DEVELOPMENT OF A SUSTAINABLE WATER RESOURCE FOR THE BIG CREEK WATERSHED

Robert W. Brashear[1], James M. Santo[2] and Thomas A. Stanko[3]

AUTHORS: [1]Senior Project Manager, Camp, Dresser & McKee Inc., One Glen Lakes, 8140 Walnut Hill Lane, Suite 1000, Dallas, TX 75231; [2]Principal Environmental Planner, Atlanta Regional Commission, 40 Courtland Street, Atlanta, GA 30303; and [3]Golder & Associates, 3730 Chamblee Tucker Road, Atlanta, GA 30342 (Former ARC staff).
REFERENCE: Proceedings of the 2001 Georgia Water Resources Conference, held March 26-27, 2001, at the University of Georgia. Kathryn J. Hatcher, editor, Institute of Ecology, the University of Georgia, Athens, Georgia.

Abstract. The Big Creek Water Quality Management Plan has been a cooperative effort of Cherokee, Forsyth and Fulton Counties, as well as the Cities of Alpharetta, Cumming and Roswell to develop a mutually agreeable water quality protection Plan for the Big Creek Watershed. The Big Creek Watershed straddles the rapidly growing Georgia 400 Corridor in the northern part of Metropolitan Atlanta. It is a water supply for the City of Roswell and has an area of about 99 square miles at the Roswell water intake. The project purposes included: achieving and maintaining a high quality water supply; minimizing flooding, property damage and stream impacts; protecting wetlands and establish greenways; meeting minimum Georgia DNR water supply watershed criteria or developing acceptable alternatives; understanding the impacts of urbanization; and considering options for and developing multi-jurisdictional cooperation. The study encompassed watershed characterization, assessment of water quality and quantity issues, assessment of habitat and social issues and the selection of best management practices (BMP's) to meet water quality, water quantity, habitat and social goals. Study tasks included forecasting future land use and impervious areas, assessing current and future impacts and evaluating alternate management and protection scenarios.

INTRODUCTION

The Big Creek Watershed is a water supply source for the City of Roswell in Fulton County just north of Atlanta, and has an area of about 99 square miles above the Roswell intake. The watershed above the intake is also located within the Georgia 400 Corridor, one of the most rapidly developing parts of metro Atlanta and the State of Georgia, and is experiencing intense, continuing growth pressures. For the past two years, the local governments in the watershed, which include Cherokee, Forsyth and Fulton Counties as well as the Cities of Alpharetta, Cumming and Roswell, have worked together to develop a mutually agreeable water quality protection plan for the basin. The study that will serve as the basis for the multi-jurisdictional plan for this watershed, the Big Creek Water Quality Management Plan, has been completed. It will be of interest to local governments in the State that are seeking to address their own issues concerning water supply protection, watershed and stream protection, urbanization and intergovernmental cooperation.

BACKGROUND

The study purposes were to provide a means of achieving and maintaining a high quality water supply in Big Creek, to minimize flooding and other impacts, to protect wetlands and establish greenways, to meet minimum state standards or develop acceptable alternatives, and to help foster intergovernmental cooperation. The study included forecasting future land cover, assessment of current and future impacts through stream reconnaissance and the development of water quality and quantity models, as well as the development and evaluation of possible protection measures and management scenarios.

RESULTS AND RECOMMENDATIONS

The study determined that the Big Creek watershed will be nearly completely urbanized by the year 2020, with overall developed area increasing from 45 percent to 87 percent, and impervious area increasing from 15 percent to 35 percent. A field reconnaissance and assessment of about 44 miles of stream in the Big

Creek watershed conducted as part of the study found that the waterways are not only sensitive to the overall water quality impacts of urbanization, but also to the impacts of increased flow from impervious areas. The stream channel assessment found numerous segments where erosion from high flows was causing impacts to habitat and to property. The effects of development through 2020 were assessed with the water quality and quantity models. The model results indicate that, with no protection measures, the number of stream segments affected by high flows will increase significantly as development occurs, with increasing erosion and habitat impacts.

Under the conditions predicted for 2020, the peak rates of runoff will increase 38 percent, peak runoff volumes will increase 40 percent and flood elevations would increase by three feet. Instream velocities would increase would more frequently exceed the erosion threshold of 2.5 ft/sec. Finally, between storm events, low flow conditions would occur more often and last longer than at present. Typical stream profiles would change, with increases in width and depth resulting from increased flows before they stabilized. Water quality would also suffer, with increases of up to 90 percent in total suspended solids, increases of up to 70 percent in phosphorus, nitrogen and zinc, up to 190 percent increases in BOD and up to 260 percent increases in fecal coliform.

In developing a means of offsetting these impacts and of meeting water quality goals, the study considered a number of stormwater control options. These included source controls, such as grassed swales, filter strips and riparian buffers as well as treatment controls including extended detention ponds, detention with filtration, retention ponds, constructed and enhanced wetlands, and retrofitting of existing detention facilities.

The study also developed and assessed a series of management scenarios including status quo future development, use of impervious limits of 20 and 25 percent, future development with either source or treatment controls, and future development with both source and treatment controls. Modeling indicated that the 2020 future land use impacts could be offset with a combination of source and treatment controls throughout the watershed, with an emphasis on detention controls. Such controls would be more effective than the state minimum criteria and would meet most water quality standards.

The stormwater control requirements would include on-site or regional detention for all new land uses, the use of alternate design practices that provide water quality benefits, such as swales and filter strips, and the retrofitting of existing facilities where appropriate. This scenario also includes 100-foot deep vegetative buffers - or the depth of the floodplain where greater - on all perennial streams as well as impervious surface setbacks of 150 feet within 7 miles of the intake and 100 feet beyond 7 miles.

Because of the high returns on investment, several other watershed management practices and policies were recommended as they provide important social and habitat benefits. Pollution prevention controls (those controls that limit the generation of stormwater pollution) should always be integrated into jurisdictional programs. These controls include anti-dumping, public education, and industrial management activities.

In addition to the buffers, stream preservation, stabilization, and restoration were recommended for their direct and demonstrated benefit to increasing water quality and maintaining a healthy aquatic habitat. Stabilizing already eroding streams protects both property and habitat. It was also recommended that the watershed jurisdictions develop proactive stream management programs.

RECOMMENDATIONS

This study presents the framework for a watershed management plan and program. It is now up to the participating local governments to adopt a formal agreement for them to work together and to develop a watershed protection plan based on this study. They must also develop a binding, cooperative organization that will be an effective mechanism implementing, enforcing, monitoring and updating the adopted plan.