SECTION 3.0
AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This section describes current environmental and socioeconomic conditions at the Lake Lanier project and in the surrounding area. It describes each resource that could be affected by implementing the proposed action. The information in this section also serves as a baseline from which to identify and evaluate environmental and socioeconomic changes resulting from implementation of the proposed action. The information has been provided in only enough detail to understand the effects of the alternatives on the environment and depicts conditions as they currently exist based on the most recent available data. The effects of the proposed action and alternatives are discussed in Section 4.0.

3.1.1 Regional Geographic Setting and Location

The Chattahoochee River Basin lies within parts of the Blue Ridge, Piedmont, and Coastal Plain Physiographic Regions of the Southeastern Mixed Forest Province, which extends throughout the southeastern United States (Bailey, 1995; GDNR, 1997a). The basin's northern physiography reflects a geologic history of mountain building in the Appalachian Mountains and is characterized by rugged, densely wooded terrain (under natural conditions) of conspicuous relief and well-defined, narrow valleys. Lake Lanier is in the upper Piedmont, which consists of red hills of up to 1,200 feet in elevation. In this region, the Chattahoochee River has an average river slope of 2.6 feet per mile (USACE, Mobile District, 1974).

Lake Lanier, the largest impoundment located wholly in Georgia, was formed by Buford Dam at river mile 348.32 on the Chattahoochee River about 35 miles upstream from Atlanta. From Buford Dam, the reservoir extends about 44 miles up the Chattahoochee River and about 19 miles up the Chestatee River.

The project lies in the Gulf Slope Section of the Oak-Pine Region, where no virgin forests remain. Following early settlement, the land was cleared for agriculture, and when it became unproductive, it was abandoned in favor of newly cleared land. This practice continued until the project was built in 1956, resulting in modification of the region's vegetative cover.

3.1.2 Overview of Lake Lanier

Of the project's 17,745 acres above full power pool, 2,360 acres are open and the remainder is forested by pines, oaks, hickories, elm, sweet bay, ash, sycamore, persimmon, dogwood, and other trees. The land within the lake was completely cleared of trees between elevation 1,030 and 1,070 feet msl. Trees between elevation 980 and 1,030 feet msl were topped at or below 1,030 feet msl, which is 5 feet below the minimum power pool of 1,035 (USACE, Mobile District, 1974).

Lake Lanier at maximum storage capacity covers 47,182 acres at an elevation of 1,085 feet msl, providing for storage of 2,554,000 acre-feet of water.[1] At normal levels, the lake covers 39,038 acres at elevation 1,071 feet msl, providing for storage of 1,957,000 acre-feet of water. During extreme drought periods, the lake may drop as low as 1,035 feet msl, covering 22,442 acres and providing for storage of 867,000 acre-feet of water.

Buford Dam, completed in 1957, is a rolled-fill earthen dam. It is 192 feet high and 2,360 feet long with a top elevation of 1,106 feet msl. Two earth-filled saddle dikes with a total length of 6,600 feet flank the dam. The powerhouse at the dam contains three electrical generating units that provide a total of 86,000 kilowatts. The 1,049,000 acre-feet of storage volume between elevations 1,035 and 1,071 is allocated for power generation and low-water flow regulation. The 637,000 acre-feet of storage volume between elevations 1,071 feet and 1,085 feet is reserved for flood control purposes.

As measured by recreational visitor counts, Lake Lanier is one of the USACE's most popular water resources development projects. It lies within a reasonable driving distance north of Atlanta, a city that has experienced substantial growth in the past few decades. Residential development and commercial growth along the project's periphery and in a significant portion of the surrounding drainage basin have been equally substantial.

The Lake Lanier Project Management Office (PMO) oversees daily O&M activities of the project. Table 3-1 provides data on selected features of Lake Lanier. Management of this large water resources development project balances the lake's resources with hydroelectric power generation, navigation, water supply, flood control, and recreational purposes and provides benefits to the public.

Table 3-1
Lake Lanier Features as of 2001

Feature	Information/Data
Total project property	56,782 acres
Lake surface area at elevation 1,071	39,038 acres
Project property adjacent to lake at elevation 1,071	17,744 acres[1]
Permitted private and community boat docks	8,348
Marinas	10
Boat ramps (Corps, private and community operated)	83
Campgrounds	10
Day use parks	43
Swim areas	24
Visits in fiscal year 2001 (Oct 1–Sept 30)	7.27 million

[1] Mainland (including Lake Lanier Islands resort area) = 16,660 acres; islands = 1,083 acres.

Management activities are guided by several USACE directives[2] issued to ensure appropriate fulfillment of congressional intent with respect to water resources development projects like Lake Lanier. The PMO also operates within guidance contained in the locally prepared Lake Lanier Master Plan and O&M. The O&M is composed of component plans addressing natural resources and park management. By specifying goals, policies, and management actions, the two plans are vital to guiding stewardship measures and allocation of resources for the management of Lake Lanier. The PMO also relies on several site-specific plans and standard operating procedures (SOPs) that pertain to discrete matters.[3] Where appropriate, these directives are discussed in more detail throughout this EIS as they relate to specific environmental resources and conditions.

The 752 miles of Lake Lanier shoreline are allocated to Limited Development Areas, Public Recreation Areas, Protected Shoreline Areas, and Prohibited Access Areas (Figure 3-1). The initial purpose of zoning the shoreline was to aid in the protection and orderly management of a resource with diverse uses. The following subsections define the classifications and describe the management of each allocation (USACE, 1988).

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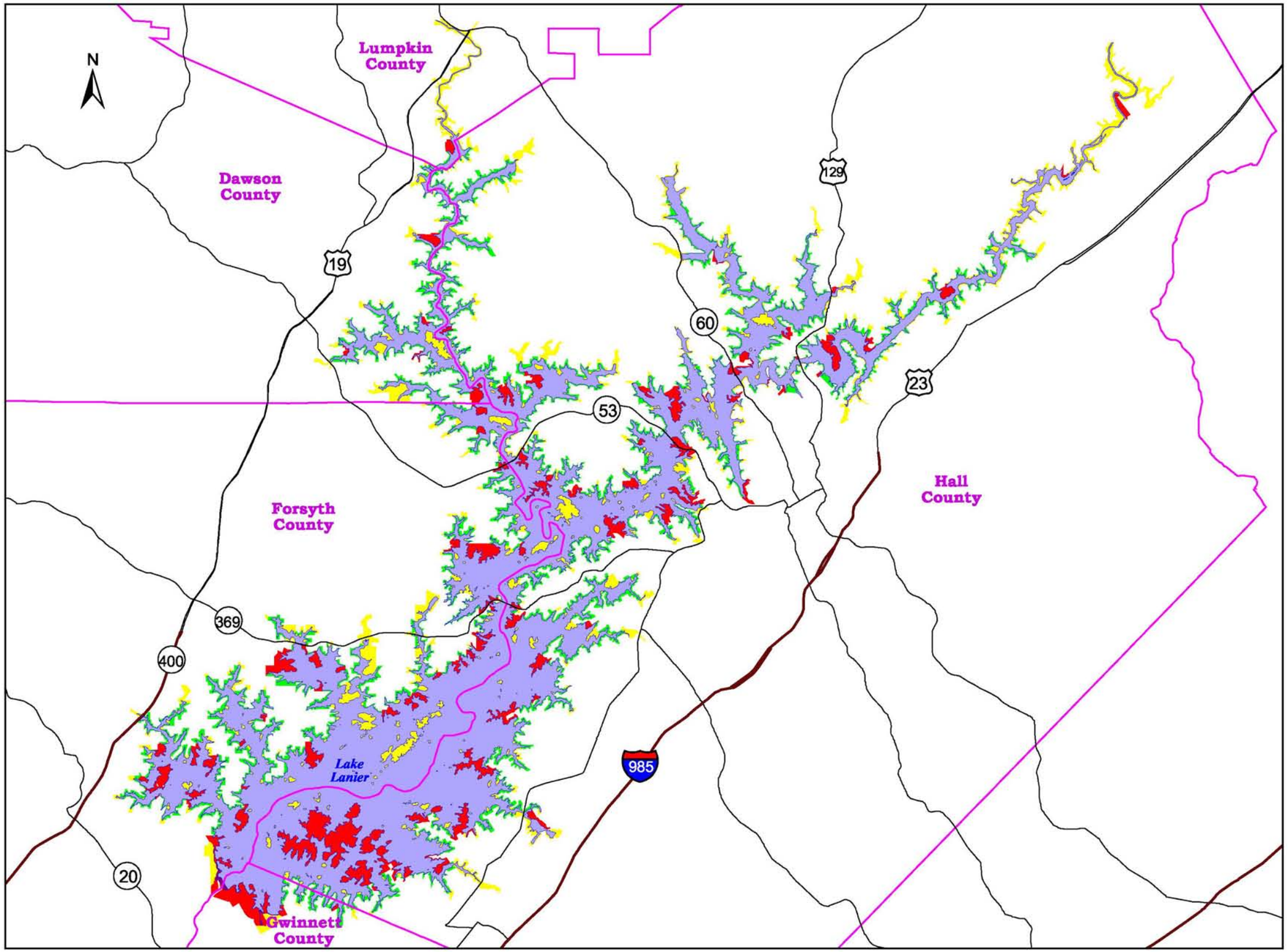
[1] An acre-foot is the volume of a liquid (water) covering 1 acre to a depth of 1 foot, or approximately 326,000 gallons.

[2] Principal guiding directives include ER 1130-2-406, *Shoreline Management at Civil Works Projects*, May 28, 1999; ER 1130-2-510, *Hydroelectric Power Operations and Maintenance Policies*, December 12, 1996; ER 1130-2-520, *Navigation and Dredging Operations and Maintenance Policies*, November 29, 1996; ER 1130-2-530, *Flood Control Operations and Maintenance Policies*, October 30, 1996; ER 1130-2-540, *Environmental Stewardship Operations and Maintenance Policies*, November 15, 1996; EP 1130-2-540, *Environmental Stewardship Operations and Maintenance Guidance and Procedures*, November 15, 1996; ER 1130-2-550, *Recreation Operations and Maintenance Policies*, November 15, 1996; and EP 1130-2-550, *Recreation Operations and Maintenance Guidance and Procedures*, October 1, 1999.

[3] Examples of site- and topic-specific management documents are the Down River Safety Plan (2001), Spill Prevention Control and Countermeasures Plan (1997), Low Water Safety Plan SOP (2000), Water Quality/Beach Testing Plan SOP (2001), and Project Response to High Lake Pool Levels SOP (1996). They are described in Section 2.2.1.



LEGEND

Shoreline Allocation Zone Types

- Limited Development Area
- Prohibited
- Protected
- Recreation
- County Boundary

0 1.5 3 Miles

Shoreline Allocation

Figure 3-1

Sources: USACE Mobile District, 2001; USACE Mobile District, 1988.

Prohibited Access Areas. This classification protects certain project operation areas and the recreational visitor. The only areas allocated under this classification at Lake Lanier are in the proximity of the powerhouse intakes, dam, saddle dikes, spillway, tailrace, and Corps marine yard. Although restricted visitation is allowed at most of these sites, Shoreline Use Permits are not issued for these locations. Less than 1 mile of shoreline and 0.4 percent (64.9 acres) of the project lands above elevation 1,071 feet msl are classified as "prohibited."

- ***Protected Shoreline Areas.*** Areas are designated as "protected" to preserve the scenic appeal of the lake, which is rapidly becoming more urban in character; to avoid conflict between private and public uses; to protect specific habitat for fish and wildlife; to protect cultural, historic, and archeological sites, endangered species, and navigation channels; to restrict placement of floating facilities in areas too shallow for navigation or too exposed to winds and currents; and to protect important natural formations and vistas.

  Pedestrian and boating access is permitted along protected shoreline provided that aesthetic, environmental, historic, or natural resource values are not damaged. However, private recreational facilities may not be authorized at these locations. Protected Areas constitute 31.9 percent (239.86 miles) of the shoreline and 34.7 percent (6,163.6 acres) of the acreage of the project lands above elevation 1,071 feet msl.

- ***Public Recreation Areas.*** Although most of the project is considered available for limited recreational purposes, certain specific areas are set aside for intensive recreational development or use. These sites include campgrounds; day use parks; primitive or natural areas; lands leased to public groups and other local, state, or federal agencies for recreational use or development; and commercial marina services. A total of 62 recreation sites are located around Lake Lanier.

  Permits for private shoreline use facilities are not granted in public recreation areas. Commercial activity is prohibited in all these areas without a permit. Authorization for commercial activity is restricted to sites currently designated for commercial purposes. These sites include the lake's 10 marinas and the Lake Lanier Islands complex. Currently no sites are available for leasing, and Corps development is restricted to existing sites designated by the Master Plan.

The Corps's primary management concern in public recreation areas is to provide sites suitable for quality recreational experiences with facilities that can sustain intensive use and are vandal-resistant, reasonably safe, and large enough to support normal weekend use during the peak recreation season. Public recreation areas constitute 20.8 percent (156.6 miles) of the shoreline and 30 percent (5,329.5 acres) of the acreage of the project above elevation 1,071 feet msl.

- ***Limited Development Areas (LDAs).*** Certain specific private uses of public lands may be permitted along shoreline designated "limited development." Permit applications are reviewed and considered solely on their own merits.

  The issuance of a Shoreline Use Permit does not preclude use of the shoreline by the public. However, boat docks and other personal property associated with an authorized dock are considered to be the permittee's private belongings. Unauthorized intrusion upon private floating facilities or picnic shelters is considered a trespass and should be reported to proper authorities. However, pedestrian traffic and general public use of the shoreline cannot be restricted or denied. Limited development areas compose 47 percent (353.8 miles) of the shoreline and 34.9 percent (6,186.6 acres) of the acreage of the project above elevation 1,071 feet msl.

Management actions are often directly affected by the classification assigned to a particular segment of the shoreline. Table 3-2 shows both the linear shoreline frontage miles and acreage of the allocations in effect at Lake Lanier. Table 3-3 shows the allocations by county. The original estimates considered in the 1974 EIS of 540 total shoreline miles and a lake surface area of 38,000 acres at 1,071 feet msl were made before the widespread use of GIS for data analysis. Using the best data currently available and GIS technology, the shoreline, including islands, is now estimated to be 752 miles (693 mainland shoreline miles plus 59 island shoreline miles) and the lake surface area to be 39,038 acres.

3.1.3 Climate

The climate of the Chattahoochee River Basin is temperate, with warm, humid summers and mild, wet winters (GDNR, 1997a; USACE, Mobile District, 1987). Summer temperatures are moderated

Table 3-2
Lake Lanier Shoreline Allocations
(Elevation 1,071 feet msl)

Allocation[1]	Shoreline Length (miles)	Percent of Total Shoreline	Acres	Percent of Project Property
Limited Development Areas (LDA)	344.70	45.8		
LDA in water[1]	9.13	1.2		
Total LDA	**353.83**	**47.0**	**6,186.6**	**34.9**
Protected along *main* shoreline	177.44	23.6	5,079.8	28.6
Protected in water	3.14	0.4		
Protected along *island* shoreline	59.28	7.9	1,083.9	6.1
Total Protected	**239.86**	**31.9**	**6,163.7**	**34.7**
Recreation along *main* shoreline	136.80	18.2	4,479.1	25.2
Recreation in water	0.28			
Lake Lanier Islands Resort islands	19.53	2.6	850.4	4.8
Total Recreation	**156.61**	**20.8**	**5,329.5**	**30.0**
Prohibited Areas	**1.74**	**0.2**	**64.9**	**0.4**
Total Allocation	**752.05**	**100.0**	**17,744.6**	**100.0**
Total *Main* Shoreline[2]	**692.77**			
Total *Island* Shoreline	**59.28**		**1,083.9**	
Total Shoreline	**752.05**			
Total Lake Surface Area			**39,038.1**	

[1] "In water" refers to areas where the Corps's boundary runs into the water. It is assumed that the shoreline paralleling these segments is of the same allocation as the adjacent shoreline segments.
[2] Includes Lake Lanier Islands Resort islands.

Table 3-3
Shoreline Allocation by County

Acres of Shoreline Allocation by County

	Dawson	Forsyth	Gwinnett	Hall	Lumpkin	Total
LDA	522.2	1,953.0	150.5	3,548.2	12.7	6,186.6
Protected	519.9	1,755.1	106.8	3,477.4	304.5	6,163.6
Recreation	173.4	1,457.6	384.8	3,275.2	38.4	5,329.4
Prohibited	-	32.2	32.7	-	-	64.9
Total	**1,215.5**	**5,197.9**	**674.8**	**10,300.8**	**355.6**	**17,744.5**

Miles of Shoreline Allocation by County

	Dawson	Forsyth	Gwinnett	Hall	Lumpkin	Total
LDA	32.8	101.1	7.0	212.2	0.7	353.8
Protected	14.5	65.8	0.7	148.4	10.4	239.9
Recreation	5.0	45.7	5.0	100.0	0.8	156.6
Prohibited	-	0.6	1.1	-	-	1.7
Total	**52.3**	**213.2**	**13.8**	**460.6**	**11.9**	**752.0**

because Lake Lanier is at an altitude of 1,000 feet msl at the foot of the Blue Ridge Mountains, while winter temperatures are moderated by the breezes from the Atlantic Ocean and Gulf of Mexico. January is the coldest month, with an average temperature of 45 degrees Fahrenheit (°F); July is the warmest month, with an average temperature of 77.9 °F. The average growing season in the area is 233 days. The first killing frost occurs in November, and the last occurs in March (USACE, Mobile District, 1987).

The historical average monthly rainfalls in Hall and Forsyth Counties are 4.58 inches and 4.75 inches (CH2MHill, 2000a, 2000b). The highest rainfalls occur during July and March, and October has the lowest rainfall. Although snow is not uncommon in the area, its accumulation is slight and it remains on the ground for only short periods. Dry periods typically occur in autumn, when long stretches of pleasant, mild temperatures are common (USACE, Mobile District 1997a).

Since 1998 Georgia has been plagued by severe to extreme drought conditions. Average statewide precipitation deficits range from 20 to 30 inches below normal, and some gauges indicate rainfall shortages close to 50 inches (GDNR, 2001). Severe droughts have occurred in the basin several times since the construction of the Lake Lanier project began in the 1950s. The most notable droughts occurred from 1950 through 1957, 1980 through 1982, and 1985 through 1989 (USGS, 2000).

Wind direction during the winter is usually from the northwest; during periods of cold, wet weather, however, winds originate from the east and northeast (USACE, Mobile District, 1987). During the summer winds are mostly from the south.

3.2 LAND USE, LAND COVER, AND LAND USE CONTROLS

Land use refers to human use of the land for economic production (residential, commercial, industrial, recreational, or other purposes) and for natural resource protection, and it generally describes what is practiced, permitted, or planned on the land. *Land cover*, an increasingly important attribute of land use, describes what is physically on the ground. The following sections address land use and land cover immediately adjacent to the shoreline of Lake Lanier and in the lake watershed.

3.2.1 Land Use/Land Cover

3.2.1.1 Lake Lanier Shoreline

The entire shoreline of Lake Lanier is allocated to one of four land use classifications described in Section 3.1.2 (Prohibited Access, Protected Shoreline, Public Recreation, and Limited Development). Refer to that section for complete descriptions of the shoreline allocations. Regulatory notes about the land use classifications are provided below. Shoreline allocation extends from the project boundary with adjacent private land to the lake shoreline and onto the surface of the lake adjacent to the allocated shoreline (for floating facility considerations).

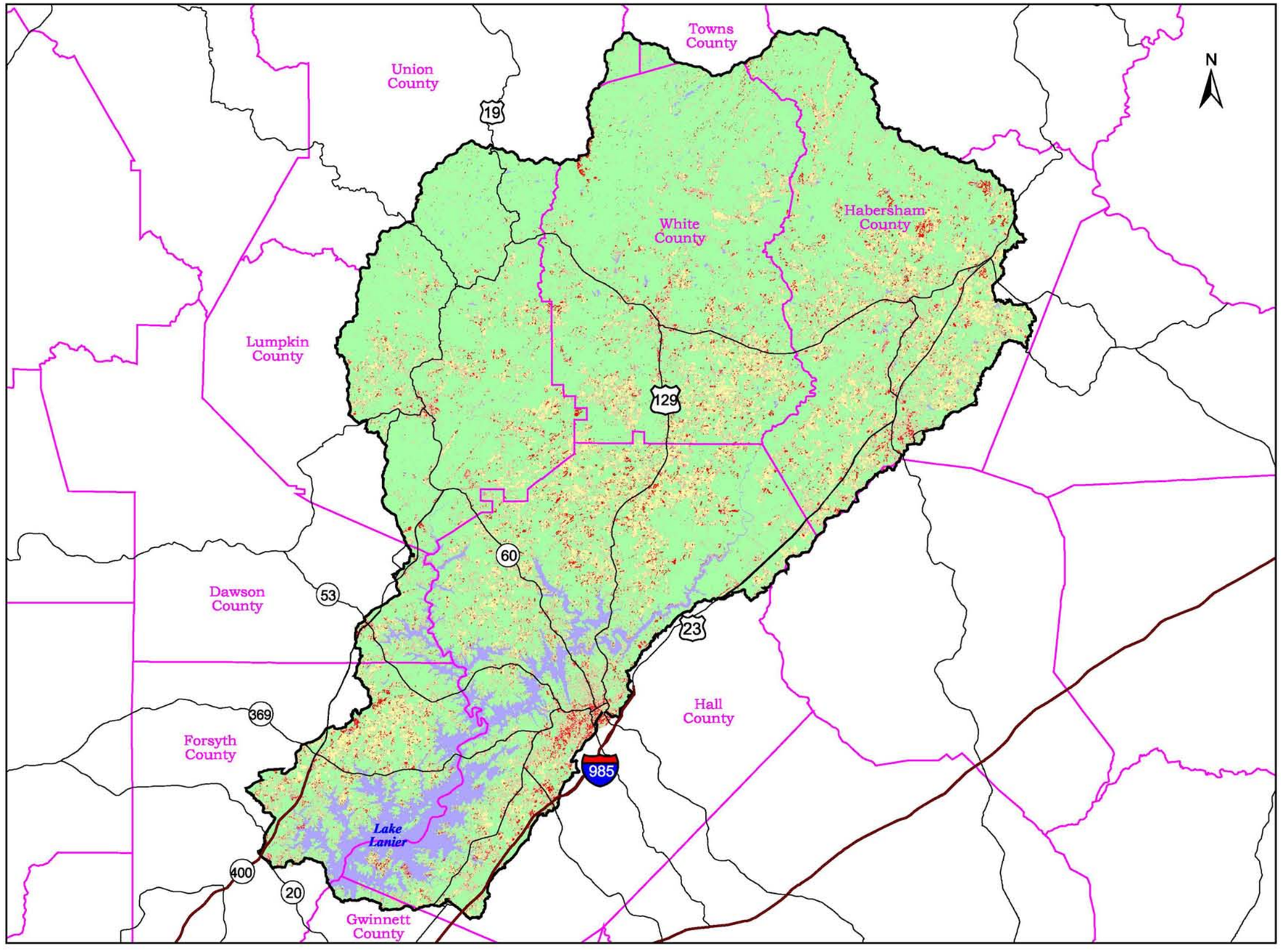
3.2.1.2 Adjacent Private Land

The area around Lake Lanier is a popular vacation and retirement area and essentially serves as a suburb of Atlanta, Georgia. This area is heavily developed for residential use. The lower lake is the most densely developed area. Development around the upper lake is continuing and almost equals that of the lower lake.

Because of the steep topography surrounding the lake (see Section 3.3.1.4), complete clearing of the land for development has not been possible or desired and residences are interspersed within still-abundant tree cover. Some residences adjacent to project land have reduced the vegetative cover on the project land lying between the residential land and the lake. In those areas where private land extends to the lake surface (these areas are very limited in extent), some property owners have removed the natural vegetation and planted grass.

3.2.1.3 Watershed

Based on the latest available multiresolution land cover satellite imagery, the principal land cover in the lake's watershed is forest (77.86 percent), followed by water (5.90 percent), pasture (4.55 percent), low-intensity urban (4.54 percent), crops (0.24 percent), and high-intensity urban (6.34 percent) (Figure 3-2). Table 3-4 provides information on the distribution of land uses on Corps property (Zone 1), private land adjacent to Corps property (Zone 2), and the rest of the Lake Lanier watershed (Zone 3).



LEGEND

Land Use Types

- Low-Intensity Urban
- High-Intensity Urban
- Transitional/Construction
- Agriculture
- Pasture
- Forest
- Water

0 3 6 Miles

Lake Lanier Watershed Land Use

Figure 3-2

Source: LimnoTech, 1997.

Table 3-4
Lake Lanier Watershed Land Use Distribution by Zone

Land Use	Zone 1 Government Areas (mi^2) [1]	Zone 2 Nongovernment Areas (mi^2)	Zone 3 Regional Areas Upstream (mi^2)	Total Land Use Area (mi^2)	Percent of Total
Open Water	60.76	0.00	0.00	60.76	5.90
Low-Density Urban	1.35	17.66	27.74	46.74	4.54
High-Density Urban	0.39	30.74	34.17	65.30	6.34
Forest	23.29	210.22	568.37	801.87	77.86
Pasture	0.39	19.22	27.26	46.87	4.55
Construction	0.00	2.64	3.26	5.90	0.57
Cropland	0.16	0.97	1.34	2.47	0.24
Wetlands	0.00	0.00	0.00	0.00	0.00
Totals	**86.34**	**281.45**	**662.14**	**1,029.91**	**100.00**

[1] mi^2 = square miles.

3.2.2 Land Use Controls

3.2.2.1 Lake Lanier Project Land

Regulations governing the use of land along Lake Lanier's shoreline and within the boundaries of government-owned land are stated in the 1988 LMP. Title 36 CFR Part 327 is used to enforce these rules and regulations within project-owned land. The Corps has exclusive jurisdiction over administration of the shoreline covered by the LMP. No American Indian lands are present within the boundaries of the Lake Lanier project.

The 1988 LMP contains details on shoreline allocation, Shoreline Use Permit guidelines, design of private floating facilities, facilities existing under special conditions (grandfathered facilities), construction and maintenance requirements for private boat docks, and private use of the shoreline. The LMP is being updated and renamed the Shoreline Management Plan (SMP).

Vegetation clearing on government land is permitted on foot paths authorized under a Lakeshore Use Permit only. Forest litter may be removed on government land within 6 feet of a residence where residences were constructed close to the government property line, and grassy areas on government property may be maintained as such if authorized under a Lakeshore Use Permit. The use of chemicals for modifying vegetation is not permitted on Lake Lanier, although topical applications to control noxious species may be authorized under a Specified Acts Permit.

In addition to the restrictions on land use on the shoreline, there are restrictions on boats with marine sanitation devices (MSDs) on the lake itself. Because the lake has been classified as a "No Discharge" lake, the use or possession of any type of MSD other than a U.S. Coast Guard-approved MSD is prohibited on boats operated on the lake. All MSDs must be pumped out only at marine dump stations located at marinas on the lake. The discharge of any type of effluent into the waters or lands of the lake is prohibited.

Floating facilities used in conjunction with commercial concessions in the parks (marinas) are not affected by the SMP. These concessions are controlled under real estate regulations. Floating facilities used in connection with motel, resort, campground leases must be located within LDAs.

3.2.2.2 Adjacent Private Land

Land use controls on private lands in the area around Lake Lanier are imposed by the respective county or city and vary from very lax controls to very restrictive covenants, codes, and restrictions. Among the covenants and restrictions are limits on the minimum size of a dwelling, dwelling height, and distance to lot lines. They also include required Architectural Control Committee approvals for dwelling unit and out-building plans, driveway paving material requirements, lot subdivision prohibitions, propane tank placement and landscaping requirements, septic tank installation, and garbage burning prohibitions.

3.2.2.3 Watershed Land

The watershed above the dam lies largely within six counties (Forsyth, Dawson, Lumpkin, White, Habersham, and Hall), with small areas in Gwinnett, Union, Towns, and Banks Counties. Land use is governed by these counties' comprehensive plans and zoning ordinances, except for lands in incorporated areas. Land use in incorporated areas is governed by their respective city zoning ordinances.

3.3 LAKE LANIER WATER RESOURCES

3.3.1 Watershed Characterization

3.3.1.1 Location and Description

Lake Lanier is in the Upper Chattahoochee watershed, which is assigned U.S. Geological Survey (USGS) Hydrologic Unit Code (HUC) 03130001. The Lake Lanier watershed and its contributing

counties—White, Habersham, Hall, Forsyth, and Lumpkin, along with small portions of Gwinnett and Dawson Counties—are outlined in Figure 3-3. The total area of the Upper Chattahoochee watershed is 660,000 acres (1,040 square miles).

The primary towns in the Lake Lanier watershed are Helen, Clarkesville, Demorest, Cornelia, Baldwin, Lula, Oakwood, Flowery Branch, Cleveland, Clermont, Gainesville, and Dahlonega, located upstream of Buford Dam on the lake. Other towns near Lake Lanier are Clermont, Lula, Gainesville, Oakwood, Flowery Branch, Cummings, and Buford. The remainder of the Lake Lanier watershed is primarily forest, with a small percentage of urban land uses, pasture, and crops.

3.3.1.2 Lake Lanier

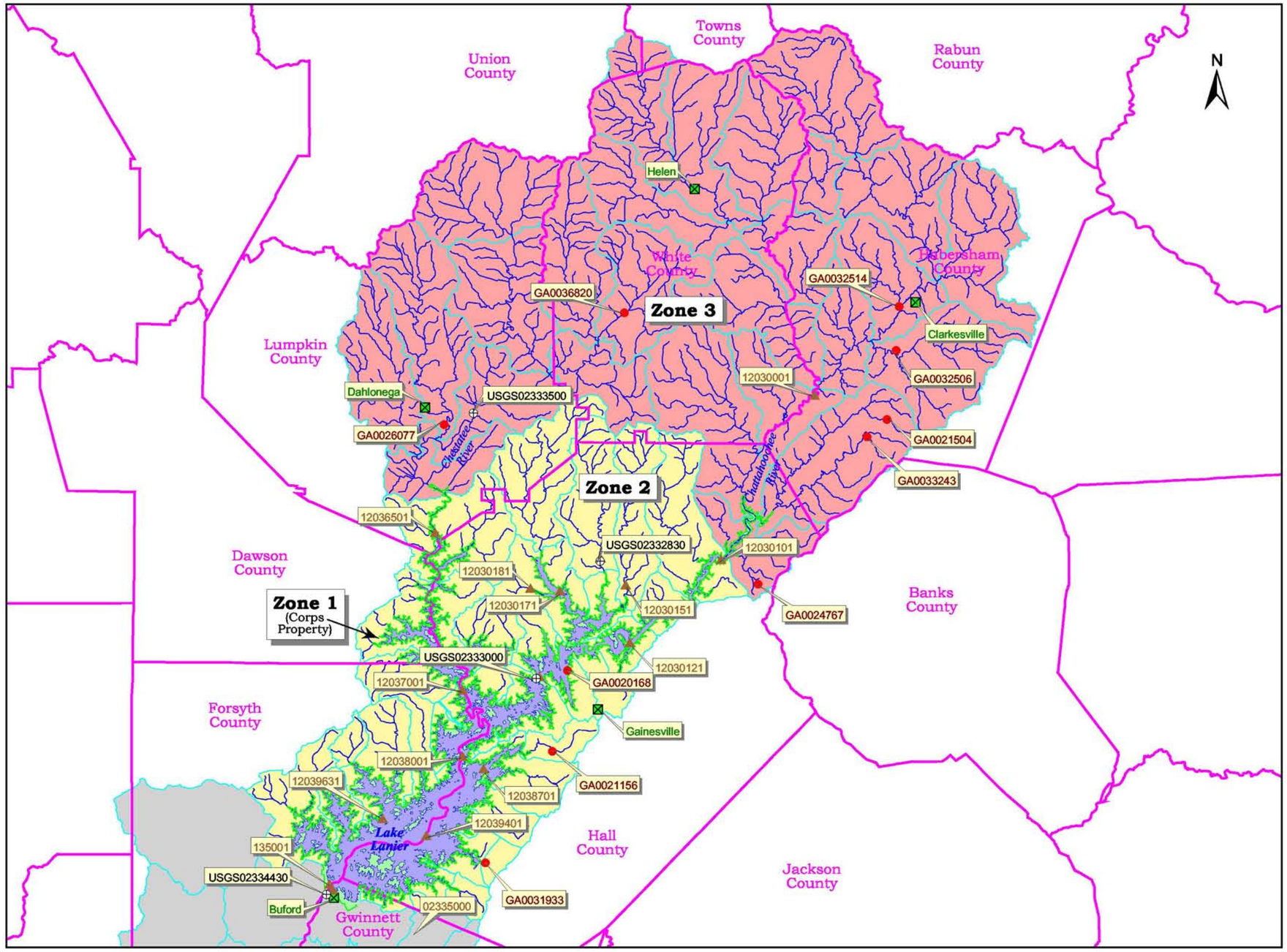
Lake Lanier has an average depth of 60 feet and a maximum depth of approximately 160 feet near the dam based on the 1993 USGS Buford Dam quad map. A minimum flow of 600 cubic feet per second is discharged constantly through a hydroelectric service unit operated for peaking power on a schedule of 5 days per week. The project operates to maintain a minimum flow of 750 cubic feet per second at Peachtree Creek (Atlanta) to provide for wastewater assimilation (USACE, Mobile District, 1998).

The lake is highly dendritic, with numerous branches and coves. The lake is oriented from the northeast going downstream in approximately a southwesterly direction and is about 31 miles in length. The lake is narrow and thin upstream where the Chattahoochee River feeds into it, and it swells and becomes wider going downstream toward the dam. The average width of the lake is about 1.4 miles. The area of the lake upstream at the north end where the Chattahoochee River feeds in covers 500 square miles (LTI, 1998). The Chestatee River feeds in from the northwest, covering an area of approximately 294 square miles (LTI, 1998).

The average inflow to Lake Lanier is 2,071 cubic feet per second. Of this flow, 45 percent (934 cubic feet per second) is contributed by the Chattahoochee River and 28 percent (568 cubic feet per second) by the Chestatee River. The remaining water comes from direct inflow to the lake (23 percent) and precipitation (4 percent) (LTI, 1998).

3.3.1.3 Tributaries

As discussed earlier, two major tributaries flow into Lake Lanier and drain about 75 percent of the Lake Lanier watershed—the Chattahoochee River and the Chestatee River (Figure 3-3). Various



LEGEND

- Gaging Station
- Water Quality Monitoring Station
- Point Source Discharge
- Meteorological Station

Zones of Influence

- Zone 1 (Corps Property)
- Zone 2 (Lower Watershed)
- Zone 3 (Upper Watershed)

- County Boundary
- Stream

0 3 6 Miles

Lake Lanier Watershed

Figure 3-3

Sources: USACE Mobile District, 2001; USEPA, 1998.

smaller tributaries also drain into Lake Lanier. Moving upstream to downstream, they include Wahoo, Little River (East and West Fork), Flat & Mud Creek, Flowery Branch, Big Creek, Shoal Creek, Thompson Creek, Six Mile Creek, Young Deer Creek, Mid-Channel Bypass, and Bald Ridge Creek. These minor tributaries typically have small urban watershed areas located close to the lake.

3.3.1.4 Topography

The topography of the Lake Lanier watershed is relatively steep. The Blue Ridge Province, where the Chattahoochee River begins, is very mountainous and steep. Elevations in the watershed range from more than 4,439 feet (1355 meters) National Geodetic Vertical Datum (NGVD) to 1,071 feet (327 meters) at lakeside.

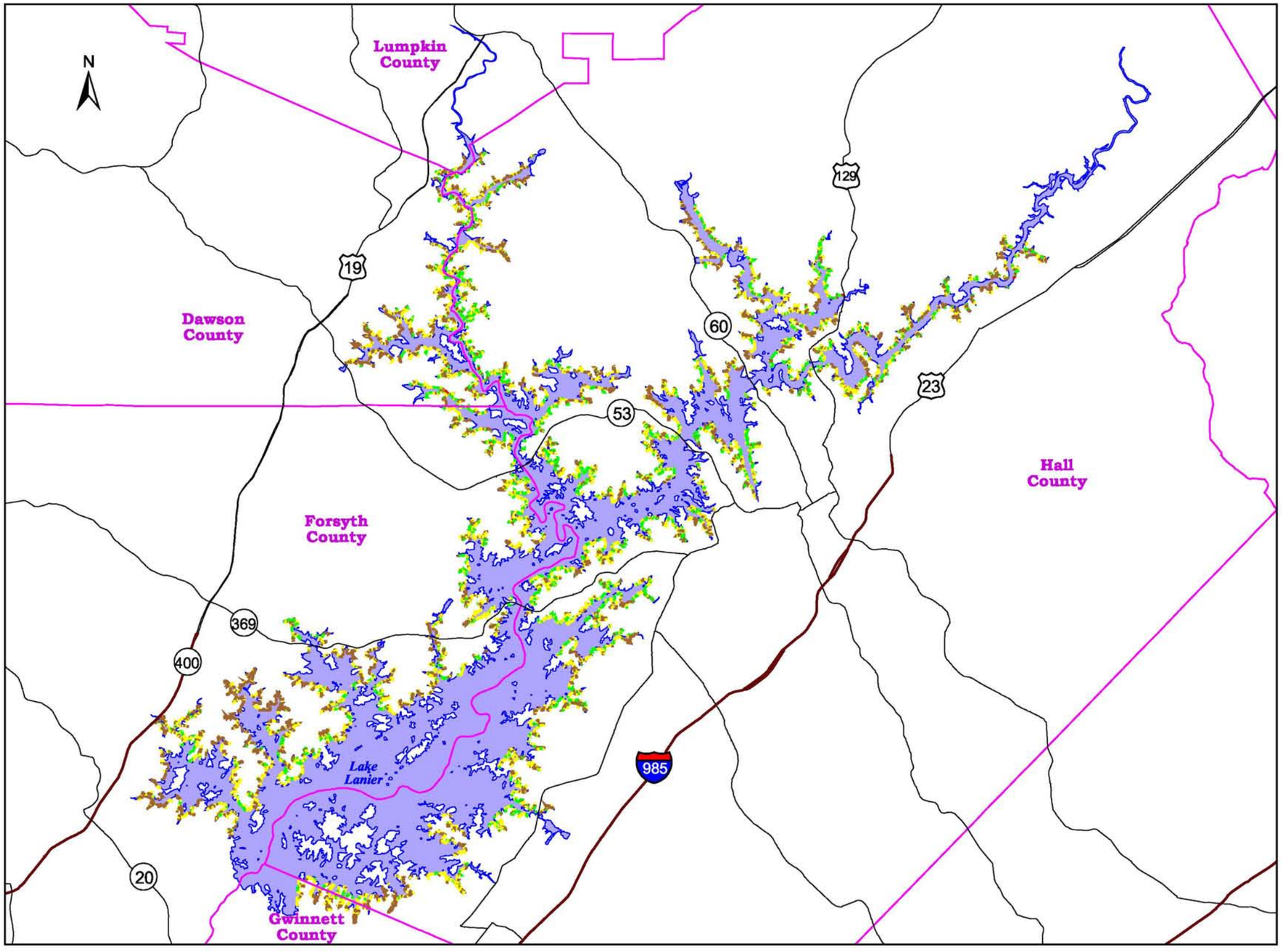
In the immediate vicinity of the lake, the topography ranges from steep cliffs and bluffs extending to the water's edge to relatively flat, sloping shorelines in various coves. Figure 3-4 shows the distribution of slope along the shoreline of the lake. The areas with steep bluffs and cliffs are concentrated in the upstream portions of the Chestatee and Chattahoochee River.

3.3.1.5 Flows and Exchanges

Historically, the USGS has maintained flow gauges at various locations throughout the Lake Lanier watershed. The USGS has gauges on the Chattahoochee River near Gainesville, Chattahoochee River at Buford Dam, Chestatee River near Dahlonega, and West Fork Little River near Clermont. Station 02334430 is immediately downstream of Buford Dam and reflects the discharge out of the dam on the Chattahoochee River. Table 3-5 lists the USGS flow stations, and Table 3-6 presents the results of statistical analyses on the stations for which data were available. The historic flow records were analyzed to determine the range of flow conditions and the average flows in the various tributaries and out of the dam. Buford Dam is used to generate electricity and controls the outflow from Lake Lanier. Controlling the outflow of the lake contributes to controlling the level of the lake so that the inflow to the lake will not equal the outflow from the lake.

3.3.1.6 Water Quality Standards and 303(d) Listed Waters

Section 303(d) of the Clean Water Act requires states to identify and develop a list of those water bodies that are impaired where technology-based and other required controls have not provided



LEGEND

Slopes Along LDA Shoreline

- 0 - 10%
- 10 - 20%
- 20 - 49%
- 49 - 67%

0 1.5 3 Miles

Slopes Along LDA Shoreline

Figure 3-4

Sources: Lake Sidney Lanier, 2002; USGS, 1979.

Table 3-5
USGS Flow Stations in the Lake Lanier Watershed

USGS Station	Latitude	Longitude	Station Name
02333000	34.321	83.879	Chattahoochee River near Gainesville, Georgia
02334430	34.157	84.079	Chattahoochee River at Buford Dam
02333500	34.528	83.940	Chestatee River near Dahlonega
02332830	34.415	83.822	West Fork Little River near Clermont

Table 3-6
Daily and Monthly Mean Statistics on USGS Flow Stations[1]

Station	Dates of Analysis	Min	Max	Mean	7Q10	Annual Average
02333000	6/26/1901 to 2/29/1956	208	38,500	1,236	280	1,192
02334430	1/10/1971 to 9/30/2000	330	9,570	2,036	630	2,054
02333500	7/8/1929 to 9/30/2000	31	11,400	366	69	366
02332830	2/1/1993 to 4/11/1999	8.4	1,310	33	N/A	36

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
02333000	1,424	1,836	2,069	1,597	1,268	1,112	1,131	1,090	795	649	772	1,059
02334430	1,888	2,230	2,258	2,582	2,243	1,947	1,926	2,244	2,044	1,940	1,665	1,475
02333500	474	536	605	531	403	297	260	254	202	212	259	365
02332830	52	52	60	41	28	32	20	25	15	25	30	25

[1] All flow values are in cubic feet per second.

attainment of water quality standards. The table of 303(d) listed waters located within the study area is provided in Appendix G.

3.3.1.7 Subwatersheds

Two major subwatersheds drain to Lake Lanier—the Chattahoochee River watershed and the Chestatee River watershed.

Chattahoochee River Watershed. The Chattahoochee River watershed drains 559 square miles. The subwatershed discharges an annual average of 1,192 cubic feet of water per second into Lake Lanier. The designated uses for water bodies in the subwatershed are recreation (from SR 255 to Buford Dam) and fishing (headwaters to SR 255).

Fifty-five point discharge permits, two active mines, and 16 locations of either former mines or possible future mines are located in this subwatershed (Appendix H). Four water bodies in the subwatershed, including the Chattahoochee River, are listed on the state's section 303(d) list of impaired water bodies (USEPA, 2001) (Appendix G).

Chestatee River Watershed. The Chestatee River watershed drains 153 square miles. The subwatershed discharges an annual average of 366 cubic feet of water per second into Lake Lanier. The designated use for water bodies in the subwatershed is fishing.

Eighteen point discharge permits, two active mines, and 46 locations of either former mines or possible future mines are located in this subwatershed (Appendix H). Three water bodies in the subwatershed are listed on the state's 303(d) list (USEPA, 2001).

3.3.2 Hydrogeology/Groundwater

Lake Lanier is in the Piedmont Province, just north of the Fall Line that separates that province from the Coastal Plain Province. This area is underlain by bedrock and a crystalline-rock aquifer. The crystalline rocks have few primary pore spaces, and the porosity and permeability of the unweathered and unfractured bedrock are extremely low. However, groundwater is stored in unconsolidated material known as the regolith and in rock fractures. The regolith is primarily composed of the saprolite layer, which is a layer of earthy, decomposed rock formed by the weathering of exposed bedrock (USGS, 2002).

Water in the crystalline rock aquifers generally is unconfined, but the water in the bedrock is restricted entirely to flow through fractures. Water enters the Piedmont crystalline rock aquifer as precipitation falls on the land surface and percolates vertically downward to the water table. Once the water reaches the water table, it moves laterally to discharge points such as springs, baseflow to streams, and seepage to lakes (USGS, 2002).

The crystalline rock aquifer is used primarily for domestic water supply wells and agricultural wells for animal watering. Well yields are typically small, and the Chattahoochee River Basin Management Plan states that "it is commonly believed that groundwater in this area is not sufficient to support municipal and industrial uses" (GDNR, 1997a). Table 3-7 shows active municipal and industrial groundwater withdrawal permits in the counties surrounding Lake Lanier.

Well yields in the crystalline-rock aquifers are variable and range from zero to 471 gallons per minute but are usually less than 50 gallons per minute (GDNR, 1997a). The typical range is approximately 15 to 20 gallons per minute (USGS, 2002). Contact zones between crystalline-rock types are good locations for wells to yield large volumes of water (USGS, 2002).

Table 3-7
Municipal and Industrial Groundwater Withdrawal
Permit Holders near Lake Lanier

County	Permit	Facility Type[1]	Name	Monthly Permitted Flow (MGD)	Yearly Permitted Flow (MGD)
Forsyth	058-0001	I	Laurel Springs Farm Golf Course	0.400	0.160
Hall	069-0004	I	Con Agra Broiler Company	0.300	0.300
Hall	069-0002	I	Fieldale Farms Corporation	1.200	1.200
Hall	069-0003	M	City of Flowery Branch	0.367	0.367
Lumpkin		M	City of Dahlonega	0.7	0.672

[1] I = industrial; M = municipal.
Source: GDNR, 1997a.

The water from the Piedmont crystalline rock aquifer is of suitable quality for drinking and other uses. The saprolite layer of the regolith contains clay, which acts as a barrier to groundwater pollution. This area has a low susceptibility to pollution (GDNR, 1997a). With the exception of fluoride, iron, manganese, and, locally, sulfate, concentrations of dissolved constituents seldom exceed state and federal drinking-water standards (USGS, 2002). Some public water system wells in the Chattahoochee River subbasin, however, have been contaminated by local pollution sources, such as leaking underground storage tanks, malfunctioning septic tanks, and spills (GDNR, 1997, cited in USACE, Mobile District, 1998).

3.3.3 Water Quality

3.3.3.1 Pollutant Loadings to the Lake

Potential pollutant loadings to Lake Lanier come from various sources, including the following:

- Watershed runoff entering the lake through the two major tributaries, the Chattahoochee River and the Chestatee River.
- Watershed runoff draining directly to Lake Lanier and its smaller tributaries. These loads are reflective of the immediate lake watersheds (i.e., adjacent land uses, septic system malfunction, and marina development).
- Permitted point source discharges to the tributaries and Lake Lanier.
- Boating activities on the lake (fueling, illegal discharge of human waste).

Watershed Loadings. The two major tributaries that flow into Lake Lanier drain more than 81 percent of the total watershed above the dam and deliver the majority of the loadings. The remaining watersheds provide direct loadings to the lake. To determine annual average loadings to Lake Lanier, the watershed was broken down into three discrete zones of influence surrounding the project: Zone 1, the principal study area, which includes all government-owned lands and waters constituting the Lake Lanier project (direct influence); Zone 2, the nongovernmental lands bordering government lands surrounding the lake (direct influence); and Zone 3, the watershed upstream of Lake Lanier (to address indirect regional issues influencing the lake). The modeling methodology and assumptions are contained in Appendix I.

An examination of the acreage distribution shows that the overall watershed of Lake Lanier is relatively undisturbed. About 78 percent of the watershed is forested, with coniferous forest, mixed forest, hardwood forest, or forested wetlands. The remaining 22 percent is primarily urban (low- and high-density) and water, with small percentages of pasture and cropland.

Most of the forested area (around 70 percent) lies in Zone 3, in the areas upstream of the lake. The total urban area for Zone 1 and Zone 2 combined is approximately equal to the regional areas upstream of the watershed, i.e., Zone 3. It may be noted that the government areas are all the direct discharge areas adjacent to the lake and make up about 8 percent of the total watershed area (Table 3-4). Their predominant land use is open water, followed by forest.

Based on the watershed model results, the primary loading constituents associated with the land uses in the Lake Lanier watershed are sediment, total nitrogen (TN), and total phosphorus (TP). Table 3-8 presents the annual average loadings of the primary loading constituents by source. The results in Table 3-8 show that on a total loading basis, Zone 3 contributes approximately 62 percent of the total load of nitrogen to the lake, whereas Zone 1 contributes only 3 percent. This analysis shows that the bulk of the overall loading to the lake enters through the two primary tributaries, the Chattahoochee and the Chestatee. For all the constituents, the load from Zone 3 is greater than the load from the areas immediately adjacent to the lake. This is primarily because of the size of the area of Zone 3 in relation to the watersheds immediately adjacent to the lake. However, because this area is predominantly forested (about 70 percent of the total area) and has less open space and fewer construction activities than Zone 2, the amount of suspended solids is an order of magnitude lower than that in Zone 2. It may be noted that septic systems, point sources, and groundwater are

Table 3-8
Annual Average Loads by Zone for Nitrogen, Phosphorus, Erosion, and Runoff

Source	Total Nitrogen (tons/yr)	Total Phosphorus (tons/yr)	Sediment (tons/yr)	Runoff (cm)
Zone 1—Government Lands				
Low-Density Urban	960.98	106.83	0.00	339.38
High-Density Urban	1,801.21	200.68	0.00	64.47
Forest	2,712.89	358.35	1,612.70	71.42
Pasture	808.03	274.06	11.19	17.27
Construction	320.82	129.41	92.61	14.16
Cropland	745.03	375.02	669.14	192.62
Wetland	0.00	0.00	0.00	0.00
Point Sources	0.00	0.00	0.00	0.00
Septic Systems	11,103.59	341.10	0.00	0.00
Groundwater	53,198.60	531.99	0.00	0.00
Totals	**71,651.14**	**2,317.44**	**2,385.65**	**699.32**
Percentages of Overall Total	**2.8**	**1.7**	**1.8**	**4.6**
Zone 2—Non-Government Lands				
Low-Density Urban	12,572.60	1,397.69	0.00	4,440.20
High-Density Urban	140,325.22	15,634.43	0.00	5,022.38
Forest	24,486.21	3,234.41	131,380.86	644.63
Pasture	40,934.69	13,884.08	28,152.82	874.97
Construction	23,959.35	9,664.76	516,544.22	1,057.18
Cropland	4,528.18	2,279.29	24,718.25	1,170.73
Wetland	0.00	0.00	0.00	0.00
Point Sources	1,543.00	3,400.00	0.00	0.00
Septic Systems	114,105.69	3,505.32	0.00	0.00
Groundwater	546,693.78	5,466.94	0.00	0.00
Totals	**909,148.78**	**58,466.91**	**700,796.14**	**13,210.10**
Percentages of Overall Total	**35.0**	**40.8**	**91.3**	**88.2**
Zone 3—Regional Areas Upstream of Lake Lanier				
Low-Density Urban	22,003.62	2,486.47	0.00	328.81
High-Density Urban	159,416.88	17,784.15	0.00	347.81
Forest	85,165.14	5,577.30	24,078.80	82.25
Pasture	84,368.65	28,085.02	2,138.08	92.67
Construction	10,979.07	4,428.76	35,151.31	104.93
Cropland	7,190.25	3,688.49	3,393.21	123.20
Wetlands	0.00	0.00	0.00	0.00
Point Sources	103,434.00	5,157.00		
Septic Systems	186,540.55	5,730.72		
Groundwater	955,344.20	9,553.44		
Totals	**1,614,442.36**	**82,491.36**	**64,761.39**	**1,079.68**
Percentages of Overall Total	**62.2**	**57.6**	**8.4**	**7.2**
Overall Total	**2,595,242.28**	**143,275.71**	**767,943.18**	**14,989.10**

Source: EIS model results.

significant contributors to the overall loading of nitrogen and phosphorus. When looking at the overall annual average loading, however, the phosphorus loadings coming from point sources,

septic systems, and groundwater are of secondary importance (24 percent) when compared to loadings coming from storm water runoff (76 percent).

NPDES Permitted Point Source Discharges. A list of all the National Pollutant Discharge Elimination System (NPDES) permitted facilities in the Lake Lanier watershed was compiled from numerous sources (LTI, 1998). A total of 40 facilities were identified; however, only the facilities with permitted flows greater than 0.1 million gallons per day were included in the watershed analysis. This was done mainly because effluent nutrient concentration data for smaller facilities were not available and because the smaller facilities contribute less than 1 percent of the total watershed nitrogen and phosphorus load. Table 3-9 presents the identification numbers, names, locations, receiving waters, and design discharges for each NPDES permitted facility included in the watershed analysis. Appendix H lists all point sources in the Lake Lanier watershed. The average annual loads of these point sources are presented in Table 3-8.

Loadings from Boating Activities. Boating activities and operations affect water quality in Lake Lanier in numerous ways. Sediment can be resuspended through boat operations and wakes, although resuspension is generally a localized condition. Refueling and boat operation can introduce hydrocarbons to the water. Introduction of metals and other toxic materials can occur through boat maintenance activities.

Table 3-9
Water Pollution Control Plant Discharge Locations in the Lake Lanier Watershed

Identification Number	Name	City Name	County	Receiving Water	Design Flow (MGD)
GA0032514	Clarksville WPCP	Clarksville	Habersham	Soquee River	0.75
GA0032506	Demorest WPCP	Demorest	Habersham	Hazel Creek Tributary	0.40
GA0021504	Cornella WPCP	Cornella	Habersham	South Fork Little Mud	3.00
GA0033243	Baldwin WPCP	Baldwin	Habersham	Little Mud Creek	0.30
GA0036820	Cleveland WPCP	Cleveland	White	Tesnatee Creek	0.75
GA0026077	Dahlonega WPCP	Dahlonega	Lumpkin	Yahoola Creek	0.72
GA0020168	Gainesville #2 Linwood Dr. WPCP	Gainesville	Hall	Lake Lanier	3.00
GA0021156	Gainesville #1 WPCP	Gainesville	Hall	South Flat Creek	7.20
GA0031933	Flowery Branch WPCP	Flowery Branch	Hall	Lake Lanier	0.20
GA0030261	Lanier Habersham Utility Corp.	Clermont	Forsyth	Unknown tributary to Lake Lanier	0.50
GA0024767	Lake Lanier Islands WPCP	Clermont	Hall	Unknown tributary to Lake Lanier	0.35

Boat maintenance is one potential source of increased metal concentrations. USEPA (1993) reports that the typical metals that can pollute water surrounding boating activities are as follows:

- Arsenic: used in paint pigments, pesticides, and wood preservatives
- Zinc anodes: used to deter corrosion of metal hulls and engine parts
- Copper and tin: biocides in antifoulant paints
- Others (iron, chrome): used in construction of marinas and boats

Only generic literature is available regarding the effects of marinas on lake water quality. The impact a marina has on Lake Lanier is largely dependent on the actions of individuals, making the quantification of pollutant loadings difficult. According to Part 2 of the Clean Lakes Study (Hatcher et al., 1994), there were detectable levels of arsenic, chromium, copper, lead, mercury, nickel, selenium, zinc, and dichlorodiphenyldichloroethylene (DDE) in the tissue of fish caught at two marinas on the lake. The concentrations were not found to be significantly different from those found in other parts of the lake. The Clean Lakes Study therefore concluded that there is no direct link between boating activities and elevated metal concentrations, although it is possible that the marinas are the source of the metals.

Illegal discharges from marine toilets can increase the fecal coliform counts in the lake. The Official Code of Georgia Annotated, Section 12-5-29(c), prohibits discharging the contents of marine toilet holding tanks into Lake Lanier.

Former Mines. The Clean Lakes Study reports that during the 19th and early 20th centuries gold was mined extensively in the Lake Lanier watershed, mainly in what is known as the Dahlonega Gold Belt and the Hall County Gold Belt. Mercury was commonly used to amalgamate and separate the gold from the ore, and as a result mercury waste is present in soils and sediments in many parts of the watershed. In addition to gold, copper was mined at the Chestatee Pyrite Mine on the Chestatee River 1.75 miles below its confluence with Tesnatee Creek.

The Clean Lakes Study concluded that the former mines, particularly those in the Chestatee River watershed, are apparently the sources of mercury and copper in Lake Lanier, but only at slightly elevated levels. Although mining is one potential source, atmospheric deposition is another source of mercury common throughout the southern states. A list of known former, current, and possible future mines is provided in Appendix H.

3.3.3.2 Historical In-lake Water Quality

Water quality data from 1974 through 1979 were obtained from both the USEPA Storage and Retrieval (STORET) database system and the USGS National Water Information System Database (NWISWeb). The STORET database includes sampling data collected by federal and state agencies sampling water quality in the Lake Lanier watershed, and the USGS database includes sampling done by the USGS. Historical water quality was evaluated at six monitoring stations (Table 3-10), four from the STORET database and two from the NWISWeb. Results of the historical water quality analysis are included in Appendix J.

3.3.3.3 Current In-lake Water Quality

Water quality in Lake Lanier is considered satisfactory for the designated uses of the reservoir. Current water quality in the lake was evaluated based on results reported in the Clean Lakes Study and from 18 EPA and USGS monitoring stations in the lake and its adjacent tributaries. The Clean Lakes Study sampled water quality parameters at two categories of stations: Category I stations were located in Lake Lanier, and Category II stations were located on tributaries to the lake. Table 3-11 lists the numbers of the 18 additional monitoring stations with their descriptions.

The overall water quality of Lake Lanier is good. There are indications that without nonpoint source controls the anthropogenic nutrient sources could cause an increase in eutrophication. The main body of the lake has the greatest transparency and the lowest fecal coliform counts and nutrient concentrations. Those areas in the Chattahoochee River and Chestatee River arms of the lake where the lake is shallower have the highest levels of turbidity, total suspended solids, chlorophyll *a,* and nutrient concentrations.

Table 3-10
Historical (1974–1979) Water Quality Stations in the Lake Lanier Watershed

Station Identification	Station Number
Chattahoochee River, Georgia Highway 384	12030001
Chattahoochee River, Georgia Highway 369, Brown's Bridge	12038001
Chattahoochee River, upstream from Buford Dam	12040001
Chattahoochee River, downstream from Buford Dam	12041001
Chestatee River near Dahlonega, GA	02333500
Chattahoochee River near Gainesville, GA	02333000

Table 3-11
STORET and NWISWeb Water Quality Stations in the Lake Lanier Watershed

Station Identification	Station Number
Chattahoochee River Headwaters	
Chattahoochee River, Georgia Highway 384	12030001
Chattahoochee River at Lula Bridge, Highway 52	12030101
Chestatee River Headwaters	
Lake Lanier–Wilkie Bridge, Highway 136	12036501
Chestatee River near Dahlonega	02333500
Little River Headwaters	
West Fork Little River–Jess Holton Road	12030141
East Fork Little River–Honeysuckle Road	12030151
Squirrel Creek at Tomacheche Road	12030181
West Fork Little River near Clermont	02332830
Lake Lanier–Chattahoochee River Arm	
Lake Lanier, Clarks Bridge, Georgia Highway 384	12030121
Lake Lanier–Chestatee River Arm	
Lake Lanier–Chestatee River at Bolling Bridge	12037001
Lake Lanier–Little River Arm	
Wahoo Creek at Ben Parks Road	12030171
Lake Lanier–Middle	
Chattahoochee River at Georgia Highway 369, Brown's Bridge	12038001
Lake Lanier–Flat Creek/Balus Creek confluence	12038701
Lake Lanier–Chattahoochee River at Lanier Bridge	12030201
Lake Lanier–Lower	
Chattahoochee River upstream from Buford Dam	12040001
Lake Lanier	135001
Lake Lanier–0.75 mile southwest of Aqualand Marina	12039401
Lake Lanier–6 Mile Embayment, Mount Zion Park	12039631

Lake Lanier experiences thermal stratification during the summer. In a typical stratified lake, dissolved oxygen concentration may drop below 2 milligrams per liter in the hypolimnion or approach anoxic conditions within a meter from the bottom. Low dissolved oxygen concentrations were observed in the reviewed water quality data, but the overall dissolved oxygen concentrations were good and water quality standards were met. A detailed discussion of the water quality analysis and trends is provided in Appendix K.

3.4 INFRASTRUCTURE

3.4.1 Shoreline Structures

The waters of Lake Lanier are designated as "recreational" by the Georgia Department of Natural Resources (DNR). The lake experiences the highest annual recreational visitation of all Corps lakes in the Apalachicola-Chattahoochee-Flint (ACF) River Basin. As a result, the lake has a highly developed shoreline (USACE, Mobile District, 1998). There are 8,348 boat dock permits for Lake Lanier, with an average annual increase of 175 over the past 9 years. There is a potential to reach up to 25,000 dock permits, ultimately covering 350 miles (47 percent) of the lake's shoreline. Each permittee is allowed a pedestrian access path to the lake shoreline and a boat dock. Corps regulations specify that these access paths may be up to 6 feet wide and must follow a meandering route that conforms to the topography as much as possible to help prevent erosion, avoid the need for removal of native vegetation, and prevent bridge construction. The pathway permit does not convey the right to construct any other structure unless specifically authorized by the Corps (USACE, Mobile District, 1988a).

In addition to the private docks on the lake's shoreline, there are more than 50 boat launching lanes, 10 public marinas, 10 campgrounds, and 43 day use parks (see Section 3.7 for details).

3.4.2 Traffic and Transportation

Lake Lanier lies about 35 miles northeast of Atlanta. In recent years the area around the lake has become increasingly urban and is now considered part of the Atlanta metropolitan area. Two-lane roads serve the parks on the lake and the towns that surround it. GA 400 connects Atlanta with the Chattahoochee National Forest in northern Georgia, passing through Cumming west of the lake. Interstate 985 (I-985), a spur to I-85 angling northeast toward Gainesville, is the major access route to areas east of the lake. State Highway (SH) 369, SH 306, and SH 53 serve as the main east-west corridors across Lake Lanier, connecting GA 400 in the west with Gainesville and I-985 in the east. US 23 connects Gainesville with Clarksville in the northeastern part of Georgia. SH 60 and SH 136 serve Murrayville and Price, respectively. Bridges on the lake are located on SH 369, SH 53, SH 60, SH 284, SH 136, and US 129/SH 11.

During the off-season, generally from October through March, traffic on U.S. highways, state highways, and local roads in the vicinity of the lake is typical of rural areas. Traffic during this

period is lighter than during the boating season (April through September), and roads are not used at or near their design capacities. Traffic on area roads can be very heavy during the boating season, especially at the more popular parks at the southern end of the lake near Buford Dam. The heavily used parks are Lower/Upper Overlook, Buford Dam, Shoal Creek Day Use, Big Creek, Burton Mill, Van Pugh North/South, Old Federal Day Use, East/West Bank, Lanier Park, and Lower Pool. Parking is sufficient for the recreational space available (Williams, personal communication, 2002).

Rapid population and transportation growth in the surrounding communities of Lake Lanier has created the need to improve local and regional travel options and travel conditions for east-west traffic between US 41 and SH 400. The Northern Arc project is a proposed four-lane limited-access highway designed to meet the existing and future east-west transportation needs of Bartow, Cherokee, and Forsyth Counties. The proposed route would extend from just south of Cummings west to just north of Cartersville and provide an alternative to the already heavily used SH 20.

In addition, the Georgia Regional Transportation Authority has initiated the next phase of the Northern Sub-Area/GA 400 Study, which is a comprehensive evaluation of transportation, land use, economic growth, and air quality issues along SH 400 from just north of Cummings in Forsyth County to Atlanta. The study, when completed, will provide recommendations for transportation improvement programs and regional transportation along SH 400.

3.4.3 Potable Water Supply

Water withdrawn from Lake Lanier for municipal purposes is provided to five entities, as summarized in Table 3-12.

Table 3-12
Water Withdrawals at Lake Lanier

Water User	Monthly Average (MGD)
City of Cummings	18.00
Forsyth County Board of Commissioners	14.00
City of Buford	2.00
City of Gainesville	30.00
Gwinnett County Water and Sewage Authority	150.00
Total	**214.00**

Source: GDNR, 1997b.

Lake releases are made so that the minimum flow from Buford Dam, when combined with local inflows from the 410-square-mile area between the dam and Atlanta (Morgan Creek) (assuming no withdrawals), will total not less than 750 cubic feet per second (USACE, 1974, 1998).

3.4.4 Wastewater Treatment

Treated sewage from 10 municipal and private wastewater treatment plants is discharged into the Lake Lanier watershed. The total treated sewage discharge from these plants is approximately 19 million gallons per day (MGD) (USEPA, 2000).

In November 2000 the Georgia Environmental Protection Division (EPD) issued Gwinnett County a permit for a discharge of 40 MGD of treated sewage into Lake Lanier beginning in 2005. This additional discharge would come from an expansion of Gwinnett County's north plant that went on-line in 2001. In addition, Forsyth and Hall Counties are poised to apply for permits allowing the release of a total of 23 MGD and 29 MGD of treated sewage, respectively.

3.4.5 On-site Wastewater Treatment Systems

Septic tanks remove solids by settling and/or liquefaction by biological processes. The clarified liquid at the top of the tank is displaced into the soil as new influent enters the tank. The effluent from septic tanks can potentially degrade surface waters and groundwater with chloride, nitrate, phosphate salts, oil fractions, fuel oil, trichloroethylene, gasoline, turpentine, and pathogens.

Unlike larger towns that use wastewater treatment facilities, most rural areas around Lake Lanier use septic tanks to treat and dispose of waste. Such decentralized on-site wastewater treatment systems are a significant method of wastewater management.

Septic tanks occasionally degrade the water quality of Lake Lanier if they are located too close to the floodplain or are not functioning correctly. If septic tanks are close to the lake, it is possible that some of the contaminants will reach the lake before they can be "treated" by the soil and microbes. These contaminants can stimulate plant growth and cause eutrophication. A 1975 EPA study of eutrophication and its effects on lakes determined that septic tanks located within 300 feet of the shoreline would adversely affect a lake.

Septic systems are not allowed on government property at Lake Lanier. In an effort to limit the number of septic tanks located close to the Lake Lanier shoreline, Corps and local health officials

have broadened their policy toward septic tank systems. The policy states that septic tanks and drain fields will not be permitted on public property, regardless of their age, if located below elevation 1,085 feet msl (USACE, Mobile District, 1988a).

Existing septic systems have never been permitted under a Shoreline Use Permit/License, and policy requires removal of only those systems that have failed. The Corps relies on local agencies to monitor septic systems and enforce the removal of failed systems. County environmental health departments require two inspections for all proposed septic tanks: a Level 3 Soil Analysis and a post-installation inspection to ensure proper installation. Further inspections or requirements to ensure that septic systems are maintained and function properly are not currently components of the Lake Lanier counties' environmental health department programs (Carter, personal communication, 2002; Jarrett, personal communication, 2002; Sternberg, personal communication, 2002).

A review of the soil surveys from the five Lake Lanier counties indicated that large areas of the soils surrounding the lake impose moderate to severe limitations on septic tank absorption fields. These limitations are due to high water tables, flooding, slope, and moderate permeability. Further discussion is provided in Section 3.8.1.

3.4.6 Public Safety

Law enforcement on federal lands and waters at Lake Lanier is the responsibility of the surrounding city and county sheriff's and police departments. The Georgia DNR is the primary investigating agency for boating enforcement and accident investigation on the lake. Its personnel also enforce hunting and fishing laws. Agents regularly patrol the lake. All criminal activities, boating accidents, serious injuries and loss of life are ultimately reported to the Corps's District Safety Office (DSO) or District Law Enforcement and Security Office, where factors such as location of accident, personal information, time of day, and circumstances are examined. In 2001, 41 boating accidents and 56 criminal incidents were reported and forwarded to the DSO. The most common accidents involved personal watercraft (Zeutenhorst, personnel communication, 2002).

Corps park rangers are responsible for the enforcement of Title 36 of the CFR, Park Rules and Regulations. These rules and regulations are designed to protect natural resources and enhance public safety. Agency policy dictates that enforcement will be conducted in a low-profile manner. In 2001 park rangers issued 282 citations and 2,029 warnings.

3.4.7 Employee Safety

The Lanier PMO specifies safety response and training rules for its personnel. Relevant components of the safety plan are as follows:

- Engineer Manual (EM) 385-1-1 requires a hazard analysis for each employee. The analysis identifies the work activity, safety hazards associated with performing the activity, and safety precautions for the activity.
- All potential health hazards to employees in the workplace are identified and evaluated. Recommendations are made for engineering, protective controls, and medical surveillance.
- Project management is committed to providing a safe and healthy workplace for all employees. Specific annual employee training requirements are as follows:
  - Emergency Spill Response
  - First Aid/CPR (all except Administration)
  - Hazard Communication
  - Drowning Prevention
  - Fire Prevention
  - Blood-Borne Pathogens (all except Administration)

3.4.8 Utilities

Electrical, natural gas, and communication systems are not discussed because they are not an issue in this particular EIS.

3.5 SOCIOECONOMICS

3.5.1 Economic Development

This section describes the contribution of Lake Lanier to the economy and to the sociological environment of the region. The socioeconomic indicators used for this study include regional economic activity, population, housing, and schools. Also discussed are recreational and

community facilities and public and social services. These indicators characterize the region of influence (ROI).

An ROI is a geographic area selected as a basis on which social and economic impacts of project alternatives are analyzed. The criteria used to determine the ROI for this EIS are the geographic location of Lake Lanier and the locations of businesses providing goods and services to residents around the lake and recreational users of the lake. Based on these criteria, the ROI for the social and economic environment is defined as the entire area of Dawson, Forsyth, Gwinnett, Hall, and Lumpkin Counties, Georgia. The ROI covers an area of 1,265 square miles (USDOC, Census, 2001a).

The baseline year for socioeconomic data is 2000. Where 2000 data are not available, the most recent data available are presented.

Regional Economic Activity. Table 3-13 shows ROI employment by industry for 1990 and 2000. Employment in the ROI over the last decade was almost exclusively nonagricultural. The primary sources of employment in 1990 were services, retail trade, manufacturing, and wholesale trade, which together accounted for 70 percent of regional employment. In 2000 the largest source of jobs in the ROI was still the services sector, which accounted for 28.1 percent of total employment, a 5.4 percent increase since 1990. The services industry includes establishments primarily engaged in providing a variety of services, such as hotels and other lodging places; establishments providing

Table 3-13
Lake Lanier ROI Employment by Industry

Employment Sector	1990 ROI Employment (Percent)	2000 ROI Employment (Percent)
Agricultural, Forestry, Fishing, and Other	1.3	0.2
Mining	0.1	0.0
Construction	7.9	9.0
Manufacturing	17.3	13.3
Transportation and Public Utilities	2.9	3.5
Wholesale Trade	10.9	10.6
Retail Trade	18.0	17.8
Finance, Insurance, and Real Estate	7.0	7.2
Services	22.7	28.1
Government and Government Enterprises	10.5	8.3
Total Nonfarm Employment	**98.6**	**99.5**
Total Farm Employment	**1.4**	**0.5**
Total Employment	**100.0**	**100.0**

Source: USDOC, BEA, 2001.

personal, business, repair, and amusement services; health, legal, engineering, and other professional services; educational institutions; membership organizations; and other miscellaneous services (OSHA, 2001). The retail trade sector was the second-largest employer, providing 17.8 percent of the total number of jobs, followed by manufacturing, which accounted for 13.3 percent, and then wholesale trade with 10.6 percent. Between 1990 and 2000 the agricultural services, farming, and mining sectors dropped in total number of persons employed. All other industry sectors saw an increase in the number of persons employed.

Economic expansion during the 1990s, primarily associated with the city of Atlanta, attracted approximately 195,000 additional persons into the workforce (Table 3-14). Several nationally and internationally known companies, including Coca Cola, Delta Airlines, Lucent Technologies, and UPS, have their headquarters in the Atlanta metropolitan area. The unemployment rates in Dawson, Forsyth, Gwinnett, Hall, and Lumpkin Counties have all decreased over the past decade. In 1990 the unemployment rate in each county in the ROI was about the same as or below the national and state unemployment rates. In 2000 the unemployment rate for each county in the ROI was below both the national unemployment rate and the rate for Georgia.

Because of Lake Lanier's location and recreation and tourism opportunities, it has a measurable economic impact on the region. However, estimates of that economic impact vary. One study estimated that the lake has a $5.5 billion annual direct and indirect impact on Atlanta and the north Georgia area (10 counties were included in that study area), using a multiplier of 2.5 (Hughes, 2001). The USACE Recreation Economic Assessment System (REAS) estimates the economic impact of the lake to be $155 million (USACE, 2001c). The REAS study uses a smaller, more

Table 3-14
Labor Force and Unemployment Rates

	1990			2000		
Location	Civilian Labor Force	Persons Unemployed	Rate (percent)	Civilian Labor Force	Persons Unemployed	Rate (percent)
Dawson County	5,252	269	5.1	10,621	223	2.1
Forsyth County	24,871	1,143	4.6	56,053	860	1.5
Gwinnett County	215,421	9,009	4.2	347,985	7,870	2.3
Hall County	52,773	2,951	5.6	75,560	1,736	2.3
Lumpkin County	7,226	372	5.1	11,084	198	1.8
ROI	305,543	13,744	4.5	501,303	10,887	2.2
Georgia	3,300,380	182,127	5.5	4,173,274	154,398	3.7
United States	125,840,000	7,047,000	5.6	140,863,000	5,655,000	4.0

Source: Georgia Department of Labor, 2002.

conservative effective spending multiplier of 1.08. It also uses a smaller study area, which is a 30-mile radius from the project site and includes all of Dawson, Forsyth, Gwinnett, Hall, and Lumpkin Counties.

3.5.2 Demographics

Table 3-15 portrays population trends in the ROI from 1980 to 2000, with comparative data for Georgia. According to the U.S. Census, each county in the ROI experienced a high rate of growth, compared to Georgia, between 1990 and 2000. Forsyth County experienced the highest growth rate at 123 percent, more than doubling its population. The average percent change in population for the ROI as a whole was almost 70 percent.

General population characteristics of the ROI, including per capita income, average household size, and median household income for 2000, are presented in Table 3-16. ROI per capita income was about the same as that of Georgia. The number of persons per household was slightly higher in the ROI compared to the state, and the median household income for the ROI was about $10,000 more than the state level. Forsyth and Gwinnett Counties, in particular, have significantly higher median household incomes than the state.

3.5.3 Housing

Table 3-17 portrays selected housing characteristics for the ROI. The number of housing units in the ROI is 312,659. The average percent of housing units occupied in the ROI is about the same as in the state (92 percent). The homeowner vacancy rate in the five counties ranges from 1.1 up to

Table 3-15
Population Changes for the ROI and Georgia

Location	Population 1980[1]	Population 1990[1]	Population 2000[2]	Percent Change 1990–2000
Dawson County	4,774	9,429	15,999	69.7
Forsyth County	27,958	44,083	98,407	123.2
Gwinnett County	166,903	352,910	588,448	66.7
Hall County	75,649	95,428	139,277	45.9
Lumpkin County	10,762	14,573	21,016	44.2
ROI	286,046	516,423	863,147	69.9
Georgia	5,463,105	6,478,216	8,186,453	26.4

[1] USDOC, Census, 1995.
[2] USDOC, Census, 2001a.

Table 3-16
Selected Population Characteristics for the ROI

Location	Per Capita Income 2000[1]	Persons per Household, 2000[2]	Median Household Income, 2000[2]
Dawson County	$23,691	2.62	$40,128
Forsyth County	$31,576	2.83	$60,250
Gwinnett County	$31,893	2.88	$56,082
Hall County	$25,631	2.89	$38,435
Lumpkin County	$22,455	2.61	$35,598
ROI	$27,049	2.77	$46,099
Georgia	$27,324	2.65	$36,372

[1] Source: USDOC, BEA, 2001.
[2] Source: USDOC, Census, 2001a.

Table 3-17
Selected Housing Characteristics for the ROI[1]

Location	Total Housing Units	Occupied Housing Units		Vacant Housing Units[2]		Homeowner Vacancy Rate (Percent)	Rental Vacancy Rate (Percent)
		No.	Percent	No.	Percent		
Dawson County	7,163	6,069	84.7	1,094	15.3	2.1	5.1
Forsyth County	36,505	34,565	94.7	1,940	5.3	1.6	4.1
Gwinnett County	209,682	202,317	96.5	7,365	3.5	1.2	5.7
Hall County	51,046	47,381	92.8	3,665	7.2	2.5	5.6
Lumpkin County	8,263	7,537	91.2	726	8.8	1.1	8.3
ROI	312,659	297,869	92.0	14,790	8.0	1.7	5.8
Georgia	3,281,737	3,006,369	91.6	275,368	8.4	1.9	8.2

[1] Source: USDOC, Census, 2001b.
[2] Approximately 20 percent of the vacant housing units in the ROI are for seasonal and recreational use.

2.5 percent, with an average of 1.7 percent for the ROI, slightly lower than that for Georgia. With the exception of Lumpkin County, all the counties in the ROI have a lower rental vacancy rate compared to the state rate of 8.2 percent.

3.5.4 Quality of Life

3.5.4.1 Law Enforcement and Fire Protection Services

The 13 police departments (municipal and county) in the ROI are responsible for the protection of the population (CapitolImpact.com, 2002). In total there are more than 1,000 law enforcement personnel (full-time and part-time officers and civilians) in the ROI (Georgia Department of Industry Trade and Tourism, 2001). In addition to the state police, municipal police departments and county sheriff offices serve Forsyth, Gwinnett, and Hall Counties, and county sheriff offices serve Dawson and Lumpkin Counties.

Fire protection services in the ROI are provided through full-time and volunteer municipal and county fire departments (Table 3-18). Typically, municipal fire departments are responsible for fire protection services within their municipal boundaries, whereas county fire departments are responsible for protection services in unincorporated areas. Where only a county fire department is established, however, the county stations respond to all calls, whether in an incorporated (municipal) or unincorporated area.

3.5.4.2 Medical Services

The ROI has four hospitals with a total of 550 beds (Table 3-19). There are also 20 assisted living facilities or nursing homes in the ROI (Georgia Department of Industry Trade and Tourism, 2001). Medical, dental, eye, and other specialty clinics also provide medical services in cities and towns throughout the ROI. Specialty services include chiropractic, physical therapy, alcohol and drug treatment, counseling, and mental health treatment.

3.5.4.3 Recreation and Shopping

In addition to the water sports and fishing activities at Lake Lanier, many other recreational opportunities are available in the ROI. Dawson County is home to Amicalola Falls, a 729-foot

Table 3-18
Fire Services in the ROI

Dawson County	County volunteer fire department with one full-time fire chief
Forsyth County	County volunteer fire department with 345 volunteers and two full-time personnel. City of Cumming municipal fire department with 15 volunteers and three full-time personnel
Gwinnett County	County fire department with 461 full-time personnel and 18 stations
Hall County	County fire department with 145 full-time personnel. City of Gainesville municipal fire departments with 67 full-time personnel
Lumpkin County	County and municipal cooperative fire department with 35 volunteers

Source: Georgia Department of Industry Trade and Tourism, 2001.

Table 3-19
Hospitals in the ROI

Hospital	Location	Number of Beds
Baptist Medical Center	Cumming, Forsyth County	36
Chestatee Regional Hospital	Dahlonega, Lumpkin County	52
Lanier Park Hospital and North East Georgia Health Care Systems Hospital	Gainesville, Hall County	462

Sources: Georgia Department of Industry Trade and Tourism, 2001; Dawson County Chamber of Commerce, 1999.

waterfall that is part of the Amicalola Falls State Park, where the Appalachian Trail begins (Dawson County Chamber of Commerce, 1999). Canoeing, kayaking, and rafting are available on Lake Lanier and on the Upper and Lower Chestatee Rivers, Etowah River, and Amicalola Creek (Dawson County Chamber of Commerce, 1999). Seasonal hunting, horseback riding, fishing, and camping are offered at the Dawson Forest Wildlife Management Area (Dawson County Chamber of Commerce, 1999). Lanierland Country Music Park is an amusement park in Forsyth County open from May to October (Georgia Department of Industry Trade and Tourism, 2001). Auto racing is very popular in the ROI: Road Atlanta international raceway is in Hall County, and the Thunder Road USA Racing Hall of Fame is in Dawson County (Hall County Government, 1999; Dawson County Chamber of Commerce, 1999).

Each county has parks, playgrounds, community playfields (softball, baseball, soccer), tennis courts, swimming pools, jogging and walking trails, and community centers that are open to county residents.

A variety of shopping is available in the ROI at gift, craft, antique, and general merchandise stores. The North Georgia Premium Outlets, a large outlet mall with 140 retailers, is in Dawson County (Dawson County Chamber of Commerce, 1999).

3.5.4.4 Schools

There are seven public school districts in the ROI, as listed in Table 3-20. The ROI also has several postsecondary schools. Gwinnett Technical Institute, Gainesville College, and Lake Lanier Technical College are 2-year programs that offer associate's degrees. Brenau University is a 4-year

Table 3-20
Schools in the ROI

School District	Elementary Schools	Middle Schools	High Schools	Total Enrolment	Student/Teacher Ratio
Buford City	1[1]	1	1	2,104	15.4:1
Dawson County	2	1	1	2,653	15:1
Forsyth County	12	4	3	15,703	16.3:1
Gainesville City	3	1	1	3,814	14.8:1
Gwinnett County	14	2	4	104,552	15.7:1
Hall County	12	4	3	19,456	15.8:1
Lumpkin County	2	1	1	3,268	15.1:1

[1] In addition to the one elementary school, Buford City has the Buford Academy, which enrolls students in grades 3, 4, and 5.
Source: CapitolImpact.com, 2002.

women's college. The North Georgia College and State University is a publicly funded coeducational liberal arts military college offering bachelor's degrees.

3.5.5 Environmental Justice

The primary objective of environmental justice analysis is to ensure that vulnerable populations do not bear a disproportionately high and adverse share of human health or environmental effects from proposed federal actions. To address environmental justice concerns, on February 11, 1994, President Clinton issued Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations,* requiring each federal agency to "make the achievement of environmental justice part of its mission by identifying and addressing disproportionately high and adverse human health and environmental effects on minority and low-income populations." The EO and accompanying Presidential Memorandum direct federal agencies to identify and analyze the potential socioeconomic impacts of proposed actions in accordance with health and environmental laws and to identify alternatives that might mitigate these impacts.

In accordance with this EO, efforts were made during the scoping process to reach minority and low-income groups (see Section 1.6) to inform them of the proposed Corps action and give them the opportunity to participate in the decision-making process.

Demographic information on ethnicity, race, and economic status of the residents of the ROI is provided in Table 3-21 as the baseline against which potential impacts can be identified and analyzed. Any potential disproportionate risks to minority or low-income groups as a result of implementing the Corps's proposed action are identified in Section 4.0.

The ROI has a significantly lower percentage of minority residents than Georgia or the United States, as shown in Table 3-21. In 2000, 88 percent of the ROI population was white. Each of the other racial and ethnic groups accounted for approximately 4.5 percent or less of the ROI population (Table 3-21). In total, 12 percent of the ROI population was of a minority race and 8 percent was of Hispanic ethnicity. In the state of Georgia, 35 percent of the population was of a minority race and 5 percent of Hispanic ethnicity; in the United States 25 percent of the population was of a minority race and 12.5 percent of Hispanic ethnicity.

Table 3-21
Race, Ethnicity, and Poverty Status for the
ROI, Georgia, and the United States for the Year 2000

Race/Ethnicity	ROI[1] (Percent)	Georgia (Percent)	United States (Percent)
White	87.9	65.1	75.1
Black or African American	4.6	28.7	12.3
American Indian and Alaska Native	0.5	0.3	0.9
Asian	2.0	2.1	3.6
Native Hawaiian and Other Pacific Islander	0.1	0.1	0.1
Other Race	3.5	2.4	5.5
Two or More Races	1.4	1.4	2.4
Hispanic[2]	8.2	5.3	12.5
Living in Poverty[3]	9.6	14.7	13.3

[1] Percentages for the ROI are an average of the five counties in the ROI.
[2] Persons of Hispanic origin may be of any race.
[3] Percentages of persons living below the poverty line are for 1997.
Source: USDOC, Census, 2001a.

Poverty status, used in this EIS to define low-income status, is reported as the number of persons with income below the poverty level. The 2000 Census defines the poverty level as $8,794 of annual income, or less, for an individual and $17,603 of annual income, or less, for a family of four. The Census Bureau bases the poverty status of families and individuals on 48 threshold variables, including income, family size, number of family members under the age of 18 and over 65 years of age, and amount spent on food. Approximately 10 percent of the ROI residents were classified as living in poverty, lower than the poverty rates for Georgia and the United States.

3.5.6 Protection of Children

On April 12, 1991, the President issued EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*. The EO seeks to protect children from disproportionately incurring environmental health or safety risks that might arise as a result of Corps policies, programs, activities, and standards. Historically, children have often been present at Lake Lanier as residents and visitors. The Corps has taken precautions for their safety at the lake and dam. Above and below the dam are warning signs to stay out of the restricted area near the dam. An AM radio station broadcasts a warning message when water is going to be discharged from the dam, and four warning sirens are located downstream from the dam. Other measures implemented by the Corps to protect the safety of the visiting public include the following (Lake Lanier Project Management Office, 2001):

- Water samples are taken once a month at 23 Corps-managed swim areas around the lake during the swimming season to test for fecal coliform bacteria. Public health advisories are posted if the water is unsafe for swimming.

- The Lake Lanier Project Office maintains and conducts a Lanier Water Safety Task Force that promotes water safety through education, training, safety inspections, and law enforcement.

- Lake Lanier Management Office personnel are trained to respond to hazardous incidents and disasters such as storms (hurricanes, tornados, and tropical storms), floods, oil or gas spills, chemical/hazardous material spills, and earthquakes.

- Boating accidents are reported, and data from the reports are compiled to acquire information to help prevent future accidents.

- At all Corps beaches along Lake Lanier, swim lines are floated in the water to designate the safe swimming areas, and all Corps beaches are posted with permanent signs that read "Danger, Deep Drop Beyond Swim Line."

- During times of drought or flood, special public safety controls are implemented and news releases are issued.

- The Low Water Safety Plan is implemented during low-lake-level situations (i.e., 1,066 feet msl and below). Hazards are identified and the public is alerted to any potential dangers.

- Lake Lanier ranger staff perform water safety patrols during the summer recreation season.

3.6 VISUAL AND AESTHETIC RESOURCES

Visual and aesthetic resources are those natural resources, landforms, vegetation, and man-made structures in the environment that generate one or more sensory reactions and evaluations by the observer, particularly with respect to a pleasurable response. These sensory reactions are traditionally categorized as visual (sight), auditory (sound), and olfactory (smell) responses. The visual sense is so predominant in the observer's reaction and evaluation that visual resources are the focus of this section. The other sensory stimulants, sound and smell, are addressed, to the extent

their presence is perceivable, in the Water Quality, Air Quality, and Noise sections (3.3.3, 3.11, and 3.13, respectively).

3.6.1 Lake Lanier

Lake Lanier is large with an irregular shape typical of a man-made reservoir. The Chattahoochee River and its tributaries have cut deep ravines, producing numerous islands and promontories that offer vistas of the water and opposite shoreline. The lake's shoreline, as described above, is largely forested with residences visible from the lake. Some shoreline areas resemble well-manicured lawns with residences clearly visible. Marinas, campgrounds, boat ramps, and boat docks are visible from the lake surface. When the water level is low, the shoreline nearest the water is unvegetated.

For a lake of its size, there are relatively few public vantage points for viewing the lake from the surrounding network of public roads and highways, other than from the parks and campgrounds. There are no developed overlook areas.

3.6.2 Scenic Attractiveness

Lake Lanier is not identified or mentioned as a sight worth visiting in any of the standard travel guides covering the United States or in the Michelin USA Recreational Sites map (Michelin, 1997). Lake Lanier is mentioned, however, in one guide to the southeastern United States, without any reference to its scenic quality (Mobile Travel Guide, 2001). In Georgia the lake is noted for its recreational opportunities. The lake has had more than 7 million visits almost every year since 1993 (Williams, personal communication, 2002).

A visual assessment survey was conducted on July 10–13, 2001. Of the 85 locations and sites surveyed, 45 were assessed from randomly assigned locations on a boat on the lake and 40 were assessed from representative park, campground, road, or other vantage points on land surrounding the lake. Table 3-22 shows the results of the water and land-based visual landscape assessments. Table 3-23 provides definitions of the three scenic attractiveness classes used in Table 3-22. More than 60 percent of the sites were rated to have typical scenic attractiveness.

Figures 3-5 through 3-7 provide photographic examples of the scenic attractiveness classes at Lake Lanier, both from the water (upper panel) and from the land (lower panel).

Table 3-22
Scenic Attractiveness of Water- and Land-Based Sites

Class	Water-Based Sites	Percent	Land-Based Sites	Percent	Total Sites	Percent
Class A Distinctive	7	15	4	10	11	13
Class B Typical	34	76	19	48	53	62
Class C Indistinctive	4	9	17	42	17	17
Total	**45**		**40**		**81**	

Source: QAR, 2001.

Table 3-23
Scenic Attractiveness Class Definitions

Class A Distinctive	Areas where landform, vegetation patterns, water characteristics, and cultural features combine to provide unusual, unique, or outstanding scenic quality. These landscapes have strong positive attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance.
Class B Typical	Areas where landform, vegetation patterns, water characteristics, and cultural features combine to provide ordinary or common scenic quality. These landscapes have generally positive, yet common, attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance. Normally they would form the basic matrix within the ecological unit.
Class C Indistinctive	Areas where landform, vegetation patterns, water characteristics, and cultural land use have low scenic quality. Often water and rockform features of any consequence are missing in Class C landscapes. These landscapes have weak or missing attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance.

Source: U.S. Forest Service, 1995.

3.6.3 Scenic Integrity

Table 3-24 presents the scenic integrity results of the 45 water-based and 40 land-based visual landscape assessments. Table 3-25 provides a definition for the scenic integrity classes used in Table 3-24. None of the sites were judged to have an "Unacceptably Low" scenic integrity rating. More than 60 percent of the sites were rated to have either low or very low scenic integrity.

Figures 3-8 through 3-12 provide photographic examples of the five scenic integrity classes at Lake Lanier, both from the water (upper panel) and from the land (lower panel).

From the Water: West of Lake Lanier Islands (Map Reference No. 35, *Field Trip Report*, pp. 114-115, QAR, Inc., 2001).

From the Land: View from Harbor Pointe (Map Reference No. L-45A, *Field Trip Report*, pp. 159-160, QAR, Inc. 2001).

Distinctive Scenic Attractiveness

Figure 3-5

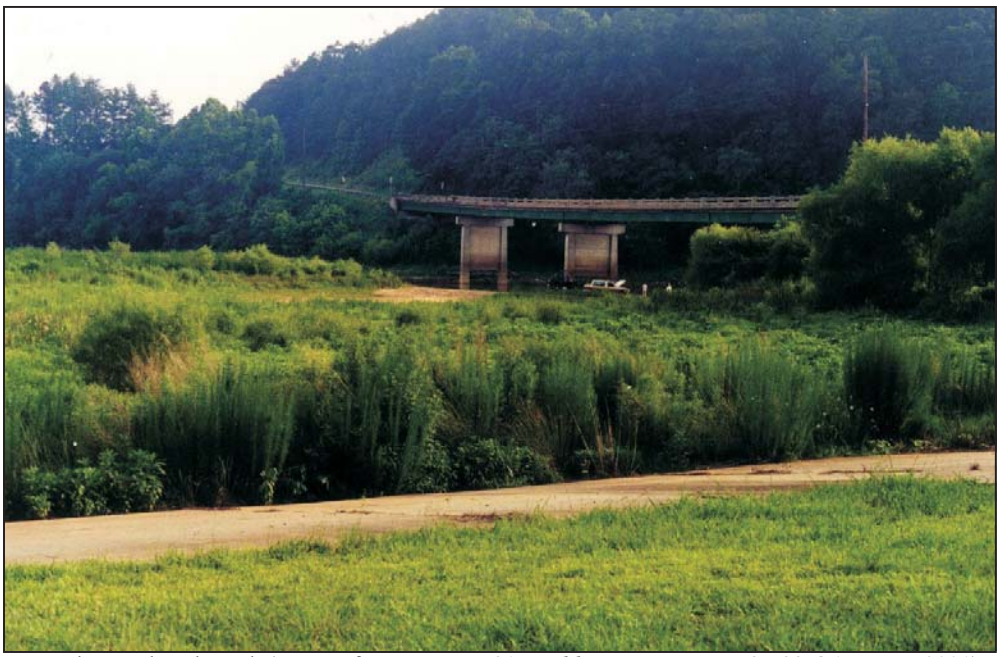
From the Water: Mouth of Six Mile Creek (Map Reference No. 31, *Field Trip Report*, pp. 103-104, QAR, Inc. 2001).

From the Land: From Old Federal Campground (Map Reference No. L-17, *Field Trip Report*, pp. 39-40, QAR, Inc. 2001).

Typical Scenic Attractiveness

Figure 3-6

From the Water: Location Code 3128.0 (Map Reference No. 54, *Field Trip Report*, pp. 87-88, QAR, Inc., 2001).



From the Land: Lula Park (Map Reference No. L-31, *Field Trip Report*, pp. 65-66, QAR, Inc., 2001).

Indistinctive Scenic Attractiveness

Figure 3-7

Table 3-24
Scenic Integrity of Water- and Land-Based Sites

Class	Water-Based Sites	Percent	Land-Based Sites	Percent	Total Sites	Percent
Very High (Unaltered)	8	17	1	3	9	11
High (Appears Unaltered)	7	16	5	13	12	14
Moderate (Slightly Altered)	7	16	4	10	11	13
Low (Moderately Altered)	14	31	15	37	29	34
Very Low (Heavily Altered)	9	20	15	37	24	28
Total	**45**		**40**		**85**	

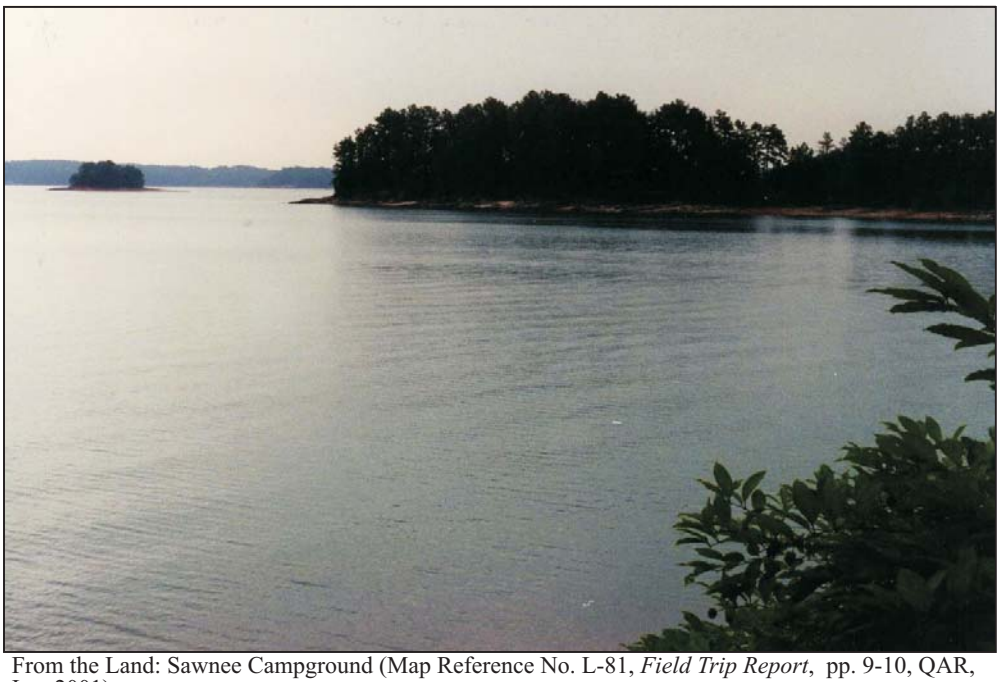
Source: QAR, 2001.

Table 3-25
Scenic Integrity Definitions

Very High (Unaltered)	Landscapes where the valued landscape character "is intact" with only minute, if any, deviations. The existing landscape character and sense of place are expressed at the highest possible level.
High (Appears Unaltered)	Landscapes where the valued landscape "appears intact." Deviations may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so completely and at such scale that they are not evident.
Moderate (Slightly Altered)	Landscapes where the valued landscape "appears slightly altered." Noticeable deviations must remain visually subordinate to the landscape character being viewed.
Low (Moderately Altered)	Landscapes where the valued landscape character "appears moderately altered." Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect, and pattern of natural openings, vegetative type changes, or architectural styles outside the landscape being viewed. They should only appear as valued character outside the landscape being viewed but compatible or complementary to the character within.
Very Low (Heavily Altered)	Landscapes where the valued landscape character "appears heavily altered." Deviations may strongly dominate the valued landscape character. They may not borrow from valued attributes such as size, shape, edge effect, and pattern of natural openings, vegetative type changes, or architectural styles within or outside the landscape being viewed.
Unacceptably Low	Landscapes where the valued landscape character being viewed "appears extremely altered." Deviations are extremely dominant and borrow little, if any, form, line, color, texture, pattern, or scale from the landscape character.

Source: U.S. Forest Service, 1995.

From the Water: Lake Lanier Islands (Map Reference No. 35; *Field Trip Report*, pp.115-116, QAR, Inc. 2001).



From the Land: Sawnee Campground (Map Reference No. L-81, *Field Trip Report*, pp. 9-10, QAR, Inc. 2001).

Very High Scenic Integrity

Figure 3-8

From the Water: Big Creek (Map Reference No. 51, *Field Trip Report*, pp. 89-90, QAR, Inc., 2001).

From the Land: Two Mile Park (Map Reference No. L-67, *Field Trip Report*, pp. 25-26, QAR, Inc., 2001).

High Scenic Integrity

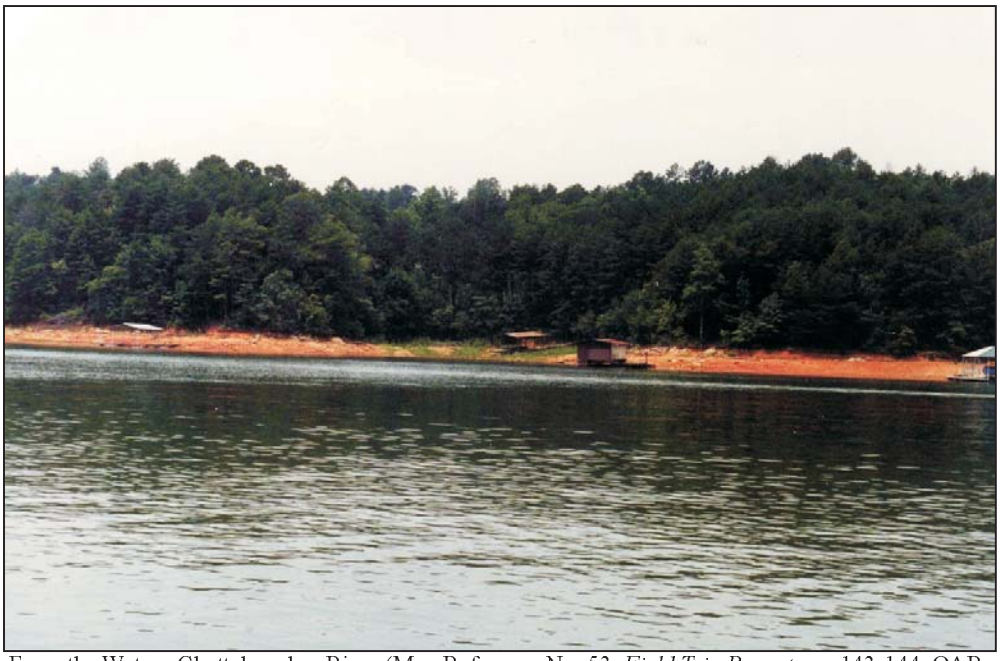
Figure 3-9

From the Water: Rocky Point (Map Reference No. 8, *Field Trip Report*, pp. 79-80, QAR, Inc., 2001).

From the Land: Robinson Park (Map Reference No. L-43, *Field Trip Report*, pp. 157-158, QAR, Inc., 2001).

Moderate Scenic Integrity

Figure 3-10



From the Water: Chattahoochee River (Map Reference No. 53, *Field Trip Report*, pp. 143-144, QAR, Inc., 2001).

From the Land: Little Hall Park (Map Reference No. L-46, *Field Trip Report*, pp. 163-164, QAR, Inc., 2001).

Low Scenic Integrity

Figure 3-11

From the Water: Thompson Creek (Map Reference No. 41, *Field Trip Report*, pp. 155-156, QAR, Inc., 2001).

From the Land: Lanier Beach South (Map Reference No. L-81A, *Field Trip Report*, pp. 13-14, QAR, Inc., 2001).

Very Low Scenic Integrity

Figure 3-12

3.6.4 Landscape Visibility

Landscape visibility is a function of many interconnected considerations, including context of viewers, duration of view, degree of discernible detail, seasonal variations, and number of viewers. Viewers of the Lake Lanier shoreline include residents, recreational users (boaters, sailors, fishermen, waterskiiers, others), and visitors to the area who drive on the roads surrounding the lake. Of these, recreational users and park visitors (campers, picnickers, and hikers) are by far the most numerous. Section 3.7.1 identifies the number of visitors and recreational users of the lake.

Of particular concern is the duration of view and the degree of discernible detail of nonnatural features on the lake's shoreline, both to recreational users of the lake and its parks and to residents of the adjoining subdivisions. The most numerous and visible nonnatural features are private boat docks and residences along the lake shoreline. Private boat docks have been permitted on Lake Lanier since impoundment began in 1957. The number of private floating facilities on the lake has continued to increase since that time. Figure 3-13 depicts the growth in the number of docks on the lake between 1985 and 2001. Using a visibility range of 1 mile, Figure 3-14 shows the areas of the lake from which existing boat docks and marinas are clearly visible.

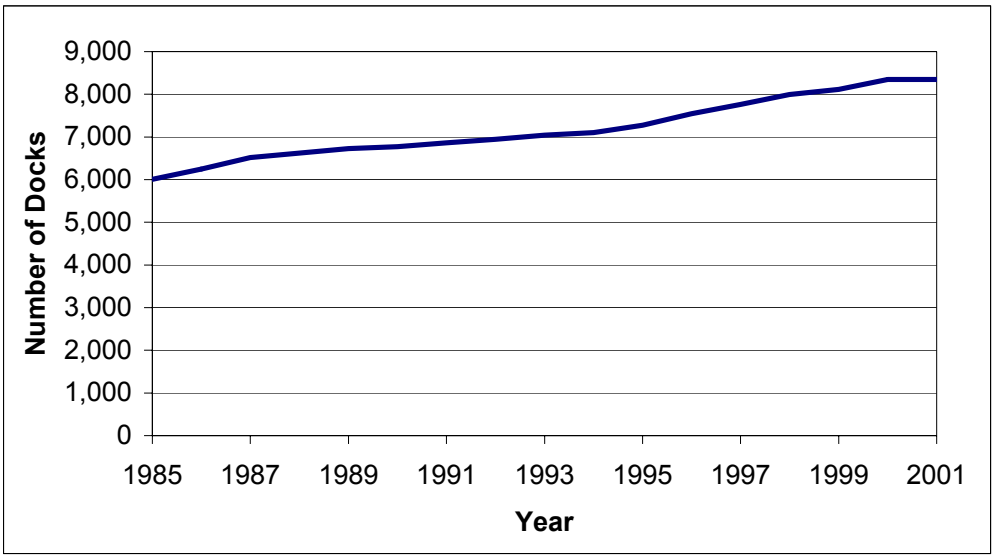
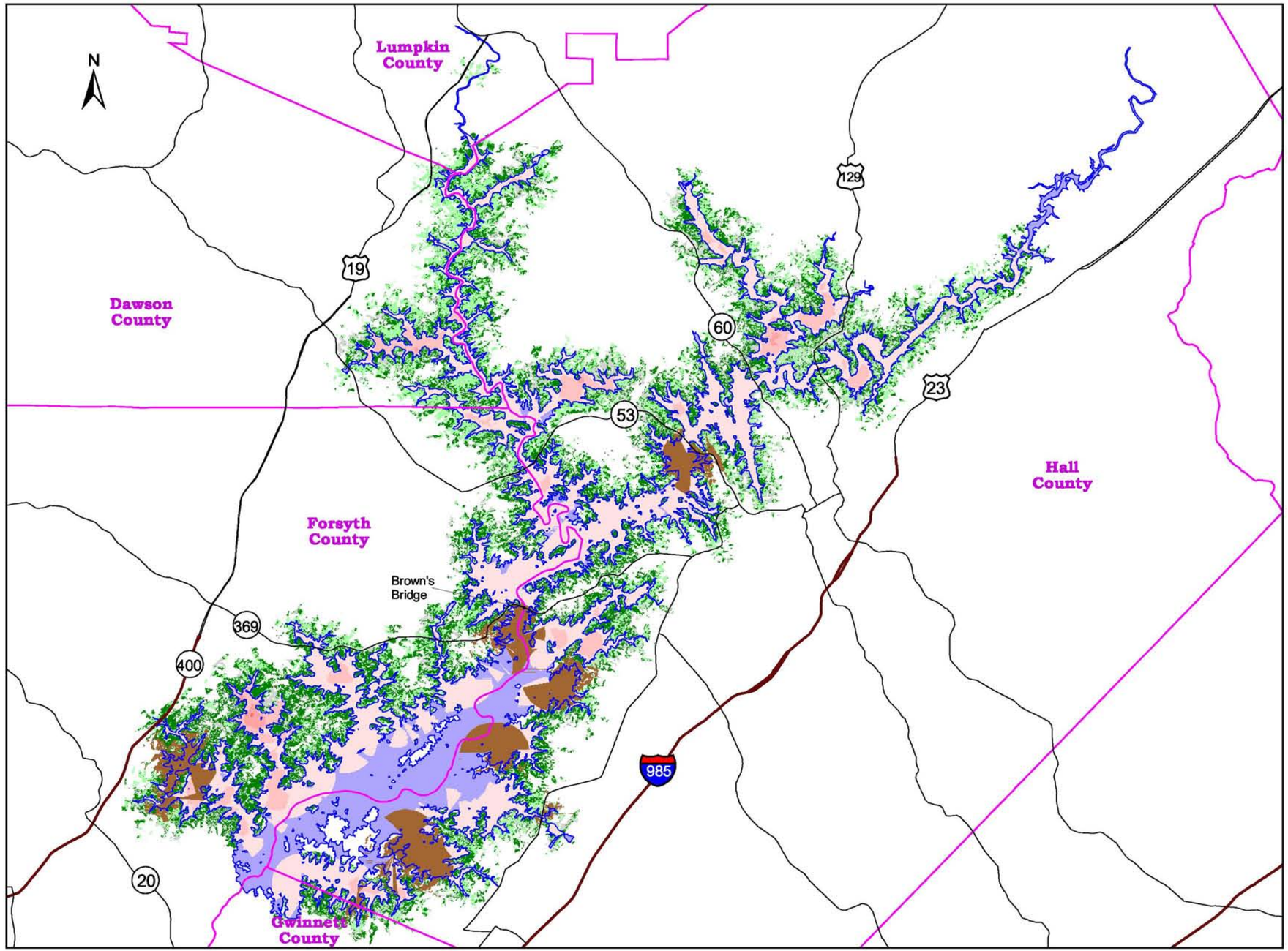


Figure 3-13. Growth in the Number of Boat Docks from 1985 to 2001.



LEGEND

Marina Visible

Docks Visible from Lake
- 1 - 40
- 41 - 80
- 81 - 120
- 121 - 125

Docks Visible from Land
- Not Visible (Coniferous Forest)
- Partially Visible (Deciduous Forest)
- Visible (Developed/Other)

Water (Also no docks visible)

0 1.5 3 Miles

Existing Boat Dock Viewsheds

Figure 3-14

Source: GIS Calculations.

The visibility range varies with weather, amount of sunlight, and other aspects based on observation at Lake Lanier; however, 1 mile is a reasonable maximum distance for being able to see docks and marinas against the varied topography and vegetation of the lake's shoreline and for them to make a visual impression upon the viewer. Beyond 1 mile, the docks begin to blend in with the shoreline's rock outcrops and vegetation, becoming less and less noticeable, and are a less dominant feature within the entire vista. Using the 1-mile visibility range, at least 1 dock is visible from almost 76 percent of the lake's surface, with 1 to 20 docks visible from 46 percent of the lake's surface (see Table 3-26).

3.7 RECREATION AND RECREATIONAL FACILITIES

Lake Lanier is the most popular and most visited Corps reservoir in Georgia. Georgia supports nine Corps projects, and the cumulative number of facilities in the state is listed in Table 3-27. Georgia ranks high among states with Corps facilities in many categories. The state's rankings for some recreational facilities are listed in Table 3-28.

Table 3-26
Acreage of Lake from Which Boat Docks Are Clearly Visible

Number of Visible Docks	Lake Acreage	Percent of Lake's Total Surface
1–20	18,042	46.2
21–40	7,882	20.2
41–60	2,785	7.1
61–80	599	1.5
81–100	144	0.4
101–125	55	0.1
TOTAL	29,507	75.6

Source: GIS calculations.

Table 3-27
Corps Dock Permits and Marina Slips in Georgia and on Lake Lanier

Facility Type	Georgia	Lake Lanier
Docks	16,730	8,348
Private Boats	25,513	16,696[1]
Community Docks	145	11
Community Boats	975	488[1]
Floating Facilities[2]	66	unknown
Dry Slips in Concessions	3,403	3,038
Wet Slips in Concessions	10,227	6,067
Total Concessions	13,630	9,105

[1] For Lake Lanier, this is the number of slips. The number for docks is approximate.
[2] "Floating facilities" are mooring buoys, swim floats, ski jumps, and the like.
Source: Perales, 1998.

Table 3-28
Georgia's Ranking among Corps Projects (1996 data)

Rank	Category	Georgia as Percent of Corps Total	Lake Lanier as Percent of Corps Total
1	Private boat docks	52.3	26.1
6	Community docks	3.9	0.3
1	Concession dry slips	18.7	16.7
3	Concession wet slips	11.5	6.8

Source: Perales, 1998.

3.7.1 Visitation to Lake Lanier

Visitation to the lake for the years 1993 through 2001 is reported in Table 3-29. The distribution of those visits among activities for the calendar years 1999 and 2000 (through May) is shown in Table 3-30.

Table 3-29
Annual Visitation to Lake Lanier

Year	Total Visitation (thousands)
2001	7,408
2000	7,877
1999	7,666
1998	7,599
1997	7,480
1996	7,147
1995	6,857
1994	6,747
1993	7,051

Source: Williams, personal communication, 2002.

Table 3-30
Distribution of Visitation to Lake Lanier

	Estimated Distribution of Visits (thousands)								
	Camp	**Picnic**	**Boat**	**Fish**	**Hunt**	**Ski**	**Swim**	**Sightsee**	**Other**
2000 (through May)	95	175	285	221	0	23	179	69	258
1999	333	575	1,341	1,093	1	74	542	387	940

Source: Williams, personal communication, 2002.

3.7.2 Lake Lanier Recreational Facilities

Lake Lanier has 10 marinas, 8 of which have more than 500 slips each. The marinas are listed in Table 3-31. Other recreational facilities on the lake include 1,195 campsites, 14 group campsites, 43 day use parks, and 9 county and city parks (Lake Lanier Project Office, 2002).

The distribution of recreational facilities between the lower lake (south of Brown's Bridge) and the upper lake is shown in Table 3-32. Private recreational facilities on the lake include 8,348 private permitted boat docks, each with one or two (average 1.7) slips, and 11 permitted community docks with a total of 488 slips. Most private permitted boat docks have two slips, the maximum number of slips allowed on these docks.

3.7.3 Lake Lanier Boating Capacity

Boating capacity is a combination of physical and social carrying capacities. The physical carrying capacity of a lake is the maximum number of vessels that can safely be on the water at one point in time. It is affected by factors such as use characteristics, depth, usable and unusable water area, and

Table 3-31
Slips Available at Lake Lanier Concessions

Marina Name	Number of Dry Slips	Number of Wet Slips	Wet Slips (percent)
Lanier Harbor	400	10	2.4
Aqualand Marina	405	1,871	82
Holiday On Lanier	0	1,340	100
Lan Mar Marina	320	500	61
Sunrise Cove Marina	25	741	97
Bald Ridge Marina	0	691	100
Habersham Marina	648	0	0
Lazy Days	640	37	5.5
Starboard Marina	20	448	96
Gainesville Marina	334	312	48
Total	**2,792**	**5,950**	**68**

Sources: Perales, 1998; Williams, 2002.

Table 3-32
Recreational Facilities Distribution

	Marinas	Campgrounds	Day Use Parks	State, County, City Parks	Total
Upper Lake	1	4	17	7	29
Lower Lake	9	6	26	2	43
Total	**10**	**10**	**43**	**9**	**72**

shoreline characteristics. Social carrying capacity is increasingly becoming an important part of calculations of boating capacity. Boater satisfaction plays an important role in the perception of social carrying capacity and includes factors such as aesthetics, water and weather conditions, perceived change over time, and the behavior of other boaters. Common factors that decrease overall enjoyment of a recreational resource include the behavior of other boaters, lake crowding, and fluctuating water levels.

The only study of boating carrying capacity for Lake Lanier was conducted in 1984. The study of boat use and boating distribution was conducted over the weekend that preceded the Fourth of July in 1984 (July 4 fell on Wednesday in 1984) (USACE, Mobile District, 1985). Boating density over the weekend was described as having "less visitation than a typical holiday weekend." The study was undertaken to determine the degree of overuse, if any, of the lake surface for boating activities. Using published ratios of type of boating activity (e.g., motorboating, sailing, water skiing) to acres of lake surface area needed for a "quality" recreational experience (which encompasses the need for both safety and enough space to conduct activities without unreasonable conflict with other users), the study's analysts found that the surface of Lake Lanier was overused by 71 percent on that particular weekend in 1984. At that time the lake had the facilities listed in Table 3-33. The facilities that give boats access to the lake, and presumably the number of boats on the lake at any given time, have increased since 1984. The lake, therefore, would be expected to have an even greater level of weekend overuse today. A more recent study of boating density on Lake Lanier has not been conducted.

Table 3-33
Facilities on Lake Lanier in 1984 and 2001

	1984	2001
Marina wet slips	4,198	5,950
Marina dry slips	1,665	2,792
Dry storage on private land	480	NA[1]
Clubs, wet slips	627	816[2]
Clubs, dry slips	142	242
Boat launching lanes	73	154
Private boat docks	6,500	8,593[3]

[1] NA means not available.
[2] Includes Lake Lanier Islands.
[3] Includes 8,348 private docks and the 245 "private dock equivalents" that the lake's 11 community docks represent.
Sources: Lake Lanier Project Management Office, 2002; USACE Mobile District, 1985.

Note that despite this calculated level of overuse, most boaters interviewed during the study about the quality of their experience (a measure of social carrying capacity) indicated that their boating experience that day was "very pleasant, rewarding, and satisfying" (USACE, Mobile District, 1985).

Estimates of the lake's physical boating carrying capacity using three different methods yield a different picture of the current level of lake overuse from that calculated in 1984. Using the acreage of the lake's surface and published numbers of acres of water surface required for each type of boating activity (for the purposes of safety and quality of recreational experience), Lake Lanier is estimated to be able to accommodate about 6,400 to 6,500 boats at one time. Alternatively, the number of boats that could be on the lake at one time can be estimated based on the facilities available from which boats can be placed on the lake. Assuming 40 boats launched per day from each of 154 launching lanes on the lake, and 25 percent of all marina slip renters and 15 percent of all community- and private-slip boats active on the lake at one time, an estimate of 7,351 boats capable of being on the lake in a morning or an afternoon is obtained. These calculations provide an estimate of current lake overuse of from 12.8 to 15.3 percent. It should be noted that this level of overuse would correspond to weekend use of the lake and not use of the lake during the week.

3.7.4 Boating Accident Analysis and Reports

The Program Manager is responsible for reporting boating accidents to the District Office and compiling data from boating accident reports. Any accident that involves a fatality, a personal injury, or more than $500 of personal property damage is reportable. Boating accidents are reported by the Corps, Georgia DNR, and county agencies. During calendar year 2000, the Program Manager prepared more than 100 incident reports and forwarded them to the Security Office. Surprisingly, despite the tremendous growth in use at Lake Lanier, boating-related fatalities decreased from 27 in 1983 to 4 in 2000.

Other recreation-related programs and aspects of project management at Lake Lanier are described in Section 2.2.1.2.

3.8 GEOLOGY

The physiography of the Lake Lanier region reflects a geologic history of mountain building, most recently during the Appalachian orogeny. Lake Lanier is located primarily in the Piedmont

Province; a segment of the northern shoreline of the lake is in the Blue Ridge Province. Elevation in the Southern Piedmont ranges from 500 to 1,500 feet above sea level, and topography is gently rolling to steep. The Blue Ridge ranges in elevation from 700 to 4,800 feet above sea level and is characterized by steep mountain slopes with narrow valleys.

Both the Blue Ridge and the Piedmont Provinces are underlain by Precambrian and Paleozoic crystalline rocks. Surface lithologies are predominantly ancient, highly deformed metamorphic granite gneisses, schists, and amphibolites. Younger igneous, intrusive rocks include granite, diorite, syenite, diabase, and coarse-grained pegmatites. Less extensive outcrops of quartzites are also present.

3.8.1 Soils

Soils in the Lake Lanier study area are derived from in-place weathering of underlying rock strata, except in the active floodplain of the lake, where soils consist of alluvial silts and sands. All the soils in the Lake Lanier study area are susceptible to erosion. The degree of susceptibility depends on the erosion hazard, the frequency and intensity of rainfall, the steepness and length of slopes, and the kind and amount of ground cover.

Shoreline erosion affects resource use at Lake Lanier, causing severe shoreline loss and degrading water quality (USACE, 1987). Riprap is widely used to prevent shoreline and bank erosion on Lake Lanier. Landowners interested in stabilizing the shoreline near their private boat docks are permitted to do so with the installation of riprap. To reduce the site impact and future erosion, the Corps of Engineers has authorized contractors to work the material and equipment from barges. This avoids bringing heavy equipment across Corps property, thus limiting site impact on the immediate shoreline area (Wahus, 2002).

This erosion control program is successful because of cooperation between the Corps of Engineers and adjacent private landowners. In 1999 alone, more than 30,000 linear feet of riprap was installed along Lake Lanier's shoreline at a cost to adjacent landowners of more than $3 million (Wahus, 2002).

Vegetative buffers are widely used at the lake to control surface erosion. Maintaining a vegetative buffer is an important and effective way to control erosion along the shoreline and subsequent sedimentation in the lake. Regulations are currently in place to control the removal of the natural

vegetative buffer around the lake. Homeowners occasionally remove the vegetation between the house and the lake to improve visual aesthetics. This action is punishable by a fine that many homeowners are willing to pay in exchange for the view. Local governments have the responsibility to enforce the Georgia's Best Management Practices as well as local erosion control ordinances.

Erosion and sediment control during construction activities close to the lake is an important means to control sedimentation in Lake Lanier. Appropriate erosion and sediment control techniques, including silt fences and sediment retention ponds, can be very effective in minimizing the impacts of construction activity.

3.9 ECOLOGICAL SYSTEMS

3.9.1 Vegetative Communities

Lake Lanier lies in the Piedmont Physiographic Province. This unglaciated region with hot summers and mild winters supports a wide variety of plant species. Although many plant species found in the Piedmont overlap into adjacent mountain and coastal plain provinces, the Piedmont region also has its own endemic flora, including plants adapted to living on granite rock outcrops. Georgia is unusually rich in tree species: Approximately one-third of all the native tree species known from the United States and Canada are found in Georgia (Brown, 1990). Although the Piedmont Region is noteworthy for its biological diversity, the plant communities in this region of the southeastern United States have been extensively altered since European settlement nearly 300 years ago (GDNR, 1997a). Cotton and tobacco farming since colonial times depleted and eroded Piedmont soils. Timber harvest and clearing for agriculture peaked in the early 20th century. Most forest communities in the Piedmont today are second-growth forests that rose on abandoned agricultural lands (GDNR, 1997a). In general, pine forest communities are more often observed in younger and more frequently disturbed upland second-growth forests, while older and less disturbed upland forests support a mix of pine and hardwood trees. Wet areas, usually adjacent to rivers and streams, support hardwood tree species adapted to periodic flooding. Plant communities known from the vicinity of Lake Lanier are described below.

3.9.1.1 Riparian Forests

Riparian forests occur in low areas of lake tributary floodplains and in lake coves. This habitat is not abundant in lakeshore areas because steep banks do not support a wide transition area between dry uplands and deepwater aquatic habitats. Less than 10 percent of the project area features riparian forests (USACE, Mobile District, 1974). Trees adapted to periodic flooding and moist soils are the most abundant in riparian forests. The most frequently flooded areas, often called swamps, support an overstory of red maple (*Acer rubrum*), black willow (*Salix nigra*), green ash (*Fraxinus pensylvanica*), American elm (*Ulmus americana*), water oak (*Quercus nigra*), and black gum (*Nyssa sylvatica*). Less frequently flooded areas, often called floodplains, have many of the same tree species common in swamps as well as other trees such as box elder (*Acer negundo*), silver maple (*Acer saccharinum*), eastern cottonwood (*Populus deltoides*), sycamore (*Platanus occidentalis*), sweetgum (*Liquidambar styraciflua*), and tulip poplar (*Liriodendron tulipifera*) (USACE, Mobile District, 1974).

3.9.1.2 Pine Forests

Woodlands that burn periodically or have been subject to timber harvest or other disturbance often support pine forests. Historically, shortleaf pine (*Pinus echinata*) was dominant in many pine forests in northern Georgia. Extensive timber harvest, agriculture, soil erosion, and subsequent abandonment of agricultural lands in the Piedmont Region in the past 100 years have left a variety of pine forest types. Loblolly pine (*Pinus taeda*) and Virginia pine (*Pinus virginiana*) are common species in addition to shortleaf pine. Invading hardwood species are a constant factor in Piedmont pine forests. Oaks (*Quercus* spp.), hickories (*Carya* spp.), persimmon (*Dyospiros virginiana*), sumac (*Rhus* spp.), and chalk maple (*Acer leucoderme*) are often present as understory and mid-story trees (USACE, Mobile District, 1974).

3.9.1.3 Hardwood-Pine Mixed Forest

Forested areas that have been free of fire and other disturbance often succeed into hardwood-pine mixed forests. As early-establishing pine trees grow old and die, hardwood species such as American beech (*Fagus grandifolia*), white oak (*Quercus alba*), and Florida maple (*Acer barbatum*) establish dominance (USACE, Mobile District, 1974). Fraser magnolia (*Magnolia fraseri*) and cucumber tree (*Magnolia acuminata*) are sometimes found in mesic coves. Understory shrubs are common in mixed forests, especially in light gaps and forest edges. Some common

shrubs and small trees are plums (*Prunus* spp.), serviceberries (*Amelanchier* spp.), and fringetree (*Chionanthus virginicus*) (USACE, Mobile District, 1974).

3.9.1.4 Nonforested Land

The remainder of the lands surrounding Lake Lanier feature a variety of nonforested communities, including pastures, mowed areas, and old fields (USACE, Mobile District, 1974). Regular maintenance by landowners discourages woody plants and keeps grasses, weeds, and wildflowers dominant. Without mowing, burning, or grazing, these areas would be expected to succeed into pine forests or mixed forests composed of fast-establishing species such as red cedar (*Juniperus virginiana*), sweetgum, Virginia pine, and sumac.

3.9.2 Wildlife

The lands surrounding Lake Lanier support game and nongame wildlife species common in the Piedmont Region. Waterfowl hunting occurs on the lake in September, November, December, and January (USACE, Mobile District, 2001a). Seasons for waterfowl hunting conform to federal and state regulations. Many resident and migratory birds can be observed near Lake Lanier. At least 127 species have been reported (USACE, no date a).

The Chattahoochee River Basin supports 104 species of fish, representing 22 taxonomic families. Especially well represented in the basin are minnows, sunfishes (Centrarchidae), catfishes (Ictalaridae), and suckers (Catostomidae) (GDNR, 1997a). Not all these species are found in Lake Lanier or its tributaries. Fish species intolerant of lentic conditions, once known from the area, are not likely to be found in Lake Lanier.

Fishing is a popular recreational activity at Lake Lanier. Popular sport fish species in the lake are largemouth bass (*Micropterus salmoides*), spotted bass (*Micropterus punctulatus*), striped bass (*Morone saxitilis*), white bass (*Morone chrysops*), and crappie (*Pomoxis* spp.). (USACE, Mobile District, 2001b). Other lake fish species include sunfish (*Lepomis* spp.), yellow perch (*Perca flavescens*), carp (*Cyprinus carpio*), catfish (*Ictalurus* spp.), shad (*Dorosoma* spp.), and blueback herring (Clupeidae) (USACE, Mobile District, 1974).

In the mid-1960s, Georgia DNR established a two-story coldwater trout fishery in the lake (Weaver and England, 1982). Annually stocked rainbow trout (*Oncorhynchus mykiss*) survived in the deep, cold oxygenated zone not normally occupied by warmwater species, and thus improved the quality

of the sport fishery. The trout stocking program, however, was discontinued in 1987 after it became apparent that the lake could no longer support significant trout survival through the summer stratification period, when dissolve oxygen levels dropped too low in the metalimnion and hyplimnion. Striped bass can tolerate slightly warmer water temperatures and slightly lower dissolved oxygen levels than trout, and have since filled that cool water niche. The current striped bass fishery is sustained through annual stockings of fingerlings produced at Georgia Wildlife Resources Division (GAWRD) hatcheries. As a result of hypolimnetic releases from Buford Dam, a significant trout fishery does occur in the first 45 miles of the Lake Lanier tailwater. The trout fishery is sustained through stockings of hatchery-raised fish by GAWRD and the U.S. Fish and Wildlife Service to accommodate high angling pressure. The federal stockings are considered mitigation for the negative effects of the Buford Dam project on the native fish community and sport fishery.

3.9.3 Sensitive Species

Sensitive species are unique plants and animals that have been observed to be declining toward extinction. Using available scientific research, state, federal, and nongovernmental organizations have assigned conservation priority to many rare or declining species. The most significant protection for sensitive species is the Endangered Species Act (ESA). The ESA was passed in 1973 to address concerns about the decline in populations of many unique wildlife species. Supporters of the ESA argued that America's natural heritage was of aesthetic, ecological, educational, recreational, and scientific value to the nation and therefore worthy of protection. The purpose of the ESA is to rebuild populations of protected species and conserve "the ecosystems upon which endangered and threatened species depend" (USFWS, 2001a). The law offers two classes of protection for rare species in decline—endangered and threatened. Endangered status means a species is in danger of extinction throughout all or a significant portion of its range. Threatened status indicates that a species is likely to become endangered within the foreseeable future. All species of plants and animals, except pest insects, are eligible for listing as endangered or threatened (USFWS, 2001a). All federal agencies are required to protect threatened and endangered species (TES) while carrying out projects and to preserve TES habitats on federal land.

Under the ESA it is illegal to "take" TES. As defined in the ESA, "the term take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." The Secretary of the Interior, through regulations, defined the term "harm" in this

passage as "an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering" (USFWS, 2001a). Because it is unlawful to hunt or collect TES, habitat degradation is the primary reason for population declines in listed species.

3.9.3.1 Sensitive Plant Species

Eighteen sensitive plant species have been reported from Gwinnett, Hall, Dawson, Lumpkin, and Forsyth Counties (Appendix L). Of the 18 sensitive plant species known from the region, only 5 have been reported within 1 mile of Lake Lanier by the Georgia Natural Heritage Program (2001). These species are Ozark bunchflower (*Melanthium woodii*), Indian olive (*Nestronia umbellula*), broadleaf white spiraea (*Spiraea alba* var. *latifolia*), broad-toothed hedge-nettle (*Stachys latidens*), and Georgia aster (*Aster georgianus*). All records except for that of Georgia aster are historical records. Historical records indicate plant populations that have been documented in the past but have not been observed in the field recently. Because some of the historical records are from submerged areas, it is likely that populations of Ozark bunchflower, Indian olive, broadleaf white spiraea, and broad-toothed hedge-nettle were destroyed by creating the reservoir.

Georgia aster (*Aster georgianus*) is a wildflower that once grew in Post Oak Savanna communities in the southeastern United States. It is a candidate for federal listing under the ESA. Georgia aster is known from North and South Carolina, Alabama, and Georgia in about 20 populations, with each population consisting of about 10 to 100 stems (Natureserve, 2001a). It persists in disturbed areas such as roadsides, utility rights-of-way, and other open areas maintained by disturbance. It is threatened by fire suppression, succession of woody plants, development, herbicide use, and highway expansion (USFWS, 2001b). Georgia Natural Heritage Program (2001) data indicate that one population of Georgia aster currently occurs along the Lake Lanier shoreline, directly north of the Buford Dam and powerplant.

3.9.3.2 Sensitive Animal Species

Twelve sensitive animal species are known from the counties around Lake Lanier (Appendix M). Of these species, 2 are federally listed and 10 are of special concern within the state.

Several sensitive animal species are not known from Lake Lanier or its tributaries, but these species could be affected by economic and land use changes in the ROI. Bluestripe shiner (*Cyprinella*

callitaenia) is a rare minnow endemic to the Appalachicola River drainage in Florida, Alabama, and Georgia. Populations of bluestripe shiner have been observed in the upper Appalachicola River, upper and middle Chattahoochee River, and middle Flint River. It is found in segments of large alluvial rivers having open sand or rock bottoms with flowing water and little aquatic vegetation (Natureserve, 2001e). The impoundment of reservoirs, including Lake Lanier, has eliminated bluestripe shiner habitat because the species cannot tolerate lentic conditions. Georgia DNR has listed the bluestripe shiner as a threatened species, and it has been reported in Dawson, Forsyth, Gwinnett, Hall, and Lumpkin Counties (GNHP, 2001).

The bald eagle (*Haliaeetus leucocephalus*) is a federally listed threatened species that the USFWS has proposed for delisting. Bald eagles are widespread in North America but suffered population declines in the middle of the 20th century because of the adverse effects of the pesticide dichlorodiphenyltrichloroethane (DDT). More recently, the bald eagle population has increased to the point where the species is no longer threatened with extinction in the 48 contiguous states. Bald eagles nest in large trees near rivers and lakes, and they feed mostly on fish and carrion. Bald eagles are sensitive to disturbance during the breeding season, and development within 1,500 feet of a nest is likely to have adverse effects (USFWS, 1987). Bald eagles have been reported in Dawson, Forsyth, Gwinnett, Hall, and Lumpkin Counties (Tucker, 2001). Georgia Natural Heritage Program (2001) data do not report any bald eagle nests within 1 mile of Lake Lanier.

Red-cockaded woodpeckers (*Picoides borealis*) nest and forage in mature pine stands frequently burned to promote an open understory and thick herbaceous layer. Research indicates that red-cockaded woodpeckers excavate nest cavities in pines 60 years or older. The birds were once abundant in pinelands throughout the southeastern United States, but fire suppression, subsequent hardwood encroachment, conversion to short-rotation pine plantations, and development have eliminated most suitable habitat (Natureserve, 2000). Red-cockaded woodpeckers are reported in Forsyth, Gwinnett, and Hall Counties (Tucker, 2001). Georgia Natural Heritage Program (2001) data do not report any red-cockaded woodpecker nesting areas within 1 mile of Lake Lanier.

3.9.4 Sensitive Habitats

Sensitive habitats are areas inhabited by federally listed species, as well as rare vegetative communities described and listed by the Georgia Natural Heritage Program. There are no records of any federally listed species or rare vegetative communities within 1 mile of Lake Lanier (GNHP,

2001). A lack of records in the Heritage database, however, does not provide definitive evidence of an absence of sensitive habitats. Site-specific field surveys for sensitive habitats would be needed when assessing specific proposed actions in the future.

3.9.5 Wetlands

Wetlands are the transitional area between dry land and aquatic habitat. As defined by the Corps (USACE, 1987), wetlands are "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas." Three diagnostic characteristics are typically employed to recognize wetlands:

- ***Hydrology.*** Wetlands are inundated with less than 6.6 feet of water on average; otherwise, they are considered deepwater habitat. However, unless wetlands are saturated to the soil surface at least some time during the growing season, they are considered upland or non-wetland habitat.

- ***Soils.*** Long-term inundation leads to oxygen depletion in soils. The lack of oxygen in wetland soils during part or all the year causes wetland soils to develop differently than upland soils.

- ***Vegetation.*** Wetlands feature plant species that are adapted to thrive in wet soils with little or no oxygen. Wetland plants have specialized structural or reproductive features that allow them to compete with other plants and persist in inundated soils.

Wetlands are susceptible to many different kinds of impacts because they are the active interface between the terrestrial and aquatic components of a drainage basin (Schneider, 2000). Water, sediment, nutrients, toxic substances, and organic matter from upstream or upslope move into wetlands. In the wetlands these inputs can be changed in energy or biochemical status before they are eventually removed farther downstream. Animals also move in and out of wetlands, using them as sources of food, water, and habitat and transferring energy and chemical components between the terrestrial and aquatic ecosystems. Because of these interrelationships, activities upstream or upslope have profound effects on wetlands and on aquatic sites downstream. Consequently,

management activities in wetlands can have substantial effects on communities downstream or within the radius of movement of organisms that use the wetlands.

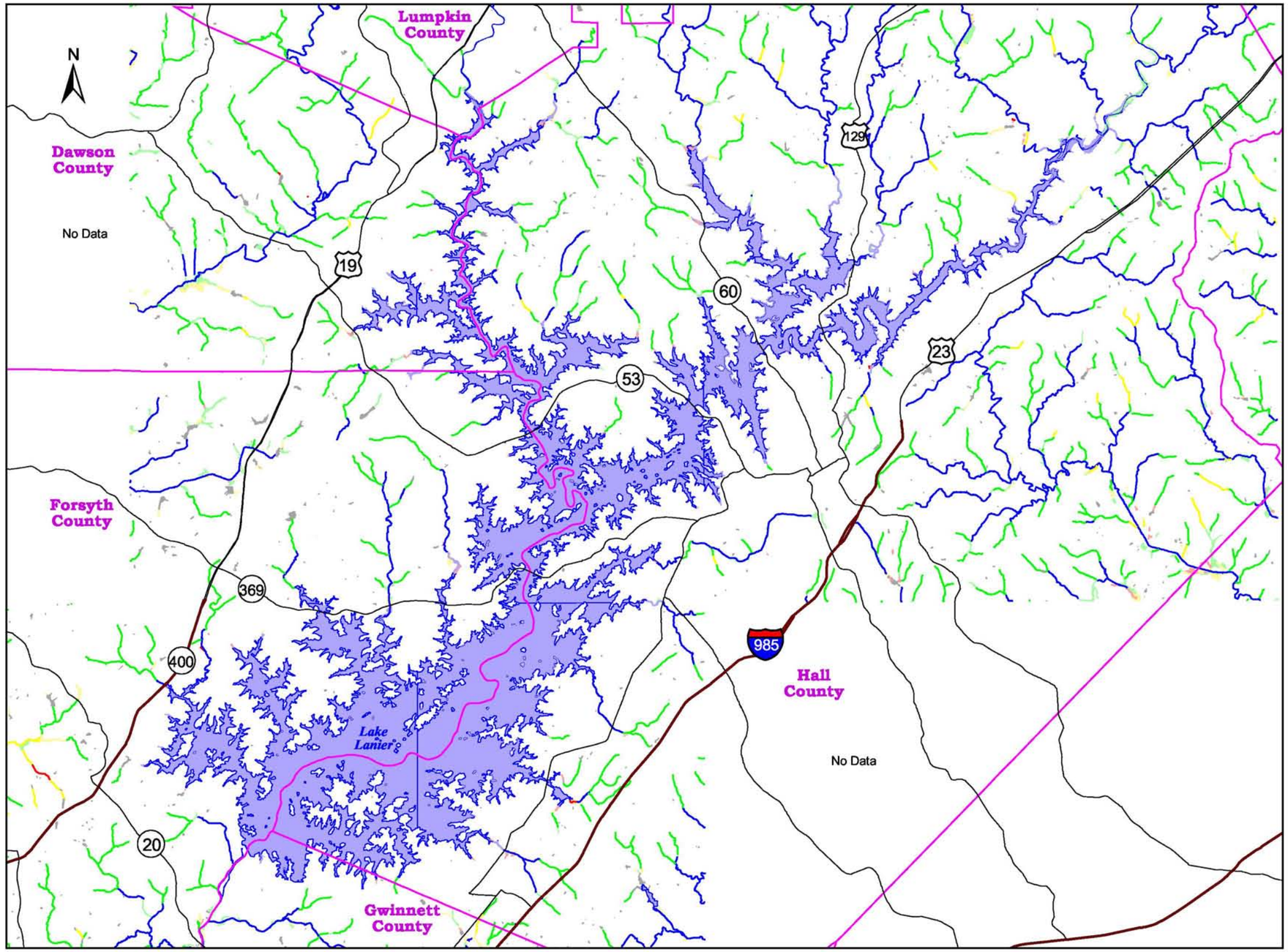
The National Wetlands Inventory (NWI) of the USFWS has identified and mapped most of the known wetlands in the conterminous United States, including those at Lake Lanier. Locations of wetlands within 1 mile of Lake Lanier are shown in Figure 3-15, and their types are listed in Table 3-34.

According to NWI data, there are 1,491 acres of wetlands within 1 mile of Lake Lanier (USFWS, 2002). Considering that the lake's surface water covers 39,038 acres, wetlands make up a relatively small portion of the shoreline and adjacent land. Wetlands at Lake Lanier are present mostly in coves and along tributaries in the upper part of the lake. In the lower part of the lake near the dam, the shoreline is steep and unfavorable to wetland vegetation. Daily and weekly fluctuations in water level for hydropower production, water consumption, and wave action from boat wakes also erode the lakeshore and make it nearly impossible for wetland vegetation to persist. Despite the generally unfavorable conditions, some littoral wetlands can be found in narrow bands along the shoreline in areas protected from wave action. Palustrine wetlands are usually found in coves and in the floodplains of lake tributaries. These wetlands have been further identified by their dominant vegetation—deciduous trees, shrubs, or emergent herbaceous vegetation. Palustrine wetlands with an unconsolidated bottom are mostly small ponds. Riverine wetlands are those found within a channel of continuously flowing water. The channels of the Chattahoochee and Chestatee Rivers are counted as riverine wetlands.

Table 3-34
Lake Lanier Wetlands

Wetland Type	NWI Code	Acres
Littoral, Unconsolidated Bottom	L2U	644
Palustrine, Emergent (Herbaceous)	PEM	117
Palustrine, Forested	PFO	282
Palustrine, Shrub-Scrub	PSS	222
Palustrine, Unconsolidated Bottom	PUB	130
Palustrine, Unconsolidated Shore	PUS	2
Riverine, Lower Perennial, Unconsolidated Bottom	R2U	60
Riverine, Upper Perennial, Unconsolidated Bottom	R3U	34
Total		1,491

Source: USFWS, 2002.



LEGEND

Wetland Types

- Lacustrine
- Palustrine Aquatic Bottom
- Palustrine Emergent
- Palustrine Forested
- Palustrine Scrub Shrub
- Palustrine Unconsolidated Bottom
- Riverine

0 1.5 3 Miles

Wetlands in the Vicinity of Lake Lainer

Figure 3-15

Source: USFWS, 2002.

3.10 CULTURAL RESOURCES

Six prehistoric and/or historic period archaeological sites that are eligible or potentially eligible for the National Register of Historic Places (NRHP) are present within the project lands (Gibbens, personal communication, 2002; USACE, Mobile District, 1997a). Three historic cemeteries (Little Hall Cemetery, Shockley Cemetery, and an unnamed cemetery at the University Yacht Club) are also located within the fee-owned lands. Table 3-35 lists the sites and the cemeteries. No standing historic structures are located within the government-owned lands.

3.10.1 Native American Resources

No Native American resources, including traditional cultural properties, have been identified in the project area, apart from archaeological sites. Four federally recognized Native American tribes are identified for Georgia: the Eastern Band of Cherokee Indians of North Carolina; the Muskogee (Creek) Nation of Oklahoma; the Seminole Nation of Oklahoma; and the Seminole Tribe of Florida, Dania, Big Cypress, Brighton, Hollywood, and Tampa Reservations. Only the Eastern Band of Cherokee Indians of North Carolina has been identified for the counties included in the project area (National Park Service, 2001).

The Works Progress Administration (WPA) conducted surveys in the Lake Lanier area during the late 1930s. These surveys identified 24 sites in Hall, Gwinnett, Dawson and Forsyth Counties. In

Table 3-35
Historic Resources Located in the Project Area

Resource Type	Description	Resource Status
Archaeological Site 9HL20	Prehistoric midden and eroded mound site	Eligible for NRHP
Archaeological Site 9HL54	Prehistoric stone pile	Potentially eligible for NRHP
Archaeological Site 9HL176	Prehistoric stone configuration	Potentially eligible for NRHP
Archaeological Site 9HL230	Remains of prehistoric occupation and of historic early settler residence (two stone vaults)	Potentially eligible for NRHP
Archaeological Site 9HL429	Prehistoric stone pile	Potentially eligible for NRHP
Archaeological Site 9LU7	Prehistoric site	Eligible for NRHP
Little Hall Cemetery	Nineteenth century cemetery	Protected status
Schockley Cemetery	Nineteenth century cemetery	Protected status
Unnamed cemetery at University Yacht Club	Nineteenth century cemetery	Protected status

1950 and 1951 the River Basin Surveys of the Smithsonian Institution were conducted, and a total of 60 sites were identified. The University of Georgia surveyed the government-owned lands at Lake Lanier in 1978. Approximately 6,000 acres of a total of 20,000 fee-owned lands were surveyed, and 540 prehistoric archaeological sites were recorded. Of these, 53 were initially recommended as potentially NRHP-eligible, but through consultation with the Georgia SHPO only 6 of these sites are now recommended as potentially eligible (USACE, Mobile District, 1994). An additional 480 acres of fee-owned lands at the lake were surveyed by Jacksonville State University.

A Historic Properties Management Plan was completed for Lake Lanier in 1997 (USACE, Mobile District, 1997a). The plan states that with the exception of some isolated tracts of fee-owned lands at the north end of the project, on the Chattahoochee and Chestatee Rivers, historic resource surveys have been completed for all fee-owned lands in the Lake Lanier project area. The plan provides a specific protection plan for historic resources on fee-owned lands.

The Lake Lanier Corps of Engineers Project Office has two SOPs regarding historic resources. SOP No. 2-18 concerns the use of metal detectors and the procedure for handling violations (USACE, Mobile District, no date b). Metal detectors may be used only in areas classified as "open." Open areas at Lake Lanier include only Corps-maintained beach areas at the following parks: Buford Dam Park, Shoal Creek Campground, Old Federal Campground, Old Federal Dayuse, Shady Grove, Young Deer Creek, Bald Ridge Campground, Mary Alice, Sawnee, and West Bank. SOP No. 2-21 concerns vandalism to archaeological sites (USACE, Mobile District, no date c). The SOP directs that all violations are to be reported immediately to supervisors and action is to be coordinated through the cultural resources program coordinator. Violations include surface collections and unauthorized excavations.

In addition to these SOPs, federal laws and regulations and EOs also protect cultural resources considered eligible for listing on the NRHP, and certain Native American resources. These laws include the National Environmental Policy Act of 1969; the National Historic Preservation Act of 1966, as amended 1992, and regulations at 36 CFR Part 800, *Protection of Historic and Cultural Properties*; the Antiquities Act of 1906; the Archeological Resources Protection Act of 1979; the Archeological and Historic Preservation Act of 1974; the Native American Graves Protection and Repatriation Act of 1990 and 43 CFR 10 regulations; the American Indian Religious Freedom Act of 1978; EO 13007–*Indian Sacred Sites*, dated May 24, 1996; Presidential Memorandum dated April 29, 1994–*Government-to-Government Relations with Native American Tribal Governments*;

Curation of Federally-Owned and Administered Archaeological Collection (36 CFR Part 79); and EO 13175–*Consultation and Coordination with Indian Tribal Governments,* dated November 6, 2000.

3.10.2 Prehistoric Period Resources

Prehistoric occupation in Georgia is divided into four major periods: the Paleo-Indian Period (ca. 10,500 B.C. to ca. 8,000 B.C.), the Archaic Period (ca. 8,000 B.C. to ca. 1,000 B.C.), the Woodland Period (ca. 1,000 B.C. to ca. A.D. 1000), and the Mississippian Period (ca. A.D. 1000 to ca. A.D. 1600).

Five prehistoric sites and one site with both prehistoric and historic components considered eligible or potentially eligible for the NRHP are located within the fee-owned lands.

3.10.3 Historic Period Resources

One historic period archaeological site and three existing historic cemeteries are located in the project area. The historic period archaeological site (9HL230, which also includes a prehistoric component) is the remains of an early settler's residence. The 19th-century Little Hall Park Cemetery is fenced and maintained by the family and the Corps. The Shockley Cemetery is located in a densely wooded isolated, undeveloped tract and is maintained by Corps personnel. It is not fenced and is periodically monitored by Corps staff. The unnamed cemetery is located at the University Yacht Club. It is also in a wooded area, and it is mowed and maintained by the University Yacht Club and checked by Corps staff. It is not fenced.

3.10.4 Historic Architectural Resources

No standing historic structures are present in the project area.

3.11 AIR QUALITY

The Clean Air Act (CAA) provides the principal framework for national, state, and local efforts to protect air quality. Under the CAA, the U.S. Environmental Protection Agency's (EPA's) Office of Air Quality Planning and Standards (OAQPS) is responsible for setting standards, also known as National Ambient Air Quality Standards (NAAQS), for pollutants considered harmful to humans and the environment. OAQPS is also responsible for ensuring that these air quality standards are

attained (in cooperation with state, tribal, and local governments) through national standards and strategies to control pollutant emissions from automobiles, factories, and other sources (USEPA, OAQPS, 2001).

Table 3-36 shows NAAQS values for the six criteria pollutants. The CAA requires states to monitor ambient levels of these pollutants and to develop air quality management plans to ensure that the federal air quality standards are achieved and maintained. Georgia has an approved State Implementation Plan (SIP) to address the requirements of the CAA. Areas that fail to meet the NAAQS are designated as nonattainment areas and are potentially subject to regulatory enforcement.

Air quality around Lake Lanier is affected largely by emissions from the five surrounding counties —Gwinnett, Forsyth, Hall, Dawson, and Lumpkin. Each county has individual attainment/ nonattainment classifications. As a result of the Clean Air Act Amendments of 1990, attainment/nonattainment classifications were made based on metropolitan areas and further delineated by county in the state of Georgia. The Atlanta metropolitan area, which includes Gwinnett and Forsyth Counties, is considered in attainment for all criteria pollutants except ozone.

Table 3-36
National Ambient Air Quality Standards (Primary)

Pollutant	Standard Value	Standard Type
Carbon Monoxide (CO)		
8-hour average	9 ppm	Primary
1-hour average	35 ppm	Primary
Nitrogen Dioxide (NO_2)		
Annual arithmetic mean	0.053 ppm	Primary & secondary
Ozone (O_3)		
1-hour average	0.12 ppm	Primary & secondary
Lead (Pb)		
Quarterly average	1.5 $\mu g/m^3$	Primary & secondary
Particulate (PM 10)		
Annual arithmetic mean	50 $\mu g/m^3$	Primary & secondary
24-hour average	150 $\mu g/m^3$	Primary & secondary
Sulfur Dioxide (SO_2)		
Annual arithmetic mean	0.03 ppm	Primary
24-hour average	0.14 ppm	Primary
3-hour average	0.50 ppm	Secondary

Source USEPA, OAQPS, 2001.

The other three counties in the study area are currently considered in attainment for all six criteria pollutants (Borel, personal communication, 2002).

Activities at Lake Lanier can affect air quality. Mobile emissions from automobiles and watercraft are a considerable source of air pollutants. Corps activities at the lake, including construction activity and heavy machinery use, can also contribute pollutant emissions. Air quality issues related to commuter traffic have been identified as well. Buford Dam Road becomes an alternative for approximately 4,000 vehicles per day that bypass Georgia State Highway 20 during peak traffic hours. The increase in the number of tourists traveling into and out of the area also affect air quality.

It is believed that air quality in the Atlanta area has been affected by pollutant transport from outside the Atlanta metropolitan airshed. To address this problem, the state issued an "NO_x SIP Call," which established required control measures for nitrogen oxides (NO_x) in a local and regional context. The NO_x SIP Call is expected to cause a reduction in ozone precursors, including those transported from outside the study area, by May 31, 2004. Based on this expectation, the state produced an attainment demonstration for the Atlanta metropolitan area. This prediction was based on required local and regional control measures and air quality modeling. The attainment demonstration showed that the area would meet the current ambient air quality criteria in the future (Borel, personal communication, 2002).

Because of the revised but not implemented ozone standard, future attainment/nonattainment status has not been decided. The Governor of Georgia recommended attainment classifications based on the proposed standard using air quality information from 1997 to 1999. These attainment classifications did take into account the current activities at the lake. The final recommendation was to consider 21 counties in the state, including Dawson and Hall Counties, as in nonattainment. At the time, Dawson County was consistently violating the standard at one monitoring station. Hall County was recommended as in nonattainment because of increasing industry and traffic emissions. EPA agreed with the Governor's recommendation (Borel, personal communication, 2002).

3.12 HAZARDOUS AND TOXIC SUBSTANCES AND POLLUTION

Potential hazardous spill areas at the lake include the marinas, boat ramps, parking lots, and roadway bridges. Oil and fuel from powerboats might be discharged into the lake if proper care is

not taken when performing maintenance or refueling. Hazardous and toxic substances can also be generated through the cleaning, painting, or repair of boats in the lake. In addition, the powerhouse, transformer yard, switchyard, and contractor's operation and maintenance facility store a variety of chemicals, such as oil, primers, rust inhibitors, paints, paint thinner, fuel (diesel/gasoline), and the like. These facilities have some form of containment, usually a concrete berm or floor drain, to minimize the potential effects of a leak or spill (USACE, Mobile District, 1997b).

Private contractors complete most of the maintenance work performed at Lake Lanier and are responsible for disposing of any hazardous waste generated during such activities (solvents, oils) according to applicable state regulations. Contractors use pesticides, herbicides, and fungicides on an as-needed basis and thus do not require storage on Corps property (Shinall, personal communication, 2002).

The Georgia EPD, part of the Georgia DNR, is responsible for handling any hazardous waste issues that occur in the Lake Lanier area. Three documented releases from leaking underground storage tanks have occurred at Lake Lanier since 1996. The releases occurred at Habersham, Aqualand, and Lan Mar, all of which are public marinas. The Georgia EPD sent a notification to each of the three facilities requiring preparation of a plan to investigate and remediate contamination of the soil and/or groundwater caused by a release from the underground storage tanks (Shinall, personal communication, 2002). In addition, 23 chemical and sewage spills were investigated and reported during 2000 (Hazardous Incident/Disaster Program Coordinator). There are no other known hazardous waste issues on the USACE property at Lake Lanier.

3.13 NOISE

Noise and *sound* are often used interchangeably. The sensation of sound is produced when pressure variations having a certain range of characteristics reach a responsive ear. Sound is the term describing pressure variations that are pleasant or useful for communication. Noise is generally defined as unwanted sound, and it is often made up of different frequency components.

Sound levels, reported in decibels (dB), are used to represent how people hear sound and to determine the impact of noise on public health and welfare. Table 3-37 presents a range of sound levels by various sources of noise. EPA recommends use of the day-night sound level for environmental noise to quantify the intrusiveness of nighttime noise where the A-weighted sound

Table 3-37
Sound Levels of Various Sources

Source	Sound Level (dB)
Near jet plane at takeoff	140
Gun muzzle blast	140
Threshold of pain	120
Loud rock music	115
Car horn	115
Thunder	110
Racing boat–283-ci engine with exhaust below waterline at 50 feet	105
Chainsaw	100
Inboard/outboard boat–352-ci engine with exhaust above waterline at 50 feet	90
Lawn mower at 50 feet	90
Inboard/outboard boat–350-ci engine with exhaust below waterline at 50 feet	85
Personal watercraft–750-cc engine in the water at 50 feet	81
Watercraft with single 175-hp outboard engine at 50 feet	81
Pop-up toaster	75
Alarm clock	75
Normal conversation	60
Rainfall	50
Light traffic	50
Refrigerator	40
Rustle of leaves	20
Normal breathing	10
Threshold of hearing	0

Sources: Bearden, 2000; Oskam and Mitchell, no date; PWIA, no date; USEPA, 1974.

level is used for industrial situations. The day-night sound level is the A-weighted equivalent sound level for a 24-hour period, with an additional 10-dB weighting imposed on the equivalent sound level occurring during the nighttime hours (10 p.m. to 7 a.m.).

Many federal agencies, such as EPA and the Federal Highway Administration, Department of Housing and Urban Development, Federal Aviation Administration, and Department of Defense, use the day-night sound level to protect the public from the impact of community noise (Cavanaugh and Tocci, no date) and apply an L_{dn} of 55 dB as a recommended outdoor limit (USEPA, 1974). These agencies recognize 65 dB as the noise level where residential land use becomes questionable, and areas where the level exceeds 75 dB are considered unacceptable for residential use. The World Health Organization (WHO) has identified the range of noise between 50 and 55 dB for a period of 16 hours as the annoyance threshold (WHO, 2001). Although some federal agencies use them, these values are only guidance values, not regulatory criteria. The control of environmental or community noise is left to state and local agencies. Georgia has a state-level regulation relating to motorboat noise level control. Marine noise is limited to 84 dB, using the SAE-J34 testing procedure.

Lake Lanier is used primarily for recreation, and a common byproduct of recreation is noise. Therefore, the majority of noise at Lake Lanier is caused by activities related to recreational activities, including watercraft use and traffic around the lake. The receptors of this noise are the recreational users themselves, as well as residents living adjacent to the lake, who also commonly use the lake for recreation. In general, this noise is acceptable to both residents and recreational users as long as applicable laws are obeyed.