# AN ANALYSIS OF THE IMPACT OF LOCAL DROUGHT CONDITIONS ON GROSS SALES IN THE LAKE HARTWELL REGION

Jeffery S. Allen, Robert T. Carey, Lori A. Dickes, Ellen W. Saltzman, Corey N. Allen, and G. Michael Mikota

AUTHOR: Strom Thurmond Institute of Government and Public Affairs, Clemson University.
REFERENCE: *Proceedings of the 2011 Georgia Water Resources Conference*, held April 11–13, 2011, at the University of Georgia.

**Abstract**. Lake Hartwell is a United States Army Corps of Engineers (USACE) impoundment of the Savannah River constructed between 1955 and 1963 as a part of a flood control, navigation and hydropower project on the border of South Carolina and Georgia. In addition to the original reasons for its creation, the lake is increasingly used today for tourism and recreational purposes, as well as issues related to water quality, water supply, and fish and wildlife management.

As economic activity on and around the lake has intensified, the perceived importance of the lake as a driver of economic activity has correspondingly strengthened. Increased interest in Lake Hartwell has resulted in the creation of a number of stakeholder associations with the objective of protecting the economic interests of lake property owners and lake-oriented businesses. These stakeholders have increasingly brought their economic concerns into discussions of lake management. The multiyear regional droughts of 1999 to 2003 and 2006 to 2009 escalated stakeholder concerns about the economic impact of prolonged low lake levels on lake-oriented real estate and businesses. As drought conditions worsened throughout 2007 and 2008, stakeholders increasingly called for policy changes that would take greater account of the economic and tourism concerns of lake stakeholders.

This research documents the unique relationship between consumer spending activity and Lake Hartwell lake levels for the six county region bordering the lake. While this research is portion of a much larger analysis documenting the economic impacts of drought conditions on the region, this piece of the project is informative for understanding the complexities of the relationship between general economic activity and lake levels. This analysis covers the six counties that border Lake Hartwell: Franklin, Hart, and Stephens counties in Georgia, and Anderson, Oconee, and Pickens counties in South Carolina.

## DROUGHT AND LAKE LEVELS

Lake Hartwell is at summer full pool at 660 feet above mean sea level (MSL). Lake levels vary over time under normal Corps lake management practices. But during long droughts Lake Hartwell has remained well below full pool for months at a time (Figure 1). For example, the lake was below full pool over the entire 30 month period between January 2007 and June 2009. The lake hit its lowest level of the recent drought in December 2008, 21 feet below full pool. As the drought worsened throughout 2007 and 2008, public boat ramps, private docks and marinas dried up. As the drought worsened, lake area stakeholders called for changes in the USACE's Drought Management Action Plan. As outflows were reduced according to the Drought Management Plan, environmental and power stakeholders argued against further restrictions on outflows.

## LITERATURE REVIEW

One of the most relevant studies for this project is The University of Tennessee's Center for Business and Economic Research *Economic and Fiscal consequences of TVA's Draw Down of Cherokee and Douglas Lakes* completed in October 1998. This analysis used three different methodological approaches to estimate the overall economic impacts of higher lake levels. The first methodology estimated the increase in expenditures from non-resident visitors in response to higher lake levels. Using survey data, estimates indicate that higher lake levels will result in an increase of $1 million to $1.8 million in nonresident expenditures. The resulting employment is estimated to generate total personal income in the region of between $588,000 and $976,000.

Using a statistical model relating county-level retail sales to lake level, the second approach estimated higher lake levels would create $1.6 million in additional retail sales in the local region, generating 43 annual full-time positions and $700,000 in personal income. The third model used a survey of area retail businesses to estimate the direct impacts of higher lake levels. Based on survey responses, higher lake levels in August and September were estimated to increase area spending by $7 million through the first of October supporting 351 annual full time positions with an income impact of $4.2 million. These three different approaches all suggest that higher lake levels will generate positive economic benefit to the

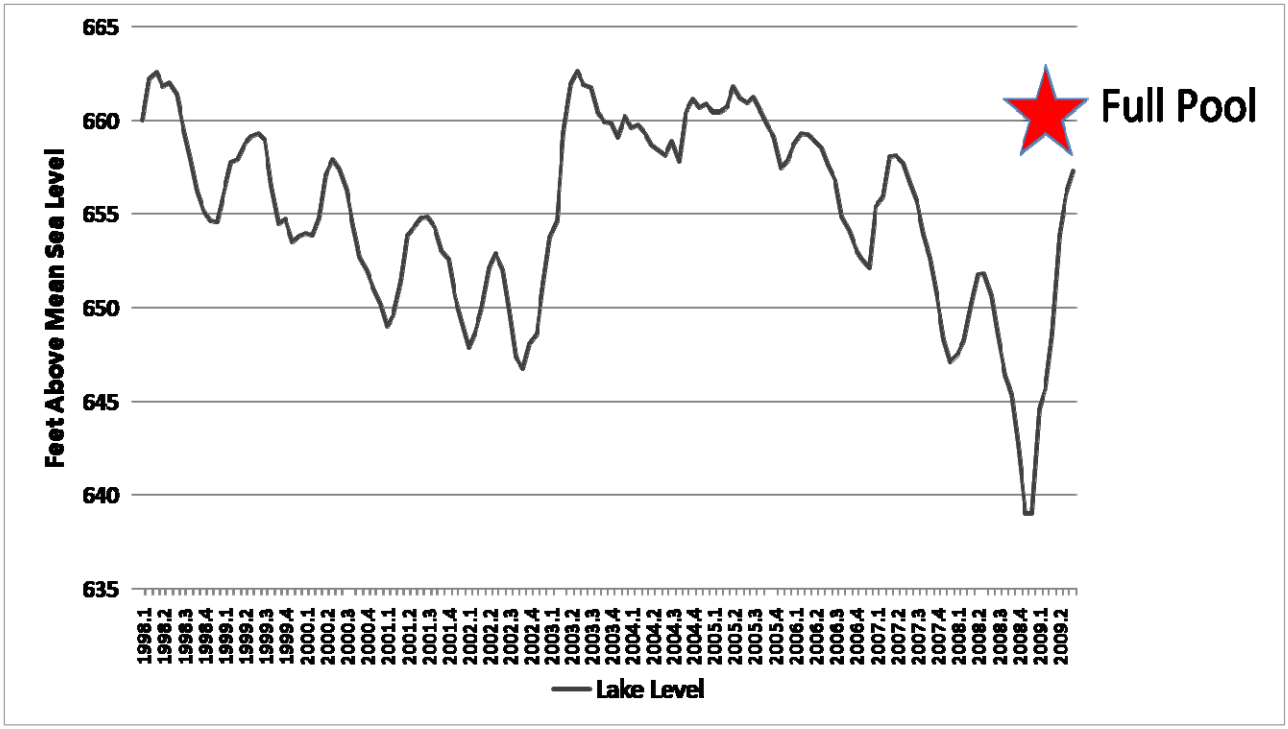


**Figure 1: Lake Hartwell average monthly lake levels in feet above mean sea level.**
**Source: United States Army Corps of Engineers, http://www.usace.army.mil/**

lower bound estimate of the economic impacts of higher lake levels (University of Tennessee, Center for Business and Economic Research, 1998).

## METHODOLOGY AND DATA COLLECTION

A thorough economic impact analysis attempts to measure direct, indirect and induced economic impacts of specific types of economic activity. Because this research is a portion of a much larger study measuring the overall economic impact of drought on the six counties, this study only addresses one measure of economic activity. The essential independent variable is Lake Hartwell's average monthly level measured in feet above MSL. Gross sales in industry sectors identified as having a potential connection to lake-oriented activity was used as the measure of economic activity. Data was collected for monthly lake level from 1998-2008. Due to limitations in data availability, monthly gross sales were only available at the necessary level of detail from the South Carolina Department of Revenue (DOR) for the years 2005 through 2008, and from Georgia DOR for July 2001 through the end of 2008. Georgia gross sales figures were calculated from gross sales tax receipts. All dollar amounts were discounted for inflation.

Two stages of analysis were used to model the impact of changes in gross sales associated with lake level on the overall economy in the six-county region. First, linear regression models were utilized to characterize this relationship. Independent variables for seasonal variation and general economic conditions were also used to control for other key determinants of sales activity. Models were run on a county-by-county basis, and only those sectors that showed a statistically significant correlation with lake levels were included in the second stage of the analysis. Due to apparent substitution effects between Lake Hartwell and Lake Keowee, a Duke Energy lake that shares shoreline with Oconee and Pickens counties and has a more stable water level than Hartwell, some sectors had to be modeled using non-linear regression techniques. The total impact from changes in gross sales, including all "spillover"effects, was then estimated using the Regional Dynamics (REDYN) input-output (I/O) modeling engine.

## RESULTS

The regression models indicate a statistically significant relationship between economic activity, as defined by county-level gross retail sales, and lake level, as measured as percent BFP, in the six-county region. R-squares from these models range from a low of 0.2 to a high of over 0.4, revealing that between 20 percent and 40 percent of the variation in county gross sales can be explained by these statistical models. The sign of coefficients for each industry sector vary, however. It is

hypothesized that this is due, in part, to substitution of other types of activities for lake recreation during times of drought. For example, the models indicate that residents of Stephens County spend less at boat dealerships when lake levels are lower, but more at restaurants. The results from the I/O model indicate a positive correlation between lake level and the regional economy overall. Taken individually, however, two counties – Oconee and Stephens – showed a negative correlation. For Oconee County, this is believed to be largely due to possible substitution effects from Lake Keowee. For Stephens County, it may be explained by the distance of the county's primary economic center, the city of Toccoa, and thus its disassociation, from the lake.

## CONCLUSION

While Lake Hartwell was primarily constructed for purposes of flood control, navigation, and power generation, it has become a component of regional economic activity. The lake is an attractive location for retirees from Georgia, South Carolina, and other states which, along with other factors, have encouraged luxury real estate development on and near the lake, as well as new retail and service businesses associated with that type of growth. Communities and neighborhoods around the lake now strongly identify themselves with Lake Hartwell. As a result, two major droughts in the period between 1998 and 2008 have highlighted concerns about lake level management and the effect on local economies.

This study was a part of a much larger analysis designed to estimate the amount by which changes in lake level affect local economic activity. For this research, the economic variable of interest was gross sales in selected industry sectors. Our findings indicate that, while the overall correlation between sales and lake level is positive, the sign of the coefficients varies between sectors and counties. This may indicate that individuals will substitute other types of activities, such as eating out or shopping, for lake activity during times of drought. Variation in impact between counties may be explained by the presence of a substitute recreation destination – in this case, Lake Keowee – or by the disassociation of the county's economic center from the lake. We hypothesize that the diversity of economic activity in these six counties may serve as a mitigating force in reducing the overall impact that declining lake levels may have on general economic activity across the region.

## REFERENCES

United States Army Corps of Engineers (2009). http://www.usace.army.mil

University of Tennessee, Center for Business and Economic Research. (1998). *Economic and Fiscal Consequences of TVA's Lake Draw-Down of Cherokee and Douglas Lakes.* Prepared for the Tennessee Valley Authority, October 1998.