

## **Land Use Change Around Protected Areas in LCLUC Sites: Synthesis of Rates, Consequences for Biodiversity, and Monitoring Strategies**

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### **Project Summary**

The global network of nature reserves is considered a cornerstone of efforts to maintain biodiversity. The number of species that can be supported in a reserve is a function of its size and the types of habitats represented. The functional size of most reserves includes the protected area plus a surrounding buffer of semi-natural habitats. Recent studies of land use change suggest that the functional size of many nature reserves is shrinking due to land use intensification in the surrounding buffers. Although not focusing specifically on nature reserves, the initial NASA Land Cover Land Use Change (LCLUC) case studies found high rates of land use change in many regions of the world. During the period of Landsat satellite imagery (since 1973), case studies quantified regional human population expansions of up to 600% and destruction of up to 40 % of natural habitats.

The proposed study will take advantage of the unique data generated by the LCLUC case studies to synthesize rates of land cover change around nature reserves in several biomes of the world. We will also evaluate the use of coarse-resolution MODIS data to provide a basis for future monitoring. Specific objectives are:

- 1. Synthesize results from case studies to quantify rates of change in land cover and use in and around nature reserves in a range of biomes.**
- 2. Determine the consequences of this change for biodiversity (species richness, key habitats, threatened species).**
- 3. Test the feasibility of monitoring future change using coarse-resolution MODIS data.**

The case study sites include: Greater Yellowstone, USA; Southern Yucatán Region of Mexico; Santarém Region, Brazil; Mecuburi Forest Reserve, Mozambique; and the Nang Rong District, Thailand.

The study team will include the P.I.s, collaborators from each site, and research assistants. The collaborators will compile current data on land cover and ancillary layers following a specified protocol. The study team will convene in a workshop to analyze, interpret, and synthesize rates of change in land cover and use in and around nature reserves in the case study sites for the 1970's to 1990's. Consequences for biodiversity will be quantified in three ways. First, the species area relationship will be used as a basis for predicting changes in numbers of species based on changes in area of natural habitats. These predictions will be validated against lists of extinct or threatened species for each site. Second, the spatial attributes of key natural habitats will be quantified for each time period and change among time periods will be analyzed. Third, change in the abundance of several individual threatened species will be modeled based on change in natural habitats.

This study will be significant in: synthesizing the results from five of the NASA LCLUC sites; quantifying for several regions of the world rates of land use intensification and consequences for biodiversity; evaluating the use of coarse-scale MODIS data to extend land cover studies based on finer-scale Landsat data; and helping to alert policy-makers of threats to nature reserves and opportunities for more sustainable management approaches.