



Central African Regional Program
for the Environment

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Proposal Title: *Using High-Definition Satellite
Imagery to Assess the Loss of Ecotone
Habitats in the Congo Basin*

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Abstract

Research conducted in Central Africa and Australia has found that transitional habitats (or ecotones) between rainforest and savanna or dry forest play an important role in divergence and likely speciation. Because these areas have previously been assumed to be less important than core forest areas or those associated with ice age refugia in generating biodiversity, their importance in conservation planning has been discounted. In the current proposal, we seek to assess the degree of ecotone loss in the absence of protection. This will be done by analyzing time-series satellite images in collaboration with scientists at JPL/NASA. The study will provide important empirical data on the loss of ecotone habitats and will provide a critical first step in formulating possible conservation measures for these regions.

It is proposed to use satellite imagery to measure rate of loss and degradation of ecotone habitats surrounding the Guinea-Congo rainforest block using radar image data collected since 1992, and optical data gathered since the 1970's (Landsat TM). Initially, we will focus our efforts on a small region of savanna with gallery forest in Cameroon and CAR (500 km²). Depending on the results of this initial survey, we will widen the geographic scope in a second larger phase to examine the entire ecotone region surrounding the Congo rainforest block.

The method that will be used is as followed:

Remote sensing approach -- We will focus our efforts on ecotone areas in Cameroon and CAR. Using available remote sensing data (including, Landsat TM, Radar, and Topography) we will derive the best vegetation and land cover classification for the study areas, that maximizes the use of available historical data.

In this study we will use the JERS-1 single channel radar images acquired during the 1996 GRFM (Global Rain Forest Mapping) project to produce a preliminary classification of gallery forests in Cameroon and CAR, and a base map of test sites for field verification. SAR data over Central and West Africa, from the Eastern coast of Kenya to Liberia and Guinea in the West were acquired in January-March 1996. The area covered lies between 9.5 deg. north and 9.5 deg. South, extends approximately 6000 km along the Equator and amounts to about 2200 scenes. The Congo River Basin - some 1500 scenes - was covered again during the general high water season of the river (October-November 1996). The image files received by the satellite are processed in 12.5 meter pixel spacing. By using several training sites based on existing maps and field data, the gallery forests will be classified to land cover types with the intention of separating degraded galleries and regenerating vegetation from intact gallery rainforest. The dominance of few species (such as *Musanga cecropioides*) in young regenerating galleries, and the disturbance of the understory and the presence of gaps in galleries utilized as plantations, can be detected by radar backscatter and texture measurements. Preliminary results suggest that the resolution, coverage, and sensitivity of JERS-1 radar data are suitable for land cover types investigated in this study. The classification methodology is robust and can be modified to include vegetation types in our study area.

Field verification of remote sensing data -- Through vegetation analysis at various research sites in Cameroon, we will classify gallery forest and other mosaic forest vegetation that comprise the ecotone with respect to degradation. We will concentrate our efforts in North-Central Cameroon where there are many gallery forests and satellite image coverage is considerable. We will supply the JPL's remote sensing project with geographical coordinates of each site and classify the vegetation using transect methodology. In addition to vegetation analysis, existing maps of the areas will be examined and features such as topography, soil type, and geology will be compared to the radar images in an added effort to confirm evident patterns. This process of ground-truthing will be a vital component in verification of information gathered by NASA's remote sensing techniques. Once this region is characterized we will make preliminary extrapolations to other regions around the Congo basin.