# PROGRESS REPORT

## Title of the Grant

Agricultural Colonization in the Ecuadorian Amazon: Population, Biophysical, and Geographical Factors Affecting Land Use/Land Cover Change and Landscape Structure

## Type of Report

Progress Report – Year 1 of Grant

## Principal Investigators

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## Period Covered by the Report

June 15, 1999 – October 15, 1999

## Name and Address of Recipient's Institutions

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# Agricultural Colonization in the Ecuadorian Amazon: Population, Biophysical, and Geographical Factors Affecting Land Use/Land Cover Change and Landscape Structure

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## Introduction

During the period of June 15 through October 15, 1999, the social surveys were completed for the male head of household and spouse for the 480 farms or fincas initially surveyed in 1990. The 1990 sample was a probability sample of settler plots and households representative of the entire principal colonization area of the Ecuadorian Amazon. The final 1990 sample comprised 6 percent of all plots in the main lowland settlement areas of Napo and Sucumbios provinces. The 1999 survey, began in February and was completed in August 1999, surveyed the exact set of fincas assessed in 1990. But because of sub-divisions associated with the sale of property or informal and formal kinship ties, the number of fincas surveyed in 1999 increased considerably. The protocols developed for the 1999 survey called for the survey team to also survey all of the new land tenants, because the survey is a land-based approach to examine demographic characteristics of the population using all or parts of the 480 fincas sampled in 1990. In 1990, deforestation was associated with the geographic accessibility of sectors and fincas to roads of varying types. Now, with fincas being sub-divided, areas further removed from the roads are being cleared to support another family or two, and smaller parcels are being cleared at a more accelerated rate associated with agriculture.

Below describes a number of project accomplishments during the period in question. Project accomplishments are organized by administration, social survey, database development for the entire study area, database development for intensive study areas, analysis, and development of meta-data protocols for the assembled spatial and non-spatial information.

## Project Accomplishments

### Project Administration

- Coordination of Ecuadorian collaborators and affiliates: budgets and project participation for Ecociencia, CEPAR, PROFORS, and Aeromapa
- Examine preliminary social survey data automated at CEPAR for subsequent use in GIS and statistical models

- Develop and test procedures (including codebooks) for linking 1999 household survey data to 1990 and to 1999 satellite imagery, GIS, and GPS observations

**Social Survey**

- Social survey completed in the Oriente of Ecuador
- All survey-collected GPS data sent to CPC from Ecuador
- GPS field sheet info in Excel format sent to CPC from Ecuador
- All sketch maps returned from Ecuador
- All GPS field sheets returned from Ecuador
- Survey team field notebooks returned from Ecuador
- Survey team LULC photos returned from Ecuador

**Data Development – Entire Study Area**

- Digitizing of roads completed for entire study area
- Digitizing of hydrography completed for entire study area
- All survey-collected GPS data converted to ArcView shapefiles and linked with database containing point attribute information
- Protocols established for location and correction of existing sector coverages using survey GPS points
- 1999 Landsat TM data ordered for Path 9 Row 60 and Path 9 Row 61
- Collected ground control GPS points by Ecuadorian collaborators to aid in the rectification of the full satellite scene for the study area
- Generation of a Landsat TM, MSS, and SPOT Pan-MX Image Time-Series and Processing for Landscape Characterization, including LULC, Plant Biomass, Roads/Water Patterns, and Patch Dynamics across the Series

**Data Development – Intensive Study Areas (ISA)**

- 1986, 1989 and 1996 Landsat TM scenes rectified for North ISA
- 1986 and 1996 Landsat TM scenes rectified for South ISA
- Road, hydrography, and contour layers digitized for North and South ISAs
- DEM, aspect, slope, and topographic moisture index created for North and South ISAs
- ARCINFO vector coverages created for 5 of 7 sectors in North ISA
- ARCINFO vector coverages created for all sectors in South ISA
- Decision made to create one or two more ISAs, with focus on areas of lesser colonization so that natural vegetation assumes more the landscape composition
- Implementation of Intensive Study Areas positioned strategically throughout the Oriente to test LULC Characterization and Image Change-Detection Protocols

## Analysis

- Preliminary classifications on North ISA imagery begun in Geography (supervised, unsupervised, and hybrid approaches)
- Map created showing land use intensification for South ISA; includes subdivision increase from 1990 to 1999, and presence of solares, or small lots (Figure 1)
- Continued testing of rules and procedures for the use of CA (Cellular Automata) procedures for LULC modeling and the generation of LULC simulations
- Completion of project related Master's Thesis (1999), "Colonization, Comunas, and Reserves: The Ecology of Landu Use and Land Cover Change in Indigenous Communities of Northeastern Ecuador," Gabriela Valdivia (Department of Geography, University of North Carolina), Stephen J. Walsh, research supervisor
- Five abstracts and conference proceedings have been submitted for the presentation of elements of the NASA-Ecuador research (manuscripts "in press") to the Applied Geography Conference, Charlotte, NC, October 1999 – presenters include Stephen J. Walsh, Joseph P. Messina, Gabriela Valdivia, Kelley A. Crews-Meyer , Brian Frizzelle and Stephen McGregor
- Six abstracts have been submitted for the presentation of elements of the NASA-Ecuador research to the LASA, Miami, FL, March 2000 – presenters include Stephen J. Walsh, Richard E. Bilsborrow, Gabriela Valdivia, Joseph P. Messina, Kelley A. Crews-Meyer, William Pan, Gregory Taff, Brian Frizzelle, Stephen J. McGregor, and Laura Murphy
- Four abstracts have been submitted for the presentation of elements of the NASA-Ecuador research to the Association of American Geographers, Pittsburgh, PA, March, 2000 – presenters include Richard E. Bilsborrow, Gregory Taff, Philip McDaniel, Laura Murphy, Brian Frizzelle and Stephen J. McGregor

## Metadata

- Preliminary metadata protocols established
- One copy of SMMS 3.0 metadata creation software ordered