Chapter 2 Rivers and Streams

2.1 Wadeable Rivers and Streams Monitoring Program (RSMP)

As a first step towards fully implementing the Monitoring Strategy, ADEM initiated a pilot project to evaluate the ability of the Strategy to meet ADEM's monitoring goals and objectives. The 2005 ACT Basin Assessment Pilot Project focused on the wadeable rivers and streams in the Alabama, Coosa, and Tallapoosa River Basins. ADEM continued this monitoring approach in the wadeable rivers and streams in the Escatawpa, Mobile Bay, and Tombigbee River Basins (2006) and the Black Warrior and Cahaba River Basins (2007).

2.1.1 Background

ASSESS outlined seven programs established to meet ADEM's monitoring objectives in wadeable rivers and streams. A coordinated monitoring approach was employed to use available resources as effectively as possible. To this end, the Department developed an adaptive monitoring strategy for wadeable rivers and streams that included implementation of a Watershed Management Approach, an Ecoregional Reference Reach Program, and development of tiered and probabilistic monitoring methods.

ASSESS implemented an adaptive management strategy to evolve as the needs of the Department change or better information or sampling techniques become available. An important component of this strategy is a thorough review of ADEM's monitoring programs to address program weaknesses and changing data needs. As part of this effort, ADEM's Wadeable Rivers and Streams Monitoring Programs were reviewed in 2004. The findings of this review are summarized in the following paragraphs.

Review of the first five year monitoring cycle have shown that ADEM's tiered monitoring approach effectively met the needs of both the Office of Education and Outreach (OEO), responsible for administering ADEM's §319 program, and ADEM's Water Quality Branch (WQB), responsible for developing the State's §303(d) list. During the first tier or phase of monitoring, basin-wide screening assessments were conducted at stream reaches where landuse estimates and nonpoint source information from the local Soil and Water Conservation Districts indicated a moderate or high potential for impairment from nonpoint sources in non-urban areas. At that time, the §319 program only needed a method to prioritize waterbodies for funding, thereby concentrating implementation of best management practices in areas with high risk land use practices, but also providing enough flexibility to administer funds in areas where there was also stakeholder interest.

The basin-wide screening assessments also served as the first phase of ADEM's §303(d)/ TMDL process. The list of potentially-impaired sub-watersheds generated during the basin-

wide screening assessments was prioritized for further monitoring to more accurately assess the extent and cause of impairment.

Recent changes to EPA and ADEM monitoring requirements have impacted the effectiveness of ADEM's tiered monitoring approach as a management tool for ADEM's §303(d) and §319 Programs. First, the EPA required that §319 funds only be used on waterbodies with approved TMDLs. Then in 2004, the EPA released the Integrated Water Quality Monitoring and Assessment Report Guidance which requires that all waters in the state be placed into one of five categories that indicates whether or not a waterbody is meeting all of its use classifications. In 2005, the ADEM Water Quality Assessment and Listing Methodology established minimum data quantity and quality requirements necessary to categorize all waterbodies. With these requirements, the basin-wide screening assessment results were of limited value to both programs because they did not meet the minimum data requirements to categorize any water as impaired and place it on the §303(d) list.

Review of ALAMAP data, ADEM's probabilistic monitoring program, showed that the program did not meet its primary objective of providing an accurate estimate of overall water quality in wadeable rivers and streams. Additionally, the ALAMAP data were too limited to be useful or applicable to ADEM's other monitoring programs.

Additionally, development and evaluation of nutrient and sediment TMDLs throughout the state will require the development of accurate and reliable indicators that can detect both impairment from these sources and any changes in water quality due to decreases in nutrient and sediment loads. The EPA has required that all states have nutrient criteria for wadeable rivers and streams developed or in development by 2008. The first five year basin cycle was used primarily to collect baseline water quality data and to screen water quality conditions of potentially impaired waters and waters with no recent assessment data. Greater emphasis must be placed on intensive-level monitoring to meet these challenges.

Based on analysis of the first five year monitoring cycle described above and emerging data needs, ADEM's Wadeable Rivers and Streams Monitoring Program was modified in 2005.

2.1.2 Objectives

The objectives of ADEM's Wadeable Rivers and Streams Program were to provide data:

- To estimate overall water quality;
- To categorize waters in Alabama's Integrated Assessment Report; and,
- To develop nutrient criteria, sediment criteria, biological condition gradients, and assessment criteria that can be used to assess wadeable rivers and streams statewide.

2.1.3 Monitoring Strategy

ADEM's new monitoring strategy maintained its five basin groups targeted for monitoring on a

5-year rotation and continued to incorporate a combination of targeted and probabilistic monitoring to meet state monitoring goals and objectives. However, the seven individual monitoring programs were combined into four types of wadeable, flowing monitoring sites:

- **Probabilistic sites** are sites in randomly-selected watersheds that reflect both overall water quality conditions within a basin group, as well as the complete gradient of potential human disturbances. They are sampled in accordance with ADEM's five year rotating basin cycle.

- **Targeted sites** are selected by ADEM's Water Quality Branch or Office of Education and Outreach or one of the Clean Water Partnerships of Alabama to provide data for listing/ delisting decisions, TMDL development, Use Attainability Analyses, and education and outreach. Where possible, targeted sampling is conducted in accordance with ADEM's five year rotating basin cycle.

- **Long term ecoregional reference reaches,** established to reflect the best available conditions present within a specific ecoregion, are sampled to evaluate assessment results. Reaches to be sampled each year are selected to compliment the Level IV Ecoregions within any given basin group.

- **Ambient trend sites** are sampled to identify long-term trends in water quality statewide and to provide data for the development of TMDLs and water quality criteria. Sampling frequency and parameters collected at these sites vary from other station types. They are sampled statewide annually.

Tiered monitoring efforts are no longer used to screen potentially impaired sites. A set of core indicators are collected at all stations to meet the new data requirements for Alabama's Integrated Assessment Report and Listing and Assessment Methodology. Because these programs meet Alabama's new data requirements, the collected data can be used in listing/ delisting decisions and categorizing waters in the Integrated Report.

ADEM's reach-based probabilistic monitoring design was modified to a watershed-based probabilistic monitoring program. A Human Disturbance Gradient (HDG) was developed to classify each watershed by its potential level of disturbance. By monitoring the watersheds in proportion to the number of watersheds in each HDG category, the monitoring strategy will provide an estimate of overall water quality throughout the basin. Additionally, by sampling the entire gradient of watershed conditions within the basin group, the monitoring strategy will increase ADEM's monitoring capacity by providing data to develop indicators and criteria appropriate for wadeable rivers and streams statewide. Because the HDG provides disturbance and landuse information for all stations assessed within the basin group, it will enable ADEM to document the "least-impaired" landuse characteristics to set criteria for reference reach status in each Ecoregion or Bioregion. It will also assist ADEM in stressor identification for §303(d) listing and TMDL development.

Program Coordination and Development: An important aspect of the new strategy involved communication among ADEM's Field Operations and Water Divisions and Office of Education and Outreach. Personnel from each division met on July 7, 2004 to review results from the first

five year monitoring cycle, to identify data needs that were not met by the 1997 ASSESS monitoring strategy, and to discuss potential changes to the monitoring design that could address these needs. ADEM drafted a formal proposal outlining a monitoring strategy to meet the above objectives. ADEM also coordinated a series of conference calls between the Environmental Indicators Section and Water Quality Branch of ADEM, USEPA Region 4 (Atlanta, Georgia), responsible for reviewing the monitoring strategies of all Region 4 states, and EPA Western Ecology Division (WED)-Corvallis, Oregon, who have designed many of the probabilistic EMAP programs nationwide. Based on these discussions and subsequent discussions among ADEM personnel, ADEM's Monitoring Strategy was finalized and, in January 2005, a pilot study was initiated in the wadeable rivers and streams in the Alabama, Coosa, and Tallapoosa River Basins.

During the first ASSESS monitoring cycle, ADEM's §303(d) Monitoring Program focused on meeting consent decree requirements of a 1998 lawsuit over Alabama's 1996 §303(d) Impaired Waters List. Because of the sheer number of waterbodies to be assessed statewide, it was difficult for ADEM's Watershed Management Approach and five year rotation cycle to be fully implemented. However, ADEM completed the requirements of the consent decree at the end of 2003. This has enabled ADEM to coordinate its monitoring efforts to a much greater degree. Sixty-eight wadeable stations are being monitored for multiple programs in 2005. Most §303 (d) monitoring is conducted within the ACT target basin group, allowing ADEM to combine the results of this program with those of the probabilistic basin assessment.

2.1.4 Monitoring Design

Indicator selection and sampling frequency: ADEM combined its Tier I or screening-level ALAMAP, NPS Basin-wide Screening Assessment, and §303(d) Monitoring Programs into one watershed-based, probabilistic monitoring program. Core indicators and sampling frequency were selected to meet minimum data requirements as outlined in Alabama's Listing and Assessment Methodology so that all waterbodies monitored during the pilot project can be categorized in Alabama's 2006 Integrated Report and listing/delisting decisions can be made to prioritize sites for §319 funding and BMP implementation.

Monitoring Units: The resulting comprehensive program was further modified from reach-based to watershed-based monitoring to more closely link watershed condition and assessment results. As recommended in the Integrated Water Quality Monitoring and Assessment Guidance, ADEM delineated the wadeable, flowing portions of the 2004 12-digit hydrologic unit codes (HUCs) into smaller monitoring units (MUs) that represent true watersheds. This system limited the variability in drainage area and waterbody type associated with the 12-digit HUCs. Since 2005, a total of six hundred and ten wadeable, flowing MUs have been delineated in the ACT (300), the EMT (126), and the BWC (183).

Human Disturbance Gradient: Monitoring watersheds in proportion to an environmental index or Human Disturbance Gradient (HDG) has been recently proposed as a method to limit error or bias associated with targeted sampling, a weakness of *ASSESS* identified during the review of the first monitoring cycle. The use of an HDG has also been recommended by the EPA to develop Tiered Aquatic Life Uses, to correlate suspected stressors to known levels of impairment, and consequently improve the overall assessment of water quality. Sampling MUs

with relatively low and high potentials of impairment also provides a method of identifying the least- and most-impaired sites in support of the Ecoregional Reference Reach and §303(d) Monitoring Programs.

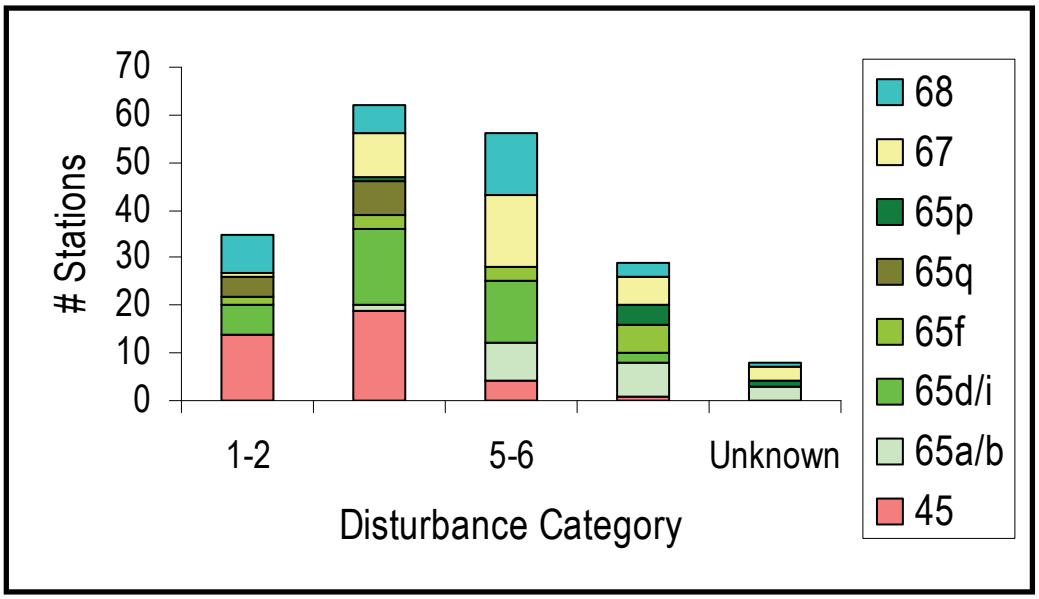
The Landscape Development Intensity Index (LDI) or disturbance gradient, used by the Florida Department of Environmental Protection, relates water quality conditions (physical, chemical, and biological) to human activity within a watershed (Fore 2004) using landuse data and a development-intensity measure derived from energy use per unit area (Brown and Vivas 2004). The Florida LDI was applied to the ACT flowing, wadeable MUs using the 2000 USEPA MRLC dataset, Departmental permit databases, population estimates, and the number of road crossings to place each MU into one of 8 Human Disturbance Gradient (HDG) categories (1=least potential for disturbance and 8=greatest potential for disturbance).

The current HDG lacks information pertaining to some common stressors in Alabama, including silviculture and animal husbandry. *Advantage of monitoring unit—can test and refine using stressor data*. See Table 2-1 and Figure 2-1..

Table 2-1 Number / % of total wadeable, flowing MUs in each HDG category

HDG Category	Total # Wadeable Flowing MUs	% Total MUs	# MUs Assessed
1	14	5%	6
2	14	5%	6
3	42	15%	8
4	69	25%	14
5	69	25%	14
6	42	15%	8
7	14	5%	6
8	14	5%	6
Total	**278**		**68**

Figure 2-1 Number of Monitoring Units Assessed by Disturbance Category and Bioregion.



Watershed and Reach Selection: All MUs within each category were randomly numbered using Arcview's random number generator function. Using the random number assigned, each MU was selected for assessment in numerical order. The number of sites selected for assessment in each category is in proportion to the total number of MUs in that category. A total of 190 MUs have been scheduled for assessment since 2005. These sites have represented the full gradient of conditions within eight of ADEM's established bioregions (Fig. 2-1). However, thirty-eight of the 190 MUs could not be assessed due to the severe drought conditions experienced throughout the state during 2006 and 2007. At least 50 MUs are assessed each year to estimate overall water quality throughout the basin group. Ninety-one watersheds were assessed in 2005 because of the sheer size of the ACT basin, the diversity of the watersheds, and to have a dataset large enough to develop assessment indices for the ACT.

Stations targeted for sampling by ADEM's Water Quality Branch, the Office of Education and Outreach, or one of Alabama's Clean Water Partnerships must be prioritized for monitoring to meet the multiple objectives and goals of the CWA. Using an HDG to categorize watersheds enables ADEM to coordinate targeted and probabilistic monitoring to maximize the efficiency and effectiveness of both monitoring designs and increase the accuracy of all assessments. Sixty-five targeted sites were incorporated into the basin assessment projects conducted during 2005-2007. Data from basin assessment stations will be used for use support assessments, TMDL and criteria development, Use Attainability Analyses, NPS Intensive Watershed Surveys, and education and outreach.

2.1.5 Core and Supplemental Indicators

Core indicators and sampling frequency were selected to meet data requirements as outlined in Alabama's Listing and Assessment Methodology so that the majority of waterbodies monitored each year can be categorized in Alabama's Integrated Report. The Ambient Monitoring Program was designed to provide the required data over the five year monitoring cycle. Sampling frequency and indicators collected at these sites differ from the other wadeable rivers and streams programs.

A primary objective of ADEM's Monitoring Strategy was to collect data to develop indicators and assessment criteria that link chemical, physical, and biological conditions within a wadeable stream reach to conditions throughout the stream's watershed. Criteria development requires extensive and intensive monitoring of chemical, physical, and biological indicators under a range of watershed conditions. To this end, ADEM's 2005 Surface Water Quality Monitoring Plan expanded its intensive monitoring efforts to include targeted, basin assessment, and ecoregional reference reaches.

All wadeable stream and river stations were visited monthly from March through October of 2005. Due to personnel and equipment limitations in ADEM's Central Chemical Laboratory, metals samples were collected four times during the sampling period, which meets the minimum data requirements for all wadeable rivers and streams in Alabama's Listing and Assessment Methodology. For all wadeable rivers and streams classified as "Outstanding Alabama Water", "Public Water Supply", "Swimming", and "Fish and Wildlife", the Alabama's current Listing and Assessment Methodology requires at least five pesticide

(organochlorine and organophosphorus), chlorinated herbicides, and atrazine by immunoassay be collected at each station to fully assess each reach for the Integrated Assessment Report *if a biological community assessment has not been conducted*. Laboratory equipment limitations only allowed for two pesticide and atrazine samples to be collected at each station. ADEM's Laboratory currently does not have the capacity to conduct chlorinated herbicide analysis.

Intensive macroinvertebrate assessments were conducted at one-hundred and twenty seven stations statewide, one-hundred and twenty one of which are located within the ACT Basin Group. ADEM's screening-level macroinvertebrate assessment is essentially a subset of ADEM's intensive-level macroinvertebrate assessment. Therefore, conducting intensive macroinvertebrate assessments will enable ADEM to calibrate metrics resulting from both methods to intensive water quality sampling and watershed conditions and will provide data that can be used to develop new metrics.

This level of effort will be required during the entire five year monitoring cycle to build a database sufficient for accurate metric calibration and testing. Although ADEM has collected approximately one hundred and thirty macroinvertebrate samples annually since 1997, this effort represents a significant increase in the number of intensive samples that will need to be identified to genus level in the laboratory. Additional taxonomists and field personnel will be needed to fully implement the strategy and to refine ADEM's macroinvertebrate assessment criteria.

ADEM has been developing and evaluating periphyton bioassessment methods since 2002 to collect data to address nutrient TMDLs currently being developed throughout the state and to develop nutrient criteria for wadeable rivers and streams by EPA's 2008 deadline. The effort began as a 2002 104(b)(3) grant from USEPA Region 4 to test the ability of three periphyton bioassessment methods to verify and document nutrient enrichment problems at twenty-nine riffle-run segments with known or suspected nutrient enrichment impairments and to characterize reference conditions based on periphyton assessment data from twelve ecoregional reference reaches. Periphyton sampling in 2004 continued to address nutrient TMDL issues statewide, including low-gradient, sandy-bottomed streams. In 2005, ADEM received an extension on their 2002 104(b)(3) grant to refine their periphyton standard operating procedures based on training received during the 2004 USEPA Region 4 Periphyton Workshop, as well as the 2002 and 2004 sampling results. The grant extension also provided funding to conduct training of nine ADEM personnel to use the 2005 standard operating procedures. These methods were used to collect periphyton biomass as chlorophyll *a*, diatom community assessment samples, and to conduct Rapid Periphyton Surveys (RPS) at one hundred and twenty seven stations encompassing both riffle-run and low-gradient, sandy-bottomed stream reaches. This will provide ADEM with data to calibrate periphyton bioassessment samples to intensive chemical and physical parameters and watershed conditions and to compare with intensive macroinvertebrate assessment results.

One aspect of the periphyton standard operating procedures still under consideration is the timing and number of samples required to fully characterize nutrient conditions at any given stream reach. To help answer this question, monthly periphyton bioassessments were conducted at forty stations in the ACT basin group. The number was determined by chlorophyll *a* laboratory loading limits. The forty sites represent the most complete gradient in watershed condition for six of ADEM's established bioregions. The USEPA Region 4 has

recognized the importance of this project for all Region 4 states and has set aside funding to process and identify eighty of the diatom samples collected during 2005 in the ACT Basin Group and one hundred and twenty eight samples collected in conjunction with the Cahaba River Intensive Survey. The diatom community assessment appears to have the greatest potential for addressing nutrient enrichment impairments, particularly in areas prone to scouring due to high percentage impervious surface. However, additional trained personnel and equipment will be required for this program to continue to develop and expand.

ADEM has been conducting fish IBI community assessments since 1997. The methods used were developed by the Geological Survey of Alabama (GSA) specifically for the Black Warrior and Cahaba River Basins (O'Neil and Shepard 1998). Personnel and equipment constraints have limited the number of fish community assessments conducted each year and criteria for the remaining basins have not yet been developed. The GSA has since refined its sampling protocols and is in the process of developing criteria. The GSA trained three ADEM personnel to use the revised protocols, which will be used to conduct fish IBI assessments during 2005. At a minimum, ADEM will conduct fish IBI assessments at the subset of forty stations where monthly periphyton assessments are conducted. These sites represent the most complete gradient in watershed condition for six of ADEM's established bioregions. The GSA is also working in the ACT Basin Group in 2005 and sampling efforts will be coordinated where possible.

Another important objective of the strategy is to collect data to address siltation TMDLs currently being developed throughout the state. To date, the completion of visually-based, qualitative habitat assessments, physical characterizations, and professional observations are the primary indicators of habitat degradation in wadeable rivers and streams.

Habitat assessments will be conducted at least once at all wadeable stations assessed statewide. This information will provide a good screening-level assessment of habitat impairments caused by siltation impairments. However, more quantitative measures will be needed to measure the extent of the impairment and to assess changes in habitat condition after TMDLs and BMPs have been implemented. ADEM has undertaken an initiative to train ADEM personnel to conduct Geomorphic Assessments as a measure of habitat degradation at wadeable rivers and streams. The effectiveness of this technique will be tested during 2005 at five segments on four streams in the ACT Basin Group listed for habitat degradation from siltation.

2.1.6 Data Analysis and Assessment

The development of indicators and assessment criteria was a primary objective of ADEM's Monitoring Strategy. Therefore, a very significant part of the 2005 ACT Basin Assessment Pilot Project and the 2005 Surface Water Quality Monitoring Plan will be to link results from chemical, physical, and biological indicator sampling to conditions throughout each stream's watershed. These analyses will include the following:

- Methods analysis, including optimal sampling frequencies, timing and number of samples collected, and redundancy among parameters;

- Calculation of method performance characteristics based on duplicate samples, samples collected at reference sites, and known levels of watershed disturbance;

- Development of stream classification (bioregions) based on biological community data; and,

- Development of indicators, criteria, and assessment indices based on correlations among chemical, physical, and biological indicators, and watershed conditions.

2.1.7 Reporting

Results of data analysis will be compiled and documented in a Methods Development Document. All necessary changes to sampling methods, protocols, and assessment indices and criteria will be incorporated into the next revision of the appropriate standard operating procedures manual and the Alabama Listing and Assessment Methodology document.

Once appropriate indicators have been selected and criteria and assessment indices have been established, data collected during 2005 at wadeable rivers and streams can be categorized and reported in Alabama's Integrated Assessment Report. Assessment results will also be documented in ADEM's 2005 basin assessment report, which summarizes data and assessment results on the basis of watershed or monitoring unit.

2.1.8 Programmatic Evaluation

Methods and programmatic evaluation is a primary objective of the 2005 ACT Basin Assessment Pilot Project. Analysis of the 2005 monitoring results will be compiled and documented in a Methods Development Document. All necessary changes to sampling methods and protocols will be incorporated into sampling conducted during the remainder of the five year monitoring cycle.

An important component of ADEM's Monitoring Strategy is a thorough review of data and assessment results from ADEM's five year monitoring cycle to address program weaknesses and changing data needs. Further program evaluation will be conducted in 2010, after the five year monitoring cycle is complete. Annual status reports on methods development will be completed and provided to USEPA Region 4 to document interim progress during the monitoring cycle.

2.1.9 Future Initiatives

A primary goal of the 2005 ACT Pilot Project was to develop and evaluate a monitoring strategy that can be used to assess wadeable rivers and streams statewide and to continue to implement the strategy over the five-year monitoring cycle. The development of indicators and assessment criteria will assist the Department to implement TMDLs and to set water quality standards and criteria. This will likely trigger a greater need for Intensive Surveys and Compliance Monitoring Programs to assess the effect of BMPs and TMDLs on water quality and to ensure that water quality standards are consistently being met. Over the next two five year monitoring cycles, additional personnel and funding resources will be needed to fully

implement both phases of the monitoring strategy statewide. A summary of anticipated needs is provided below.

GIS Support: The use of watershed-based monitoring and human disturbance gradients are essential to the successful implementation of ADEM's Monitoring Strategy statewide. Minimum data requirements for Alabama's Listing and Assessment Methodology are determined by both waterbody type and water use classification. ADEM's Water Quality Branch delineated the ACT monitoring units by waterbody type based on Arcview coverages. Delineation of MUs in the remaining basin groups and refinement of the ACT MUs will require staff dedicated to GIS development and management of GIS data. Additionally, GIS coverage of Alabama waters by use-classification as well as waterbody type would greatly assist in the planning and implementation of ADEM's monitoring strategy.

The current HDG lacks information pertaining to some common stressors in Alabama, including silviculture and animal husbandry. The landuse information to calculate the HDG was developed in 1993 and has been shown to overestimate percent agriculture and underestimate percent urban as many cities continue to grow, including Montgomery and Auburn/Opelika in the ACT Basin. Factors that may mitigate or effect impacts from high-risk landuses, such as buffer zones, distance from source, riparian and channel gradients, have also not been factored into the current HDG. Up-to-date GIS coverages and tools that can incorporate this type of information would greatly improve the accuracy of the HDG as a predictive tool.

Increased intensive surveys and compliance sampling: The development of indicators and assessment criteria will increase the need for Intensive Surveys and Compliance Monitoring Programs to assess the effect of BMPs and TMDLs on water quality and to ensure that water quality standards are consistently being met. Long-term intensive surveys require annual sampling at a larger number of sites to accurately assess the cause and degree of impairment and trends in water quality. Multiple intensive chemical, physical, and biological indicators of water quality will have to be monitored for a minimum of five years. Additional staff and equipment will be needed to meet these challenges.

Laboratory capacity and equipment: Personnel and equipment limitations in ADEM's Central Chemical Laboratory limited the collection of some indicators required to fully assess wadeable rivers and streams for Alabama's Integrated Assessment Report during the 2005 pilot study. These included chlorophyll *a*, trace metals, pesticides, and herbicide sampling. New laboratory facilities are under construction, however, with completion scheduled for June 2006. Increased monitoring of low level metals analyses, particularly mercury in coastal plain streams, will be essential within the next few years. Other potentially important parameters for future analysis include endocrine disrupters and perfluorooctanoic acid (PFOA). PFOA has been manufactured in the Decatur area and an investigation is ongoing to determine the concentration and areal extent of the compound. It has been found in the soil, groundwater, surface water, and fish tissue but, its effects are not well known.

Biological taxonomists: Increased collection of intensive macroinvertebrate samples and fish IBI assessments will require additional trained taxonomists. To date, processing and

identification of diatoms for ADEM's Periphyton Bioassessment Program have been completed by outside contractors with federal funding. ADEM will have to incorporate in-house processing and identification of diatom samples for the program to grow.

For more information on the Wadeable Rivers and Streams Monitoring Program contact Ms. Lisa Huff in ADEM's Montgomery Office at (334) 260□2752 or ehh@adem.state.al.us.

2.2 Ecoregions

Innate regional differences exist in climate, landform, soil, natural vegetation, and hydrology. These factors, in turn, affect nutrient regime, substrate characteristics, and the composition of biological communities within aquatic ecosystems. By defining relatively homogeneous ecological areas, ecoregions provide a geographic framework for more efficient management of aquatic ecosystems and their components (Hughes et al. 1986, Hughes 1985, and Hughes and Larsen 1988). The USEPA has recommended the development of ecoregional reference conditions as a scientifically defensible method of defining expected habitat, biotic, and chemical conditions within streams, rivers, reservoirs, and wetlands. Level IV ecoregions have been developed or are under development in 37 states nationwide. Griffith et al. (2001) delineated six Level III ecoregions in Alabama: Piedmont, Southeastern Plains, Ridge and Valley, Southwestern Appalachians, Interior Plateau, and the Southern Coastal Plain. Within these, they delineated 27 Level IV ecoregions.

ADEM has maintained an Ecoregional Reference Reach Monitoring Program since 1991 (ADEM 2001b). Intensive monitoring assessments, including chemical, physical, habitat, and biological data, are collected to develop baseline reference conditions for each of Alabama's 29 Level IV subecoregions (Griffith et al. 2001). ADEM's ecoregional reference database was analyzed during 2003 to develop assessment guidelines for ADEM's habitat assessments, screening-level macroinvertebrate assessments, and chemical parameters, including nutrient concentrations for 10 of the 29 subecoregions.

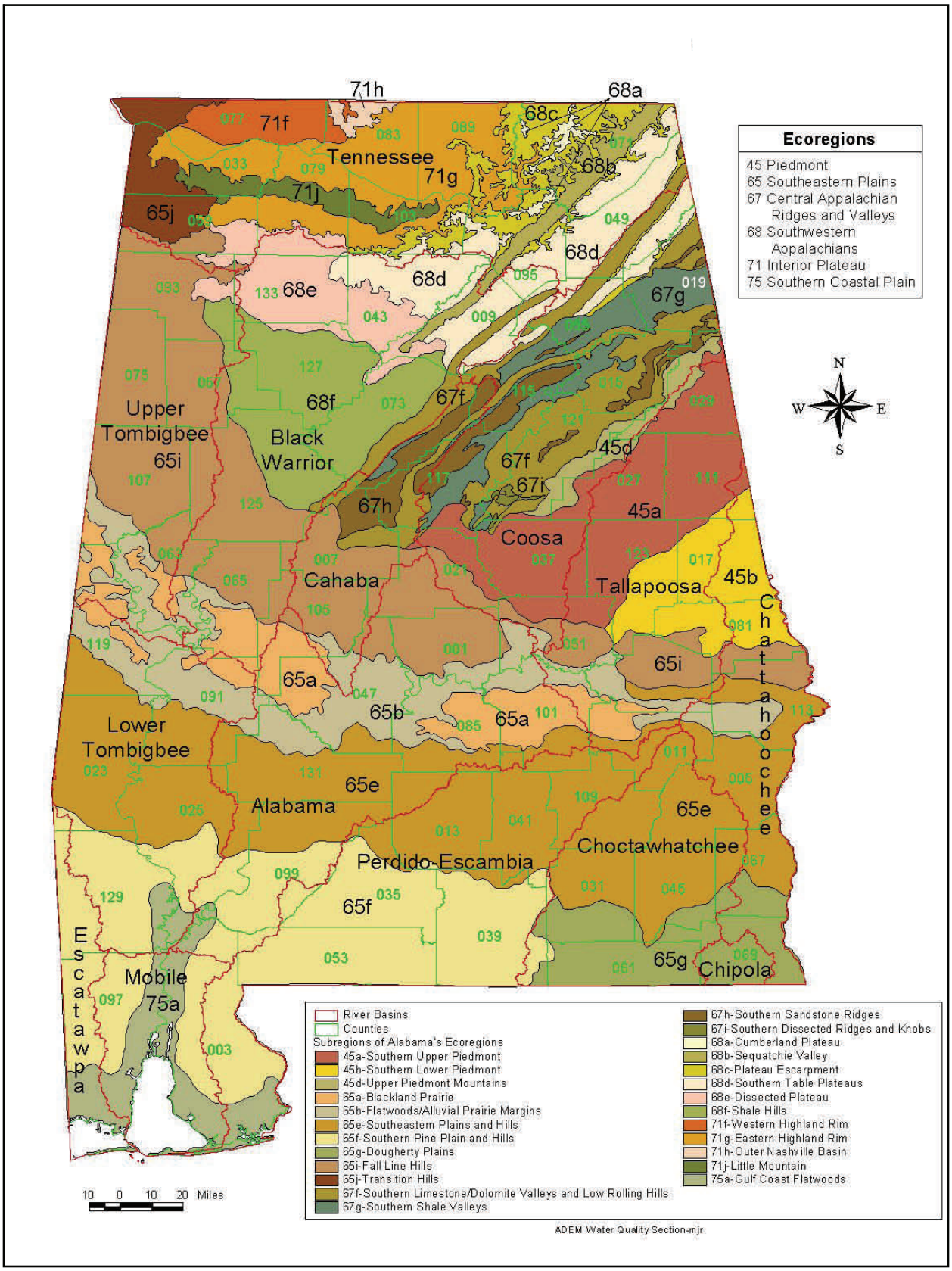
2.2.1 ADEM's Ecoregional Reference Reach Program: 1992-2004

Specific selection criteria were used to ensure that reference reaches were typical of the subecoregion and relatively unimpaired. Watersheds containing the highest percentage of natural vegetation were first located using topographic maps and land use information compiled by USEPA and local Soil and Water Conservation Districts. Departmental databases were used to ensure that potential reference watersheds do not contain any point source discharges, mining, or urban runoff, and minimal agricultural sources. Improved GIS capabilities have enhanced ADEM's ability to more accurately quantify land use within each of the reference reach watersheds. Field reconnaissance was then conducted to ground truth land use estimates. In situ field parameters were collected and visual macroinvertebrate surveys were conducted to screen for obvious impacts to chemical and biological conditions. Substrate composition, gradient, canopy cover, sinuosity, and habitat quality and availability were estimated to assess stream condition and comparability to other streams in the subecoregion. Intensive site assessments were then conducted to verify that the reaches were in relatively good condition.

Table 2-2 Alabama Ecoregional Reference Stations

Station	Stream Name	County	Ecoregion	River Basin	Latitude	Longitude
CYD-1	Chaney Creek	Dallas	65a	Alabama River	32.35439	-87.28939
SPD-1	Soapstone Creek	Dallas	65b	Alabama River	32.32220	-86.90630
SRC-1	Silver Creek	Clarke	65q	Alabama River	31.69517	-87.58156
SWFC-1	Swift Creek	Chilton	65i	Alabama River	32.72145	-86.69159
VLYD-1	Valley Creek	Dallas	65i	Alabama River	32.57499	-86.98474
WASP-1	Washington Creek	Perry	65a	Alabama River	32.56997	-87.39136
BLVC-1	Blevens Creek	Cullman	68d	Black Warrior River	34.26736	-87.07761
BRSL-3	Brushy Creek	Lawrence	68e	Black Warrior River	34.33068	-87.28578
HNMB-4	Hendrick Mill Branch	Blount	67f	Black Warrior River	33.87612	-86.56885
INMW-1	Inman Creek	Winston	68e	Black Warrior River	34.21525	-87.22447
MRTC-1	Marriott Creek	Cullman	68e	Black Warrior River	34.04211	-86.86283
SSB-1	South Sandy Creek	Bibb	65i	Black Warrior River	32.96994	-87.39775
TPSL-1	Thompson Creek	Lawrence	68e	Black Warrior River	34.34092	-87.47108
MAYB-1	Mayberry Creek	Bibb	67h	Cahaba River	33.07125	-86.93853
BCR-1	Adams Branch	Russell	65i	Chattahoochee River	32.42469	-85.26067
IHGR-1	Ihagee Creek	Russell	65d	Chattahoochee River	32.23850	-84.98069
BRH-1	Bear Creek	Houston	65g	Choctawhatchee River	31.20769	-85.54619
DRYB-1	Dry Creek	Barbour	65d	Choctawhatchee River	31.93467	-85.61036
PATC-1	Patrick Creek	Coffee	65d	Choctawhatchee River	31.43840	-86.11210
BERD-9	Bear Creek	DeKalb	68d	Coosa River	34.38094	-85.69789
CHEC-6	Cheaha Creek	Clay	45d	Coosa River	33.45275	-85.90273
CHOC-2	Choccolocco Creek	Cleburne	45d	Coosa River	33.82946	-85.58173
DRYC-2	Dry Creek	Calhoun	67h	Coosa River	33.84240	-85.59422
FRMS-9	Fourmile Creek	Shelby	67f	Coosa River	33.25649	-86.48980
JNSC-16	Jones Creek	Coosa	45a	Coosa River	32.90492	-86.29758
LCNE-1	Little Canoe Creek	Etowah	67f	Coosa River	33.97006	-86.17892
PNTC-11	Paint Creek	Coosa	45a	Coosa River	33.01838	-86.44741
SHLC-3	Shoal Creek	Cleburne	45d	Coosa River	33.72529	-85.60115
TCT-5	Talladega Creek	Talladega	45d	Coosa River	33.37847	-86.03008
WGFC-1	Weogufka Creek	Coosa	45a	Coosa River	33.07288	-86.24847
WLFS-9	Wolf Creek	St. Clair	67g	Coosa River	33.56883	-86.33817
ULCC-1	Ulcanush Creek	Clarke	65q	Lower Tombigbee River	31.78408	-88.10808
PPM-1	Poplar Creek	Marengo	65b	Lower Tombigbee River	32.27733	-87.60669
HLB-1	Halls Creek	Baldwin	65f	Mobile Bay Area	31.05264	-87.83701
BRE-1	Bear Creek	Escambia	65f	Perdido-Escambia River	31.03334	-86.70961
CLC-1	Clear Creek	Covington	65g	Perdido-Escambia River	31.12153	-86.37575
PYW-1	Pineywoods Creek	Crehshaw	65d	Perdido-Escambia River	31.58378	-86.46186
CHNE-18	Channahatchee Creek	Elmore	45a	Tallapoosa River	32.65024	-85.95085
CRHR-9	Cornhouse Creek	Randolph	45a	Tallapoosa River	33.21195	-85.51806
EMKT-14	Emuckfaw Creek	Tallapoosa	45a	Tallapoosa River	33.05527	-85.69489
HCR-1	Hurricane Creek	Randolph	45a	Tallapoosa River	33.17546	-85.59829
LBM-1	Long Branch	Macon	65i	Tallapoosa River	32.41319	-85.48119
LCC-1	Little Chattahospee Creek	Chambers	45b	Tallapoosa River	32.90761	-85.51100
LINB-1	Line Creek	Bullock	65a	Tallapoosa River	32.20881	-85.89750
BYTJ-1	Bryant Creek	Jackson	68d	Tennessee River	34.64658	-85.84303
INCL-1	Indiancamp Creek	Lauderdale	71f	Tennessee River	34.92425	-87.62108
BLBP-1	Blubber Creek	Pickens	65i	Upper Tombigbee River	33.14725	-88.17053
BRP-1	Bear Creek	Pickens	65i	Upper Tombigbee River	33.36961	-87.90364
CLKM-4	Clark Creek	Marion	65i	Upper Tombigbee River	34.08091	-88.02659
CTML-6	Cantrell Mill Creek	Lamar	65i	Upper Tombigbee River	34.04098	-88.03327
JNS-1	Jones Creek	Sumter	65a	Upper Tombigbee River	32.70161	-88.14775

Figure 2-2 Subregions of Alabama's Ecoregions



Through this process, a total of 594 locations have been investigated as potential reference reaches statewide. Information from these site visits identified 53 ecoregional reference reaches across the state. An additional 13 candidate reaches are currently being monitored to validate their selection. The program concentrated on wadeable streams and rivers, for which the USEPA and ADEM have developed rapid bioassessment protocols (Plafkin et al. 1989, Barbour et al. 1999, ADEM 1996, ADEM 1999, ADEM in press). Large river ecoregional reference reaches have been recently established on Sipsey Fork and Hatchet Creek to assess specific impacts to Locust Fork, Mulberry Fork, and the Cahaba River.

2.2.2 ADEM's Monitoring Strategy: Identifying Ecoregional Reference Reaches

In 2005, ADEM revised its monitoring strategy to assess wadeable rivers and streams using a watershed-based probabilistic monitoring design. A Human Disturbance Gradient (HDG) was developed to classify each watershed by its potential level of disturbance. By monitoring the watersheds in proportion to the number of watersheds in each HDG category, the monitoring strategy provides an estimate of overall water quality throughout the basin. Habitat assessments, biological assessments (macroinvertebrates, fish, and periphyton), and monthly water quality data collected at all sites are used to verify the high quality of sites within the least-impaired HDG categories. Additionally, because the HDG provides disturbance and landuse information for all stations assessed within the basin group, it will enable ADEM to document the "least-impaired" landuse characteristics to set criteria for reference reach status in each Ecoregion or Bioregion. Figure 2-2, shows Subregions of Alabama's Ecoregions, and Table 2-2 provides a list of Alabama's Ecoregional Reference Stations.

For more information on Alabama's Ecoregions, contact Ms. Lisa Huff in ADEM's Montgomery Office at (334) 260□2752 or ehh@adem.state.al.us.

2.3 Trend Stations

Sampling frequency presently occurs 3 times a year during the months of May, August, and October at most trend stations. Selected sites are sampled more Frequently. Figure 2-3, and Table 2-3 shows Alabama's Active Trend Stations (Ambient Monitoring).

A list of water quality survey reports can be found at www.adem.state.al.us.

For more information on Alabama's Trend Stations contact Mr. Johnathan Hall in ADEM's Montgomery Office at 334-271-7835or Jehall@adem.state.al.us.

Figure 2-3 Representation of Alabama's Active Trend Station Network

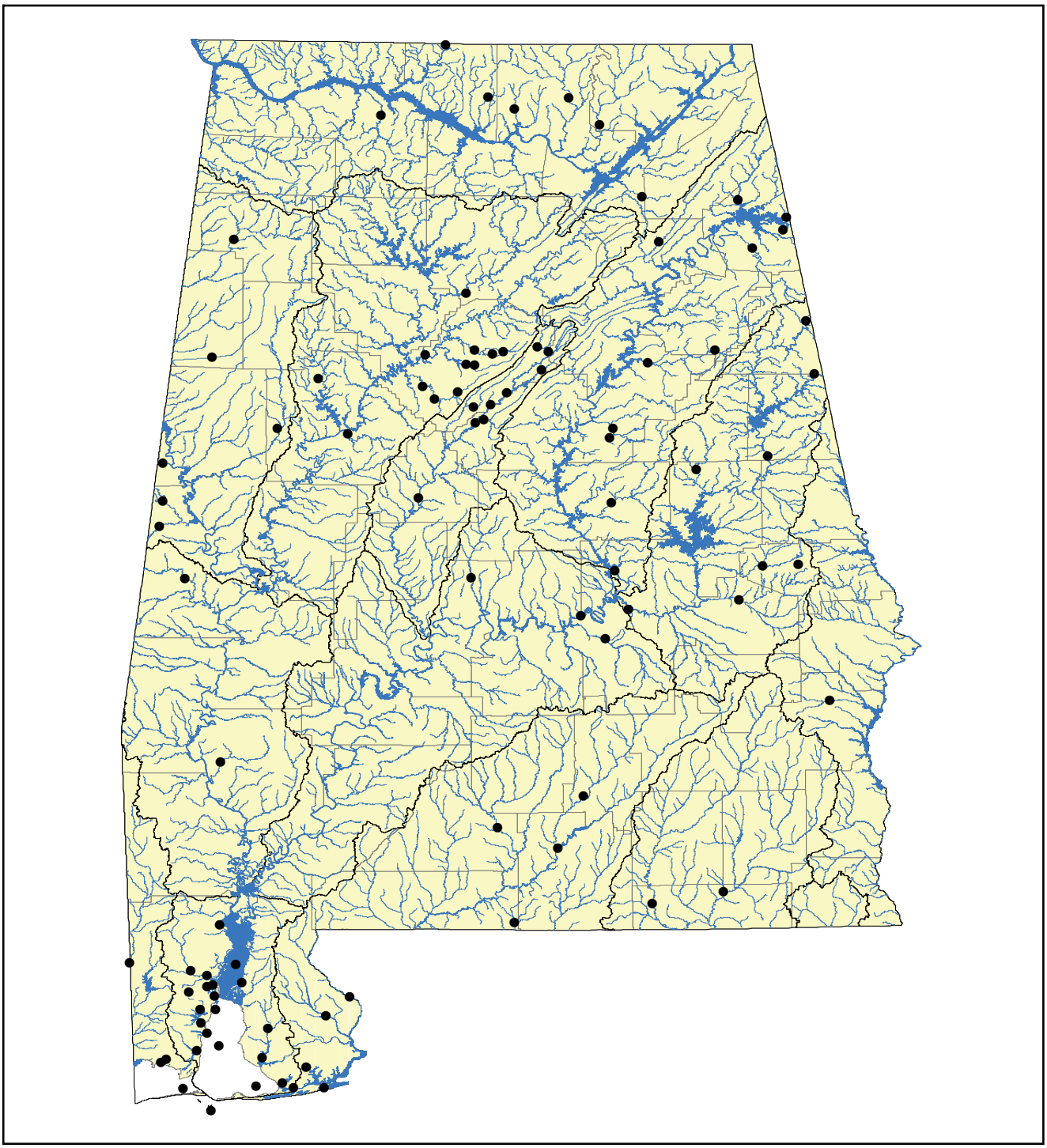


Table 2-3 Alabama's Active Trend Stations - Ambient Monitoring

Station	Stream Name	County	River Basin	Latitude	Longitude
CATM-3A	Catoma Creek	Montgomery	Alabama	32.30736	-86.29941
MULD-1	Mulberry Creek	Autauga/Dallas	Alabama	32.58278	-86.90361
WDFA-2A	Alabama River	Montgomery	Alabama	32.41142	-86.40836
FM1	Five Mile Creek	Jefferson	Black Warrior	33.59111	-86.80361
FM2	Five Mile Creek	Jefferson	Black Warrior	33.61111	-86.88556
FMCJ-1B	Five Mile Creek	Jefferson	Black Warrior	33.60191	-86.75527
H1	Hurricane Creek	Tuscaloosa	Black Warrior	33.22983	-87.46181
LFKJ-6	Locust Fork	Jefferson	Black Warrior	33.58726	-87.10933
MBFB-1	Mulberry Fork	Blount/Cullman	Black Warrior	33.87235	-86.92329
NRRT-1	North River	Tuscaloosa	Black Warrior	33.47980	-87.59681
VA1	Valley Creek	Jefferson	Black Warrior	33.38694	-87.06783
VALJ-8	Valley Creek	Jefferson	Black Warrior	33.44733	-87.12222
VC-5	Valley Creek	Jefferson	Black Warrior	33.41917	-86.96306
VI3	Village Creek	Jefferson	Black Warrior	33.54797	-86.92567
VLGJ-5	Village Creek	Jefferson	Black Warrior	33.62729	-87.05334
B-1	Buck Creek	Shelby	Cahaba	33.29694	-86.84264
C1	Cahaba River	St. Clair	Cahaba	33.60503	-86.54924
C2	Cahaba River	Shelby	Cahaba	33.41546	-86.74002
C3	Cahaba River	Jefferson	Cahaba	33.28400	-86.88193
CABB-1	Cahaba River	Bibb	Cahaba	32.94456	-87.13983
CABJ-8	Cahaba River	Jefferson	Cahaba	33.62283	-86.60007
CAHS-1	Cahaba River	Shelby	Cahaba	33.36350	-86.81320
LC1	Little Cahaba River	Jefferson	Cahaba	33.52128	-86.57939
SH1a	Shades Creek	Jefferson	Cahaba	33.35528	-86.89056
SFCB-1	South Fork Cowikee Creek	Barbour	Chattahoochee	32.01874	-85.29589
CHO09	Choctawhatchee River	Geneva	Choctawhatchee	31.15934	-85.78438
PEAG-2	Pea River	Geneva	Choctawhatchee	31.11200	-86.09937
BWCE-1	Big Wills Creek	Etowah	Coosa	34.09805	-86.03809
CHAC-1	Chattooga River	Cherokee	Coosa	34.29028	-85.50917
CHOC10	Choccolocco Creek	Calhoun	Coosa	33.60625	-85.79032
CHOT-1	Choccolocco Creek	Talladega	Coosa	33.54818	-86.09660
CO12	Little River	Cherokee	Coosa	34.28186	-85.67244
COSE-1	Coosa River	Elmore	Coosa	32.61396	-86.25498
HATC-1	Hatchet Creek	Coosa	Coosa	32.91684	-86.27030
SHIRTEE03	Shirtee Creek	Talladega	Coosa	33.21167	-86.27306
TERC-1	Terrapin Creek	Cherokee	Coosa	34.06294	-85.61227
TH1	Tallaseehatchee Creek	Talladega	Coosa	33.25606	-86.25825
WEIC-12	Coosa River	Cherokee	Coosa	34.20000	-85.44472
BLB-1	Bayou La Batre River	Mobile	Escatawpa	30.40590	-88.24810
BLBM-1	Bayou La Batre River	Mobile	Escatawpa	30.38670	-88.27000
E-1	Escatawpa River	Mobile	Escatawpa	30.86265	-88.41794

Table 2-3 Alabama's Active Trend Stations -Ambient Monitoring (Continued)

Station	Stream	County	Basin Name	Latitude	Longitude
LT12	Satilpa Creek	Clarke	Lower Tombigbee	31.74444	-88.02133
SUCS-1	Sucarnoochee Creek	Sumter	Lower Tombigbee	32.57390	-88.19420
BS1	Bon Secour River	Baldwin	Mobile	30.30221	-87.73575
Channel1a	Mobile Bay	Mobile	Mobile	30.62973	-88.03263
Channel2	Mobile Bay	Mobile	Mobile	30.46437	-88.01577
CKSM-3	Chickasaw Creek	Mobile	Mobile	30.80297	-88.14334
CS1	Chickasaw Creek	Mobile	Mobile	30.78389	-88.07306
CS2	Chickasaw Creek	Mobile	Mobile	30.73925	-88.04571
DGRM-1	Dog River	Mobile	Mobile	30.56510	-88.08780
DR1	Dog River	Mobile	Mobile	30.62845	-88.10166
FI1	Fish River	Baldwin	Mobile	30.54542	-87.79861
FR1	Fowl River	Mobile	Mobile	30.44417	-88.11306
IC1a	Intracoastal Waterway	Baldwin	Mobile	30.27930	-87.68700
MB1a	Intracoastal Waterway	Mobile	Mobile	30.27308	-88.17317
MB2a	Mobile Bay	Mobile	Mobile	30.17180	-88.04895
MB3a	Intracoastal Waterway	Baldwin	Mobile	30.28407	-87.85137
MO1A	Mobile River	Baldwin/Mobile	Mobile	30.83640	-87.94406
MO2	Mobile River	Mobile	Mobile	30.69137	-88.03646
MOBM-1	Mobile River	Mobile	Mobile	31.05556	-88.02083
TC1	Theodore Industrial Canal	Mobile	Mobile	30.53333	-88.12389
TENB-2	Tensaw River	Baldwin	Mobile	30.75291	-87.91987
TM1	Threemile Creek	Mobile	Mobile	30.73333	-88.07083
TMCM-3	Threemile Creek	Mobile	Mobile	30.70630	-88.15111
WB1	Weeks Bay	Baldwin	Mobile	30.41469	-87.82583
BKRE-1	Blackwater River	Escambia	Perdido-Escambia	31.02656	-86.71001
CNR-1a	Conecuh River	Covington	Perdido-Escambia	31.36128	-86.51968
PALC-2	Patsaliga Creek	Crenshaw	Perdido-Escambia	31.59590	-86.40407
PDBB-0	Perdido Bay	Baldwin	Perdido-Escambia	30.27968	-87.54948
PDBB-5	Perdido River	Baldwin	Perdido-Escambia	30.69047	-87.44026
SPLC-3	Sepulga River	Conecuh	Perdido-Escambia	31.45362	-86.78680
STXB-3	Styx River	Baldwin	Perdido-Escambia	30.60532	-87.54700
WO1A	Wolf Creek	Baldwin	Perdido-Escambia	30.37167	-87.63056
HILT-2	Hillabee Creek	Tallapoosa	Tallapoosa	33.06635	-85.87993
LTRR-1	Little Tallapoosa River	Randolph	Tallapoosa	33.49466	-85.33788
PPLL-2	Pepperell Branch	Lee	Tallapoosa	32.63470	-85.42540
SOGL-1	Sougahatchee Creek	Lee	Tallapoosa	32.62670	-85.58808
TA1	Tallapoosa River	Randolph	Tallapoosa	33.11679	-85.56079
TA2	Tallapoosa River	Cleburne	Tallapoosa	33.73272	-85.37217
TARE-1	Tallapoosa River	Elmore/Tallapoosa	Tallapoosa	32.43972	-86.19556
UPHM-3	Uphapee Creek	Macon	Tallapoosa	32.47751	-85.69554
BGNL-1	Big Nance Creek	Lawrence	Tennessee	34.67009	-87.31722
FLIM-2A	Flint River	Madison	Tennessee	34.74926	-86.44666
INDM-249	Indian Creek	Madison	Tennessee	34.69731	-86.70000
LIML-300	Limestone Creek	Limestone	Tennessee	34.75210	-86.82320
PRRJ-1	Paint Rock River	Jackson	Tennessee	34.62417	-86.30639
SCRL-2	Scarham Creek	Marshall	Tennessee	34.29843	-86.11664
TN04A	Elk River	Giles, TN	Tennessee	35.01415	-86.99465
BCTP-1	Bogue Chitto Creek	Pickens	Upper Tombigbee	33.09222	-88.30064
BDKS-48	Bodka Creek	Sumter	Upper Tombigbee	32.80679	-88.31213
BUTL-2A	Buttahatchee River	Marion	Upper Tombigbee	34.10597	-87.98869
LUXL-1	Luxapallila Creek	Lamar	Upper Tombigbee	33.57500	-88.08340
NXBS-50	Noxubee River	Sumter	Upper Tombigbee	32.91979	-88.29728
SPYG-3	Sipsey River	Tuscaloosa	Upper Tombigbee	33.25710	-87.77682

2.4 TMDL Program

The 2008 303(d) List is provided in the Appendix. For more information about the TMDL Program, contact Ms. Daphne Smart in ADEM's Montgomery Office at (334) 271-7827 or dsmart@adem.state.al.us

Table 2-4 provides the total number of TMDLs that have been developed and approved/ finalized by the ADEM Water Quality Branch and by Region 4 EPA during FY2006 and FY2007. Table 2-5 and 2-6 shows a list of the TMDL Program Initiatives and TMDL Standing as of December 31, 2007, respectively. Table 2-7 shows the current TMDL Development Plan.

Table 2-4 TMDL Development Progress FY2006 and FY2007

ADEM
● 3 TMDLs were Finalized and Approved by EPA Region 4 during FY06
● 10 TMDLs were Finalized and Approved by EPA Region 4 during FY07

Table 2-5 TMDL Program Initiatives for FY 2008

● Finalize all Consent Decree TMDLs (8 waterbodies)*
● Elk River Model and TMDL Development
● Draft TMDLs for Impaired Waters in accordance with the FY08 Workplan
● Provide assistance to EPA to finalize the Mobile Bay Water Quality Model

*Excludes TMDLs which will be developed by EPA

Table 2-6 Alabama's TMDL Standing as of December 31, 2007

Activity	ADEM	EPA	Total
Approved TMDLs (waterbody-pollutant combinations)	97*	45	146
Approved Delistings (total)	-	-	-
(1998 to December 31, 2007)	337	-	337
Final TMDLs Pending EPA Approval	-	-	-
Draft TMDLs Pending Finalization/Approval	8	1	9
Draft Delistings Pending Approval (includes Final/Approved TMDLs for each waterbody-pollutant combination)	35	-	35
TMDLs Withdrawn & Approved	1	-	1

*Including 4 jointly proposed by EPA and ADEM

Table 2-7 TMDL Development Plan for FY 2008 and FY 2009

FISCAL YEAR 2008					
Waterbody Name	**Waterbody ID (12-Digit HUC)**	**River Basin**	**County**	**Pollutant**	**When Will Draft TMDL Be Sub-mitted to EPA?**
Alabama River	AL03150203-0703-101	Alabama	Wilcox	OE/DO	1st QTR FY08
Alabama River	AL03150203-0805-102	Alabama	Wilcox	OE/DO	1st QTR FY08
Alabama River	AL03150203-0805-103	Alabama	Wilcox	OE/DO	1st QTR FY08
Alabama River	AL03150203-0805-104	Alabama	Wilcox	OE/DO	1st QTR FY08
Alabama River	AL03150203-0805-105	Alabama	Wilcox	OE/DO	1st QTR FY08
Brindley Creek	AL03160109-0105-101	Black Warrior	Cullman	Nutrients	2nd QTR FY08
Brindley Creek	AL03160109-0105-102	Black Warrior	Cullman	Nutrients	2nd QTR FY08
Buxahatchee Creek	AL03150107-0502-100	Coosa	Chilton/Shelby	Nutrients	1st QTR FY08
Lake Neely Henry	AL03150106-0309-101	Coosa	Etowah	Nutrients	3rd QTR FY08
Lake Neely Henry	AL03150106-0309-101	Coosa	Etowah	pH	3rd QTR FY08
Lake Neely Henry	AL03150106-0309-101	Coosa	Etowah	OE/DO	3rd QTR FY08
Lake Neely Henry	AL03150106-0309-102	Coosa	Etowah	Nutrients	3rd QTR FY08
Lake Neely Henry	AL03150106-0309-102	Coosa	Etowah	pH	3rd QTR FY08
Lake Neely Henry	AL03150106-0309-102	Coosa	Etowah	OE/DO	3rd QTR FY08
Lake Neely Henry	AL03150106-0104-101	Coosa	Etowah	Nutrients	3rd QTR FY08
Lake Neely Henry	AL03150106-0104-101	Coosa	Etowah	pH	3rd QTR FY08
Lake Neely Henry	AL03150106-0104-101	Coosa	Etowah	OE/DO	3rd QTR FY08
Lake Neely Henry	AL03150106-0104-102	Coosa	Etowah	Nutrients	3rd QTR FY08
Lake Neely Henry	AL03150106-0104-102	Coosa	Etowah	pH	3rd QTR FY08
Lake Neely Henry	AL03150106-0104-102	Coosa	Etowah	OE/DO	3rd QTR FY08
Lake Logan Martin	AL03150106-0801-100	Coosa	St. Clair	Nutrients	3rd QTR FY08
Lake Logan Martin	AL03150106-0801-100	Coosa	St. Clair	OE/DO	3rd QTR FY08
Lake Logan Martin	AL03150106-0501-101	Coosa	St. Clair	Nutrients	3rd QTR FY08
Lake Logan Martin	AL03150106-0501-101	Coosa	St. Clair	OE/DO	3rd QTR FY08
Lake Logan Martin	AL03150106-0501-102	Coosa	St. Clair	Nutrients	3rd QTR FY08
Lake Logan Martin	AL03150106-0501-102	Coosa	St. Clair	OE/DO	3rd QTR FY08
Lay Lake	AL03150107-0401-100	Coosa	Talladega	Nutrients	3rd QTR FY08
Lay Lake	AL03150107-0401-100	Coosa	Talladega	OE/DO	3rd QTR FY08
Lay Lake	AL03150107-0101-102	Coosa	Talladega	Nutrients	3rd QTR FY08
Lay Lake	AL03150107-0101-102	Coosa	Talladega	OE/DO	3rd QTR FY08
Lay Lake	AL03150107-0808-102	Coosa	Talladega	Nutrients	3rd QTR FY08
Lay Lake	AL03150107-0808-102	Coosa	Talladega	OE/DO	3rd QTR FY08
Lake Mitchell	AL03150107-0601-100	Coosa	Chilton	Nutrients	3rd QTR FY08
Puppy Creek	AL/03170008-030_01	Escatawpa	Mobile	Nutrients	1st QTR FY08
Sougahatchee Creek Emb	AL03150110-0204-101	Tallapoosa	Lee	Nutrients	1st QTR FY08
Sougahatchee Creek Emb	AL03150110-0204-101	Tallapoosa	Lee	OE/DO	1st QTR FY08

Table 2-7 TMDL Development Plan for FY 2008 and FY 2009 (Continued)

FISCAL YEAR 2008					
Peperrell Branch	AL03150110-0201-700	Tallapoosa	Lee	Nutrients	1st QTR FY08
Flint River	AL06030002-0401-102	Tennessee	Madison	Pathogens	1st QTR FY08
Cotaco Creek	AL06030002-0603-102	Tennessee	Morgan	Pathogens	1st QTR FY08
West Fork Cotaco Cr.	AL06030002-0602-102	Tennessee	Morgan	Pathogens	1st QTR FY08
Poplar Spring Branch	AL03130004-0601-201	Chattahoochee	Houston	pH	1st QTR FY08 (delisting)
Hurricane Creek	AL03140201-0502-100	Choctawhatchee	Dale	Pathogens	2nd QTR FY08
Cypress Creek	AL03130012-0201-400	Chipola	Houston	Nutrients	3rd QTR FY08
Cypress Creek	AL03130012-0201-400	Chipola	Houston	OE/DO	3rd QTR FY08
Dowling Branch	AL03140201-0704-600	Choctawhatchee	Geneva	OE/DO	2nd QTR FY08
Dowling Branch	AL03140201-0704-600	Choctawhatchee	Geneva	Pathogens	1st QTR FY08
FISCAL YEAR 2009					
Waterbody Name	**Waterbody ID (12-Digit HUC)**	**River Basin**	**County**	**Pollutant**	**When Will Draft TMDL Be Sub-mitted to EPA?**
Beaver Creek	AL03140201-0602-201	Choctawhatchee	Houston	Nutrients	3rd QTR FY08
Beaver Creek	AL03140201-0602-201	Choctawhatchee	Houston	OE/DO	3rd QTR FY08
UT to Harrand Creek	AL03140201-1001-700	Choctawhatchee	Coffee	Nutrients	4th QTR FY08
UT to Harrand Creek	AL03140201-1001-700	Choctawhatchee	Coffee	Siltation	4th QTR FY08
UT to Jackson Lake (2-S)	AL03140103-0102-700	Perdido-Escambia	Covington	OE/DO	3rd QTR FY08
UT to Jackson Lake (2-S)	AL03140103-0102-700	Perdido-Escambia	Covington	Pathogens	3rd QTR FY08
UT to Jackson Lake (3-C)	AL03140103-0102-800	Perdido-Escambia	Covington	OE/DO	3rd QTR FY08
UT to Jackson Lake (3-C)	AL03140103-0102-800	Perdido-Escambia	Covington	Pathogens	3rd QTR FY08
Boggy Branch	AL03140106-0302-202	Perdido-Escambia	Escambia	OE/DO	3rd QTR FY08
Boggy Branch	AL03140106-0302-202	Perdido-Escambia	Escambia	Zinc	3rd QTR FY08
Boggy Branch	AL03140106-0302-202	Perdido-Escambia	Escambia	Chlorides	3rd QTR FY08
Brushy Creek	AL03140106-0302-101	Perdido-Escambia	Escambia	OE/DO	4th QTR FY08
Rocky Creek	AL03140303-0302-101	Perdido-Escambia	Butler	Unknown toxicity	3rd QTR FY08
Sipsey River	AL03160107-0306-100	Upper Tombigbee	Pickens/Greene	Metals(Fe)	3rd QTR FY08
Elk River	AL06030004-0105-101	Tennessee	Limestone/ Lauderdale	pH	4th QTR FY08
Elk River	AL06030004-0105-101	Tennessee	Limestone/ Lauderdale	Nutrients	4th QTR FY08
Three Mile Branch	AL03150201-0104-302	Alabama	Montgomery	Pesticides (Dieldrin)	4th QTR FY08
Catoma Creek	AL03150201-0309-100	Alabama	Montgomery	Pathogens	2nd QTR FY08
Boggy Branch	AL03170008-0402-400	Escatawpa	Mobile	Metals (Fe)	4th QTR FY08
Collins Creek	AL03170008-0402-700	Escatawpa	Mobile	Pathogens	4th QTR FY08
Bayou La Batre	AL03170009-0102-100	Escatawpa	Mobile	Pathogens	4th QTR FY08
Threemile Creek	AL03160204-0504-101	Mobile	Mobile	Pathogens	4th QTR FY08
Threemile Creek	AL03160204-0504-102	Mobile	Mobile	Pathogens	4th QTR FY08
Threemile Creek	AL03160204-0504-103	Mobile	Mobile	Pathogens	4th QTR FY08
Toulmins Spring Branch	AL03160204-0504-300	Mobile	Mobile	Pathogens	4th QTR FY08
UT to Threemile Creek	AL03160204-0504-500	Mobile	Mobile	Pathogens	4th QTR FY08
Bolton Branch	AL03160205-0202-300	Mobile	Mobile	Pathogens	4th QTR FY08
Eslava Creek	AL03160205-0202-400	Mobile	Mobile	Pathogens	4th QTR FY08
UT to Bon Secour River	AL03160205-0310-702	Mobile	Baldwin	Pathogens	4th QTR FY08
Bon Secour Bay	AL03160205-0104-200	Mobile	Baldwin	Pathogens	4th QTR FY08
Purgatory Creek	AL03160103-0204-202	Upper Tombigbee	Marion	pH	4th QTR FY08
Purgatory Creek	AL03160103-0204-203	Upper Tombigbee	Marion	pH	4th QTR FY08

Table 2-7 TMDL Development Plan for FY 2008 and FY 2009 (Continued)

FISCAL YEAR 2009					
Bassett Creek	AL03160203-0601-100	Lower Tombigbee	Clarke	Pathogens	4th QTR FY08
Mud Creek	AL03160109-0201-102	Black Warrior	Cullman	Organic Enrichment/ DO	4th QTR FY09
Lost Creek	AL03160109-0403-103	Black Warrior	Walker	Siltation Other habitat altera-tions	4th QTR FY09
Black Branch	AL03160109-0404-500	Black Warrior	Walker	Metals pH Siltation Other habitat altera-tions	4th QTR FY09
Lost Creek	AL03160109-0405-102	Black Warrior	Walker	Siltation Other habitat altera-tions	4th QTR FY09
Wolf Creek	AL03160109-0503-101	Black Warrior	Walker	Siltation Other habitat altera-tions	4th QTR FY09
Ryan Creek	AL03160110-0502-100	Black Warrior	Cullman	Pathogens	4th QTR FY09
Dry Creek	AL03160111-0203-100	Black Warrior	Blount	Nutrients Ammonia Organic Enrichment/ DO Pathogens	4th QTR FY09
Newfound Creek	AL0316011-0406-101	Black Warrior	Jefferson	Biology	4th QTR FY09
Mud Creek	AL03160112-0105-101	Black Warrior	Jefferson	pH Siltation	4th QTR FY09
Big Yellow Creek	AL03160112-0201-101	Black Warrior	Tuscaloosa	Metals	4th QTR FY09
North River	AL03160112-0404-102	Black Warrior	Fayette Tuscaloosa	Nutrients Siltation Other habitat altera-tions	4th QTR FY09
Lee Branch	AL03150202-0103-300	Cahaba	Shelby	Pathogens	4th QTR FY09
Buck Creek	AL03150202-0202-101	Cahaba	Shelby	Pathogens	4th QTR FY09
Cahaba Valley Creek	AL03150202-0202-401	Cahaba	Shelby	Pathogens	4th QTR FY09
Barbour Creek	AL03130003-1307-100	Chattahoochee	Barbour	Siltation	4th QTR FY09
Mobile Bay	AL03160205-0104-100	Mobile	Mobile	Pathogens	4th QTR FY09

2.5 Summaries of Designated Use Support

Table 2-8 and Table 2-9 show the Size of Rivers and Streams Impaired by causes and sources respectively. For more information about Designated Use Support contact Mr. John Pate in ADEM's Montgomery Office at (334) 270-5662 or jtp@adem.state.al.us

Table 2-8 Size of Rivers and Streams Impaired by Causes

Rivers and Streams	Size of Water Impaired
Ammonia	32.14 miles
Chlorides	0.22 miles
Metals (Aluminum)	24.17 miles
Metals (Arsenic)	19.56 miles
Metals (Chromium)	29.24 miles
Metals (Copper)	1.54 miles
Metals (Cyanide)	12.43 miles
Metals (Iron)	69.97 miles
Metals (Lead)	31.00 miles
Metals (Mercury)	485.57 miles
Metals (Zinc)	0.22 miles
Nutrients	275.09 miles
Organic Enrichment - CBOD	132.09 miles
Organic Enrichment - NBOD	132.09 miles
Pathogens	375.66 miles
Pesticides (Chlordane)	2.04 miles
Pesticides (DDT)	18.77 miles
Pesticides (Dieldrin)	24.29 miles
pH	38.43 miles
Priority Organics (PCBs)	42.22 miles
Siltation (Habitat Alteration)	622.91 miles
Toxicity	9.26 miles
Turbidity	22.59 miles
Unknown	36.80 miles
Unknown Toxicity	31.81 miles
Total	2,470.11 miles

Table 2-9 Size of Rivers and Streams Impaired by Sources

Rivers and Streams	Size of Impaired Waters
Agriculture	441.23 miles
Atmospheric Deposition	91.5 miles
Collection System Failure	61.22 miles
Contaminated Sediments	65.2 miles
Feedlots	8.46 miles
Flow Regulation/Modification	4.21 miles
In Place contaminants	3.75 miles
Industrial	60.21 miles
Land Development	172.75 miles
Municipal	476..07 miles
Natural	66.73 miles
Non-irrigated crop production	115.49 miles
On-site wastewater systems	5.15 miles
Pasture Grazing	407.29 miles
Surface Mining	114.72 miles
Surface Mining-Abandoned	489.72 miles
Unknown Source	633.2 miles
Urban Runoff/Storm Sewers	478.21 miles

2.6 Industrial River Monitoring

The Industrial River Monitoring Program is a water quality monitoring program with the participation of twenty (20) facilities located within various river basins. The purpose of the river monitoring program is to assess the impact of the facilities discharge on the receiving streams. Each facility's NPDES permit contains specific monitoring requirements which may include parameters such as pH, DO, H_2O Temperature, BOD_5, etc. Most of the facilities which collect this type of information are pulp and paper mills although other types of industries are included. Much of the sampling takes place during the months May through September when critical water quality conditions are likely. This information was particularly useful in assessing the effects of the drought during the summer and fall of 2007. Table 2-10 and Figure 2-3 show industrial facilities that conduct river monitoring.

For more information about Industrial River Monitoring contact Ms. Carla Crews in ADEM's Montgomery Office at (334) 271-7804 or Ccrews@adem.state.al.us

Table 2-10 Industrial River Monitoring

Facility Name	NPDES #	Facility Type	Parameters Sampled	Receiving Stream Name	Number of Stations	River Basin	City	County
ABC Coke	AL0003417	Iron and Steel Manufacturer	Stream Temperature, pH, Turbidity, Total Cyanide, Available Cyanide, Stream Depth	Five Mile Creek	2	Warrior	Birmingham	Jefferson
Alabama River Pulp Co., Inc.	AL0025968	Paper Mill	D.O. (at 5 foot depth), BOD5, Stream Temperature and pH	Alabama River	5	Alabama	Claiborne	Monroe
Boise White Paper LLC	AL0002755	Paper Mill	D.O. (at 5 foot depth), BOD5, Stream Temperature and pH	Tombigbee River	6	Lower Tombigbee	Jackson	Clarke
Bon Secour Fisheries	AL0003298	Seafood Processing	Stream Temperature, pH, DO, Salinity	Bon Secour River	3	Mobile Bay	Bon Secour	Baldwin
Bowater Alabama Inc.	AL0003158	Paper Mill	D.O. (at 5 foot depth),Sample Time, Stream Temperature and pH	Coosa River	17	Coosa	Coosa Pines	Talladega
Carson & Company, Inc.	AL0048194	Seafood Processing	Stream Temperature, pH, DO, Salinity	Bon Secour River	3	Mobile Bay	Bon Secour	Baldwin
Ciba Specialty Chemical	AL0003093	Chemical Plant	Stream Temperature, pH, DO, Chloride,	Tombigbee River	6	Lower Tombigbee	McIntosh	Washington
Degussa Corporation	AL0023272	Chemical Plant	D.O. (at half -meter increments from 0.5 to a depth of 4.5 meters), Salinity, Conductivity, BOD5, Stream Temperature and pH	Theodore Industrial Barge Canal or Middle Fork Deer River	8	Mobile	Theodore	Mobile
Georgia Pacific Naheola Mill	AL0003301	Paper Mill	D.O. (at 5 foot depth), BOD5, Stream Temperature and pH	Tombigbee River	2	Lower Tombigbee	Pennington	Choctaw
International Paper-Courtland Mill	AL0000396	Paper Mill	D.O. (at 5 foot depth), BOD5, Stream Temperature and pH	Tennessee River	5	Tennessee	Courtland	Lawrence
International Paper- Prattville Mill	AL0003115	Paper Mill	D.O. (at 5 foot depth), BOD5, Stream Temperature and pH	Alabama River	10	Alabama	Prattville	Autauga
International Paper- Riverdale Mill	AL0003018	Paper Mill	D.O. (at 5 foot depth)	Alabama River	1	Alabama	Selma	Dallas
Kimberly-Clark Corporation Mobile Mill	AL0002801	Paper Mill	D.O. (at 5 foot depth), Conductivity, pH and Temperature (both ambient & stream)	Mobile River	5	Mobile	Mobile	Mobile
MeadWestvaco Coated Board (non-continuous)	AL0000817	Paper Mill	D.O. (at 5 foot depth), Stream Temperature and pH	Chattahoochee River	12	Chattahoochee	Cottonton	Russell
MeadWestvaco Coated Board (continuous)	AL0000817	Paper Mill	D.O. (at 5 foot depth), Stream Temperature and pH	Chattahoochee River	4			
Rock-Tenn Company	AL0002828	Paper Mill	D.O. (at 5 foot depth), BOD5, Stream Temperature and pH	Tombigbee River	2	Lower Tombigbee	Demopolis	Marengo
SCA Tissue NA LLC (Barton Operations)	AL0074667	Paper Mill	D.O. (at 5 foot depth), Stream Temperature and pH	Tennessee River	3	Tennessee	Cherokee	Colbert
Sloss Industries	AL0003247	Iron and Steel Manufacturer	Stream Depth, Stream Temperature, pH, Hardness, Turbidity, Total Cyanide, Available Cyanide	Five Mile Creek	2	Warrior	Birmingham	Jefferson
Smurfit-Stone Container Corporation	AL0022314	Paper Mill	D.O. (at 5 foot depth), Stream Temperature and pH	Tennessee River	6	Tennessee	Stevenson	Jackson
Smurfit-Stone Corporation Brewton Mill, Inc.	AL0002682	Paper Mill	D.O. (at 5 foot depth), BOD5, Stream Temperature, Color and pH	Conecuh River	3	Perdido-Escambia	Brewton	Escambia
Weyerhaeuser Pine Hill Mill (Weyco)	AL0002674	Paper Mill	D.O. (at 5 foot depth), Stream Temperature and pH	Alabama River	8	Alabama	Pine Hill	Wilcox

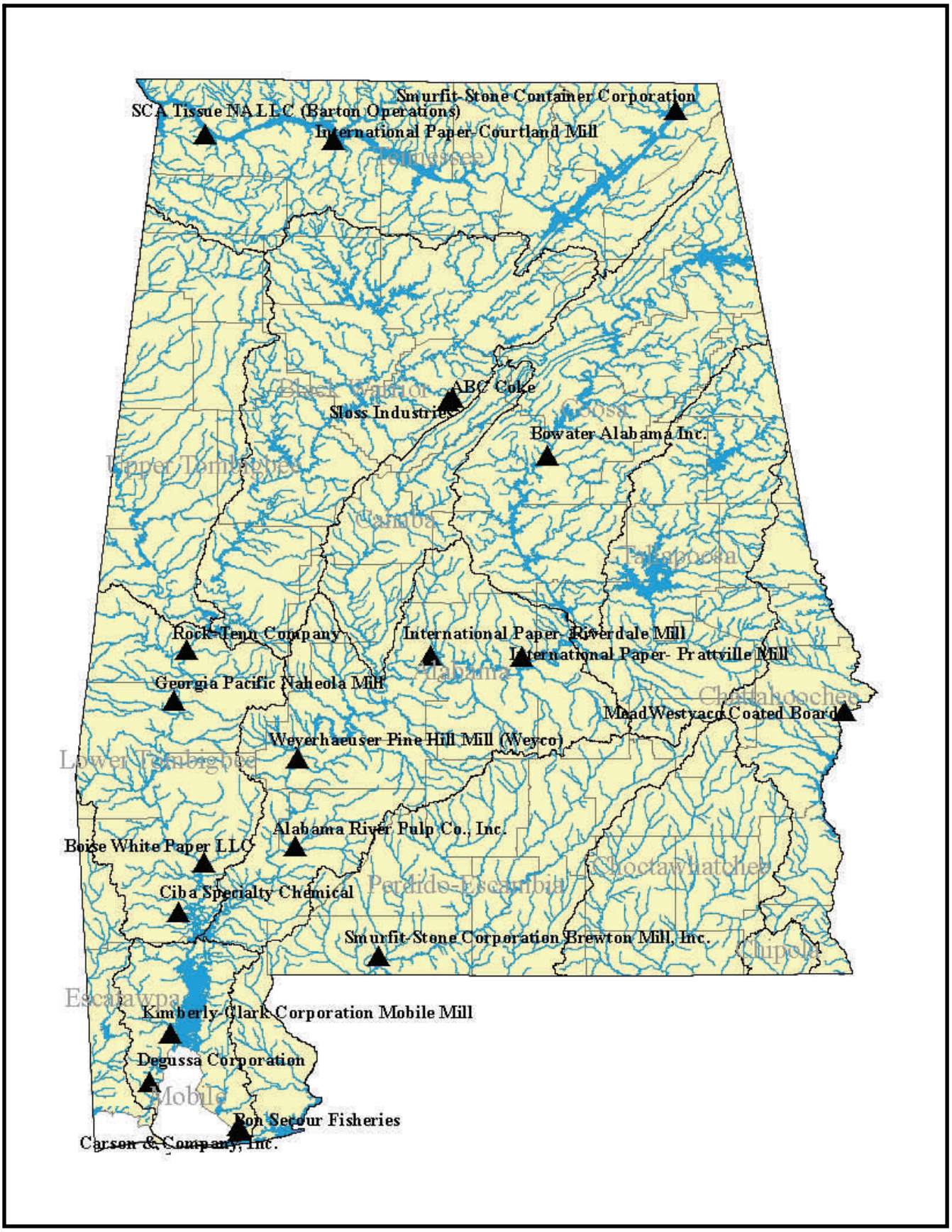



Figure 2-4 Representation of Industrial River Monitoring