



Citizen Volunteer Water Quality Monitoring of Alabama's Reservoirs



...special lakes
worth protecting



Lake Wedowee
Alabama Water Watch
June 2003

Introduction to the Alabama Water Watch Reservoir Series

Alabama has a few natural lakes, but from the 1920s to the 1960s, about 40 large reservoirs were constructed on several major rivers throughout the state. These man-made lakes were primarily created for hydroelectric power, navigation, flood control and irrigation. Over the years, they also have become increasingly important for lake-front real estate, drinking water sources and recreation points for fishing, boating and other water sports. Because of their high economic, social and ecological value, Alabama's reservoirs have been extensively studied by power companies, governmental agencies, universities and others. Too often, however, this important information remains in technical reports that are not easily understandable or accessible to the general public and key decision makers.

Since 1993, many citizen groups have been voluntarily collecting water quality data on reservoirs as a part of the Alabama Water Watch program. Most of these groups are established lake associations or "Home Owner/Boat Owner" organizations (HOBOS) which have strong interests in the safety and quality of their lake. The purpose of this report series is to feature AWW reservoir groups and present a summary of their activities, data and issues that will lead to further discussion and action. Whenever possible, the citizen information is supplemented and compared with professional data to give a more complete picture of lake quality.

These reports are intended for policy makers, educators and all citizens who are concerned about our lakes. You are invited to read, ponder and comment on this information. Better yet, become an AWW water quality monitor and join a growing group of dedicated citizens who volunteer thousands of hours per year to learn about and protect our magnificent lakes!

Current Titles:

- Volume 1 Lewis Smith Lake
- Volume 2 Lake Martin
- Volume 3 Weiss Lake
- Volume 4 Lake Wedowee

Future Titles:

- Lake Guntersville
- Neely Henry Lake
- Lay Lake
- Lake Logan Martin
- ...and others!

Abbreviations:

- LWPOA (Lake Wedowee Property Owners Association)
- AWW (Alabama Water Watch)
- AWWA (Alabama Water Watch Association)
- AU (Auburn University)
- ADEM (Alabama Department of Environmental Management)

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Largemouth bass,
Micropterus salmoides

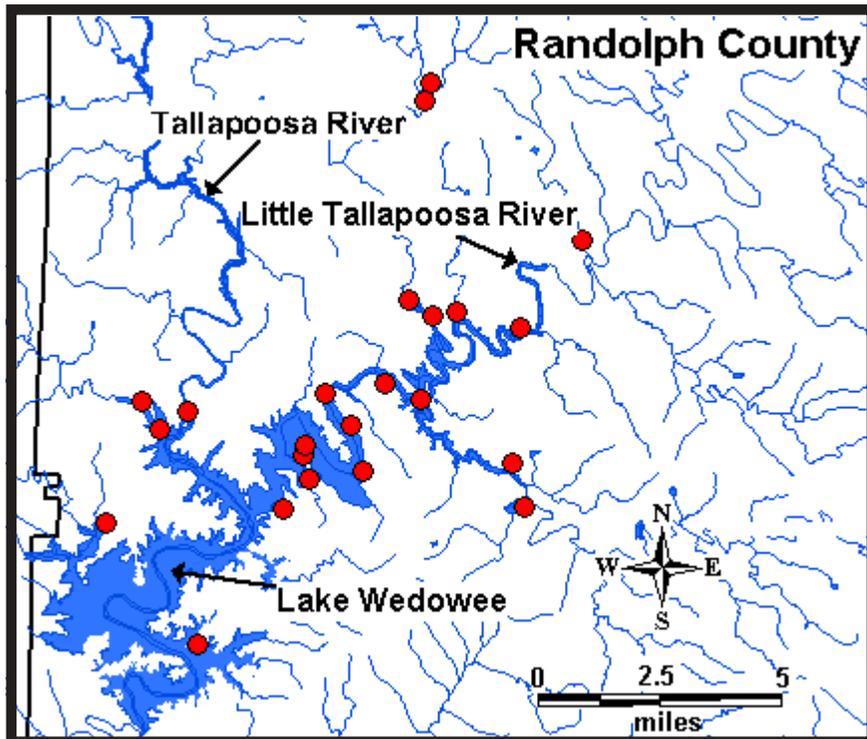
Cover photos: Top Left: Kids competing to catch fish at Fishing Derby; Top Right: Ellene Pool, Chuck Smith, and Gleason Pool testing water; Bottom Left: R.L. Harris Dam; Bottom Right: Spotted bass, *Micropterus punctulatus*.

Lake Wedowee...Facts and Figures

- Lake Wedowee, also known as Harris Reservoir, is an impoundment of the upper Tallapoosa River located in Randolph County, AL. The watershed of this reservoir begins in Georgia and covers 1,453 sq. miles (note: a watershed is the total land area that drains to a common point such as a lake, larger river or the ocean). Lake Wedowee is one of the newest lakes in the state and was formed by the construction of the R.L. Harris Dam, begun in 1974 and completed in 1983.
- The 10,700-acre lake is the second-largest reservoir on the Tallapoosa River (Lake Martin located in the middle part of the basin is about 40,000 acres). Lake Wedowee is approximately 25 miles long, with 270 miles of shoreline and a maximum depth of 135 feet.
- Wedowee is considered one of Alabama's cleanest lakes, and has been rated as one of the top three fishing lakes in the state by the Alabama Department of Conservation and Natural Resources.



The Tallapoosa River Basin in Alabama and Georgia with the Lake Wedowee region circled



Lake Wedowee Property Owners Association sampling sites (●)

- Many lake residents committed to lake protection formed the Lake Wedowee Property Owners Association (LWPOA) in 1997. Not long after, the group incorporated as an Alabama not-for-profit organization and has almost 500 member families as of June 2003.

- LWPOA became involved with Alabama Water Watch in 1998. Several members became AWW certified monitors and have collected water data from 36 sites on the lake and its tributaries. Over the last five years, they have submitted 500 water chemistry records and 230 bacteria records. Their data have become one of the most important sources of information about lake conditions and trends.



Bluegill, *Lepomis macrochirus*

What Do Volunteers Do?

- LWPOA volunteers attend one or more AWW workshops to become certified monitors of water quality. In the workshops, participants learn simple techniques for measuring various chemical, physical and biological characteristics of water, such as dissolved oxygen and bacterial concentrations (AWW 1998).



Channel catfish, *Ictalurus punctatus*



LWPOA Volunteers learn how to collect bacteria samples for determining *E. coli* concentrations in water.



With the Alabama Power Company, the LWPOA sponsors and participates in spring and fall lake clean-ups.

- LWPOA has a marine radio group with over 70 members who transmit sheriff office warnings of bad weather and who contact the Alabama Marine Police in the event of an emergency or stranded boater. They have also purchased buoys and cable which the Marine Police use to mark shallow or dangerous areas in the lake.
- LWPOA holds a *Kid's Fishing Derby* each May. Over 1,200 pounds of catfish are purchased and placed in a netted area in the lake for a fun day of fishing for children under the age of 16.

- The LWPOA and AWW have partnered with Randolph County agents of the Alabama Cooperative Extension System for organizing workshops and water data interpretation sessions. In this way, the general public may become aware of lake conditions and conservation measures.



A young angler shows his catch at the Fishing Derby.

Lake property owners learn facts, voice concerns

Apalachicola-Chautauque-Flint River System among others. Laird, states as well as...

by Vanessa Sarnell Burnside

Home called the runoff of a causing 4-foot drop in the lake "an unsatisfactory situation." He didn't know if a decrease in levels would be enough to impact one side or the other. However, he did say that a decrease in the amount of energy...

for dumping into the Chautauque. Another project, the Lake Wedowee property owners could be taking dumping into...

Kid's Fishin' Derby promises fun for all



Reeling in some fun... More than 220 kids came out to the Lake Wedowee Boat Club...

Letter to the editor

Lake property owners organize association to better community

Dear Fellow Lake Wedowee property owner, Many of you have expressed the need for and your desire to become a participant in a Lake Wedowee Property Owners Association. This letter is to introduce you to the LWPOA and invite you to a kickoff meeting on May 11 at 7 p.m. at the Hub Restaurant.



Kids' Fishing Derby on Lake Wedowee

Cooperative efforts helping boost Lake Wedowee's crappie population

Problems with the Lake Wedowee property owners... Cooperative efforts... Crappie population...



Lake clean-up



Water watch works

Wendy Hartup and Brooke Smith from Alabama Water Watch recently provided training and recertification in water monitoring to 27 volunteers in Randolph County. This group of certified monitors will work with Janice Davis and the Lake Wedowee Property Owners Association to keep a close eye on the water quality of Lake Wedowee.

Randolph Leader

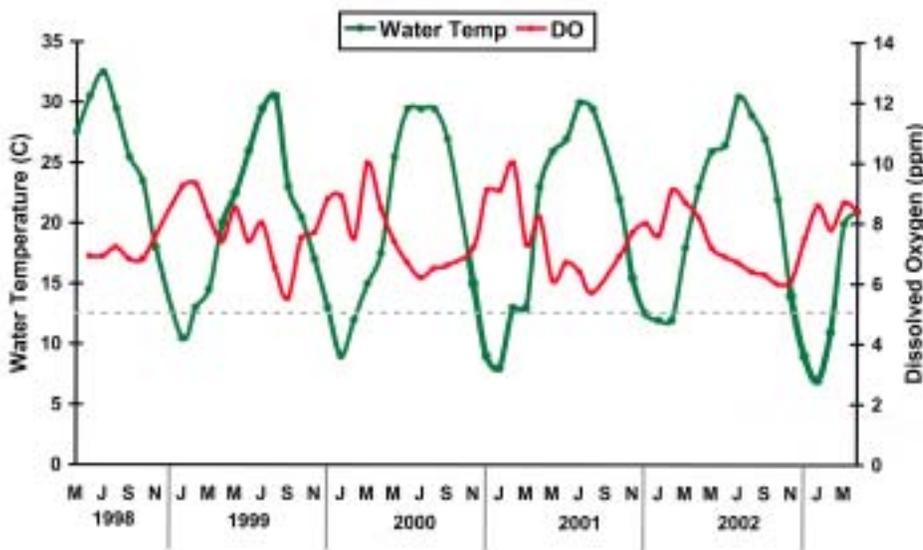
In addition to water quality sampling, several LWPOA members are active in environmental education, waterbody clean-ups and advocacy for greater awareness of lake issues.

What Have Volunteers Found?

- After several years of monitoring a particular site, valuable records of water quality conditions and trends are established. The following graphs on pages 6-11 document both seasonal and multi-year changes in water quality at several LWPOA sampling sites.

- The graph below documents a five-year trend of water temperature and dissolved oxygen (DO) concentrations at Site 1. Temperatures ranged from about 30-33 C (86-91 F) in summer to about 7-10 C (45-50 F) in winter. Oxygen values varied inversely with temperature (as expected) and ranged from about 6 parts per million (ppm) in the summer to 10 ppm in the winter. The DO values at the site were consistently above the minimum standard of 5 ppm that is required for the “Swimming and Other Whole Body Water-Contact Sports” use classification of the lake (grey dashed line on DO graph).

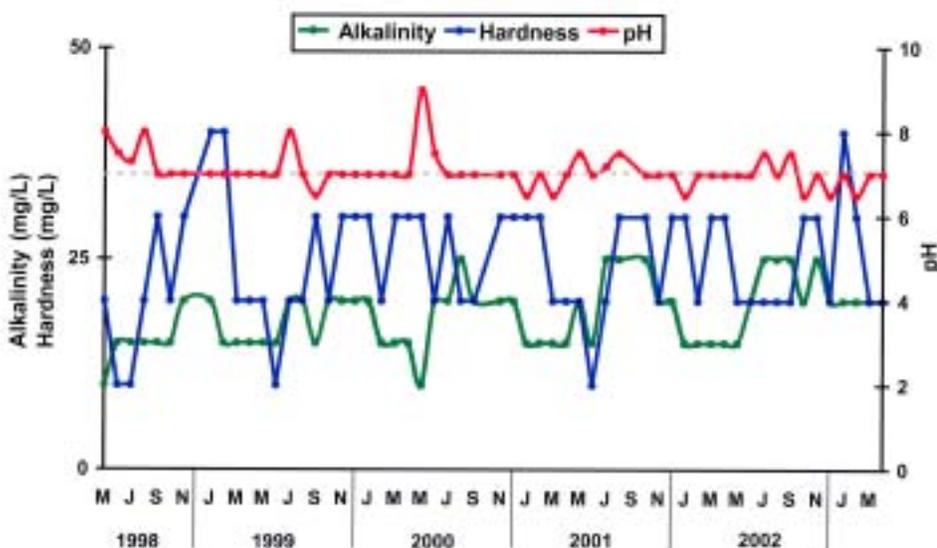
Site 1 (07004001): Joy and Joe Allen
16 miles N of Harris dam



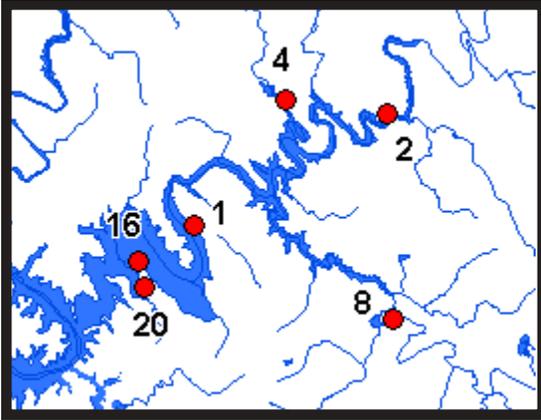
- Other important water quality variables monitored by LWPOA volunteers are alkalinity, hardness and pH. Alkalinity is a measurement of the water’s buffering capacity (concentration of carbonates and bicarbonates). Hardness is the concentration of minerals in water such as calcium and magnesium. The pH value indicates if the water is acidic, neutral or basic.



Black crappie,
Pomoxis nigromaculatus



- Data from Site 1 reveals that Lake Wedowee has low alkalinity (10-30mg/L), moderately soft water (10-40mg/L) and a neutral pH (usually 7.0; grey dashed line on pH graph). These water quality values have been relatively stable over the last five years. Such conditions are typical of other LWPOA sites and other waterbodies in the Piedmont area of Alabama because this physiographic region has relatively infertile soils, insoluble granite deposits and little natural limestone (calcium carbonate).

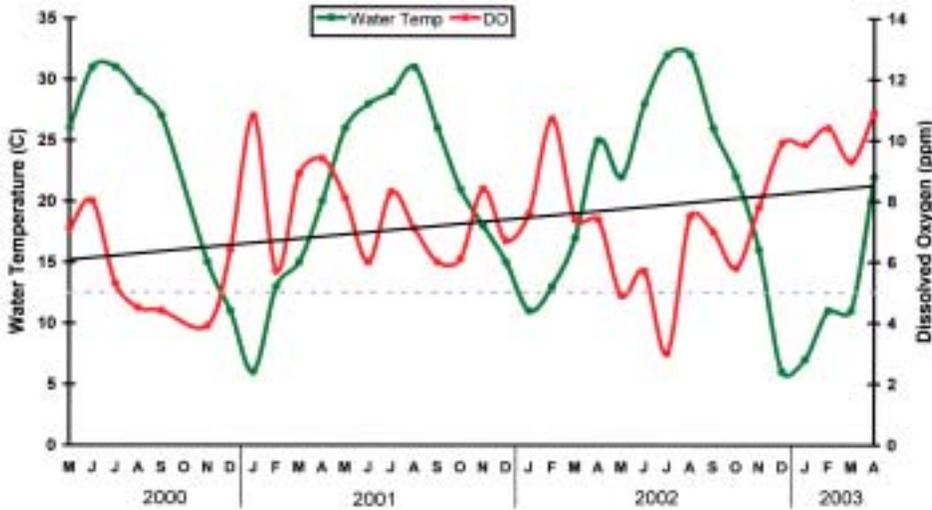


Map of Lake Wedowee with Sites 1, 2, 4, 8, 16 and 20

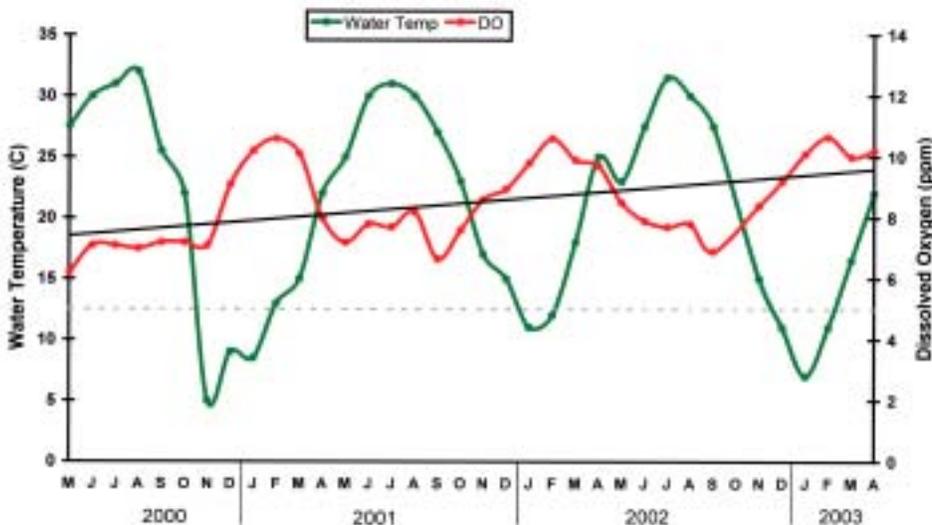


Charles Vance and Ron Newsome measure DO in the lake.

Site 16 (07004016): Jack Duncan
Dock at lot 43, Crescent Manor CR 240



Site 20 (07004020): Floyd and Janice Davis
Lot 216, CR 2404 Allen Creek (Dan Williamson's dock)



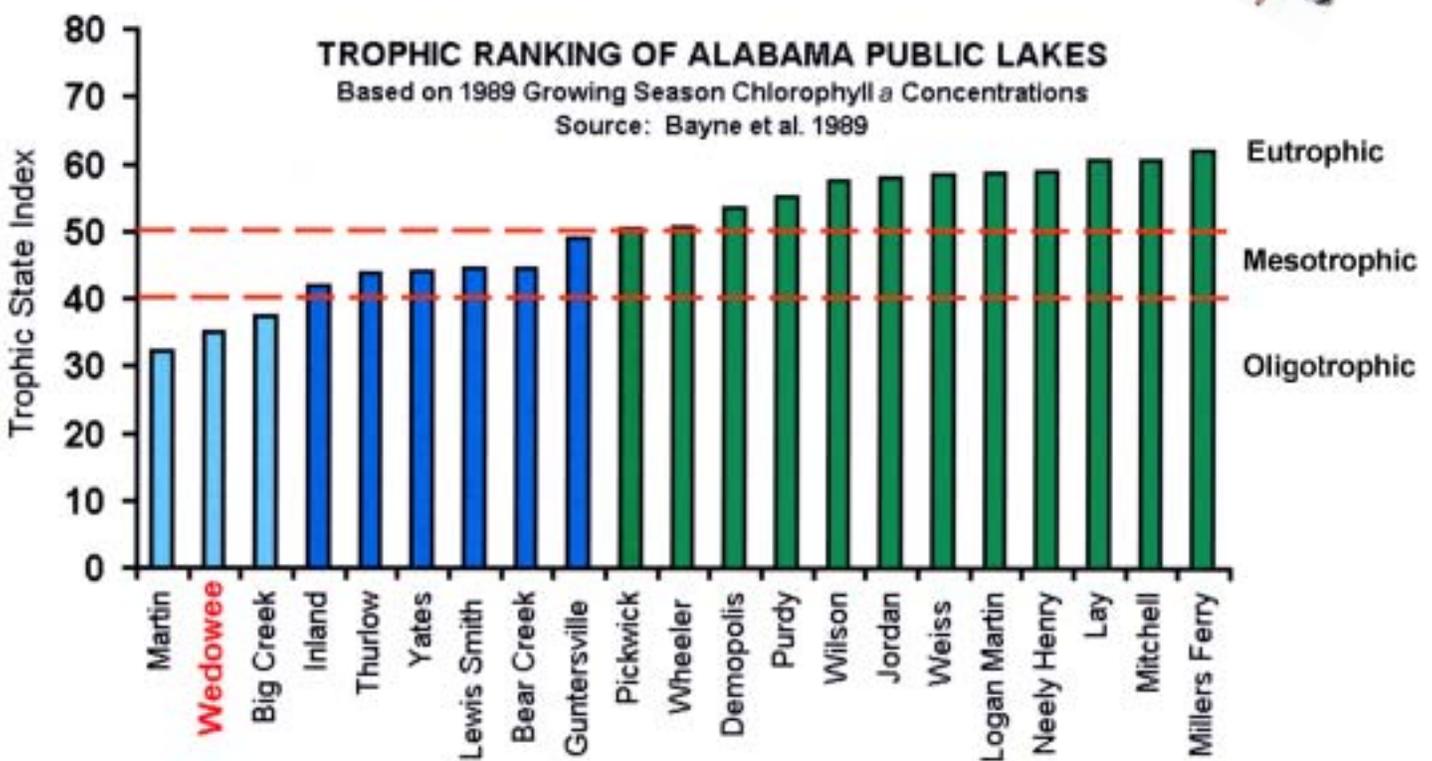
- The statistical trend lines for dissolved oxygen at sites 16 and 20 (black lines on graphs) suggest that DO concentrations have been increasing over the last 3-4 years. Similar trends also seem to be occurring at sites 2 and 4. Higher DO levels generally indicate a healthy lake with decreased risk of fish kills and other adverse environmental effects.

- The reasons for increasing DO levels in Lake Wedowee are uncertain. They may relate to less pollution that consumes dissolved oxygen (such as from municipal wastewater or animal feeding operations) or to an increasing amount of nutrients (phosphorus and nitrogen) that result in growth of aquatic plants such as algae.

- Dissolved oxygen is produced by aquatic plants during photosynthesis, and it usually reaches a daily maximum in the early afternoon. Because citizen volunteers typically monitor the lake between 10 am and 2 pm, they are probably documenting the daily maximum DOs.

Lake Nutrients a

- Nutrients such as phosphates and nitrates are essential for supporting plant and animal communities in lakes, but excess amounts can cause environmental problems including algal blooms, spread of aquatic weeds, low nighttime DO and fish kills. Nonpoint sources of nutrients in Lake Wedowee include fertilizer runoff from lawns, gardens and agricultural land, and faulty septic systems. Point sources include eight, permitted wastewater treatment plants (7 in Georgia; 1 in Alabama) and some industrial discharges.
- The concentrations and biological effects of nutrients in lakes are used in a classification system called the “Trophic State Index,” or TSI. Oligotrophic lakes have low levels of nutrients, mesotrophic lakes have moderate levels and eutrophic lakes have high levels (AFA 1998). A lake’s TSI may be determined by the direct measurement of nutrients or from the concentration of a plant pigment called chlorophyll *a*.

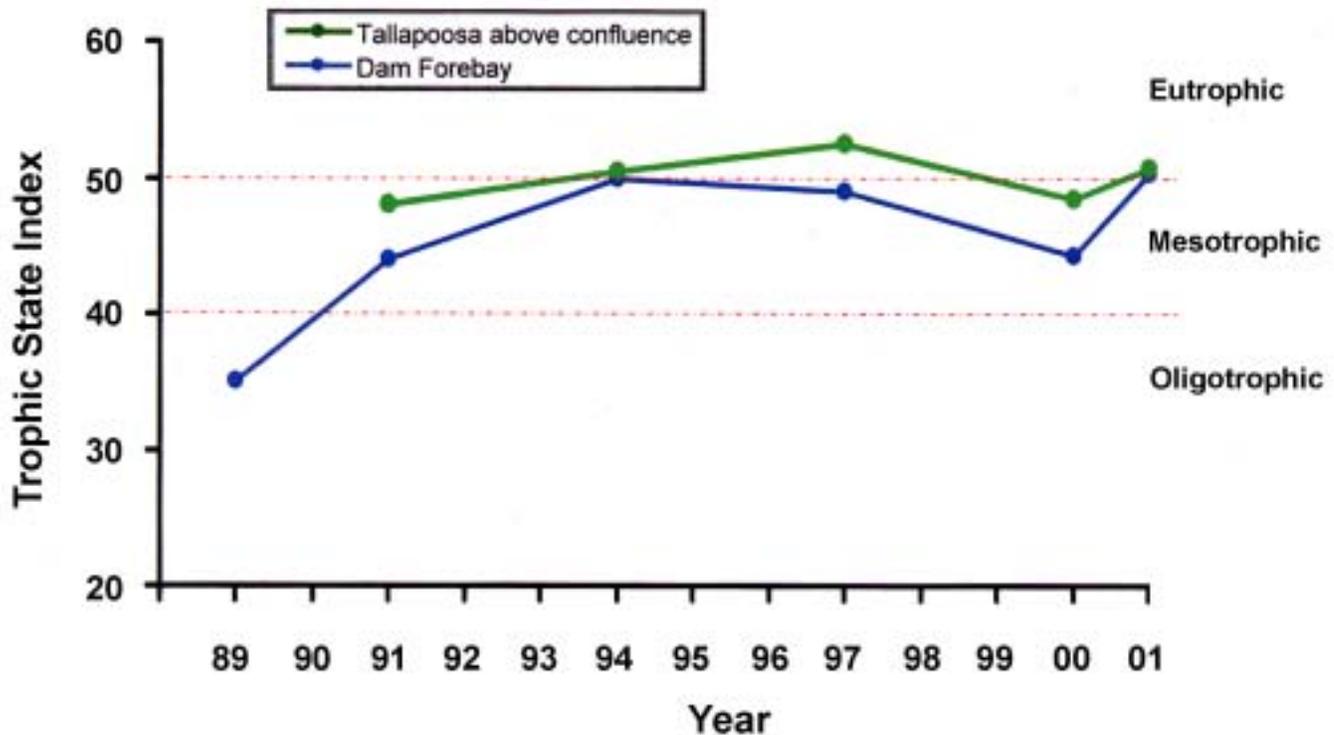


- A 1989 survey of the state’s reservoirs found that Lake Wedowee had relatively low levels of chlorophyll *a* (less than 2 micrograms per liter, or $\mu\text{g/L}$) and it was, therefore, ranked as oligotrophic (see graph above). This designation supported the reputation of Wedowee as being a clear, clean lake.
- In general, reservoirs in the Tallapoosa Basin (Martin, Yates, Thurlow and Wedowee) had low TSI’s, primarily because the watersheds were largely forested and in a region of low natural fertility.

and Trophic State

Lake Wedowee Trophic State Index, 1989-2001

Sources: Bayne et al. 1989; ADEM 1996, 1999, 2000, 2002



- Between 1989 and 1997, the lake's concentration of chlorophyll *a* increased about 10-fold (ADEM 1999), and the trophic state changed from oligotrophic to eutrophic (see graph above). With higher nutrient inputs, the lake has become more productive. As a result, both fish growth rates and biomass have increased.

- Alabama has recently begun to initiate lake nutrient standards based on chlorophyll *a* concentrations. The new standard for Lake Wedowee, established by ADEM in 2001, is 12 $\mu\text{g/L}$ of chlorophyll *a* in the upper part of the lake, and 10 $\mu\text{g/L}$ at the dam. This standard will, ideally, maintain the lake in a productive state for good fishing and prevent excess nutrient problems.



Tom Hoggle and Larry Raughton measure lake water clarity using a Secchi Disk.

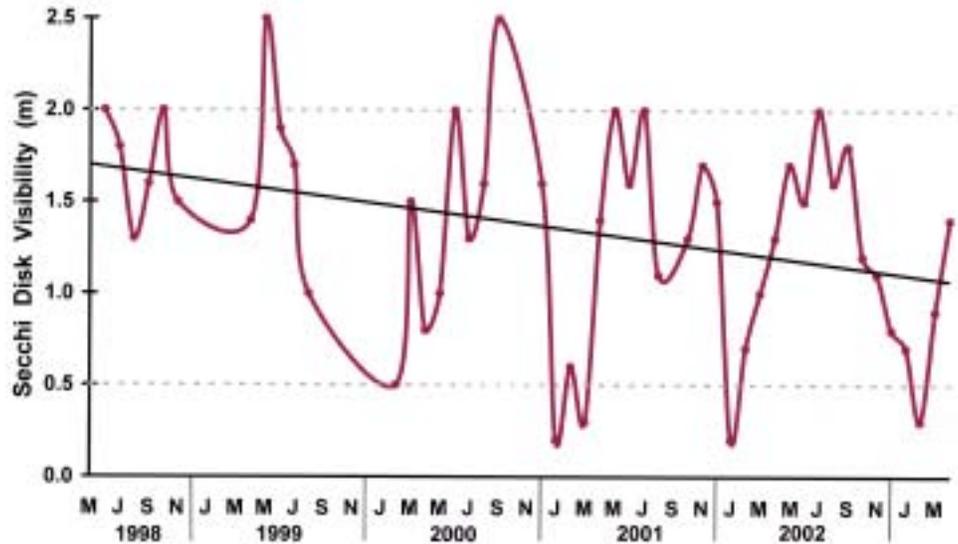
Trends in Lake Clarity



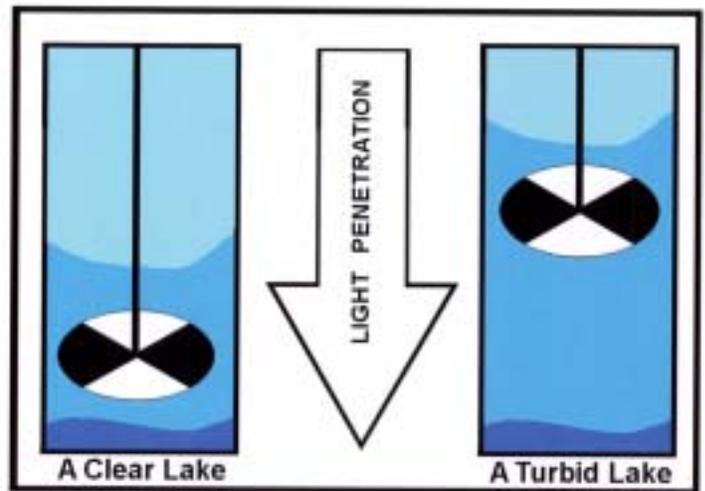
- The clarity of lake water is often measured using a simple device called a Secchi disk. The disk is 20 cm (8 in.) in diameter, with black and white quadrants and an attached line marked in meter increments. It is lowered into the water from a boat or dock, and Secchi depth is recorded as the distance from the water surface to the greatest depth at which the disk is still visible.

- Secchi depth at Site 1 has been decreasing since 1998, indicating that the lake is becoming more turbid. Lakes generally become turbid because of either increasing concentrations of nutrients which stimulate phytoplankton blooms (microscopic algae that turn the water green), or increasing amounts of suspended soil (that turns the water brown).

Site 1 (07004001): Joy and Joe Allen
16 miles N of Harris dam



Unvegetated lakeshore is a source of erosion and increased lake turbidity.



- The seasonal and yearly patterns of Secchi depth at Site 1 offer important clues about the sources of turbidity. Lake clarity is considerably lower in the winter and increases in the summer (see graph above). This indicates that the primary source of turbidity at the site is suspended soils, eroded from the lakeshore or washed in from tributaries. Water levels of Lake Wedowee are typically drawn down in the fall, exposing unvegetated shoreline to winter rains and erosion.

- Decreasing water clarity at Site 1 may also be caused by increasing plankton blooms in summer. The summertime Secchi depth reached 2.5 m in 1999 and 2000, but was only 2.0 m in 2001 and 2002.

Citizen Data Reliability and Recommendations

- LWPOA water monitors have collected a considerable amount of water quality data since 1998. This information generally confirms the findings of previous studies conducted by ADEM and greatly expands the amount of data, with more sites and greater sampling frequency.

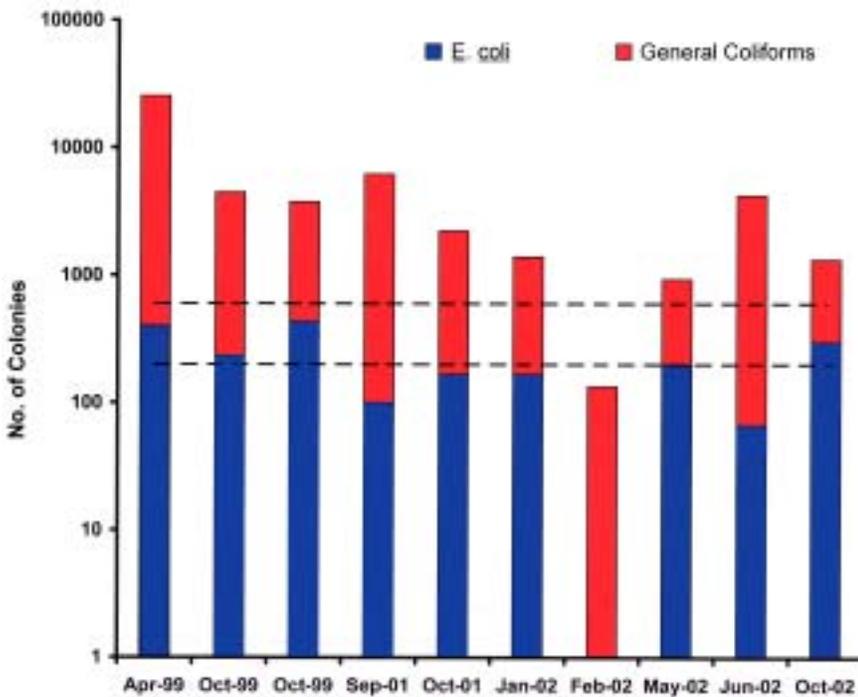
- A comparison was made of about 50 water quality samples collected at three sites (Dam Forebay; Mad Indian embayment; Little Tallapoosa River) during similar months in 2000 by LWPOA (21 samples) and ADEM (31 samples). Both data sources confirmed that Lake Wedowee had good levels of oxygen (6.3-8.6 ppm) and that the water had relatively low hardness (10-30 mg/L) and alkalinity (8-20 mg/L). Measurements of pH were virtually identical (7.0-7.4).



John Swann gets certified in chemical monitoring.



Site 8 (07004008): Janice and Floyd Davis, J.B. Stanley
East of Wedowee Creek bridge, West of CR 133



Bacteriological monitoring in Wedowee Creek documented the presence of *E. coli* in nine of ten samples collected from April 1999 to October 2002. Upper and lower dashed lines on graph represent concentrations of 600 and 200 colonies per 100mL of water, respectively. Concentrations of *E. coli* exceeded safe limits (200 colonies/100mL) for swimming on four occasions. Fecal coliform bacteria were the most commonly listed cause of failure to support designated uses in tributaries of the upper Tallapoosa River Basin in GA (EPD 1998).

- The LWPOA volunteers have generally found that lake water quality is good, however, there are some water pollution issues that need to be addressed.

- The U.S. Environmental Protection Agency (EPA 1998) and ADEM have developed a registry of impaired segments of waterbodies statewide that is called the 303(d) List. Wolf Creek, which enters the Little Tallapoosa River upstream of Lake Wedowee, is listed because of contamination by pathogens, ammonia, organic enrichment and periodic low oxygen levels. Animal feeding operations were listed as the potential source of this condition.

- Water monitors provide a valuable service to the lake community and to managers of Lake Wedowee. Consistent, future monitoring is encouraged with recommendations for LWPOA to expand Secchi disk and bacteriological monitoring, add nutrient monitoring and strategically test more lake tributaries (including 303(d) segments).

A Summary of Key Water Quality Issues

The Lake Wedowee Property Owners Association and Alabama Water Watch identified the following topics as important for discussion and action by all stakeholders in the watershed.

Lake Development

- How can fishing and water recreation be promoted with improved lake access and public facilities?
- How can the lake be made safer and cleaner with such things as county-wide garbage pick up and increased police patrol of boat ramps?



Citizens enjoy fishing and water recreation at a lakeside park.

Water Allocation and Flow

- How should water levels be managed to optimize lake use, minimize erosion, protect the downstream environment, conserve biodiversity and generate hydropower?
- How will the Alabama-Coosa-Tallapoosa Basin Compact (“water wars” agreement) and interstate water allocations affect lake levels, water quality, public water supplies and recreation?

“The upper reaches of the Tallapoosa River in Georgia and northeast Alabama are a true wonderland and among the most biologically rich in the world.”

- American Rivers report, April 10, 2003

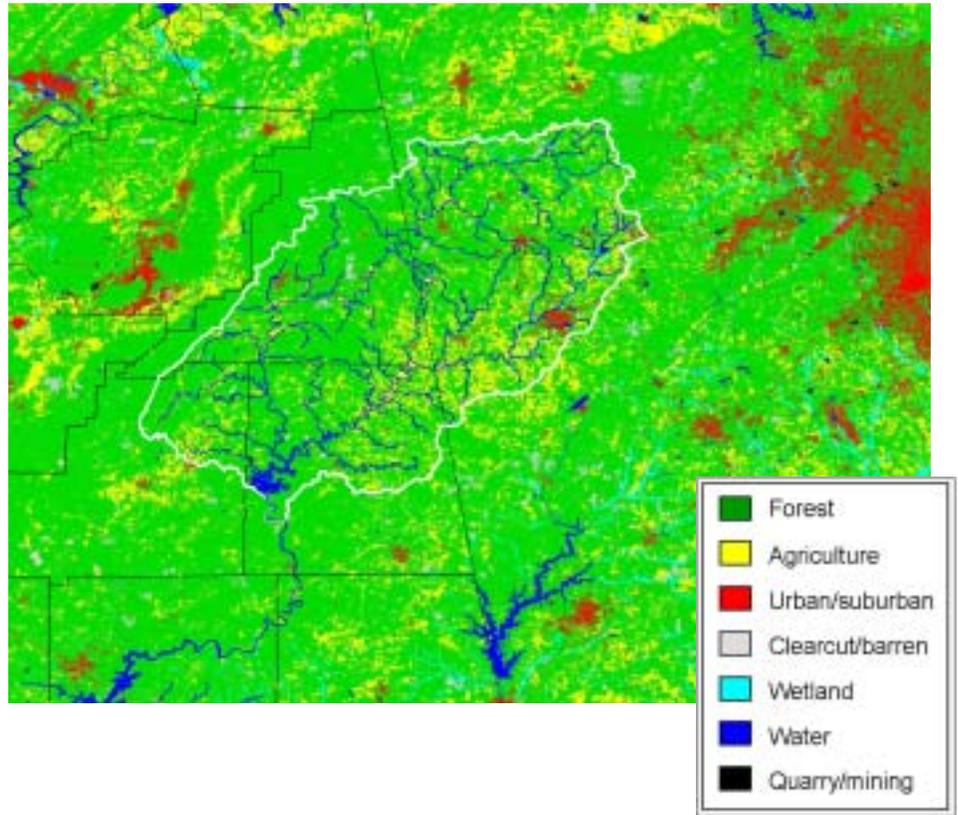


Several lake residents participate in an AWW workshop on water quality monitoring.

Stakeholder Action

- What are the roles of citizens and the Upper Tallapoosa Clean Water Partnership in protecting and managing Lake Wedowee?
- How can policy makers and legislators best be educated about key lake issues and needed actions?

An enhanced land use map generated from a 1992 Landsat Satellite image of the Lake Wedowee watershed (delineated with white line) and surrounding areas in Alabama and Georgia. Though much of the region is forested, rapid growth of Atlanta and the Atlanta-Birmingham corridor along Interstate 20 may have a profound effect on the future of the lake.



Watershed Management and Basin-Level Planning

- What are the current trends in land and water use within the Lake Wedowee watershed that will affect the lake in the future?
- How will the expansion of metro-Atlanta influence water quality/quantity and the development potential of east Alabama and the Lake Wedowee area?
- How can a consensus be attained for designing and implementing a comprehensive Basin Management Plan?



The natural beauty of this site on Lake Wedowee can be preserved through an active Clean Water Partnership of citizens, government, and business and industry.

Why Is Volunteer Monitoring Important?

Many citizens who cherish, live near and use Lake Wedowee want to be personally involved with lake monitoring and protection. They are capable of determining lake quality near their homes or favorite swimming and fishing sites, and deserve to be a part of lake and watershed development decisions...they have a *stake* in their *lake*!

Advantages of Local, Citizen-Based Water Monitoring

- large numbers of sampling sites
- frequent and consistent sampling
- “eyes and ears” for lake changes and polluters
- fast response time to detect and measure polluted runoff
- local awareness and public outreach
- neighbor-to-neighbor persuasion of polluters
- important data supplement to agency and research studies
- leads to science-based, citizen-involved action plans



Clockwise from upper left: Students from Wedowee Middle School get involved with a lakeside litter pickup. Don Willingham, Ray Mansfield and Jerri Mansfield get certified as water monitors. Rob and Debbie Haylock get hands-on experience as new, water quality workshop participants.

“I have lived previously on the Tennessee and Coosa Rivers and experienced first hand the deterioration of those river systems. When I retired and moved to Wedowee, I wanted to help to make sure this lake remained in pristine condition. Working with Alabama Water Watch and LWPOA volunteers has been a great experience. I have learned that Alabama should be proud of the job done to preserve the environment by professionals and volunteers.”
- Janice Davis, LWPOA Water Monitoring Chairperson

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A rare snowfall at Lake Wedowee

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The LWPOA Radio Club's annual fish fry

For Further Information...

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Boating into the sunset on Lake Wedowee

LWPOA Mission Statement

"The Lake Wedowee Property Owners Association (LWPOA) is dedicated to taking good care of the lake and making it a safe, clean and pleasant place for all."



Alabama Water Watch

Alabama Water Watch is a citizen volunteer water quality monitoring program, centered at Auburn University, that provides training, data management, information exchange and other means of support for the public to become personally involved in water issues. The AWW Association is a nonprofit affiliation of water monitoring groups and other interested citizens that promotes the AWW program and advocates better water quality and water policy in Alabama.

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