

# Chapter 58

## Mapping the Distribution of Tsetse Flies in Eastern Uganda: A Geoinformatics Approach

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### ABSTRACT

*This study demonstrates the ability of GIS and Remote Sensing in capturing spatial-temporal data on land use and land cover classes. The nine land cover classes captured were Built-up area, Secondary forests, Savannah, Grasslands, and Shrublands containing herbaceous, Rain-fed shrub crops, Fresh water swamps, Water bodies, and Farmlands. The remote sensed imageries also displayed how the land use and land cover classes changed between 1986 and 2001, while helping to identify the suitability of the land cover classes for tsetse fly habitation. In this paper, the authors demonstrate that GIS and remote sensing coupled with statistical analyses could help immensely in mapping tsetse habitats. Results show that the tsetse fly habitat area in Eastern Uganda has been decreasing with time due to the increase in the Savannah and grassland land cover types and urbanization.*

### 1. INTRODUCTION

Eastern Uganda is one of regions in Africa that have the highest cases of sleeping sickness recorded. The continued spread and shifting of the sleeping sickness distribution within Uganda and the potential for sub-species overlap highlight the need

for increased understanding of disease dynamics and factors driving transmission. The continued spread and shifting of the sleeping sickness distribution within Uganda and the potential for sub-species overlap highlight the need for increased understanding of disease dynamics and factors driving transmission. Previous studies focused on infection of the disease using parametric and

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non-parametric technique for their analysis. The prominent among these are the studies by Ford (1969), Buyst (1977), Welde (1989), Khonde (1995), and Leak (1999). Recently, evidence of disease spread to districts considered to be previously uninfected (Fèvre, 2001) has highlighted the need for increased understanding and implementation of disease prevention and control. This study aims, therefore, at using remote sensing and GIS techniques to examine and map the spatio-temporal landcover dynamics and their relationship with tsetse fly occurrence in Uganda between 1986 and 2001. Satellite products were used for the land cover analysis with the aim of assessing the influence of land cover types on the distribution of tsetse flies. To achieve the above aim the study was divided into three phases: (1) satellite data of 1986 and 2001 were used to provide information on land cover types and thereby identification of the tsetse habitat; (2) the spatial distribution of a vector-borne disease were related to the habitat of the tsetse flies as the vectors; and (3) data on land cover types, habitat and human population were analysis to provide information on the spatial distribution of sleeping sickness and Nagana in livestock (Curran et al., 2000).

## 2. STUDY AREA

Uganda is in latitudes  $4^{\circ}.0'$  North and  $1^{\circ}.30'$  South of the equator, and longitudes  $30^{\circ}.0'$  East and  $35^{\circ}.0'$  East of Greenwich (Figure 1). The greater part of Uganda consists of plateaus which are about 800 to 2,000 m (2,600–6,600 ft) in height. Along the western border, is the Rwenzori Mountains, Margherita Peak reaches a height of 5,109 m (16,762 ft), while on the eastern frontier Mount Elgon rises to 4,321 m (14,178 ft). By contrast, the Western Rift Valley, which runs from north to south through the western half of the country, is below 910 m (3,000 ft). For example, the surface of Lake Edward, Lake George and Lake Albert (L. Mobutu Sese Seko) is about 621 m (2,036 ft). The

White Nile has its source in Lake Victoria and as the Victoria Nile, it runs northward through Lake Kyoga and then westward to Lake Albert, from which it emerges as the Albert Nile to resume its northward course to the Sudan. (Advameg, 2007), Uganda has a typically tropical climate with little variation in temperature throughout the year. Distinctive wet and dry seasons characterize the climate of most of the country, except in the semi-arid north east. The country's natural environment provided good grazing for cattle, sheep, and goats, with indigenous breeds dominating most livestock. Smallholder farmers owned about 95 percent of all cattle, although several hundred modern commercial ranches were established during the 1960s and early 1970s in areas that had been cleared of tsetse-fly infestation.

## 3. MATERIALS AND METHODS

Raw data on livestock populations in Uganda was obtained from the statistical abstracts and background to the Budget (several years), Ministry of Finance, Planning and Economic Development; Small Ruminant Development Study Report, Ministry of Agriculture, Animal Industry and Fisheries in Uganda. The data cover the periods

*Figure 1. Map of Uganda showing eastern Uganda*



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