

# Improvement or degradation of water quality? A field visit to forest reserves near Kampala Uganda 5-years after initial survey

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## ABSTRACT

Four forest reserves within 50 km of Kampala in Uganda act as a critical buffer to the Lake Victoria watershed and habitat for local populations. In 2013-2014 the forest reserves were monitored monthly for physical and chemical parameters (pH, dissolved oxygen, biological oxygen on demand, nitrates, phosphates, fecal coliform, and temperature turbidity) that were used to determine a Water Quality Index value. During the time of sampling, the WQI at all four reserves ranked between poor and medium. This follow-up study occurring nearly five-years later revisited each of the sampling locations and monitored for the same parameters. It was found that the WQI for each of the forest reserves was within +/- 5% of the averages reported in 2013-2014. Notably, in areas where cattle were moved away from water sources per our recommendations (namely, Kitubulu Forest) the levels of *Escherichia coli* contamination improved significantly from 220 colonies/100 ml to 100 colonies/100 ml. Additionally, despite problems with forest encroachment at Zika Forest, the water quality maintained similar quality as measured in 2013-2014. Although Mabira Forest remains guarded by environmental activists groups (namely Friends of Mabira) the threat from the sugarcane industry remains a pressure; water sources adjacent to crops remain degraded. No ambient changes were noted at Mpwanga Forest.



Photograph 1. Dr. Jovanelly collaborates with stakeholders of the Lake Victoria watershed to collaborate on ideas to promote conservation and sustainable harvesting of fish.

## OUTCOMES



Photograph 4. A. Dr. Jovanelly uses the water with non-profit organizer for clean water near Mabira Forest Reserve. B. The women pictured here are some of the 500 community members who use the water source daily.

After data analysis was completed in 2013/2014 the research team determined solutions and strategies that could improve habitat and water quality in the forest reserves. Those included: 1. Moving cattle away (downstream, at minimum) from areas where drinking water was collected. 2. Tapping nearby streams and building infrastructure to increase down gradient discharge and flow. This would stop water stagnation whereby leading to malaria ponds (Photo 4a). Additionally, a guaranteed water source would reduce the distance women and children would have to travel daily (Photo 4b). 3. Planting tree buffers along the edge of Lake Victoria would prevent fecal coliform runoff from animals and humans entering the lake. Secondly, it would provide a sustainable wood source for locals to use instead of harvest old growth trees.

## DISCUSSION

Five-years after the initial site assessment it appears that all of the solutions and strategies we put into place are generating positive outcomes for the rural communities. The wildlife education clubs that we worked with continue to educate youth about water quality assessments. Additionally, equipment that we left from 2013/2014 is still used monthly to collect data for each of the forest reserves. This provides a talking point for the youth groups and area stakeholders. We feel that the education and outreach component that we emphasized in 2013/2014 was a large part of the projects overall success. We will continue to monitor the watersheds as the climate continues to alter the Lake Victoria shoreline.

This research would not be possible without my colleagues at Makerere University, Ugandan Wildlife Education Center and the Ugandan Wildlife Clubs.

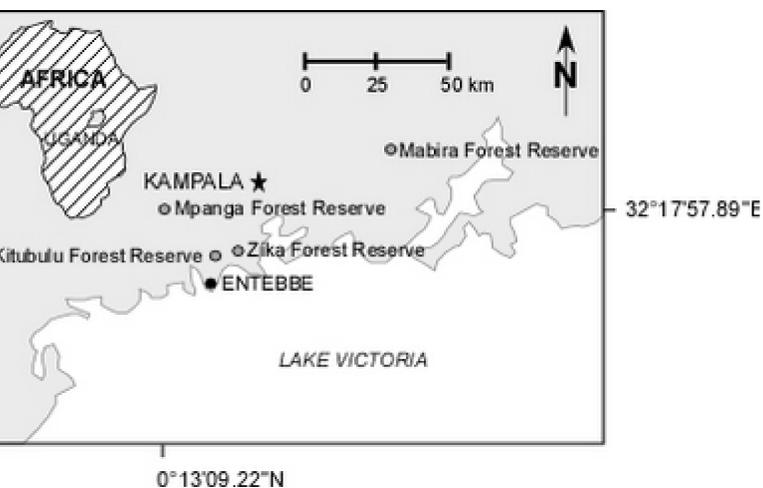
Photograph 5. Board member of the Ugandan Wildlife Education Center stands with trees planted in 2013/2014 as seedlings. These quick growing indigenous trees can be used for firewood.



Photograph 2. Sustaining bird habitat and conservation is large part of Uganda's environmental mission. Above, maribu stork search for food under changing shoreline conditions.



Photograph 3. Dr. Jovanelly introduces the field equipment for the water quality assessment at Mabira Forest. The equipment remained at the Uganda Wildlife Center for weekly sampling throughout the 2018/2019 year.



## RESULTS

In addition to challenges with farming and industry, the drastic increases to Lake Victoria water levels is impacting coastlines. Additionally, changes in wind patterns is inducing sediment erosion from areas that were once beach face. This increase in turbidity and total suspended solids is an additional cause of temperature ramping in lake water and, ultimately, the lowering of dissolved oxygen levels. It appears to be a positive feedback loop, however, further investigations will need to confirm this hypothesis.