

# Mara River Flows

## Integrated Water Resource Management

... for people and for nature

December 2009

Greetings from the Mara River Basin, where the El Niño appears to have finally arrived! The first half of the month saw a lack of rains and a slowly falling river, as you can see from the pictures and water quality data below. However, by mid-month, sporadic rains like those we saw for two weeks in November had started again, and by the end of the month, major rainfall had caused the river to rise higher than we have seen it since our work began in May 2008. This is a fortuitous beginning to a New Year, and we hope for better and wetter times to come...

### State of the River

In spite of occasional rains in both November and December, the river continued to remain at below-normal levels. December marks the 4th month the dissolved oxygen (DO) levels in the river remain below 80%, considered a general benchmark for a healthy aquatic ecosystem. Although even very low levels of DO are unlikely to kill aquatic organisms immediately, they have long-term impacts on the reproduction, feeding and habitat-seeking behavior of organisms that ultimately impact the populations of those species.



New Mara Bridge – November 14<sup>th</sup>, 2009



New Mara Bridge – December 13<sup>th</sup>, 2009

### Water quality parameters for the Mara River

<i>Date</i>	<i>Time</i>	<i>Temp</i>	<i>pH</i>	<i>DO%</i>	<i>Salinity</i>	<i>Turbidity</i>
<i>M/D/Y</i>	<i>hh:mm:ss</i>	<i>C</i>		<i>%</i>	<i>ppt</i>	<i>NTU</i>
11/14/2009	14:22:40	26.25	6.88	66.5	0.08	653
12/13/2009	10:11:48	23.59	6.21	55.6	0.21	149

An interesting observation about the data presented above: although turbidity is significantly lower in the December reading than in November, the salinity value is much higher. Salinity is essentially a measure of the total dissolved solids in the water. One would expect that salinity (dissolved solids) might increase as turbidity, a measure of suspended solids, increases. Here, we are seeing the opposite pattern. But one almost must consider the effect of flow levels—as flow levels decrease, suspended solids will settle to the bottom of the river, which will decrease turbidity. Dissolved solids, on the other hand, will become more concentrated in the water column, increasing salinity. These data patterns indicate the variable impacts of flow level on water quality in the Mara.

Although we were gone when the real rains began, we were fortunate to have colleagues in the basin keep us posted on the changing river levels. Dave Green, a [Michigan State University hyena researcher](#) in the Masai Mara, William Deed, with the [Mara Conservancy](#), and Veronica Minaya, a [UNESCO-IHE](#) graduate student, all captured photos of the dramatic effects of heavy December rainfall, so we almost felt like we were there. The picture below was taken from a posting on [William Deed's blog](#), which you can see [here](#). This is far higher than we have seen the river during the last 19 months that we have been in the basin, and we're eager to get back to the basin to take some samples and learn more about the effects of these rapidly rising water levels!



*Picture 1: Photo taken by William Deed of the Mara Conservancy on January 4th, 2010. Taken from the New Mara Bridge, facing North.*



*Picture 2: Photo taken on December 13<sup>th</sup>, 2009.*

## Research

When the first rains began in the middle of December, it looked like someone had just flushed out the river. Chunks of aquatic plants and algae floated downstream, dotting the river, and stagnant pools were flowing again. We continued to do more 24-hour sampling during these early rains, interested in the subsequent impacts on water quality and hoping to catch another large fish kill. Although we didn't witness anything that extreme, we did see some interesting changes in the river's parameters. Most notably, as flow levels increased over the 36 hours of monitoring, salinity values decreased from 0.13 to 0.05, as you can see in the graph below. This was strikingly different than the salinity levels we observed during our November monitoring, when they increased from 0.05 to 0.40 within the first few hours after the rains. We still have a lot to learn about why rain events cause such variable impacts on the river.

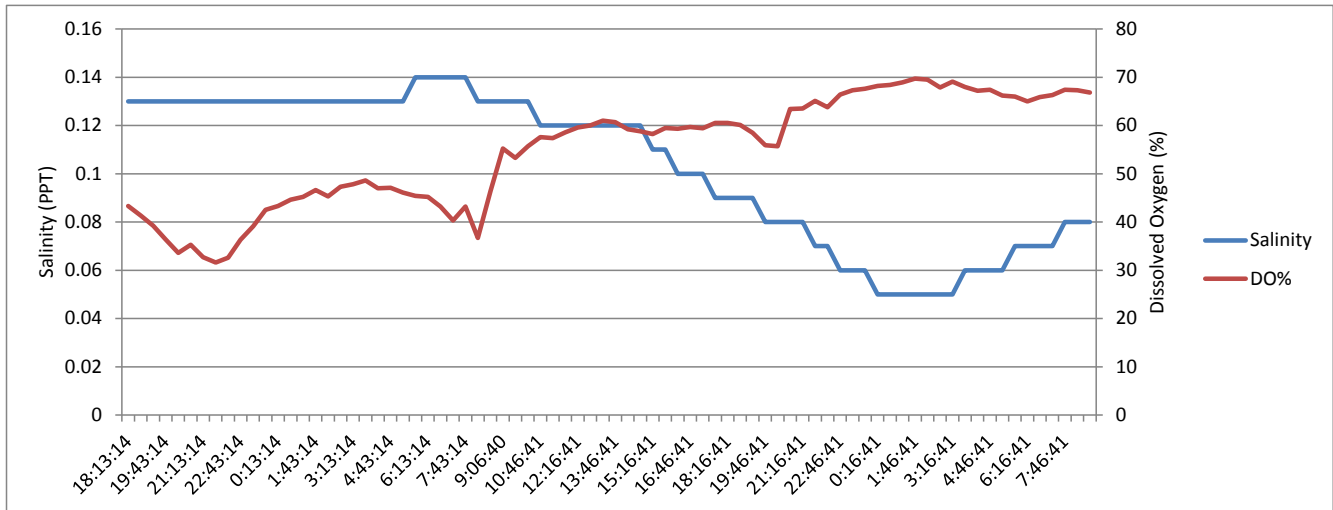


Figure 1: Graph illustrating the change in salinity (PPT) and dissolved oxygen (%) in response to rain events over 36 hours.

Crocodile nests typically hatch in late November-early December in the Mara, so we took some time this month to look for successful nesting events and hatchlings we could monitor in the coming months. Crocodiles typically nest at the same site year after year, and multiple individuals will use these sites. With the gracious assistance of Brian Heath, the Director of the [Mara Conservancy](#), we visited three of these traditional nesting sites that Brian has been observing for the past 5-6 years. Although he generally sees an average of twelve nests across the three sites, this year, we found only one nest. We also visited a site where last year we observed five active nests, but there were none there this year. Thus, out of 17 potential nesting sites, there was 1 active nest in 2009.



Picture 3: Crocodile nesting site on the bank of the Mara River.

This drop in crocodile reproduction could be due to the low wildebeest mortality we saw in the Mara during this year’s migration. Much of the wildebeest mortality typically occurs in the first month or two of the migration—June and July—as hungry crocodiles line up to feed and high waters make the crossings more challenging. These feasts are probably a major component of the Mara crocodiles’ annual diet, and they come just before the crocodiles begin nesting in September, likely playing a critical role in providing the needed energy for crocodiles to reproduce. This year, though, low water levels during the beginning of the migration made it easy for the wildebeest to cross and difficult for the crocs to hunt, resulting in very low mortality. Whether this low mortality was responsible for the subsequent decline in crocodile reproduction is difficult to know for certain, but it will be something important to monitor in the future.



Picture 4: Burnt papyrus in the Mara Swamp, Kirumi, Tanzania

This month we also visited two other [UNSECO-IHE](#) graduate students conducting their work in the Mara River Basin. Both students are originally from Tanzania, and for their research they were based in Musoma, Tanzania, near where the Mara River enters into Lake Victoria. Wande Kume is studying the environmental services that the Mara Wetland provides to communities living around it. She was interviewing the communities and asking them to describe these ecosystem services (such as fish for food, clean water for drinking, and papyrus for building) and map the locations where they are found. Victoria Mwaifunga was studying several of the Environmental Flow Assessments conducted to-date

in East Africa, on the Pangani, Wami, Ruaha and Mara Rivers, and comparing methodologies and recommendations. Both of these students' theses will make valuable contributions to ongoing conservation efforts in the Mara Basin, and it was great to meet with them and learn more about their work. This was also a wonderful opportunity to re-visit the beautiful Mara Wetland and nearby Musoma, places we always enjoy.

## Governance



Picture 5: Mr. David Kinyua (USAID/EA), Dr. Taye Teferi (WWF-ESARPO) and Mr. Sam Gichere (LVBC) signing the minutes of the workshop for the EFA and BSAP.

In December, we participated in a very exciting meeting in Kisumu with representatives from [Worldwide Fund for Nature](#) – Eastern and Southern Africa Regional Programme Office (WWF-ESARPO), [USAID/East Africa](#), and the [Lake Victoria Basin Commission \(LVBC\)](#) of the East African Community. The goal of the meeting was to finalize the Biodiversity Strategy and Action Plan and Environmental Flow Assessment reports that have been prepared for the Mara River Basin. These reports were approved by the LVBC Council of Ministers in May, 2009, and recommended for implementation. However, we wanted to work together to ensure the final documents were in perfect form before printing and distribution. It was a great meeting in which all partners provided input, and the finalized

documents were submitted for printing before the end of the year. We are eagerly awaiting their official launch in January or February, 2010. The most exciting part of this work is that USAID/EA has given the LVBC \$3 million USD over the course of three years to implement the findings of these two reports, making the Mara River Basin a model for water resources management in trans-boundary systems.

## Partners on the Ground

Last month we described the ongoing work by [World Vision–Kenya](#) under the USAID-funded Trans-boundary Water for Biodiversity and Human Health in the Mara River Basin (TWB-MRB) Project. This month we visited with another TWB-MRB partner, CARE-Tanzania, to learn about their efforts to improve the livelihoods of communities living in the Mara River Basin through increased provision of water and sanitation services. CARE-TZ has an office in Mugumu, just outside the Serengeti National Park. But despite the high dollars international tourists pay to visit this world-famous park, the rural communities around it live in poverty and are often lacking basic sanitation facilities. CARE-TZ has been working for the past two years to provide Ventilated Improved Pit (VIP) latrines in local schools, and they took us to visit one of their project sites.



*Picture 6: Latrine currently in use at the Mbalibali Primary School.*

Mbalibali Primary School was an interesting site because it actually had four latrine blocks on the school grounds built by various people and in various states of disarray. There was one block of concrete latrines built several years ago by a donor that had been blocked from use after the floor started collapsing and they became unsafe. The community had then constructed the mud latrines you can see in the picture to the left. Although still functional, this block of latrines was shared by both boys and girls, and because the walls between each unit had large holes in them, this design was very challenging for the students to maintain privacy. There was a third block of concrete latrines that was being built by another

donor when poor construction caused the entire structure to collapse, leaving a pile of wasted material. And then there was the new latrine block under construction, which you can see in the picture below.

It was really remarkable, and frustrating, to see the amount of money and effort that had gone into this school over the years without anything to show for it. It was also a valuable lesson in the importance of doing things right the first time, spending the money to hire good contractors, and conducting ongoing monitoring to ensure work is being done properly. We accompanied CARE-TZ in surveying the new construction, and we were impressed with the quality of workmanship. We were also pleased to see the attention being given to structure support and longevity, so these latrines would not follow the same fate as their predecessors. In 2010, Mbalibali will finally have two new blocks of latrines, for boys and girls, that



*Picture 7: The new VIP latrine under construction at the Mbalibali Primary School.*

they have worked for so long to have.

### Other Interesting Happenings



Picture 8: Our home in the Masai Mara after baboons broke in...

During this month our travels took us to the Masai Mara and Kisumu in Kenya, and Mugumu and Musoma in Tanzania, covering a distance of 1,800 km. During all of these travels, we had no breakdowns! But it wouldn't be field work without some interesting challenge... this month we learned why you shouldn't keep food inside your tent in the Masai Mara. We also learned that baboons can undo zippers. During one day at camp, we spent several hours working on the Land Rover. Unbeknownst to us, only 200 m away, baboons were breaking into our tent, stealing all of our food, emptying out our bags and defecating on the floor. One of our friends found the tent door opened, and was surprised to look inside, thinking we just

kept a very messy tent. But we recovered fairly quickly, with the help of a broom and a padlock. Another valuable lesson learned in the Mara!

### See you next month!

During the latter half of December, Chris and I headed home to spend holiday leave with our families. We wish everyone a peaceful holiday season, and we look forward to the exciting work that awaits us in the Mara River Basin in 2010!

#### Who are we?

Amanda Subalusky is the Research Coordinator – East Africa for Florida International University. Christopher Dutton is the Coordinator of the Trans-boundary Water for Biodiversity and Human Health in the Mara River Basin (TWB-MRB) Project. We both work within the GLOWS consortium. Read more about us at <http://maraadventure.blogspot.com>

#### What is GLOWS?

GLOWS is a consortium financed by the United States Agency for International Development (USAID) working to increase social, economic, and environmental benefits to people of the developing world through clean water, healthy aquatic ecosystems and sustainable water resources management. Read more about it at [www.globalwaters.net](http://www.globalwaters.net)