

Land use change and nutrient dynamics impact on water quality, focusing on supporting sustainable Nile tilapia aquaculture in Lake Victoria

Where:

East Africa, Lake Victoria

When

AY 25-26 to AY 29-30

Mentor

Stu Hamilton, ECU

Qubin Qin, ECU

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Project Overview

This project models the effects of land use change and nutrient dynamics on water quality, focusing on supporting sustainable Nile tilapia aquaculture in Lake Victoria. As one of the world's largest tropical freshwater lakes, Lake Victoria provides vital food resources and economic opportunities for millions within its basin. Although historically productive, the lake's capture fisheries have declined due to factors like overfishing, invasive species, and unregulated fishing. Consequently, cage aquaculture of Nile tilapia has gained momentum as a sustainable alternative to help meet regional fish demand. However, the growth of aquaculture also depends heavily on water quality, which has been compromised by nutrient inflows resulting from land use changes across the basin. Runoff containing sediment, fertilizers, and urban pollutants has led to eutrophication and oxygen-depleted zones, jeopardizing fish health and productivity.

To understand and manage these challenges, this study will develop a model linking land use shifts, nutrient inflows, sediment transport, and lake water quality. By simulating various land use scenarios, the model will help determine how landscape changes affect key water quality indicators—such as dissolved oxygen, pH, and nutrient concentrations—crucial for sustaining Nile tilapia farming. These insights aim to inform policies on nutrient management, land use planning, and aquaculture site selection, supporting sustainable aquaculture expansion in Lake Victoria. Ultimately, this research seeks to enable decisions that protect water quality and secure the region's long-term food and economic security.

Student

We seek a graduate (with MS) student with regional expertise to help develop this project. They will have experience working in lacustrine environments, have GIS/RS skills, and have English proficiency.