

4.0 NUTRIENT RESULTS

The following section presents the nutrient results for the Current Assimilative Capacity Resource Assessment. More details results, including cumulative watershed loading, are presented in Appendix C.

4.1 Water Quality Standards

The applicable water quality standards that were used for the Current Assimilative Capacity Resource Assessment are presented below.

4.1.1 Coosa River

EPA established a Total Maximum Daily Load (TMDL) for Lake Weiss in October 2008 that set the TMDL for Total P on the Coosa River at the Georgia and Alabama state line to a growing season median concentration of 0.060 mg/L (EPA, 2008).

4.1.2 Lake Allatoona

The Lake Allatoona criteria for nutrients and chlorophyll *a*, as stated in Georgia's Rules and Regulations for Water Quality Control, Chapter 391-3-6-.03(17)(d) are:

(i) Chlorophyll *a*: For the months of April through October, the average of monthly mid-channel photic zone composite samples shall not exceed the chlorophyll *a* concentrations at the locations listed below more than once in a five-year period:

1.	Upstream from the Dam	10 µg/L
2.	Allatoona Creek upstream from I-75	10 µg/L
3.	Mid-Lake downstream from Kellogg Creek	10 µg/L
4.	Little River upstream from Highway 205	15 µg/L
5.	Etowah River upstream from Sweetwater Creek	12 µg/L

(iii) Total Nitrogen: Not to exceed 4 mg/L as nitrogen in the photic zone.

(iv) Phosphorous: Total lake loading shall not exceed 1.3 pounds per acre-foot of lake volume per year.

(viii) Major Lake Tributaries: For the following major tributaries, the annual total phosphorous loading to Lake Allatoona shall not exceed the following:

1.	Etowah River at State Highway 5 spur and 140, at the USGS gage	340,000 lbs/yr
2.	Little River at State Highway 5 (Highway 754)	42,000 lbs/yr
3.	Noonday Creek at North Rope Mill Road	38,000 lbs/yr
4.	Shoal Creek at State Highway 108 (Fincher Road)	9,200 lbs/yr

4.1.3 Lake Jackson

The Lake Jackson specific criteria for nutrients and chlorophyll *a*, as stated in Georgia’s Rules and Regulations for Water Quality Control, Chapter 391-3-6-.03(17)(c) are:

(i) Chlorophyll *a*: For the months of April through October, the average of monthly mid-channel photic zone composite samples shall not exceed 20 µg/L at a location approximately 2 miles downstream of the confluence of the South and Yellow Rivers at the junction of Butts, Newton and Jasper Counties more than once in a five-year period.

(iii) Total Nitrogen: Not to exceed 4.0 mg/L as nitrogen in the photic zone.

(iv) Phosphorous: Total lake loading shall not exceed 5.5 pounds per acre-foot of lake volume per year.

(viii) Major Lake Tributaries: For the following major tributaries, the annual total phosphorous loading to Lake Jackson shall not exceed the following:

- | | | |
|----|---|----------------|
| 1. | South River at Island Shoals: | 179,000 lbs/yr |
| 2. | Yellow River at Georgia Highway 212: | 116,000 lbs/yr |
| 3. | Alcovy River at Newton Factory Bridge Road: | 55,000 lbs/yr |
| 4. | Tussahaw Creek at Fincherville Road.: | 7,000 lbs/yr |

4.2 Coosa River

The following table shows the modeled median growing season Total P concentrations for the Coosa River for each year.

Table 4-1 Coosa River Growing Season Median Concentration of Total Phosphorus (mg/L)

Station	Standard	2001	2002	2003	2004	2005	2006	2007
Coosa River at Georgia-Alabama State Line	0.060	0.116	0.123	0.063	0.085	0.077	0.136	0.166

4.3 Lake Results

4.3.1 Lake Allatoona

Chlorophyll a

Table 4-2 shows the calibrated modeled growing season average chlorophyll levels for Lake Allatoona. The bolded values indicate the locations and years where the model predicted the lake did not meet its chlorophyll a standards.

Table 4-2 Lake Allatoona Growing Season Average Chlorophyll a (ug/L)

Station	Standard	2001	2002	2003	2004	2005	2006	2007
Upstream from the Dam (Station 14309001)	10	5.8	9.1	8.6	9.4	8.0	5.6	9.8
Allatoona Creek upstream from I-75 (Station 14307501)	10	6.1	11.7	14.8	11.3	11.3	6.9	13.8
Mid-Lake downstream from Kellogg Creek (Station 14305801)	10	6.8	11.4	10.7	10.5	9.6	6.4	11.8
Little River upstream from Highway 205 (Station 14304801)	15	8.5	16.5	7.0	12.0	8.2	11.2	24.1
Etowah River upstream from Sweetwater Creek (Station 14302001)	12	8.1	15.2	9.7	12.3	9.6	9.4	17.2

Total Nitrogen

Figure 4-1 shows the maximum simulated Total Nitrogen in Lake Allatoona during 2007. Areas shown in red are exceeding the Total Nitrogen standard (>4.0 mg/L).

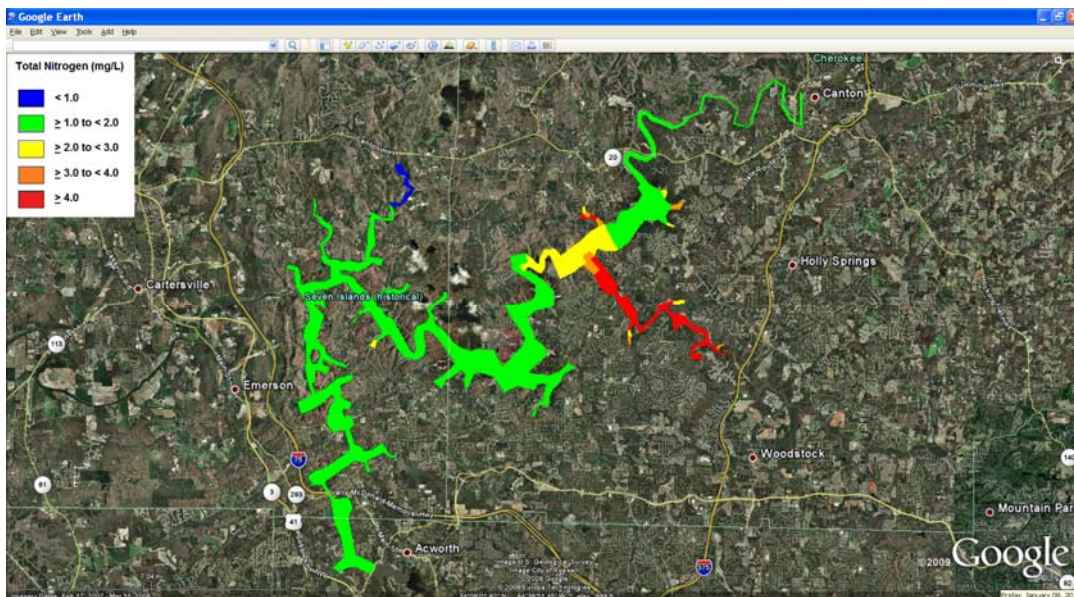


Figure 4-1 Maximum Value of Total Nitrogen (mg/L) in Lake Allatoona in Photic Zone: year 2007

Total Phosphorus

Table 4-3 shows the annual Total Phosphorus loading into Lake Allatoona. All years are simulating below the standard of 1.3 lbs/acre-ft.

Table 4-3 Lake Allatoona Annual Total Phosphorus Loading

	Standard	2001	2002	2003	2004	2005	2006	2007
Lake Volume (Acre-Ft)		346,973	330,282	352,487	345,482	351,327	311,680	307,967
Annual Load of Phosphorus (lbs)		273,110	347,838	391,114	377,856	287,333	257,477	162,166
Specific Loading (lbs/Acre-Ft)	1.3	0.79	1.05	1.11	1.09	0.82	0.83	0.53

Major Tributary Phosphorus Loading

Table 4-4 shows the annual tributary loading simulated at the four tributary compliance points. The bolded values indicate the locations and years where the model predicted the tributary loading exceeded its standard.

Table 4-4 Lake Allatoona Watershed Annual Tributary Total Phosphorus Loads (lbs)

Station	Standard	2001	2002	2003	2004	2005	2006	2007
Etowah River at State Highway 5 spur and 140, at the USGS gage	340,000	95,306	122,157	121,631	107,972	75,762	84,926	49,396
Little River at State Highway 5 (Highway 754)	42,000	20,374	27,748	31,581	25,637	23,176	22,004	15,101
Noonday Creek at North Rope Mill Road	38,000	36,749	38,787	42,403	37,686	36,106	25,147	15,697
Shoal Creek at State Highway 108 (Fincher Road)	9,200	5,877	11,403	12,541	9,305	6,028	6,494	3,780

Table 4-5 shows the calculated loading (lbs/acre) for each of the tributary compliance points, and Table 4-6 shows the simulated loading (lbs/acre). The bolded values indicate the locations and years where the model predicted the annual tributary loading exceeded its standard.

Table 4-5 Lake Allatoona Watershed Annual Tributary Total Phosphorus Loads (lbs/acre)

Station	Standard (lbs)	Area (Acres)	Loading (lbs/acre)
Etowah River at State Highway 5 spur and 140, at the USGS gage	340,000	391,801	0.868
Little River at State Highway 5 (Highway 754)	42,000	55,536	0.756
Noonday Creek at North Rope Mill Road	38,000	25,922	1.466
Shoal Creek at State Highway 108 (Fincher Road)	9,200	42,677	0.216

Table 4-6 Lake Allatoona Watershed Annual Tributary Total Phosphorus Loads (lbs/acre)

Station	Standard	2001	2002	2003	2004	2005	2006	2007
Etowah River at State Highway 5 spur and 140, at the USGS gage	0.868	0.243	0.312	0.310	0.276	0.193	0.217	0.126
Little River at State Highway 5 (Highway 754)	0.756	0.367	0.500	0.569	0.462	0.417	0.396	0.272
Noonday Creek at North Rope Mill Road	1.466	1.418	1.496	1.636	1.454	1.393	0.970	0.606
Shoal Creek at State Highway 108 (Fincher Road)	0.216	0.138	0.267	0.294	0.218	0.141	0.152	0.089

4.3.2 Lake Jackson

Chlorophyll a

Table 4-7 shows the calibrated modeled growing season average chlorophyll levels for Lake Jackson. The bolded values indicate the locations and years where the model predicted the lake did not meet its chlorophyll a standards.

Table 4-7 Lake Jackson Growing Season Average Chlorophyll a (ug/L)

Station	Standard	2001	2002	2003	2004	2005	2006	2007
Mid-Lake (Station 04350051)	20	14.5	11.9	9.5	10.2	10.9	13.0	16.7
Mid-Lake (Station 04220111)	20	14.4	11.6	8.9	10.3	10.5	13.3	16.9
Forebay (Station 04500001)	N/A	12.4	10.7	10.4	9.7	11.7	11.4	12.6

Total Nitrogen

Figure 4-2 shows the maximum simulated Total Nitrogen in Lake Jackson during 2007. Areas shown in red are exceeding the Total Nitrogen standard (>4.0 mg/L).

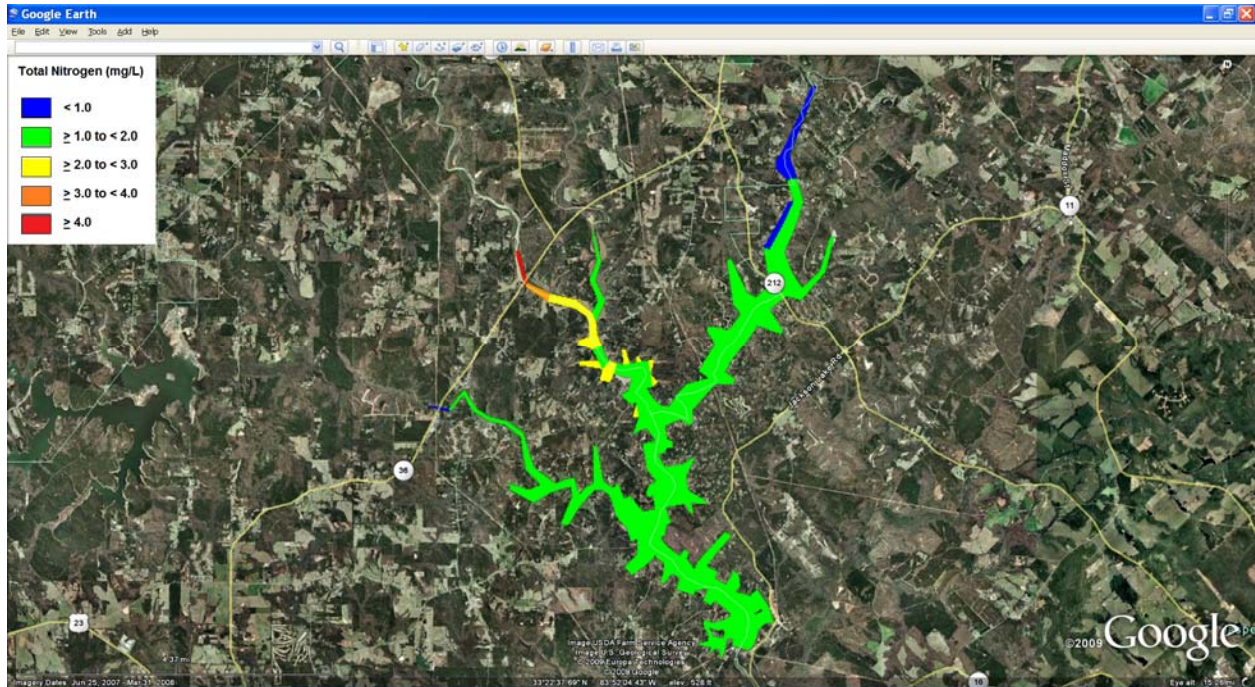


Figure 4-2 Maximum Value of Total Nitrogen (mg/L) in Lake Jackson in Photic Zone: year 2007

Total Phosphorus

Table 4-8 shows the annual Total Phosphorus loading into Lake Jackson. All years are simulating below the standard of 5.5 lbs/acre-ft.

Table 4-8 Lake Jackson Annual Total Phosphorus Loading

	Standard	2001	2002	2003	2004	2005	2006	2007
Lake Volume (Acre-Ft)		96,008	97,180	97,307	98,652	99,083	100,710	101,090
Annual Load of Phosphorus (lbs)		113,243	106,073	168,663	114,588	158,510	92,081	71,063
Specific Loading (lbs/Acre-Ft)	5.5	1.18	1.09	1.73	1.16	1.6	0.91	0.7

Major Tributary Phosphorus Loading

Table 4-9 shows the annual tributary loading simulated at the four tributary compliance points. The bolded values indicate the locations and years where the model predicted the tributary loading exceeded its standard.

Table 4-9 Lake Jackson Watershed Annual Tributary Total Phosphorus Loads (lbs)

Station	Standard	2001	2002	2003	2004	2005	2006	2007
South River at Island Shoals	179,000	65,782	57,168	73,008	56,664	71,860	53,003	44,240
Yellow River at Georgia Highway 212	116,000	33,571	36,614	48,169	33,902	44,622	29,510	24,789
Alcovy River at Newton Factory Bridge Road	55,000	10,471	10,193	19,228	11,427	15,829	8,068	6,373
Tussahaw Creek at Fincherville Road	7,000	1,980	2,117	4,634	2,631	4,211	1,847	1,435

Table 4-10 shows the calculated loading (lbs/acre) for each of the tributary compliance points, and Table 4-11 shows the simulated loading (lbs/acre). The bolded values indicate the locations and years where the model predicted the annual tributary loading exceeded its standard.

Table 4-10 Lake Jackson Watershed Annual Tributary Total Phosphorus Loads (lbs/acre)

Station	Standard (lbs)	Area (Acres)	Loading (lbs/acre)
South River at Island Shoals	179,000	333,142	0.537
Yellow River at Georgia Highway 212	116,000	281,436	0.412
Alcovy River at Newton Factory Bridge Road	55,000	164,104	0.335
Tussahaw Creek at Fincherville Road	7,000	39,166	0.179

Table 4-11 Lake Jackson Watershed Annual Tributary Total Phosphorus Loads (lbs/acre)

Station	Standard	2001	2002	2003	2004	2005	2006	2007
South River at Island Shoals	0.537	0.197	0.172	0.219	0.170	0.216	0.159	0.133
Yellow River at Georgia Highway 212	0.412	0.119	0.130	0.171	0.120	0.159	0.105	0.088
Alcovy River at Newton Factory Bridge Road	0.335	0.064	0.062	0.117	0.070	0.096	0.049	0.039
Tusshaw Creek at Fincherville Road	0.179	0.051	0.054	0.118	0.067	0.108	0.047	0.037

4.3.3 Lake Oconee

There are no lake specific standards for Lake Oconee. Therefore results for chlorophyll *a*, total nitrogen, and the total phosphorus loading are compared to the standards for Lake Jackson. The major tributary phosphorus loading was determined for 6 tributaries to Lake Oconee.

Chlorophyll *a*

Table 4-12 shows the calibrated modeled growing season average chlorophyll levels for Lake Oconee.

Table 4-12 Lake Oconee Growing Season Average Chlorophyll *a* (ug/L)

Station	Standard	2001	2002	2003	2004	2005	2006	2007
Lake Oconee at Highway 44 – Oconee River Arm (Station 03038501)	N/A	16.0	18.5	14.4	17.9	13.8	20.0	22.7
Lake Oconee – Richland Creek Arm (Station 03038841)	N/A	10.6	11.9	9.8	12.9	10.5	11.5	12.5
Lake Oconee – 300 m Upstream of Wallace Dam (Station 03038901)	N/A	13.5	14.3	12.8	15.3	13.4	14.7	15.5

Total Nitrogen

Figure 4-3 shows the maximum simulated Total Nitrogen in Lake Oconee during 2007.

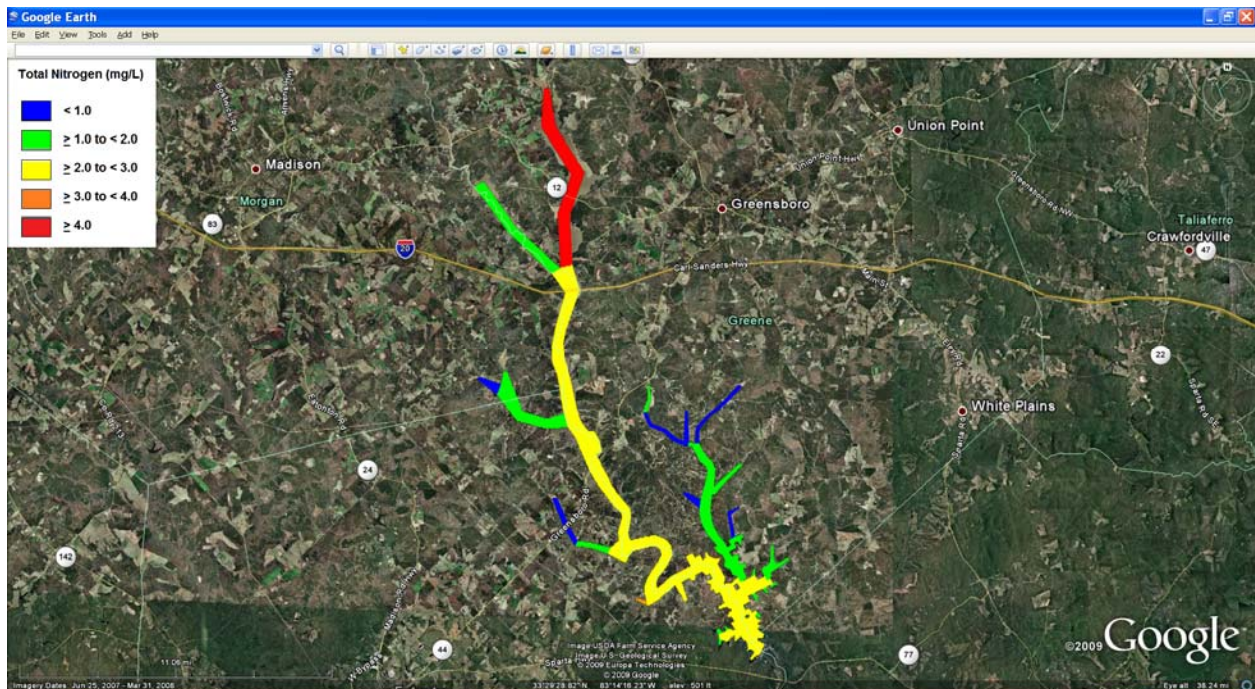


Figure 4-3 Maximum Value of Total Nitrogen (mgN/L) in Lake Oconee in Photic Zone: year 2007

Total Phosphorus

Table 4-13 shows the annual Total Phosphorus loading into Lake Oconee.

Table 4-13 Lake Oconee Annual Total Phosphorus Loading

	Standard	2001	2002	2003	2004	2005	2006	2007
Lake Volume (Acre-Ft)		360,818	360,159	367,292	366,294	367,312	364,221	355,827
Annual Load of Phosphorus (lbs)		325,986	325,246	363,858	324,084	327,947	384,364	434,542
Specific Loading (lbs/Acre-Ft)	N/A	0.9	0.9	1.0	0.9	0.9	1.1	1.2

Major Tributary Phosphorus Loading

Table 4-14 shows the annual tributary loading simulated at six tributaries to Lake Oconee, and Table 4-15 shows the annual loading (lbs/acre) at each of the tributaries.

Table 4-14 Lake Oconee Watershed Annual Tributary Total Phosphorus Loads (lbs)

Tributary	Standard	2001	2002	2003	2004	2005	2006	2007
Oconee River	N/A	302,936	284,522	351,168	305,009	324,813	320,594	282,866
Apalachee River	N/A	34,037	32,164	61,870	42,094	47,922	27,164	18,537
Sugar Creek	N/A	3,246	2,760	4,417	4,075	3,828	2,365	2,671
Little Sugar Creek	N/A	1,293	913	2,311	2,055	1,910	810	877
Richland Creek	N/A	2,712	2,340	4,256	3,571	2,793	1,946	926
Beaverdam Creek	N/A	1,793	1,359	3,162	2,614	1,755	1,164	794

Table 4-15 Lake Oconee Watershed Annual Tributary Total Phosphorus Loads (lbs/acre)

Tributary	Area (acres)	2001	2002	2003	2004	2005	2006	2007
Oconee River	662,783	0.457	0.429	0.530	0.460	0.490	0.484	0.427
Apalachee River	288,717	0.118	0.111	0.214	0.146	0.166	0.094	0.064
Sugar Creek	26,294	0.123	0.105	0.168	0.155	0.146	0.090	0.102
Little Sugar Creek	21,308	0.061	0.043	0.108	0.096	0.090	0.038	0.041
Richland Creek	26,979	0.101	0.087	0.158	0.132	0.104	0.072	0.034
Beaverdam Creek	24,095	0.074	0.056	0.131	0.108	0.073	0.048	0.033

4.3.4 Lake Sinclair

There are no lake specific standards for Lake Sinclair. Therefore results for chlorophyll *a*, total nitrogen, and the total phosphorus loading are compared to the standards for Lake Jackson. The major tributary phosphorus loading was determined for 6 tributaries to Lake Sinclair.

Chlorophyll *a*

Table 4-16 shows the calibrated modeled growing season average chlorophyll levels for Lake Sinclair.

Table 4-16 Lake Sinclair Growing Season Average Chlorophyll *a* (ug/L)

Station	Standard	2001	2002	2003	2004	2005	2006	2007
Lake Sinclair – Midlake Oconee River Arm (Station 03040601)	N/A	4.1	4.4	4.7	4.7	4.9	3.9	4.5
Lake Sinclair – Little River and Murder Creek Arm, Upstream Highway 441 (Station 03043981)	N/A	4.7	4.5	5.5	4.8	5.4	4.2	4.4
Lake Oconee – 300 m Upstream of Dam (Station 03044501)	N/A	4.5	5.9	5.8	6.7	5.6	4.4	5.8

Total Nitrogen

Figure 4-4 shows the maximum simulated Total Nitrogen in Lake Sinclair during 2007.

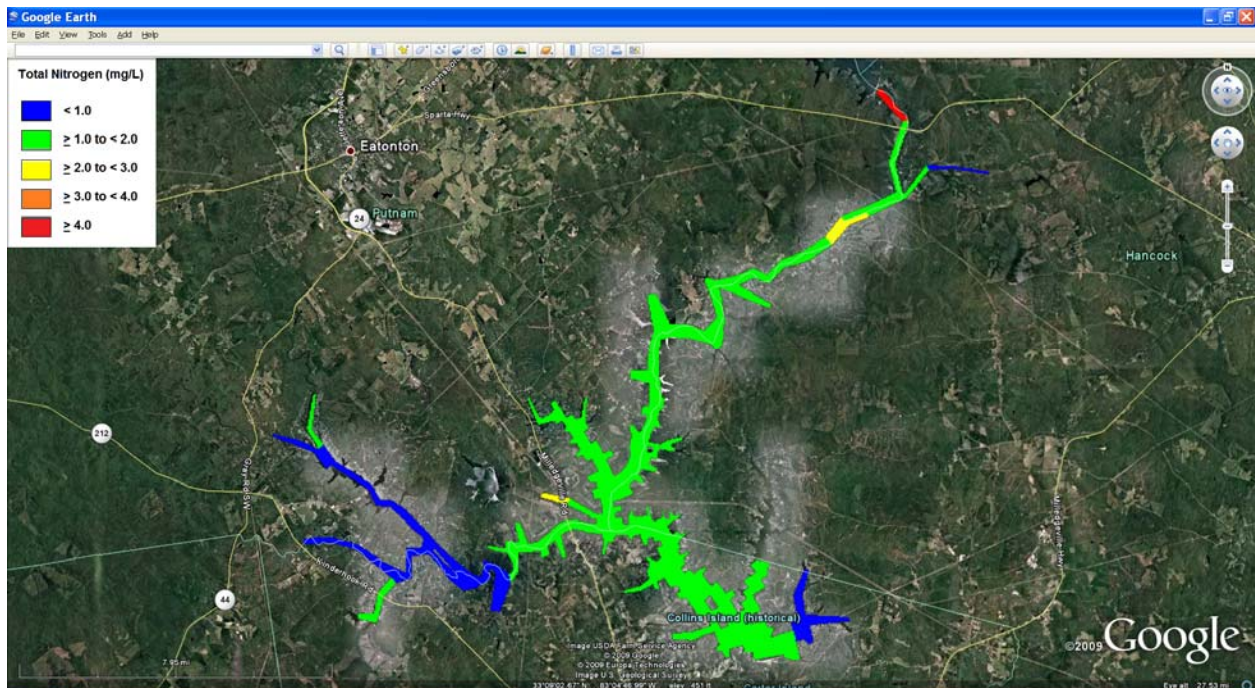


Figure 4-4 Maximum Value of Total Nitrogen (mgN/L) in Lake Sinclair in Photic Zone: year 2007

Total Phosphorus

Table 4-17 shows the annual Total Phosphorus loading into Lake Sinclair.

Table 4-17 Lake Sinclair Annual Total Phosphorus Loading

	Standard	2001	2002	2003	2004	2005	2006	2007
Lake Volume (Acre-Ft)		319,001	328,181	330,619	329,430	323,671	328,297	330,393
Annual Load of Phosphorus (lbs)		303,994	433,067	391,393	390,636	348,970	347,996	423,887
Specific Loading (lbs/Acre-Ft)	N/A	1.0	1.3	1.2	1.2	1.1	1.1	1.3

Major Tributary Phosphorus Loading

Table 4-18 shows the annual tributary loading simulated at six tributaries to Lake Sinclair, and Table 4-19 shows the annual loading (lbs/acre) at each of the tributaries.

Table 4-18 Lake Sinclair Watershed Annual Tributary Total Phosphorus Loads (lbs)

Tributary	Standard	2001	2002	2003	2004	2005	2006	2007
Big Cedar Creek	N/A	4,856	2,815	7,042	4,497	7,596	2,378	3,492
Murder Creek	N/A	12,828	4,934	13,554	8,838	10,431	3,587	5,632
Little River	N/A	16,717	11,851	23,683	21,237	19,359	9,582	10,588
Rooty Creek	N/A	2,229	1,583	3,503	3,428	3,112	1,698	2,063
Crooked Creek	N/A	1,359	1,063	2,459	2,295	1,933	807	959
Neel Creek	N/A	4,609	3,360	8,288	6,945	4,255	2,770	1,770

Table 4-19 Lake Sinclair Watershed Annual Tributary Total Phosphorus Loads (lbs/acre)

Tributary	Area (acres)	2001	2002	2003	2004	2005	2006	2007
Big Cedar Creek	87,527	0.055	0.032	0.080	0.051	0.087	0.027	0.040
Murder Creek	132,178	0.097	0.037	0.103	0.067	0.079	0.027	0.043
Little River	189,245	0.088	0.063	0.125	0.112	0.102	0.051	0.056
Rooty Creek	24,467	0.091	0.065	0.143	0.140	0.127	0.069	0.084
Crooked Creek	24,136	0.056	0.044	0.102	0.095	0.080	0.033	0.040
Neel Creek	79,699	0.058	0.042	0.104	0.087	0.053	0.035	0.022