

Mud, Microbes, and Mussels: Issues Facing Charlotte-Mecklenburg and the Water Quality Management Approach

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The City of Charlotte is in a unique situation as all streams within its' jurisdiction are headwater streams. Since all waters originate within the city, Charlotte has a distinctive opportunity to manage water quality without having to rely on sources outside its' authority. Charlotte Storm Water Services has adopted the "3-M Approach" to water quality management (Monitor, Model, and Manage). This is an exercise to determine what the data is indicating vis-à-vis the degree of problems and sources, what predictive models can tell us about future conditions and management opportunities, and using that information to develop sound environmental policies.

While the piedmont region of North Carolina may not have the highly publicized nuisance algal blooms and dissolved oxygen concerns seen in the coastal area or historic flooding that took place last summer in the mountains, there are, nonetheless, problems that result in streams not meeting their designated use. A review of available documents and monitoring data allows development of a strong understanding of watershed conditions, stressors, and future needs with regard to hydrology, water quality, and aquatic habitat. Not surprisingly, the greatest threat to an urbanizing area such as Charlotte is from physical changes such as flow volumes/velocities and temperature, as well as increased pollutant loading of contaminants such as sediment, nutrients, and pathogens. Stream channel and substrate surveys confirm what the monitoring data indicate; areas with poor macroinvertebrate populations and high concentrations of pollutants are indicative of streambeds that are typically silted in and severe stream bank erosion. Conversely, streams with cobble substrate and intact buffers had healthy aquatic populations and low pollutant concentrations. This indicates a relationship between water quality and water quantity.

Each watershed within Charlotte-Mecklenburg has a unique concern: water supply, 303(d) listing, or endangered species. A means for predicting future watershed conditions are needed so the public and agencies can better understand how water quality and habitat will be impacted without further action and how proposed ordinance requirements will address these issues. Due to conjecture that discrete management approaches to address aforementioned concerns for each watershed district would be taken in Charlotte, all 33 named watersheds in Mecklenburg County were modeled. In the interest of time, streamlined pollutant loading and stream stability modeling approaches were taken. To accurately describe the difference between existing and build-out conditions, robust, detailed land use databases were created. Pollutant load modeling was performed based on a modified simple method approach using local data and previously developed models and tools. Stream stability modeling was based on existing Hydrologic Engineering Center models developed for the Mecklenburg County Flood Insurance Study. Additionally, a tool was developed to estimate cost-effectiveness of alternative management options.

The stressor – strain relationships developed through monitoring and research and predictive modeling tools are being used by Charlotte-Mecklenburg to support a stakeholder process. The goal of the stakeholder group is to develop a water quality ordinance to address non-point sources of pollution in response to NPDES Phase II regulations, endangered species concerns, and to ensure the environmental sustainability of Charlotte-Mecklenburg.