Chapter 1 Water Quality Standards

1.1 Water Quality Standards Program

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1.2 Water Quality Rule Changes

Changes made to previous Chapter 335-6-10 Water Quality Criteria:

- Clarification was made for referencing both Mercury and Selenium in terms of their Total Recoverable form instead of Dissolved form (Date: May 29, 2007, Section: 335-6-10-.07)
- Development of Chlorophyll a criteria for portions of the Upper and Lower Tombigbee Rivers (Demopolis Lake, Gainesville Lake, Lake Jackson, and Coffeeville Lake) and for a portion of the Black Warrior River (Inland Lake).(Date: September 21, 2005, Section: 335 6-10-.11)

Changes made to previous Chapter 335-6-11 Water Use Classifications For Interstate and Intrastate Waters:

- Black Creek was upgraded from Agricultural and Industrial Water Supply (A&I) to Fish and Wildlife (F&W) which is our Fishable/Swimmable classification. (Date: May 29, 2007, Section: 335-6-11-.02)
- Wolf Bay was upgraded from F&W to Outstanding Alabama Water (OAW) (Date: May 29, 2007 Section: 335-6-11-.02)
- A segment of Choccolocco Creek was upgraded to Public Water Supply (PWS) (Date: May 29, 2007, Section: 335-6-11-.02)
- Previous designation of PWS was removed for a portion of Shoal Creek (Date: September 21, 2005 Section: 335-6-11-.02)

1.3 Conceptual Approach to Nutrient Criteria Development

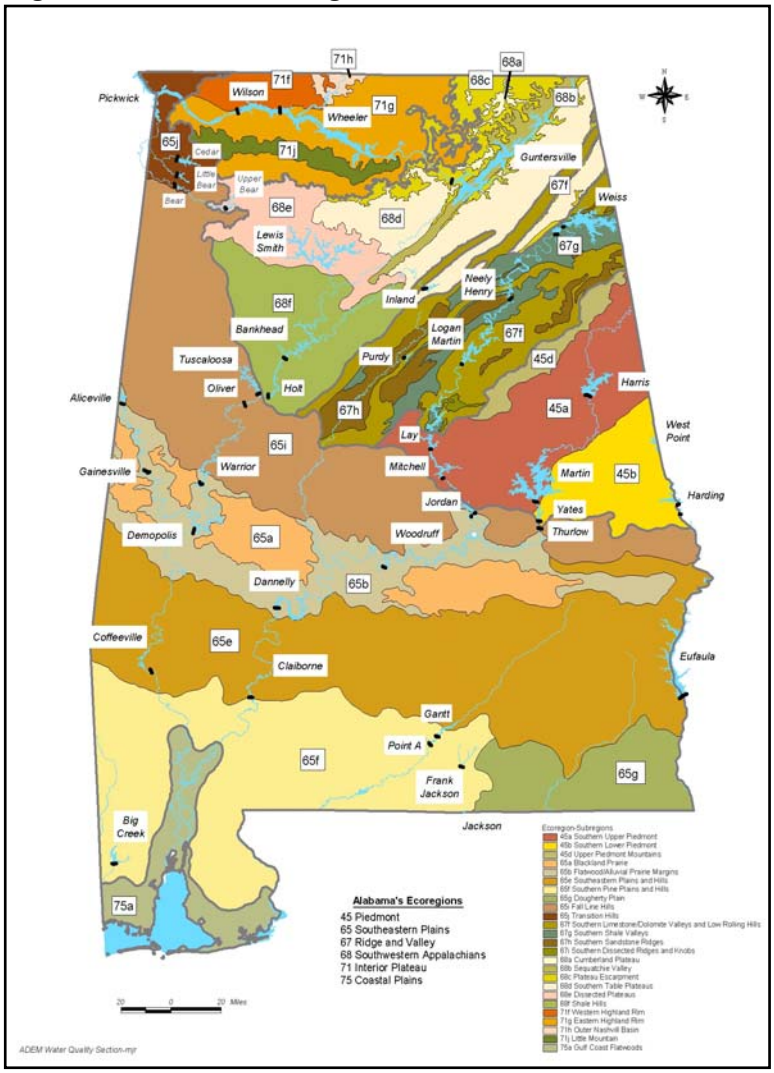
In developing nutrient criteria, the Department's objective is to determine nutrient levels that are protective of the beneficial uses designated for each reservoir. Keeping in mind that these reservoirs serve a variety of uses, including swimming and recreation, sport-fishing, and public water supply, while also supporting a wide diversity of aquatic life, nutrient criteria are targeted that support the designated uses and are protective of aquatic communities. Thus, the Department's rationale is to establish nutrient criteria consistent with the "fishable/swimmable" goal of the Clean Water Act.Located within 14 major river basins and 25 different sub-ecoregions, Alabama's surface waters represent some of the most biologically diverse aquatic ecosystems in the United States. Because of the large diversity in geographic and climatic conditions from one region to another, as well as the significant variability in dam operations between reservoirs, the Department used best professional judgment to develop nutrient criteria on a lake-specific basis rather than on a more aggregate basis such

as an ecoregional approach. The lake-specific approach captures the large variability inherent in man-made reservoirs, where chlorophyll a concentrations are typically affected by such factors as reservoir depth, reservoir retention time, and scheduling of power generation. During the criteria development process, historical data were studied to provide an overall perspective of the condition of each reservoir. This information was analyzed to determine trends in trophic conditions, the degree to which reservoir conditions remained stable over time, and whether any impairment has occurred due to nutrient over-enrichment. From this data, nutrient levels (expressed as seasonal means of chlorophyll a concentrations) were targeted that correlate with reservoir conditions that support the designated beneficial uses. The historical data depicts the diversity of reservoir conditions in Alabama, from lakes in the Tallapoosa River Basin that are naturally oligotrophic-mesotrophic, such as lakes Martin, Yates and Thurlow, to lakes that tend to be more eutrophic in nature, such as the mainstem reservoirs on the Tennessee and Coosa Rivers. The Department recognizes that using reference condition analysis to establish nutrient criteria in reservoirs can be limited due to the fact that there is uncertainty regarding what constitutes "natural" conditions in a man-made water body. Therefore, in developing nutrient criteria, the Department has selected to analyze historical ambient data on an individual reservoir basis to determine if each reservoir continues to support its designated uses. If so, the nutrient concentrations that have historically corresponded to that reservoir's use support are evaluated to determine a chlorophyll a target specific to that reservoir. This same approach is used regardless of the reservoir's trophic state (i.e. eutrophic, oligotrophic, or mesotrophic). Thus, the intent is that the selected chlorophyll a criteria values are specifically associated with a condition of full use support in each respective reservoir, taking into account the factors unique to various trophic conditions. Nutrient criteria were developed to support the existing uses that define each reservoir system and protect the aquatic communities that inhabit them. Data were analyzed to determine the ranges of chlorophyll a and total phosphorus concentrations historically occurring in each reservoir. To maintain nutrient levels within the ranges associated with full use-support conditions, best professional judgment was used to derive criteria values that "cap" each reservoir system with a protective chlorophyll a concentration. In establishing chlorophyll a targets, the variability occurring within the growing season was taken into account. The cooler months are generally less productive and lower chlorophyll a values are usually recorded while the warmer months are generally more productive with higher values typically recorded.

To determine what constitutes healthy conditions in various types of reservoirs and how trophic gradients relate to use attainment, the Department utilizes research conducted by Dr. David Bayne at Auburn University. This research examines how the quality of fisheries correlates to varying trophic conditions in Alabama reservoirs. The study assesses the potential impacts of reverse eutrophication and nutrient reduction on reservoir fisheries and calculates target levels of primary production that provide both quality fishing and satisfactory water clarity for other recreational users, while protecting all aquatic communities. This research ("Compatibility between Water Clarity and Quality Black Bass and Crappie Fisheries in Alabama"; American Fisheries Society Symposium 16:296-305. 1996) provides substantial evidence that fish biomass and sport-fish harvesting are positively correlated to algal production in reservoirs.

The research by Dr. Bayne demonstrates that the size, growth rates and condition of certain species of sports fish are generally higher in eutrophic than in oligo-mesotrophic reservoirs. This study, along with case studies of reservoirs in other regions, raises the concern that the reversal of eutrophication and improvement in water clarity in some reservoirs can be deleterious to its warm-water sports fisheries by reducing fish production and biomass. The Department, therefore, believes that when establishing nutrient criteria it is vital to set water quality standards that adequately consider all the beneficial uses of the reservoir, fishing and swimming alike. Thus, caution is warranted when

Figure 1-1 Alabama's Ecoregions



regulatory actions can potentially result in an undesirable shift in fish species. If, historically, a reservoir has supported all of its uses, including high-quality fisheries and other aquatic communities, nutrient criteria were targeted to preserve these reservoir conditions. The typical hydraulic regime and flow characteristics of each reservoir were other key factors considered during criteria development. The relationship between water quality, biomass accumulation, and hydraulic residence time (or retention time), which is the average amount of time required to completely renew a reservoir's water volume, was taken into account when establishing the chlorophyll a criteria. For example, reservoirs associated with "run-of-the-river" dams typically have small hydraulic head, limited storage area and short retention times and are less likely to be susceptible to conditions that can lead to eutrophication or promote excessive algal growth. In contrast, reservoirs associated with larger dams, such as storage or hydroelectric dams, are more likely to have longer retention times, providing a greater potential for incoming nutrients to stimulate increased algal production. Increased algal biomass can potentially deplete dissolved oxygen levels within the reservoir through bacterial decomposition and photosynthetic respiration. The relationship between reservoir water retention times and phytoplankton algae production was examined in a study by Dr. Bayne on Weiss Lake during the summer of 2001. Dr. Bayne, along with Auburn University professor Dr. Mike Maceina,

Table 1-1 Nutrient Criteria Implementation Schedule for Alabama Reservoirs

Year	Number of Reservoirs	Major Basin(s)	Name of Reservoirs
2001	4	Chattahoochee, Coosa, Tallapoosa	West Point, W.F. George, Weiss, R.L. Harris
2002	9	Tallapoosa, Tennessee	Martin, Yates, Thurlow, Guntersville, Wheeler, Wilson, Pickwick, Little Bear, Cedar
2004	11	Alabama Black Warrior Chattahoochee Perdido-Escambia	Claiborne, Dannelly Bankhead, Holt, Lewis Smith, Oliver, Tuscaloosa, Harding Gantt, Point A
2005	5	Black Warrior Perdido-Escambia Lower Tombigbee Upper Tombigbee Alabama	Inland Jackson Coffeeville Demopolis, Gainsville Woodruff
2006	11	Cahaba Coosa Escatawpa Tennessee Upper Tombigbee	Purdy Jordan, Lay, Logan Martin, Mitchell, Neely Henry Big Creek Bear, Upper Bear Aliceville
2007	1	Perdido-Escambia	Frank Jackson
2008	8	Alabama Coosa Escatawpa Upper Tombigbee	Woodruff Jordan, Lay, Logan Martin, Mitchell, Neely Henry Big Creek Aliceville
2009	1	Cahaba	Purdy
2010	1	Perdido-Escambia	Frank Jackson
2011	2	Tennessee Tennessee	Bear Creek Upper Bear

assessed the potential water quality effects on Weiss Lake of the draft Coosa River water-sharing agreement between Alabama and Georgia. Their study showed that reservoirs with typically short retention times, such as reservoirs on the Coosa River, are more susceptible to hypereutrohic effects and higher chlorophyll a concentrations when retention times are increased even moderately. Historical data shows that higher chlorophyll a concentrations in Weiss Lake have consistently corresponded to longer retention times. Hydrologic models in their study indicated that longer retention times in the reservoir would likely increase phytoplankton algae production and algal biomass accumulation, assuming that other factors remain unchanged. This result is particularly evident during drought periods, such as occurred in 2000 and in 2006.

Also, the nutrient criteria were developed to reflect downstream transport of nutrients and the processes by which nutrient uptake occurs in streams. Nutrient concentrations generally tend to decrease as they move downstream. This attenuation occurs as nutrients are absorbed by micro-organisms and plants (biotic uptake) or as they adsorb onto sediment particles (abiotic uptake) and settle out of the water column. Thus, in developing nutrient criteria, the chlorophyll a targets were set so that along certain stretches of river, each successive reservoir has a lower criteria value as you move downstream. This approach takes into account natural processes that determine nutrient concentrations and is protective of downstream water quality.

1.4 Implementation of Alabama's Antidegradation Policy

On June 25, 2002, the Alabama Environmental Management Commission adopted Rule 335-6-10-12, Implementation of the Antidegradation Policy. This rule codifies procedures for implementing the Department's antidegradation policy (contained in Rule 335-6-10-.04) which was last amended in 1991 and approved that same year by the U.S. Environmental Protection Agency (EPA), Region 4. In response to a petition from the Legal Environmental Assistance Foundation (LEAF), in 1997 EPA requested that ADEM develop written procedures for implementing the state's antidegradation policy.

Final written implementation procedures were submitted to EPA in December 1998 and approved by EPA in August 1999.In November 1999, LEAF sued ADEM alleging that the Department's use of the EPA-approved implementation procedures in the NPDES permitting process was improper because these procedures were, in act, "rules" that had not been adopted through the formal rulemaking process. The Montgomery Circuit Court found in favor of ADEM; a decision later affirmed by the Court of Civil Appeals.

LEAF then applied for a writ of certiorari to the Alabama Supreme Court, which was granted, and thereafter the Alabama Supreme Court concluded in a decision dated March 1, 2002, that the implementation procedures are "rules" within the context of the Alabama Administrative Procedure Act, reversed the judgment of the Court of Civil Appeals and remanded the case to the lower courts. As a result of the Supreme Court decision, the Department ceased the review of permit applications for new or expanded discharges of treated wastewater to those waters affected by the Supreme Court decision until April 10, 2002, following adoption by the Alabama Environmental Management Commission of emergency rule (335-6-10-.12-.01ER) establishing implementation procedures. As adopted, the emergency rule procedures incorporate suggestions made by EPA and are essentially equivalent to the written procedures utilized by the Department prior to the Supreme Court decision. The provisions of the permanent rule adopted on June 25, 2002, are the same as those of the emergency rule and, as such, have been determined by EPA to be consistent with the federal requirement for implementation procedures included in EPA's water quality standards regulation. The final implementation procedures rule became effective on August 1, 2002.

The Department's antidegradation policy serves to conserve and protect the waters of Alabama and their beneficial uses and to prevent the deterioration of a water body even when its water quality surpasses the level necessary to meet the fishable and swimmable goals of the Clean Water Act. The antidegradation implementation policy addresses three categories of waters and beneficial uses:

- High-quality waters that constitute an outstanding national resource (Tier 3 waters);
- Waters where the quality exceeds levels necessary to support propagation of fish, shellfish, and wildlife as well as recreation in and on the water (Tier 2 waters); and
- Existing instream water uses and the level of water quality necessary to protect the existing uses (Tier 1 waters).
- The implementation policy codifies procedures for reviewing applications for new or expanded discharges to waters designated as Tier 2 waters. The two basic components of the implementation policy involve:
- The Departments determination, based on the applicant's demonstration, that the proposed discharge is necessary for important economic or social development in the area in which the waters are located; and
- An evaluation by the applicant of alternatives other than the proposed discharge to Tier 2 water.
- The antidegradation implementation procedures comply with federal law and provides ADEM with adequate guidelines for making environmentally and economically sound decisions, industries with the predictability needed to operate and the public with the assurances needed to guarantee clean water.

1.5 Surface Water Use Classification Maps

The following maps depict Outstanding Alabama Waters and Outstanding National Resource Waters. Alabama's classified surface waters are listed in *ADEM Water Division-Water Quality Program-Chapter 335-6-11-Water Use Classifications for Interstate and Intrastate Waters (effective 05/29/2007)*. Figures 1-2 through 1-6 and Tables 1-2 through 1-6 show waters classified as Outstanding Alabama Waters (OAW) and waters with the special designation of Outstanding National Resource Waters (ONRW). Table 1-8 shows Surface Water Classifications and Designations

Table 1-2 Cahaba River and Tributaries

#	Assessment Unit #	Name	From	To	Use Classification	Miles
1	AL03150202-0503-102	Cahaba River	Alabama Highway 82	lower Little Cahaba River	OAW/S	10.58
2	AL03150202-0203-101	Cahaba River	Shades Creek	Shelby County Road 52	OAW/F&W	23.61
3	AL03150202-0405-100	Cahaba River	lower Little Cahaba River	Shades Creek	OAW/F&W	13.51
4	AL03150202-0201-102	Cahaba River	dam near U.S. Highway 280	Grant's Mill Road	OAW/PWS	13.45
5	AL03150202-0101-102	Cahaba River	US Highway 11	I-59	OAW/F&W	3.13
6	AL03150202-0101-103	Cahaba River	I-59	Its source	OAW/F&W	2.22
7	AL03150202-0404-100	Little Cahaba River	Cahaba River	Its source	OAW/F&W	16.54
8	AL03150202-0902-100	Cahaba River	Alabama River	Alabama Highway 82	OAW/S	89.50
					Total Miles	172.54

Figure 1-2 Cahaba River and Tributaries

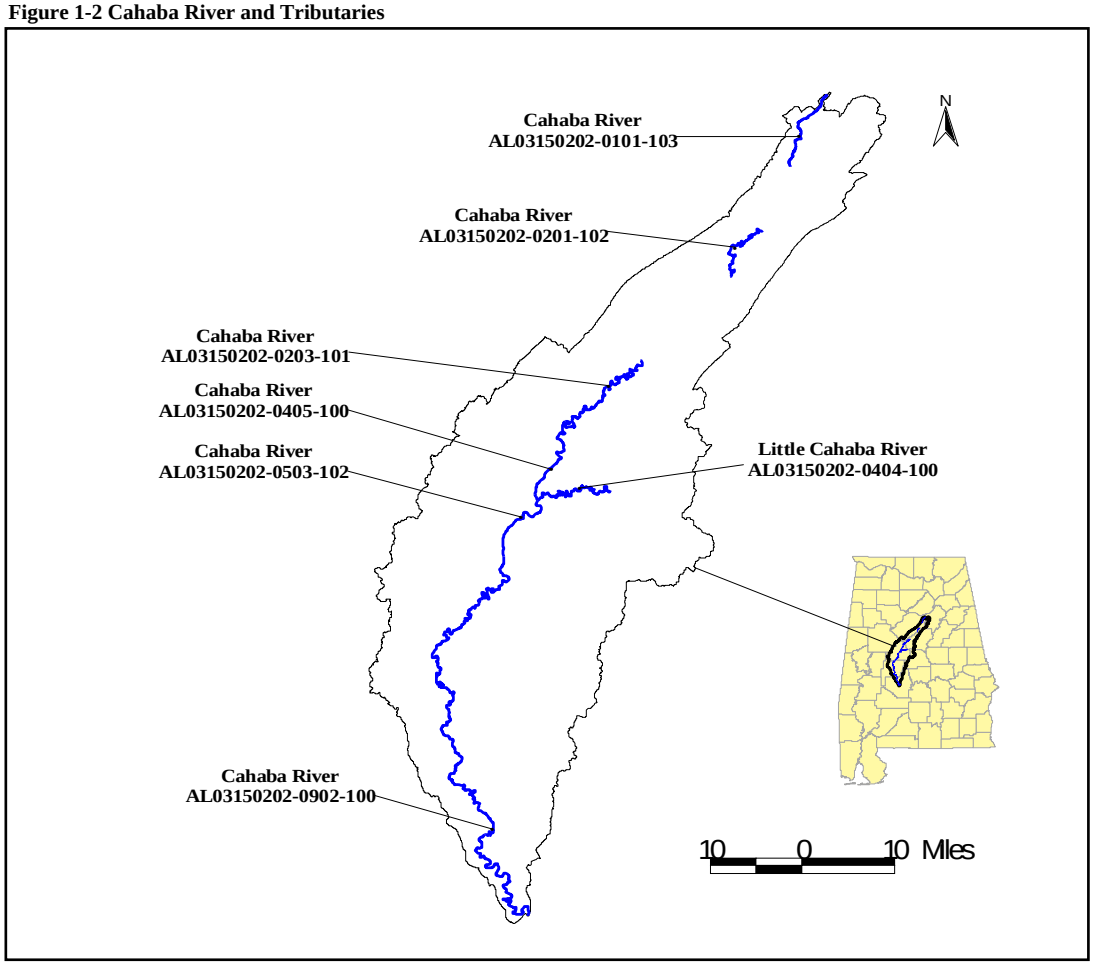


Table 1-3 Hatchet Creek and Tributaries

#	Assessment Unit #	Name	From	To	Use Classification	Miles
1	AL03150107-0807-100	Hatchet Creek	Coosa River	Norfolk Southern Railway	OAW/S/F&W	44.4
2	AL03150107-0802-102	Hatchet Creek	Norfolk Southern Railway	Its source	OAW/PWS/S/F&W	17.7
3	AL03150107-0801-300	East Fork Hatchet Creek	Hatchet Creek	Its source	OAW/F&W	5.3
4	AL03150107-0801-400	West Fork Hatchet Creek	Hatchet Creek	Its source	OAW/F&W	7.7
					Total Miles	75.1

Figure 1-3 Hatchet Creek and Tributaries

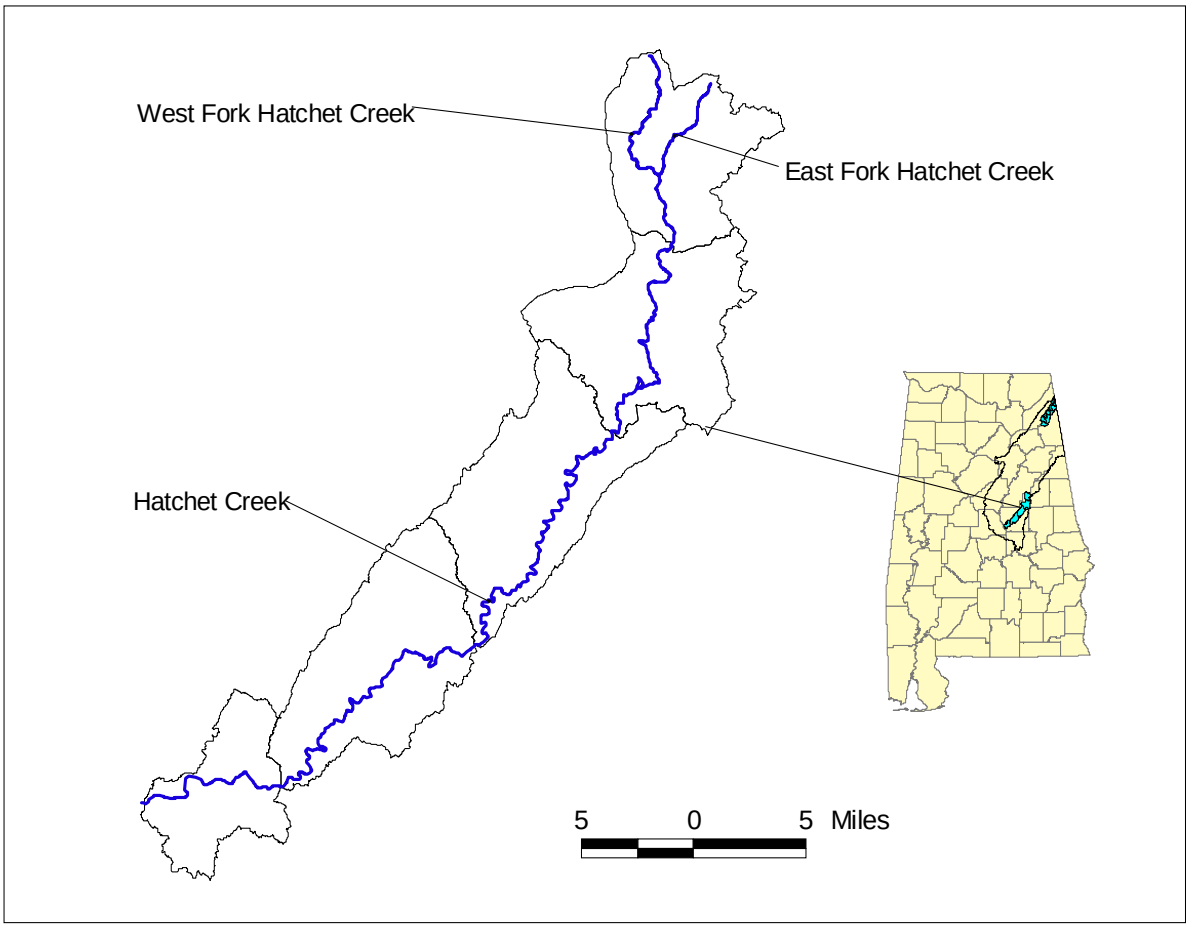


Table 1-4 Little River and Tributaries

#	Assessment Unit #	Name	From	To	Use classification	Miles
1	AL03150105-0806-100	Little River	Coosa River	Its source	PWS/S/F&W (ONRW)	22.2
2	AL03150105-0805-100	Wolf Creek	Little River	Its source	PWS/S/F&W (ONRW)	8.9
3	AL03150105-0804-100	Johnnies Creek	Little River	Its source	PWS/S/F&W (ONRW)	11.5
4	AL03150105-0804-200	Camprock Creek	Johnnies Creek	Its source	PWS/S/F&W (ONRW)	3.3
5	AL03150105-0804-300	Dry Creek	Johnnies Creek	Its source	PWS/S/F&W (ONRW)	2.3
6	AL03150105-0803-100	Bear Creek	Little River	Its source	PWS/S/F&W (ONRW)	8.2
7	AL03150105-0803-300	Hicks Creek	Bear Creek	Its source	PWS/S/F&W (ONRW)	3
8	AL03150105-0803-200	Falls Branch	Bear Creek	Its source	PWS/S/F&W (ONRW)	2.1
9	AL03150105-0806-200	Brooks Branch	Little River	Its source	PWS/S/F&W (ONRW)	1.5
10	AL03150105-0802-100	Yellow Creek	Little River	Its source	PWS/S/F&W (ONRW)	5.8
11	AL03150105-0802-200	Straight Creek	Yellow Creek	Its source	PWS/S/F&W (ONRW)	2.7
12	AL03150105-0801-200	Hurricane Creek	Little River	Its source	PWS/S/F&W (ONRW)	6.3
13	AL03150105-0705-100	West Fork of Little River	Little River	AL-GA state line	PWS/S/F&W (ONRW)	18.7
14	AL03150105-0705-200	Straight Creek	West Fork of Little River	Its source	PWS/S/F&W (ONRW)	4.1
15	AL03150105-0705-300	Sharp Branch	West Fork of Little River	Its source	PWS/S/F&W (ONRW)	1.4
16	AL03150105-0705-400	Seymour Branch	West Fork of Little River	Its source	PWS/S/F&W (ONRW)	2.4
17	AL03150105-0704-201	East Fork West Fork of Little River	West Fork of Little River	AL-GA state line	PWS/S/F&W (ONRW)	0.4
18	AL03150105-0703-100	East Fork of Little River	Little River	AL-GA state line	PWS/S/F&W (ONRW)	9.3
19	AL03150105-0703-200	Laurel Creek	East Fork of Little River	Its source	PWS/S/F&W (ONRW)	3.9
20	AL03150105-0703-300	Gilbert Branch	East Fork of Little River	Its source	PWS/S/F&W (ONRW)	1.9
21	AL03150105-0702-101	Middle Fork of Little River	East Fork of Little River	AL-GA state line	PWS/S/F&W (ONRW)	2.4
22	AL03150105-0703-400	Shrader Branch	Laurel Creek	Its source	PWS/S/F&W (ONRW)	1.8
23	AL03150105-0703-500	Armstrong Branch	Laurel Creek	Its source	PWS/S/F&W (ONRW)	1.8
24	AL03150105-0702-200	Brush Creek	Middle Fork of Little River	Its source	PWS/S/F&W (ONRW)	3.3
25	AL03150105-0702-300	Anna Branch	Middle Fork of Little River	Its source	PWS/S/F&W (ONRW)	2.2
26	AL03150105-0702-400	Blalock Branch	Anna Branch	Its source	PWS/S/F&W (ONRW)	3.3
27	AL03150105-0702-500	Stillhouse Branch	Blalock Branch	Its source	PWS/S/F&W (ONRW)	1.1
		Unnamed Tributaries				141
					Total Miles	277

Figure 1-4 Little River and Tributaries

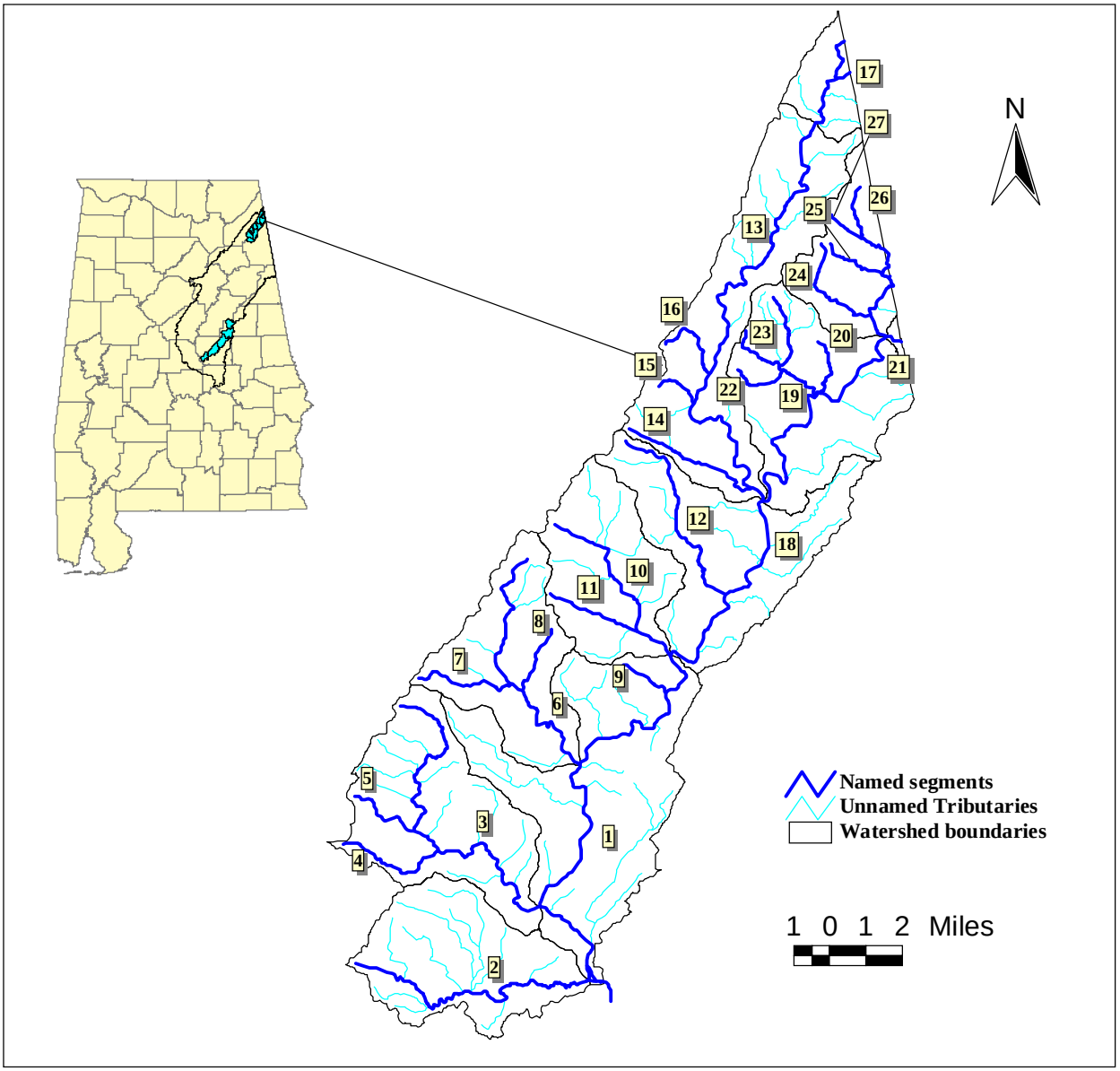


Table 1-5 Sispsey Fork and Tributaries

#	Assessment Unit #	Name	From	To	Use Classification	Miles
1	AL03160110-0104-102	Sipsey Fork	Sandy Creek	Its source	F&W (ONRW)	21.23
2	AL03160110-0103-200	Payne Creek	Sipsey Fork	Its source	F&W (ONRW)	3.89
3	AL03160110-0103-300	Caney Creek	Sipsey Fork	Its source	F&W (ONRW)	4.66
4	AL03160110-0103-700	South Fork Caney Creek	Caney Creek	Its source	F&W (ONRW)	5.04
5	AL03160110-0103-600	North Fork Caney Creek	Caney Creek	Its source	F&W (ONRW)	6.38
6	AL03160110-0103-400	Hurricane Creek	Sipsey Fork	Its source	F&W (ONRW)	2.29
7	AL03160110-0103-500	Davis Creek	Sipsey Fork	Its source	F&W (ONRW)	2.83
8	AL03160110-0102-500	Montgomery Creek	Borden Creek	Its source	F&W (ONRW)	3.99
9	AL03160110-0102-400	Horse Creek	Borden Creek	Its source	F&W (ONRW)	1.76
10	AL03160110-0102-100	Borden Creek	Sipsey Fork	Its source	F&W (ONRW)	23.35
11	AL03160110-0102-300	Flannagin Creek	Borden Creek	Its source	F&W (ONRW)	9.99
12	AL03160110-0102-700	Dry Creek	Flannagin Creek	Its source	F&W (ONRW)	2.17
13	AL03160110-0102-600	Hagood Creek	Braziel Creek	Its source	F&W (ONRW)	7.57
14	AL03160110-0102-200	Braziel Creek	Borden Creek	Its source	F&W (ONRW)	13.77
15	AL03160110-0101-200	Fall Creek	Sipsey Fork	Its source	F&W (ONRW)	2.06
16	AL03160110-0101-300	Bee Branch	Sipsey Fork	Its source	F&W (ONRW)	2.09
17	AL03160110-0101-400	Thompson Creek	Sipsey Fork	Its source	F&W (ONRW)	8.59
18	AL03160110-0101-700	Mattox Creek	Thompson Creek	Its source	F&W (ONRW)	3.26
19	AL03160110-0101-800	Ross Branch	Tedford Creek	Its source	F&W (ONRW)	2.06
20	AL03160110-0101-600	Tedford Creek	Thompson Creek	Its source	F&W (ONRW)	10.40
21	AL03160110-0101-900	Quillan Creek	Hubbard Creek	Its source	F&W (ONRW)	3.77
22	AL03160110-0101-140	Basin Creek	Hubbard Creek	Its source	F&W (ONRW)	4.39
23	AL03160110-0101-500	Hubbard Creek	Sipsey Fork	Its source	F&W (ONRW)	6.59
24	AL03160110-0101-110	Parker Branch	Hubbard Creek	Its source	F&W (ONRW)	3.82
25	AL03160110-0101-120	Whitman Creek	Hubbard Creek	Its source	F&W (ONRW)	3.73
26	AL03160110-0101-160	Natural Well Branch	Maxwell Creek	Its source	F&W (ONRW)	1.45
27	AL03160110-0101-150	Dunn Branch	Maxwell Creek	Its source	F&W (ONRW)	1.33
28	AL03160110-0101-130	Maxwell Creek	Hubbard Creek	Its source	F&W (ONRW)	2.02
29	AL03160110-0101-170	White Oak Branch	Thompson Creek	Its source	F&W (ONRW)	1.69
30	AL03160110-0101-180	Wolf Pen Branch	Sipsey Fork	Its source	F&W (ONRW)	1.00
31	AL03160110-0101-190	Ugly Creek	Sipsey Fork	Its source	F&W (ONRW)	3.05
		Unnamed Tributaries				240.37
					Total Miles	410.59

Figure 1-5 Sipsey Fork and Tributaries

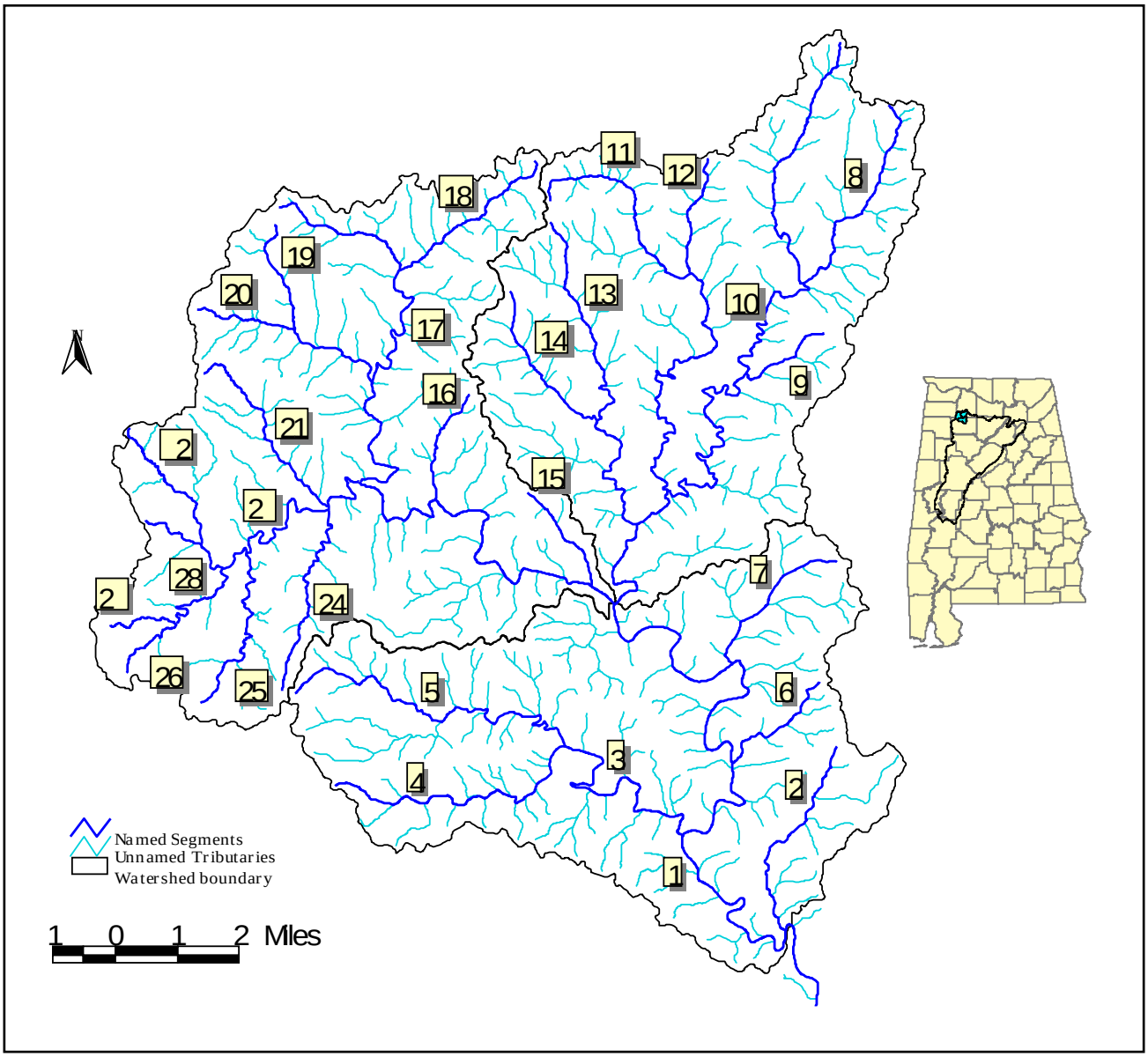


Table 1-6 Tensaw River, Weeks Bay and Tributaries

Tensaw River and Tributaries						
#	**Assessment Unit #**	**Name**	**From**	**To**	**Use Classification**	**Miles**
1	AL03160204-0505-202	Tensaw River	Junction of Tensaw and Apalachee Rivers	Junction of Briar Lake	OAW/S/F&W	21.73
2	AL03160204-0105-302	Tensaw River	Junction of Briar Lake	Junction of Tensaw Lake	OAW/F&W	2.93
3	AL03160204-0105-700	Briar Lake	Junction of Tensaw River	Junction of Tensaw Lake	OAW/F&W	3.60
4	AL03160204-0105-801	Tensaw Lake	Junction of Tensaw River	Bryant Landing	OAW/F&W	5.20
					Total Miles	33.46
Weeks Bay and Tributaries						
#	**Assessment Unit #**	**Name**	**From**	**To**	**Use Classification**	**Sq Miles**
1	AL03160205-0307-101	Weeks Bay	Bon Secour Bay	Fish River	S/F&W (ONRW)	2.7
					Total Square Miles	2.7

Figure 1-6 Tensaw River, Weeks Bay and

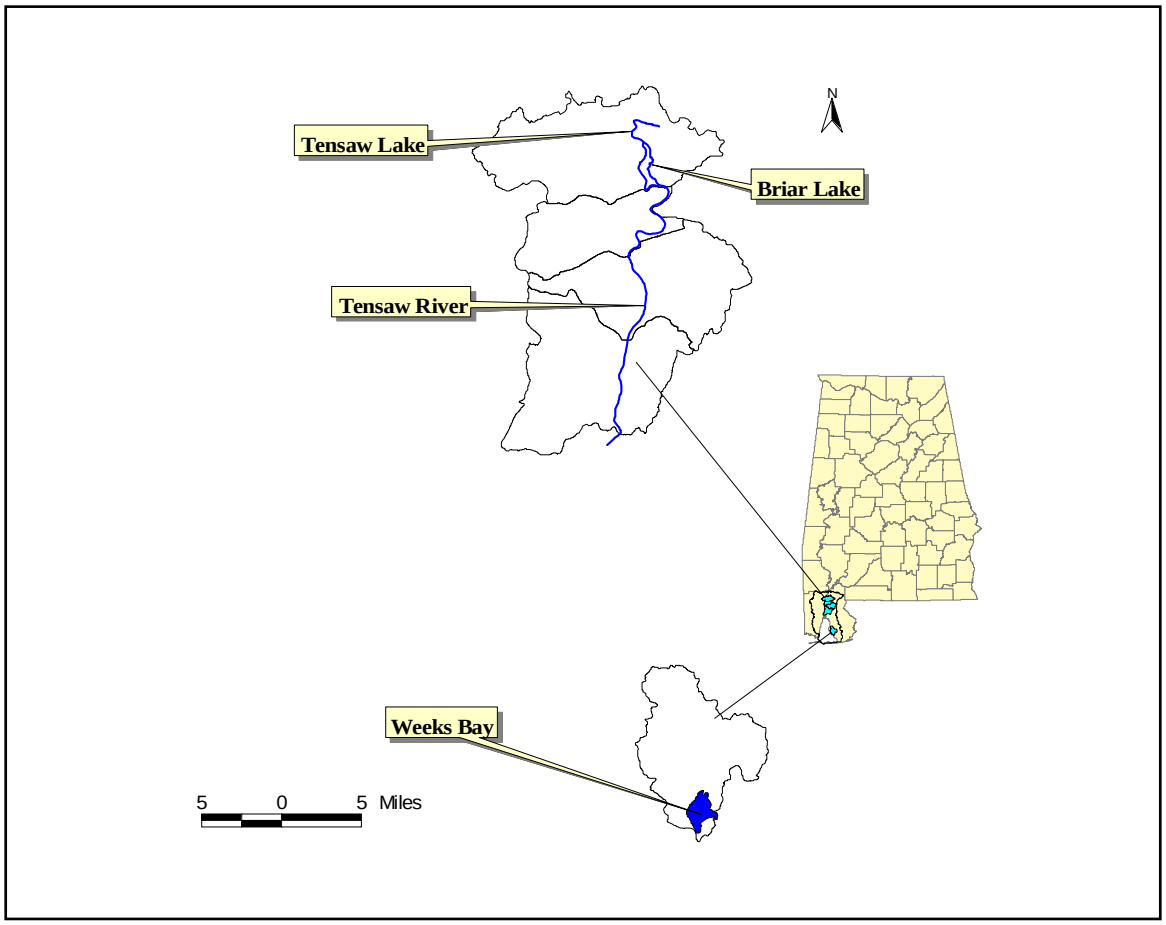


Table 1-7 Wolf Bay and Tributaries

#	Assessment Unit #	Name	From	To	Use Classification	Square Miles
1	AL03140107-0204-600	Wolf Bay	Bay la Launch	Moccasin Bayou	OAW/SH/S/F&W	4.65
2	AL03140107-0203-102	Wolf Bay	Moccasin Bayou	Its source	SH/S/F&W	0.22
					Total Square Miles	4.87

Figure 1-7 Wolf Bay and Tributaries

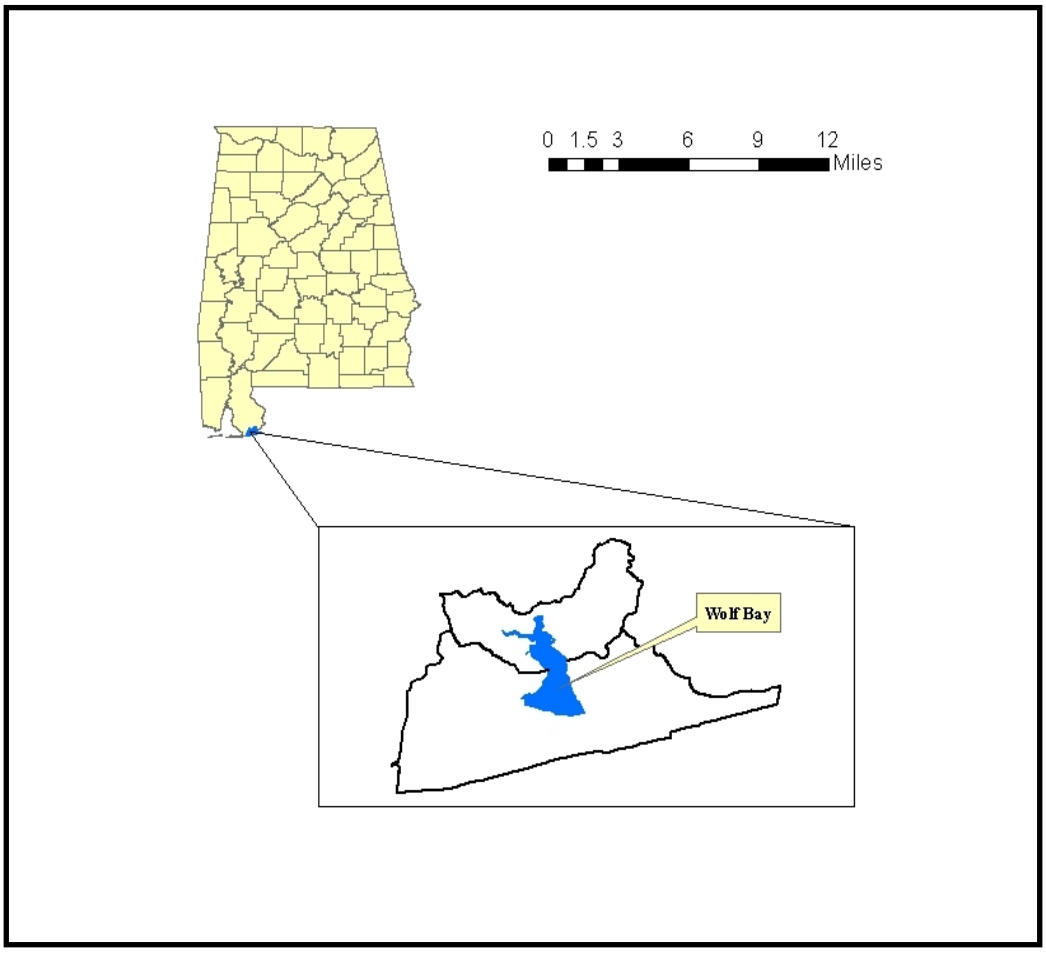


Table 1-8 Surface Water Classifications and Special Designations

Use Classifications	
Outstanding Alabama Water	OAW
Public Water Supply	PWS
Swimming and Other Whole Body and Water Contact Sports	S
Shellfish Harvesting	SH
Fish and Wildlife	F&W
Limited Warmwater Fishery	LWF
Agricultural and Industrial Water Supply	A&I
Special Designations	
Outstanding National Resource Water	ONRW