LAND-COVER AND LAND-USE CHANGE (LCLUC) IN THE SOUTHERN YUCATÁN PENINSULAR REGION (SYPR)

REFINING MODELS & PROJECTIONS OF DEFORESTATION WITH APPLICATION TO THE CARBON CYCLE, BIOTIC DIVERSITY & REGENERATION CAPACITY, SUSTAINABILITY AND VULNERABILITY

LCLUC Abstract

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For the past three years the LCLUC-SYPR project has undertaken an ambitious, integrated land-change study focused on one of the last tropical forest frontiers remaining in Mexico and currently registered by international organizations as a hotspot of deforestation. The project seeks to develop spatially explicit land-change models whose empirical findings inform an agent-based, dynamic spatial simulation (ADSS) model to be used in planning for the juxtaposed, regional demands for increasing subsistence and market cultivation leading to deforestation and governmental goals to preserve forest for the Calakmul Biosphere Reserve, El Mundo Maya (archaeo-eco-tourism plan), and a major biological corridor linking the north and south of the peninsula. Starting virtually from ground zero, this project undertook: [1] ecological studies to determine the types of forest present and the dynamics of their recovery after different land uses; [2] socioeconomic studies to determine the types of land uses and users and the character of decision making in the region; and [3] remote sensing studies to track the land changes in terms of fine-tuned critical land-covers signifying different human-environment conditions and histories of those conditions. Exploratory discrete choice models were developed, focused on explaining change at the TM pixel level, and the development of an ADSS begun.

The project stands poised to make significant advances in both kinds of models and their application to various themes in the new NASA NRA. The proposed project adds a modest amount of socioeconomic data-gathering and imagery analysis (TM ETM) to move the trial discrete choice model towards maturation and the ADSS model towards application. With the combined extant and proposed data array and the spatially explicit, integrated land models, the proposed project seeks to determine the carbon stocks of the region and their change, the vulnerability of various vegetation complexes to loss of biodiversity, and to apply the ADSS model in real-world planning exercises throughout the region. To accomplish these tasks requires added fieldwork on carbon and imagery analysis to deal with problems of illumination, separation of upland from wetland forests and both from successional growth (MODIS), as well as methods using AVHRR that promise to uncover potentially "missed" causes of deforestation. Coupling the extant and new data and findings will permit [1] refined estimates of the magnitude, location and rates of deforestation-forestation in the region, [2] fine-tuned estimates of carbon (sink-source) and the costs of carbon sequestration, and [3] determination of the loss biota (ECOSUR unit of the project) and model projections of locations most vulnerable to further losses. Finally, the completed ADSS model will be validated in the field and used by ECOSUR in their work on local-regional level land planning aimed at maintaining livelihoods while protecting forests and biological corridors.