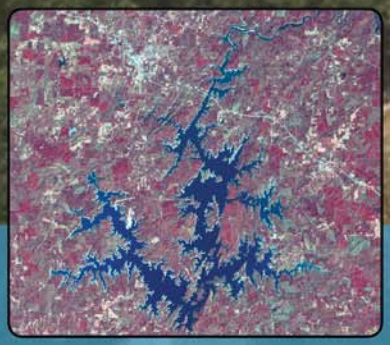
Citizen Volunteer Watershed Stewardship of Alabama's Reservoirs

...special lakes worth protecting



Lake Martin Watershed

About This Publication

Alabama has only one natural lake (Lake Jackson in Florala), but from the 1920s to the 1980s, 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 areas for fishing, boating and other water activities. 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 lakes. Lake Watch of Lake Martin was the first citizen-volunteer group established as part of Alabama Water Watch and has monitored the water quality around Lake Martin every month for nearly 20 years. The purpose of this report series is to feature AWW reservoir groups, such as Lake Watch of Lake Martin, 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.

This is the '12th Anniversary' second edition of the Lake Martin publication (the first was published in 2000). Many changes have occurred on the landscape comprising the lake's watershed, as well as in the evolution of community-based watershed stewardship. Lake Watch of Lake Martin continues to be at the leading edge of such stewardship, and it is the purpose of this publication to highlight changes in the lake and its landscape as well as the many achievements of Lake Watch of Lake Martin in protecting the Lake Martin Watershed.

These reports are intended for policy makers, educators and all citizens who are concerned about our lakes. They are available in hard copy from Lake Watch of Lake Martin or digitally from the AWW website (see back cover). You are invited to read, ponder, and comment on this information. Better yet, become an AWW water monitor and join a growing group of dedicated citizens who volunteer thousands of hours per year to protect our magnificent lakes!

Contributors:

Alabama Water Watch
Alabama Power Company
Geological Survey of Alabama
Lake Watch of Lake Martin
Russell Lands, Inc.

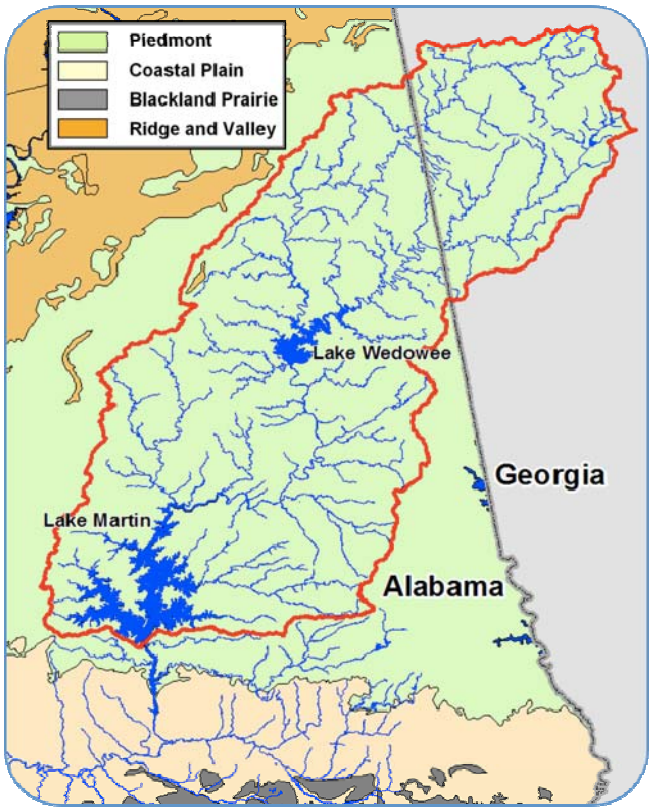
Contents:

Dr. Bill Deutsch gives a lecture among the shoal lilies on the Tallapoosa River downstream from Horseshoe Bend

Front cover photos: Martin Dam (background), SOURCE: Alabama Power Company.
Color infrared Landsat satellite image of Lake Martin in 2009.
Back cover photo: Sunrise viewed from near The Ridge Marina on Lake Martin, SOURCE: Russell Lands on Lake Martin.
Unlabeled photos and graphics are from the Alabama Water Watch Program at Auburn University.

Lake Martin Watershed... Facts and Figures

Lake Martin is located in east-central Alabama in Tallapoosa, Elmore and Coosa Counties. The lake's watershed covers about 3,000 square miles and extends into western Georgia (see map at right). A watershed is the total land area drained by a stream or river.



Alabama is divided into several physiographic regions based on its diverse geology. Nearly all of Lake Martin's watershed lies in the Piedmont (see map at right). The underlying geology consists primarily of mica, schist, gneiss and granite bedrock and is generally lacking in limestone. Piedmont soils are relatively infertile and high in clay (especially red clay) content. This is why the Tallapoosa River and Lake Martin often have a reddish tint when sediment enters their tributaries during heavy rain events, and why waters in this region are naturally low in alkalinity (poorly buffered), hardness and fertility.

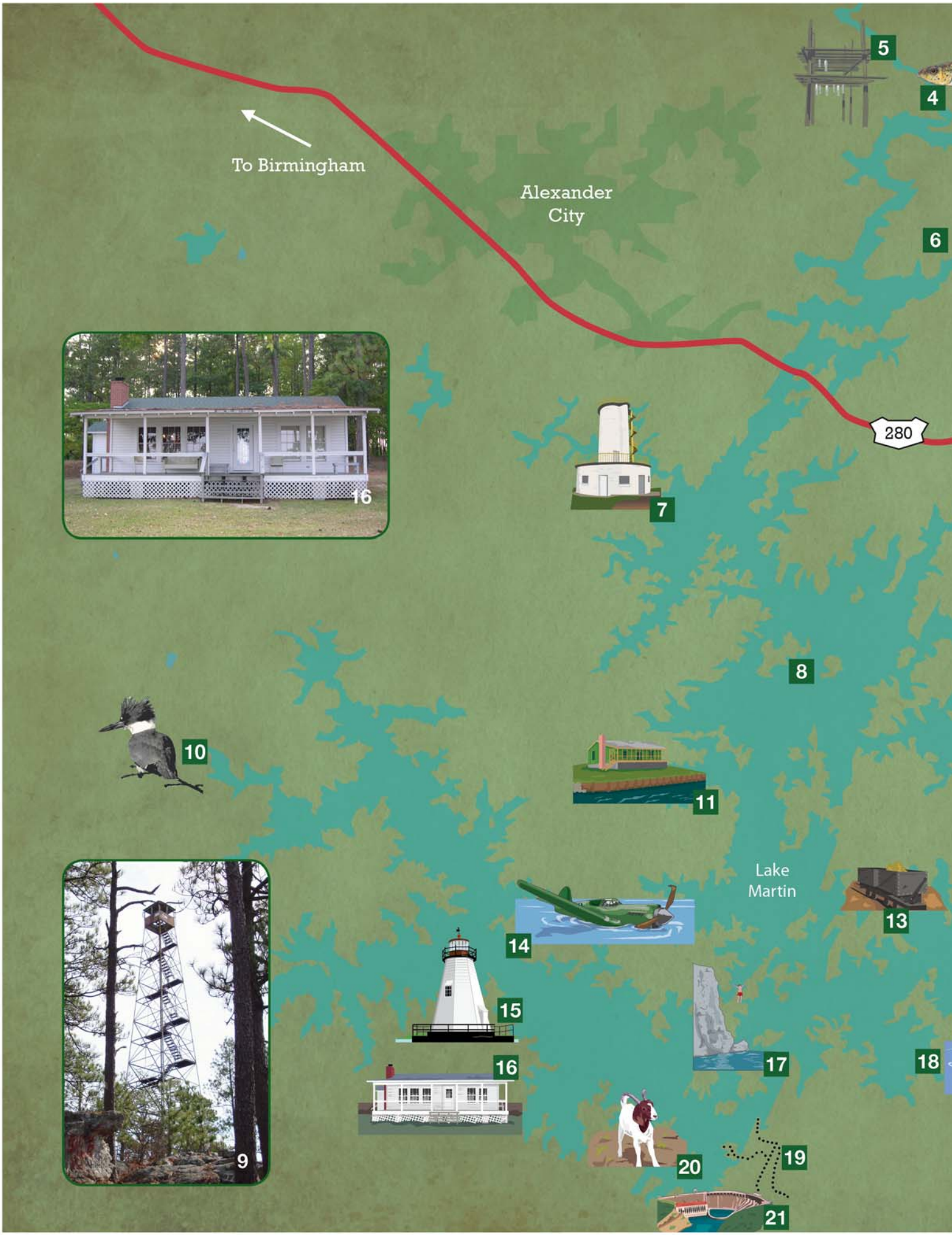
Martin became the first Treasured Alabama Lake (TAL) in April 2011, after then-Governor Bob Riley created the TAL designation in December 2010 (see page 19). Lake Watch of Lake Martin President Dick Bronson had pursued protective status for the lake for several years and laid the groundwork for the TAL designation of Lake Martin.

Lake Martin Watershed (in red) in the Tallapoosa Basin

- The lake and its tributaries are part of the Tallapoosa River Basin. 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 via Mobile Bay.

- The Lake Martin Watershed drains both the Upper and Middle Tallapoosa basins (outlined in red on map at left). The Tallapoosa River originates in western Georgia in Carroll, Haralson and Paulding counties, and runs south and westward through parts of five Alabama counties before entering Lake Martin.

- When dam construction was completed in 1926, Lake Martin was the **largest reservoir in the world**. It has a surface area of about 41,200 acres and 880 miles of shoreline. The lake is the largest in the state by volume and second deepest in the state, with a 168-foot dam and a water retention time of about 194 days. It is commonly referred to as Alabama's crown jewel, the cleanest lake in Alabama, and possibly in the southeastern United States.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Dadeville

To Auburn

1. Native American Fish Weir
2. Horseshoe Bend National Military Park
3. Striped Bass at Jaybird Landing
4. Killifish at Hillabee Creek
5. Fish-drying Site
6. Camp ASCCA
7. Wind Creek State Park
8. Woods Island (largest island)
9. Fire tower at Smith Mountain
10. Piedmont Plateau Birding Trail
11. Russell Cabins (around the lake)
12. B-25 Crash in Sandy Creek (1945)
13. Abandoned Gold Mine
14. Tuskegee Airman plane crash (1942)
15. Children's Harbor Lighthouse
16. Hank Williams Cabin
17. Acapulco & Chimney Rocks
18. Insurance executive plane crash (1988)
19. Cherokee Ridge Alpine Trail system
20. Goat Island
21. Martin Dam

Points of Interest around LAKE MARTIN

(see next page for site details)

Points of Interest around Lake Martin (contd)

Numerous geological, historical, cultural and natural features of Lake Martin and its surrounding watershed make Lake Martin an Alabama Treasure! Here are a few of them:

1. A Native American fish weir is still intact after centuries of disuse, visible on aerial photographs. (actual location of weir is upstream near Frog Eye, AL).

2. Horseshoe Bend National Military Park is the site of the Battle of Horseshoe Bend (see page 9).

3. Many large stripers have been caught in the lake and the Tallapoosa River (see page 12-13).

4. The beautiful Killifish known as the Stippled Studfish (*Fundulus bifax*) can be found in Hillabee Creek.

5. A Native American fish-drying site was discovered in recent years when AL DOT replaced the bridge over Hillabee Creek on State Route 22.

6. Camp ASCCA, Alabama's Special Camp for Children and Adults, is a nationally recognized leader in therapeutic recreation for individuals with both physical and mental disabilities (see www.campascca.org).

7. Wind Creek State Park spans 1,445 acres along the shores of Lake Martin, and boasts the largest state-operated campground in the United States, with 626 sites (see www.alapark.com/windcreek).

> ***Access to Heaven on Earth*** – "This state park has lakeside spots with wide open views of awe inspiring sunrises and spectacular sunsets"
> (QUOTE SOURCE: Yahoo! Travel Contributor, 2007).

8. Woods Island is the largest island on the lake.

9. The Smith Mountain Fire Tower that looms above Sandy Creek Embayment was recently renovated and is slated to become a component of the Cherokee Ridge Alpine Trail system.

10. The Piedmont Plateau Birding Trail, Chapman Creek Site – Wood Ducks on the lakeshore pictured at right (SOURCE: Mitford Fontaine), (see page 13).

11. Russell cabins are recognizable as the numerous quaint green cabins sprinkled on the shores of the lake. Dating back to the 60's, many of them are scattered on mostly undeveloped shoreline areas of the lake.

12. B-25 bomber crashed in Sandy Creek on March 20, 1945. Three World War II airmen died in the crash. Placement of a granite marker displaying their names is planned along the lakeshore in the U.S. Air Force's Maxwell-Gunter Recreation Area on Sandy Creek Embayment near the crash site.

13. Abandoned gold mines are sprinkled throughout the area from Devil's Backbone along the east side of the lake north to Goldville (see page 10).

14. Tuskegee Airmen crashed their AT-6 plane into the lake in 1942 while attempting a risky maneuver underneath the Kowaliga Bridge.

15. The Lighthouse on the south side of Kowaliga Bridge (pictured at right, SOURCE: Mitford Fontaine) is the beautiful landmark for Children's Harbor, which, through collaboration with Children's Hospital of Alabama, provides camping/adventure services to children with serious illnesses and special needs, and to their families (see www.childrensharbor.com).

16. Hank Williams Cabin, on the shores of the lake, is the site where the country music legend composed the song 'Kaw-liga', a number one song on the country music charts in 1953.

17. Acapulco and Chimney rocks, tall outcroppings near Martin Dam, are popular recreation sites, particularly Acapulco Rock, where brazen youth come to plunge from its heights into the lake.

18. Piper-Archer plane crash in 1988. Four years of rampant speculation about the whereabouts of the pilot, a Huntsville insurance executive under investigation for embezzlement, ended when the plane and his body were found in 65 feet of water in 1992.

19. Cherokee Ridge Alpine Trail, a scenic trail that is under expansion, can be accessed near Martin Dam (see www.crata.org). Scenic view of the lake from the trail is pictured at the right (SOURCE: www.crata.org).

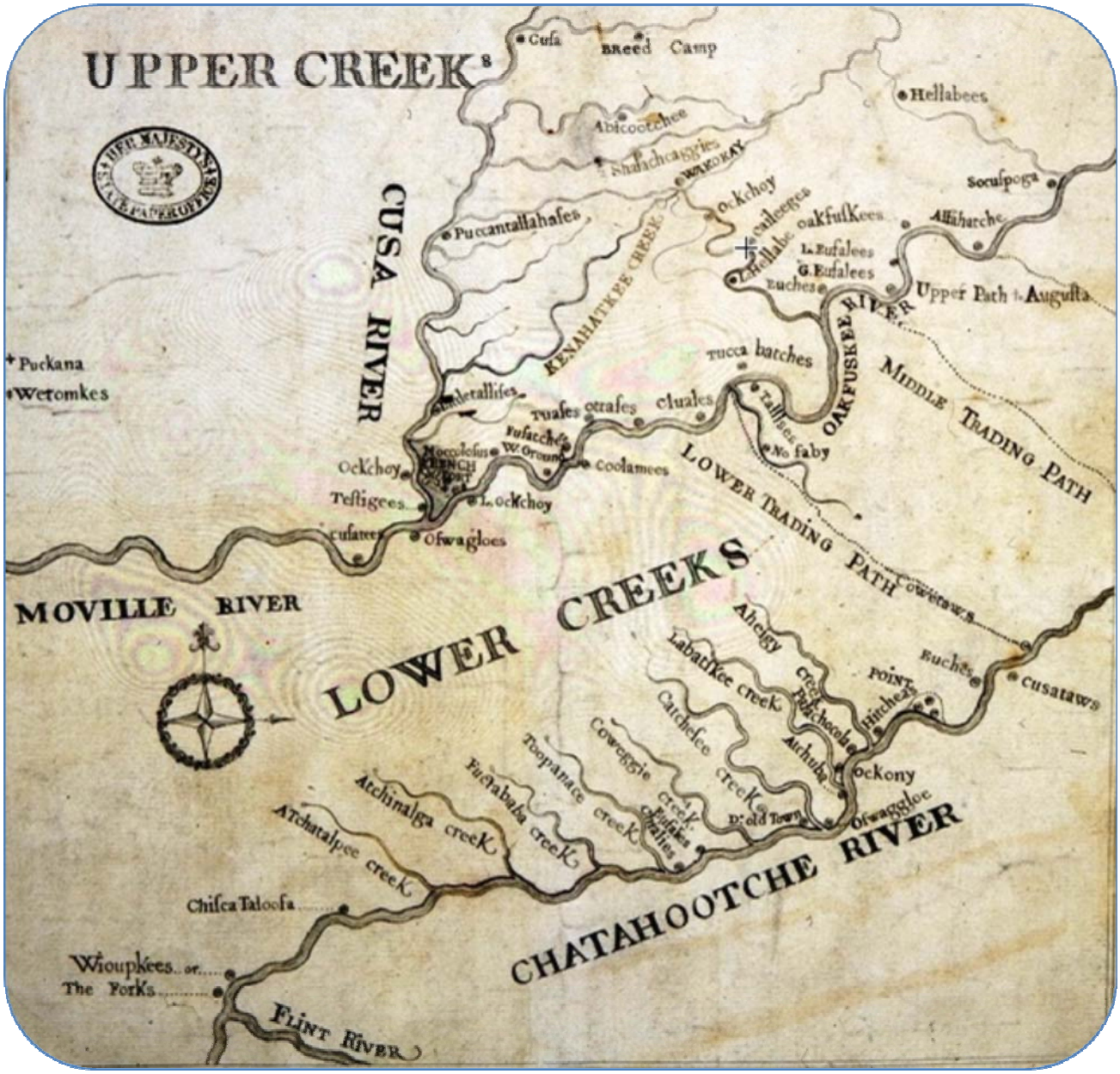
20. Goat Island, just north of the dam, is known for its population of resident goats. Sadly during winter months, hunting dogs sometimes kill the goats, but periodic re-population always seems to occur.

21. Martin Dam (see page 10).

Early Life along the Tallapoosa River

Native People

The Tallapoosa Watershed, like that of the Coosa and Alabama rivers, was owned by the Creek Indians before European settlement. The Creek Nation was divided into two geopolitical regions, the Upper and Lower Towns. The Upper Towns included the Tallapoosa division, whose eight tribes lived on the lower Tallapoosa River, and the Abeika towns, whose towns were located between the Coosa and Tallapoosa rivers and on the upper Tallapoosa. Creek towns were located along the rivers, which served as a source of food and transportation (see map below).



Towns and Trading Paths of the Creek Nation circa 1757. This map was created by William Bonar, who was more of an artist than a cartographer. His main source of geographic information was from interactions with deerskin traders. Bonar was a Carolinian sent to spy on the French Ft. Toulouse, which was located at the junction of the Coosa and Tallapoosa Rivers. SOURCE: William Bonar. A Draught of the Creek Nation. 1757 Manuscript map owned by the National Archives (United Kingdom). Plate 59E in William P. Cumming and Louis De Vorsey, Jr., *The Southeast in Early Maps*, 3rd ed. (Chapel Hill, 1986).

On the map on the previous page, the portion the Tallapoosa River that was eventually impounded to become Lake Martin is located in the vicinity of the river segment labeled *Oakfuskee River*, between the Middle and Lower trading paths of the Creek Nation. Major Upper Creek towns included Okfuskee (near present-day Dadeville) which was the largest town in the colonial south until the mid-eighteenth century. The Creek town of Tuckabatchee, near present-day Tallassee, served as the capital of the Creek Nation in the nineteenth century. Other significant towns around present-day Lake Martin included Okchai, Hillabee, and Kialigee (now under water) along Kowaliga Creek. Subsistence depended on hunting, fishing and cultivation of corn, which was grown in communal fields which stretched for miles along rivers and streams. Corn was their dietary staple, supplemented with nuts, berries and starchy roots gathered from the forest.

European Settlement

European explorers trekked through the Lake Martin area, led by Spanish Conquistador Hernando de Soto, in search of gold for their mother country in 1540. His expedition entered Alabama near present-day Cedar Bluff and traveled south, meeting the Tallapoosa River at present-day Tallassee. Desoto, frustrated by not discovering riches, turned the expedition around in Texas, and died from fever on the return trip.

In the eighteenth century, a trading and military alliance with the British colonies brought wealth to the Creek Nation and made them the power brokers of the eighteenth-century South. After the American Revolution, Americans were not interested in trading for native deerskins and other produce, but turned to commercial agriculture. As a result, conflicts with Indians over land increased dramatically. Increasing encroachments on Creek lands by America settlers ultimately led to civil war among the Creeks in 1813 as a faction of Creeks, known as the Red Sticks, denounced their national leadership for repeatedly giving in to American demands for land, and on other issues. Creeks fought on both sides during the Creek War.

Did you know that:

- The site of the Battle of Horseshoe Bend was saved due to the efforts of Judge C. J. Coley of Alexander City and Thomas Martin, of Alabama Power Company, who sought and obtained federal protection for the site, which is now a national military park.
- Menawa, who commanded Red Stick forces at Horseshoe Bend, later served with the United States military in the Seminole Wars.
- The Creek term for Americans in the nineteenth century was "ecunnaunuxulgee," which meant "people greedily grasping after the lands of the red people."

The Battle of Horseshoe Bend Diorama
SOURCE: Horseshoe Bend National Military Park

The Battle of Horseshoe Bend, fought at the site of what is today the Horseshoe Bend National Military Park, was the decisive battle in the Creek War. On March 27th in 1814, General Andrew Jackson led 3,300 soldiers, including Creek and Cherokee Indians, in an attack on the Creek Red Sticks. During the ensuing battle nearly all of the 1,000 Creek Red Sticks were killed. This battle effectively diminished the power of the Creek Indians, and made Andrew Jackson a national hero, catalyzing his ascent to the Presidency of the United States in 1828. At the end of the war, the Creeks were forced to cede over 21 million acres of Creek lands to United States. A series of treaties from 1814 to 1832 effectively ceded all Creek lands to the U.S. Following an outbreak of violence in 1836, most Creek Indians were forcibly removed to western reservations opening up the area to white settlement.

Tallapoosa County, which was formed from Creek territory in 1832, was home to a western-style gold rush in the early 1840s. The town of Goldville, about nine miles north of Horseshoe Bend, sprang up overnight and incorporated in 1843. Thousands came in search of gold. The town exploded and then died off between the 1840 and 1850 Census. Now a tiny post office and service station remain where once stood one of Alabama's most populated towns

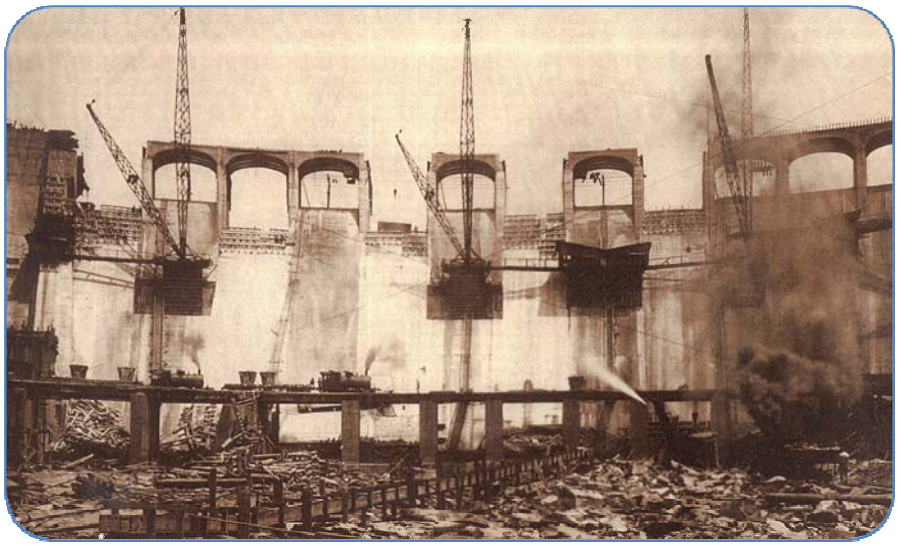
"The town's boisterous environment resulted in a number of families moving down the road to a new site", hence the birth of New Site, Alabama. Gold mining continued sporadically until the late 1930s, when yields were no longer profitable. Gold was mined at many locations in Tallapoosa County, from the southern end of Devil's Backbone (near Martin Dam) northward to Hog Mountain and Goldville. Old mine shafts still exist in the Lake Martin Watershed.

Alabama Gold!

Damming the Tallapoosa

Work on the Martin Dam began in 1923 at a remote location known as Cherokee Bluffs, as a result of the visionary guidance of the 'trinity of twentieth century Alabama pioneers,' William Lay, James Mitchell and Thomas Martin, who established the Alabama Power Company.

The original purpose of the dam was to provide electrical power for homes and industrial development, flood control and help maintain river navigation downstream. At a cost of $13 million, the dam was completed in 1926, and 40,000 acres of cleared forest, fields, houses and small towns were engulfed by the newly formed lake that was billed as the largest man-made lake in the world. That same year, the dam and lake were named after the visionary, Thomas Martin, president of the fledgling Alabama Power Company. The dam began generation of over 300 million kilowatts per year, enough energy to supply about 28,000 homes.



Martin Dam Construction (SOURCE: Alabama Power Company)

The lake filled to capacity in April 1928. An unfortunate result from the damming of the Tallapoosa was the threat of malaria in the newly formed 'backwaters.' The Alabama State Board of Health initiated a spraying program via watercraft to control mosquito populations, and distributed quinine capsules to local residents who lived within one mile of the backwaters. Much has changed over the past eighty years – the lake has become a major tourist attraction, a desirable retirement destination, and is known as the engine that drives economic growth in the central part of the state.

Aquatic Creatures in the Watershed

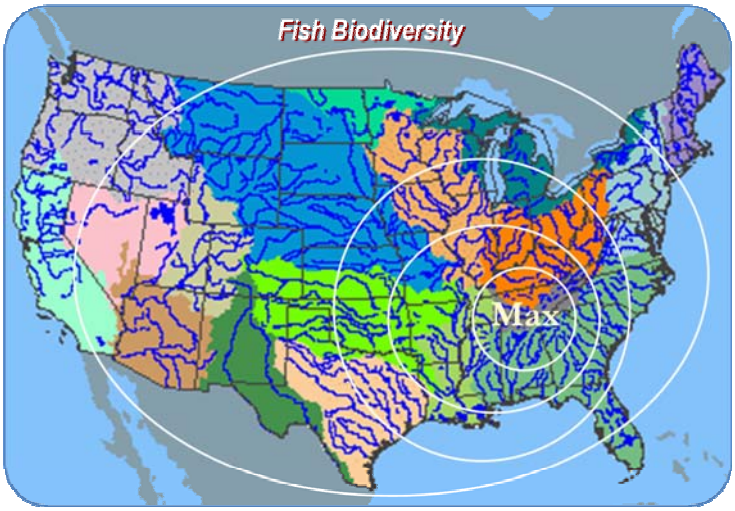
Aquatic Biodiversity

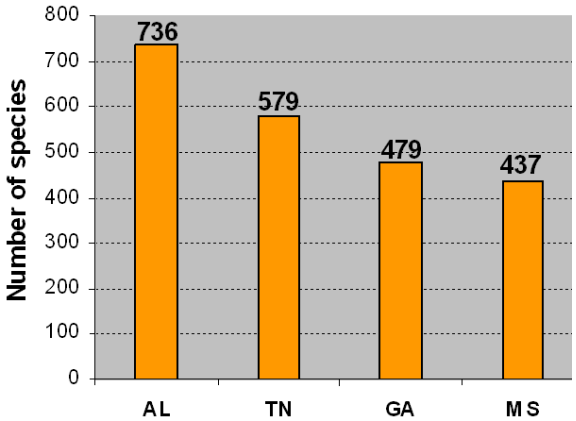
The southeastern U.S. is a hotspot for plant and animal biodiversity. Alabama is home to about 3,400 plant species, 73 amphibians, 81 reptiles, 420 birds, 180 mussels (59% of North America's mussel species), 320 freshwater fishes (one-third of fishes in the lower 48 states) and 60 mammals. Many of these plants and animals are found in the Tallapoosa Basin, which is home to 134 of Alabama's 320 fish species.

SHOAL LILIES, *Hymenocallis coronaria*, (also known as the Cahaba Lily, Shoal Spider Lily and Rocky Shoal Spider Lily) blooming on the Tallapoosa River downstream from Horseshoe Bend.

Great Blue Heron, *Ardea herodias*, is often sighted around Lake Martin angling for a meal (SOURCE: Scott Thompson).

Why is this area such an ecological hotspot? Because the stars did truly align over Alabama (and the southeastern U.S. – see figure below-left, modified from the National Atlas of the United States). There are several factors that contribute to this 'biodiversity hotspot' phenomenon, but the most important are climate patterns, landscape diversity, and landscape geologic age and stability. This area was beyond the reach of the Pleistocene glaciation – a long-term catastrophic event for biodiversity. Many geologically-diverse land types and their associated ecoregions converge within the state, including the Piedmont, Southeastern Plains, Blue



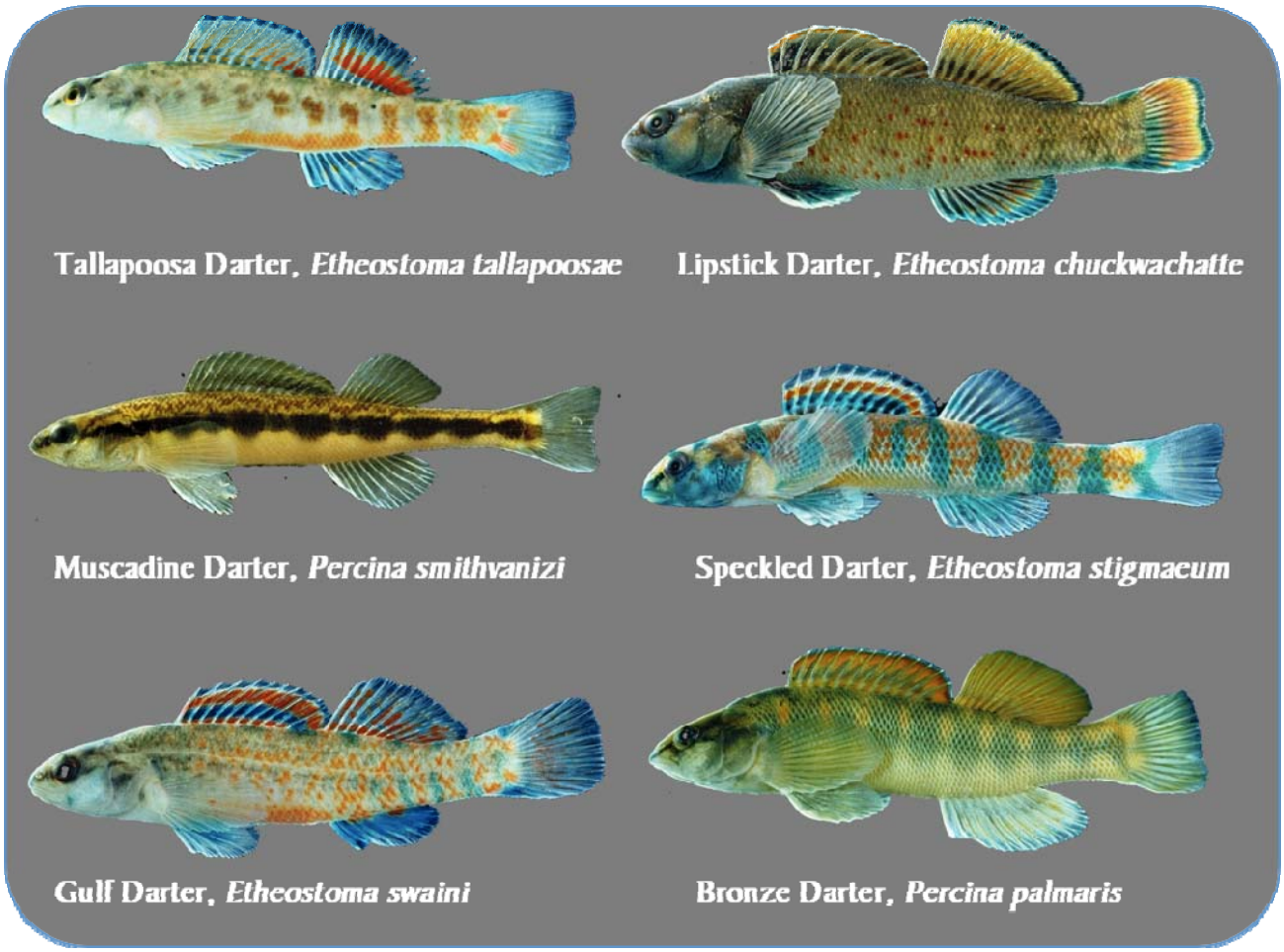


Alabama Leads the Southern States in aquatic biodiversity with a total of 736 species of aquatic critters (fishes, mussels, snails and crayfish).

Ridge, Ridge and Valley, Southwestern Appalachians, Interior Plateau and Southern Coastal Plain. The Southeast is also blessed with abundant precipitation (up to 85 inches per year in the Great Smokey Mountains), the highest in the continental United States excepting the Pacific Northwest. A high diversity in land types (which equates to highly diverse terrestrial and aquatic habitats) and a lot of year-round water in streams, rivers, and lakes combine to yield an array of aquatic species that rivals anywhere in the world!

The Darters

Darters are some of the most beautiful, yet least-seen fishes in Alabama streams. These small fish, members of the family Percidae (perches and darters), get their name from their 'darting' movement along the bottom of streams. There, they forage for aquatic insects, and go mostly unnoticed by the casual passer-by. There are currently 77 species of darters in Alabama (more species are being discovered), 25 of which live in the Tallapoosa Basin. The Tallapoosa Darter and the Lipstick Darter occur exclusively in the Tallapoosa Basin. Darters generally grow to only a few inches in length. They tend to be sexually dimorphic, with the males generally larger and more colorful than the females (particularly in the genus *Etheostoma*). The six species of darters pictured below are all found in the Tallapoosa Basin (SOURCE: Geological Survey of Alabama).



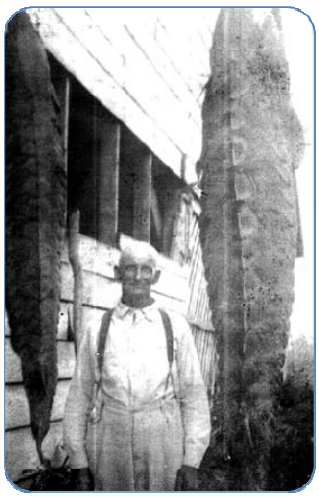
Tallapoosa *River Monsters*

The Tallapoosa River is home to some exceptional aquatic creatures. Sport fishing in the Tallapoosa is popular, and several species grow quite large. Based on the popularity of Striped Bass fishing, several striper guide services have sprung up on Lake Martin. In pre-dam times, large runs of stripers would migrate from the Gulf of Mexico up Alabama rivers to spawn, akin to the great salmon runs of the Pacific Northwest. Information on fishing and fish species in Lake Martin and its tributaries is available at www.dcnr.state.al.us/fishing.

After the damming of nearly all of the rivers in the state, State Wildlife and Freshwater Fisheries began stocking saltwater stripers in several Alabama lakes, including Lake Martin. They typically stock about 120,000 striper fingerling into Martin each year. Lake Martin, along with Lewis Smith Lake, serves as a source of brood stock for spawning of native Gulf Coast strain of Striped Bass. Many large stripers have been caught from the lake and from the Tallapoosa River (see photo at right, SOURCE: Wes Wood), the biggest one taken from the lake weighed in at around 50 lb.

Trophy Striper: Wes Wood weighing a 42.5 lb striper taken from Lake Martin in 2009

The gigantic catfish pictured to the left was allegedly caught on a trotline (not on the fly rod in the photo) in the Tallapoosa River near Tallassee in 1949 by Mr. Charles Lindsey (SOURCE: photocopy of article from unidentified source). The Tallapoosa, its tributary streams and Lake Martin host a variety of sport fish, all of which are of excellent quality for eating since the river system is one of the cleanest in the state.



The GULF STURGEON, *Acipenser oxyrinchus desotoi,* grows to a huge size (over 300 lb and 13 feet long), lives up to 60 years old, and once migrated during its anadromous spawning runs from the Gulf up the Tallapoosa River (before dams were built on the rivers). This fish is fairly rare, and is classified as a threatened species and protected by the U.S. Fish and Wildlife Service. The photo to the left appeared in the Tallassee Tribune in 2005. The fish were caught in the Tallapoosa River below Thurlow Dam around 1933 by Mr. Leander Ward. An even bigger one was caught a few years earlier. It reportedly took two mules to pull that fish up the hill to the barn. The hide of the fish was nailed to the side of the Lambert barn where it remained for many years.

Water Fowl and Other Birds

The Lake Martin Watershed is rich in avian diversity and lies at the heart of the newly established Piedmont Plateau Birding Trail. The trail spans nine Alabama counties and boasts 34 birding sites. Seven sites are on and around Lake Martin (see www.piedmontplateaubirdingtrail.com). Among the water fowl and other birds that one may encounter include Bald Eagles, Osprey (pictured at right, SOURCE: Mitford Fontaine), Great Blue Herons, Kingfishers, Canada Geese, Cormorants and ducks, to name a few.

Impacts to the Watershed

Primary threats to the waters of the Tallapoosa, its tributaries and Lake Martin include residential and commercial development, up-river diversion of flow, point source discharges into the lake, forest clearcutting, agricultural runoff and illegal dumping (source: Tallapoosa River Basin Management Plan, CH2MHill, 2005; available at www.adem.alabama.gov/programs/water/nps/files/TallapoosaBMP.pdf). Fortunately, there are ongoing stewardship activities that, if widely adopted, will minimize these negative impacts.

Development

As development in the watershed continues, especially along the lake's shoreline and on tributaries that drain into the lake, the potential for negative impacts to lake water quality will increase. An additional 6,200 housing units are projected to be built around the lake in the next 35 years according to a Real Estate Advisors Economic Impact Study done by Robert Charles Lesser & Co. in 2009. This will result in conversion of thousands of acres of undeveloped shoreline forest into residential homes with lawns, driveways and access roads. This type of land conversion can have significant detrimental affects on water quality if development proceeds with little regard for the environment. Negative impacts on Lake Martin may include:

- Increase in impervious surfaces (roads, driveways, rooftops), which increases the amount of runoff during storm events. Increased stormwater runoff leads to increased soil erosion and erosion of banks of receiving streams. Increase in pavement can also produce more flushing of motor oil, antifreeze and other pollutants into the lake.
- Increase in soil erosion resulting in increased sediment deposition into the lake. Muddy stormwater runoff from poorly managed construction sites fouls waters, burying critters that support the aquatic food chain, burying critical spawning substrate for some fish, filling up stream channels, reducing light penetration and visibility which can interfere with aquatic plant growth, and increasing the cost of production of potable water at water plants (PHOTO above: mud flowing from Norrell Branch into Sandy Creek and then into Lake Martin; SOURCE: John Glasier).
- Increase in the amount of fertilizer and lawn chemicals flushing into the lake as a result of land conversion to residential development. This type of pollution is known as nonpoint source pollution since it washes off the landscape during storm events and cannot be traced back to a single point. Phosphorus is particularly detrimental to the aquatic environment, and has been listed by the Alabama Department of Environmental Management (ADEM) as a major pollutant to many Alabama streams and lakes, including some in the Tallapoosa Basin. When excess phosphorus is flushed into a lake, algae are overly stimulated, and an algal bloom results. Symptoms of a bloom include the water appearing soupy-green (or in rare instances, red from algae that cause red tide), and in severe cases, fish gasping at the surface or dying.
- Increase in potential for introduction of pathogens into the lake from malfunctioning septic systems installed along the lakeshore.

Up-river Diversion

Most Lake Martin residents are aware of the Water Wars that have been raging between Alabama, Georgia and Florida for more than two decades. Formerly known only to the arid western states, these southern water-rights disputes center on claims to the water of several interstate river systems. The disputes in the ACT Basin

(Alabama-Coosa-Tallapoosa Basin) have major implications for our state, and for the Tallapoosa River and its lakes, including Lake Martin. The major threat to the Tallapoosa and Lake Martin is flow reduction that would result from new dams built on the Tallapoosa or Little Tallapoosa rivers, capturing and diverting water in Georgia. Another flow-related threat comes from a possible increased flow requirement from Martin Dam to augment a federal agreement on a minimum flow downstream to the Alabama River in the event the Coosa River Basin flows are reduced by Georgia's water demands.

The ever-expanding Atlanta metro area, with an estimated population in 2010 of 5,268,860 (US Census Bureau) is actively searching for additional sources of water as shortages are experienced (Lake Lanier was drawn dangerously low during the 2007 drought). Since Atlanta is situated near the headwaters of the rivers that serve as its water source, it ranks as the largest city with the smallest watershed from which to draw water. This is why the current Georgia governor has dam and reservoir construction as one of his top priorities. Several dam projects have been proposed over the past decade, and some are currently under consideration in the upper Tallapoosa and Little Tallapoosa basins. Negative impacts from flow reduction could include lower lake and river levels, increased lake fertility (a greener lake with lower visibility from increased algae concentrations), and less water available for public utilities. Interstate negotiations have bounced between unsuccessful state negotiations and a much less desirable US Supreme Court judicial allocation. The wars continue.

Point Source Discharges

Point sources of pollution refer to those that originate from a single identifiable point, typically a discharge pipe. Examples that occur in Lake Martin's watershed include municipal wastewater treatment plants and commercial/industrial discharges. Dischargers are required to get a permit from ADEM, known as an NPDES permit, and are required to monitor their discharge, file monthly reports, and maintain discharge pollutants below acceptable levels.

Forest Clearcutting

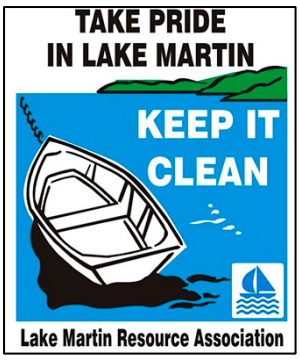
Analysis of land use of the Lake Martin Watershed (Middle Tallapoosa Basin) in 2005 indicated that the watershed was in relatively good ecological shape, since the vast majority of land (84%) was covered by forests (source: Tallapoosa River Basin Management Plan, CH2MHill, 2005). Forests protect against soil erosion, enrich soils with an annual deposition of organic matter in the form of fallen branches and leaves, and act as a large sponge to hold rainwater and infiltrate it into the ground to recharge groundwater aquifers. These benefits disappear when a forest is clearcut (pictured at right) and the land is laid bare. Soil erosion occurs when forest harvest does not follow best management practices, causing negative impacts downstream. There are large tracts of forestland in the lake's watershed that are periodically harvested, and require due diligence to assure they are managed properly.

Agricultural Runoff

Agricultural operations make up a minor portion of Lake Martin's watershed area (only 8% in 2005), but are very significant in the upper Tallapoosa and Little Tallapoosa watersheds upstream of Lake Wedowee. The Lake Wedowee Watershed is dotted with many concentrated animal feeding operations (CAFOs) in the form of chicken houses that produce tons of chicken litter every year. This litter, along with waste from grazing cattle, is a major nonpoint source of pollution into the upper Tallapoosa and Little Tallapoosa, and produces excess algal growth in the upper end of Lake Wedowee. The lake processes a large part of this excess nutrient pollution, which is much less concentrated in waters discharged from Harris Dam. Still, the upper portion of Lake Martin is enriched from these nonpoint source pollutants.

Watershed Stewardship

Several groups, organizations and private companies are involved in preserving and protecting Lake Martin and its tributaries. Among these are community groups, businesses, and local and state governmental agencies, including Lake Watch of Lake Martin, Lake Martin Resource Association (LMRA signage pictured at right), Lake Martin Home Owners/Boat Owners Association, ADEM, the City of Alexander City, the Middle Tallapoosa Clean Water Partnership, Alabama Extension Service, and the Alexander City and Dadeville Chambers of Commerce. The following narrative is not all-inclusive, but focuses on efforts of citizen volunteer monitors, the general public, the two major lakeshore landowners, Russell Lands and Alabama Power Company, and Forestry – the major land use activity in Lake Martin's watershed.

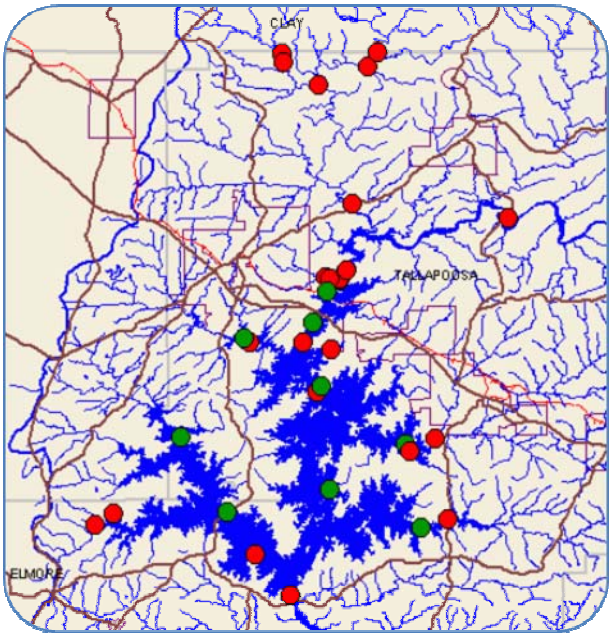


Community-based Watershed Stewardship

Lake Watch of Lake Martin (Lake Watch) is an all-volunteer nonprofit citizen group whose sole mission is "To protect and enhance the water quality of Lake Martin by working with governmental and non-governmental organizations within the Tallapoosa River Basin and throughout the state" (SOURCE: www.lakewatch.org). Since its formation in 1991, Lake Watch has become a premiere environmental group involved in water monitoring, environmental education, and environmental protection and advocacy.

• Water Monitoring

Lake Watch was the first group to join Alabama Water Watch (AWW) in 1993. In the past 20 years more than 60 Lake Watch volunteers have attended AWW workshops and become certified monitors in Water Chemistry Monitoring, Bacteriological Monitoring and Stream Biomonitoring. Lake Watch volunteers have monitored water quality at key locations throughout the watershed, at 33 lake and stream sites (see map at right). Results from over 1,700 sample events (water chemistry, bacteriological) have been submitted to the AWW statewide water quality database which can be viewed in various forms on the AWW website (go to www.alabamawaterwatch.org, and click on WATER DATA).

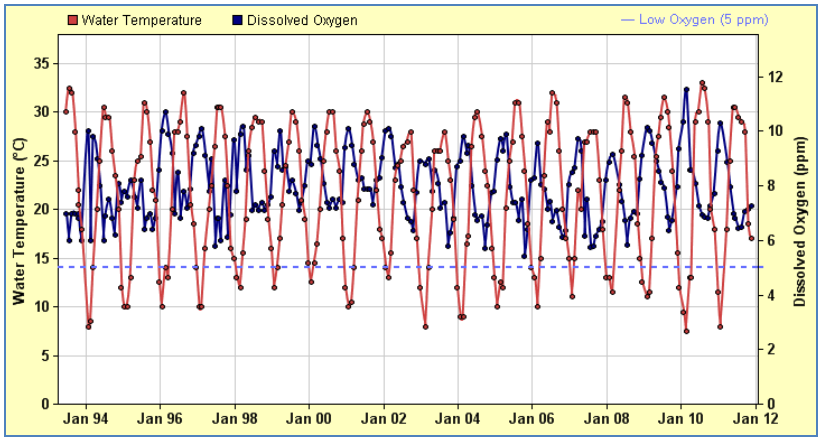


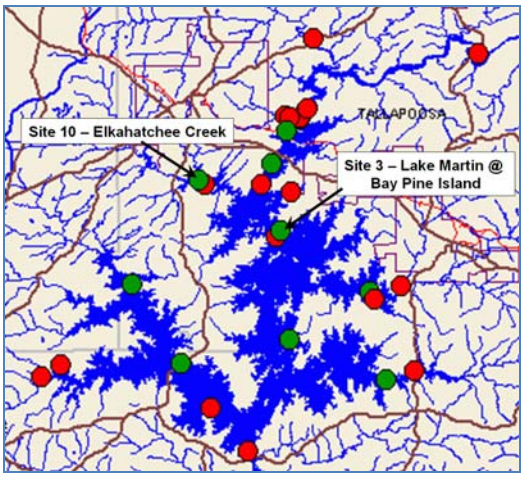
Map of Lake Watch sites
(green are active, red are inactive)

Credibility of AWW monitor data has been documented in different studies through several side-by-side comparisons with professional agency data, as discussed in the next section, and in a special AWW report, *Community-Based Water Quality Monitoring – Data Credibility and Applications*, which features Lake Watch water quality data (available at the AWW homepage, click RESOURCES, then Publications).

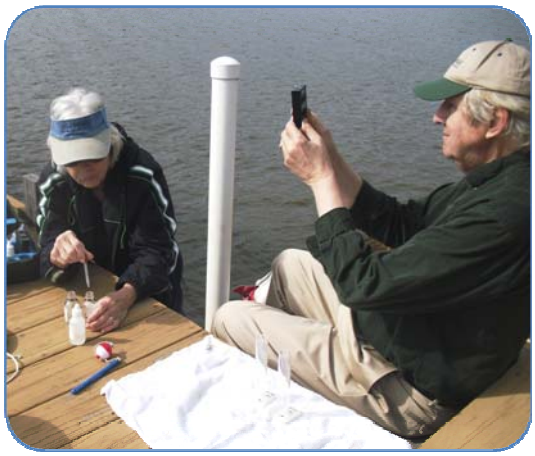
After several years of monitoring a particular site, a valuable record of water quality trends is established. These long-term trend datasets of consistent monthly monitoring would rarely be available, if not for AWW-certified volunteer monitors (ADEM monitors lakes monthly, but normally only every three years, during the growing season, April-October). The Lake Watch graph below from AWW Site 07001003 – Bronson dock at Bay Pine

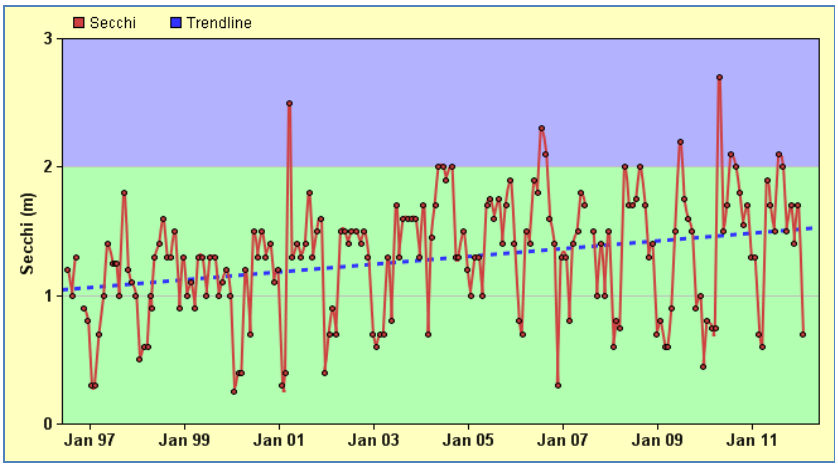
Island, documents seasonal changes in water temperature and dissolved oxygen (DO, dark blue line & points) over an **18 year** period (**220 consecutive months** of sampling conducted by Dick and Mary Ann Bronson)! Note that DO levels are inversely related to water temperature (red line & points), that is to say, DO levels are highest in the winter and lowest in the summer. This is a normal seasonal pattern. That is because, unlike sugar, oxygen dissolves better in cold water than it does in warm water. Also note that at this area of the lake, DO levels have remained well above the state-mandated minimum level of 5 parts per million (ppm, represented by the blue dashed line) for Fish & Wildlife-classified waters like Lake Martin. These and other data indicate that this portion of the lake is very clean and capable of supporting a healthy fish population.





A 15-year dataset of Sechhi Depth (red line & dots) measured in the Raintree area on Elkahatchee Creek at AWW site 07001010 (see map above), monitored by Larry Locke is presented below. The data show a significant trend of increasing visibility from an average of 1 meter to over 1.5 meters deep. This documented improvement in water clarity coincides with the 2001 re-routing of the upstream Sugar Creek wastewater treatment plant discharge from Sugar Creek (which empties into Elkahatchee Creek) into the mainstem of the lake just upstream of the confluence of Elkahatchee Creek and the lake. This trend of increasing water clarity is close to rising out of the 'green zone' of the graph, which represents overly-fertile 'eutrophic' waters. If the trend continues, the Elkahatchee Embayment will improve to the cleaner 'mesotrophic' level, which is generally more desirable because of its greater ecological stability.





There are many more sites, water quality parameters and trends to view and explore in the Lake Watch water dataset. Tom and Pat Lynch (above left) monitor near the Elk's Lodge on the lake. Their site boasts a 185-month

data record! The AWW water data is valuable, but only if it is put to use. Lake Watch has used their data for a variety of beneficial purposes in environmental education, protection and advocacy.

Environmental Education

Lake Watch has been active in environmental education for many years. The Bronsons have conducted an environmental education program, which Mary Ann named '*Living Streams*,' for hundreds of school children, scouts and teachers yearly at Camp ASCCA and at area schools over the past two decades, instilling an environmental ethic in thousands of our youth. Children get out of the classroom and into a stream and become truly excited to learn about the rich, diverse life in Alabama streams. This type of experience stimulates learning, particularly in the sciences (biology, chemistry, geology and math).

The Bronsons introduce students to 'Living Streams' at Council Middle School in Dadeville

Radney Elementary School gifted students, on a 'bridge over troubled waters' enjoy 'World Hats' program

Recently, Lake Watch developed an innovative environmental education program with gifted students at Radney and Stephens elementary schools in Alexander City in collaboration with gifted program teacher, Laurie Barrett. The program is focused on water-related topics, and students learn about water chemistry, microbiology (bacteria), algae, global water resources in the context of various cultures throughout the world, environmental pollution, ethics, forestry, geology, geography and watershed management from Auburn University scientists and AWW-certified Lake Watch volunteer monitors ('World Hats' program is pictured above, right, go to the AWW website and click on AWW SUCCESS STORIES for details). The program has been a resounding success among students, their teacher and the school administration, and was recognized by the Environmental Education Association of Alabama as the 2012 Best Environmental Education Program (BEEP) Award winner. This reinforces the belief that environmental education of our youth is the best way to ensure that the good work of Lake Watch and other such groups continues into the next generation.

Environmental Protection and Advocacy

Lake Watch has also been involved in environmental protection and advocacy since its inception. Advocacy efforts that resulted in the re-routing of waste from Sugar and Elkahatchee creeks were highlighted in the first Lake Watch publication in 2000 (available at the AWW homepage, click RESOURCES, then Publications). The strength of Lake Watch positions lays on a solid foundation of science-based credible data and knowledgeable, experienced water monitors. Government agencies and resource managers have come to respect the group because of this strong science-based foundation.

The group has actively participated in many meetings and conferences over the years, presenting findings that bolster the protection of the lake, or a need for it. Lake Watch was instrumental in the establishment of a '*State of Our Watershed Conference*' for the Tallapoosa River Basin, which has continued as an annual forum for information exchange and stakeholder networking (John Glasier, then-Lake Watch Vice President, pictured at right, presents information on Georgia's reservoir plans at the 2010 conference).

Over the past several years, Lake Watch representatives have actively participated in the Federal Energy Regulatory Commission (FERC) relicensing process of Martin Dam, advocating for environmentally sound management of Lake Martin and the Tallapoosa River over the coming decades. The group feels confident that four years of meetings and input into the stakeholder-driven process will result in improved lake management in the form of more water in the lake at various times of the year. All lake residents and most area businesses will benefit from this effort.

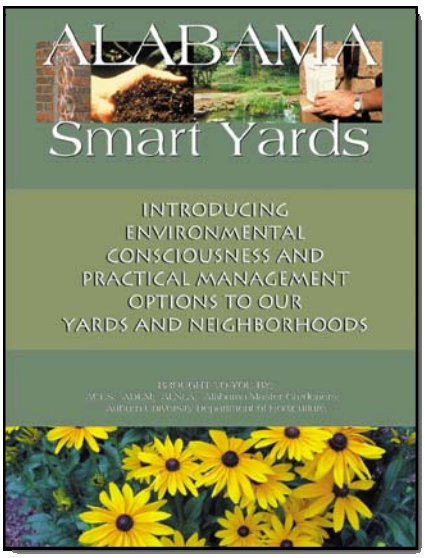
The crowning achievement in protection and advocacy came in December 2010 when then-Governor Bob Riley signed an executive order at Children's Harbor establishing the *Treasured Alabama Lake* special designation for lakes in Alabama (signing ceremony pictured at left). This came after repeated attempts by Dick Bronson over a period of six years to gain special recognition for the outstanding water quality of Lake Martin. The lake was officially designated as the first *Treasured Alabama Lake* in the spring of 2011, an event made possible through the collaborative efforts of ADEM, the Governor and Lake Watch.

> "*Treasured Alabama Lake*…will protect the lake for generations to come. We don't just think that we have the cleanest lake in the state, now we know it." (SOURCE: AlexanderCityOutlook.com YouTube video – quote from Dick Bronson, LWLM President).

Water Stewardship Efforts of the General Public

What can the average lake resident do to protect the lake? A lot! Here are SIX things you can do:

1. Join Lake Watch of Lake Martin and become an AWW-certified water monitor.
2. Convert your yard into a *Smart Yard.*
3. Properly maintain your septic system.
4. Get engaged in the management of Lake Martin's watershed.
5. Be an advocate for *Low Impact Development* around the lake and throughout the watershed.
6. Incorporate *Low Impact Development* features on your property.



The majority of the negative impacts associated with development can be greatly reduced or eliminated by the adoption of practices outlined in the recently published Alabama Cooperative Extension manual, *Alabama Smart Yards* (available in hardcopy at www.aces.edu, or digitally at www.smartyards.org). This manual covers all aspects of environmentally-conscious lawn and landscape management, and is the basis for *Smart Yard* workshops. Homeowner choices in turf and plant selection, amount of turf versus mulched area in a lawn, material for driveways and sidewalks, and frequency and method of fertilization have a profound affect on how much pollution flushes off of ones property during a rainstorm. Wise choices that save homeowners money and minimize negative impacts to the aquatic environment are outlined in the *Smart Yards* manual. Also covered are several landscape modifications that can be installed to catch stormwater runoff and aid in infiltrating it into the soil, including rain gardens, grass-lined swales, rain barrels and cisterns and pervious surfaces. These practices not only minimize stormwater runoff and the pollutants that they contain (fertilizer, lawn chemicals, pet waste), but also benefit the lawn by retaining more moisture in the soil for turf and lawn plants. Get a copy of the *Smart Yards* manual and begin converting your yard into a *Smart Yard*. One other valuable guide to maintaining an ecologically-healthy shoreline, *The Shoreline Primer, A Cottager's Guide To A Healthy Waterfront*, is available from Fisheries and Oceans Canada (see www.dfo-mpo.gc.ca/regions/central/pub/shore-rivages-on/index-eng.htm).

Business/Industry Stewardship

• Developers

Oftentimes, developers and development are identified as sources of pollution, but more and more, responsible developers are becoming part of the solution. This is achieved by adopting practices similar to those outlined for homeowners in the *Smart Yards* manual, known as *Low Impact Development* practices, which include the installation of bioretention features (rain gardens, constructed wetlands, bioswales), use of pervious pavement, wise plant selection and preservation of natural 'green' areas, especially along streams and lake shoreline areas. Some innovative examples around the lake can be seen in Russell Lands developments at Russell Crossroads – crushed-brick pervious pavement that allows rain to soak in instead of running off (pictured above, SOURCE: Russell Lands); at Sinclair's Restaurant – a constructed wetland that catches stormwater runoff, treats pollutants and infiltrates the water into the ground (pictured at left; SOURCE: Russell Lands and Hagan Wagoner); at The Ridge – an innovative on-site wastewater system utilizing

UV sanitation treatment and underground perk with zero discharge to the lake; at Ledges of the Ridge – site layout that fitted the development to topography of the site to preserve the natural landscape; and at Willow Glynn – minimizing roadside right-of-ways to preserve surrounding trees and forest habitat. Another innovative development practice approved through collaboration with the county engineer in the Nickels Cove development is the use of dirt roads in lieu of pavement. These practices preserve the natural hydrology of the landscape and aid in reducing stormwater runoff, erosion, and the flushing of pollutants into the lake.

Alabama Power Company (APC)

APC has set aside approximately 6,200 acres of land around the lake that are classified as "Natural Undeveloped" in the *Land Use Plan* (which became the *Shoreline Management Plan* in the 2011 FERC relicensing application for Lake Martin). The plan specifies that these lands are "to remain in an undeveloped state and serve as: buffer zones around public recreational areas, protection to environmentally sensitive shoreline areas, a means for preventing the overcrowding of partially-developed shoreline areas, a means for maintaining the natural aesthetic qualities of certain highly visible areas, nature trails, and areas for primitive camping activities." These lands serve not only to preserve large areas of shoreline, but provide natural habitat for a wide array of wildlife around the lake. The location of these lands are mainly in the upper part of the lake bordering the Tallapoosa River, and substantial tracts in Sandy Creek (pictured above), Manoy Creek, Blue Creek, Parkers Creek, and Little Kowaliga Creek embayments, and areas near the dam (for a map of these areas, see www.alabamapower.com/hydro/pdfs/Martin_Recreational_Plan.pdf). In the license application filed with FERC in June 2011, APC proposed to increase the acreage of these "Natural Undeveloped" lands to approximately 6,990 acres.

Forestry

A series of forestry best management practices are outlined in the manual, *Alabama's Best Management Practices for Forestry* (available at www.forestry.state.al.us/BMPs.aspx) published by the Alabama Forestry Commission. Practices such as leaving buffers of undisturbed forest along all streams, known as streamside management zones (or SMZs, pictured at right), proper logging-road and stream-crossing construction, and covering bare ground with brush (tree tops and limbs) to prevent erosion are some of the primary methods that responsible foresters employ to minimize impacts on the land and on the aquatic environment.

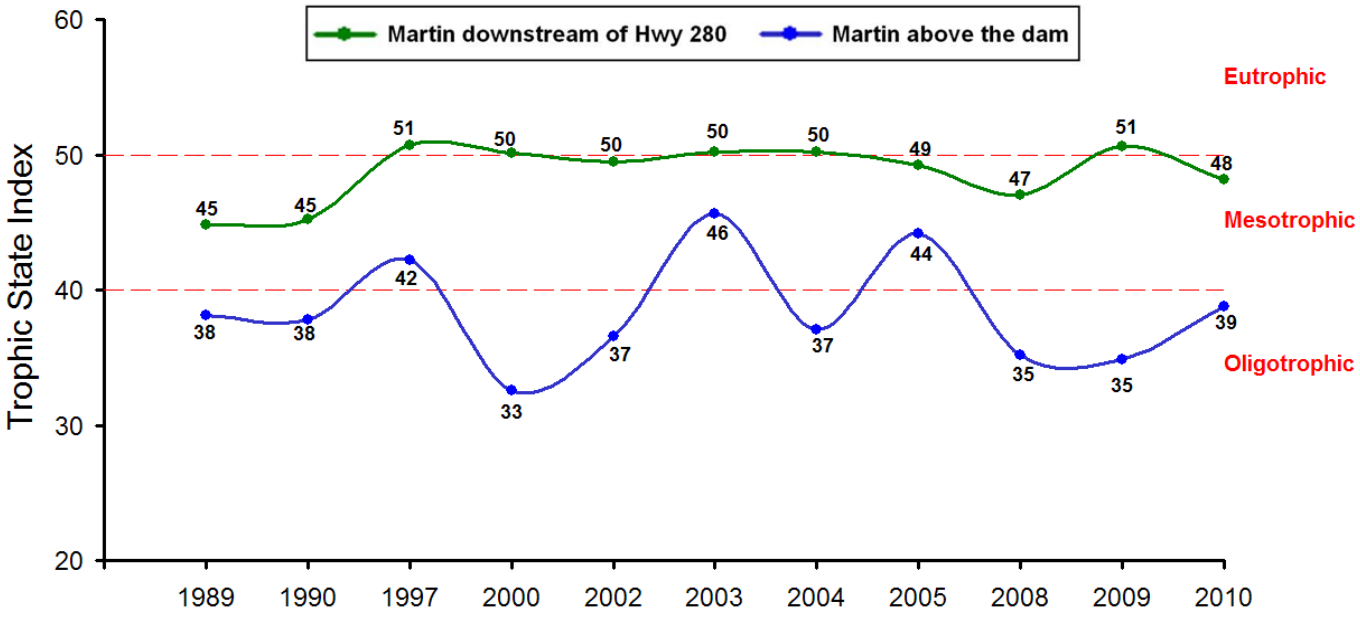
What have the Scientists Found?

There have been numerous scientific studies of Lake Martin and its tributaries focused on water quality concerns including nutrients (phosphorus and nitrogen), municipal/industrial wastewater discharge (called point source pollution), pathogens and fish population studies. Findings from several of these studies are presented below.

Long-term Trends in Lake Martin's Water Quality

Analysis of the plant pigment called chlorophyll a (responsible for photosynthesis and measured to estimate the amount of algae in a lake) is used as an indicator of lake enrichment or lake nutrient pollution levels. This is because, as nutrient pollution in a lake increases, algae levels increase and the water generally gets greener and murkier. Chlorophyll levels are often converted to a *trophic state index* value (TSI) to rate different lakes throughout Alabama (and throughout the United States) on a common numeric scale, ranging from zero to one hundred (see *A Trophic State Index for Lakes* by Robert Carlson, 1977). At the low end of the scale, zero to 39, a lake is clean and clear, with a very low concentration of nutrients, pollutants and algae, also called an oligotrophic lake. At the high end of the scale, 50-100, a lake is cloudy and green, with a high concentration of nutrient pollutants and a dense algae concentration, called a eutrophic lake (actually lakes with TSI values above 70 are extremely enriched, and known as hyper-eutrophic). Middle-of-the-road lakes with TSI values from 40-49 are in between the two extremes in water clarity, nutrients, pollutants, and algae concentrations, and are known as mesotrophic lakes.

The graph below represents results from several studies conducted by ADEM and AU, and plots the changes in Lake Martin's TSI in the upper lake (green line, sampled near Highway 280 Bridge) and the lower lake (blue line, sampled just above the dam) over a 22-year period. Dots represent the TSI for the growing season (April through October, average of 2-7 readings per year).



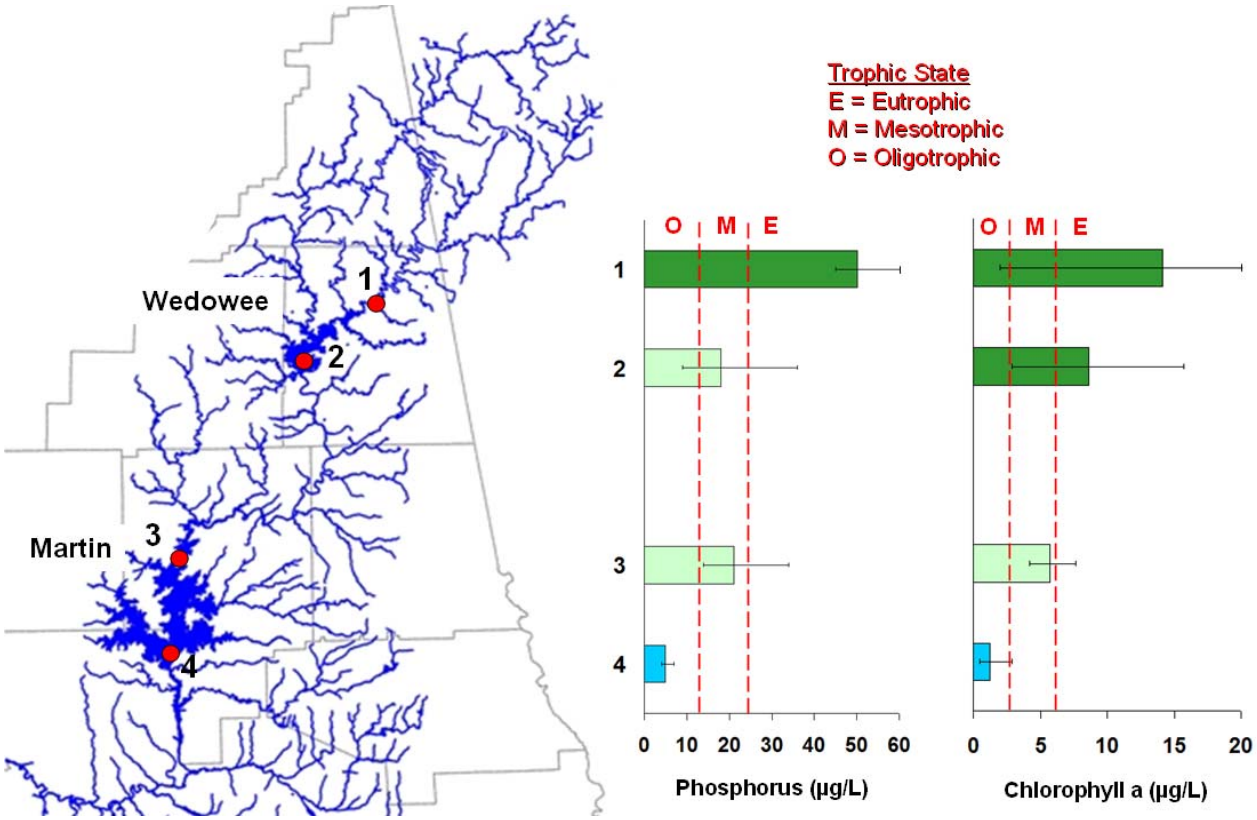
The most obvious aspect of the data is that, in effect, there are two distinct lakes based on water quality – the upper lake and the lower lake. At the lower lake site, the trophic state has flip-flopped between oligotrophic and mesotrophic. This condition probably characterizes most of the lower-to-mid portion of Lake Martin, and is why the lower lake is so clean, clear and attractive for swimming and other types of water recreation. The upper lake is quite different, however, and has changed from mid-level mesotrophic to eutrophic during the majority of this same period. Note that in 2008 and 2010, enrichment dipped lower, into the upper-mesotrophic range,

possibly a result of drought conditions. Drought translates to very little stormwater runoff and associated nonpoint source pollutants flushing from the landscape into the lake and its tributaries. Conversely, during wetter periods, during 1997, 2003 and 2005, above-normal amounts of nutrients flowing down into the lower lake resulted in higher productivity in this portion of the lake and higher TSI values, as shown on the blue line. Pollutant levels and TSI can change a good bit from year to year because there are several things influencing them, including land use changes, land management practices, extent of use of best management practices, soil types, geology, slope of the land, and precipitation patterns. The main point is that the expression of the lake's TSI is a complex interaction of many different factors, and it varies regardless of human-induced changes.

In summary, research information indicates that Lake Martin has undergone changes due to activities that resulted in an increase in polluted runoff from the watershed. Nutrients (phosphorus and nitrogen) from agricultural lands, lakefront lawn and garden fertilizers and faulty septic systems contribute to this "eutrophication" process. These changes are most obvious in the upper lake since it receives the bulk of the nutrient pollution influx from the Tallapoosa River, but are gradually becoming apparent in other parts of the lake. Policy makers and the public need to be aware of these trends and work collaboratively to protect Lake Martin from further degradation. However, there is no single trophic state that is "optimal" for all lakes. Each lake should be managed according to the objectives of stakeholders and for the best use of that particular waterbody.

Longitudinal Water Quality Trends

Longitudinal trends in water quality were documented during a USDA-CSREES-funded study known as the Tallapoosa Watershed Project (TWP, for details see www.twp.auburn.edu). Results showed that high levels of nutrients were coming down the Little Tallapoosa River from Georgia, most likely from runoff containing animal waste from poultry and cattle-rearing operations, along with municipal wastewater discharge (see figure below).



Longitudinal Water Quality – Phosphorus and chlorophyll a levels measured at four sites on lakes Wedowee and Martin during the 2004-05 growing seasons in the AU TWP study. Brackets represent the range in values (min-max).

The result was an enriched, eutrophic condition in the upper portion of Lake Wedowee. Lake Wedowee was found to serve as a nutrient pollution 'sink' by processing the excess nutrients as they passed through the lake, resulting in nearly a three-fold reduction in nutrients at the dam (measured as phosphorus, the more 'potent' of the two nutrient pollutants in most freshwater systems). Thus, the water flowing on downstream to Lake Martin, though still moderately nutrient-rich, was much cleaner than water flowing into Lake Wedowee.

A similar gradient was measured within Lake Martin (see graph, sites 3-4, on previous page). The upper end of Martin sampled at Highway 280 Bridge was moderately enriched (borderline eutrophic), while down at the dam, the water was very clear and clean (oligotrophic). Water quality maps of the two lakes were also produced from 'high-tech' remote sensing information, which show details of water quality throughout each lake. So, when speaking of it being the cleanest lake in Alabama, Martin is really 'a tale of two lakes,' very clean in the lower portions of the lake, but moderately enriched in the upper end.

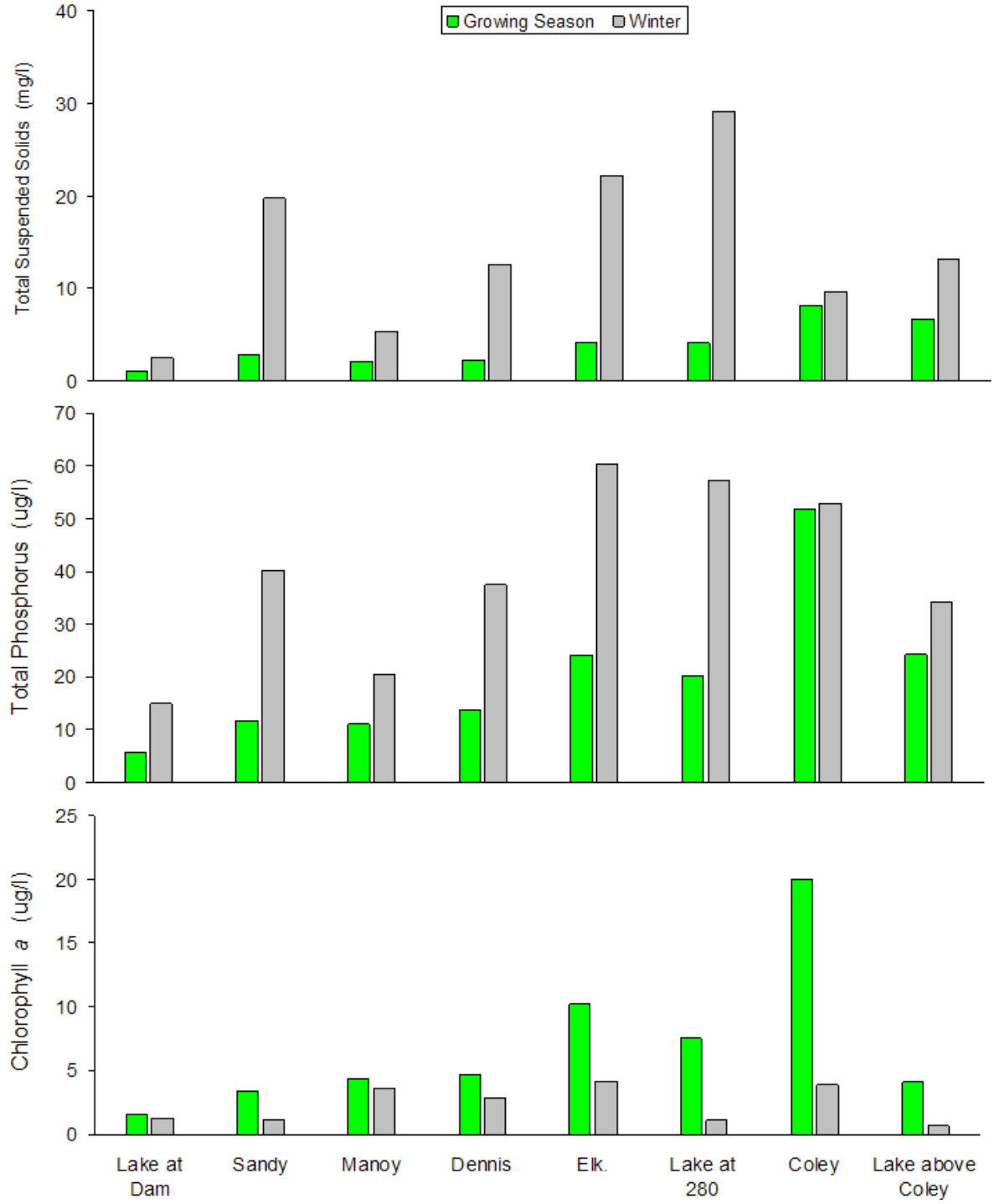
Lake Martin Embayments

As described above, the main body of Lake Martin can be thought of as two distinct lakes. In reality, it is much more complicated. Various studies by ADEM and AU (including three in which Lake Watch actively collaborated) have shown that the many embayments (where streams empty into the lake) can be quite distinct. Significant embayments from upstream to downstream include Coley, Britt, Sturdivant, Elkahatchee, Dennis, Wind, Madwin, Manoy, Sandy, Blue, Big Kowaliga and Little Kowaliga embayments. A study funded in 2009 by Alabama Power Company (APC) as part of the Martin Dam relicensing process was designed to obtain more water quality information on Lake Martin embayments and more winter water quality data, which are limited.

A Unique Lake Study was accomplished at a greatly-reduced cost through partnerships (upper photo – Lake Watch, APC and AU). Eutrophic water from Sandy Creek Embayment (lower photo) sampled during the study.

Winter Sampling on the lake. AU researchers were assisted by AU graduate students, Roxy (the Brittany) and Lake Watch volunteers who provided boats. Note the dramatic contrast in water quality of the upper lake near ASCCA (muddy and brown) and the lower lake near the dam (clear and blue) sampled on the same date.

AU, Lake Watch and ADEM collaborated on the APC-funded study. Lake Watch provided boats for AU researchers to sample the lake monthly throughout the year (from April 2009-March 2010). ADEM sampled several main-lake sites. Eight embayments were sampled during the study.



The graphs above represent 'growing season' averages (April-October, green bars) and 'winter' averages (defined as November-March, grey bars) at each of eight sites, three on the main lake and five in creek embayments: Sandy, Manoy, Dennis, Elkahatchee, and Coley. Conclusions from the above graphs follow:

- Total suspended solids (an estimator of eroded soil in water) were much higher in the winter months (as much as seven times higher in Sandy Creek Embayment and in the lake at Highway 280) than during the summer; thus, the water was generally much muddier in the winter.
- Total phosphorus (the most significant nutrient pollutant in the lake) was also much higher in the winter months (as much as three times higher in Sandy and Elkahatchee Creek embayments, and in the lake at Highway 280) than during the summer.
- By contrast, chlorophyll a (and algae) was much higher (as much as five times higher in Coley Creek Embayment) during the growing season because algae, being an aquatic plant, grows much more abundantly during the warm months.
- Embayments that stood out as highly eutrophic because of high nutrient pollutant levels (measured as phosphorus) and high chlorophyll and algae levels included Coley Creek and Elkahatchee Creek embayments.
- Although the Alexander City wastewater treatment plant outfall was relocated from Sugar Creek (which empties into Elkahatchee Creek) to the main lake, significant residual nutrient enrichment remained in Elkahatchee Creek.

Additional information from this study is available in the report, *Results of the Lake Martin Water Quality Study 2009-2010* (available at the AWW website under RESOURCES, then click Publications). Water quality data and information specific to the Sandy Creek Drainage (the largest stream entering the lake), including measures of *E. coli* pathogen levels, can be obtained from another study that Lake Watch partnered on with AU. A summary of results is available on the AWW blog (see http://blog.auburn.edu/aww/?p=119).

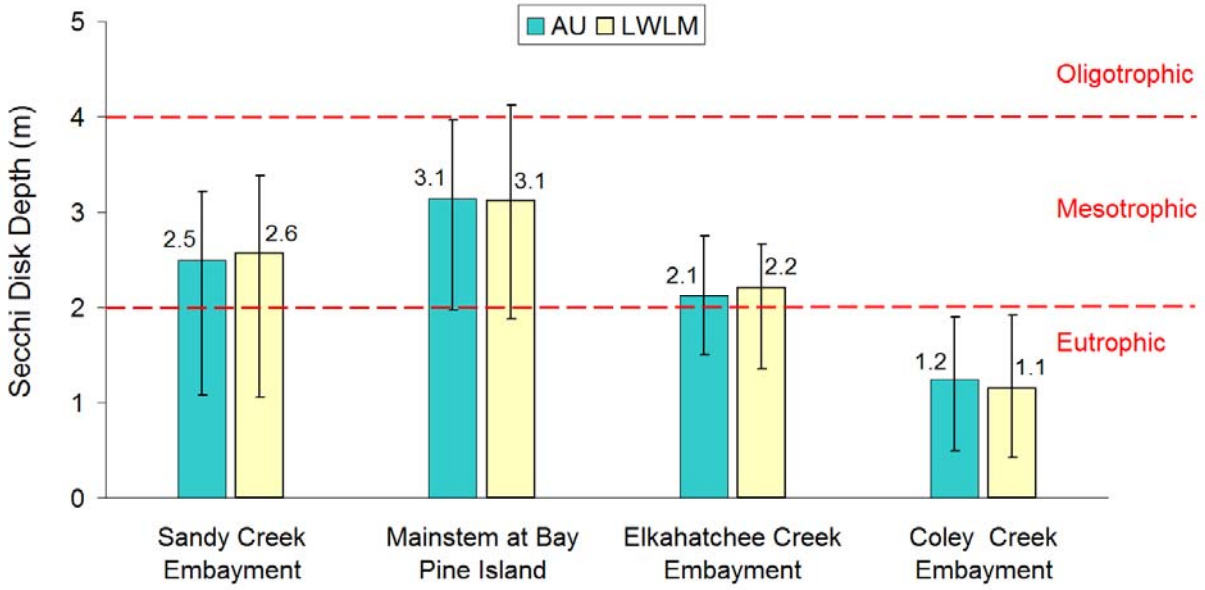
Professional Data versus Lake Watch Data

The TWP study, mentioned earlier, also provided an opportunity to conduct professional-versus-Lake Watch side-by-side testing, since it engaged both AU researchers and Lake Watch citizen volunteer monitors in lake water quality monitoring. An important objective of the TWP study was to evaluate the credibility of AWW-certified volunteer monitor data and strengthen citizen monitor capabilities in measuring lake water quality.

TSI values, described earlier, are very significant since they are used by ADEM and other agencies to communicate the 'health' of a lake to the public. The TSI of a lake can be determined by analyzing either chlorophyll or total phosphorus concentrations of water in the laboratory, both of which are complex analyses. A third way to calculate TSI is from Secchi disk depth, a measurement that many volunteer monitors routinely take at their lake monitoring sites. Secchi disk depth is simply the depth at which a Secchi disk disappears when lowered into the lake, and represents a measure of water clarity. One important caveat in using Secchi disk depth to determine lake TSI is that it only works when decreased water clarity is from suspended algae (indicative of green water) and not from suspended soil or clay particles (indicative of brown or red-brown muddy water).

The graph below compares averages of Secchi disk measurements taken by AU researchers to those of Lake Watch volunteer monitors at four sites on Lake Martin taken April-October 2004. Results indicated that there were no significant differences between Secchi measurements of Lake Watch monitors and those of professional researchers. Lake Watch monitors used the AquaScope II device to reduce surface glare while taking Secchi measurements (pictured at right), similar to the method used by AU researchers. At all four sites, both professional and citizen data indicated the same lake trophic state – mesotrophic (Secchi depth of between 2-4 meters)

at Sandy and Elkahatchee Creek embayments, and at the main lake at Bay Pine Island; and eutrophic (Secchi depth of less than 2 meters) at Coley Creek Embayment, which receives municipal waste water treatment plant effluent. Clearly, trained and certified AWW monitors can, and do yield credible water data.



Who Manages the Lake?

Several entities, including state and federal agencies and a corporate entity, are involved with water management in Alabama, including Alabama Power Company, the Alabama Department of Environmental Management (ADEM), the Alabama Department of Public Health, the Alabama Department of Conservation and Natural Resources – Wildlife and Freshwater Fisheries Division, the Federal Energy Regulatory Commission, and the Alabama Department of Economic and Community Affairs – Office of Water Resources. Of these, the major players that manage Lake Martin are Alabama Power Company (water quantity) and ADEM (water quality).

Alabama Power Company (APC)

APC's involvement in water management in the Tallapoosa Basin began in the 1920s when company president Thomas Martin oversaw the construction of the Martin Dam. The dam was completed in 1926, and was the first of four dams on the Tallapoosa River (the other three being Yates and Thurlow downstream, and R. L. Harris upstream).

APC designed Martin as a multipurpose storage reservoir. This means the lake level fluctuates seasonally to provide the many benefits the project was built to support. These benefits include hydroelectric power, limited seasonal flood control (when the reservoir is drawn down below full pool), recreation, municipal-and-industrial water supply, water quality enhancement, flow maintenance to support aquatic life downstream of the dam, and flow to support downstream navigation. Some of these operational purposes benefit users upstream of the dam, some help with needs downstream of the dam, and others, like hydroelectric power, directly benefit many people throughout the state.

Management of Lake Marin's water resources is controlled by the guide curves that are in the license that APC is required to maintain from the Federal Energy Regulatory Commission (FERC) for the Martin Project. APC utilizes three different guide curves in its operations of Martin Dam (pictured below) – the Flood Control Guide (often called the "Rule Curve"), the Operating Guide, and the Drought Contingency Curve. Lake elevation data are available at https://lakes.alabamapower.com; note, the elevations on the chart are in Martin datum (MD), which is about 1 foot lower than mean sea level datum).

The Flood Control Guide is the uppermost curve and reflects the maximum elevation at which the lake is normally maintained in the interest of flood control. At times when the reservoir is below elevation (El.) 491 ft mean sea level (msl), the upper limit of the Flood Control Guide – also known as full pool, APC has the ability to store floodwater to help control high river flow events and flooding downstream.

Lake Martin Dam (SOURCE: Alabama Power Company)

The middle guide curve is the Operating Guide. This curve was developed in the 1970s through discussions with homeowner and boat-owner groups who desired a higher pool elevation with less seasonal fluctuation than had been experienced historically. Under the original Martin license issued in 1923, APC often operated the Project in a manner that lowered the lake twenty or more feet below full pool. As part of the FERC relicensing during the 1970s, APC and the majority of stakeholders agreed that operations should be changed so that a higher pool elevation could be maintained during normal project operations. The area between the Flood Control Guide and the Operating Guide represents the range in which APC attempts to operate Lake Martin under normal conditions. However, APC attempts to maintain Lake Martin at or near the upper end of this operating range as often as possible. By operating at or near the Flood Control Guide (highest of the three curves), APC can optimize the many benefits of the Project and best ensure that Lake Martin can refill to near-full pool each summer.

The lower guide curve is the Drought Contingency Curve. This curve, which is not officially approved, acts as an indicator of impending hydrologic drought conditions. The purpose of this curve is to flag conditions when reservoirs are in drought conditions. The Martin Drought Contingency Curve is not intended to dictate operations; rather, the curve is used as one of several factors in evaluating the need for drought operations.

Looking to the future, changes to reservoir management practices seem likely as a product of on-going relicensing activities. Impact studies and stakeholder input addressing economic, recreational, and various environmental concerns have included options to modify the management of lake level. A change in reservoir management to provide for a 3 or 4 foot higher winter pool, including provisions to maintain higher pool elevations during the Fall months during non-drought years, could be specified for APC's future operations at Lake Martin in the next license issued from FERC. A new license to govern the next 30 to 50 years of operations at Lake Martin is scheduled to be issued in June 2013.

Martin is a peaking project, which means it usually operates Monday through Friday during times of peak electric power demand. During generation, the dam's four turbines release up to 18,200 cubic feet per second (cfs). Hours of power generation per day depend on reservoir inflow and releases needed to support minimum flow requirements downstream below Thurlow Dam. Releases from Martin flow directly into the Yates Lake, a 2,000 acre reservoir; and releases from Yates flow directly into Thurlow, a 574 acre reservoir. Yates and Thurlow dams are also operated by APC. Thus, the entire river segment from Martin Dam to Thurlow Dam is impounded. Below Thurlow Dam, the Tallapoosa River flows unimpeded for some 45 miles. During extremely high flow events, flows of up to 133,000 cfs can occur if conditions require that all of the flood gates on the dam be opened.

APC operates the Yates/Thurlow Project as run of river projects that take advantage of peaking releases from Martin. Since 1991, APC has provided a continuous 1,200 cfs minimum release from Thurlow powerhouse, other than in extreme drought conditions. On many occasions, releases from Martin Dam are necessary to allow Thurlow powerhouse to meet the 1,200 cfs minimum flow requirement. There are currently procedures in the Yates-Thurlow license that reduce the release requirement at Thurlow Dam whenever inflows to Yates and Thurlow are abnormally low.

Alabama Department of Environmental Management (ADEM)

ADEM is the state agency that establishes water quality standards, use classifications and special designations for waterbodies, conducts periodic water monitoring (pictured at right near Wind Creek) and regulates pollution discharges into Alabama's streams, rivers and lakes. Major advancements in the protection of Lake Martin came through the establishment of chlorophyll a standards for Lake Martin in 2002. Standards were established for three portions of the lake: 1) above the dam, 2) the Kowaliga arm of the lake and 3) above the confluence with Blue Creek. The standard for all three areas was set at 5 micrograms of chlorophyll a per liter of water. This represents the maximum level of chlorophyll allowed and equates to low-to-moderate levels of nutrients and algae in the lake (oligotrophic to mesotrophic). These lake-specific standards are vital to the protection of the lake because with standards, pollution and lake enrichment levels can be gauged against the maximum allowed level, and if this maximum is exceeded, corrective measures are required.

Another major advancement in water policy was the designation of Martin as a *Treasured Alabama Lake* (TAL, discussed on page 19) in 2011. ADEM Director Lance Lefleur is pictured at left speaking at the signing ceremony at Kowaliga that established TAL. ADEM, in collaboration with Lake Watch and the Governor, developed this new designation for man-made reservoirs of exceptional ecological and recreational value (with other qualifying criteria) since the Outstanding Alabama Water classification that Lake Watch had pursued for Martin did not apply (OAW only applies to

natural waters, e.g. streams, rivers, bays). Under TAL, additional pollution sources are either not allowed, or if allowed, their waste effluent must meet strict criteria, which ensures the protection and preservation of the lake's high water quality now, and for generations to come.

Other Management Agencies

Alabama Department of Conservation and Natural Resources – Wildlife and Freshwater Fisheries Division (ADCNR-WFFD)

ADCNR-WFFD is the state agency responsible for managing Lake Martin's fishery. Fish populations are monitored by fishery biologists through routine fish sampling in the spring and fall. Once this fish population data has been obtained and examined, regulations such as angler creel limits and length limits on game fish can be implemented or modified. Fish populations are enhanced through increasing the amount of fish habitat in the lake and through fish stocking primarily saltwater Striped Bass and Florida strain Largemouth Bass in Lake Martin (photo at right is a stocking of Florida strain Largemouth Bass at Smith Landing on Sandy Creek, SOURCE: ADCNR-WFFD). The ADCNR-WFFD provides boating access areas on public waters throughout the state, including several on Lake Martin. They are also responsible for investigating fish kills that occur in public waters to determine the extent of damage to the fishery.

ADCNR has several additional management, conservation and education programs that positively impact the Lake Martin Watershed, including the Aquatic Biodiversity Center's Non-game Recovery Program, the Alabama Clean Waters Initiative, the Alabama Birding Trail (in collaboration with the Alabama Tourism Department), the Forever Wild Program, and several conservation education programs (for details, see www.dcnr.state.al.us).

Federal Energy Regulatory Commission (FERC)

FERC is the federal agency commissioned to issue licenses for the operation of hydroelectric dams like Martin Dam. The license application process is very lengthy, involving input from all major stakeholder groups and optimization of hydro-operations to meet the many stakeholder needs. Relicensing is required every 30 to 50 years.

Alabama Department of Economic and Community Affairs – Office of Water Resources (OWR)

OWR is the state agency charged with administering, tracking and reporting water use/withdrawals from ground and surface waters, developing a state drought contingency plan, and serves as Alabama's liaison in the ongoing 'Water Wars' between Georgia, Florida and Alabama. OWR's responsibilities include the administration of programs for river basin management, river assessment, water supply assistance, water conservation, flood mapping, the National Flood Insurance Program, and water resource development.

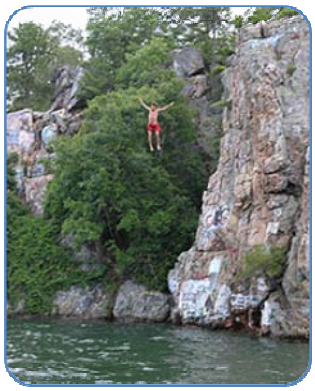
Vision for the Future of Lake Martin's Watershed

A successful watershed management plan integrates components called the "3 P's"

Partnerships of stakeholders representing major sectors of government, industry and the community.

Practical steps that are cost-effective and lead to measurable improvements in water quality.

Political will which involves the support and direction of elected officials with the authority to institutionalize a sustainable watershed management plan.



'Plunging into an uncertain future'

What is the future for the Lake Martin Watershed? We know that development around the lake will increase for decades to come, leading to significant changes in the watershed. The lake and the river will continue to be vital for the development of Alexander City and the other communities within the watershed, providing drinking water, wastewater treatment, irrigation, recreational opportunities, and other important functions. Decisions made today will affect the condition of the watershed in the future.

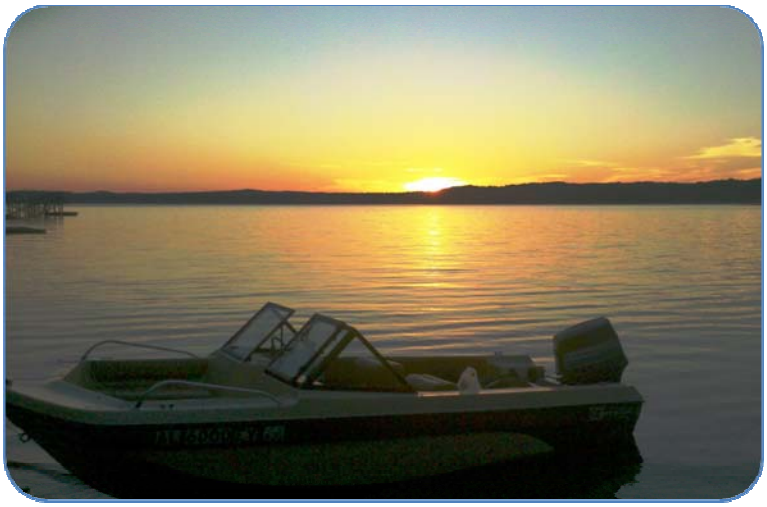
The Lake Watch Vision:

- The Lake Martin Watershed will be managed to support population growth and economic development in an ecologically sound manner, with improving water quality and sustainable land use.

- Development around the lake will increasingly consider the entire watershed (including water quality of the lake and aquatic biodiversity).

- The stakeholder partnerships of citizen groups, governmental agencies and business will become stronger and collaborate in watershed management.

- The residents of the watershed will become aware and appreciative of the economic, aesthetic, recreational, cultural and ecological benefits of Lake Martin and its many tributaries.



What would you like Lake Martin and its watershed to look like 20 years from now?

For more information about Lake Martin, and Alabama's waterways and how to get involved in protecting your watershed, contact:

Lake Watch of Lake Martin
256-825-9353 www.lakewatch.org

Alabama Water Watch
888-844-4785 www.alabamawaterwatch.org

Alabama Cooperative Extension System www.aces.edu
Tallapoosa Co: (256) 825-1050
Coosa Co: 256) 377-4713
Elmore Co: 334) 567-6301

Alabama Department of Conservation and Natural Resources
334-242-3486 www.dcnr.state.al.us

Alabama Department of Environmental Management
334-271-7700 www.adem.state.al.us

Alabama Clean Water Partnership
www.cleanwaterpartnership.org

U.S. Environmental Protection Agency (Region 4)
800-241-1754 www.epa.gov/region4

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