Lake Mitchell is located in east-central Alabama between Coosa and Chilton counties, and is one of several reservoirs on the Coosa River (see map below). The 106-foot dam that impounds the river and forms the 5,850-acre lake was completed in 1923. Lake Mitchell has 147 miles of shoreline and a watershed area of about 725 square miles. The lake’s watershed is only about 7% of the entire Coosa River Basin, which drains a total area of 10,124 square miles. The Coosa Basin is a part of the larger Mobile Basin, which drains about 75% of Alabama and is the fourth largest river basin in North America.

The Lake Mitchell Home Owners & Boat Owners Association (LMHOBO) is a citizen group organized in September 1996 to preserve, protect and improve the quality of life in and around the lake. Interests include lake water quality and improving the fisheries, recreational facilities and safety of boaters, skiers and fishermen. Lake Mitchell HOBO Water Watch formed in 1995, with initial monitoring on Pennamotely Creek. This site has been tested about 110 times. Overall, more than 700 data records from 21 sites around the lake have been submitted to the Alabama Water Watch (AWW) office for entry into a statewide database.
Lake Oxygen and Temperature Cycles

Dissolved oxygen (DO) is one of the most important parameters measured by AWW monitors. All fish and most other aquatic creatures depend upon oxygen from the water. Oxygen dissolves better in cold water, so its concentration tends to be higher in winter and lower in summer. Therefore, water temperature and DO have inverse seasonal cycles. These cycles are documented in the graphs below at two Lake Mitchell monitoring sites. An oxygen level of at least 5 parts per million (ppm) is required for streams that are classified as “Fish and Wildlife.” Levels below 5 ppm often stress fish and may result in fish kills and reduced aquatic biodiversity.

Water temperature and dissolved oxygen at Pennamotely Creek (Site 1)

Water temperature at Pennamotely Creek (graph above) ranged from a minimum of 7°C in the winter of 2001 and 2003 to a maximum of 34°C in August 1999. Dissolved oxygen ranged from a minimum of 6.0 ppm in the summer of 1995 and 1996 to a maximum of 12.0 ppm in January 2004. The range of dissolved oxygen was consistently above 5 ppm and indicated a “healthy” aquatic environment. The DO level has been steadily increasing over the last ten years, suggesting that water quality at this site is improving.

Water temperature and dissolved oxygen at Bird Creek (Site 4)

Water temperature at Bird Creek (graph to the left) ranged from a minimum of 5°C in winter 1998 to a maximum of 34°C in August 1999. Oxygen levels reached a maximum of 10.5 ppm in February 2000. DO was below the 5 ppm value (dashed line) eight times over the sampling period, with a recorded minimum of 3.8 ppm in July 2001. Data indicate that aquatic life is frequently stressed by low DO levels in the summer at this site.
Lake Clarity and Eutrophication

Water clarity is one measure of lake health. Pollution such as eroded soil reduces clarity and turns the water brown. This, in turn, reduces light penetration into the water and can upset the natural aquatic food cycles. Excess nutrients (nitrogen and phosphorous) caused by such things as faulty septic systems and runoff of lawn fertilizers or animal wastes reduce water clarity by stimulating algal blooms which turn the water green. A simple device called a Secchi disk, used by LMHOBO to measure water clarity, provides valuable data for lake management.

The Trophic State Index (TSI) is a measurement of lake productivity used by researchers and the Alabama Department of Environmental Management (ADEM). TSI may be calculated from one of three measurements:
1) concentration of a plant pigment called chlorophyll $a$,
2) concentration of total phosphorus, or
3) Secchi disk visibility.

The TSI scale goes from zero to 100, and the larger the value the more nutrient-rich the lake is. Values from zero to 49 are thought to indicate relatively clean and unpolluted (oligotrophic to mesotrophic) lakes. Values of 50 and higher indicate pollution (eutrophication) from excessive nutrients.

Secchi disk measurements (in meters) by LMHOBO at Cargile Creek are shown at right. Except for four readings in 1998-99, lake clarity has been below 2 m over the last six years, indicating a eutrophic condition. The trend of lake clarity (blue dashed line) is declining, and this suggests that this area of the lake is becoming more polluted and nutrient-rich.

TSI data published in the 2002 ADEM 305(b) Water Quality Report to Congress (insert in graph above) indicates that Lake Mitchell is a highly fertile lake characterized by green, algae-rich waters. The assessments of lake fertility obtained by LMHOBO and ADEM have been similar. For example, the 2000 growing season (April to October) average Secchi disk visibility of 1.3 meters measured by LMHOBO at site 2 equates to a TSI value of 57. This was nearly identical to the TSI value of 59 that ADEM estimated using the chlorophyll $a$ extraction technique.

Eutrophic lakes are usually productive and have excellent fishing, but run the risk of too many nutrients, taste and odor problems, low oxygen levels and fish kills. ADEM is currently establishing nutrient standards for all Alabama lakes. Eutrophication of Lake Mitchell and other Coosa River reservoirs is a concern, and residents of the watershed should reduce nutrient levels in the lake by proper management of fertilizers, animal wastes, high-phosphorus detergent, wastewater treatment plant effluents, industrial discharges and septic tanks.
Water Quality Differences in the Watershed

The figure to the left indicates differences in the alkalinity of Lake Mitchell and three tributary streams, based on LMHOBO data from 1995 to 2004. The alkalinity of the lake averaged 62 mg/L (186 readings from three sites) and is strongly influenced by the inflow of the Coosa River which drains the more alkaline-rich soils of the Limestone Ridges and Valleys to the north (brown region on map). The alkalinity of the three tributaries, Pennamotely, Weogufka and Hatchet Creeks, averaged 37 mg/L (115 readings from two sites), 37 mg/L (55 readings) and 42 mg/L (five readings), respectively. These streams drain the lower-buffered, mica-schist soils of the Piedmont (yellow region on map). Differences in LMHOBO data are, therefore, explained by difference in soil types within subwatersheds of the lake.

Why Is Volunteer Monitoring Important?

Some of the many advantages of local, citizen-based water monitoring are:

- More frequent and consistent sampling that provides long-term, credible and useful data
- “Eyes and ears” for water body changes and pollution...early warning system or first alert
- Fast response to detect and measure polluted runoff, invasive aquatic plants and other changes
- Neighbor-to-neighbor persuasion to reduce pollution
- Increased local awareness and public outreach
- Teaches the importance of water quality to youth
- Important data supplement to agency and research studies
- Science-based, citizen-involved action plans

Jim Woodrow makes sure that his water testing technique is correct while monitoring at his site on Lake Mitchell
Timeline of AWW and Lake Mitchell Home Owners & Boat Owners Association

1992
- AWW Program begins

1993
- First AWW Workshop
- AWW Association forms
- Five Active Monitoring groups

1994
- EPA approves chemistry protocols
- 1,000th chemistry record received

1995
- Lake Mitchell Water Monitoring starts at Pennamotely Creek
- First Training of Trainers workshop

1996
- LMHOBO established
- E. coli testing introduced
- BIOASSESS game developed

1997
- AWWareness list serve launched

1998
- LMHOBO cooperates to build “Lake Mitchell Live Release Tournament Facility”
- AWW website premiered
- 10,000th chemistry record received

1999
- LMHOBO Marine 9 Fire Rescue Boat Service starts
- EPA approves bacteria protocols
- 1st Reservoir Series report published

2000
- LMHOBO lake clean-up days established
- AU Continuing Education Units offered for AWW workshops

2001
- 1st Coastal Series report published
- Relational database developed

2002
- LMHOBO 500th water chemistry record submitted to AWW
- Online database and data entry launched

2003
- 1st Stream Series report published

2004
- Macro Mania game developed
- 30,000th chemistry record received
- Five volumes of Citizen Guide to Alabama Rivers published
Alabama’s Rich Water Resources and AWW

Alabama has over 75,000 miles of streams, including more navigable river miles than any other U.S. state. If these streams could be connected end-to-end, they would extend three times around the Earth! Alabama streams and rivers convey about 8% of the surface water that flows through the continental United States. Not only are our streams and lakes abundant, but they also vary tremendously in both physical and biological characteristics. Alabama’s waters cut through Appalachian valleys and ridges, prairie soils of the Black Belt, sandy soils of the Coastal Plain and other physiographic provinces. All this physical diversity leads to an impressive biological diversity. Alabama streams have been described as a “biodiversity hotspot” because they have some of the largest variety of fishes, snails, mussels and other “aquatic critters” in the world. Some of these organisms are endemic, meaning that they only occur in Alabama. Human health, environmental health and quality of life are increasingly threatened by pollution. Many citizens feel it is their right and responsibility to become actively involved in protecting and restoring Alabama’s water resources. Since 1993, more than 230 groups have participated in AWW and have collected data from about 700 water bodies statewide. The goal of this report series is to feature a particular AWW group, describe their activities and concerns, document the importance of their water data and invite you, the reader, to join in community-based action strategies for management and protection of your watershed.

Concerned citizens now have a powerful, new tool to answer the fundamental questions of water testing: Is my water body getting better or worse, and why? Hundreds of summary graphs and maps of water data, training opportunities, special meetings and other aspects of water monitoring are available via the AWW website at www.alabamawaterwatch.org. Certified monitors can enter their data online and custom graphs and statistical trends of statewide water quality data can be easily generated. Timely dissemination of quality-assured data in clear and simple ways is a vital element of a successful monitoring program. It is important to apply water quality information collected by citizen volunteers to local activities such as environmental education, protection and restoration activities, and developing watershed management plans. You are welcome to become a part of AWW and a local water-monitoring group.

Alabama Water Watch is a citizen volunteer water quality-monitoring program that provides training, data management, information exchange and other means of support for the public to become personally involved in water issues. AWW is funded in part by the U.S. Environmental Protection Agency (Region 4), the Alabama Department of Environmental Management, the Alabama Agricultural Experiment Station and the Alabama Cooperative Extension System.

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