

APPLICATION OF GIS IN TRACKING ENVIRONMENTAL DEGRADATION IN SOUTHERN VIHIGA HILLS: IMPLICATIONS FOR ENVIRONMENTAL CONSERVATION IN KENYA

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BACKGROUND TO THE STUDY

Southern Vihiga Hills present a case of a complicated history of land degradation in Kenya that has over the years defied all efforts to address. As early as 1930, the Colonial Government made efforts to arrest the situation through legislative measures that would compel residents in the region to conserve the environment. As a strategy to combat environmental degradation in the area, the Colonial Government established Maragoli Hills forest through a legal notice number 266 of the Kenya gazette supplement number 28 of 1957. Other initiatives by Colonial government to conserve environment in South Vihiga hills by planting a forest covering Maragoli Hills and extending to Bunyore Hills between 1957 and 1964 were resisted by residents who uprooted most of the trees (Mwangi, 2003). In 1964, the Colonial Government declared 1318.8 acres of Maragoli Hills Central Government Forest through the Legal Notice number 174, resistance by local communities notwithstanding. Because the local communities had not accepted the establishment of the forest, they continued to destroy the forest and sabotaged any government reforestation efforts. The last sections of the forest was cleared in 1996 (Nekesa, 2003). Further efforts to rehabilitate the forest by Vihiga County Government have also been frustrated by members of the community who uproot the planted seedlings (Ochanda, 2014).

STATEMENT OF THE PROBLEM

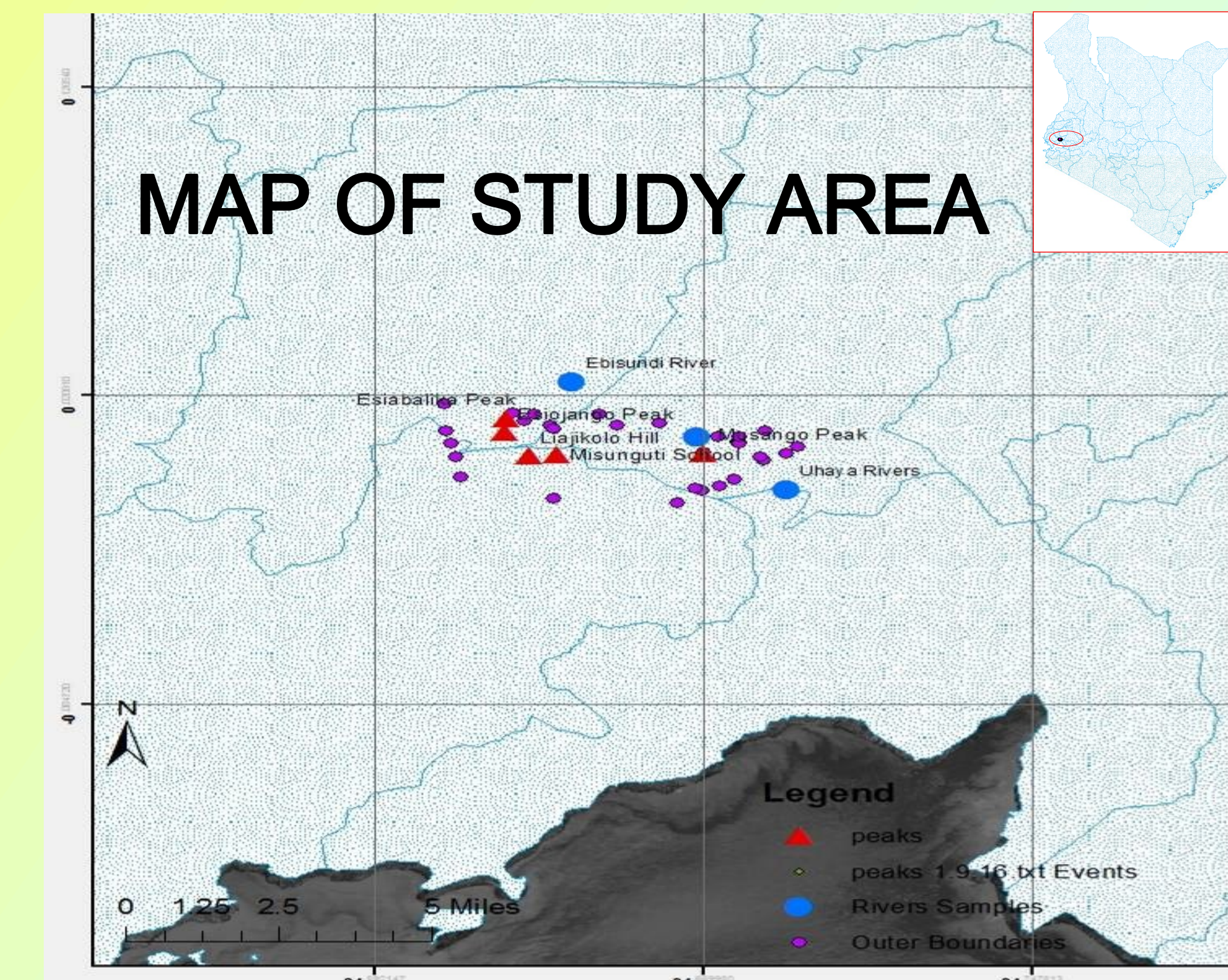
While environmental degradation in the five major water towers in Kenya is well documented and efforts to rehabilitate them put in place, scientific studies on forest loss and environmental degradation in hilly areas of southern Vihiga County are scanty.

RESEARCH OBJECTIVES

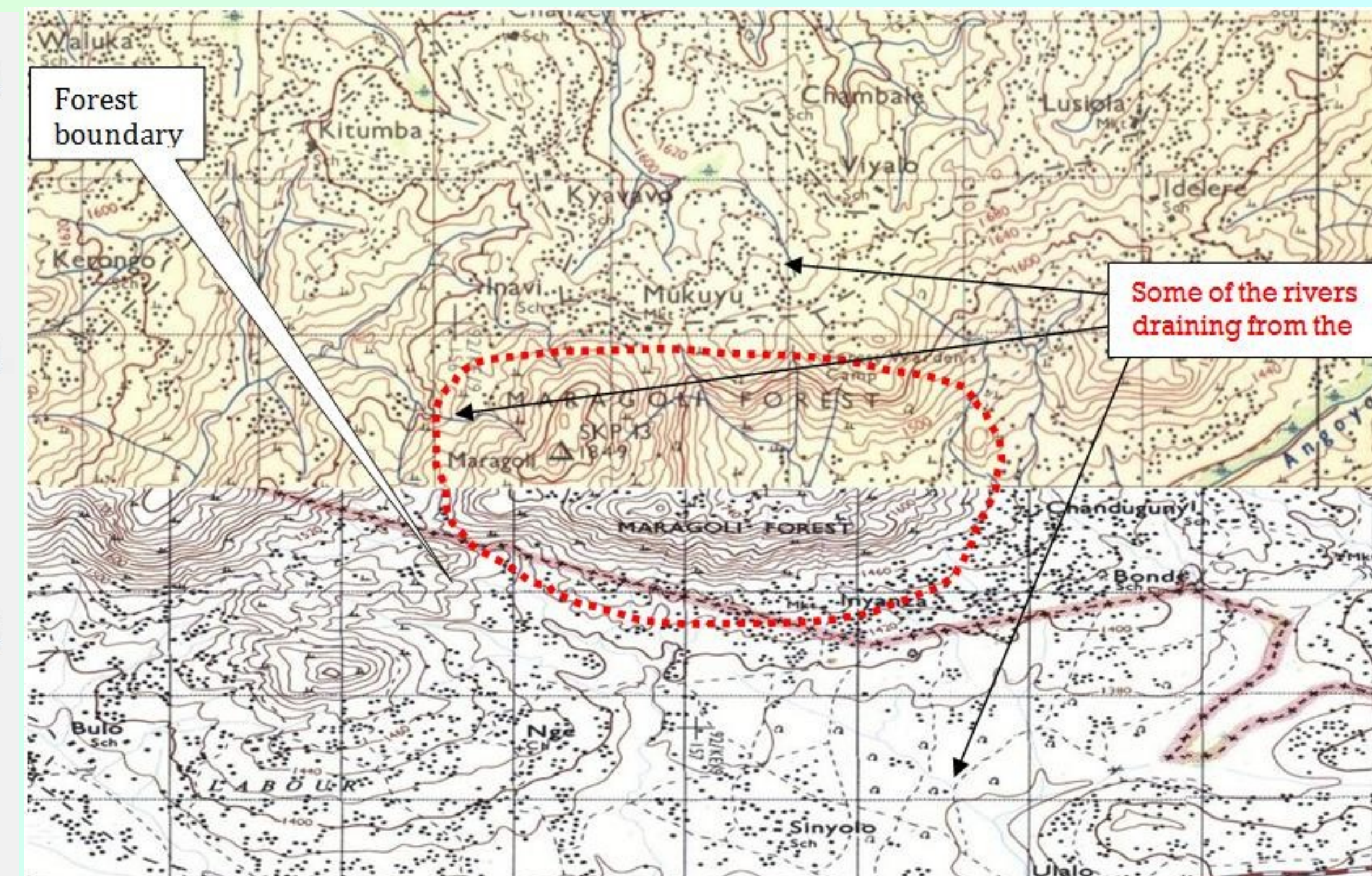
The objectives of the study were to:

1. To determine the extent of environmental degradation in southern Vihiga Hills using GIS technology; and
2. To analyze water quality of streams originating from southern Vihiga hills.

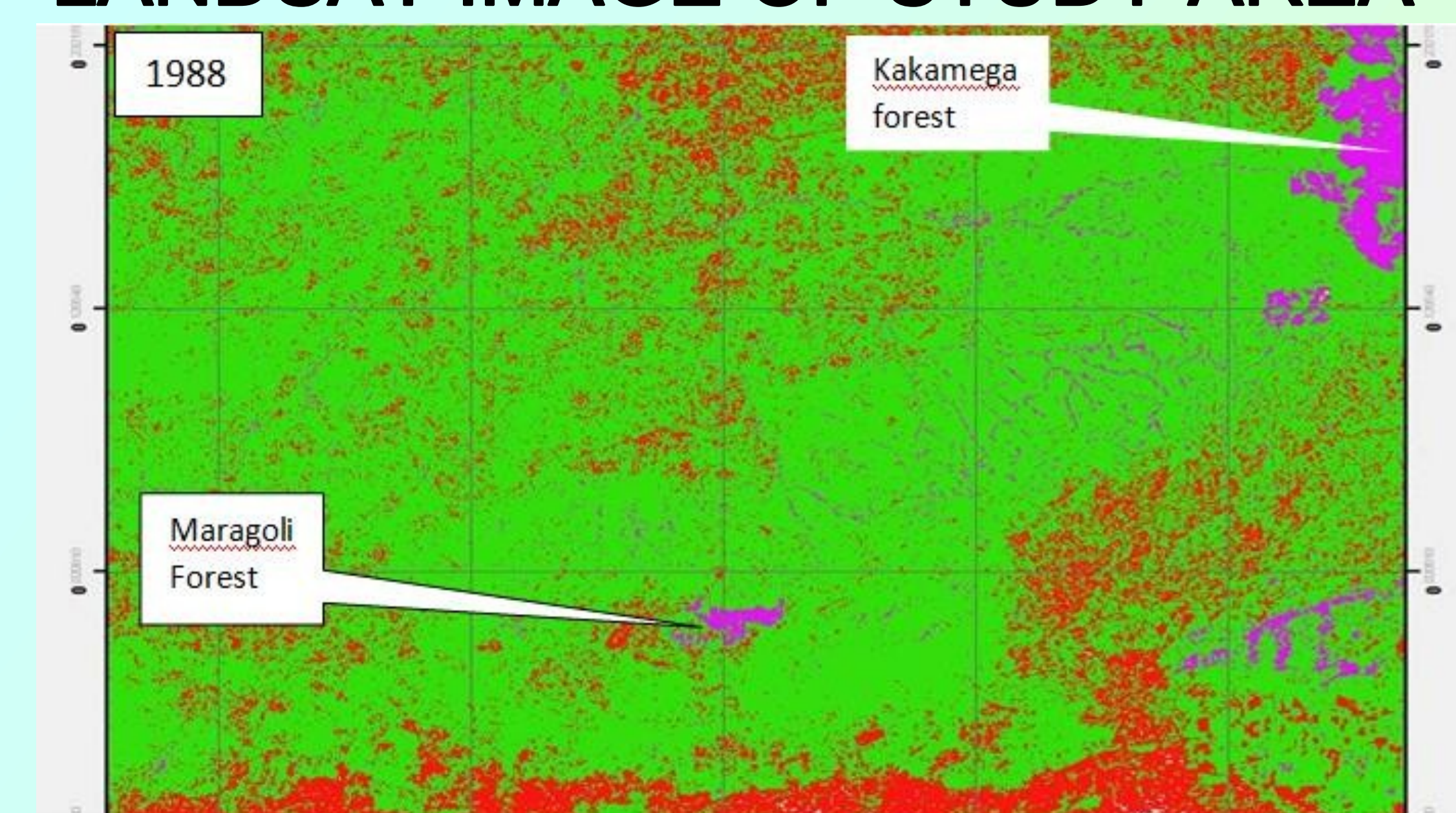
STUDY MATERIALS & METHODS



TOPO MAP OF STUDY AREA



LANDSAT IMAGE OF STUDY AREA



Data collection

- GPS surveys;
- Photography;
- Satellite imagery;
- Interviews
- Water sampling

Data analysis

- GIS analysis
- Analysis of change and areas
- Physicochemical and biological analysis of water quality

RESULTS AND DISCUSSIONS : (i) EXTENT OF ENVIRONMENTAL DEGRADATION

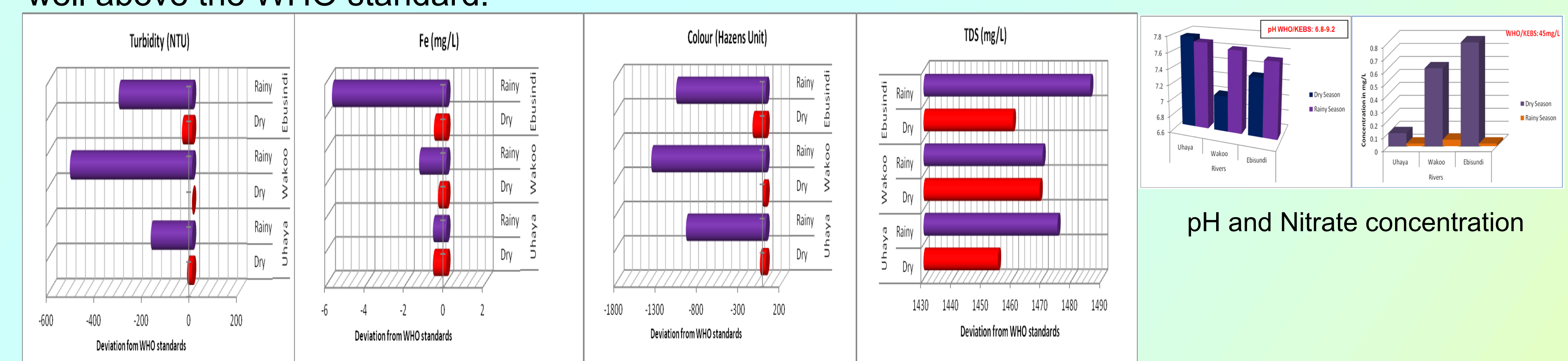
Year	Change in catchment area calculated from satellite imagery Area (sq.km)	Change (sq.km)	Percentage change
1988	4.822798	0	0
1990	4.49114	-0.33166	6.9
1995	3.915938	-0.90686	18.8
2011	0	-4.8228	100
2015	0	-4.8228	100
Total Loss area		(6.06132)	100

Validation field survey confirmed complete destruction of Maragoli forest and increased soil erosion



(ii) WATER QUALITY

Water samples for physicochemical and biological analysis was collected from Ebisundi and Wakoo streams which are important tributaries to the major rivers that join River Yala, and Uhaya stream which join river Muguruk which drains into Lake Victoria. Results revealed significant departures from the WHO water quality standards as indicated in figures here forth. Particularly, there was very high population of *Coliform* bacteria and *E.Coli* in the water in all the three streams sampled in both dry and wet seasons. Iron toxicity was found to be very high in the three streams sampled. Ebisundi had the highest concentration in both rainy season (5.9mg/L) and in the dry season (0.7mg/L) well above the WHO standard.

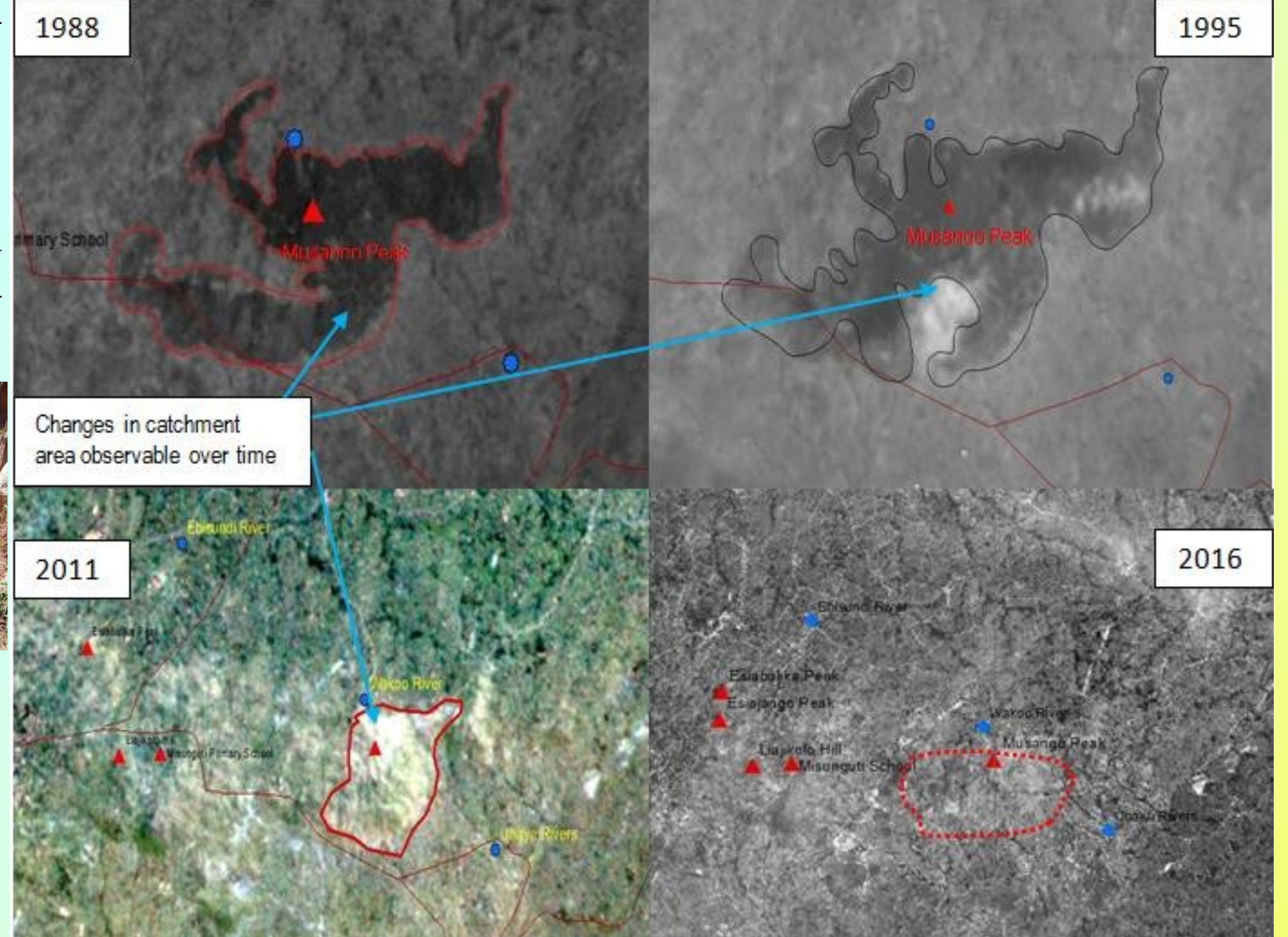


CONCLUSIONS

The study had 2 key conclusions:

1. Ground surveys revealed total loss of forest cover on Maragoli forest, with huge bare surfaces, and gulleys. These were the results of high environmental degradation taking place in Southern Vihiga Hills that posed the risk of hill collapse, rock falls, landslides and related disasters.
2. Water quality from streams sampled was found not fit for human consumption.

IMAGERY OF CHANGE OVER TIME



RECOMMENDATIONS

The study had 3 key recommendations:

1. The Government and other stakeholder should adopt an incentive based strategy for rehabilitation of Maragoli forest, and adopt environmental co-operative strategy for rehabilitation of the entire Southern Vihiga hills ecosystem.
2. County Government should prioritize and invest in projects of water treatment and supply in southern Vihiga to reduce direct consumption from streams and springs
3. County Governments should map all hilly areas with steep slopes, zone them off from human settlements and set them aside for forest land use.

REFERENCES

- Mwangi, D.M (2003) : I Did not reside Over Destruction of Maragoli Hills Forest in Vihiga, East African Standards: Standard: Group,Nairobi.
- Nekesa, P (2003) Maragoli Forest: The Causes of Present Conflict Between Residents and Government: East African Standard: Standard Group, Nairobi.
- Ochanda, J. (19.12.2014). Those Encroaching on Maragoli Forest to be Vacated. Retrieved on 6 September 2016 from <http://kenyanewsagency.go.ke/en/those-encroaching-on-maragoli-forest-to-be-vacated/>