GIS and Remote Sensing for Wildlife Monitoring and Management in Eastern Africa

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The Serengeti (Tanzania) and Mara (Kenya) ecosystems in Eastern Africa are among the most spectacular world heritages endowed with rich and diverse fauna and flora. The presence of hundreds of thousands of the migrating wildebeest (Connochaetes taurinus) makes the area a great concern for conservationists and at the same time, a major tourist attraction. The herds traverse territorial and climatic boundaries, various landscapes and biomes, and attract other herbivore and carnivore species as they migrate. The routes taken by the herds change every year depending on, among others, seasonal and climatic conditions. Foraging and movement of these large numbers of herbivores influence the structure and functions of ecosystems: they alter the dynamics of plant communities, modifying the distribution and the turnover of nutrients. The movements also affect the habitats and related disturbance regimes, e.g. frequency and intensity of fires. They also affect other communities sharing the same habitat (nomad people, their herds) often resulting in fierce human-wildlife conflicts. An integrated monitoring of these movements is of vital importance, not only for the wildlife managers in the region, but also for governments or any other decision maker concerned with this unique phenomenon at various space and time scales.

Three objectives are set for this work: (i) to determine those factors that influence the migration, and how they relatively influence the routes during different phases of the migration cycle, with special attention to food availability (green vegetation as indicated by the NDVI), landscapes and relief heterogeneity (slope and altitude), and water availability (rivers, streams, ponds and water points); (ii) to analyze the influence (direct and indirect) of climate on the migration routes and patterns, and (iii) to predict and simulate migration routes in different climatic conditions. Using GIS and remote sensing techniques, together with various ancillary digital and cartographic data, indices are developed and modeled, and then used, separately or in combination, as measurable indicators for quantitative analysis and migration route simulation. Finally, simulated results are compared to the routes determined by radio tracking techniques in order to evaluate the robustness of this new analytical methodology.