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Assessment of Groundwater Availability, Water Quality, and Habitat of the Étang Saumâtre region, Haiti following the 01-12-2010 Earthquake

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Abstract

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Assessment of Groundwater Availability, Water Quality, and Habitat of the Étang Saumâtre region, Haiti following the 01-12-2010 Earthquake

Étang Saumâtre is a brackish lake located in the southeast region of Haiti, ∼45 km from Port-au-Prince. It is the largest lake in Haiti, the second largest lake on the island of Hispaniola, is an environmental resource, and it resultantly plays an important socio-economic role for the communities living around its borders. A direct consequence of the 01-12-2010 earthquake is that many people are leaving Port-au-Prince and returning to their native towns, many of which surround Étang Saumâtre, namely, Thomazeau, Ganthier, and Fond Parisien. An essential source of irrigation and drinking water for the populations of Thomazeau, Ganthier, and Fond Parisien are freshwater springs and shallow wells tapping the complex, fractured aquifer system surrounding Étang Saumâtre. Further, the United Nations plans to build new villages sheltering ∼100,000 people in the Croix des Bouquets region, which is ∼20 minutes driving distance from Thomazeau and Ganthier. Thus, the present study is particularly timely in that we will not only assess direct effects of the 01-12-2010 earthquake on the lake and surrounding groundwater system but also provide vital baseline data for monitoring the future impact of such demographic changes on groundwater quality and the lake ecosystem.
We present physical and chemical hydrologic and sediment data for the lake and its surrounding aquifers across 3 seasons to classify Étang Saumâtre and its recharge zone. We will collect samples: (1) prior to the initiation of the rainy season (peak in mid-April); (2) during the rainy season (June-July); and (3) post-rainy season. Specifically we present an analysis of major cations and anions, trace elements (REEs), gas chemistry, and persistent organic pollutants including pesticides. We will pay particular attention to the REE which can reveal unique insights into water-rock interactions in saline systems. Sediment samples (1cm intervals) and particulate material will be used to evaluate grain size, sedimentation characteristics, and mineralogy. In addition, we will determine the age of sediments in order to monitor the history of sedimentation rate. Water samples will be analyzed for a subset of dissolved gases (i.e. CFC, SF6, He, Ne, Ar, radon, N2, CO2, CH4), and age dating techniques (3H/3He and radiogenic 4He) will be used to construct a model for hydrological transport rate and regional flow for the region surrounding Étang Saumâtre. This model will include sub-lacustrine (groundwater discharge vs. deep water fractured flow) inputs to the lake.
Bearing in mind that this region will be experiencing, over the coming months, a dramatic increase in population due to immigration and relocation, any significant reduction in annual fish production at Étang Saumâtre due to quake-induced disturbance of the ecosystem may exacerbate the already precarious health situation of

communities living in its vicinity. It is critical, therefore, that as part of the broader research focused on water quality that we assess the impact of the quake on Étang Saumâtre in terms of water quality and ability to sustain a productive fishery. These data are vital to the development of a management plan to protect the livelihood of fishers and maintaining the health of the communities surrounding the lake.