NEW WATER-QUALITY MONITORING EFFORTS IN METROPOLITAN ATLANTA, GEORGIA

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Abstract. Due to increasing population in the Metropolitan Atlanta area and recent drought conditions, water-quality issues have become more pronounced during the last several years. The U.S. Geological Survey (USGS) is conducting two new cooperative projects—the Rockdale County Watershed Monitoring Project and the City of Atlanta Water-Quantity and Water-Quality Monitoring Project, which are designed to monitor hydrologic and water-quality conditions in local streams that are used for public water supplies and recreation. These projects are an integral part of a larger USGS urban hydrology investigation in the greater Metropolitan Atlanta area and part of a nationwide water-quality data program funded by the USGS and other Federal, State and local agencies. Numerous studies have demonstrated that large population centers, along with their associated infrastructure and industrial activity, have a substantial effect on water-quality of local streams. Research has shown that urban land use in other parts of the Metropolitan Atlanta area affects stream hydrology and has a resultant effect on stream-water quality (Landers and others, 2002). Long-term water-quality monitoring can help characterize the physical, chemical, and biological processes and changes associated with climatic variations, storms, floods, droughts, and human activities. The data that are collected from both the Rockdale County Watershed Monitoring project and the city of Atlanta project will be useful in designing programs to protect watersheds, sensitive aquatic habitats, biota, and drinking water sources from point- and nonpoint-sources of contaminants.

ROCKDALE COUNTY WATERSHED MONITORING PROJECT

Faced with increasing urbanization, Rockdale County has taken a proactive approach to dealing with the increased burden on available water supplies by implementing a watershed monitoring plan to assess the current hydrologic conditions in the county and provide a baseline data set to help make informed decisions on the management of those water supplies. By comparing future data to data previously collected and by studying urbanization patterns in Rockdale County, the subsequent effects of land use and other impacts can be determined and potentially mitigated. The project is organized into five major parts: (1) biological monitoring, (2) physical and chemical sampling, (3) monitoring drinking water supplies, (4) point-source impact monitoring, and (5) hydrologic monitoring and storm sampling.

Components

Part I - Biological monitoring. The Rockdale County Watershed Monitoring Plan (Tetra Tech, 2002) calls for ten sites to be sampled annually, with five of those sites at fixed locations. The other five sites are randomly selected each year (one site in each major watershed in Rockdale County). This sampling will assess the overall ecological health of the watersheds by measuring the aquatic habitat, and sampling fish, and macroinvertebrate communities.

Part II - Physical and chemical sampling. To better monitor the water quality of local streams, 12 sites are sampled 12 times annually. At these sites, the timing of sample collection is hydrologically based and designed to span the range of hydrologic conditions in each watershed. Specifically, three samples are collected during baseflow in different seasons, and the remaining samples are collected during medium- and high-flow conditions at each site in an effort to cover 80 percent of the annual hydrograph. This sample schedule is dependent on climatological conditions and is modified to reflect extreme flow conditions. Sampling protocols are those of the USGS (Wilde and others, 1998). The measurement and computation of instantaneous streamflow are needed before constituent loads can be calculated. Of the 12 sites, 6 are continuous-discharge stations and the remaining 6 stations are nonrecording staff-gage sites that will have a low- to medium-streamflow rating developed. The measurement and calculation of streamflow follows USGS protocols published by Buchanan and Somers (1969) and Riggs (1968).

Part III - Monitoring Drinking Water Supplies. The third part of this project is designed to monitor drinking water supplies in Rockdale County. Four sites are sampled monthly and water samples are analyzed for chlorophyll A concentration, dissolved oxygen concentration, water temperature, pH, and total organic carbon concentration.

Part IV - Point-Source Impact Monitoring. Part four of this project is designed to monitor the effectiveness of the Rockdale County Watershed Management Plan (Tetra Tech, 2002). Five sites were selected for fixed monthly sampling and are sampled for a full suite of U.S. Environmental Protection Agency (USEPA) priority pollutants.

Part V - Hydrologic Monitoring and Storm Sampling. Long-term streamflow monitoring and storm event sampling is the final part of this project. Seven real-time stations collect continuous hydrologic data and use satellite telemetry to transmit these data on hourly basis to the USGS office in Atlanta, Georgia (Fig. 1). Data are transmitted more frequently when critical thresholds are exceeded. All seven stations monitor continuous river stage, streamflow, and rainfall. Four of the stations also have in-situ sondes to monitor three water-quality parameters—temperature, conductance and turbidity. At these continuous water-quality sites, storm events are sampled using automatic samplers. These samples are flow-weighted, and composited during the storm event, and then analyzed at the USGS water-quality laboratory in Ocala, Florida. These data will be analyzed to attempt to develop a relation between continuously monitored parameters and laboratory-analyzed constituents.

Data Products. The data collected from this project will be published in the USGS Georgia District Annual Data Report (CD–ROM) and on the USGS National Water Information System (NWIS) Web page (NWISWeb) at URL: http://ga.water.usgs.gov/.

CITY OF ATLANTA WATER-QUANTITY AND WATER-QUALITY MONITORING PROJECT

The project provides hydrologic and water-quality data that are essential to the preservation and use of the city's water resources. Data collection for this project includes 12 continuous monitoring stations, and 8 discrete sampling stations for a total of 20 sites. Also, 2 synoptic sampling runs will be conducted at 40 sites during high- and low-flow conditions within the city limits. The city of Atlanta encompasses several streams

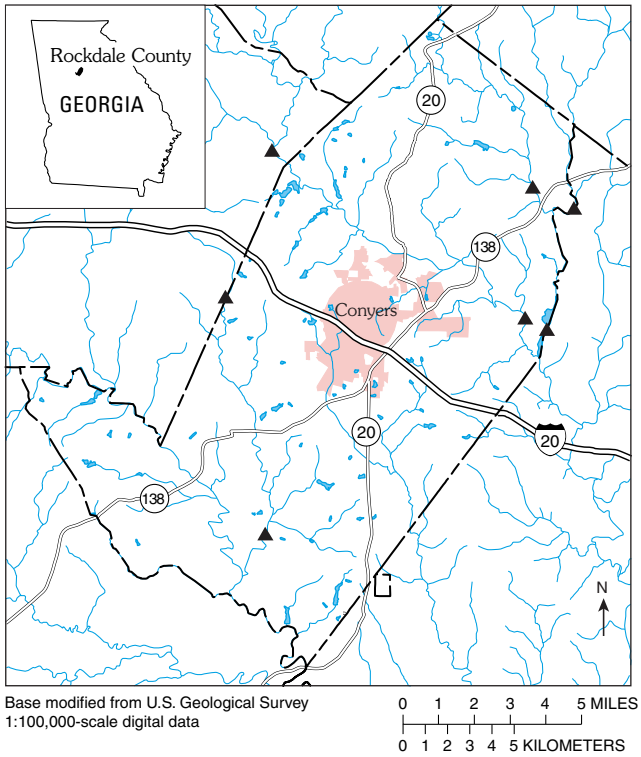

Figure 1. Study area of Rockdale County watershed monitoring project showing continuous monitoring station.

and tributaries that combine to create a diverse water system that serves a large population center and it's associated industrial activity. With Metropolitan Atlanta's continued growth, stormwater and sanitary sewer systems are strained to the point that effluent adversely affects local rivers and streams.

Components

Part I – Instrumented Monitoring Stations. Ten stations collect continuous water-quantity and water-quality parameters, and two other stations collect stage and rainfall data and transmit these data on an hourly basis. These data are collected through the use of a water-level sensor, an in-situ water-quality monitor, a flow-weighted, stage-actuated sampler, and a tipping bucket rain gauge. Stage-discharge ratings also are being developed at each of the sampling stations so that constituent loads can be calculated. Of the numerous physical parameters, pH, dissolved oxygen, turbidity, specific conductance, water temperature, stage, and rainfall are available via the Georgia District NWIS Web page at URL: http://ga.water.usgs.gov/. Separate calculations to determine constituent concentrations and transport (flux) of these constituents can be performed using these data.

Part II – Routine Sampling. The program incorporates long-term sampling at the 12 continuous monitoring stations, and at 8 other noninstrumented locations (Fig. 2). By sampling the noninstrumented sites within particular watersheds, a comprehensive picture of the locations of water-quality problem areas throughout the city of Atlanta's watersheds can be detected. Representative water column samples are collected at all sites on a hydrologically based schedule and analyzed for dissolved trace elements, nutrients, and other parameters. These samples are used to calibrate the continuous water-quality probes and automatic samplers. The routine and baseflow samples are taken using a depth and width integrated technique and are analyzed at a USGS laboratory (Wilde and others, 1998). Since significant short-term changes in chemical and suspended sediment concentrations typically occur during storm events, it is important to track these changes to estimate fluxes in concentrations and to identify potential contaminant sources. Routine samples for nutrients, dissolved and suspended trace elements, bacteria, suspended sediments, and sewage tracers allow for the evaluation of baseline conditions and sources of contamination.

Part III – Synoptic Sampling. A high- and low-flow synoptic sampling run will be conducted once to provide a snapshot of water-quality conditions within city boundaries and identify optional sampling sites (Fig. 2). Typically, low-flow synoptic sampling is used to identify and quantify areas affected by point-source pollution. The high-flow synoptic can identify areas affected by nonpoint-source pollution. As stormwater runoff increases, the runoff accelerates erosion of the land surface, especially in areas under construction and causes scouring of stream channels, resulting in much higher stream-sediment loads (Landers and others, 2002).

Data Products. The data collected will be published in the USGS Georgia District Annual Data Report (CD–ROM), and also will be available on the USGS NWIS Web page at http://ga.water.usgs.gov/.

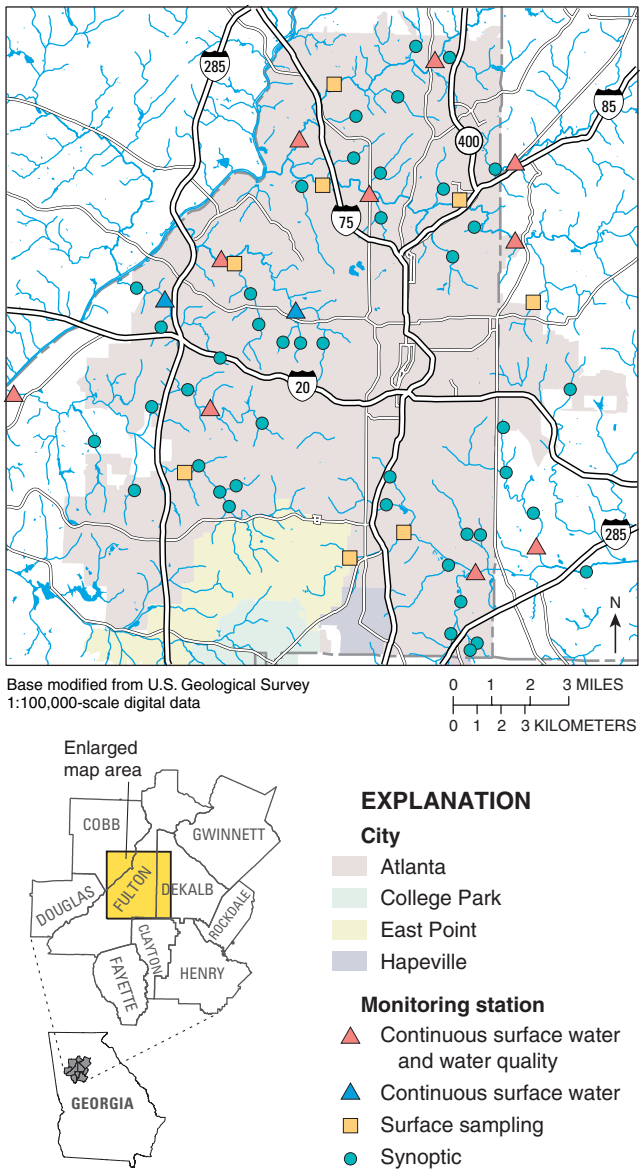

Figure 2. Study area for the city of Atlanta project showing location of monitoring stations.

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