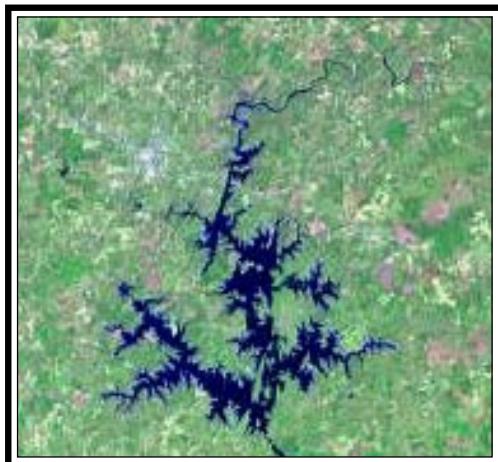




# Citizen Volunteer Water Quality Monitoring of Alabama's Reservoirs



...special lakes  
worth protecting



## Lake Martin

Alabama Water Watch  
February 2000

# Introduction to the Alabama Water Watch Reservoir Series

Alabama has 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 lakefront 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 part of the Alabama Water Watch (AWW) 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 present a summary of lake conditions and trends that have been found by AWW groups, along with identification of key 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



- Future Titles:**
- Volume 3 Weiss Lake
  - Volume 4 Lake Logan Martin
  - Volume 5 Lake Mitchell
  - Volume 6 Lake Jordan
  - Volume 7 Lake Wedowee
  - Volume 8 Lake Guntersville
  - ...and others!

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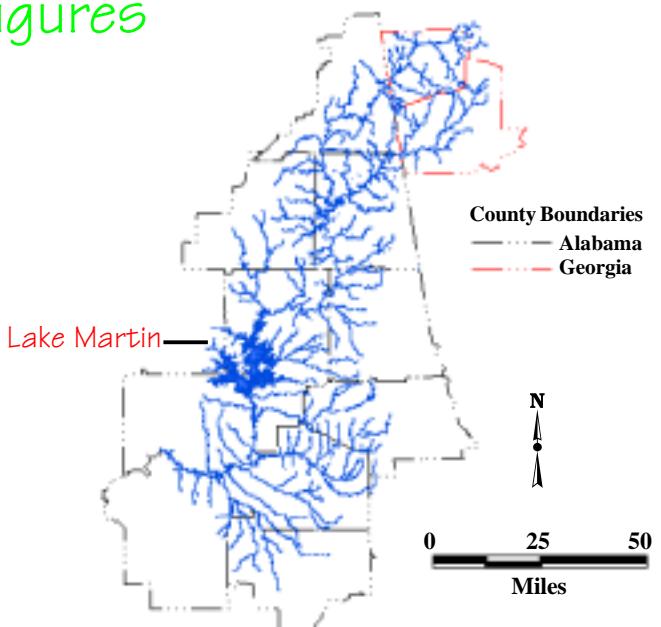
Cover photos: Top-left: Cahaba Lilies in shoals of upper Lake Martin; Top-right: John Glasier of Lake Watch of Lake Martin with students at Camp ASCCA; Bottom: Landsat Satellite photo of Lake Martin, November 1999.

# Lake Martin...Facts and Figures

- Lake Martin is located in east-central Alabama in Tallapoosa, Elmore and Coosa Counties. The lake's watershed extends into Georgia and covers 3,000 square miles (note: a watershed is the total land area which drains to a common point, such as a lake, a larger river or the ocean).

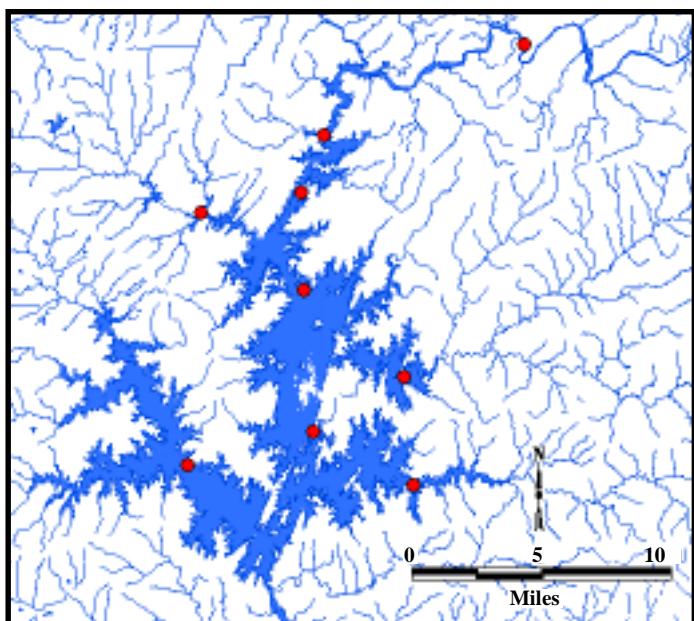
**"Water is something that is taken for granted. The Tallapoosa River and Lake Martin are the economic salvation for the county in the times we are in now."**

Betty Carol Graham, State Representative  
*Alexander City Outlook*, January 26, 2000



Lake Martin is in the Tallapoosa River watershed

- When dam construction was completed in 1926, Lake Martin was one of the largest reservoirs in the world. It has a surface area of 40,000 acres, and more than 700 miles of shoreline. The lake is the second deepest in the state, with a 168-foot dam and a water retention time of 190 days. It is commonly referred to as the cleanest lake in Alabama and possibly in the southeastern United States.
- The lake and its tributaries are part of the Tallapoosa River watershed. The Tallapoosa River joins the Coosa River just north of Montgomery, AL to form the Alabama River. This three-river system is called the "ACT Basin". The waters of Lake Martin eventually flow to the Gulf of Mexico through Mobile Bay.



Lake Watch of Lake Martin water quality sampling sites

- Citizen volunteers of Lake Watch of Lake Martin (LWLM) monitor the water quality of the lake. LWLM was the first group to join Alabama Water Watch (AWW) in 1993, and more than two dozen certified monitors have collected monthly samples on nine lake sites for more than seven years (see map). Information from 600 lake samples has been submitted to AWW for entry into the statewide water quality database, and most of this data set is summarized and posted on the AWW internet website.



## What Do Volunteers Do?



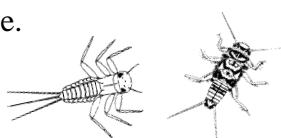
Bacteriological tests on Lake Martin

- Citizen 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 (Deutsch et al. 1998a). All monitors attend an annual refresher course to maintain good sampling techniques and replenish their test kits with fresh chemical reagents.

- The volunteer monitors help the AWW program keep accurate water quality data, and present the information to watershed residents, regulatory agencies, policy makers and other interested citizens. The citizen data set has become one of the most important sources of water quality information for Lake Martin.



- LWLM is active in environmental education and has trained students in various aspects of water monitoring and watershed protection through programs at Camp ASCCA (Alabama Special Camp for Children and Adults), Boys and Girls Clubs, Scouts, local high schools, and Central Alabama Community College.



Environmental education at Elkahatchee Creek



Watershed management workshop in the Philippines

- LWLM exemplifies the slogan, “Think Globally, Act Locally”. In partnership with international programs of Auburn University (AU), the group has hosted environmental specialists on study tours from the Philippines, Ecuador, Cape Verde, Panama, Honduras, Burkina Faso and Senegal. In September 1999, LWLM President Dick Bronson, traveled with AU/AWW personnel to the Philippines to conduct watershed protection workshops for representatives of 12 countries, including China, Mexico, Zambia and Poland.

## Lake Watch tests waters to protect lake

By Brian Moran

Photographer Editor

Some people have said Lake Martin is the cleanest lake in the state. One anti-group is trying to keep it that way.

Lake Watch of Lake Martin is part of the state-wide Alabama Water Watch Program that conducts monthly water quality tests at various sites on Alabama waters.

Lake Watch is started and run by Lake Martin homeowners concerned about the water quality in Alabama, Lake Watch president Dick Bronson said.

Members of Lake Watch test the water for dissolved oxygen, pH, turbidity, bacteria, nitrates,

litter, and fish something, we give Auburn University and ADEM and say, "We need professionals down here to really check it out." That's what Lake Watch does. We serve as an early warning system."

Information and the test results are not issued or put blame on any individuals.

"I'm not trying to find high levels to embarrass anyone. I want to work within the system to make improvements," Bronson said.

John and Vickie Glazier who live outside Dadeville on Lake Martin test the waters around Smith Landing on the Sandy Creek area of Lake Martin each month in part of the Lake Watch program.

"I am concerned with conserving the water quality of the lake," John Glazier said. "It's an excellent lake, and that's why I'm concerned with pollution. I want to do my part to maintain the high quality of the lake, which it has been chosen to state on."

Last week, a Montgomery man called Lake Watch to test the water near his home on the banks of Sandy Creek of Lake Martin because he was concerned about the quality of



Bronson/The Fisherman

## Testing the water: Bronson

If this guy likes to fish, there's probably a reason he does it, Bronson said.

Dear Mr. Bronson:

This is Hope, I just wanted to tell you that - I won!! First place in my school and first place in the County fair. I want to thank you for helping me. Whoops! Sorry. I also wanted to say - Thank you for teaching me how to work with this. I'm sorry for getting you know about this so late, it happened almost 2 weeks ago. Well almost 2 weeks ago. But, Thank you for everything. Hope to see you again.

Love,

Hope

## Rivers: Lake Martin homeowners concerned

By Brian Moran

Photographer Editor

The major problem we have is that our neighbors intend to take over the water in the Crimson River.

By moving the flow of the river, they will be able to develop a

new city of about 10,000 people.

It may never happen but the

people involved are worried.

They are worried about the

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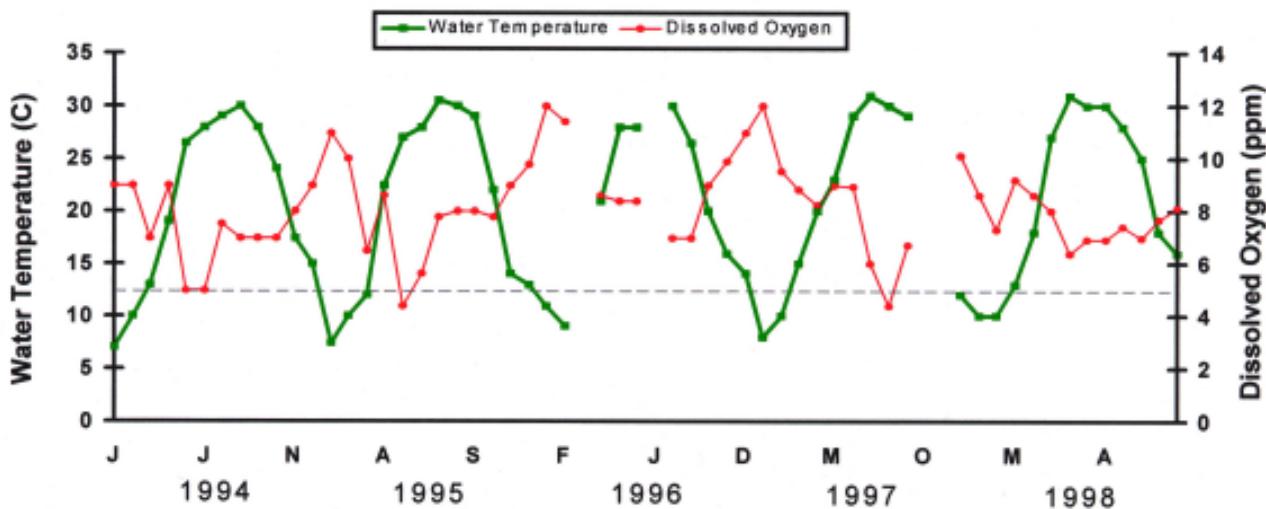
water quality in the Crimson River.

They are worried about the

# What Have Volunteers Found?

Site 2 (07001002) - Lake Martin at Elk's Lodge, Hwy 280

Citizen Monitors: BJ and Bill Niedermeier  
Bill and Linda Stewart



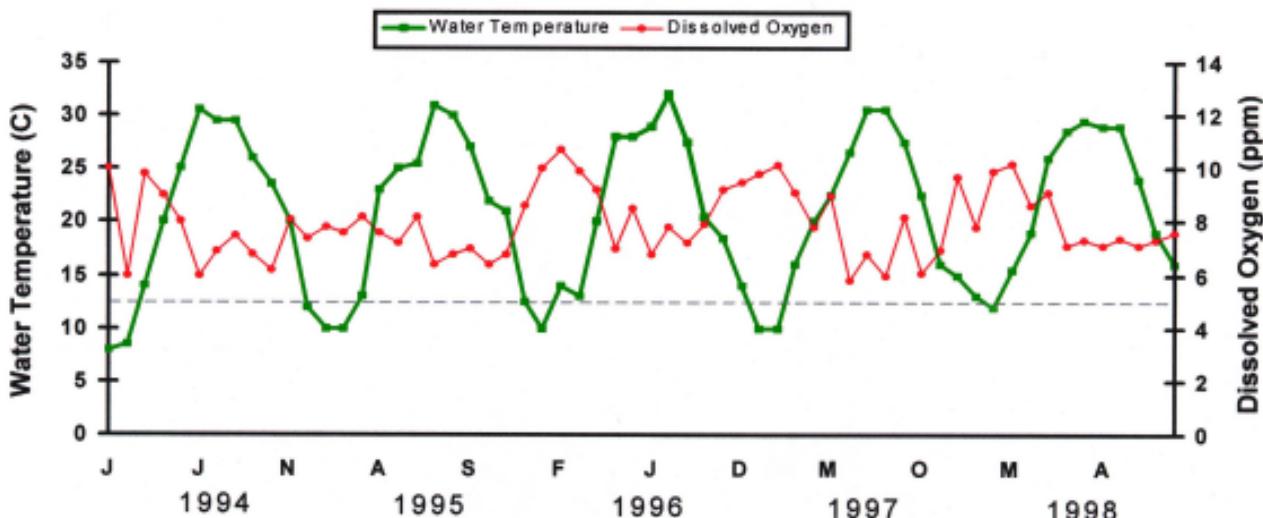
The gray, dashed line represents the minimum standard of dissolved oxygen (5 ppm) for waterbodies classified as 'Fish and Wildlife'. Sources of all data on pages 6 and 7: Deutsch et al. 1995, 1996, 1998b, 1998c, 1999.

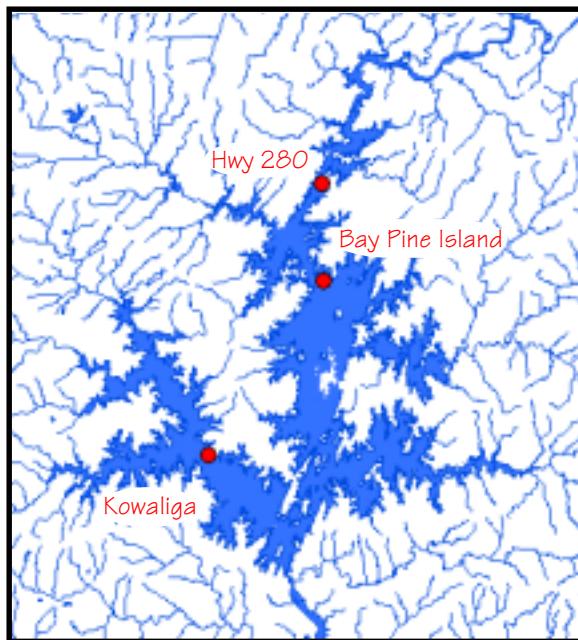
- After several years of monitoring a particular site, a valuable record of water quality trends is established. The three LWLM graphs on pages 6 and 7 document seasonal changes in water temperature and dissolved oxygen for a five-year period.



Site 3 (07001003) - Lake Martin at Bay Pine Island

Citizen Monitors: Dick and Mary Ann Bronson

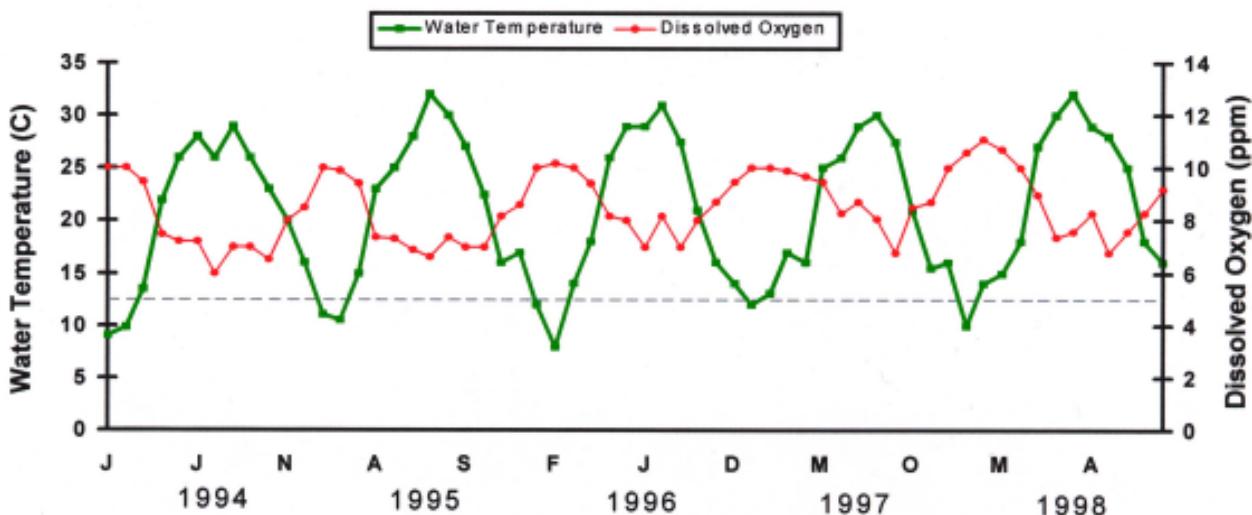




- Water quality at the three sites (see map) was generally similar. Surface water temperature of the lake varied from about 7 to 32 degrees centigrade (C) on an annual cycle. Dissolved oxygen (DO) concentrations fluctuated inversely with temperature (as expected) and ranged from about 6 to 11 parts per million (ppm) at sites 3 and 5. These DO values were consistently above the minimum 5 ppm required for the "Fish and Wildlife" classification.

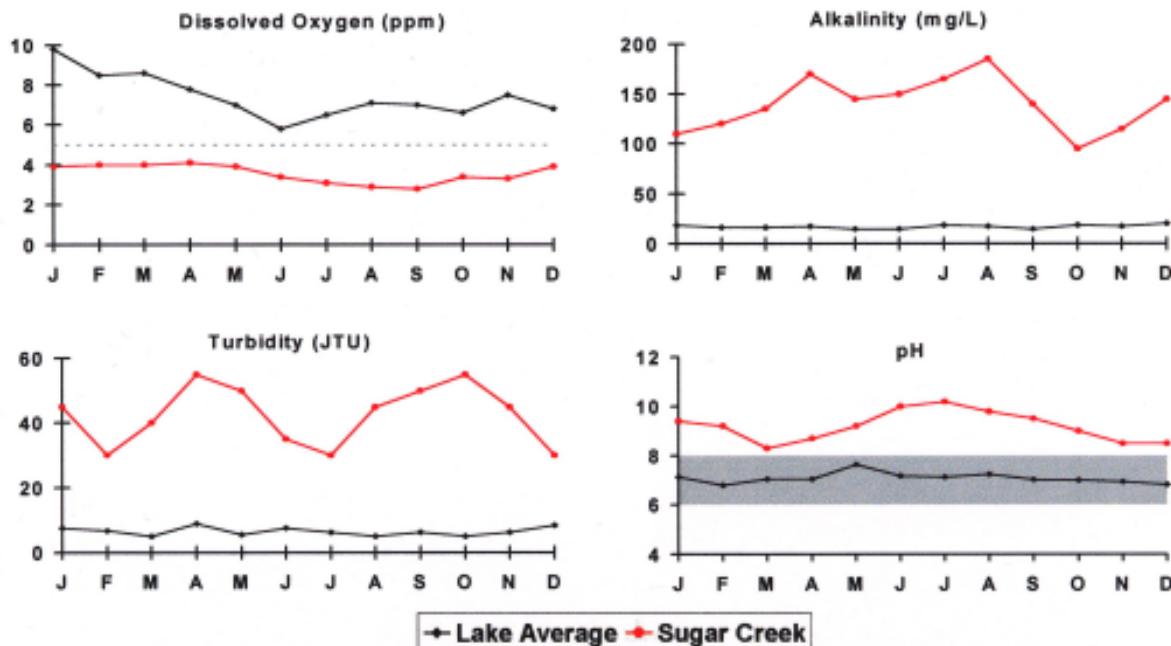


**Site 5 (07001005)** - Lake Martin at Kowaliga  
 Citizen Monitors: Stan and Virginia Pietrzykowski  
 Diana and David French



- Dissolved oxygen at site 2 (closer to effluents and runoff from Alexander City) was sometimes below 5 ppm in the summer, indicating pollution in the upper part of the lake.
- This water quality information reveals the importance of sampling several sites on a lake. Water quality often varies from place to place because of natural factors or pollution. Gathering data from many sites leads to a better lake assessment and better lake management.

# Urban Discharge . . . A Point of Concern



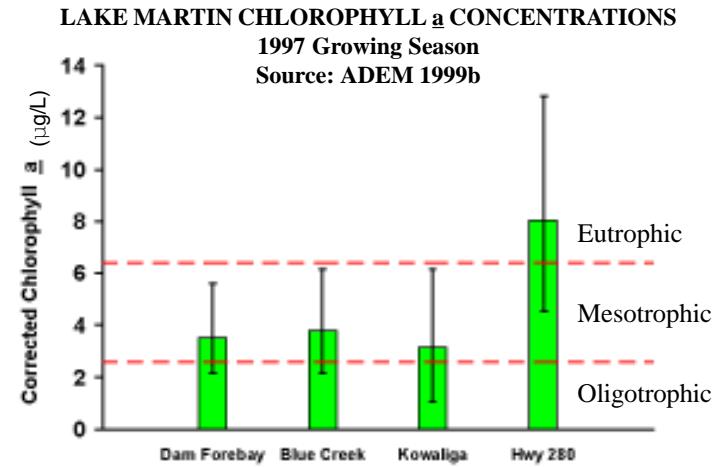
Data in red represent monthly readings recorded from Sugar Creek in 1994 and data in black represent monthly lake averages of readings recorded from four widely dispersed sites (LWLM sites 2, 3, 4 and 5) in 1994 (Deutsch et al. 1995).

- Urban discharges have degraded portions of the upper part of Lake Martin, probably contributing to the low oxygen levels detected at site 2 (p. 6). LWLM has monitored Sugar Creek, which flows from Alexander City (see map, p. 9), and found it to be of significantly poorer quality than the lake. The graphs above document that Sugar Creek had consistently low oxygen concentration, high turbidity and alkalinity, and a pH that was higher than optimal for aquatic life (gray shaded area on pH graph).

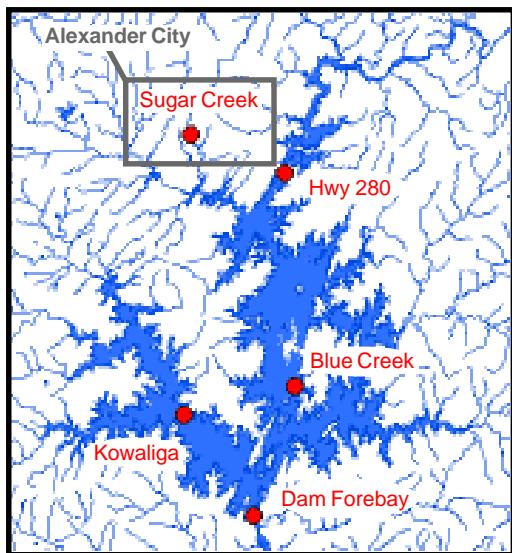


- The Alabama Department of Environmental Management (ADEM) has put Sugar Creek on the 303(d) list of impaired streams, and will develop a restoration plan (including a total maximum daily load or TMDL) to reduce creek and lake pollution.

ADEM has also detected excess nutrients (phosphorus and nitrogen) entering the upper part of the lake near Highway 280. Concentration of chlorophyll *a* (a plant pigment which is an indicator of nutrients) at the Hwy 280 site was twice as great as at three other lake sites, and in the “eutrophic” range of lake quality (see graph at right, and definitions on p. 10). ADEM (1999a) has indicated in its “305(b) Water Quality Report to Congress” that nutrients and other substances are pollutants “of concern” for the upper part of Lake Martin.

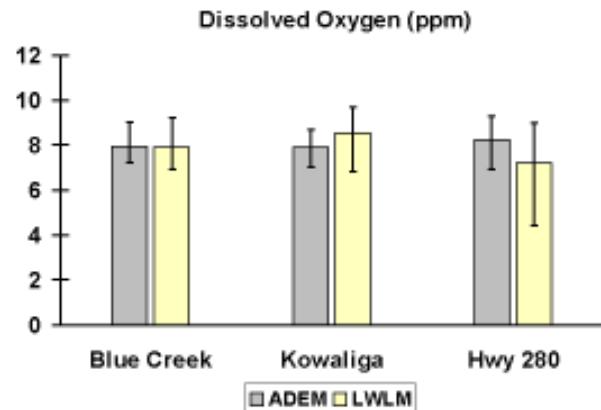
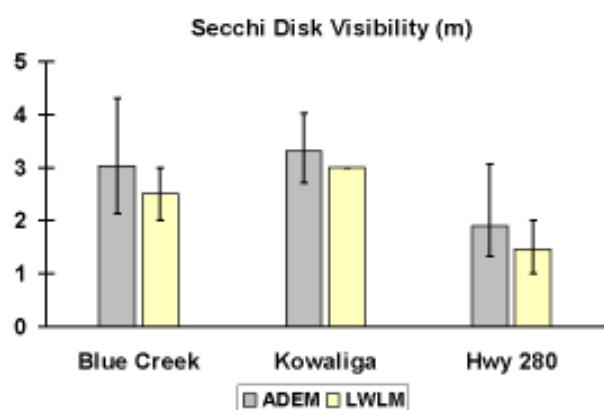
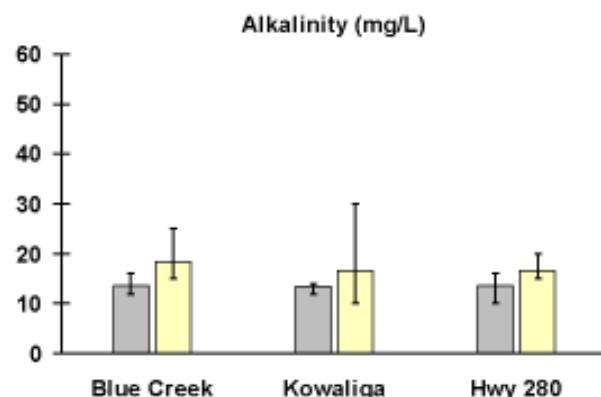
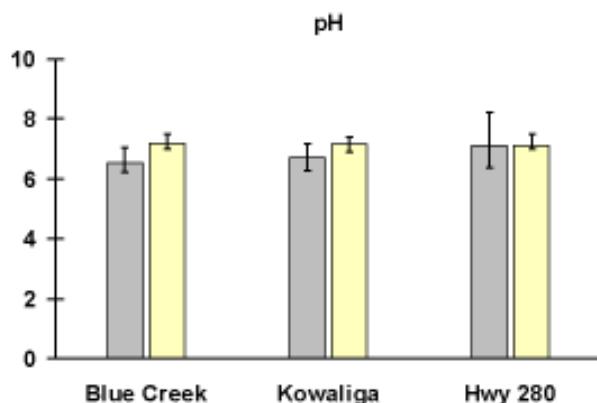


# Is the Volunteer Information Reliable?



- It is important to compare the citizen data of AWW volunteers with research data of universities and governmental agencies in order to test its reliability. The graphs below compare LWLM data with ADEM data for four water quality variables at three lake sites.

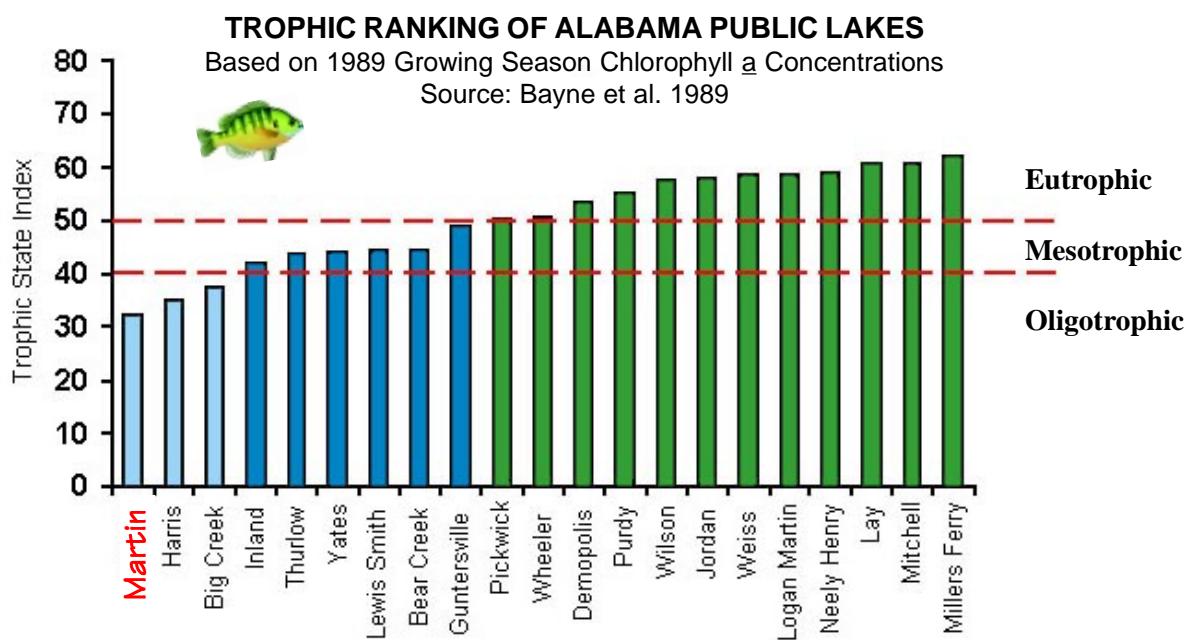
- In every case, citizen data compared favorably with research data, underscoring its reliability for use by lake managers and regulatory agencies. Of note was the lower Secchi disk visibility at the Hwy 280 site, detected by both ADEM and LWLM, which indicated pollution (algal “blooms” and other suspended or dissolved substances).



Lake Martin water quality information was collected in 1997 by ADEM and Lake Watch of Lake Martin near Kowaliga Bridge, the mouth of Blue Creek and the Highway 280 bridge (ADEM 1999b, Deutsch et al. 1998c). A bar represents the growing season (April through September) average of a variable, and the vertical line at the top of a bar represents the range of readings. About six samples of each variable were compared per lake site.

# What Does the Information Mean?

- Citizen volunteer data sets confirm the general impression that Lake Martin is clean, but that portions of the upper part of the lake are becoming degraded. This has been verified by ADEM, universities and others in studies that have been more technical but with less sampling frequency than that of LWLM.
- Lakes are commonly rated and compared according to their “trophic state.” This is related to algal densities stimulated by the amount of nutrients (especially phosphorus) received from the watershed. “Oligotrophic” lakes have low levels of nutrients, “mesotrophic” lakes have moderate levels, and “eutrophic” lakes have high levels (AFA 1998).
- It is generally believed that concentrations of an aquatic plant pigment, called “chlorophyll a,” is the best indicator to use for calculating the Trophic State Index (TSI). When TSIs are above 50 (eutrophic), this usually means that a lake is becoming polluted by too many fertilizers and other nutrients. In general, eutrophic lakes have larger fluctuations in algal blooms, dissolved oxygen concentrations and other water quality variables. This, in turn, stresses fish and can lead to fish kills.
- The graph below indicates that in 1989, Lake Martin had the lowest TSI of more than 20 lakes studied. In that sense, it was the “cleanest” lake in Alabama. Other lakes in the Tallapoosa River watershed (e.g. Harris, Thurlow and Yates) had generally lower TSIs, and lakes in the Coosa River watershed (e.g. Jordan, Weiss, Logan Martin, Neely Henry, Lay and Mitchell) had generally higher TSIs.
- What has happened to Lake Martin’s trophic state in the decade following this study?



*“Lake Martin is the jewel in the crown that is the Alexander City-Dadeville area.”*

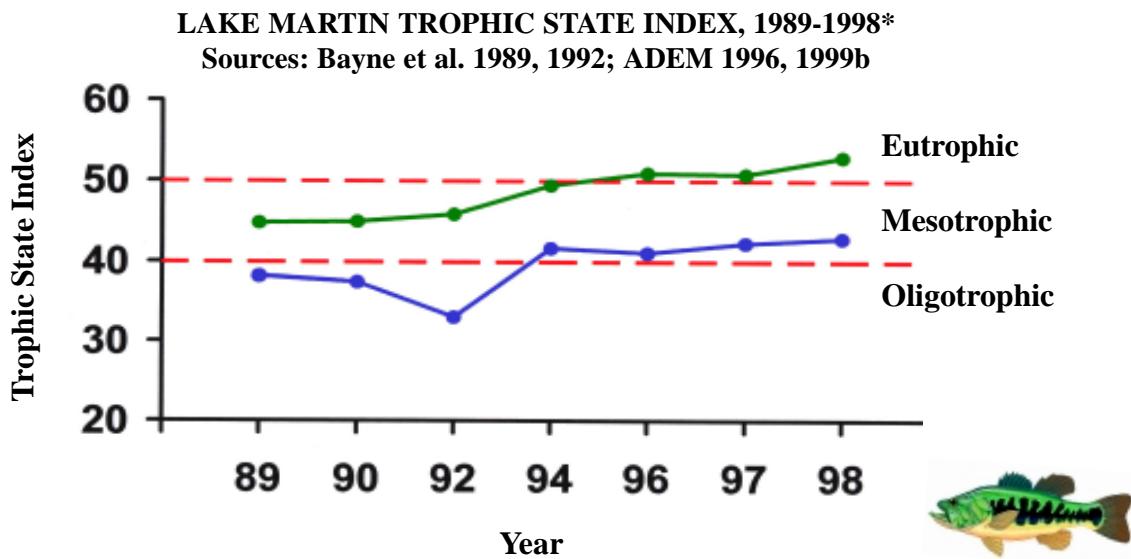
Bruce Wallace, Publisher

*Alexander City Outlook and Dadeville Record*

*“I have lived on or near Lake Martin all my life and wouldn’t want to live anywhere else in the world.”*

Doug Patterson, Striped Bass Fishing Guide, 8 years

# What Are the Water Quality Trends of Lake Martin?



\*For year-to-year comparisons, all chlorophyll **a** values were standardized with analytical methods used after 1990.



- The graph above represents research results of ADEM and Auburn University, and plots the changes in Lake Martin TSIs at both a lower lake site (blue line, Dam Forebay) and an upper lake site (green line, Highway 280 bridge crossing) over a ten-year period (see map, p. 9). Dots represent the average TSI for the growing season (April through September, 1-6 readings per growing season).
- At the lower lake site, the trophic state of the lake has changed from upper-level oligotrophic to lower-level mesotrophic. This present condition probably characterizes much of Lake Martin, and explains why the lake is still relatively clear and so attractive for fishing, swimming and other types of water recreation.
- The upper lake site is quite different from the lower site, however, and has changed from mid-level mesotrophic to eutrophic during this same period. The rate of increase in TSI is also somewhat greater than at the lower site.
- In summary, research information indicates that Lake Martin is undergoing changes due to human activity that results in increased polluted runoff from Alexander City and other parts of the watershed. Nutrients from lakefront lawn and garden fertilizers and faulty septic systems are also contributing to this “eutrophication” process. These changes are most obvious in the upper lake (closer to the main sources of pollution) and are gradually affecting the entire lake.
- It is important that the public and policy makers are aware of these trends, and that they collectively work toward protecting Lake Martin from further degradation. There is no such thing as a single trophic state that is “optimal” for all lakes, however. Ideally, each lake should be protected and managed according to the objectives of *all* stakeholders, including watershed residents and governmental agencies.

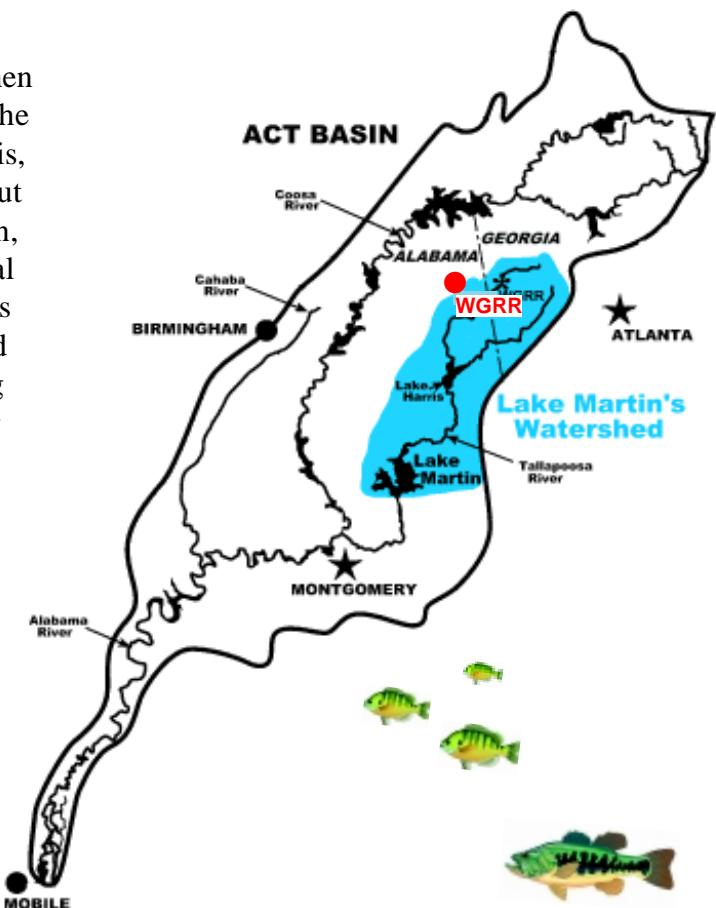
# The “Water War” and Lake Martin: Water Quantity versus Quality

- Even in the “water-rich” region of the southeast U.S., disputes over water allocations and flow are becoming more and more common. Most of Alabama’s large rivers originate in or flow to another state. Because watershed boundaries do not coincide with political boundaries, the challenges of wisely managing water resources are compounded.

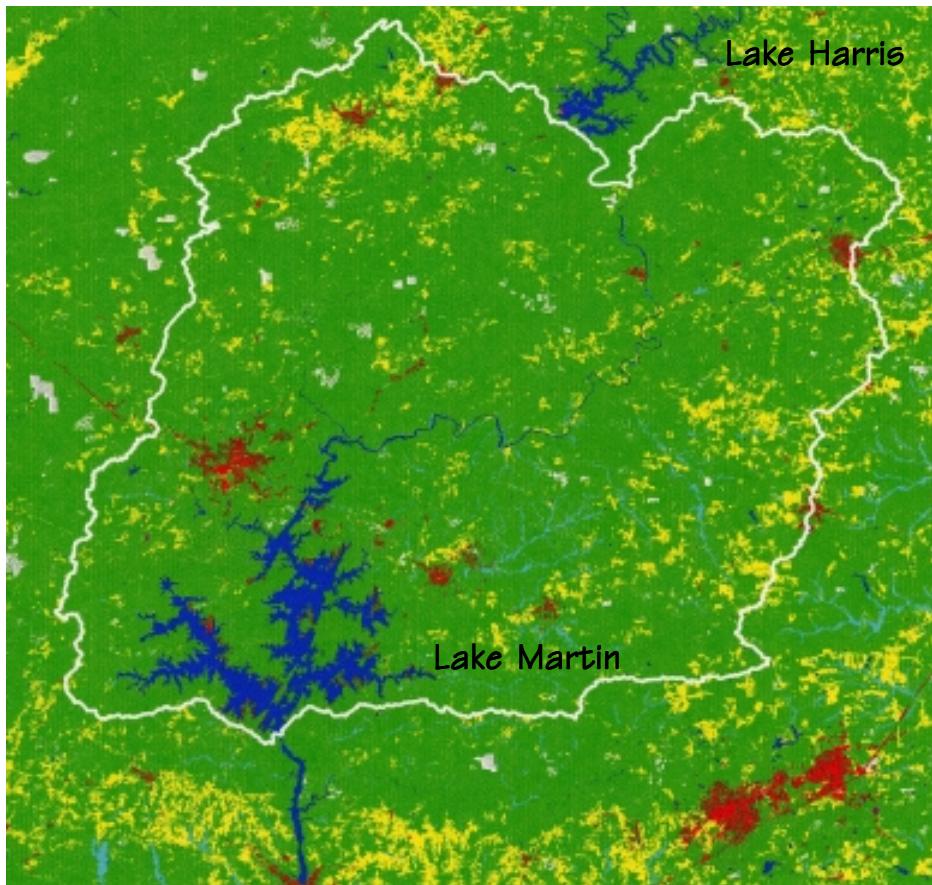
- This fact became obvious in the early 1990s when Georgia began planning for a large reservoir on the Tallapoosa River a few miles inside their state line. This, and the issue of water diversion by Georgia throughout the Alabama-Coosa-Tallapoosa (ACT) River Basin, was recognized as a major threat to Alabama’s vital water resources, including Lake Martin. Members of LWLM were at the forefront in the so-called “water wars”, and were effective in stressing the critical linkage between water quantity and water quality to officials from both states.

- Negotiations between Georgia and Alabama regarding the allocation of waters of the Tallapoosa River have been underway for more than two years. Regardless of when an agreement is reached, the results will certainly have an impact on Lake Martin. Consider the following: about 22% of Lake Martin’s 3,000 square mile watershed is in Georgia, and 8% would be controlled by the proposed West Georgia Regional Reservoir (WGRR on map). Additional Georgia reservoirs may be built on either the Tallapoosa or Little Tallapoosa Rivers, and population growth in the metro-Atlanta area suggests that water demands will increase and further threaten both water quantity and quality of Lake Martin.

- The linkage between water quantity and quality is critical. Population growth means increased water pollution, and any reduction in clean water flows into Lake Martin will concentrate pollutants. Moreover, relatively clean water used from upstream reservoirs may be returned to the Tallapoosa River in a more polluted condition, causing the problem to magnify.
- LWLM and other citizen stakeholders are *voluntarily* involved in the water allocation process, with hopes of reaching an equitable agreement that will factor in both water quantity and quality issues, and balance economic, ecological, political and social concerns.



# A Summary of Key Water Quality Issues



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<span style="background-color: #FFFF00; border: 1px solid black; padding: 2px;"></span>	Agriculture
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<span style="background-color: #CCCCCC; border: 1px solid black; padding: 2px;"></span>	Clearcut/barren
<span style="background-color: #4682B4; border: 1px solid black; padding: 2px;"></span>	Wetland

A 1992 Landsat Satellite map of Lake Martin's subwatershed (white line), which begins at the Lake Harris dam.

This image indicates that the vast majority of the watershed was protected by forests, and this has contributed to the lake's excellent water quality.



## 1. Urban/Suburban Discharges

- How can polluted streams that flow into Lake Martin be efficiently restored?

## 2. Eutrophication

- Are nutrient standards needed to preserve "clean" lakes, such as Lake Martin?

## 3. Water Allocation and Flow

- What are the potential impacts of planned, upstream reservoirs and changes in the amount and quality of water flowing into the lake?

## 4. Stakeholder Action

- How can policy makers and the public be made aware of the condition and changes in Lake Martin?
- What is the role of the citizen in lake protection?

## 5. Lakefront and Watershed Development

- What is "sustainable" lakefront development?
- Who plans watershed development and what additional information is needed?

Current and future land use of Lake Martin's watershed will determine the future condition of Lake Martin. What will be the long-term effect of our land and water use decisions?

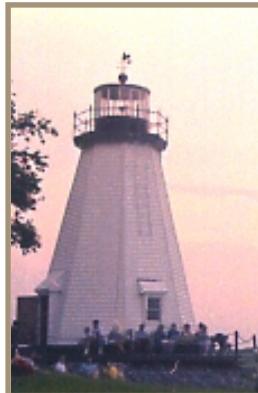
# Why Is Volunteer Monitoring Important?

Several lake residents want to be personally involved with lake monitoring and protection, to determine lake quality near their homes or favorite swimming and fishing sites, and be a part of lake and watershed development decisions...they have a *stake* in their lake!

**"We don't have the manpower to keep a constant watch on all the bodies of water in the state. Alabama Water Watch citizen monitors are our eyes and ears."**  
Charles Horn, Chief  
Water Division, ADEM

## Advantages of Local, Citizen-Based Water Monitoring

- large number of sampling sites
- frequent and consistent sampling
- “eyes and ears” for lake changes and polluters
- fast response time to detect and measure polluted runoff



Kowaliga Lighthouse

- 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



Several members of Lake Watch of Lake Martin and other interested citizens met with Alabama Water Watch staff for a “State of the Lake” report in September 1999.



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## Acknowledgments

This report was compiled by AWW program personnel in partnership with Lake Watch of Lake Martin. Dick Bronson and John Glasier (LWLM) provided photos, articles, maps and suggestions for the text. John Beck (AU) and John Pate (ADEM) provided maps used on the cover and on page 13, respectively.

Funding for AWW is provided, in part, by:

- Alabama Department of Environmental Management (ADEM)
- U.S. Environmental Protection Agency, Region 4.

Printing costs were provided by:

- Grants to the Alabama Water Watch Association from:  
The Charles Stewart MOTT FOUNDATION  
The Curtis and Edith Munson Foundation
- Lake Watch of Lake Martin
- Alabama Cooperative Extension System
- CRAFTMASTER Printers, Inc.



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Lake Martin at sunset

"When my husband and I travel to our water test site on Lake Martin, we pass a hand-painted sign tacked to a pine tree that reads, 'Go on God's errands'. That pretty well sums up Lake Watch for us. We believe it is our responsibility to honor and protect the Creator's world by careful stewardship. We must protect it from present threats and preserve its beauty and goodness for future generations."

Kathryn Braund, Ph.D.  
Lake resident, volunteer monitor and author



## 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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