The impact of land use on water quality in River Njoro watershed, Kenya
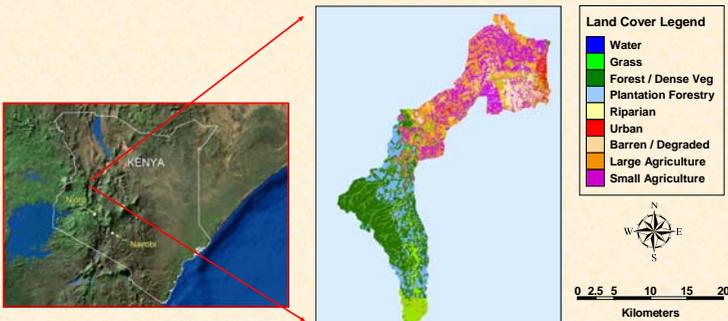
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ABSTRACT

Findings of an on-going research focusing on water quality-land use linkages in a rapidly changing rural watershed in Kenya are presented. Results show that dissolved nutrients are positively related to percentage of land cove under small scale agriculture but reduce with increasing cover under grasses and intact riparian strips.

Land Cover Legend
- Water
- Grass
- Forest / Dense Veg
- Plantation Forestry
- Riparian
- Urban
- Barren / Degraded
- Large Agriculture
- Small Agriculture

0 2.5 5 10 15 20
Kilometers

Classified Landsat Image of Study Area

Dominant land uses in the watershed: 1) Grazing, 2) cultivation 3) urbanization, 4) logging and charcoal burning and 5) forestry

INTRODUCTION

Water resources in the River Njoro watershed have been degraded due to high population growth rate and change in land use upsetting environmental stability. Between 1986 and 2003, 20% of forested areas have been converted mainly into small-scale agriculture and human settlements. These changes have impacted negatively on the on water quality of the river.

MATERIALS AND METHODS

Data recorded from ten sampling sites along River Njoro were used to examine the contribution of nutrients from subwatersheds upstream draining each of the sites. Standard Digital Elevation Model GIS analysis was used to determine the spatial distribution of land cover types and subwatershed contributing runoff to the sites in the river. Water and sediment samples were collected for chemical analysis related to upstream land use types and size of subwatersheds.

RESULTS
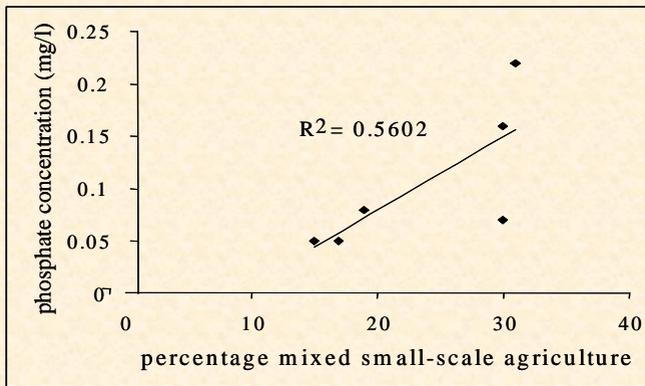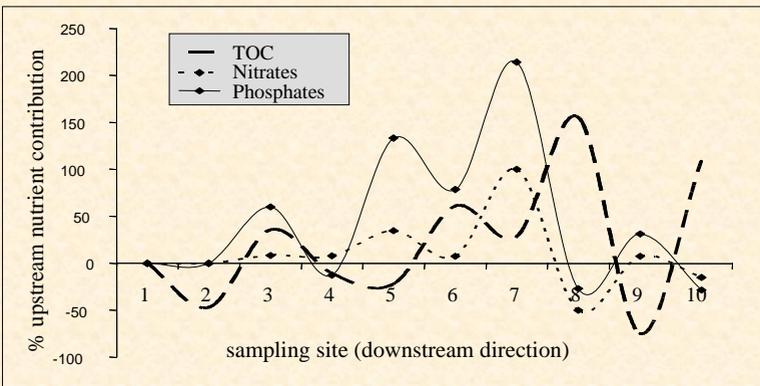
- The **mid-stream portion** of the river near Egerton University, with industrial, human settlement and agricultural land uses, accounted for the **highest cover and lowest P loss** from the subwatershed
- Nutrient levels **increased significantly** downstream indicating natural purification as the river flows through an area of large- scale farming with dense riparian vegetation.
- Small-scale farms and bare lands contribute **over 55% of the phosphorus** (P) load to the River Njoro.
- Grassland cover had a negative relationship with P loss ($R^2 = 0.42$) indicating that the **more the grass cover, the lower the P loss**

CONCLUSIONS

Quantification of land use in subwatersheds is important for characterising water quality in the River Njoro watershed. Upland land uses are as important as near-stream land uses. Intact riparian corridors along the river provide **natural purification and recovery of the water quality** of River Njoro. Grassland cover *reduces the P loss from the watershed*. The riparian buffer strips retain nutrients from farms, thereby significantly **reducing the contribution of nutrients** from the arable land to the river.