

## THE U.S. GEOLOGICAL SURVEY AND TUSCALOOSA COOPERATE TO PROTECT OUR PREMIER WATER SUPPLY

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### Introduction

Tuscaloosa is a city of about eighty thousand people in the southwest corner of the northern half of Alabama. Northport is the largest other city in the county. Its population is about twenty thousand, and that of Tuscaloosa County, inclusive of the twin cities on the Black Warrior River, is about one-hundred-fifty thousand. The majority of those people historically have been served by the public water supply of the City of Tuscaloosa.

Lake Tuscaloosa was created in 1969 by the impoundment of North River by an earth-fill dam about a mile above the river's confluence with the Black Warrior River within the city limits of Tuscaloosa.

The drainage area that is tributary to the reservoir comprises about 418 square miles of surface. Slightly less than 40 percent of that area lies in Fayette County, less than one percent is in Walker County, and the remainder is contained in Tuscaloosa County, north of the city. Surface relief in the tributary drainage area ranges approximately between 200 feet and 500 feet above sea level. The smallest rectangle that circumscribes it has side dimensions of about 14 miles and 40 miles. Less than 50 percent of the area is gently sloped and most of the gently sloped area is located in its uplands. The basin is clean and lightly inhabited.

Lake Tuscaloosa provides the city one of the most excellent water supplies in the world. The clean drainage basin and the relatively insoluble rock of which it consists yield waters of very high quality, and the lake's dependable yield greatly exceeds the foreseeable demands of the next many decades for the population of Tuscaloosa County. Its available uniform draft of 200 million gallons per day is about ten times current maximal summer drafts for Tuscaloosa's water supply.

### Resources Require Protection

Early in the last decade, it became apparent that the pressures toward development of the drainage area would promote activities that might degrade the quality of the water supply. It was ironic that the activity most feared initially would be one initiated and controlled by

federal agencies. Significant portions of the drainage area underlain by coal were controlled by the Bureau of Land Management, and that bureau's policy then was that those minerals be made available to commercial mining companies for extraction. The surface mining that would be required would expose disturbed overburden and spoils to storm waters that could cause significant sediment transport toward the lake and could add soluble metals and anions to that lake water that was blessed to possess such minimal minerality.

Earlier, beginning within two years after the completion of the dam construction, there had been other occurrences that called attention to the need to protect the quality of the lake water. An oil tank truck was wrecked on Alabama Highway 69 only a few hundred feet from the Turkey Creek bridge. The diesel fuel that was not burned when the wreck occurred drained into the creek and thence the lake.

Fish kills resulting from aerial applications of agricultural pesticides occurred in the lake and along its tributaries. They were of minor extent, but they were not of minor import to those concerned with the safety of the public water supply of Tuscaloosa. In a quirky incident, about 200 bream in the lake fed heavily and fatally upon the winged pleomorphic form of fire ants and did succumb to fire ant toxicity. There were minor fish kills for which the cause could not be established with any satisfactory degree of certainty. The use of an explosive or the use of rotenone for the illegal taking of fish were suspected.

### Cooperation

Because the staff members of the U.S. Geological Survey Tuscaloosa District Office had been helpful and cooperative to those of the Tuscaloosa Water and Sewer Department, it was natural for the City to seek help from them in this instance. The City of Tuscaloosa sought the cooperative assistance of the Geological Survey through its Tuscaloosa office so that the nature of the water resource could be defined through study and the water quality could be protected through enlightened monitoring of the factors affecting it.

As the historic gaging of North River and its continuing flow measurement by the Survey had allowed analyses to define and specify the dependable draft that the

impoundment of the river would provide, it was desired that comparable water-quality information be obtained to constitute a detailed specification of background water quality for this excellent water resource. The number of pertinent quality parameters that should be measured to provide such a benchmark specification of quality is not trivially small, and the variability of the pertinent parameters require that replications and seasonal values be obtained for them. For others, the most significant values would result from continuing samplings and analyses for them so that the trends of their values over longer periods could be detected and appreciated.

The representatives of the cooperating governmental agencies recognized that the development of the desired data for specification of the benchmark quality of the lake waters would require years of work to produce because personnel and budget constraints would not allow otherwise and because temporal trends can be demonstrated only over longer periods. Among the negotiating representatives, reason was regarded righteously and practically prevailed.

#### Agreements

Cooperative studies of the lake began with the program planned for the year of 1984. The City and the Survey agreed to share equally the cost of the program with each paying \$25,000 for the work performed by the Survey. Had the City contracted for the performance of the study by a commercial firm, it is the author's belief that the cost would have exceeded \$100,000. With that beginning and with minor increases in budgeted amounts, the cooperative program has continued to date with the 1990 program having been budgeted for \$33,000 costs each to the Survey and the City. From the twelve sites on its tributary streams and two sites on the lake studied originally, sites have been changed over time to the current six stream sites and three lake sites.

In the planned annual programs, the first studies were directed toward defining the underlying nature of the qualities and quantity of the resource in a more detailed nature than it then was known. Subsequent programs were directed toward the effects of agriculture and silviculture as they might be contributing pesticides or insecticides to the waters of the lake. Later programs were devoted to studies of the major tributaries to the lake. Those studies demonstrated to a degree that no one had suspected that the productivity of the various portions of the drainage area were highly variable. That information was very helpful when a neighboring municipality began seeking to use water from the Lake Tuscaloosa drainage area for the development of its own water supply.

#### Products of the Investments

All streamflow and water quality data collected each year are published in the annual data report for the Alabama district of the Survey which means that they also are available in the computerized data bank of the U.S.G.S.

During the continued cooperative program there have been published to date two interpretive reports respectively of about sixty and seventy pages in total extents. The first was published in 1985. Elizabeth F. Cole was responsible for its creation, and its title,

*Effects of Coal Mining on the Water Quality and Sedimentation of Lake Tuscaloosa, and Selected Tributaries, North River Basin, Alabama*, reflects the major concern of the City about the lake at that time. The Survey publication designation for that report is USGS WIR 84-4310. The subsequent report designated USGS WIR 87-4002 was the product of Larry J. Slack. From its title, *Water Quality of Lake Tuscaloosa and Streamflow and Water Quality of Selected Tributaries to Lake Tuscaloosa, Alabama, 1982-86*, one may infer that the data gathered previously had a quietening effect upon the fears reflected by the earlier report title. The possibilities of water-resource damaging occurrences had not ceased to exist, but the managers of the resource had more complete appreciations of the probabilities of such occurrences, and they had a base of benchmark quality specification with which they could fight anyone who would damage the resource.

The City of Tuscaloosa paid about 8.3 million dollars to create the water-supply reservoir. Since 1984, it has invested slightly less than a quarter million dollars to document a specification of the quality and worth of the resource and to monitor whether the resource is being degraded by anyone or by any natural phenomenon. It is difficult to think of a better way in which that money could have been spent for the maintenance and protection of the resource. A single spill event into the reservoir could cost many times that amount in damage to it.

#### The Broader Significance

This exemplary cooperation between the federal and local agencies is one that must be used to its full potential to demonstrate to other cities in our region the synergy that is possible in the use of diminishing funds to accomplish the resource protection that is crucial for us all.