

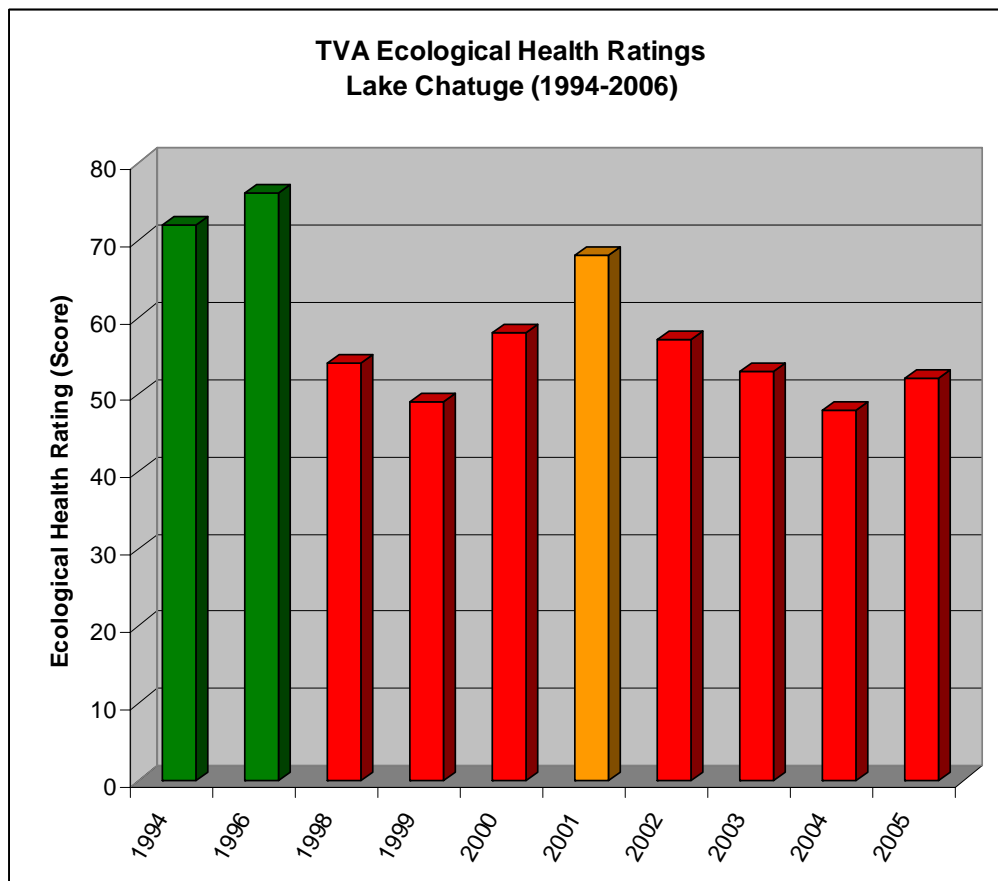
## SECTION 3 JUSTIFICATION FOR LAKE CHATUGE STUDY & PLAN

### 3.1 Decline in TVA Reservoir Ecological Health Ratings

TVA regularly monitors five indicators of ecological health in each of its reservoirs, assigning a numerical score, called an Ecological Health Rating, at each assessment. The five monitored indicators are: dissolved oxygen, chlorophyll, fish community, bottom life, and sediment quality. Lake Chatuge has been monitored annually since 1998; the scores are presented in Figure 9. Appendix I contains more information about the TVA reservoir rating system including a description of each of the five indicators.

During the 1990s, TVA's Reservoir Ecological Health Rating for Lake Chatuge declined from "Good" in 1994 and 1996 with scores in the low to mid-70s to "Poor" starting in 1998 with scores in the mid-40s and low 50s. TVA has monitored Lake Chatuge annually since 1998 and, with the exception of one "Fair" rating in 2001, the reservoir has continually been rated Poor: <http://www.tva.com/environment/ecohealth/chatuge.htm>

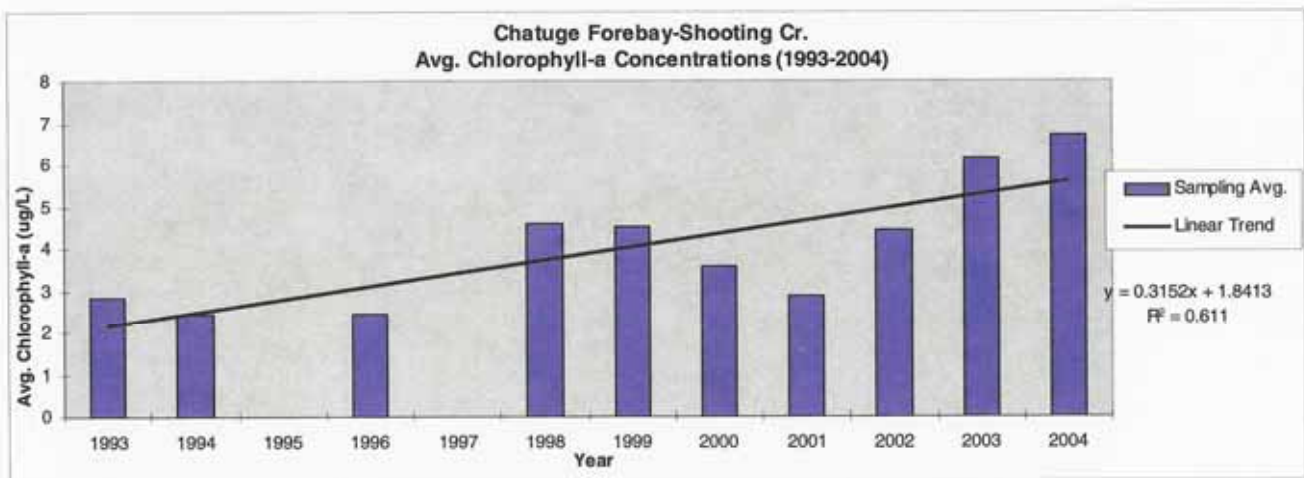
Figure 9. TVA Reservoir Ecological Health Ratings for Lake Chatuge (1994-2005)



In 2005, no one indicator received a rating higher than “Fair” at any location in Lake Chatuge. Four out of five of the indicators were rated “Poor” in the Shooting Creek Embayment. The two indicators that have the biggest influence on the Poor ecological health ratings for Lake Chatuge are dissolved oxygen and chlorophyll. Dissolved oxygen concentrations are very low in the bottom levels of Lake Chatuge for extended periods of time in the late summer and fall. Low dissolved oxygen can be a result of decomposition processes (the breakdown of organic material such as leaves or dead algae) or the introduction of oxygen-consuming wastes (such as biological oxygen demand from a wastewater treatment plant discharge). Low dissolved oxygen affects both the organisms that live on the bottom of the lake (bottom life indicator) and the fish communities as both require adequate concentrations of oxygen in the water for survival. The more organic material and/or oxygen-consuming waste in the lake, the larger the zone of low dissolved oxygen over a longer period of time. For Lake Chatuge, the low dissolved oxygen conditions also result in an odor below the dam in the fall due to the hypolimnetic (bottom layer) release from the dam.

Chlorophyll is the component of plants that gives them their green color. An increase in chlorophyll concentrations generally indicates an increase in the amount of algae living in the water. Not only can certain types of algae interfere with recreation activities in the lake and cause aesthetic problems, but there is also an impact from excess algae on dissolved oxygen concentrations. When algae in the reservoir die, they decompose and through this process, consume oxygen. According to TVA reservoir experts, average chlorophyll concentrations are increasing in Lake Chatuge (Figure 10).

Figure 10. Average Chlorophyll-*a* Concentrations in the Lake Chatuge-Shooting Creek Forebay and Linear Trend



Although average concentrations of chlorophyll-*a* have roughly doubled over the past decade, levels are still well below state and federal guidelines and criterion for consideration of “use impairment”. When compared with reservoirs in other part of Georgia and North Carolina, Lake Chatuge is still considered by both state governments to be in good condition. If the concentrations of algae continue to increase, one result could be a use impairment designation by one or both states at which point regulatory

measures could be used to reverse the trend. Often, by the time waters reach the point of state/federal impairment, it is too late to recover water quality without tremendous expense and community sacrifice.

### 3.2 Community Concerns

HRWC members and others throughout the Lake Chatuge community became very concerned in the late 1990s when the reservoir ecological health rating dropped from 76 to 54 in just two years. And, HRWC continued to be concerned when at the height of a four-year regional drought; the score still did not rebound to early 1990s levels. [Drought typically improves reservoir ratings because fewer nutrients and less organic material are carried into the lake from runoff resulting in lower chlorophyll concentrations and higher dissolved oxygen.] People in the community had different ideas about what was causing the low scores with runoff from leaky or failing septic systems and the Hiawassee wastewater treatment plant discharge being the most often identified “culprits”. However at the time, no data existed to truly document the sources of the increased chlorophyll and low dissolved oxygen concentrations.

### 3.3 HRWC Groundwork for Response

Those working with HRWC in the late 1990s understood that water quality problems must be addressed on a watershed basis. In other words, Lake Chatuge cannot be separated from the land that drains into it and all 189 square miles of the watershed must be considered and if Lake Chatuge is to be returned to an ecologically healthy condition, sustaining good water quality.

In 2001, HRWC worked with the late Representative Ralph Twiggs and former Senator Carol Jackson to obtain a \$216,000 appropriation from the Georgia legislature to determine, based on sound science, the causes and sources related to the increased algae and low dissolved oxygen. HRWC then began to take a very holistic look at the watershed, contracting for intensive professional water quality monitoring of the lake and its major tributaries, and partnering with TVA for a detailed land use analysis and computer modeling of the lake and watershed. [Section 4 details the data collection and computer modeling methods used in this intensive 4-year study of Lake Chatuge; Section 5 summarizes the results.] The purpose of this Action Plan is to recommend management strategies that, if properly implemented, will begin the process of returning Lake Chatuge to good ecological health.