

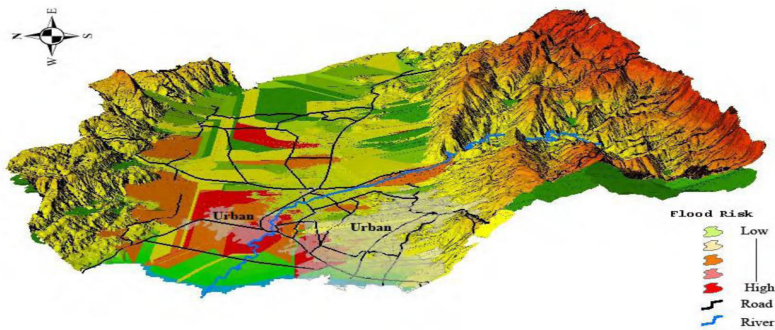
# Preliminary Assessment of Water Quality in Riviera Grise near Port-Au-Prince, Haiti



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## YSI Multiparameter Handheld, Haiti Application Note A605

The Riviera Grise drains water from the Cul-de-Sac watershed, Haiti, which covers most of the rural areas along the flood plains and areas that extend into steep hillsides. It also covers urban areas of Port-Au-Prince, the capital city of Haiti. The river drains approximately 290 km<sup>2</sup> of watershed area and attains a maximum flow 475 m<sup>3</sup>/s during its peak flow and a minimum flow 0.3 m<sup>3</sup>/s during drought conditions (US COE, 1999). The head waters start in the Massif De la Selle mountains and during peak flows, the river discharges into the Gulf of Gonave in the Caribbean sea, which serves as the natural harbor for the port city, Port-Au-Prince.



Flood risk map of Cul-De-Sac watershed showing the extent of erosion in the flood plains if Riviera Grise, Port-Au-Prince, Haiti.

The hillsides were once covered with vegetation and perennial crops such as coffee. Subsistence farming was practiced on the plains to grow crops such as sugar cane, banana, and mangoes. Deforestation in the hills over a period of time between 2000 and 2010, along with intensive agriculture, causes extreme erosion during heavy rainfall. Sediments resulting from erosion are carried across plains and discharged into the river. This has led to severe stream bank erosion and sedimentation of the river (Hylkema, 2011). The entire Port-Au-Prince area was catastrophically affected by a huge earthquake January 12, 2010 resulting in estimated deaths of more than 230,000 in the capital city. This study evaluated subsequent deterioration of the river after the earthquake and potential impacts on stream quality.

### Project

The study was conducted as part of a larger project aimed at providing assistance to the State University of Haiti Faculty of Agronomy, Medicine and Veterinary Sciences (FAMV) in rebuilding its capacity in water quality analysis. A team of scientists and engineers from the International Water Resources Management at Central State University (CSU), Ohio visited the university as volunteers through assistance from Florida Agricultural and Mechanical University's Farmer to Farmer Program funded by the United States Agency for International Development.

Very little information exists on the assessment of water quality in Riviera Grise. During the project, the river was monitored using a YSI Professional Plus multiparameter handheld. Basic water quality parameters such as pH, total dissolved solids (TDS), dissolved oxygen, specific conductivity, and temperature were measured. Turbidity of the samples was also measured.

The section of the river surveyed is approximately 2 km from FAMV and drains water from agricultural lands close to FAMV. Visual observations indicate the river habitat is severely impacted by artificial

channelization. The river carries a lot of sediment which is being manually removed from the river bed to the banks to sieve gravel from silt. Local residents collecting the gravel sell it for construction purposes. The river is losing significant substrate at the same time providing livelihood to the poor people who are surviving on the river. There is no riparian



FAMV students using the YSI Pro Plus multiparameter water quality instrument in the Riviera Grise near SUH, FAMV campus. Students monitor basic parameters under the supervision of Dr. Nedunuri.

corridor along the ½ mile section the team surveyed. However, some vegetation was noticed along certain sections of the river.

Water samples were tested at one of the riffle and pool areas. The pool section is close

to the banks and is experiencing severe algal growth to the extent DO levels were only 55.8% of saturation value at the prevailing temperatures. No fish were observed along

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the river. Water sampled on the riffle appears to be in good condition. However, the river is severely channelized, broken by silt and gravel at various sections. Poorer sections of the city depend on the river water for washing, bathing and in some cases for drinking.

### Data

From the table, it is clear that surface water has high amounts of total dissolved solids (TDS) which is indicative of nutrient run off and inorganic pollution. World Health Organization (WHO) guidelines for TDS suggests the water quality in the river is moderate (300-600 mg/L), however these levels may be considered unsafe for consumption if water contains substantial amounts of nitrites/nitrates or phosphates. Water samples having turbidity greater than 5 NTU are unsuitable for human consumption. High turbidity suggests excessive erosion from the hills followed by sedimentation in the plains. Dissolved oxygen levels on the riffle attained 100% saturation whereas levels in the pool sections close to the river banks were very low due to excessive algae and nutrient enrichment. Higher turbidity values in the pool suggests water pollution from sedimentation and algal growth. The YSI Pro Plus provides researchers with an initial look in analyzing water quality which can be followed with more precise analysis of the stream. Further analysis is required to determine nitrates and phosphates. This would enable the team to compute water quality index (WQI), an indicator of stream quality impairment. WQI coupled with Qualitative Habitat Evaluation Index (QHEI) provide accurate assessments of the current ecological condition of Riviera Grise.

A collaborative effort may be sought among the scientists at FAMV, CSU and FAMU to establish riparian corridors to restore natural conditions of the stream. Such a restoration of natural habitat may sustain the aquatic ecosystem in the river. It will also improve the stream quality and fish production. People could then find alternate means for livelihood without disturbing the natural environments of the river and its surroundings. Steps should be made to encourage poorer people living in heavily populated city

centers to move to agricultural plains and hills. This will prevent risk of house collapses from land slides. Moreover, translocated people may be provided an opportunity to cultivate land on the plains and hills using proven soil conservation practices contributing to reforestation on the hill slides and improved crop productivity on the plains. This will also lead to improvements in stream quality.



Riviera Grise experiencing artificial channelization as gravel and silt is manually removed.

### References

Hylkema, Haiti Soil Fertility Analysis and Crop Interpretations for Principal Crops in the Five WINNER Watershed Zones of Intervention, Thesis report, Soil and Water Science, University of Florida, 2011.

US Army Corp of Engineers District, Mobile Alabama and US Army Corps of Engineers Topographic Engineering Center, Alexandria, Virginia, Water resources assessment of Haiti, 1999.

For information including YSI instrument specifications, visit: [www.ysi.com](http://www.ysi.com) or [www.ysi.com/proplus](http://www.ysi.com/proplus)

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Location/Parameter	Temperature	Pressure	pH	TDS	DO	Turbidity
	Deg. F	mm Hg		mg/l	mg/l	NTU
Riffle	89.9	759	7.67	448.5	9.52	27.2
Pool	89.5	759	7.35	494	1.58	39

Basic water quality parameters measured using the YSI Pro Plus along the riffles and pools.