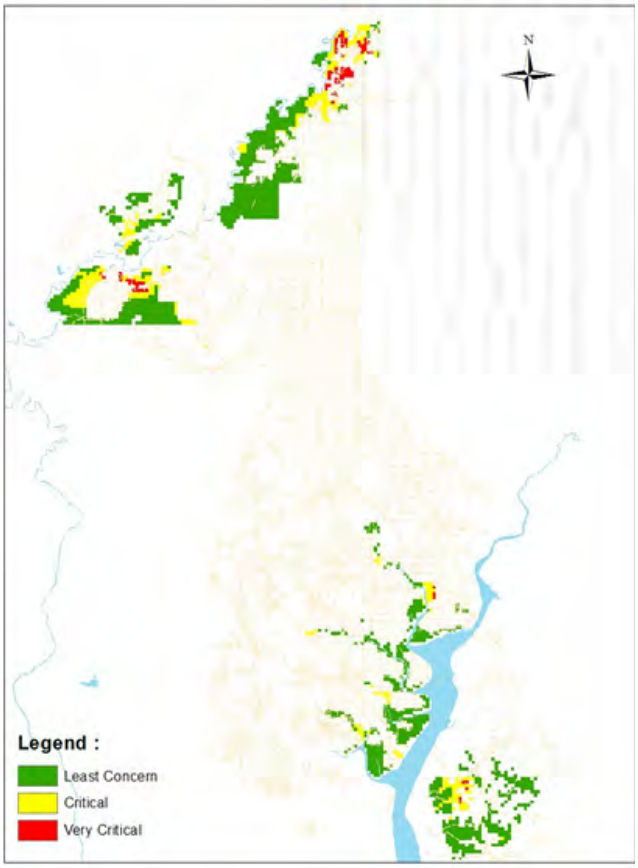

Figure 2. Prioritize map of the "conservation managed area".

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