Integrated Geospatial and Chemical Analysis of Storm Water Drainage

Christian J. Monlezun[1], Whitney P. Broussard III[2], and David M. Borrok[1,2]

[1]School of Geosciences, University of Louisiana at Lafayette, 611 McKinley St., Hamilton Hall #323, P.O. Box 44650, Lafayette, Louisiana 70504

[2]Institute for Coastal Ecology and Engineering, University of Louisiana at Lafayette, Rougeou Hall, Mezzanine, P.O. Box 43688, Lafayette, Louisiana 70504

ABSTRACT

Good storm water management requires an understanding of hydrologic flow regimes, the influence of groundwater versus surface runoff, and how local hydrology is controlled by infrastructure and impervious surfaces. This project examines the Coulee Mine microwatershed and storm water collection system in Lafayette, Louisiana, to assess storm water hydrochemistry and its relationship to urban infrastructure. A geographic information systems (GIS) database was constructed to select water testing sites along the coulee route and the associated microwatersheds were modeled to quantify the total drainage areas at each point and to calculate the percentage of impervious cover within each subwatershed. Surface water samples were collected at 12 locations and analyzed for their chemical compositions using inductively coupled plasma–optical emission spectrometry (ICP–OES) and ion chromatography (IC) instrumentation. Total alkalinity, dissolved oxygen, temperature, conductivity, salinity, pH, and turbidity, were measured in situ using a YSI, Inc. sonde. We found that the water samples could be divided into two chemical groups based on differences in the geochemistry of the major elements dissolved in the water (e.g., Ca, Mg, Na, K, SO_4, and Cl). These chemical groups may represent different sources of water (e.g., groundwater vs. runoff) and/or could be attributable to different land uses or flow pathways. Our data were also successful in identifying specific geographical areas related to chemical changes like higher concentrations of nitrate. The next step in this investigation will be to compare the GIS data and statistical information on land use and impermeable cover with the newly-measured chemical trends (including available historical data) to elucidate possible relationships.