STATE OF MISSISSIPPI

WATER QUALITY ASSESSMENT

1998

Pursuant to Section 305(b) of the

Clean Water Act

Prepared by the

Mississippi Department of Environmental Quality

Office of Pollution Control

P. O. Box 10385

Jackson, Mississippi 39289-0385

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Mississippi's 1998 Water Quality Assessment Report was prepared by the Office of Pollution Control of the Mississippi Department of Environmental Quality pursuant to Section 305(b) of the Federal Clean Water Act. The report was the immediate responsibility of the Surface Water Division's Water Quality Assessment Branch. In addition to the Water Quality Assessment Branch, personnel of the Field Services Division, Laboratory, Groundwater Division, Hazardous Waste Division, and others within the Surface Water Division contributed to the report. The purpose of the report is to describe the most recently known status of the quality of the State's waters.

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BACKGROUND AND PURPOSE

Mississippi's 1998 Water Quality Assessment Report was prepared by the Office of Pollution Control of the Mississippi Department of Environmental Quality pursuant to Section 305(b) of the Federal Clean Water Act. The report was the immediate responsibility of the Surface Water Division's Water Quality Assessment Branch. In addition to the Water Quality Assessment Branch, personnel of the Field Services Division, Ground Water Division, Hazardous Waste Division, and others within the Surface Water Division contributed to the report. Other state and federal resource agencies also contributed data and information.

The purpose of Mississippi's 1998 Water Quality Assessment Report is to describe for EPA, Congress, and the public the status of the quality of the State's waters. Along with water quality information, the report also gives the causes and sources of pollution for those waters impaired. In addition, water pollution control programs for point and nonpoint sources of pollution are discussed. Environmental improvements for the past two years are documented. Special concerns and problems remaining are noted. Also, the State's water quality monitoring program is described. In addition to describing the fixed station ambient monitoring program, various other monitoring programs and special studies are presented. Issues relating to ground water quality are also addressed. Recommendations are given for needed studies, programs and funding to adequately address Mississippi's water quality problems.

TOTAL WATERS

Mississippi's 47,700 square miles are divided into ten major stream basins totaling an excess of 84,000 miles of streams and rivers. Of these miles, 31.5% are perennial, while 65% are intermittent. The remaining 3.5% are man-made ditches and canals. The Mississippi River (approximately 400 miles) and the Pearl River (approximately 80 miles) run along Mississippi's border with Arkansas and Louisiana. The State is covered with hundreds of publicly owned lakes, reservoirs and ponds covering a combined area of approximately 500,000 acres. Wetlands cover an estimated 4,067,000 acres, of which, approximately 66,000 acres are tidal marsh. The southern edge of Mississippi's contiguous land mass borders the Mississippi Sound. The coastline along the Mississippi Sound, around the inland bays, and around the State's Barrier Islands totals approximately 245 miles. The total area of estuarine waters is approximately 760 square miles. Estuarine waters include the Bay of St. Louis, Back Bay of Biloxi, Pascagoula Bay, Mississippi Sound, and the portion of the Gulf of Mexico three miles south of the Barrier Islands.

All waters of the State are classified for uses consistent with the goals of the Clean Water Act. Waters are classified according to one or more of the following classifications: Public Water Supply; Shellfish Harvesting; Recreation; Fish and Wildlife; and Ephemeral Stream. No significant changes in waterbody classifications have occurred since the 1994 Section 305(b) report. While a waterbody in Mississippi usually has only one formally adopted classification, it may support one or more uses. Mississippi's waters are used for drinking and food processing, shellfishing, recreation and for fishing and aquatic life support. A waterbody (part or all of a stream, river, lake, estuary or coastline) normally supports one or more of these uses.

SURFACE WATER QUALITY SUMMARY

Assessment Methodology

The Mississippi Department of Environmental Quality (MDEQ) assesses the surface waters of the State every two years to determine if their uses are supported. Each use assessed for a waterbody is determined to be either Fully Supported, Fully Supported but Threatened, Partially Supported, or Not Supported in accordance with its water quality standards. A use is said to be impaired when it is only partially supported or not supported at all. While the focus of Mississippi's 1998 Water Quality Assessment Report is use support, attainment of Clean Water Act goals may also be determined from the assessment information.

For the 1998 Water Quality Assessment Report, MDEQ assessed the Mississippi’s streams, rivers, lakes, estuaries and coastlines using all existing and readily available information. Two types of assessments were made: "evaluated" assessments and "monitored" assessments. "Evaluated" assessments are based on information other than current site-specific ambient monitoring data, such as land use data, surveys and questionnaires, location of potential pollution sources and monitoring data greater than five years old. "Monitored" assessments are based primarily on current site-specific ambient monitoring data believed to accurately portray existing water quality conditions. Assessments to determine use support on a waterbody were based either on monitoring data, on other evaluated information, or on both.

All information collected during the assessment process was placed in EPA's Waterbody System version WBS96. WBS96 was useful for maintaining the quality and consistency of our assessments. Some of the information placed in WBS96 for each waterbody included location and description, assessment types, assessment category (evaluated or monitored), use support determinations, causes of impairment, and sources of impairment. WBS96 allows for the linking of impairment causes and sources. However, we did not have the information or resources to link causes and sources of impairment. WBS96 was used to generate the various required summary tables for each waterbody type for this report. In addition, the WBS96 files for the 1998 assessment were submitted electronically to EPA.

Assessment Methodology - Monitored Assessments

Whenever possible, assessments were made using current site-specific monitoring data. A waterbody was considered monitored if sufficient (both in quantity and quality) physical, chemical, biological, bacteriological, and/or fish tissue data were collected on the waterbody at any time within the appropriate data window for this assessment (1992 - 1997). The length of record of the data, the type of data and the frequency at which the data were collected were considered when making use support determinations.

Monitoring data collected from 1992 through 1997 were acquired from various resource agencies and institutions. Data collected by the Mississippi Department of Environmental Quality (MDEQ), US Army Corps of Engineers (USACE), Tennessee Valley Authority (TVA), US Geological Survey (USGS), Environmental Protection Agency (EPA), Mississippi Department of Marine Resources (DMR), University of Southern Mississippi - Gulf Coast Research Lab (GCRL), USDA Natural Resources Conservation Service (NRCS), U.S. Forest Service (USFS), and the National Oceanic and Atmospheric Administration (NOAA) were used. Most of the data were compiled and analyzed using EPA's STORET database. The remaining data were compiled and analyzed manually. Monitoring data were then compared to applicable water quality numeric criteria. This allowed MDEQ to determine which pollutant specific criteria were violated. For select water quality parameters having no specified numeric criteria, data were compared to target values which, based on best professional judgement, indicate threshold levels of water quality concern.

The size of a waterbody represented by a single monitoring site was determined based on EPA guidance. In general, data from a monitoring site on a wadeable stream represent no more than five to ten miles. Data from a monitoring site on a larger stream represent about 25 miles. For large rivers, data from a monitoring site represent 50 to 75 miles. At times during the assessment process, these guidelines were modified slightly to account for point source outfalls, major tributaries and change in land cover. For lakes, data from a monitoring site were considered representative of the entire lake for small lakes. For larger lakes, data from a monitoring site were considered representative of part of the lake. In the absence of a specific guideline, best professional judgment was used to determine the portion of the lake represented by the monitoring site. In the case of estuarine and coastal waters, data from a monitoring site were considered to represent an area within a four-mile radius for open water stations. Radii of two miles and a half-mile were used for bay monitoring sites and sheltered bay sites, respectively.

The degree of use support determination was made based on specific screening criteria provided by EPA (EPA 841 B-97-002B, September, 1997). Different guidelines were used for the categories of Designated Use Fully Supported (FS), Designated Use Fully Supported but Threatened (T), Designated Use Partially Supported (PS) and Designated use Not Supported (NS).

Assessment Methodology - Evaluated Assessments

The Mississippi Nonpoint Source Pollution Assessment Report was the primary source for evaluated assessments. Nonpoint source (NPS) pollution is defined in general as pollution from diffuse sources that are not regulated as point sources. NPS pollution is normally associated with agricultural, silvicultural and urban runoff, and runoff from construction activities. The NPS Pollution Assessment Report, completed in 1989 and prepared pursuant to Section 319 of the Clean Water Act, was an assessment made of all waters of the State using either current (at that time) monitoring data or factors such as land use, location of pollution sources or citizen complaints. The purpose of the NPS Pollution Assessment Report was to identify state waters which, without additional action to control nonpoint source pollution, could not reasonably be expected to attain or maintain applicable water quality standards. The report also listed pollutants or causes of impairment and the sources of the pollutants for each identified waterbody or watershed. With the lack of extensive statewide ambient monitoring data, the majority of information received for this report was largely in the form of surveys or questionnaires returned to MDEQ by NRCS field personnel. Consequently, the report focuses mainly on information regarding agricultural, silvicultural, and urban sources of nonpoint pollution and includes many waterbody segments for which no known monitoring data exists indicating impairment.

Waters listed in the NPS Pollution Assessment Report were considered partially supporting of their uses for the 1998 305(b) Report. However, it should be pointed out that most of the waters listed in the Nonpoint Source Assessment Report were not monitored and therefore, no known impairment exists. Consequently, the partially supporting determination for these waters is based strictly on evaluation. OPC considers these evaluated waterbody segments (in many cases large portions of, or entire NRCS watersheds) as NPS “waters of concern” warranting further investigation. These NPS-evaluated waters make up the majority of the evaluated waters reported in this 305(b) Assessment.

In addition to the information in the NPS Pollution Assessment Report, evaluated assessments were made using other information as well. Evaluated assessments were made using the locations of point sources significantly out of compliance with their permit limits during the past two years. Also, the locations of fish kills during the past two years were used. Data collected by volunteer monitors under the Adopt-A-Stream Mississippi program were also used for evaluated assessments. In addition, available monitoring data greater than five years old from other state and federal agencies and MDEQ were used and assessed as evaluated.

Assessment Methodology - Basin Assessments and Maps

A summary of the water quality of Mississippi's ten major river or drainage basins follows the assessment discussions for the various waterbody types. The ten basins are the Big Black River Basin, the Coastal Streams Basin, the Mississippi River Basin, the North Independent Streams Basin, the Pascagoula River Basin, the Pearl River Basin, the South Independent Streams Basin, the Tennessee River Basin, the Tombigbee River Basin and the Yazoo River Basin. The basins' boundaries are shown on a statewide map in Figure III-8. Tables listing monitoring stations used for the 1998 assessment and showing use support information based on the type of data collected are included. Maps showing the locations of the monitoring stations are also included in Figure III-1.

Section 303(d) Waters

Section 303(d) of the Clean Water Act and the implementing federal regulations at 40 C. F. R. ' 130.7 require the State to identify and list waterbody segments that are *known* to be water quality limited or that are otherwise expected to be water quality limited (40 C.F.R. ' 130.2(j)); establish a priority ranking for the impaired waters taking into account the severity of the pollution and the importance of the water's impaired use; and develop TMDLs for those pollutants impairing any use of the waterbody, establishing pollutant level reductions that will cause the impaired use to be fully supported.

In 1996, Mississippi's Section 303(d) List of Impaired Waterbodies included not only monitored segments, but also evaluated segments for which MDEQ lacked monitoring data. These evaluated segments were taken primarily from MDEQ's 1989 Nonpoint Source (NPS) Assessment document that included numerous NRCS delineated watersheds. These segments were not (and are not) known to be impaired, but were (and remain) on the list based upon the information gleaned from NPS surveys and questionnaires. Placing these evaluated segments on the 1996 list produced a very long list that included both monitored waterbody segments with known impairment and merely evaluated segments (most of them entire watersheds) for which no known monitoring data indicated impairment.

In 1998, MDEQ again listed the evaluated segments on the Section's 303(d) list. However, continued listing of a merely evaluated segment on the 1998 Section 303(d) list may lead to the assumption that a NPDES permit issued allowing a discharge of a pollutant into the listed segment would "cause or contribute to a violation of water quality standards" in violation of 40 C.F.R. § 122.4(i). This assumption is not valid for evaluated (unmonitored) segments. While it is appropriate to list segments based on anecdotal evidence and broad assumptions when the purpose of the list is to reflect a commitment to monitor the segment, it is not justifiable to use those assumptions regarding evaluated segments to deny a permit to which the applicant otherwise is entitled. This denial would be both an arbitrary and capricious decision of the Mississippi Environmental Quality Permit Board and a violation of the applicant's right to due process. This problem in "translation" between the commitment of an agency to monitor waters and that agency’s permitting process causes MDEQ now clearly to distinguish the import of a segment’s listing as either monitored or evaluated. In short, for permitting purposes no presumption of impairment arises due to a segment’s listing as “evaluated”. MDEQ, however, will use site-specific and application-specific data to determine whether any evaluated segment should undergo additional water quality modeling or monitoring prior to the issuance of any permit for discharge into that segment.

Because of the significant difference between monitored and evaluated segments, MDEQ no longer blends the monitored waters and the evaluated waters in its Section 303(d) list. For this reason, the 1998 list differs from the list developed in 1996; however, this modification has not caused the removal of any segment found on the 1996 list. For 1998, evaluated waters (based on evaluation only, no monitoring data) are now shown after the monitored waters in a second section of the list. MDEQ is committed to determining whether these evaluated waters actually are impaired. MDEQ will monitor these waters as it implements and proceeds through the State’s Basinwide Approach to Water Quality Management. If monitoring data indicates a waterbody segment is impaired, the segment will be moved to the State’s monitored part of the list. Conversely, if monitoring indicates the water’s uses are fully supported, the segment will be removed from the list.

Mississippi has fulfilled its obligation with respect to Section 303(d) of the Federal Clean Water Act. The document developed to meet the State’s Section 303(d) requirements includes Mississippi’s List of Waterbodies, and includes an identification of pollutants causing or potentially causing for evaluated segments the use impairment. Additionally, the 1998 Mississippi Section 303(d) List of Waterbodies includes a Priority Ranking of Waterbodies. The document also includes a discussion of the waterbodies targeted for TMDL development during 1998 and 1999. Also available is a companion document listing pollution causes delisted from the 1996 Section 303(d) list, along with the rationale for making the delisting decision.

The State submitted its draft Section 303(d) list to EPA in February 1998 at the beginning of the public notice period required for the list. MDEQ received comments from the public and EPA regarding the initial 1998 list. Also, during that review period, NPDES permitting in Mississippi began to be questioned in reference to the 303(d) list. These new ramifications for the list required additional time for EPA and Mississippi to work out the future NPDES permitting and the 303(d) list. In January 1999, Mississippi submitted a revised Section 303(d) List of Waterbodies to EPA for approval. EPA’s comments which generally only requested clarification have been reviewed and addressed. A final 1998 Section 303(d) list was submitted to EPA in April 1999.

Use Support Summary

MDEQ assessed approximately 46% of Mississippi's total 84,003 miles of streams and rivers. The degree of use support is unknown for the remaining 54% of the total length of streams and rivers in Mississippi. Of the amount assessed, evaluated assessments made up approximately 93%, while monitored assessments made up about 7%. No distinction was made between perennial and intermittent streams during the assessment process, however, most monitoring was conducted on perennial waters. Of Mississippi's assessed length of streams and rivers, approximately 2% fully support all assessed uses. Another 2.0% fully support all assessed uses, but support is threatened for at least one use. Approximately 96% of the rivers and streams assessed are listed as impaired for one or more uses. The assessments for the vast majority of these waters, however, were based on evaluative data (i.e., predominantly land-use activities) obtained from the State’s Nonpoint Source Assessment Report and were not directly monitored.

MDEQ assessed approximately 58% of its estimated 500,000 acres of freshwater lakes. The water quality status of the remaining 42% is unknown. Of the amount assessed, evaluated assessments made up approximately 5.7%, while monitored assessments made up about 94.3%. Based on the total size, Mississippi monitored approximately 55% of its lake acreage. Of Mississippi's assessed lake acreage, approximately 41% fully support all assessed uses. Another 47% fully support all assessed uses, but support is threatened for at least one use. Approximately 12% are impaired for one or more uses.

MDEQ assessed approximately 40% of the State's total square miles of estuaries. The use support status of the remaining 60% is unknown. Of the amount assessed, evaluated assessments made up approximately 0.5%, while monitored assessments made up about 99.5%. Although a large area was monitored, many of the state's estuaries were only monitored for bacteria. Of Mississippi's assessed area of estuaries, approximately 32% fully support all assessed uses. Another 48% fully support all assessed uses, but support is threatened for at least one use. Approximately 20% are impaired for one or more uses.

MDEQ assessed approximately 74% of the State's total 245 miles of coastal shoreline. The use support status of the remaining 26% is unknown. Of the amount assessed, evaluated assessments made up approximately 37%, while monitored assessments made up about 63%. Although a large area was monitored, much of the State's shoreline was only monitored for bacteria. Of Mississippi's assessed shoreline, approximately 15.6% fully support all assessed uses. Another 45% fully support all assessed uses, but support is threatened for at least one use. Approximately 39.6% are impaired for one or more uses.

In general, Mississippi's surface waters are of good (uses fully supported) to fair (uses partially supported) quality. A summary of use support for the State's waters is shown in the following tables.

TABLE I-1

State of Mississippi

Assessed Waters as a Percent of Total Waters

(1998 Assessment)

Category	River Miles	Rivers Percent	Lake Acreage	Lakes Percent	Estuary Sq. Miles	Estuaries Percent	Coastline Miles	Coastline Percent
Assessed	39080	46%	289269	58%	285	38%	181	74%
Unknown	44923	54%	210731	42%	475	64%	64	26%
Total	84003	100%	500000	100%	760	100%	245	100%

TABLE I-2
Total Waters - Use Support Summary

(1998 Assessment)

Degree of Use Support	Rivers	Lakes	Estuaries	Coastline
Percent Fully Supporting All Assessed Uses	1	24	13	12
Percent Fully Supporting but Threatened for at Least One Use	1	27	19	33
Percent Partially/or Not Supporting for One or More Uses	44	7	8	29
Percent Assessed	46	58	40	74
Percent Unknown	54	42	60	26

Waterbody Type

Causes and Sources of Impairment of Designated Uses

Causes and sources of impairment were assigned for all waterbodies having one or more uses impaired. For the majority of miles of assessed monitored rivers with major environmental impacts, impairment is caused by pathogens, nutrients, and unknown pollutants contributing to biological impairment and to a lesser extent by priority organics, metals, organic enrichment/low D.O., turbidity, and salinity. For the stream miles with moderate or minor impacts, potential impairment is caused by these same categories along with unknown toxicity, oil and grease, pesticides, siltation, other habitat alterations, and pH.

Pollutants causing major impacts to lakes are relatively few in relation to the total lake acreage impacted in the state. A major fish kill due to pesticides occurred in one lake in the Yazoo River Basin. Another small lake is significantly impaired by priority organics. Moderate or minor impacts on lakes are due to metals, pesticides, nutrients, siltation, and organic enrichment. No lakes in Mississippi have currently been identified as being affected by high acidity.

There are no known pollutants significantly impairing the State's estuaries. Mostly moderate or minor impacts are localized and occur resulting from unknown toxicity, priority and nonpriority organics, metals, nutrients, turbidity, organic enrichment/D.O., pH and pathogens.

No coastal shorelines were known to have pollutants causing major impacts. Moderate or minor impacts are caused especially by pathogens and to a lesser extent by nutrients, turbidity, metals, organic enrichment/low D.O., priority and nonpriority organics and pH.

Nonpoint sources of pollution are the most significant contributors of pollutants to the majority of rivers and lakes impaired. Less significant sources contributing pollutants are industrial and municipal point sources and other nonpoint sources such as silviculture, urban runoff, failing septic tanks and hydrologic modifications.

Nonpoint sources of pollution are also the most significant contributors of pollutants to the majority of estuaries and coastline. Impairment in coastal estuaries and along the coastline is caused primarily by urban runoff, failing septic tanks and other nonpoint sources. In places, minor impairment is also caused by industrial and municipal point sources.

With the implementation of control measures most, if not all, of Mississippi's waters could fully support their uses and attain the fishable and swimmable goals of the Clean Water Act.

WATER POLLUTION CONTROL PROGRAMS

Surface Water Division

The quality of Mississippi's surface waters has a profound effect upon the health and welfare of citizens, wildlife, fish and aquatic life. Surface water quality also significantly affects domestic, agricultural, industrial and recreational water use activities. The Surface Water Division (SWD) of the MDEQ Office of Pollution Control (OPC) is responsible for protecting the quality of the State's waters and ensuring that designated uses are supported.

The SWD considers water quality management its highest priority. The foundation of all water quality management activities is the "State of Mississippi Water Quality Criteria for Intrastate, Interstate and Coastal Waters" water quality standards adopted by the Mississippi Commission on Environmental Quality. The intent of these standards is both to protect water quality existing at the time the standards are adopted and to enhance water quality within the state. The SWD has carefully assessed the water quality problems in the state and has formulated a strategy consistent with federal guidelines for dealing with these problems.

The SWD has two pollution control programs. One program deals with point sources of pollution and the other deals with nonpoint sources of pollution. Receiving waters are protected from point source pollution by requiring, as a part of the initial project design, the highest and best practicable treatment available under existing technology. For waters receiving nonpoint source pollution, best land use management practices are encouraged. The Field Services Division provides field and laboratory support for the programs of the SWD.

Point Source Control Program

The goal of the Point Source Control Program is for waters receiving wastewater discharges to meet water quality criteria and support designated uses. The most efficient and effective way of controlling point source pollution is through a comprehensive discharge permitting program. In February 1994, MDEQ adopted comprehensive permitting regulations that provide detailed procedures for the development and issuance of permits. The regulations include specific protocols for conventional and toxic pollutant water quality-based effluent limitations. Requirements for permitting stormwater runoff and activities requiring water qualifications are also included. An inspection and compliance program ensures that permit conditions are met.

In 1998, OPC underwent a major reengineering effort. As a result of this process, permitting duties were divided between the SWD and the newly created Environmental Permits Division (EPD). The SWD issues non-industrial NPDES and State Operating permits (SOP), and Water Quality Certifications for Dredge and

Fill permits. The EPD issues industrial NPDES and SOP permits, Pretreatment, and Stormwater permits.

Nonpoint Source Control Program

Nonpoint source (NPS) pollution is pollution in runoff from the land. Rainfall, snowmelt and other water that does not evaporate becomes surface runoff and either drains into surface waters or soaks into the soil and finds its way into ground water. This runoff can pick up and carry soil particles, fertilizers, pesticides, chemicals, animal wastes, nutrients, motor vehicle wastes and other pollutants. These pollutants come from land use activities such as: agriculture; construction; silviculture; surface mining; disposal of wastewater; hydrologic modification; and urban development. Often, NPS pollution impairs the chemical, physical, biological and radiological integrity of Mississippi's water resources.

Pursuant to Section 319 of the Clean Water Act of 1987, the Office of Pollution Control (OPC) prepared a Nonpoint Source Assessment Report that was approved by EPA in August of 1989. The report includes a list of watersheds and waterbodies that cannot reasonably be expected to attain or maintain water quality standards without additional nonpoint source pollution controls. The report also includes a description of the process for developing Best Management Practices to control the various sources of nonpoint source pollution. In addition, existing state and local programs which currently control nonpoint sources of pollution are listed.

Previous assessments (including the 1989 NPS Assessment Report) of water quality in Mississippi indicate that NPS pollution is responsible for the impairment of most state waters. EPA authorized the expenditure of up to $250,000 of 1996 Section 319 grant funds to conduct watershed assessments. The OPC is planning to begin an assessment of state waters on a basin by basin approach to update the 1989 NPS Assessment Report. Up to date basin information will enable agencies to more effectively direct resources to control NPS pollution, thus improving water quality in numerous lakes and streams.

Pursuant to Section 319 of the Clean Water Act of 1987, the OPC also prepared a Nonpoint Source Management Program document that was also approved by EPA in August of 1989. This document includes an identification of Best Management Practices for various sources of NPS pollution, an identification of needed implementation programs, a four-year NPS action plan, and an identification of sources of assistance and funding. The program document is currently being updated to reflect past achievements, revised program goals and changes in water quality due to changes in land use.

Although MDEQ serves as the lead agency in Mississippi for water quality management initiatives, the responsibility for controlling NPS pollution belongs primarily to landowners and users. However, many federal and state agencies, and local governments work to address NPS pollution issues and assist landowners. These organizations conduct programs that address NPS pollution from agriculture, silviculture, resource extraction, urban runoff, construction, and hydrologic modifications. NPS pollution is also addressed by not-for-profit organizations, educational institutions, citizen groups, and volunteers. Private and public initiatives range from informational and educational projects, to watershed land treatment projects, to monitoring projects. The major NPS pollution control initiatives in Mississippi are listed in this report.

To address NPS pollution in Gulf Coast waters, the MDEQ and the Mississippi Department of Marine Resources (DMR) have implemented the Coastal Zone Act Reauthorization Amendments (CZARA). MDEQ and DMR, the lead agency, jointly prepared the Coastal NPS plan which is currently under review by EPA and NOAA. The Coastal Zone Program will serve as a tool for use in conjunction with the state's NPS program to intensify NPS pollution control efforts along the Gulf Coast.

The MDEQ realizes that the effectiveness of the NPS Program depends on the cooperation and coordination of agencies initiating and implementing NPS projects. To ensure this cooperation and coordination an Interagency Water Quality Task Force (IWQTF) was created. The task force helps identify and foster interagency relationships, clarify agency roles, and coordinate water quality improvement efforts in Mississippi. The task force includes representatives from all of the major agencies and organizations involved in NPS issues.

To date, the OPC's Water Quality Management Branch (WQMB) has secured federal grants totaling $11,762,000 to address NPS pollution. These funds were obligated to implement 44 NPS water quality improvement projects. These projects are of four types: BMP effectiveness demonstration projects; new BMP technology demonstration projects; monitoring and assessment projects; and water quality education projects. The four project types are described in this report and a list of projects for each type is given.

Basinwide Approach to Water Quality Management

The Mississippi Basinwide Approach to Water Quality Management is an effort to conduct comprehensive water quality planning and to foster the implementation of practices that will result in water quality protection on a basinwide scale. This approach recognizes the interdependence of water quality on the many related activities that occur in a drainage basin. Some of these activities include monitoring, assessment, problem identification, problem prioritization, planning, permitting, water use and land use. In Mississippi's Basinwide Approach to Water Quality Management, these activities and their associated information will be integrated by basin, resulting in basin management plans and implementation strategies that will serve to focus water quality protection efforts.

The overall goal of Mississippi's Basinwide Approach is to efficiently develop effective and consistent long range management strategies that protect the quality and intended uses of Mississippi's water resources and allow for environmentally sound economic planning and development. MDEQ is beginning to manage its water programs on a basinwide scale and intends to develop basin management plans for each of Mississippi's major river basins. These basins will serve as the hydrological boundaries that guide MDEQ's water quality activities. The majority of water quality management activities in these basins will be based on a repeating five-year management cycle. Because of the five-year rotation, all of Mississippi's river basins will be placed into five basin groups so that all basins will receive equal focus. A listing and map of the basin groups as well as a description of the basin cycle activities is given in this report.

Emergency Pollution Control

The OPC's Emergency Response Branch (ERB) is responsible for providing quick response to releases of hazardous substances and wastes and requiring containment, cleanup or other mitigation measures. The program routinely responds to releases of hazardous substances and wastes from transportation accidents and incidents (e.g., train derailments, semi-truck wrecks, etc.), industrial/commercial fires, illegally dumped barrels and containers, and oil spills. The ERB's quick and professional response prevented the loss of hazardous substances to the state's water resources in many of these reported incidents. Consequently, the ERB has been very successful in preventing and mitigating impairment of water resources from releases of hazardous substances that could have had a significant adverse impact on the waters of the State.

Many spills occurred where the responsible party was financially unable or unwilling to assume responsibility for the cleanup of the spill. In these cases, the ERB used the Pollution Abatement Fund to hire the necessary contractors to clean the spill-affected area. In cases where there is a responsible party, the MDEQ determines whether to pursue litigation to recover the funds expended for a contractor cleanup.

Wetlands Protection Activities

In Mississippi, wetlands are defined as "waters of the State", although, the State does not have separate use classifications nor numeric criteria for different types of wetlands. Narrative criteria are, however, considered applicable to wetlands. The State does not have legislation protecting wetlands statewide. However, activities in the three Gulf Coast counties that impact tidally influenced wetlands must be found to be consistent with the Mississippi Coastal Program, managed by the Mississippi Department of Marine Resources (DMR).

The State has not been delegated Section 404 permit authority and is not considering assumption of the Section 404 program. Section 404 of the Clean Water Act addresses a single class of water pollutants called dredge and fill material. The U.S. Army Corps of Engineers (USACE) administers this program. Wetlands regulated under Section 404 do, however, receive protection in Mississippi. An applicant needing a permit from the USACE must first receive a Section 401 Water Quality Certification from the Office of Pollution Control's (OPC) Water Quality Management Branch. Projects are reviewed for certification according to formal policies and guidelines developed by the OPC. If this certification is denied, the USACE's permit cannot be issued. The State may also use its anti-degradation policy to deny Section 401 Water Quality Certification. During project review, the OPC attempts to avoid any wetland losses by requesting that alternatives be considered. If practicable alternatives cannot be found, the OPC works to minimize the impacts of the project. Finally, for unavoidable losses, the OPC requests mitigation. Projects along the Gulf Coast must also be found to be consistent with the Mississippi Coastal Program, managed by the DMR. The OPC has a Memorandum of Agreement with the DMR that enables us to comment on coastal projects. The OPC also coordinates with the state's agriculture and forestry agencies when wetland projects are proposed.

One of Mississippi's significant accomplishments has been completion of Section 401 implementing regulations. These comprehensive regulations have gone through public review and were adopted in February of 1994. However, a portion of the regulations pertaining to the mining of sand and gravel were not initially adopted. After over a year of additional review and input from the public, the sand and gravel industry and environmental organizations, sand and gravel mining regulations were adopted in August of 1995. A major part of these regulations involves buffer or riparian zones. The OPC believes these riparian zones are crucial to the protection and enhancement of water resources. Riparian forests can be effective in removing excess nutrients and sediment from surface runoff and shallow groundwater and in shading streams to optimize light and temperature conditions for aquatic plants and animals. Stream-side forests also ameliorate the effects of some pesticides and directly provide dissolved and particulate organic food needed to maintain high biological productivity and diversity in the adjoining stream.

Ground Water Protection Program

Ground water protection efforts in Mississippi primarily focus on the development and implementation of the State's Wellhead Protection (WHP) Program at the local level. A considerable amount of time has been devoted to the development of various databases that will ensure compatibility with our geographic information system (GIS) and enhance administration of the WHP Program. Wellhead protection demonstration projects for several high priority public water supplies in the state are nearing completion. The OPC intends to use the success of these demonstration projects to create interest in cross-program coordination of ground water protection activities in Mississippi. It is anticipated that this strategy will kindle interest in development of a Comprehensive State Ground Water Protection Program.

The reauthorized Federal Safe Drinking Water Act (1996) requires States to develop and implement Source Water Assessment Programs (SWAPs) which identify potential contaminant sources in delineated Source Water Protection Areas. Although the Mississippi Department of Health (MSDH) regulates the public water systems in the state, the MDEQ has responsibility for development of the State SWAP. Since 1997, MDEQ has devoted a great deal of effort in developing an effective strategy to address all of the required program components. A draft of the State program plan will be submitted to EPA by the required deadline of February 6, 1999. Preliminary work on program implementation will continue until EPA approves Mississippi’s SWAP before November, 1999. After this deadline, MDEQ and MSDH will work together to ensure that susceptibility assessments are made available to the public in a timely fashion.

All of Mississippi's waters have been declared to be among the basic resources of the state, therefore, broad legislation exists for the protection and management of ground water, as well as, surface water resources. All potential sources of ground water contamination are addressed to some extent by state and/or federal regulations or statutes. Incidents involving contamination of underground sources of drinking water are pursued by the MDEQ and the Mississippi State Department of Health (MSDH) to define the source(s), initiate appropriate remedial action, and minimize the potential impact on public health.

SURFACE WATER MONITORING PROGRAM

Objectives

The objectives of the State's surface water quality monitoring program are diverse. The first objective is to develop and maintain an understanding of the quality of all waters within the state and the causes and effects of such quality. The second objective is to acquire the necessary data to accurately report on this water quality and its causes and effects. Thirdly, the monitoring program is utilized to support the state’s water quality management and regulatory programs and to assess the overall effectiveness of the state's pollution control program. This program effectiveness monitoring will not only document environmental improvements and successes, but also can identify problem areas where management priorities and resources need to be focused.

In order to accomplish these objectives, the MDEQ’s Office of Pollution Control (OPC) carries out a broad range of monitoring activities before and after implementing pollution controls. These multi-faceted activities consist of the actual measurement of water quality parameters in state waters followed by the investigation and evaluation of factors determining these water quality findings. The monitoring process culminates with an overall assessment of the specific effects of such quality upon the beneficial uses of state waters.

Monitoring Strategy

The State's surface water monitoring strategy utilizes a multi-faceted approach to realize program objectives. The OPC Surface Water Monitoring Program includes the following basic components:

1. Ambient fixed station monitoring network (including statewide coverage and geographically-targeted watershed or basin monitoring);

2. Intensive surveys and special studies;

3. Source compliance and environmental damage assessment monitoring;

4. Citizen's (volunteer) monitoring;

5. Laboratory support;

6. Quality assurance/quality control;

7. Data acquisition/data sharing with other agencies;

8. Data management, assessment and reporting.

Ambient Fixed Station Monitoring

In Mississippi, ambient fixed station monitoring is designed with the following objectives:

1. To characterize and assess statewide water quality status and trends in the state's stream, lake, estuarine and coastal waters for general reporting in the Section 305(b) Report to Congress and the annual development of the priority list of impaired waters as required in Section 303(d) of the Clean Water Act;

2. To address public interests and concerns on key waterbodies;

3. To support the design and implementation of OPC's Surface water Division water management programs including NPDES, nonpoint source, water quality standards, TMDL development, basin initiatives and water quality planning/management;

4. To evaluate the effectiveness of OPC's overall pollution control programs;

5. To address economic development interests and concerns.

In order to achieve these objectives, the OPC maintains a statewide fixed network of monitoring stations which are sampled routinely for a broad range of water quality parameters and indices. Parametric coverage at the stations includes physical, chemical, bacteriological, biological and/or fish tissue components. In 1997, OPC redesigned its ambient surface water monitoring program due to the critical need to increase the amount of assessed waters in the state and the availability of increased monitoring resources to meet this and other EPA and State Water Program needs. This resulted in a major increase in the number of ambient monitoring stations relative to the number of historical OPC ambient fixed network stations. In addition, this redesign of the OPC Ambient Surface Water Monitoring Program led to the establishment of a dual system of ambient fixed sampling stations which now consists of a statewide Primary Fixed Monitoring Network and a rotating Basin Fixed Monitoring Network. Data from this expanded network, however, was not available for this 305(b) report cycle. Consequently, the data reported in this assessment report are based on the ambient fixed station network stations active until CY1997.

Primary Fixed Station Monitoring Network

Primary stations are distributed throughout the northern, central, and southern regions of the state in streams, rivers, bayous and estuaries. This network consists of unpolluted streams, from which an assessment of baseline conditions can be made, streams below critical discharges, from which long-term trends can be established and/or improvements observed where pollution control measures are implemented, streams which represent a composite of a large watershed which will allow broad evaluations of overall abatement programs and waters of general concern (i.e., major streams entering or leaving the state and near-coastal waters). Several stations in the sampling network are historical stations that have data records dating back to the 1970's. In addition, many of these historical monitoring stations are long-time constituents of the U.S. Environmental Protection Agency's (EPA) Basic Water Monitoring Program that was designed on a national level to monitor nationwide water quality status and trends.

OPC’s new Primary Ambient Fixed Station Network consists of a total of 143 stations across the state and became operational in 1997. Prior to this time, OPC’s ambient monitoring network only numbered approximately 25 stations in any given year. The new network of statewide ambient primary fixed stations was established for systematic water quality sampling at regular intervals and for uniform parametric coverage to monitor water quality status and trends over a long-term period. The network has also enabled, for the first time, OPC to conduct routine, comprehensive long-term ambient monitoring of the states’ major lakes and reservoirs, as well as the open estuarine waters of the Mississippi Sound and its associated bays. Physical, chemical, and bacteriological parameters such as dissolved oxygen, temperature, pH, nutrients, solids, turbidity, heavy metals, and fecal coliform are collected on a monthly to quarterly basis. In addition, biological and fish tissue sampling is also conducted annually at selected primary ambient stations.

Ambient Biological and Fish Tissue Monitoring

The purpose of ambient biological monitoring is to assess the health or biological integrity of the aquatic community at a surface water site. This monitoring serves as a long-term indicator of stream water quality. The OPC's ambient biological monitoring program utilizes macroinvertebrate bioassessments in fresh waters, determinations of levels of chlorophyll a in lentic, marine and estuarine waters as well as fish tissue analysis at selected freshwater and estuarine sites. In addition, fish tissue sampling is conducted at many sites during fish kill investigations and for special studies such as the Mississippi Mercury Contamination Study.

In 1996, the entire historical ambient biological monitoring network was re-evaluated and modified, and approximately 40 fixed sites were established as macroinvertebrate status and trends sites for the new OPC Ambient Surface Water Monitoring Program. Sampling at these Primary Fixed Station Network macroinvertebrate sites began in 1997 and the sites are sampled on an annual basis using modified EPA rapid bioassessment techniques and include habitat assessments. The establishment of a Regional Biologist in each of the MDEQ field offices as well as the initiation of rotating basin studies in 1997 has greatly increased the number of biological assessments conducted on state waters. There has also been an increased demand for biological water quality information (particularly macrobenthic studies) to determine environmental damages caused by accidental spills of oil or other chemicals. In addition, macroinvertebrate bioassessments have been conducted to better define the state's ecoregions and to provide the data needed for consideration of biocriteria development.

Ambient fish tissue sampling occurs annually at 24 primary fixed stations across the state and at selected basin network sites. Additional fish tissue sampling for fish kill investigations, monitoring of fish advisory areas, and for special studies amounts to a significantly greater amount of the OPC fish tissue sampling load than ambient fixed station network sampling. The laboratory has the capability to analyze fish tissue samples for approximately 36 organic compounds, PCB’s, PCP and seven heavy metals, although it is rare when a sample is analyzed for all of the parameters.

Basin Fixed Station Monitoring Network

The OPC’s Basinwide Approach to Water Quality Management strategy is supported by a basin fixed station monitoring network which augments the statewide primary fixed station network by adding monitoring sites in specific drainage basins or watersheds. One objective of the basin monitoring network is to increase the total areal coverage of waters monitored in Mississippi. This objective is achieved by concentrating monitoring and assessment resources in specific drainage basins thereby maximizing sampling efficiency. As a consequence, basin management plans and implementation strategies may be developed. Another major objective of the basin network is to verify the actual water quality of waters assessed as "potentially impaired" and classified as “waters of concern” during a previous Section 305(b) reporting period, in cases where these assessments were based on evaluations rather than actual monitoring data. Such verification by monitoring ultimately confirms the accuracy of the state’s list of waterbodies prepared pursuant to Section 303(d).

Basin sampling is rotated annually among the five major basin groupings for the state so that each basin group is monitored every five years. The predominant sampling tool chosen for the basin stations is screening level biological assessment monitoring for benthic macroinvertebrates using modified EPA rapid bioassessment protocols. In addition, the basin monitoring effort utilizes multi-media sampling involving limited water chemistry, bacteria, algae, fish and/or sediment sampling. For chemical/physical and bacteriological station sampling, the stations are visited quarterly during the sampling year. The biological, fish and sediment station sampling occurs once generally during the late summer and fall of the year when low flow, warm temperature conditions are prevalent.

In FY97, the Pascagoula River Basin was targeted for monitoring as a pilot project for the Basinwide Approach strategy. The basin network for the Pascagoula Basin consisted of a total of 197 stations at 102 locations across the basin. For 1998, the Coastal Streams, North Independent Streams, and Tennessee River Basin group was targeted for basin monitoring.

Intensive Surveys and Special Studies

Intensive surveys and special studies are conducted by the OPC to meet a variety of site-specific water quality needs. Data generated from intensive surveys are primarily used for calibration and verification of mathematical computer models. These models are used to develop wasteload allocations (WLA) for wastewater discharges to predict water quality impacts of pollutants from these sources on the state's freshwater and estuarine waterbodies as well as to determine pollutant total maximum daily loads (TMDLs) for receiving streams. An intensive hydraulic and water quality field data collection effort is conducted on both the wastewater effluent from the industrial or municipal facility under scrutiny and at numerous sites along the receiving stream both upstream and downstream of the discharge. Future intensive surveys will likely include a nonpoint source pollution study component to determine load allocations for pollutant total maximum daily loads for these receiving streams. Intensive surveys conducted since 1992 are described in this report.

Special studies, by the OPC, address numerous water quality needs and problems and are undertaken on an as-needed basis. These projects range from one-time limited parametric surveys to in-depth ecological assessments involving physical, chemical, bacteriological, biological and fish tissue monitoring. Special studies include gathering water quality information in areas where the database is nonexistent, investigating known or suspected water quality problem areas below both point and nonpoint pollution sources and resolving public health issues. Examples of special studies conducted by OPC include WLA investigation studies/biological assessments below point source discharges, and specialized monitoring for public health/aquatic life concerns such as dioxin, PCBs, mercury and bacteria. Ongoing or just completed studies are discussed in this report.

WLA Investigations/Biological Assessments Below Point Source Discharges

One of the most cost-effective and comprehensive methodologies for documenting the effect of a potential point source discharge is to gather biological and physical/chemical data prior to effluent release and then compare this data with data collected after initiation of the discharge. Further, when accompanying a chronic bioassay, this technique provides complementary data on the health of a particular stream. It is also an excellent tool for cause and effect studies at existing facilities and is used by OPC for complaint investigations, enforcement actions and WLA investigation studies. OPC WLA investigation studies, in particular, have seen increased usage over the years as part of the water quality-based effluent limitation (WQBEL) process. Although not as rigorous in data collection as an intensive survey for WLA model calibration, these studies provide valuable and cost-effective water quality information for use in WLA decision-making. The in-stream data coupled with the WLA outputs from OPC's empirical computer model more accurately ensures the protection of instream water quality standards and the biological community, and also prevents unfair penalties to NPDES permittees which could occur based on incorrect modeling assumptions.

This type of study involves biological data collection to assess the instream benthic macroinvertebrate community and the collection of limited physical/chemical data in the stream and in the effluent. During 1992 to 1997, the Office of Pollution Control (OPC) conducted 21 such investigations throughout the state, exclusive of environmental damage assessments. Most of these were done as part of wasteload allocation (WLA) investigations to provide supporting information for decisions on NPDES permit limitations. Those sites studied, and their results based on the field evaluations are outlined in this report.

Source Compliance and Environmental Damage Assessment Monitoring

A regulatory surface water monitoring tool used increasingly is facility or permittee in-stream water quality monitoring. This tool is used primarily for some industrial NPDES facilities and hazardous substance sites under the regulation of the Uncontrolled Sites Section of OPC's Hazardous Waste Division. These facilities may have to document compliance with water quality criteria (physical, chemical and biological) in the receiving stream. If so, the facility or site owner submits an in-stream monitoring plan which is reviewed and approved by the OPC. Monitoring is generally carried out by the owner or his designee and the results are then submitted to the OPC for review and storage. Facility in-stream monitoring efforts currently on-going or under review are listed in this report.

Environmental damage assessment monitoring refers to monitoring performed as a result of complaints, fish kills, hazardous waste remediations/mitigations and emergency response investigations involving surface waters. These incidents can result from either point or nonpoint source pollution releases. These investigations may include the collection of surface water samples, sediment, fish and/or a biological assessment of the affected waterbodies as well as on-site soil, waste and groundwater sampling. Increasingly, the biological assessment is being utilized as a key investigative tool in documenting the severity and extent of environmental damage due to spills. Biotic communities affected by the spill are compared with biological communities from ecoregional reference sites or control sites. These comparisons help ensure that no long-term damage has occurred in the state's waters. Analyses of the information and/or data collected during the initial response investigation can frequently trigger more intensive monitoring to better define water quality and public health impacts and support enforcement actions. The information and/or data generated from environmental damage assessment investigations are used in the overall assessment of the State's water quality. Significant investigations are detailed in this report.

GROUND WATER ASSESSMENT

Assessment Methodology

Section 106(e) of the Clean Water Act requests that each state monitor the quality of its ground water resources and report the status to Congress every two years in its State 305(b) report. To gain a more detailed overview of the ambient ground water quality in the various states, EPA revised the reporting criteria for the 305(b) report in 1996. The 1996 guidelines encouraged states to assess ground water quality within specific aquifers or hydrogeologic settings rather than defining the ground water quality for the entire state as in early 305(b) reports. This revised reporting format, which was carried over to the 1998 report as well, presents a significant challenge for Mississippi in attempting to fulfill its 305(b) reporting obligations. Most of the aquifer-specific ground water quality data available in the state consist of basic inorganic analyses conducted on samples collected by the United States Geological Survey (USGS) or the Mississippi Department of Environmental Quality's Office of Land and Water Resources (OLWR). Typically, assessment of ground water in Mississippi for known and suspected contaminants has not been conducted on an aquifer-specific basis.

EPA guidelines encourage the use of the best available data in reflecting the quality of the water resource. To obtain data required to provide an accurate and representative assessment of ground water quality, cooperation between multiple agencies is necessary. The information provided in this report represents the best available data that can be obtained in electronic format from the MDEQ, the Mississippi State Department of Health (MSDH) who is the agency responsible for regulating the public water systems in the state, and the USGS.

The perplexing hydrogeology in many areas of the state contribute to a certain amount of additional difficulty in following the revised ground water assessment format. The rapid facies changes which often characterize the state’s stratigraphy and the occurrence of perched ground water conditions in many areas of the state can make it difficult to distinguish between various aquifers.

Ground Water Monitoring Program

Mississippi’s Agricultural Chemical Ground Water Monitoring (AgChem) Program serves as the State ambient ground water monitoring program. This program began in 1989 with an attempt by the Office of Pollution Control’s Ground Water Division to locate and sample three shallow drinking-water wells or springs in each of the 82 counties in Mississippi. As a result of the difficulty experienced in locating shallow wells in certain areas of the state, some deep wells were sampled. The database maintained by this program includes aquifer designations for most of the sampled AgChem wells.

Through March 31, 1998, a total of 396 drinking water wells were sampled as part of the Agricultural Chemical Ground Water Monitoring (AgChem) Program. Four hundred and thirty-five samples from these 396 wells were analyzed for 96 pesticides and metabolites, 48 volatile organic compounds (VOCs) and 27 minerals, residues, nutrients, and metals.

Fourteen major aquifer systems and numerous minor aquifers are recognized in Mississippi. Information related to four aquifers used in Mississippi are presented in this report -- the Mississippi River Valley Alluvial Aquifer, the Paleozoic aquifer system, the Coffee Sand aquifer, and the Ripley aquifer. The basis for selecting these water-bearing units are that they represent major aquifers of limited areal extent.

Mississippi River Valley Alluvial Aquifer

Eighty-one drinking water wells in the Delta region of Mississippi were included in the initial sampling phase of the AgChem Program. Analyses from these wells typically indicated some detections of pesticides and nitrates. However, only one well initially exceeded a single maximum contaminant limit (MCL). Sampling of the well on two subsequent occasions indicated concentrations below all MCLs. None of the other eighty samples had detections exceeding or even approaching MCLs for volatile organic compounds (VOCs), synthetic organic compounds (SOCs), nitrates or other inorganic constituents.

During 1994, the ambient ground water monitoring program began shifting strategy from a statewide approach to devoting most of its efforts to sampling irrigation and fish culture wells in the Mississippi Delta region. This change is a reflection of the overall importance of the Mississippi River Alluvial Aquifer (MRVA) to the economy of the state and its perceived susceptibility to surficial contamination.

In addition to the 396 drinking water wells sampled as part of the AgChem Program, 267 samples from 231 irrigation and fish culture wells have been collected in the Mississippi Delta. These samples were analyzed for 96 pesticides and metabolites, chlorides and nitrates. Analysis for VOCs was not performed due to budget constraints. Seven pesticides were detected at extremely low levels in 25 of the 231 wells screened in the shallow Mississippi River Valley alluvial aquifer. Low concentrations of nitrates were detected in 71 of the wells sampled. These concentrations are not surprising in a region with high pesticide use.

The most frequently detected compound, pentachlorophenol, was found in 98 of the 396 drinking water wells and in 15 of the 231 irrigation/fish culture wells sampled. Pentachlorophenol is now restricted to wood use only and can probably be excluded as an agricultural chemical. Importantly, the lower level of detection established for pentachlorophenol in this study is 100 times lower than the Minimum Reporting Limit of 0.1 ppb used in the U.S. EPA National Pesticide Survey (NPS). If NPS guidelines had been followed during the analyses, all of the wells sampled as part of the state ambient ground water monitoring program would have reported concentrations of pentachlorophenol as "none detected."

Based on the results to date, there is no evidence that agricultural chemicals or other contaminants have significantly impacted the quality of ground water in the Mississippi River Valley alluvial aquifer. The MDEQ will continue its efforts to monitor and protect this valuable resource.

Paleozoic Aquifer System, Coffee Sand Aquifer, and Ripley Aquifer

The AgChem Program has sampled only one well using the Paleozoic aquifer system in northeast Mississippi. No detections of contaminants are were indicated in the Tishomingo County well.

The Coffee Sand aquifer was represented by samples collected from four wells by the AgChem Program. The three wells sampled in Alcorn County only showed low levels of pentachlorophenol; the constituent ranged in concentration between 0.009 and 0.029 parts per billion. Samples collected from one well in Union County indicated no detections of any constituents and very low nitrate concentrations.

Eleven Ripley aquifer wells have been sampled as part of the AgChem Program. No detections of contaminants were indicated in the analytical results obtained on the ground water samples collected from four wells in Chickasaw County, three wells in Pontotoc County, and two wells in Union County. Of the two Ripley wells sampled in Tippah County, one indicated no detections of constituents and one had a pentachlorophenol concentration of 0.092 ppb. None of the sampled Ripley wells had nitrate concentrations of note.

Ground Water Quality

Overall, ground water in Mississippi is of very good quality. Most of the state's public water supply (PWS) wells are in deep confined aquifers, therefore, contamination from above ground or from other ground water sources is rare. The sporadic "boil water" notices that are issued usually are a reflection of inadequate system maintenance or are a result of unforeseen natural disasters and are not a result of contamination of drinking water aquifers from point or nonpoint sources of pollution.

SPECIAL STATE CONCERNS

Historically, the major water quality problems in Mississippi have been the result of waste discharges from point sources, notably from industrial and municipal discharges in the heavily populated Gulf Coast and Jackson Metropolitan areas, and from nonpoint source pollution in the Mississippi Delta, and from the oil production industry. Impacts from waste discharges have been greatly reduced across the state due to point source control activities that have greatly improved water quality conditions below these discharges. Improvements have also been realized in the Delta from better management of the use of pesticides, the development of less persistent chemicals, and the education of farmers in the installation of Best Management Practices. Also, many of the oil production-related problems have been resolved.

Control of nonpoint source pollution from stormwater runoff appears to be one of our greatest challenges in the future. Once the remaining needs for Publicly Owned Treatment Works are addressed, additional control of nonpoint sources of pollution will be needed to attain additional water quality improvements. Grants or cost-share programs will be necessary to implement control measures for agricultural activities. The viability of the Stormwater Regulatory Program, is a source of concern due to a deficiency of resources.

Although the State is able to issue stormwater permits, this program has little resources available for stormwater compliance activities. Urban runoff must be addressed before water quality problems can be completely solved in some areas, particularly along the Gulf Coast. Failing septic tanks along the Gulf Coast and the shorelines of many lakes must also be addressed.

The issue of toxic pollutants is another major concern. The State has adopted widely expanded toxics criteria in our water quality standards. Parameters of particular concern are some of the pesticides, mercury, and PCBs. Where necessary, biological and chemical screening and monitoring will be used to assess the extent of contamination. The dioxin advisories on the Leaf River and the Escatawpa River have been lifted, however, of special concern are elevated mercury levels in fish tissue in some Mississippi waters. Mercury advisories for fish consumption are in place for some segments of the Bogue Chitto, Escatawpa, Yockanookany and Pascagoula Rivers, and for Enid Reservoir and Archusa Creek Water Park. In addition, an advisory was issued for King Mackerel in all coastal waters. Additional mercury advisories are anticipated in the next several years.

Another growing area of concern is the rapid residential, commercial, and industrial growth occurring throughout the state and the demands this economic development may place on the State’s environmental resources. Historically, Mississippi has always been characterized as a rural state. With the advent of the gaming industry as well as a favorable economic climate, this is gradually changing. Previously, only Jackson and the Gulf Coast were the major population and industrial centers. In recent years, this economic development and growth has been experienced not only in Jackson and the Gulf Coast, but also in Hattiesburg, Meridian, Tupelo and in Northwest Mississippi.

Other issues of concern noted in this report include wetland loss, the potential water quality impacts from and the regulation of confined animal operations (CAOs) and the pending development of nutrient criteria guidance by EPA in the year 2000 and the short time frame for state adoption of scientifically-valid criteria for the entire state by 2003. In addition, the extensive monitoring required to verify potential impairment and need for TMDL development for the large number of evaluated waters on the State’s 303(d) list, many of which are listed as partial watersheds and drainage areas, are also a concern.
An expanded discussion of the State’s concerns can be found beginning on page 42.

RECOMMENDATIONS

Recommendations are made in this report for needed studies, programs, staffing and funding to adequately address water quality management in Mississippi. Additional studies are needed on the Mississippi Gulf Coast to quantify the impacts of nonpoint source (NPS) pollution and to develop Best Management Practices (BMPs) for use in this area. More complex data analysis tools for conducting nonpoint source assessments are also needed for documenting NPS impacts from land use changes particularly from agriculture and construction activities. Educational and incentive programs are needed to promote the statewide use of BMPs to control nonpoint source pollution. In addition, continued development and implementation of basin-wide planning and watershed-based water quality management is needed. Identification of crucial wetland resources in each watershed has also been identified as a need to focus local, state and federal protection efforts.

Recent funding increases by the Mississippi legislature will allow surface water permitting, assessment, TMDL, protection and standards programs to be adequately implemented. However, other resource needs still need to be addressed. Additional resources are needed to fund the State's stormwater program as well as to implement and manage the State's Wellhead Protection Program and the Agricultural Chemical Groundwater Monitoring Program. Resources are needed to address the development of a risk assessment approach for fish tissue contamination and to increase analytical capabilities for tissue analysis. Resources are also needed to address beach monitoring in fresh water swimming areas similar to the existing Coastal Beach Monitoring Program on the Gulf Coast.

PART II

BACKGROUND

BACKGROUND

BACKGROUND AND PURPOSE

Mississippi's 1998 Water Quality Assessment Report was prepared by the Office of Pollution Control of the Mississippi Department of Environmental Quality pursuant to Section 305(b) of the Federal Clean Water Act. The report was the immediate responsibility of the Surface Water Division's Water Quality Assessment Branch. In addition to the Water Quality Assessment Branch, personnel of the Field Services Division, Laboratory, Groundwater Division, Hazardous Waste Division, and others within the Surface Water Division contributed to the report. Other state and federal resource agencies also contributed data and information.

The purpose of Mississippi's 1998 Water Quality Assessment Report is to describe for EPA, Congress, and the public the status of the quality of the State's waters. Along with water quality information, the report also gives the causes and sources of pollution for those waters impaired. In addition, water pollution control programs for point and nonpoint sources of pollution are discussed. Environmental improvements for the past two years are documented. Special concerns and problems remaining are noted. Also, the State's water quality monitoring program is described. In addition to describing the fixed station ambient monitoring program, various other monitoring programs and special studies are presented. Issues relating to ground water quality are also addressed. Recommendations are given for needed studies, programs and funding to adequately address Mississippi's water quality problems.

TOTAL WATERS

Mississippi lies predominantly within the East Gulf Coastal Plain physiographic region with the exception of a small part of northeastern Mississippi which is part of the Interior Low Plateaus Province. The state is characterized with low to moderate topographic elevations, and slopes generally from the north southward to the Gulf of Mexico. The climate of the state is humid and subtropical with climatic variations influenced by the large land mass to the north and the Gulf to the south. Mean annual precipitation ranges from 50 inches in the north to 65 inches near the coast. The wettest months occur in the spring for most of the state; but on the coast, July, August and September are often the wettest. Fall is the driest season for the whole state. Streams and rivers generally reach their lowest stage for the year during October. Temperatures in the state vary with latitude and in the winter average from 31^{o}F in the north to 43^{o}F on the coast. Summer temperatures throughout Mississippi average in the eighties with frequent excursions into the nineties especially in the south.

Mississippi has a population in excess of 2,573,216 (1990 Census) and covers a surface area of 47,700 square miles. The state is divided into ten major stream basins with a total length of streams in excess of 84,000 miles. Of these miles, 31.5% are perennial, while 65% are intermittent. The remaining 3.5% are man-made ditches and canals. The Mississippi River (approximately 400 miles) and the Pearl River (approximately 80 miles) run along Mississippi's border with Arkansas and Louisiana. The state is covered with hundreds of publicly owned lakes, reservoirs and ponds covering a combined area of approximately 500,000 acres. Wetlands cover an estimated 4,067,000 acres (National Wetlands Inventory, June, 1989). Of this area approximately 66,000 acres are tidal marsh (Department of Marine Resources, Gary Cuevas, 1992). The southern edge of Mississippi's contiguous land mass borders the Mississippi Sound. The coastline along the Mississippi Sound, around the inland bays, and around the State's Barrier Islands totals approximately 245 miles. The total area of estuarine waters is approximately 760 square miles. This area includes the Bay of St. Louis, Back Bay of Biloxi, Pascagoula Bay, Mississippi Sound, and the portion of the Gulf of Mexico three miles south of the Barrier Islands. A summary of this information is found in Table II-1.

All waters of the State are classified for uses consistent with the goals of the Clean Water Act. Waters are classified according to one or more of the following classifications: Public Water Supply; Shellfish Harvesting; Recreation; Fish and Wildlife; and Ephemeral Stream. These classifications are explained in the State's water quality standards found in Appendix A. No significant changes in waterbody classification have occurred since the 1996 Section 305(b) report. While a waterbody in Mississippi usually has only one formally adopted classification, it may support one or more uses. Mississippi's waters are used for drinking and food processing, shellfishing, recreation and for fishing and aquatic life support. A summary of classified uses of State waters is found in Table II-2.

TABLE II-1

Mississippi Atlas

State Population	2,573,216
State surface area (square miles)	47,700
Number of water basins (according to State subdivisions)	10
Total number of river and stream miles*	84,003
- Number of perennial river miles (subset)*	26,454
- Number of intermittent stream miles (subset)*	54,862
- Number of ditches and canals (subset)*	2,687
- Number of border miles (subset)	490
Number of lakes/reservoirs/ponds	B
Acres of lakes/reservoirs/ponds	500,000
Square miles of estuaries/harbors/bays	760
Number of ocean coastal miles	245
Number of Great Lakes shore miles	0
Acres of freshwater wetlands	4,001,000
Acres of tidal wetlands	66,000

*From USEPA RF3/DLG estimates

TABLE II-2

Total Sizes of Waters According to Use Classification

Classified Use	Total Size According to Classification			
	Rivers (miles)	Lakes (acres)	Estuaries (sq. miles)	Coastal Shoreline (miles)
Fish & WildlifeH	82,853	246,113	167	118
Public Water Supply*H	38	12,350	(na)	(na)
Recreation*	980	216,421	536	74
P. Water Supply & Rec.*	0	25,116	(na)	(na)
Shellfish Harvesting*9	0	0	43	46
Recreation/Shellfish*	0	(na)	14	7
Ephemeral	132	(na)	(na)	(na)
Totals	84,003	500,000	760	245

*Also suitable for Fish and Wildlife
HAlso suitable for Secondary Contact Recreation
9Also suitable for Recreation

WATER POLLUTION CONTROL PROGRAMS

Surface Water Division

The Surface Water Division (SWD) of the Office of Pollution Control (OPC) deals with the water quality of all intrastate, interstate and coastal waters. The quality of these waters has a profound effect upon the health and welfare of Mississippi's citizens, wildlife, and fish and aquatic life. The quality of Mississippi's waters also significantly affects domestic, agricultural, industrial and recreational water use activities.

Careful assessments have been made of the water quality problems in the state. OPC has formulated a strategy consistent with federal guidelines to deal with these water quality problems. Water quality management is considered a high priority activity. The foundation of all water quality management activities is the "State of Mississippi Water Quality Criteria for Intrastate, Interstate and Coastal Waters" water quality standards adopted by the Mississippi Commission on Environmental Quality (see Appendix A). The intent of water quality standards is both to protect water quality existing at the time the standards are adopted and to enhance water quality within the state. There are two types of pollution control programs in the SWD. One program deals with point sources of pollution and the other deals with nonpoint sources of pollution. Receiving waters are protected from point source pollution by requiring, as a part of the initial project design, the highest and best practicable treatment available under existing technology. For waters receiving wastewater discharges, the goal is for those waters to meet water quality criteria and support their designated uses. This is insured by conducting a rigorous permit issuance and compliance program. For waters receiving nonpoint source pollution, best land use management practices are encouraged.

The Surface Water Division has undergone substantial change during recent years. Legislative action during 1978 abolished the Mississippi Air and Water Pollution Control Commission. In its stead, the Office of Pollution Control was created and, along with other state agencies (the Office of Geology and the Office of Land and Water Resources), became the Department of Natural Resources. In July, 1990, the Department's name was changed to the Department of Environmental Quality. Organizational changes are occasionally made to cope with growing and new environmental programs. One such change occurred in 1998 with OPC undergoing a major reengineering effort. As a result of this, one former SWD branch, the Industrial Wastewater Control Branch, no longer exists. It has been subsumed under the new OPC Environmental Permits Division. A discussion of this may be found under the heading, Point Source Control Program. The Surface Water Division presently consists of the Division Chief, Water Quality Management Branch, Water Quality Assessment Branch, Municipal Construction Branch, Municipal Permit Compliance Branch, Commercial Control Branch, and Data Control Branch.

Water Quality Management Branch

The Water Quality Management Branch (WQMB) performs numerous primary and support functions in the Office of Pollution Control's Surface Water Division. These functions include Water Quality Certifications for Dredge and Fill (Section 404) Projects, Review of Environmental Impact Statements, Clean Lakes Program, Nonpoint Source Program, Coordination of Wastewater Research, Statewide Water Quality Management Planning, and Water Quality Standards.

The Section 404 Dredge and Fill Program conducted by the U.S. Army Corps of Engineers requires that the state issue a water quality certification for each project prior to issuance of a permit. The WQMB has an active program for reviewing applications for 404 Projects in order to determine their impacts on the quality of state waters. The water quality certification process is detailed in regulations adopted by the Commission on Environmental Quality. Numerous field inspections are required to make these determinations. Special attention has been given to the importance of wetlands to water quality.

The Nonpoint Source Control Program is conducted in the WQMB. With the approval of the state's Nonpoint Source Assessment Report and the Management Program, efforts are well underway to implement this program. These efforts include the development of practices to control nonpoint source pollution and educational/demonstration projects to encourage use of the practices.

Water Quality Standards and Stream Use Classifications are periodically reviewed and amended. This effort is coordinated through the WQMB. The most recent triennial review of the water quality standards was completed on November 16, 1995. A new triennial review is now being initiated.

Water Quality Assessment Branch

The Water Quality Assessment Branch (WQAB) also performs numerous primary and secondary support functions in the Office of Pollution Control's Surface Water Division. The Branch coordinates the state's surface water ambient fixed station monitoring program including program planning, data assessment, and data management and reporting. Ambient physical/chemical water quality data is routinely collected from a statewide network of fixed monitoring stations. Selected stations from the network and a few additional stations are also monitored for biological parameters and pesticides and metals in fish tissue. Data are collected by staff of the Field Services Division and provided to the WQAB for compilation, assessment and reporting.

The WQAB serves as a clearinghouse for OPC surface water monitoring activities. In this capacity, information on surface water monitoring data collected by the various divisions of OPC (Surface Water, Field Services, Hazardous Waste) as well as information concerning other agencies that conduct monitoring in the state is maintained in one central location. Monitoring information can then be more easily compiled for information requests, water quality reports, and entry into computerized databases (i.e. STORET). The Branch also reviews Receiving Water Criteria Compliance Monitoring Plans and Water Quality Model Verification Plans submitted by permittees.

The Branch uses computer models for predicting impacts from conventional pollutant wastewater discharges on freshwater and estuarine systems in Mississippi. These models are used to develop wasteload allocations (WLAs) for use in NPDES permits. Site-specific data from intensive surveys are used in the models where possible. This data, collected primarily by the WQAB, requires extensive hydrological, physical, chemical, bacteriological and biological sampling over a short term period of days or weeks. The Branch is also responsible for the development of total maximum daily loads (TMDLs).

The maintenance of water quality assessment data in the Water Body System (WBS), the entry of water quality data into EPA's STORET system, and integrating these with OPC's SWIMS system are also responsibilities of this Branch. For more information on these data systems, see <u>Data Management, Assessment and Reporting</u> in Part III of this document. The Branch is also responsible for the development of the State's Section 305(b) report, and Section 303(d) list. Another responsibility is the implementation of the Basinwide Approach to Water Quality Management (see page 29 below). To help fulfill these responsibilities, the Branch is developing expertise in geographic information systems (GIS).

The Branch, in cooperation with the WQMB, provides technical training for citizen volunteer monitors statewide, through the Adopt-A-Stream Mississippi program. The training includes watershed surveying and mapping, physical/chemical sampling, and biological sampling. Data collected by the volunteers are used for assessment purposes.

The Branch includes fourteen technical staff. The staff includes one branch chief, three environmental scientists, a geographer, seven engineers, and two data technical specialists. In addition to Branch supervisory duties, the branch chief oversees the development of the agency's new Watershed Protection Approach. The staff engineers develop WLAs, coordinate and perform TMDL development, provide modeling expertise, and supervise the development of the 303(d) List. The staff scientists develop and review monitoring plans, coordinate and support the ambient monitoring program, plan and perform water quality field assessments for WLA and TMDL studies, oversee 305(b) Report development and conduct citizen volunteer monitoring workshops. The geographer and data technical specialists assist with computer operations and data management in computer databases including GIS, WBS, and STORET. All members of the Branch participate in intensive stream surveys and 305 Report/303(d) List development as needed.

Municipal Permit Compliance Branch

The Municipal Permit Compliance Branch is responsible for the issuance of municipal wastewater treatment permits, compliance and enforcement of those permits, and approval of additions to municipal wastewater treatment and collection systems. Staffing consists of one secretary, five project engineers and one supervisor. The five project engineers are responsible for directly administering all regulatory activities for their assigned municipalities. The supervisor has overall management responsibility including development of program organization and strategy.

Commercial Control Branch

The Commercial Control Branch is responsible for the regulation of privately owned facilities which have domestic sewage collection and treatment systems. Private facilities include residential subdivisions, trailer parks, schools, and all other privately owned facilities. Car washes and laundromats are also regulated by this section.

Two staff engineers review plans and specifications for collection and treatment systems for compliance with design standards. Permits containing effluent criteria and monitoring requirements are developed for treatment systems. After treatment systems are constructed, operation and maintenance inspections and samplings are conducted, and discharge monitoring reports reviewed, to verify compliance with permit requirements.

Data Control Branch

The Data Control Branch provides data processing support for the Surface Water Division (SWD). The Branch is responsible for administering a 130-user Windows NT Network and a 5-user Sun Network. The staff provide both hardware and software support for all division personnel. This Branch is responsible for managing Mississippi's portion of EPA's Permit Compliance System (PCS) database. Additionally, the Branch assists SWD scientists and engineers in developing computer solutions in response to program requirements, evaluates divisional data processing needs, recommends solutions, and provides appropriate data-processing interfaces with other state and federal agencies.

Field Services Division

The Field Services Division (FSD) of the Office of Pollution Control has three regional offices strategically located in Oxford, Jackson and Ocean Springs for the purpose of providing closer contact with potential pollution sources and the affected population. This local presence allows for quicker response times to environmental problems in these areas.

Regional office personnel are assigned responsibility for a number of pollution control activities. These include:

1. gathering samples;
2. performing operation and maintenance inspections;
3. investigating proposed facility sites;
4. responding to spills, accidents, and emergency episodes;
5. investigating fish kills;
6. operating and maintaining monitoring stations;
7. operating and perform field maintenance on sampling networks;
8. collecting emissions inventory data;
9. providing evidence of violations;
10. investigating complaints;
11. providing technical assistance; and
12. supporting the wastewater operator certification program.

Each office is staffed with a supervisor, assistant supervisor, technicians supporting the various regulatory programs, an operator trainer, a biologist, and a secretary. The number of people in each office varies slightly.

The FSD also operates the Office of Pollution Control Laboratory located near Jackson. This lab provides accurate and timely analysis of pollutants in air, water, soil, sediment and tissue; and conducts various biological analyses including taxonomy and toxicity testing. The lab also solves analytical problems, provides expert witnesses in environmental litigation, conducts various training activities for both field staff and outside personnel and offers technical support and information.

The staff of chemists and biologists handle a wide variety of analytical problems and have areas of specialization which include wet chemistry, chemical microscopy, volatile and semi-volatile organics, trace metals, fisheries biology, invertebrate taxonomy, botany, and microbiology.

The ability to analyze environmental contaminants has increased, both in sensitivity and complexity. As instrumentation, specialized techniques and capabilities needed to detect these chemicals and their effects have become more and more sophisticated. Gas and Gel permeation chromatography, mass spectroscopy, atomic absorption spectrophotometry, flow injection colorimetry, fish pathology, and bioassay are a few of the tools used by the laboratory to evaluate air and water quality.

Emergency Response Branch

The OPC Emergency Response Branch (ERB) of the Office of Pollution Control, consists of three scientists and a supervisor. The ERB is responsible for providing quick response to releases of hazardous substances and wastes and requiring containment, cleanup or other mitigation measures. The program routinely responds to releases of hazardous substances and wastes from transportation accidents and incidents (e.g., train derailments, semi-truck wrecks, etc.), industrial/commercial fires, illegally dumped barrels and containers and oil spills. During State Fiscal Year 1998, the ERB responded to approximately 400 reported releases of oil and/or hazardous substances. The ERB's quick and professional response prevented the loss of hazardous substances to the state's water resources in many of these reported incidents.

Additionally, the ERB provides assistance to law enforcement agencies in the handling of chemicals from illegal drug laboratories. They also assist the U.S. Army Explosives Ordinance Division at Camp Shelby in handling explosives, and provide emergency response training to law enforcement agencies and other groups.

Many spills occurred where the responsible party was financially unable or unwilling to assume responsibility for the cleanup of the spill. In these cases, the ERB used the Pollution Abatement Fund to hire the necessary contractors to clean the spill affected area. In cases where there is a responsible party, the MDEQ determines whether to pursue litigation to recover the funds expended for a contractor cleanup.

In summary, the ERB has been very successful in preventing and mitigating impairment of water resources from releases of hazardous substances which could have had a significant adverse impact on the waters of the State.

Basinwide Approach to Water Quality Management

The Mississippi Basinwide Approach to Water Quality Management is an effort to conduct comprehensive water quality planning and to foster the implementation of practices that will result in water quality protection on a basinwide scale. This approach recognizes the interdependence of water quality on the many related activities that occur in a drainage basin. Some of these activities include monitoring, assessment, problem identification, problem prioritization, planning, permitting, water use and land use. In Mississippi's Basinwide Approach to Water Quality Management, these activities and their associated information will be integrated by basin, resulting in basin management plans and implementation strategies that will serve to focus water quality protection efforts.

The mission of the Mississippi Department of Environmental Quality (MDEQ) is to safeguard the health, safety, and welfare of present and future generations of Mississippians by conserving and improving our environment and fostering wise economic growth through focused research and responsible regulation. In keeping with this mission, the overall goal of Mississippi's Basinwide Approach is to efficiently develop effective and consistent long range management strategies that protect the quality and intended uses of Mississippi's water resources and allow for environmentally sound economic planning and development.

MDEQ is beginning to manage its water programs on a basinwide scale and intends to develop basin management plans for each of Mississippi's major river basins. These basins will serve as the hydrological boundaries that guide MDEQ's water quality activities. The majority of water quality management activities in these basins will be based on a repeating five-year management cycle (Figure II-1). Because of the five-year rotation, basins will be placed in groups so that all basins will receive equal focus. The Big Black and Tombigbee River Basins are in Group 1. The Yazoo River Basin and adjacent tributaries of the Mississippi River are in Group 2. The Pearl River Basin and South Independent Streams Basin and adjacent tributaries of the Mississippi River are in Group 3. The Pascagoula River Basin is in Group 4. The Coastal Streams, North Independent Streams and the Tennessee River Basins are in Group 5. The grouping of the basins is shown in Figure II-2.

The first activity under Phase I (Planning) of the Basin Management Cycle is preparing a Basin Status Report. This document provides an interdisciplinary overview of the basin by describing the basin's water quantity and water quality conditions. Resource agencies and the public can use the information in this report to better understand the basin's current condition and to predict areas needing attention. The planning phase ends by prioritizing issues to be addressed in the basin during this cycle, and by identifying information gaps that should be filled before establishing basin management plans. Phase II involves gathering additional data and information on the basin to fill information gaps identified during the planning phase. In Phase III, the comprehensive information gathered in Phase II will be evaluated to clarify the causes and sources of water quality problems, identify high quality waters in need of special protection, and develop models or other tools to help with management plan development. Phase IV involves the development of a basin management plan and action strategies to address priority issues. Phase V begins implementation of the management plan.

Figure II-1

Basin Management Cycle under the Mississippi Basinwide Approach to Water Quality Management

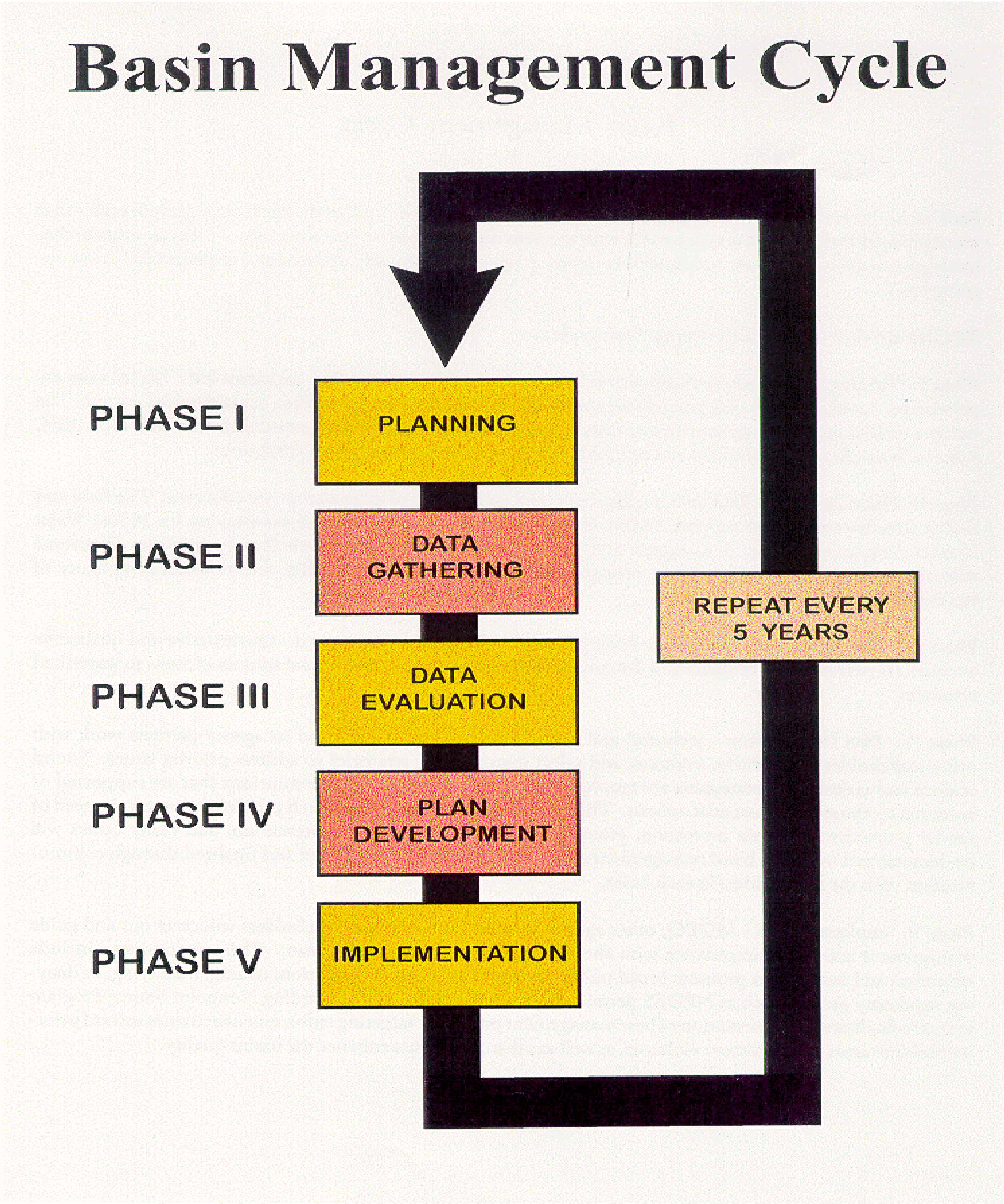
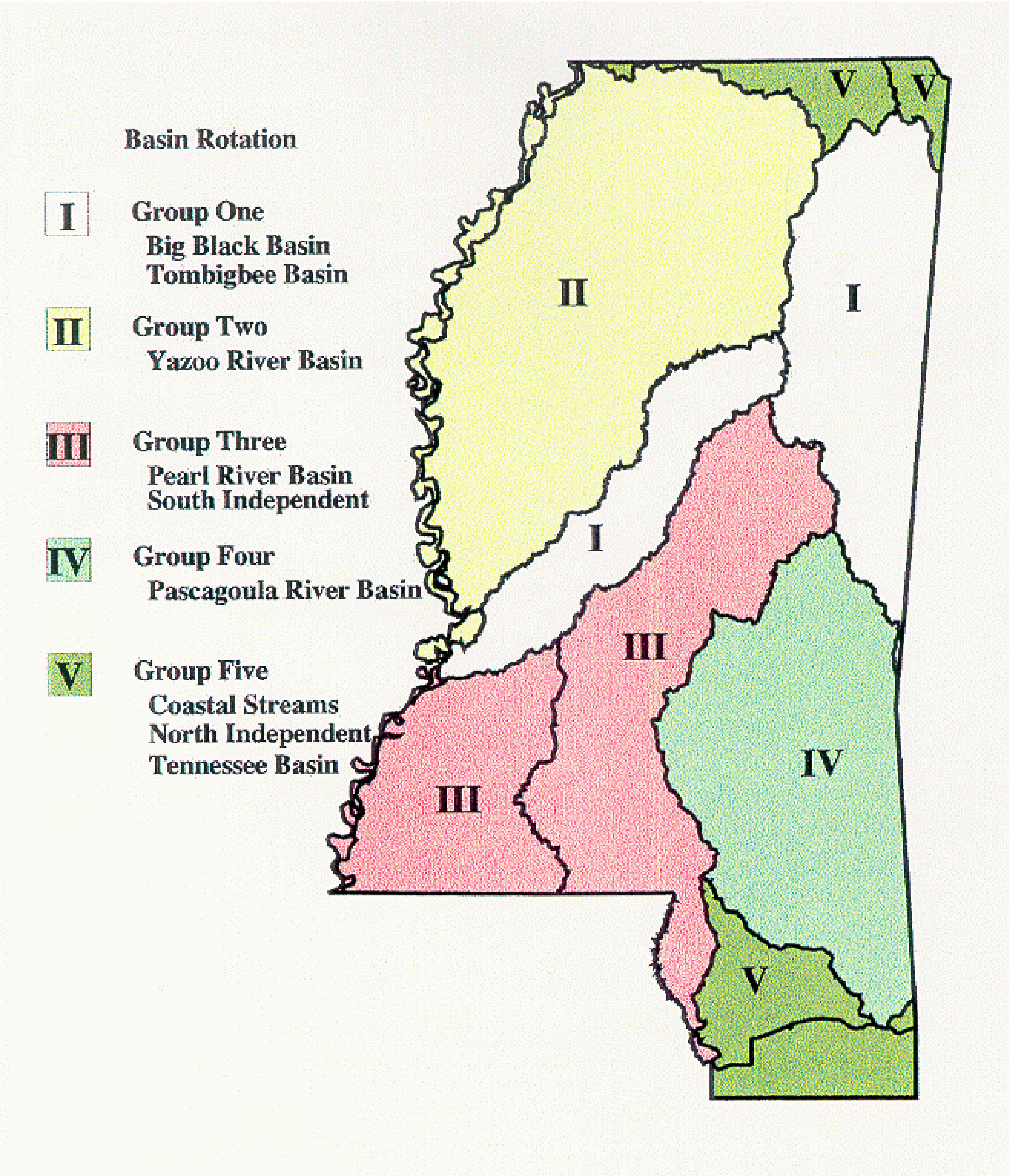


Figure II-2

Basin Management Groups under the Mississippi Basinwide Approach to Water Quality Management



Water Quality Standards Program

The State has developed water quality standards for all surface waters in response to the federal Clean Water Act. The standards are published as the State of Mississippi Water Quality Criteria for Intrastate, Interstate and Coastal Waters (see Appendix A). All waters in the state are classified as to their primary designated use. These primary designated uses include Public Water Supply, Shellfish Harvesting, Recreation, Fish and Wildlife and Ephemeral Streams. Narrative and numeric criteria have been developed to protect these uses. Use classifications are based on the actual use of the waterbody and the attainment or likelihood of attainment of the water quality criteria required to protect that use.

Mississippi completed a triennial review of its water quality standards with the adoption of amendments by the Mississippi Commission on Environmental Quality on November 16, 1995. The State is currently initiating a new triennial review.

Point Source Control Program

The most efficient and effective way of controlling point source pollution is through a comprehensive discharge permitting program. In February 1994, MDEQ adopted comprehensive permitting regulations which provide detailed procedures for the development and issuance of permits. The regulations include specific protocols for conventional and toxic pollutant water quality-based effluent limitations. Requirements for permitting stormwater runoff and activities requiring water qualifications are also included. Additionally, the State's water quality standards were modified to allow the use of 'water effects ratios' in determining permit limits. The permit regulations also describe how translators may be used in determining permit limits and include specific protocols for the use of biomonitoring and the establishment of whole effluent toxicity limits.

In 1998, OPC underwent a major reengineering effort. As a result of this process, permitting duties were divided between the SWD and the newly created Environmental Permits Division (EPD). The SWD issues non-industrial NPDES and State Operating permits (SOP), and Water Quality Certifications for Dredge and Fill permits. The EPD issues industrial NPDES and SOP permits, Pretreatment, and Stormwater permits.

NPDES Permits

By far, the largest water permit program administered by the Office of Pollution Control is the National Pollutant Discharge Elimination System (NPDES) Program. The state received initial authority for this program in 1974. Authority was extended to include federal facilities in 1982 and to include general NPDES permits in 1991. The Municipal and Commercial or Domestic permits are issued by the Surface Water Division (SWD). The latter consist of all non-municipal domestic waste sources, such as private subdivisions, trailer parks, schools, commercial businesses, and most of the federal facilities. All Industrial permits are issued by the Environmental Permits Division (EPD).

There are approximately 1586 NPDES permits currently in force in Mississippi. Of these, 335 (17.9%) are municipal, 723 (38.6%) industrial, and 815 (43.5%) commercial. The state maintains a policy of reissuing expired permits immediately. The EPD administers nine general permits addressing stormwater discharges associated with industrial activity. Approximately 3500 facilities are covered under these general permits.

State Operating Permits

In addition to the federal NPDES permit program administered by the state, state law requires that any person who operates a wastewater treatment facility must obtain a permit from the Office of Pollution Control. NPDES permits are issued when a discharge to state waters occurs. However, there are many facilities which do not discharge to state waters. State Operating Permits (SOPs) are issued to these facilities. Most SOPs are issued by both the EPD and the SWD. Examples of such facilities are land application systems, recycle systems, forced evaporation systems, and pretreatment systems. Three important types of industrial facilities who are regulated by EPD are; sand and gravel washing plants, animal feedlots, and aerial pesticide applicators. During the past fiscal year, approximately 300 State Operating Permits were either issued or reissued. The majority of these were issued to animal waste facilities. During FY'99 a primary effort will be issuance of new source State Operating Permits to poultry facilities. The Environmental Permits Division expects to permit approximately 300 new facilities.

Pretreatment Permits

The federal Pretreatment Program was delegated to Mississippi in FY'82. Instead of utilizing the local delegation option, the State has assumed full responsibility for implementing the program. The program is operated very much along the lines of the NPDES program, utilizing individual indirect permits and similar compliance assurance methods.

As in the past, priority will be placed on the issuance of pretreatment permits to those indirect discharges known to be interfering with the efficiency of publically owned treatment works (POTWs), those subject to categorical standards, or any other significant industrial indirect discharge. By the end of FY'98, the Environmental Permits Division had issued permits to approximately 300 pretreatment facilities.

The EPD has a specific procedure for permitting non-categorical indirect discharges existing prior to 1982. The EPD will not regulate existing non-categorical and non-significant industrial indirect discharges unless a problem develops at a POTW. If a POTW experiences noncompliance suspected to be related to an industrial user, the EPD and/or the city will evaluate the causes of the noncompliance and the impact the industrial user is having on the POTW. If an industrial user is implicated, the industry will be issued a pretreatment permit and be regulated by the EPD. The pretreatment permit will be based on the city sewer use ordinance, if an effective ordinance exists. If not, the EPD will work with the city to develop a meaningful ordinance.

Dredge and Fill Permits

The Section 404 Dredge and Fill Program conducted by the U.S. Army Corps of Engineers (USACE) requires the State to issue a water quality certification for each project prior to issuance of a Section 404 permit. The OPC actively reviews applications for Section 404 projects and determines their potential impacts on water quality. Numerous field inspections are required to make these determinations. Special attention is given to the importance of wetlands to water quality.

The Office of Pollution Control has one environmental administrator and one environmental scientist in the Water Quality Management Branch who work on the evaluation and issuance of Water Quality Certifications. In order to resolve permitting problems quickly and to pool knowledge and resources, field trips, comments, and decisions are closely coordinated with the various USACE Districts, the U.S. Fish and Wildlife Service, the Environmental Protection Agency, and the

Mississippi Department of Marine Resources. During 1996 and 1997, approximately 252 individual applications for 401 certification and 169 nationwide applications were received and reviewed. In addition, 22 violations were reported to this office by the USACE. Comments were issued on these violations.

Whole Effluent Toxicity (WET) Testing and Monitoring

The Clean Water Act of 1978 (P.L. 95-217) established, as a national policy, that the discharge of toxic materials in toxic amounts be prohibited. In accordance with this policy, and to insure compliance with the intent of the 1987 Clean Water Act, the Office of Pollution Control (OPC) has established procedures using chemical specific analyses and toxicity tests, to screen industrial and municipal wastewaters for acute and chronic toxicity.

The first step in the OPC approach to toxicity reduction involves a detailed review of the permit application for each discharger, including historical toxicity tests and chemical-specific analytical results. This initial review insures that permit applications adhere to EPA accepted analytical procedures, with all of the appropriate parameters reported.

The second step involves the development of permit limits in accordance with accepted state and national water quality criteria for those facilities exhibiting potential toxicity. Permit limits may take the form of chemical specific and/or whole effluent toxicity based limits.

The third step in the OPC approach to toxicity reduction involves additional testing in the form of whole effluent toxicity (WET) tests for those permittees with WET limits in their permits. If non-compliance of WET permit limits occurs, the permit language then requires the facility to provide a schedule for the implementation of a Toxicity Reduction Plan to reduce the toxicity of the wastewater discharge to safe levels.

Due to lack of resources, no WET tests were conducted by OPC from October 1995 through FY98. For tests prior to these dates, please refer to MDEQ’s 1996 305(b) report.

Environmental Improvements Due to Point Source Controls

Historically, one of the major water quality problems in Mississippi has been the result of waste discharges from point sources, notably from industrial and municipal discharges in the heavily populated Gulf Coast and Jackson Metropolitan areas. The pollution problems in the Pearl River below Jackson have been substantially corrected with the construction of a wastewater treatment plant that went on line in 1975 and the subsequent regional sewerage system that has been completed and now serves all surrounding communities in the Jackson planning area. Regional sewerage systems have also been completed for the three counties on the Gulf Coast. Projects for compliance with State water quality standards continue to be completed each year. Such projects recently resulted in elimination of three municipal water quality limited discharges in 1997 and 1998 for Aberdeen (24775), Byhalia (20052), and Senatobia (21431) in Mississippi.. Numerous other projects throughout the state for sewer rehabilitation, new collection sewers, and other upgrades of existing facilities are also completed each year. All of these should lead to water quality improvements.

The more stringent fecal coliform bacteria standard adopted in 1991 continues to result in municipalities providing disinfection of their treated effluent. This will also include chlorine residual limits, where necessary, to protect aquatic life from toxicity.

Since the fall of 1986, the OPC has been evaluating industrial permittees for potential toxicity using toxic screening procedures. The program evaluates application data on the basis of acute and chronic toxicity and human health concerns for all Section 307(a) toxicants plus ammonia and chlorine. Efforts to evaluate and control municipal toxicity continued in 1996, 1997, and 1998. These efforts have resulted in the screening of most major municipal discharges as well as minor discharges with industrial customers with 307-A toxicants. These evaluations also should be resulting in improved water quality.

Nonpoint Source Control Program

Nonpoint source (NPS) pollution is pollution in runoff from the land. Rain fall, snowmelt and other water that does not evaporate becomes surface runoff and either drains into surface waters or soaks into the soil and finds its way into ground water. This runoff can pick up and carry soil particles, fertilizers, pesticides, chemicals, animal wastes, nutrients, motor vehicle wastes and other pollutants. These pollutants come from land use activities such as: agriculture; construction; silviculture; surface mining; disposal of wastewater; hydrologic modification; and urban development. Often, NPS pollution impairs the chemical, physical and biological integrity of Mississippi's water resources.

Most states, including Mississippi, report that more than half of their surface waters are impaired by NPS pollution. This information, along with nationwide progress made in eliminating point source pollution, and the increasing public awareness of NPS pollution, has resulted in state and federal resource agencies addressing NPS pollution.

Pursuant to Section 319 of the Clean Water Act of 1987, the Office of Pollution Control (OPC) prepared a Nonpoint Source Assessment Report. The OPC was assisted in this effort by the Mississippi Soil & Water Conservation Commission and the USDA Natural Resources Conservation Service. A preliminary list of watersheds and waterbodies with high probabilities of water quality impairments due to agricultural activities was developed. Questionnaires were then sent out to district conservation offices, other state and federal agencies and the public to solicit input. Through this process, waterbodies impacted by other sources of NPS pollution were added to the report. The Assessment Report includes:

1. A list of waterbodies that, without additional action to control nonpoint sources of pollution, cannot reasonably be expected to attain or maintain water quality standards; and

2. A list of categories and subcategories of nonpoint pollution sources or, where appropriate, specific nonpoint pollution sources which add significant pollution to each waterbody mentioned above in amounts which contribute to not meeting water quality standards.

The Assessment Report also includes a description of the process for developing Best Management Practices to control the various categories of nonpoint source pollution. In addition, existing state and local programs which currently control nonpoint sources of pollution are listed. The State's Nonpoint Source Assessment Report was approved by EPA on August 7, 1989. The OPC will continue to review and update this list as new data become available.

According to the Assessment Report, the most significant problems caused by nonpoint source pollution are related to agricultural activities and urban development. Intensive agricultural practices in the Mississippi Delta Region have caused water quality problems in many lakes and streams. Elevated levels of sediment, nutrients and pesticides are often found in these waters. Other waters in the state have experienced problems from agricultural nonpoint source pollution because of the clearing and farming of highly erodible lands. The Mississippi Gulf Coast, in particular, has experienced water quality problems related to urban runoff. Significant problems have been caused in recreational and shellfish harvesting waters by runoff from unsewered areas served by septic tanks and from urban stormwater runoff. Pollutants from these sources are bacteria, nutrients, solids.

Previous assessments (including the 1989 NPS Assessment Report) of water quality in Mississippi indicate that NPS pollution is responsible for the impairment of most state waters. EPA authorized the expenditure of up to $250,000 of 1996 Section 319 grant funds to conduct watershed assessments. The OPC is planning to begin an assessment of state waters on a basin by basin approach to update the 1989 Assessment Report. Up to date basin information will enable agencies to more effectively direct resources to address NPS pollution. This basin monitoring approach should improve the water quality in numerous lakes and streams.

Pursuant to Section 319 of the Clean Water Act of 1987, the Office of Pollution Control also prepared a Nonpoint Source Management Program document. Again, OPC worked closely with other resource agencies during the development of the NPS Management Program. This document includes an identification of Best Management Practices for various sources of NPS pollution, an identification of needed implementation programs, a four-year NPS action plan and an identification of sources of federal funding and other assistance. The Nonpoint Source Management Program document was approved by EPA on August 22, 1989. The program document is currently being updated to reflect past achievements, revised program goals and changes in water quality due to changes in land use.

Although MDEQ serves as the lead agency in Mississippi for water quality management initiatives, the responsibility for controlling NPS pollution belongs primarily to land owners and users. However, many federal and state agencies, and local governments work to address NPS pollution issues and assist land owners. These organizations conduct programs that address NPS pollution from agriculture, silviculture, resource extraction, urban runoff, construction, and hydrologic modifications. NPS pollution is also addressed by not-for-profit organizations, educational institutions, citizen groups, and volunteers. Private and public initiatives range from informational and educational projects, to watershed land treatment projects, to monitoring projects. Table II-3 lists major NPS pollution control initiatives in Mississippi. In the near future, many new and expanded initiatives will be implemented statewide.

To address NPS pollution in Gulf Coast waters, the MDEQ and the Mississippi Department of Marine Resources (DMR) have implemented the Coastal Zone Act Re-authorization Amendments (CZARA). MDEQ and DMR, the lead agency, jointly prepared the Coastal NPS plan which is currently under review by EPA and NOAA. The Coastal Zone Program will serve as a tool for use in conjunction with the state's NPS program to intensify NPS pollution control efforts along the Gulf Coast.

The MDEQ realizes that the effectiveness of the NPS Program depends on the cooperation and coordination of agencies initiating and implementing NPS projects. To ensure this cooperation and coordination an Interagency Water Quality Task Force (IWQTF) was created. The task force helps identify and foster interagency relationships, clarify agency roles, and coordinate water quality improvement efforts in Mississippi. The task force includes representatives from all of the major agencies and organizations involved in NPS issues. A Memorandum of Agreement (MOA) was established between the MDEQ and the U.S. Forest Service (USFS) to address NPS management on national forest lands. The MDEQ will continue to investigate the need for additional MOAs to ensure coordination among all NPS activities and the programs listed in Table II-3.

To date, the OPC's Water Quality Management Branch (WQMB) has secured federal grants totaling $11,762,000 to address NPS pollution. These funds were obligated to implement 44 NPS water quality improvement projects. These projects are of four types: BMP effectiveness demonstration projects; new BMP technology demonstration projects; monitoring and assessment projects; and water quality education projects. The four project types are described below and a list of NPS projects, their locations and status are given for each.

BMP Effectiveness Demonstration Projects

These projects are designed to demonstrate the effectiveness of a selection of BMPs in controlling NPS pollution in priority watersheds. The purpose of these demonstration projects is to promote the voluntary use of BMPs and educate the public. A total of fifteen watershed projects were funded.

1. Bogue Chitto Agricultural Watershed. (Hinds and Madison Counties; completed)
2. Lake Washington Agricultural Watershed. (Washington County; completed)
3. Lake Hazle Urban Watershed. (Copiah County; Completed)
4. Luxapallila Creek Agricultural Watershed. (Lowndes County; Completed)
5. Roebuck Lake Agricultural Watershed. (LeFlore County; Completed)
6. Muddy Creek Agricultural Watershed.(Tippah County; Completed)
7. Okatoma Creek Agricultural Watershed.(Covington, Completed)
8. Ten Mile Creek Agricultural Watershed.(Marian County; Completed)
9. Wolf Lake Agricultural Watershed. (Yazoo County; Ongoing)
10. Moon lake Agricultural Watershed. (Coahoma County, Ongoing)
11. Pushepatapa Agricultural Watershed. (Walthall County, Ongoing)
12. Cane/Mussacunna Agricultural Watershed. (Desoto County, Ongoing)
13. Twenty Mile Donivan Agricultural Watershed. (Prentiss County, Ongoing)
14. Souinlovey Creek Agricultural Watershed. (Jasper County, Ongoing)
15. Upper Bogue Phalia Agricultural Watershed. (Bolivar County, Ongoing)

TABLE II-3

Major Nonpoint Source Pollution Control Programs in Mississippi					
Program	Program Type	NPS Category(s)	Administrative Agency(s) Local	State	Federal
Clean Lakes Program	Incentive	Agriculture Urban Runoff	Statewide Local Gov't	MDEQ	USEPA
NPS Information/Education Programs	Education	All	SWCD	MDEQ, MCES, MSWCC, State Agencies	USEPA USDA
319 NPS Grant Program	Incentive	All	---	MDEQ	USEPA
NPS Research/Assessment	Education	All	---	Stenciling Agencies	---
Urban Stormwater Stenciling Program	Education	Urban	Private & Local Gov't	MDEQ	---
NPS Complaint Response & Enforcement	Regulatory Voluntary	All	---	MDEQ	---
NPS Monitoring Program	Monitoring	All	SWCD	SWCC	USEPA
Agrichemical Monitoring Program	Monitoring	Agriculture	---	MDEQ	---
Ambient Water Quality Monitoring Network	Monitoring	All	---	MDEQ	USEPA
Well Head Protection Program	Voluntary Regulatory	Groundwater	Local Gov't	MDEQ	USEPA
Coastal NPS Pollution Program. (Sec. 6217)	Voluntary Regulatory	All	Local Gov't	MDEQ MDMR	USEPA
Wetland Protection Program Section 401 Certification	Regulatory	Hydro Modifications	---	MDEQ	USEPA CORPS
NPS Land Acquisition	Voluntary	Other	---	MDEQ MDWFP	USEPA
Local Stormwater & Erosion Control Ordinances	Regulatory	Urban Runoff Hydro Modifications Construction	Local Gov't	C	---
Surface Mining & Reclamation Program	Regulatory	Resource Extraction	---	MDEQ	---
NPDES Stormwater Permit Program	Regulatory	Construction Urban	Local Gov't	MDEQ	USEPA
Wastewater Disposal Permit Program	Regulatory	Land Disposal	---	MDEQ	USEPA
Landfill Operational Permit Program	Regulatory	Land Disposal	---	MDEQ	USEPA

Major Nonpoint Source Pollution Control Programs in Mississippi

Program	Program Type	NPS Category(s)	Administrative Agency(s) Local	State	Federal
Road & Bridge Construction Permit Program	Regulatory	Hydro Modifications	---	MDOT, MDEQ, MDWFP	C
Adopt-A-Stream Program	Voluntary Monitoring Education	All	Local Gov't & Groups	MDEQ MSWCC MWF	---
Under Ground Storage Tanks Program	Regulatory	Other	---	MDEQ	USEPA
Emergency Response Program	Regulatory	Other	---	MDEQ	USEPA
Watershed Protection Flood Protection	Incentive	Agriculture Urban Runoff	SWCD	MSWCC	USDA,NRCS
Food Security Act --CRP --Swampbuster --Sodbuster BWQIP	Incentive Voluntary	Agriculture Wetland Silviculture	SWCD MFCD	MSWCC MFC	USDA, CFSA, NRCS
Agricultural Conservation Practices (ACP)	Incentive	Agriculture Silviculture	Local Gov't MSWCD	MSWCC MFC	USDA,CFSA NRCS
Water Quality Incentive Program (WQIP)	Incentive	Agriculture	Local Gov't MSWCD	MSWCC MFC	USDA,CFSA NRCS
Forestry Incentive Programs	Incentive Tech Assistance	Silviculture	MFCD	MFC	---
Waste Pesticide Disposal Program	Voluntary Regulatory	Agriculture	SWCD	MSWCC MDEQ MDA	---
Pesticide Container Recycling Program	Voluntary	Agriculture	SWCD	MDEQ MSWCC	C

New BMP Technology Projects

These are projects designed to evaluate and/or demonstrate relatively new BMP technology. Ten projects of this type were funded.

1. Animal Waste Lagoon Pump-out and Irrigation.(Southwest, Ongoing)
2. Constructed Wetlands to Treat and Re-circulate Effluent from Catfish Ponds. (Lamar County, Completed)
3. Abandoned Agricultural Wells Plugging and Capping. (Delta, Completed).
4. Constructed Wetlands to Treat Waste From Swine Facilities.(Pontotoc, Completed)
5. Dead Chicken Composting. (Southwest, Completed)
6. Irrigation Return Flow. (Delta, Ongoing)
7. Golf Coarse BMPs Demonstration. (Co-Lin Community College, Ongoing)
8. Urban Resource Conservation Plan. (Madison County, Ongoing)
9. Forestry BMPs Demonstration Sites. (Ongoing)
10. MSEA BMPs Implementation/ Education Project. (Delta, Ongoing)

Monitoring/Assessment Projects

These projects are designed to either obtain needed water quality monitoring data, investigate a pollution problem or conduct a study to protect public health. Ten projects of this type were funded.

1. Study the Susceptibility of Major Aquifers in the Delta to Groundwater Contamination. (Delta, Completed)
2. Tangipahoa Watershed Monitoring. (Southwest, Completed)
3. Rural Drinking Well Water Testing. (Statewide, Completed)
4. Water Valley Wellhead Protection. (Yalobusha, Ongoing)
5. Ackerman Surface/Groundwater Interaction.(Choctaw, Ongoing)
6. Adopt A Stream Volunteer Citizen Monitoring Program. (Statewide, Ongoing)
7. Groundwater GIS Development. (Statewide, Ongoing)
8. Abandoned Mines Assessment. (Statewide, Ongoing)
9. Silvicultural GIS Development. (Statewide, Ongoing)
10. Impact of Flooding on the Nitrogen Cycle. (Delta, Ongoing)

Water Quality Education Projects

These are educational projects designed to increase public awareness of NPS pollution and treatment alternatives. Nine projects of this type were funded.

1. Forestry BMPs Manual Development and Training Workshops for Loggers and Landowners.(Statewide, Completed)
2. Advanced Forestry BMPs Training Workshops for Loggers and Logging Industry. (Statewide, Completed)
3. NPS Statewide Education Project. (Completed)
4. Urban Statewide NPS BMPs Education/Information. (Completed)
5. Nutrient Management Manual Development. (Completed)
6. Erosion, Sediment, and Stormwater BMPs Management Manual Development and Training. (Ongoing)
7. Pesticide Amnesty Days. (Statewide, Ongoing)
8. Storm Drain Stenciling Project. (Statewide, Ongoing)
9. Onsite Wastewater Treatment BMPs Demonstration. (Statewide, Ongoing)

The WQMB has a very active statewide NPS Education Program. In addition to the projects listed above, this program assists in coordinating most if not all of the NPS educational activities in the state. Some of these include: annual Soil and Water Conservation Carnivals and Youth Camps; Project WET; Project Wild; Project Earth Teacher workshops, the annual Aqua Fair Event; and the Adopt A Stream and Storm Drain Stenciling Programs.

Additional information on any of these projects may be obtained from the Water Quality Management Branch, Mississippi Office of Pollution Control. A copy of the state's Nonpoint Source Assessment Report or the state's Nonpoint Source Management Program document can be obtained from:

Mr. Robert H. Seyfarth, Chief
Water Quality Management Branch
Mississippi Department of Environmental Quality
Office of Pollution Control
P. O. Box 10385
Jackson, Mississippi 39289-0385

COST/BENEFIT ASSESSMENT

Under the EPA Construction Grants Program, the cumulative investment for municipal wastewater facilities in Mississippi through FY'88 was in excess of $500 million. For Federal FY'89 through FY'98 the State Revolving Fund (SRF) Program capital investment was approximately $200 million.

It has been estimated that wastewater and non-point source pollution needs across the state are approximately $1.3 billion for the year 2016. Significant improvements have been noted in our streams due to facilities built under the Construction Grants and SRF Programs. This is particularly evident below our major municipal dischargers. In addition, the State's implementation of the National Municipal Policy which required municipalities to upgrade to meet final effluent limits by July 1, 1988 is resulting in significant water quality improvements.

The OPC has no way of assessing capital investments for upgrading industrial wastewater treatment facilities, nor for assessing the actual costs of operating and maintaining municipal and industrial facilities. Also, the OPC does not know the economic benefits resulting from recent water quality improvements.

SPECIAL STATE CONCERNS

Historically, the major water quality problems in Mississippi have been the result of waste discharges from point sources, notably from industrial and municipal discharges in the heavily populated Gulf Coast and Jackson Metropolitan areas, and from nonpoint source pollution in the Mississippi Delta, and from the oil production industry. Impacts from waste discharges have been greatly reduced across the state due to point source control activities which have greatly improved water quality conditions below these discharges. Improvements have also been realized in the Delta from better management of the use of pesticides, the development of less persistent chemicals, and the education of farmers in the installation of Best Management Practices. Also, many of the oil production related problems have been resolved.

Control of nonpoint source pollution appears to be one of our greatest challenges in the future. The OPC's water pollution control program to date has been very effective in correcting water quality problems caused by point sources. However, current assessments of water quality indicate that nonpoint sources contribute to the majority of the State's impaired waters. Once the remaining needs for Publicly Owned Treatment Works are addressed, additional control of nonpoint sources of pollution will be needed to attain additional water quality improvements. Additional planning will be required to develop implementation strategies for nonpoint source control. Grants or cost-share programs will be necessary to implement control measures for agricultural activities. Urban runoff must be addressed before water quality problems can be completely solved in some areas, particularly along the Gulf Coast. Failing septic tanks along the Gulf Coast and the shorelines of many lakes must also be addressed.

Wetland losses is another concern of the state. Wetlands provide many benefits, including fish and wildlife habitat, erosion control and water quality improvement. Water quality functions include flood water retention, ground water recharge, sediment stabilization, and pollutant assimilation. Historically, Mississippi's wetland losses were due primarily to conversion to agriculture. Urban wetlands are now at higher risk due to increased pressure from residential and commercial development.

The issue of toxic pollutants is another major concern. The State has adopted widely expanded toxics criteria in our water quality standards. Parameters of particular concern are some of the pesticides, mercury, and PCBs. Where necessary, biological and chemical screening and monitoring will be used to assess the extent of contamination.

Another growing area of concern is the rapid residential, commercial, and industrial growth occurring throughout the state and the demands this economic development may place on the State’s environmental resources. Historically, Mississippi has always been characterized as a rural state. With the advent of the gaming industry as well as a favorable economic climate, this is gradually changing. Previously, only Jackson and the Gulf Coast were the major population and industrial centers. In recent years, this economic development and growth are being experienced not only in Jackson and the Gulf Coast, but also in Hattiesburg, Meridian, Tupelo and in Northwest Mississippi.

Specific State Concerns

Mississippi Gulf Coast

Elevated bacterial counts in the past have caused concern in swimming and shellfish harvesting areas along the Mississippi Sound. This situation had developed over many years due to the lack of proper planning and the necessary ordinances or controls to ensure proper wastewater disposal. Developments had been allowed to install individual home disposal systems in areas where these systems do not work properly. Also, there were over one hundred fifty private sewage systems discharging wastewater to coastal streams. Improvements in water quality have occurred with the implementation of regional sewage treatment plants for the three-county area.

All publicly owned treatment works along the Gulf Coast have now completed the construction necessary to bring these facilities into compliance with current water quality standards. However, with the ongoing growth of the gaming industry, there have been some facility expansions. The Harrison County Wastewater and Solid Waste Management District completed expansion of the Keegan Bayou Facility (MS0023159). Also, they completed construction of a new facility to serve the Gulfport area, known as Gulfport North (MS0051756). The Mississippi Gulf Coast Regional Wastewater Authority also expanded the Escatawpa Facility (MS0021521). Growing pains will likely continue over the next several years.

Another concern on the Gulf Coast has been sanitary sewer overflows (SSOs) from the publicly owned collection systems. The Environmental Protection Agency (EPA) has initiated a program called Management, Operation, and Maintenance directed toward such systems, abbreviated MOM. The program is asking for public wastewater systems to conduct management, operation, and maintenance self-audits of their own treatment and/or collection facilities problems or violations. Facilities that choose not to conduct the self-audit, will be audited by EPA. EPA used a ranking system in each state to determine the first systems selected for the MOM program. In Mississippi the public systems in the three Gulf Coast counties were selected. EPA conducted an introductory meeting with the selected systems in January, 1999, and is currently working towards beginning the audit process.

Previously, due to the number of municipal and industrial discharges which enter the confined area of Back Bay, concerns existed regarding the overall water quality and environmental health of the bay. The OPC requested and received initial EPA funding for a study of the bay in 1992 and 1993. Field sampling for this study was completed in 1995, and a water quality model for the bay developed. Based on the study findings, with the exception of Bernard Bayou, Gulfport Lake, and the Industrial Seaway, the waters of the Back Bay and Biloxi Bay estuarine system are fully supporting of the aquatic life designated use. For more information, see Basin/Waterbody Information, Coastal Streams Basin, page 165).

After meeting the wastewater collection and treatment needs along the coast, the nonpoint source problems are the next priority. Pollutants in stormwater runoff from the heavily populated urban and industrial areas along the Gulf Coast are a special concern. The establishment of OPC's new Beach Monitoring Network in 1996 and the redesigned and expanded OPC Ambient Monitoring Network in 1997 provides an improved surveillance program for monitoring pollutant levels in the waters of the Gulf Coast.

Agricultural Impacts

Another major water quality concern is impact from agricultural activities, especially in Mississippi's Delta region. This fertile farm land has been subjected to intense tillage and use of agricultural chemicals over many years, with significant impacts to most of the lakes and streams in the area. Nutrients, siltation and pesticides are common pollutants indicated for water quality impacts reported in the Nonpoint Assessment Report for this agricultural region. In addition, DDT and its derivatives, and toxaphene caused serious problems in the past, but levels have declined significantly since 1976. Although this area continues to have agrichemical related fish kills, improvements have been gradually noted due to better management and the use of less persistent chemicals at optimum spraying times. Also, educational efforts through the Nonpoint Source Program and other agricultural programs are resulting in the use of more Best Management Practices such as minimum tillage, filter strips, crop residue use and safe pesticide container disposal.

Current nonpoint source assessment data also indicates concern in the Hill Section of the state. High erosion rates have been experienced when this steeply sloping land is converted to cultivation. The Conservation Reserve Program (CRP) has been effective, however, in beginning to return this highly erodible land back to forests or pasture.

Escatawpa River near Moss Point

The Escatawpa River near Moss Point is currently assigned a dissolved oxygen criterion variance to 3.0 mg/l. Natural conditions, current industrial and past municipal discharges, in combination with the poor flushing action of the estuary have necessitated this variance. A Use Attainability study is underway by the EPA to determine if this variance is still appropriate (see Basin/Waterbody Information, Pascagoula River Basin, page 195).

In August 1990, a consumption advisory for all species of fish and shellfish and a commercial shellfish fishing ban were issued for the lower 12 miles of the Escatawpa River near Moss Point due to elevated levels of dioxin. The advisory continued to become less stringent each year as dioxin levels in fish declined. In 1996, the advisory was lifted. For more information, see Public Health/Aquatic Life Concerns, Dioxin Studies, page 139.

Mercury Contamination in Fish Tissue from Surface Waters

The OPC continues to commit significant resources to determining the status of mercury contamination in Mississippi's waters. Advisories were issued in 1995, 1997 and 1998 for black bass and catfish greater than 10 pounds for some segments of the Bogue Chitto, Escatawpa, Yockanookany and Pascagoula Rivers, and for Enid Reservoir and Archusa Creek Water Park. In addition, an advisory was issued for King Mackerel in all coastal waters. Resources are presently being divided between aggressive monitoring of sites where elevated levels have been found and the monitoring of new sites. Additional mercury advisories are anticipated in the next several years. For more information, see Public Health/Aquatic Life Concerns, Statewide Mercury Contamination Study, page 137.

Lower Pearl River

A significant concern of MDEQ and the residents of the lower Peal River Basin, Pearl River County, is the loss of flow in the historic channel of the lower Pearl River near Picayune, Mississippi. Since the turn of the century, Wilson Slough has progressively captured an increasing amount of flow from the Pearl River, diverting it to the West Pearl River via the Bogue Chitto River. This has greatly reduced the volume of water in the historic channel of the Pearl River passing Wilson Slough at all stages. Hydrographic models projected that, if unchecked, there would be no flow past Wilson Slough during periods of low flow by as early as 1997. This reduction in flow caused the loss or degradation of many of the system's unique environmental features and several miles of aquatic habitat. This was of particular concern since much of the area is shallow, sandy or gravel bottom substrate with excellent mussel habitat. As this reduction in flow occurs at higher and higher stages, there is also concern that wetlands along the historic channel are dewatering. Water-oriented recreation and commercial fishing have been adversely affected or curtailed because of this condition.

MDEQ and the Vicksburg District of the Corps of Engineers (COE) worked cooperatively to evaluate the feasibility of restoring dependable flows during low-flow conditions from Wilson Slough, through Walkiah Bluff to Holmes Bayou. Restoration efforts consisting of a weir in the old channel of the Pearl River designed to push 50% of low flows down the historic channel around Walkiah Bluff, four distributary closures and a pilot channel were begun during the summer of 1998, and were completed in November of the same year. The project, while successful in restoring flow to the river has experience some problems which will require additional work in the summer and fall of 1999. For more information, see Basin/Waterbody Information, Pearl River Basin, page 210).

Tallahala Creek Below Laurel

Tallahala Creek below Laurel is currently assigned a 28 mile dissolved oxygen (DO) criterion variance to 3.0 mg/1 from Highway 15 near Laurel to below Ellisville. This variance has been necessary due to the discharges from numerous city lagoons and the Masonite Corporation. The Masonite Corporation significantly upgraded its wastewater treatment facility in mid 1978. The City of Laurel upgraded its facilities to meet final effluent limits by February 1991. This upgrading offered the possibility of achieving the dissolved oxygen criterion of 5.0 mg/l in at least a larger portion of Tallahala Creek. Due to Tallahala Creek’s inclusion on the state’s 303(d) list of impaired waters, field studies were conducted in 1996 and 1997 to develop a TMDL for oxygen-demanding pollutants in Tallahala Creek at and below the city of Laurel and to investigate the feasibility of removing the dissolved oxygen water quality standards variance. From these studies, a TMDL has been developed and study findings have shown that the lower portion of the Tallahala Creek DO variance area could be removed. The DO variance for the upper portion of Tallahala Creek from Highway 15 to the confluence with Tallahoma Creek near Ellisville is still warranted. For more information, see Basin/Waterbody Information, Pascagoula River Basin, page 195).

Other State Water Quality Concerns

The State is concerned about the potential water quality impacts from and the regulation of confined animal operations (CAOs). Guidance has been issued by EPA at the national level in addressing this issue. The State is currently evaluating this guidance.

EPA is working toward the development of nutrient criteria guidance by the year 2000 and is expecting states to adopt criteria by 2003. The State is concerned that the short time frame will not lend itself to valid scientific conclusions that would be appropriate for the varied ecoregional conditions across the state.

The State has listed a large number of evaluated waters, many of which are identified as partial watersheds or drainage areas, on its 303(d) list for which no actual monitoring data exists indicating impairment. The State is committed to the monitoring of all these waters for the next few years to verify the potential impairment and the need for TMDL development. MDEQ is attempting to monitor these waters utilizing the basin monitoring networks established as part of OPC's Basinwide Planning Approach to Water Quality Management process. For more information, see Basin Fixed Station Monitoring network, page 51, 62 and Basinwide Planning Approach to Water Quality Management, page 29).

Resource Concerns

The OPC laboratory made tremendous progress in the late 1980's and 1990's in upgrading its analytical equipment and securing a facility. However, the process of maintaining and replacing aging equipment is an ongoing process. Present equipment needs include a graphite furnace atomic absorption spectrophotometer, sampling equipment, and boats. Additionally, resources need to be provided each year to upgrade Field Service Division computer equipment.

In the early 1990's, a significant decline in state and federal resources had affected the OPC's ability to conduct effective surface water assessment, standards, TMDL, permitting and protection programs. EPA's concerns about the decline in the State's assessment and permitting programs and their intervention and assistance in the OPC's surface water program in 1996, prompted the State's Legislative Budget Office (LBO) to perform a detailed review of the resource needs of the surface water program. The LBO concluded that 29 additional positions were needed in order for the Surface Water Division to conduct adequate surface water assessment and permitting program. At the recommendation of the LBO, the State legislature in 1996 funded all 29 positions and provided funds for much needed equipment. In 1998 the legislature funded an additional 14 positions which the agency has dedicated to water quality assessment, total maximum daily load (TMDL), and water quality management activities.

This action by the State legislature has provided the staff and equipment necessary to monitor and assess the water quality of more of the State's surface waters, to develop TMDLs, to conduct more extensive water quality testing and analyses, and to respond timely to fish kills and pollution incidents. The OPC has also been able to resume its historical role in the compliance, inspection, and enforcement of permits.

MDEQ has issued coverages for storm water projects under Phase I of the NPDES Storm Water Program since 1992. Unfortunately, since its inception the program has been handicapped by a lack of resources for permitting as well as compliance and enforcement. A recent internal reorganization helped this situation by creating an Environmental Compliance and Enforcement Division (ECED). This has created more resources for the compliance and enforcement portion of the program. However, only the industrial facilities have compliance inspections. Construction storm water is still handled on a complaint basis only. Even with the creation of this new division, the lack of resources is evident because each ECED inspector has a back-log of construction storm water complaints to address.

RECOMMENDATIONS

1. Additional studies are needed on the Mississippi Gulf Coast to quantify the impacts of nonpoint source pollution and to develop BMPs for use in this area.

2. Educational and incentive programs are needed to promote the use of Best Management Practices to control nonpoint source pollution.

3. More complex non-point data analysis tools (e.g., GIS analysis tools) are needed for conducting additional assessments. They are needed for documenting NPS impacts from land use changes particularly from agriculture and construction activities.

4. Continued development and implementation of basin-wide planning and watershed-based water quality management is needed.

5. Identification of crucial wetland resources in each watershed is needed to focus local, state and federal protection efforts.

6. Additional resources are needed to fund the State's stormwater program with specific emphasis on compliance and enforcement, education, and permit development.

7. In addition, resources are needed to implement and manage the State's Wellhead Protection Program and the Agricultural Chemical Groundwater Monitoring Program.

8. A greater emphasis on fish tissue contamination is needed. EPA and most other states have switched from action levels for the issuance of consumption advisories in favor of a risk assessment approach. Additional resources are needed to evaluate existing data, state-wide and local consumption patterns and develop Mississippi specific risk assessments. Additional resources are also required to increase analytical capabilities for tissue analysis.

9. Resources are needed to address beach monitoring in fresh water swimming areas similar to the existing Coastal Beach Monitoring Program on the Gulf Coast.

10. Continued emphasis and resources are needed to develop and implement Total Maximum Daily Loads (TMDLs).

11. The development of Eco-regional nutrient criteria is needed by 2003.

PART III

SURFACE WATER ASSESSMENT

CHAPTER ONE

SURFACE WATER MONITORING PROGRAM

Objectives

The objectives of the surface water monitoring program in Mississippi are diverse. The first objective is to develop and maintain an understanding of the quality of all waters within the state and the causes and effects of such quality. The second objective is to acquire the necessary data to accurately report on this water quality and its causes and effects. Thirdly, the monitoring program is utilized to support the state’s water quality management and regulatory programs and to assess the overall effectiveness of the state's pollution control program. This program effectiveness monitoring will not only document environmental improvements and successes, but also can identify problem areas where management priorities and resources need to be focused.

In order to accomplish these objectives, the MDEQ’s Office of Pollution Control (OPC) carries out a broad range of monitoring activities before and after implementing pollution controls. These multi-faceted activities consist of the actual measurement of water quality parameters in state waters followed by the investigation and evaluation of factors determining these water quality findings. The monitoring process culminates with an overall assessment of the specific effects of such quality upon the beneficial uses of state waters.

Monitoring Strategy

The OPC’s surface water monitoring strategy utilizes a multi-faceted approach to realize program objectives. The OPC Surface Water Monitoring Program includes the following basic components:

1. Ambient fixed station monitoring network (including statewide coverage and geographically-targeted watershed or basin monitoring);

2. Intensive surveys and special studies;

3. Source compliance and environmental damage assessment monitoring;

4. Citizen's (volunteer) monitoring;

5. Laboratory support;

6. Quality assurance/quality control;

7. Data acquisition/data sharing with other agencies;

8. Data management, assessment and reporting.

Ambient Fixed Station Monitoring Network

In Mississippi, ambient fixed station monitoring is designed with the following objectives:

1. To characterize and assess statewide water quality status and trends in the state’s stream, lake, estuarine and coastal waters for general reporting in the Section 305(b) Report to Congress and the annual development of the priority list of impaired waters as required in Section 303(d) of the Clean Water Act;

2. To address public interests and concerns on key waterbodies;

3. To support the design and implementation of OPC’s Surface water Division water management programs including NPDES, nonpoint source, water quality standards, TMDL development, basin initiatives and water quality planning/management;

4. To evaluate the effectiveness of OPC’s overall pollution control programs;

5. To address economic development interests and concerns.

In order to achieve these objectives, the OPC maintains a statewide fixed network of monitoring stations which are sampled routinely for a broad range of water quality parameters and indices. Parametric coverage at the stations includes physical, chemical, bacteriological, biological and/or fish tissue components. In 1997, OPC redesigned its ambient surface water monitoring program due to the critical need to increase the amount of assessed waters in the state and the availability of increased monitoring resources to meet this and other EPA and State Water Program needs. This resulted in a major increase in the number of ambient monitoring stations relative to the number of historical OPC ambient fixed network stations. In addition, this redesign of the OPC Ambient Surface Water Monitoring Program led to the establishment of a dual system of ambient fixed sampling stations which now consists of a statewide Primary Fixed Monitoring Network and a rotating Basin Fixed Monitoring Network. Data from this expanded network, however, was not available for this 305(b) report cycle. Consequently, the data reported in this assessment report are based on the ambient fixed station network stations active until CY1997.

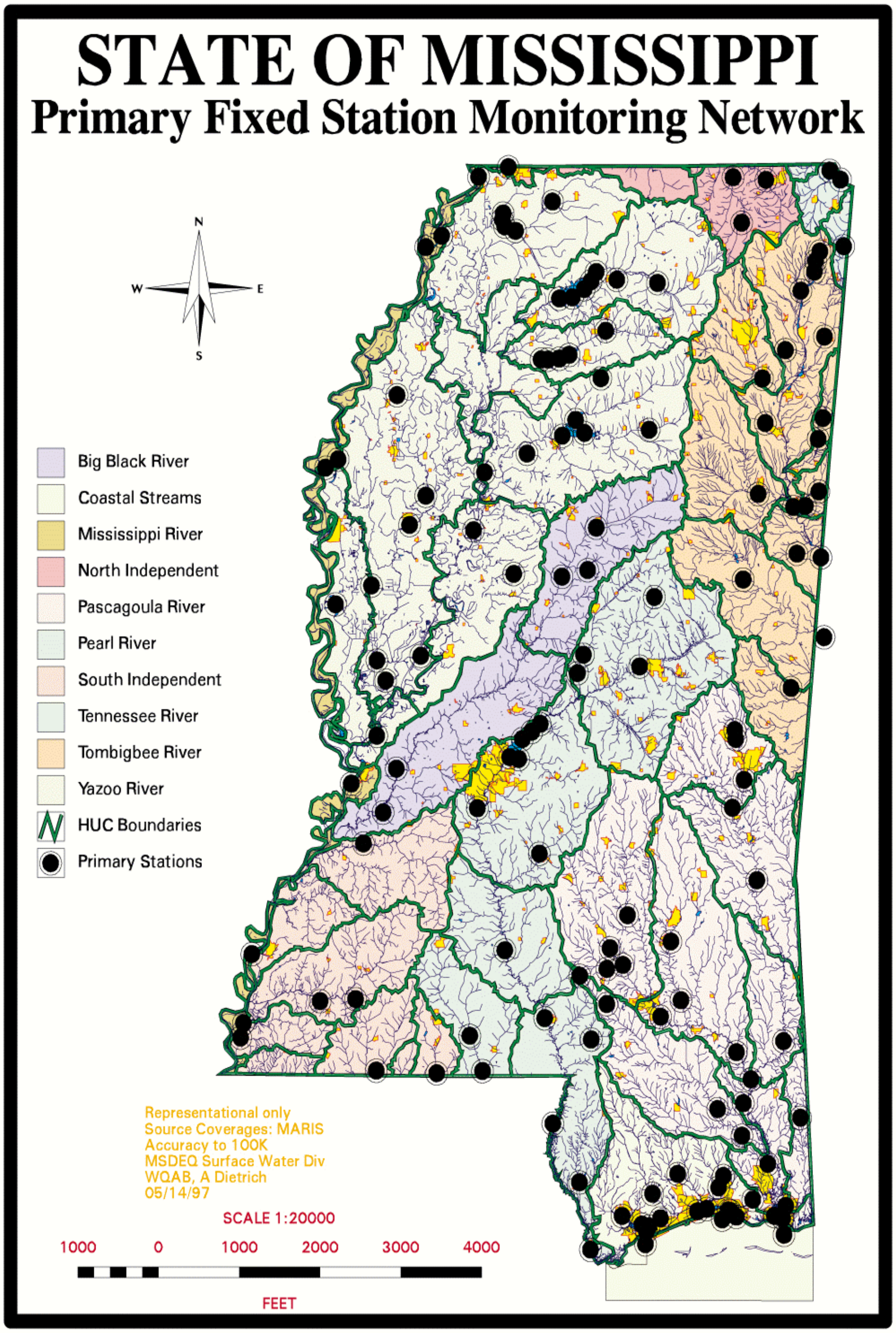
Primary Fixed Station Monitoring Network

Primary stations are distributed throughout the northern, central, and southern regions of the state in streams, rivers, bayous and estuaries. This network consists of unpolluted streams, from which an assessment of baseline conditions can be made, streams below critical discharges, from which long-term trends can be established and/or improvements observed where pollution control measures are implemented, streams which represent a composite of a large watershed which will allow broad evaluations of overall abatement programs and waters of general concern (i.e., major streams entering or leaving the state and near-coastal waters). Several stations in the sampling network are historical stations that have data records dating back to the 1970's. In addition, many of these historical monitoring stations are long-time constituents of the U.S. Environmental Protection Agency's (EPA) Basic Water Monitoring Program which was designed on a national level to monitor nationwide water quality status and trends.

The locations of primary fixed monitoring stations operated for long-term water quality status and trends data collection are shown in Figure III-1. OPC’s Primary Fixed Station Network consists of a total of 143 stations across the state and became operational in 1997. Prior to this time, OPC’s ambient monitoring network only numbered approximately 25 stations in any given year. In addition, the network has also enabled, for the first time, OPC to conduct routine, comprehensive long-term ambient monitoring of the states’ major lakes and reservoirs, as well as the open waters of the Mississippi Sound and its associated bays

FIGURE III-1

Primary Fixed Station Monitoring Network



The Primary Fixed Monitoring Network is of a conventional (i.e. targeted) design. Each station was required to meet the monitoring objectives of the program and also specific selection criteria for station locations. The specific criteria utilized for the location and establishment of Primary Fixed Stations are:

1. Major perennial stream, major lake or estuary;

2. At or close to a hydrological recording station (required for most physical/chemical stations);

3. Strategic basin location (lower end of basin, confluence of major streams, mouth of major tributary, maximum spatial coverage, etc.);

4. High recreational activity or designated use;

5. Interstate waters;

6. Ecological, public health, or economic significance (below major pollution sources, fish advisory area, ecoregional reference site, high quality waters, endangered/threatened species, high economic interest, etc.)

7. Other logistical and administrative criteria (safety, accessibility, multi-agency coordination, historical data record)

Ambient - Physical/Chemical/Bacteriological Monitoring

The network of statewide ambient primary fixed stations was established for systematic water quality sampling at regular intervals and for uniform parametric coverage to monitor water quality status and trends over a long-term period. Physical, chemical and bacteriological parameters monitored at each station are shown in Table III-1.

The ambient fixed stations targeted for physical, chemical and bacteriological sampling are sampled either monthly (bridge sites) or quarterly (boat sites) depending on the designated access. Prior to the redesign of the monitoring network, ambient network chemical stations were only visited every other month. Sampling is carried out by Field Services Division (FSD) biologists from each of three regional offices (northern, central, and southern regions) located in Oxford, Pearl and Ocean Springs, respectively. Each office is responsible for the stations in its region. Upon arrival on site, field instruments are used to record in-situ water quality measurements for dissolved oxygen, temperature, specific conductance/TDS/salinity and pH. Water column samples are collected, preserved, and transported to OPC's Laboratory in Pearl for analysis. Stations and sampling route schedules are carefully selected so that all samples are received by the OPC lab in a timely manner, allowing analyses to be conducted within acceptable holding times. Due to limited holding times, special provisions have been made for bacteriological samples collected in the northern and southern regions where travel times for bacteria samples would be exceeded if they were shipped to the OPC laboratory. For the north region, bacteriological analysis is done at the OPC Oxford field office. For the southern region, the analysis is performed under contract by the Gulf Coast Research Laboratory in Ocean Springs.

TABLE III-1
Primary Fixed Station Network
Physical/Chemical/Bacteriological Station Parameter List

Parameter	STORET CODE
Physical/Chemical Parameters Sampled Monthly	
Water Temperature (C)	00010
Dissolved Oxygen (mg/l)	00299
Dissolved Oxygen, % Saturation (%)	00301
pH (Standard Units)	00400
Conductivity (umhos/cm @ 25 C)	00094
*Salinity (0/00)	00480
**Transparency, Secchi Disc (meters)	00078
***Total Dissolved Solids (mg/l)	70294
Total Suspended Solids (mg/l)	00530
Turbidity (NTU)	82079
Total Chlorides (mg/l)	00940
Total Alkalinity (mg/l)	00410
Total Organic Carbon (mg/l)	00680
***Chemical Oxygen Demand (mg/l)	00340
Total Kjeldahl Nitrogen (mg/l)	00625
Total Ammonia Nitrogen (mg/l)	00610
Nitrite + Nitrate (mg/l)	00630
Total Phosphorus (mg/l)	00665
****Flow-Instantaneous (cfs)	00061
*Tide Stage (Code)	00067
Bacteriological Parameters Sampled Monthly	
***Fecal Coliform-MF,M-FC Media (/100 ml)	31616
*Fecal Coliform-MPN,A-1 Media (/100 ml)	31621
Chemical Parameters Sampled Quarterly	
Total Aluminum (ug/l)	01105
Total Arsenic (ug/l)	01002
Total Cadmium (ug/l)	01027
Total Chromium (ug/l)	01034
Total Copper (ug/l)	01042
Total Lead (ug/l)	01051
Total Manganese (ug/l)	01055
Total Mercury (ug/l)	71900
Total Nickel (ug/l)	01067
Total Selenium (ug/l)	01147
Total Zinc (ug/l)	01092
Total Hardness (mg/l)	00900
Total Phenols (mg/l)	46000

*Estuaries and Tidal Rivers Only
**Estuaries and Lakes Only
***Freshwater Streams and Lakes Only
****Freshwater Streams Only

NOTE: Sampling frequencies noted above are applicable to bridge sites only. For boating sites, all samples are collected quarterly (January, April, July and October).

Ambient Biological and Fish Tissue Monitoring

The purpose of ambient biological monitoring is to assess the health or biological integrity of the aquatic community at a surface water site. This monitoring serves as a long-term indicator of stream water quality. The OPC's ambient biological monitoring program utilizes macroinvertebrate bioassessments in fresh waters, determinations of levels of chlorophyll a in lentic, marine and estuarine waters as well as fish tissue analysis at selected freshwater and estuarine sites. In addition, fish tissue sampling is conducted at many sites during fish kill investigations and for special studies such as the Mississippi Mercury Study (see Statewide Mercury Contamination Study, p.137).

Ambient fish tissue sampling occurs annually at 24 primary fixed stations across the state and at selected basin network sites. Additional fish tissue sampling for fish kill investigations, monitoring of fish advisory areas, and for special studies amounts to a significantly greater amount of the OPC fish tissue sampling load than ambient fixed station network sampling. Fish samples are normally collected from early spring through the fall of the year, depending upon ambient conditions. Target species include one predator or carnivore such as flathead catfish or large mouth bass, and one bottom feeder or omnivorous species such as channel catfish or smallmouth buffalo. Ideally, fillet composite samples consisting of five individuals are analyzed, and all fish in the composite are at least 75% of the weight of the largest fish in the composite. The laboratory has the capability to analyze fish tissue samples for approximately 36 organic compounds, PCB's, PCP and seven heavy metals, although it is rare when a sample is analyzed for all of the parameters outlined above (Table III-2).

Ambient biological monitoring for benthic macroinvertebrates also occurs at selected fixed stations in wadeable freshwater streams. In 1996, the entire historical ambient monitoring network was re-evaluated and modified, and approximately 40 fixed sites were established as macroinvertebrate status and trends sites for the new OPC Surface Water Monitoring Program . Sampling at these Primary Fixed Station Network macroinvertebrate sites began in 1997 and the sites are sampled on an annual basis using modified EPA rapid bioassessment techniques and include habitat assessments. The establishment of a Regional Biologist in each of the MDEQ field offices as well as the initiation of rotating basin studies in 1997 (see Basinwide Approach to Water Quality Management, p.29, and Basin Fixed Station Network, p.51, 62) has greatly increased the number of biological assessments conducted on state waters. There has also been an increased demand for biological water quality information (particularly macrobenthic studies) to determine environmental damages caused by accidental spills of oil or other chemicals (see Source Compliance and Environmental Damage Assessment Monitoring, p.69).

TABLE III-2
Ambient Fish Parameters and Minimum Detection Levels

Parameter	MQL (ug/kg) (mg/kg)	STORET Code	Frequency
alpha BHC	23	39074	Annually
delta BHC	16	34263	Annually
gamma BHC (Lindane)	17	39075	Annually
Aldrin	23	34680	Annually
Dieldrin	29	39404	Annually
Endrin	26	34685	Annually
Endrin Aldehyde	34	34370	Annually
Heptachlor	27	34687	Annually
Heptachlor Epoxide	21	34686	Annually
Alpha Chlordane	5.4	79025	Annually
Gamma Chlordane	25	79005	Annually
Technical Chlordane	67	34682	Annually
Methoxychlor	58	81644	Annually
Endosulfan I (Alpha)	20	34365	Annually
Endosulfan II (Beta)	27	34360	Annually
Endosulfan Sulfate	23	34355	Annually
Total DDT		39290	Annually
p,p-DDE	34	39322	Annually
p,p-DDD	34	39312	Annually
p,p-DDT	34	39302	Annually
Mirex	23	81645	Annually
Toxaphene	58	34691	Annually
Total PCB's		39525	Annually
PCB 1016	36	34674	Annually
PCB 1221	670	34664	Annually
PCB 1232	34	34667	Annually
PCB 1242	34	34689	Annually
PCB 1248	34	34669	Annually
PCB 1254	67	34690	Annually
PCB 1260	67	34670	Annually
Trifluralin (Treflan)	23	81652	Annually
Pendamethalin (Prowl)	80		Annually
Profenofos (Curacron)	80		Annually
Dicofol (Kelthane)	27		Annually
Hexachlorobenzene	10	34688	Annually
Pentachlorophenol	50	39060	Annually
Azinofos Methyl (Guthion)	272	81802	Annually
Arsenic	5	01004	Annually
Cadmium	1	71940	Annually
Chromium	1	71939	Annually
Copper	5	71937	Annually
Lead	5	71936	Annually
Mercury	5	71930	Annually
Selenium	5	01149	Annually
beta-BHC	15.0		Annually
cis-Permethrin	250	82419	Annually
trans-Permethrin	64	82422	Annually
Chlorpyrifos (Dursban)	23	81807	Annually
Atrazine	200	82404	Annually
Simazine	200	82406	Annually
Endrin Ketone	40		Annually

For the past several years, a portion of the monitoring effort using macrobenthos has focused on streams considered to be "least disturbed". This monitoring has been done in conjunction with the Alabama/Mississippi Pilot Ecoregional Reference Site Project, the Mississippi Alluvial Plains Ecoregion Study, and as independent efforts in the Mississippi Valley Loess Hills ecoregions. Ecoregions, or ecological regions, identify areas of relatively similar ecological systems. Ecoregions provide resource managers with a logical regional strategy for locating representative reference sites, designing sampling schemes, analyzing and evaluating data and assessing regional patterns of attainable terrestrial and aquatic ecosystem quality. To examine seasonal patterns of benthic abundance, sampling at a selected number of those ecoregional streams deemed "least disturbed" occurred several times during 1994 and 1995. This important effort was abandoned in 1996 due to budgetary constraints, but was resumed in 1998. The data from these streams may become the foundation for the development of biological criteria for the state's water quality standards. Figure III - 2 shows the ecoregions and subecoregions present in Mississippi.

Beginning in 1997, routine long-term ambient monitoring of the states' lakes and reservoirs, as well as the Mississippi Sound and its associated bays was initiated for the first time as part of OPC's new Surface Water Monitoring Program. Previously, biological monitoring of these lentic waters had been limited to periodic assessments such as for the Clean Lakes Program or other special studies (see Lakes Water Quality Assessment, p.99). A contractual arrangement with the Pearl River Valley Water Supply District has enabled biological section staff to monitor levels of chlorophyll a at one site on the Ross Barnett Reservoir monthly since January 1995. With the expanded fixed station network, a significant increase in phytoplankton assessments has occurred with determinations of levels of chlorophyll a being a routine part of the water quality assessments done on these lentic systems. Phytoplankton are now sampled in 24 lakes and reservoirs on a quarterly basis for chlorophyll a analysis. Annual collections of phytoplankton at nine estuarine and marine sites are presently used for chlorophyll a analysis but an increase to a quarterly frequency is planned in the near future. Historically, periphyton had been the assessment technique utilized in estuarine waters.

Parameters measured at all biological stations are outlined in Table III-3. These data are used to make status and trend assessments, to evaluate water quality below dischargers, to document environmental damage in cases of accidental releases, and to identify least impaired waters for ecoregional reference sites.

Sampling frequency at Ecoregional Reference Sites was three times per year in 1994-95 and in 1998. Chlorophyll a analyses were conducted quarterly at lentic sites beginning in 1997. Sampling frequency for all other parameters is one time per year.

Biological Monitoring - 1995 Budget constraints prevented macroinvertebrate-based ambient biological monitoring in 1995, with the exception of a joint sampling QA/QC effort with the Alabama Department of Environmental Management. However, several Environmental Damage Assessments (EDA's) were completed by Biological Services Section staff. These assessments resulted in 14 sites being sampled for macroinvertebrates, water column chemistry, physical habitat, and a variety of chemical parameters, depending upon the specific needs of the study. An additional three sites were sampled and assessed as part of a special water quality investigation of the effects of the City of Tupelo's wastewater discharge. Finally, two sites were sampled to obtain background information on characteristics of the benthic community and water quality prior to the beginning of a dredging operation on the lower reaches of the Leaf River. No marine or estuarine sites were sampled for periphyton during 1995.

Approximately 140 fish samples were collected for mercury analysis from 32 sites in 1995. Additionally, 74 fish samples were analyzed for mercury from the 25 Clean Lakes sites discussed below. Data from this sampling effort resulted in consumption advisories being issued for Archusa Creek Reservoir, the Pascagoula River, and the Yocana River from Enid Reservoir to the confluence with the Little Tallahatchie River.

TABLE III-3
Biological Station Parameter List

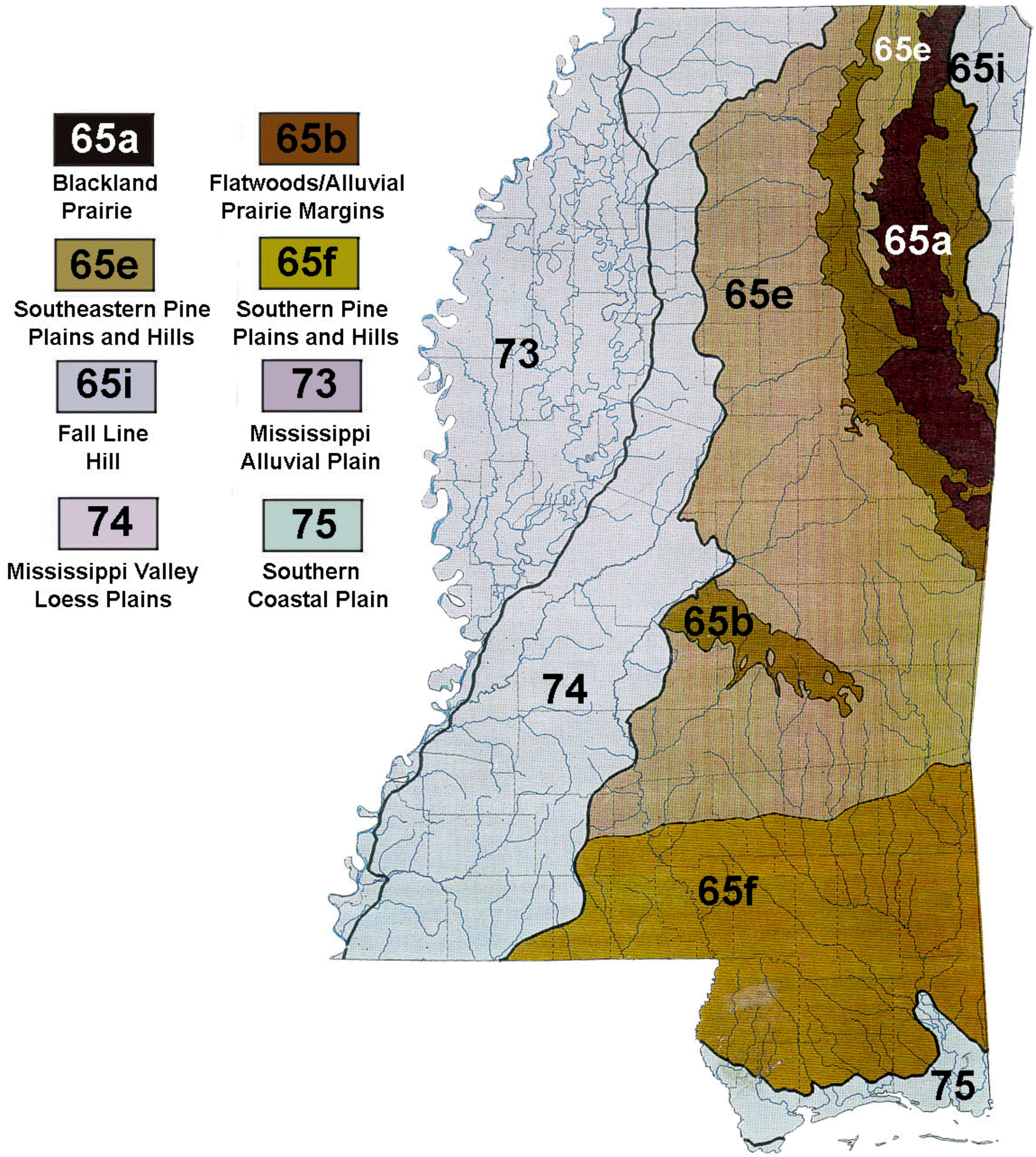
Parameter	Location
Phytoplankton	Estuarine and Lentic stations
Pigments (chlorophyll a)	
Macroinvertebrates	Freshwater stations only
Habitat assessment	
Identification	
Taxa richness	
EPT richness	
EPT/Chironomid ratio	
North Carolina Biotic Index	
% Contribution of dominant taxon	
Trophic community structure	
Similarity Index to Reference Site	
Fish	All stations
Identification	
Pesticide and Heavy Metals analyses	

Dioxin monitoring continued on the Leaf and Escatawpa Rivers in 1995 at the same rate as in 1994. Fewer samples (43) were collected this year, even though the effort was comparable to that of years past. This was primarily because fish collected in the spring and fall were composited at the year's end, as opposed to biannual analysis as had been the practice in previous years. This was done in an effort to decrease the number of samples containing only one fish (i.e. to increase sample size) and thereby decrease variability. The dioxin advisory on the Leaf River, which was issued in 1990, was removed early in 1995, but the Escatawpa River advisory remains unchanged. A macroinvertebrate report initiated in 1991, assessing the water quality of the Leaf River above and below the Georgia Pacific paper mill discharge, was completed this year.

A total of 25 lakes were sampled for fish tissue, nutrients, and basic limnological parameters as part of our Section 314 LWQA Program. An enhancement to this program was the collection of samples for analysis of chlorophyll a. This was done at all lakes to provide a more complete assessment of lake water quality. The Section 314 Phase II monitoring of Lake Washington, as outlined above, continued for the entire year. The Biological Services Section began monthly monitoring of chlorophyll a in the Barnett Reservoir for the Pearl River Valley Water Supply District in January, 1995.

Biological Monitoring B1996 A total of 19 fish tissue samples was collected, processed and analyzed during this year. Forty one sites were assessed using macroinvertebrates, however, only 10 of these sites were considered to be ambient monitoring sites. Approximately 30 sites were done as part of special studies or Environmental Damage Assessments. An additional two sites were bioassessed as a part of a southeastern QA/QC exercise sponsored by the Southeastern Water Pollution Biologists Association.

FIGURE III-2
Ecoregion Map of Mississippi



Significantly, during this year, OPC reevaluated the ambient monitoring network in anticipation of increased monitoring resources needed to conduct adequate surface water assessment and permitting activities and initiation of rotating basin studies in support of OPC's new Basin Approach. This led to the establishment of Regional Biologists in the three regional offices to perform full-time ambient monitoring sampling. Modified biological monitoring networks were established for macroinvertebrates, phytoplankton, and fish tissue monitoring. These sites are monitored on an annual basis to supplement the Basin Approach studies, to provide continuous annual monitoring of Ecoregional Reference Sites, and to provide status and trends spatial coverage to the entire state. Due to the cessation of funding for the Section 314 Program, routine lakes monitoring was built into the ambient network with levels of phytoplankton chlorophyll a and fish tissue analysis being the biological parameters of choice.

Biological Monitoring-1997 During this year, sampling of both the modified ambient monitoring network and the initial rotating basin monitoring network was begun. The statewide ambient monitoring network was constructed so that the monitoring responsibility for macroinvertebrates and chlorophyll a levels was assigned to the Regional Biologists whereas the primary responsibility . Approximately 20 sites in each of the states' three regions were bioassessed as part of the Primary Fixed Monitoring Network using macroinvertebrates, and a like number of sites on reservoirs, the Mississippi River, or the Mississippi Sound were monitored on a quarterly to annual basis using chlorophyll a as the biological indicator of water quality. Fish samples for tissue analysis was collected at 25 sites throughout the state as specified in the ambient monitoring network, and at an additional 30 sites for the Mississippi Mercury Study. Fish tissue collection for analysis for dioxin was done at three sites during this year.

Basinwide Approach Pilot Study - Pascagoula River Basin (1997) To meet the needs of the Basinwide Approach initiative, an initial rotating basin network was established by the MDEQ in the Pascagoula River Basin in 1997 (see Basin Fixed Station Monitoring Network, p.51, 62). Biological monitoring was the assessment tool of choice to assess water quality impacts in the basin. Because of the heavy sampling load, our rapid bioassessment technique was modified to a "screening level" sampling effort which was used only during data collection for these basin studies. The "screening level" bioassessment consisted on collecting macroinvertebrates from the two most productive habitats in the stream. A total of 79 sites within this basin fixed station network was assessed with macroinvertebrates as a part of this study. Fish tissue was collected at eight sites, and determinations of levels of chlorophyll a were made at one site. Sediment samples were collected at three sites.

Biological Monitoring-1998 The monitoring networks established during 1996 continued to be monitored this year. The only modification made was to sample those sites designated as Ecoregional Reference Sites three times per year to attempt to understand seasonal variation. In addition, a proposed Reference Site was added to the monitoring network in the North Region. All sites were assessed as scheduled. The sampling efforts for the mercury and dioxin studies remained the same as the previous year.

Basinwide Approach Studies-1998 The basin studies for this year consisted of three of the smaller basins within the state. A synopsis of the activities undertaken in each basin is given below:

Northern Independent Streams Basin A total of 17 sites were assessed using the macroinvertebrate screening level technique developed during the Pascagoula Basin Study last year, and fish tissue was collected at one site.

Tennessee River Basin During this basin study, 18 sites were bioassessed using macroinvertebrates, 8 sites were assessed using chlorophyll a, and fish tissue was collected at three sites. Sediment samples were collected at 3 sites.

Southern Coastal Streams Basin This basin encompasses both freshwater and estuarine sites. Fifty-one sites were assessed using chlorophyll a, and 8 sites were bioassessed using macroinvertebrates. Fish were collected at 11 sites. Sediment collections were made at 27 sites.

Biological Criteria Development

OPC's Biological Services staff have taken the leading role in gathering data to support agency considerations of developing biological criteria. The expansion of the ambient monitoring network during 1990-1992, incorporation of nutrient analyses into biological monitoring protocols, the AL/MS and LA/MS ecoregion projects, and the inclusion of sites designated as Ecoregional Reference Sites into the annual monitoring network are all integral to the development of a database upon which biocriteria can be developed.

Significant resources are still needed to develop biological criteria. Additional sampling is needed in all of Mississippi's ecoregions to build an adequate database. During the past two years, the whole basin studies have done much to provide large amounts of information about streams within a concentrated areas, however because these studies are not based upon ecoregions, data have not yet been collected which encompasses an entire ecoregion or subecoregion. Also, the majority of the data collected during the whole basin studies has thus far focused upon streams thought or known to be impaired. Data from other streams is a critical need and hopefully, as the basin cycle proceeds, ecoregion-wide data will be available and the process of establishing biological criteria can begin. Reference sites have been established, but need to be intensively studied to define natural, annual and seasonal variability.

Once an adequate database has been accumulated, it must be tested in streams of comparable drainage size and in areas of varying land use to determine if the sample size is indeed sufficient. Seasonal variation of the stream fauna is an area that has only recently begun to be addressed, but one of paramount importance in considering the development of further biological criteria. It is quite likely that different degrees of attainability are possible in some of the states ecological regions. If so, differing sets of biological criteria will be needed for each ecoregion in Mississippi.

A higher level of protection should be provided for those stream segments chosen as ecoregional reference sites. Two sites, which data indicated would be excellent candidate reference sites, can no longer be used due to human disturbance. A list of ecoregional reference sites follows:

Site Name	Ecoregion	Status	Cause
Monroe Creek (Lamar Co.)	65f	Degrading	New Bridge
Black Creek (Lamar Co.)	65f	Stable	
Lower Little Creek (Lamar Co.)	65f	Stable	
Caston Creek (Homochitto NF)	74	Stable	
Turkey Creek nr. Coffeeville	65e	Stable	
Lee Creek East of Abbeville	65e	Stable	
Lobutcha Creek (Winston Co.)	65e	Stable	
Yellow Creek (Noxubee Co.)	65b	Degrading	Unknown
James Creek (Lowndes/Noxubee Cos.)	65a	Removed	Silviculture
Cane Creek nr Holcomb (Grenada Co.)	74	Stable	
Greenwood Creek (Itawamba Co.)	65b	Degrading	Development

Little Cedar Creek at Hwy	613	65f	Stable
Cedar Creek nr Aberdeen	65a	Degrading	Nonpoint
W. Tallahala Creek (NW Jasper Co.)	65b	Removed	Poor Biology
Wade Bayou (Panther Swamp NWR)	73	Stable	
Howlett Bayou (Panther Swamp NWR)	73	Stable	
McCurtain Creek (Choctaw Co.)	65e	under evaluation	

Basin Fixed Station Monitoring Network

The OPC's Basinwide Approach to Water Quality Management strategy is supported by a basin fixed station monitoring network which augments the statewide primary fixed station network by adding monitoring sites in specific drainage basins or watersheds. A description of this management program can be found in the section Basinwide Approach to Water Quality Management on page 29. There are a few fundamental differences between the basin fixed station monitoring network and the primary fixed station network. The primary fixed station network is static with a rigid set of parameters, routine sampling intervals, and is designed to study long-term trends in monitored data across the entire state. In contrast, the basin network is dynamic, sampling is relatively short-term and the monitoring is basin/watershed specific. Due to its dynamic nature, the basin network is subject to more variation in station selection, parameters sampled and sampling frequency. Basin fixed station monitoring is conducted on one basin group at a time and is rotated annually among the five designated basin groups representing Mississippi's ten major river basins.

One objective of the basin monitoring network is to increase the total areal coverage of waters monitored in Mississippi. This objective is achieved by concentrating monitoring and assessment resources in specific drainage basins thereby maximizing sampling efficiency. As a consequence, basin management plans and implementation strategies may be developed. Another major objective of the basin network is to verify the actual water quality of waters assessed as "potentially impaired" and classified as "waters of concern" during a previous Section 305(b) reporting period, in cases where these assessments were based on evaluations rather than actual monitoring data. Such verification by monitoring ultimately confirms the accuracy of the state's list of waterbodies prepared pursuant to Section 303(d).

Basin monitoring requires the collection of additional data relative to the primary fixed station network. The OPC field staff are already committed to the data collection of the primary ambient fixed station network. Therefore, to implement basin monitoring, a sampling effort which is cost-effective, reliable and rapid must be utilized. The predominant sampling tool chosen for the basin stations is screening level biological assessment monitoring for benthic macroinvertebrates using modified EPA rapid bioassessment protocols. In addition, the basin monitoring effort utilizes multi-media sampling involving limited water chemistry, bacteria, algae, fish and/or sediment sampling. At a minimum, the sampling methodology must meet the minimum criteria for monitored waters as defined by EPA 305(b) guidance. Data from the basin network is intended solely for use as a screening tool in the general assessment of the water quality status of those waters sampled at that particular sampling event. In other words, basin monitoring data reflect specific conditions existing during the year the basin monitoring was conducted, and can not be used to imply long-term trends. In general, there is no overlap between the waterbodies monitored in the basin network and the primary fixed station network. However, some supplemental sampling at primary fixed stations also occurs where additional monitoring needs arise such as to identify causes of persistent water quality violations at a site.

Sampling of the basin network stations is conducted through a coordinated effort between the FSD regional office biologists and Central Laboratory biologists and chemists. Parametric coverage for these stations generally includes biological/habitat assessments in combination with: chemical/physical, bacteriological, algal, fish tissue and/or sediment monitoring parameters. In order to allow for maximum geographic coverage, the water column parameter list is limited to the non-toxic parameters listed in the Primary Fixed Network parameter list (Table III-1) which can be field-measured or lab-analyzed with rapid analytical turnaround. Sampling frequency is much reduced from primary fixed stations and a screening level biological assessment with less taxonomic resolution (family level instead of genus/species) is used. Sediment sampling is an add-on component at selected primary fixed stations and specially selected areas (i.e. below pollution sources, EPA Basic Water Monitoring Core stations) in the basin. Sediment samples are analyzed for the same parameters as fish tissue samples (Table III-2).

Basin sampling is rotated annually among the five major basin groupings for the state so that each basin group is monitored every five years. The annual sampling period for each year's targeted basin runs from January to December in a calendar year. For chemical/physical and bacteriological station sampling, the stations are visited quarterly during the sampling year. The biological, fish and sediment station sampling occurs once generally during the late summer and fall of the year when low flow, warm temperature conditions are prevalent.

Like the Primary Fixed Station Monitoring Network, the network stations are of a conventional (i.e targeted) design and must meet not only the monitoring objectives of the OPC surface water monitoring program but also specific selection criteria for station locations. The specific criteria utilized for the location and establishment of Basin Network Stations are:

1. Perennial stream, significant lake or estuary;

2. Most downstream access to mainstem of the Natural Resources Conservation Service (NRCS) watershed units in the basin and represents the effluent from the watershed unit. Stations may be located on the mainstem and on a major tributary when the confluence of the two is in close proximity to end of watershed unit;

3. Waterbody on 303(d) list of impaired waters or Mississippi's "waters of concern" list;

4. Strategic watershed location (maximum spatial coverage, major land use change within watershed unit, etc.);

5. Areas with same selection criteria as applied to primary stations such as:

6. High recreational activity or designated use;

7. Interstate waters;

8. Of some ecological, public health or economic significance (below point and nonpoint pollution sources, fish advisory area, ecoregional reference sites, high quality waters, endangered/threatened species, high economic interest, etc.);

9. Other logistical and administrative criteria (safety, accessibility, multi-agency coordination, historical data record).

In FY97, the Pascagoula River Basin was targeted for monitoring as a pilot project for the Basinwide Approach strategy. The basin network for the Pascagoula Basin consisted of a total of 197 stations at 102 locations across the basin. Of these, 81 stations were to be sampled for water chemistry, 13 stations to be sampled for bacteria, 87 stations to be sampled for biology (macroinvertebrates or algae), 14 stations to be sampled for fish tissue and 12 stations to be sampled for sediment analysis. Results are pending. For 1998, the Coastal Streams, North Independent Streams, and Tennessee River Basin group was targeted for basin monitoring.

Intensive Surveys and Special Studies

Intensive surveys and special studies are conducted by the OPC to meet a variety of site-specific water quality needs. These diverse activities are accomplished using the varied water quality expertise found throughout OPC and is performed by staff as needed from the various divisions. These monitoring efforts are usually conducted at the request of various sections in OPC, other agencies, the regulated community, the general public or by some identified need to fulfill agency program goals. Intensive surveys and special studies are planned, where possible, to coincide with OPC's Basinwide Approach strategy. Consequently, applicable surveys and studies are scheduled and conducted according to the data collection phase in the five year basin rotation cycle.

Data generated from intensive surveys are primarily used for calibration and verification of mathematical computer models. These models are used to develop wasteload allocations (WLA) for wastewater discharges to predict water quality impacts of pollutants from these sources on the state's freshwater and estuarine waterbodies as well as to determine pollutant total maximum daily loads (TMDLs) for receiving streams. The water quality-based effluent limitation (WQBEL) process as described in the MDEQ document Wastewater Regulations for National Pollutant Discharge Elimination System (NPDES) Permits, Underground Injection Control (UIC) Permits, State Permits, Water Quality Based Effluent Limitations and Water Quality Certification sets forth the conditions in which these mathematical models are needed.

Special studies by the OPC address numerous water quality needs and problems and are undertaken on an as-needed basis. These projects range from one-time limited parametric surveys to in-depth ecological assessments involving physical, chemical, bacteriological, biological and fish tissue monitoring. Situations requiring special studies include gathering water quality information in areas where the database is nonexistent, investigating known or suspected water quality problem areas below both point and nonpoint pollution sources and resolving public health issues. Examples of special studies conducted by OPC include WLA investigation studies/biological assessments below point source discharges, and specialized monitoring for public health/aquatic life concerns such as dioxin, PCBs, mercury and bacteria.

Descriptions of OPC intensive surveys and special studies conducted or presently on-going since 1992 are presented later in this report under the appropriate basin section in Basin/Waterbody Information beginning on page 157.

Model Calibration/Verification Surveys for WLA and TMDL Development

Intensive field surveys for WLA and TMDL model calibration/verification studies are conducted by the OPC Water Quality Assessment Branch with support from Field Services Division. These surveys are generally conducted in the low stream flow, warm temperature months (August-October) and are resource-intensive, involving multi-parameter, multi-station and frequent water quality sampling over a period of several days or weeks. After considerable reconnaissance and preliminary monitoring in the proposed study area, an intensive hydraulic and water quality field data collection effort is conducted. The data collection effort includes both the wastewater effluent from the NPDES industrial or municipal facility under scrutiny, if point sources are a focus of the study, and at numerous sites along the receiving stream both upstream and downstream of the discharge or problem area.. Hydraulic data collection usually includes a time of travel, dispersion and/or flow determination dye tracer study. Extensive physical and chemical data collection over a diel (24-48 hour) period involving deployment of multi-parameter dataloggers and manual water quality sampling for such parameters as dissolved oxygen, temperature, specific conductance/salinity, BOD5, ultimate BOD and nutrients is conducted. Other data such as biological community metabolism (primary productivity and respiration) and biological assessment data are also obtained. Following the field study, applicable data are then input into a computer model to reflect actual field conditions and to develop a WLA or TMDL that will protect water quality in the receiving stream. Future intensive surveys will likely include a nonpoint source pollution study component to determine load allocations for pollutant total maximum daily loads for these receiving streams.

WLA Investigation Studies/Biological Assessments Below Point Source Discharges

One of the most cost-effective and comprehensive methodologies for documenting the effect of a potential point source discharge is to gather biological and physical/chemical data prior to effluent release and then compare this data with data collected after initiation of the discharge. Further, when accompanying a chronic bioassay, this technique provides complementary data on the health of a particular stream. It is also an excellent tool for cause and effect studies at existing facilities and is used by OPC for complaint investigations, enforcement actions and WLA investigation studies. OPC WLA investigation studies, in particular, have seen increased usage over the years as part of the WQBEL process documented earlier. Although not as rigorous in data collection as an intensive survey for WLA model calibration, these studies provide valuable and cost-effective water quality information for use in WLA decision-making. The in-stream data coupled with the WLA outputs from OPC's empirical computer model more accurately ensures the protection of instream water quality standards and the biological community, and also prevents unfair penalties to NPDES permittees which could occur based on incorrect modeling assumptions.

This type of study involves biological data collection to assess the instream benthic macroinvertebrate community, stream flow measurements, land use survey and the collection of limited physical/chemical data in the stream and in the effluent. Increasingly, multi-parameter dataloggers are deployed in the stream to monitor dissolved oxygen, temperature, pH, and specific conductance/salinity/total dissolved solids at hourly intervals for a 24 - 48 hour period to determine the diurnal fluctuations in these parameters. Chemical sampling of the effluent and in-stream locations generally involve conventional water quality parameters such as biochemical oxygen demand, nutrients, solids and turbidity. Each study generally involves sampling at two to three sites in the receiving stream at the following locations: an upstream (control) site for background conditions, a mixing zone site in the area of expected maximum pollutant assimilation and at a site further downstream in the recovery zone. These studies are normally carried out by OPC’s Water Quality Assessment Branch and Biological Services Section between May and November during low-flow, warm temperature conditions when possible. Studies of this type are scheduled by basin according to the Basinwide Approach cycle wherever possible.

During 1992 to 1997, the Office of Pollution Control (OPC) conducted 21 such investigations throughout the state, exclusive of environmental damage assessments which are outlined later in this report. Most of these were done as part of wasteload allocation (WLA) investigations to provide supporting information for decisions on NPDES permit limitations. These studies were conducted upstream and downstream of eight industrial and thirteen municipal dischargers. Those sites studied, and their results based on the field evaluations are outlined in Table III-4.

Because of budgetary resource constraints, only one survey of this nature was conducted by OPC in 1994. EPA, however, conducted five point source investigations in Mississippi in 1994 with OPC assistance. These investigations are collectively called the Lagoon Upgrade Study.

In May 1994, the Lagoon Upgrade Study was conducted in which OPC staff assisted EPA Environmental Services Division Region IV staff in a water quality study to assess the impact of upgraded municipal lagoon effluents on small streams. Five representative facilities in Mississippi were selected which, despite the upgrade, had been unable to consistently meet their required NPDES permit limits. Information gathered during this study would benefit the permit review and evaluation process regarding wastewater treatment upgrade technology and the associated impacts to the biology, hydrology and water quality of small receiving streams. The five facilities chosen for this study are listed below:

Municipality	Facility (permit no.)	Treatment	Receiving Stream	Basin
Maben	MS0020966	Sand Filter	Unnamed Tributary to Pigeon Roost Crk	Big Black River
French Camp	MS0044075	Sand Filter	Poplar Creek	Big Black River
Bentonia	MS0020478	Sand Filter	Town Creek	Big Black River
Terry	MS0025224	Artificial Wetland	Rhodes Creek	Pearl River
Newton	MS0036323	Artificial Wetland	Richardson Mill Crk	Pascagoula River

At each facility, the receiving stream was monitored upstream and downstream of the discharge. Bioassessments and water chemistry monitoring for nutrients, total organic carbon (TOC), solids and field measurements of diurnal dissolved oxygen (DO), temperature, pH, and conductivity were conducted. In addition, effluents were sampled for biochemical oxygen demand.

The unnamed tributary to Pigeon Roost Creek at the Maben facility is severely impacted. The headwaters of this stream originate in the Town of Maben contributing to poor macroinvertebrate habitat conditions. The station downstream of the discharge showed water quality standards violations of instantaneous and daily average DO. This station also exhibited nutrient enrichment. The enrichment and DO standards violations can be attributed, in part, to a lagoon bypass that the facility experienced shortly before the study. No long-term record of DO was obtained for the effluent discharge, however, in-situ measurements revealed no violation of permit limits.

TABLE III-4

Biological Surveys/WLA Investigations Below Point Source Discharges

(1992 - 1997)

Site	Date	Facility Name	Comments
Tributary of Leaf River Perry County	Mar. 1992	Hood Industries Beaumont	Impact detected, although sampling site was also affected by a wetland.
Tributary to Lane Bayou Bolivar County	July 1992	City of Rosedale POTW	Significant impact detected upstream and downstream due to NPS pollution.
Unnamed tributary to Big Black River Holmes County	July 1992	City of Durant POTW	Impact detected.
Joe's Creek Noxubee County	July 1992	City of Brooksville POTW	Impact detected but upstream impairment due to NPS pollution also noted.
Moorhead Bayou Sunflower County	Sep. 1992	City of Moorhead POTW	Significant impact detected upstream of POTW due to NPS pollution.
Bogue Chitto River Pike County	Oct. 1992	Sanderson Farms McComb	Pre-discharge monitoring conducted. Post-discharge monitoring canceled due to budget cuts.
James Creek Monroe County	Oct. 1992	Vista Chemicals Aberdeen	Significant impact detected; upstream impairment due to NPS pollution noted.
Unnamed trib. to Beaver Creek, Amite County	Mar. 1993	City of Gloster POTW	No impact detected.
Wells Creek Franklin County	July 1993	City of Roxie POTW	No impact detected.
Unnamed trib. to Chiwapa Creek, Lee County	July 1993	City of Shannon POTW	Trib. is effluent ditch. Chiwapa Cr. showed impact downstream of confluence of trib.; but impairment upstream due to NPS pollution.
Indian Creek Tishomingo County	Aug. 1993	City of Iuka POTW	Slight impairment downstream.
Unnamed trib. to Tenn-Tom Waterway Lowndes County	May 1994	Eka Nobel Columbus	Slight impairment downstream. Habitat limited due to overflow from TTW.
Town Creek Lee County	June 1995	City of Tupelo POTW	Impact detected at all sites; None could be linked conclusively to the POTW
Pickens Creek Leake County	Aug. 1995	Choctaw Maid Carthage	No impact detected although sampling site was affected by a wetland.
Upper Leaf River Jones County	Sep. 1995	Southern Hens, Inc., Moselle	Effluent pH and residual chlorine violate permit limits. No apparent dwnstrm effect.
Bogue Homa Creek Jones County	Aug. 1996	City of Sandersville POTW	No impact detected.
Keegan Bayou Harrison County	Sep. 1996	City of Biloxi - East Biloxi POTW	Pre-discharge monitoring conducted.
Unnamed Trib. to Bowie River, Forrest County	Nov. 1996	Hercules, Inc. Hattiesburg	WQ standards violations noted in stream for DO, TDS, and sp. conductance
Unnamed Tributary to Stinson Creek Lowndes County	Feb. 1997	Southgate Utility District Columbus	No impact detected during winter conditions.
Four Mile Creek Stone County	July 1997	City of Wiggins - West POTW	Slight Impairment detected.
Unnamed Tributary to Red Creek, Stone County	Aug. 1997	Coastal Paper Co. Wiggins	Impact detected.

Habitat limitations affected the macroinvertebrate taxa richness at Town (Bentonia), Rhodes (Terry), and Poplar (French Camp) Creeks. However, no marked differences in community structure upstream and downstream of the discharges occurred, indicating that the facilities are not significantly affecting the fauna.

At the time of the study, the French Camp (Poplar Creek) and Terry (Rhodes Creek) facilities were only minimally discharging. No DO standards violations were observed upstream or downstream of either outfall, although DO concentrations were somewhat depressed on Poplar Creek. Both the upstream and downstream stations on Town Creek (Bentonia) exceeded state DO standards. However, the DO concentration in the effluent discharge ditch was below the required concentration during the entire study period.

The effluent discharge from the Newton artificial wetland dominates the flow of Richardson Mill Creek, however, DO concentrations up and downstream of the outfall revealed no violations of state DO standards. The discharge into Richardson Mill Creek does not adversely affect DO concentrations downstream, however, elevated nutrient levels may possibly affect the macroinvertebrate community. Further evaluation of this stream system is needed.

Special Water Quality Studies for Parameters of Concern (Dioxin, Mercury, Bacteria, etc.)

Toxic pollutants and pathogenic organisms in our environment are a growing public concern. As tremendous progress has been made over the years in environmental protection in Mississippi and the United States, risk assessment and public health issues are receiving greater attention. Special monitoring activities to address levels of these pollutants in water, fish/shellfish tissue and sediment are frequently undertaken by OPC usually in cooperation with other state and federal agencies. Examples of these type studies are the Mercury Contamination Study and the Dioxin Studies conducted by OPC and discussed in the Public Health/Aquatic Life Concerns section of this report (p.135). Other examples of past special studies are nonpoint source pollution monitoring before and after best management practice implementation and the Clean Lakes Program monitoring. An additional special study initiated by OPC in 1997 and likely to become part of our routine ambient monitoring network program is coastal bathing beach monitoring for bacteria levels (see Estuary and Coastal Information, p.115).

Source Compliance and Environmental Damage Assessment Monitoring

Proper treatment of industrial, domestic, and municipal wastewaters must be accomplished prior to discharge into state waters. Pollutants in these effluent discharges, as well as in stormwater runoff and unpermitted or uncontrolled releases, must be removed or reduced to levels which will protect the uses of the receiving stream. OPC permit compliance monitoring of discharges and facility in-stream monitoring provides the necessary information to ensure compliance and enforcement of NPDES permit limitations. Environmental damage assessment monitoring ensures accurate documentation of complaint and emergency response investigations.

Source Compliance Monitoring

NPDES Permit Compliance Monitoring

NPDES permit compliance monitoring is the principal instrument used to enforce effluent discharge limitations from municipal, industrial, and commercial facilities. This program is administered by the OPC Surface Water Division's (SWD) Municipal Permit Compliance and Commercial Control Branches as well as OPC's Environmental Compliance and Enforcement Division (ECED) and includes several monitoring components. Self-monitoring by the permitted facility in the form of effluent discharge monitoring reports is a condition of the NPDES permit and reports are submitted routinely to OPC. In addition, a number of state and federal inspections as well as compliance sampling are also conducted on the facility directly by OPC's SWD, ECED and Field Services Division's regional office staff.

Facility/Permittee In-Stream Monitoring

A regulatory surface water monitoring tool used increasingly is facility or permittee in-stream water quality monitoring. This tool is used primarily for some industrial NPDES facilities and hazardous substance sites under the regulation of the Uncontrolled Sites Section of OPC's Hazardous Waste Division but has also been used at municipal facilities (see Instream Bacteria Monitoring (POTWS), on page 70. These facilities may have to document compliance with water quality criteria (physical, chemical and biological) in the receiving stream below the facility. If so, the facility or site owner submits an in-stream monitoring plan which is reviewed and approved by the OPC. Monitoring is generally carried out by the owner or his designee and the results are then submitted to the applicable OPC division for review and storage. Facility in-stream monitoring efforts currently on-going or under review are listed in Table III-5.

Environmental Damage Assessment Monitoring

Environmental damage assessment (EDA) monitoring refers to monitoring performed as a result of complaints, fish kills, hazardous waste remediations/mitigations and emergency response investigations involving surface waters. These incidents can result from either point or nonpoint source pollution releases. Responding divisions of the OPC may be the Field Services Division, Surface Water Division or the Hazardous Waste Division's Emergency Response Branch or Uncontrolled Sites Section. All responses are carried out as promptly as possible but investigations may be prioritized as the situation demands. The three regional offices are strategically located in the state to meet this need to provide closer and more rapid response to a pollution incident and the affected population.

These investigations may include the collection of surface water samples, sediment, fish and/or a biological assessment of the affected waterbodies as well as on-site soil, waste and groundwater sampling. Analyses of the information and/or data collected during the initial response investigation can frequently trigger more intensive monitoring to better define water quality and public health impacts and to support enforcement actions. Waterbodies with recurrent complaints or prolonged contamination are examined and may be included as part of the routine ambient monitoring program.

Increasingly, the OPC's biologists are assisting the Emergency Response Branch in documenting the severity and extent of environmental damage due to spills. Biotic communities affected by the spill are compared with biological communities from ecoregional reference sites or control sites. These comparisons help ensure that no long-term damage has occurred in the state's waters.

Sampling protocols for EDAs are designed on a case by case basis, depending upon the habitat type and environmental conditions at the site. To determine potential damage to the ecosystem, the spilled chemical, the characteristics of the waterbody, and many other factors dictate the methodology employed and the parameters measured.

The information and/or data generated from environmental damage assessments are used in the overall assessment of the state's water quality. Where significant, the site is reported in the appropriate basin section in the Basin/Waterbody Information beginning on page 157 of this report.

POTW Instream Bacteria Monitoring

In 1991, OPC and EPA discussed the need for state-wide across-the-board fecal coliform limits for POTWs. EPA accepted OPC's opinion that effluent disinfection should be based on site-specific conditions. If instream bacteria monitoring indicated that an effluent did not significantly contribute to the receiving stream's existing condition, disinfection of the effluent could be waived. This waiver applied only to municipal dischargers into streams classified as Fish and Wildlife.

In 1992, OPC's Water Quality Assessment Branch developed guidelines for POTWs to conduct their own instream bacteria monitoring. These guidelines required that proper sampling and analytical procedures (acceptable to EPA) be used. Using these guidelines, municipalities monitored ambient surface water conditions and the POTW effluent. Laboratory analyses were performed by an independent contract laboratory. Based on the instream monitoring reports submitted by the municipalities, OPC would decide whether effluent disinfection could be waived. Decisions were made on a case-by-case basis.

During FFYs 1993 and 1994, approximately 48 POTWs submitted instream bacteria monitoring reports. During FFYs 1995 and 1996, approximately 21 POTWs submitted similar reports. OPC found that approximately 50% of these facilities did not contribute to the existing fecal coliform count in the receiving streams. Disinfection was waived for these facilities. This process helped many smaller economically strapped communities avoid the extra expense of disinfection and often dechlorination. The operational hazards of chlorination were also avoided. The process was discontinued after FFY 1996.

TABLE III-5
NPDES and Uncontrolled Sites Programs
Facility In-Stream Monitoring

Proximity	Waterbody	Class.	Facility Name	Mntrg. Status	Parameters of Concern	Media Sampled: Water Col.	Sed.	Fish/ Shllfish	Grnd Water
Columbus	Tenn-Tom Wtrway	FW	Weyerhaeuser Paper	O^{*}	Convent Phys./Chem.	x			
					Dioxin			x	
Aberdeen	James Creek	FW	Vista/Conoco Chem.	$(93)^{H}$	TCL, VOA, Semi-VOA	x	x		x
Philadelphia	Town Creek	FW	Weyerhaeuser Paper	$(94)^{H}$	Dioxin		x	x	x
				O^{H}	PCP	x			x
Kosciusko	Yockanookany Rvr	FW	Texas E. Gas Pipeline	$(97)^{H}$	PCBs	x	x	x	x
Monticello	Pearl River	REC	Georgia Pacific Corp.	O^{*}	Convent Phys./Chem.	x			
Laurel	Tallahala Creek	FW	Masonite Corp.	O^{*}	Convent Phys./Chem.	x			
New Augusta	Leaf River	FW	Georgia Pacific Corp.	O^{*}	Convent Phys./Chem.	x		x	
					Dioxin				
Gautier	W. Pascagoula Rvr	FW	Gautier Oil Site	$(93)^{H}$	Dioxins, Furans			x	
				O^{H}	PAH	x	x		x
Moss Point	Escatawpa Rvr	FW	International Paper	O^{*}	Convent Phys./Chem.	x			
					Dioxin			x	
Pascagoula	Bayou Casotte	FW	Port of Pascagoula	$(94)^{H}$	Lead, Inorganics	x	x		
				O^{H}	Lead, Inorganics			x	
Lyman	Little Biloxi Rvr	FW	Cavanham Forest Ind./ Crown Zellerbach	$(91)^{H}$	Dioxins, Furans			x	
Crosby	Foster Creek	FW	Southern Lumber Co.	O^{H}	Dioxins, Furans	x	x	x	x
				O^{H}	PAHs, PCP	x			
Crosby	Homochitto Rvr	FW	Southern Lumber Co.	$(94)^{H}$	Dioxins, Furans, PCP	x	x	x	
					PAHs, Semi-VOA				
Seminary	Swamp Creek	FW	Seminary Truck Stop (Green Oil Co./Hazclean)	O^{H}	VOA	x	x		x
Wesson	Trib. to Dye Br.	FW	Potter Company	$(96)^{H}$	PCBs			x	
Port Gibson	Mississippi Rvr	FW	Syst. Energy Resources	O^{*}	Temperature	x			
Grenada	Yalobusha Rvr	FW	Newsprint South, Inc.	O^{*}	Convent Phys./Chem.	x			
Batesville	Lake Susie	FW	Tenn. Gas Pipeline	O^{H}	PCBs			x	
Tinsley	Perry Creek	FW	Pennzoil Company	P^{*}	Convent Phys./Chem.	x			
Hattiesburg	Mineral Creek	FW	Davis Timber Co.	$(95)^{H}$	Dioxin	x	x	x	x

Monitoring Status: O=Ongoing, ( ) - Year Sampling Completed, P=Proposed, *-NPDES Program, ^{H}-Uncontrolled Sites (Hazardous Waste Div.) Program

Volunteer Monitoring

The Mississippi Department of Environmental Quality (MDEQ), Office of Pollution Control, in cooperation with the Mississippi Wildlife Federation (MWF), has developed the Adopt-A-Stream Volunteer Monitoring Program in Mississippi. This program trains volunteers to conduct water quality monitoring on streams and rivers in the state and educates them on the relationship between point and nonpoint source pollution and water quality. This program seeks to foster a relationship between the MDEQ and the public in order to enhance awareness of and appreciation for our natural resources as well as to supplement existing government water quality data.

The objectives of the Adopt-A-Stream program are four-fold: (1) to educate the public about the concept of watersheds and the effects of point and nonpoint source pollution on water quality; (2) to serve as a "first alert" for the MDEQ in spotting a water quality problem on a previously unmonitored waterbody; (3) to form a database of historical water quality information; and (4) to supplement agency data for the Section 305(b) report.

Staff from the MDEQ's Water Quality Management and Assessment Branches, and the USDA Natural Resource Conservation Service provide technical training for the program at two-day workshops. Participants are taught to conduct biological and chemical monitoring, read topographic maps, implement BMPs, survey watersheds for point and nonpoint source impacts, and map watersheds. After leaving the workshop, the volunteers understand and appreciate the intricate relationship between the environment's biological, chemical, and physical components. In addition, the MDEQ has completed a 195 page field guide as a supplement to the workshops.

The first Adopt-A-Stream workshop was held in December 1993. Ten additional training sessions have been conducted with the next scheduled for April 1999. Two to three workshops will be conducted each year as needed. An estimated 50 to 70 people will be trained each year and hundreds more will be exposed to the Adopt-A-Stream program through talks, exhibits, and news releases. MDEQ staff conduct a follow-up visit with each volunteer at his site, before monitoring is begun. In addition, a QA/QC Certification Program was begun in June 1996. This rigorous, but optional, performance evaluation is conducted at a volunteer's adopted stream to review chemical and biological sample collection techniques, chemistry test kit protocols, and macroinvertebrate identification. QA/QC certified data may be used, by MDEQ, to list a stream in the 303(d) List of Impaired Waters. The MDEQ also enters the data collected by the Adopt-A-Stream volunteers into a database to aid in review and analysis.

In FY '97, the Adopt-A-Stream program was expanded to include a "Stream Stewardship" component. Volunteers are recruited to adopt a stream or watershed and choose a non-monitoring stewardship activity such as litter cleanups, stream bank restoration, community education, nonpoint source surveys, or advocacy work. Optional one-day stewardship workshops will be offered on an as needed basis.

To date, 169 people have been educated at workshops and chemical and/or biological monitoring data has been received from 44 streams. Table III-6 lists volunteer monitored streams with sufficient data to meet the assessment criteria required for use in this Section 305(b) Report.

TABLE III-6
Volunteer Monitored Streams

STREAM	LOCATION	BASIN	USE SUPPORT
Shoaf Creek	Near Bigbee	Tombigbee	Fully Supporting, Threatened
Sand Creek	Near Starkville	Tombigbee	Partially Supporting
Perkins Creek	At Clyde	Pascagoula	Fully Supporting, Threatened
Clark Bayou Trib	Near Coll Town	Pascagoula	Fully Supporting, Threatened
Okatoma Creek	Near Sanford	Pascagoula	Fully Supporting
Milky Creek	At New Augusta	Pascagoula	Fully Supporting
Vaughn Bayou	Near Three Rvrs	Pascagoula	Fully Supporting
Beaverdam Branch	Near Talowah	Pascagoula	Fully Supporting
Red Creek	Near Beatrice	Pascagoula	Fully Supporting
Brushy Creek	Near Lucedale	Pascagoula	Fully Supporting
Black Creek	Near Brooklyn	Pascagoula	Fully Supporting
Wolf Creek	Nr Philadelphia	Pearl	Partially Supporting
Wolf Creek Trib.	Nr Philadelphia	Pearl	Partially Supporting
Kentawka Canal	Near Philadelphia	Pearl	Fully Supporting, Threatened
Big Branch	Near Poplarville	Pearl	Partially Supporting
Big Creek	At Bogue Chitto	Pearl	Fully Supporting, Threatened
Topisaw Creek	At Holmesville	Pearl	Fully Supporting, Threatened
Catahoula Creek	Near Santa Rosa	Coastal	Fully Supporting
Tuxachanie Creek	Near Latimer	Coastal	Fully Supporting, Threatened
King Creek	At New Albany	Yazoo	Fully Supporting
Millstone Cr. Trib.	Near Kiern	Yazoo	Partially Supporting
Spring Branch	Near Kiern	Yazoo	Partially Supporting
Unnamed Trib. of Tuscumbia R. Canal	At Rienzi	N. Independent	Partially Supporting
Love Creek	Near Peoria	S. Independent	Fully Supporting
Tanyard Creek	Near Liberty	S. Independent	Partially Supporting
Shiloh Creek	Near Edwards	Big Black	Fully Supporting
Baker's Creek	Near Clinton	Big Black	Partially Supporting

Laboratory Support

The Office of Pollution Control Laboratory performs a wide array of water quality analyses including nutrients, minerals, demands, trace metals, pesticide residue, volatile and semi-volatile organics, microbiological testing, and biological determinations. The laboratory also performs analyses of air samples for particulates and lead, as well as asbestos identification on construction materials.

Biological determinations routinely performed by the laboratory staff include sampling and analyses of fish tissue and macroinvertebrate, phytoplankton and periphyton communities. Analyses of the population structures of the various trophic levels are used to assess water quality conditions. The lab also prepares and analyzes fish tissue for pesticides and heavy metals. The lab analyzes periphyton and phytoplankton for ash free dry weight and chlorophyll to estimate algal productivity and standing crop. Because of budgetary constraints and lack of demand, the lab curtailed its Whole Effluent Toxicity (WET) testing program in 1994.

OPC has completed Phase II of its laboratory construction project, and the Chemical Services Section moved into its new building in April 1998. The new lab facility adjoins the Biological Services Laboratory which was occupied in 1993. The new facility gives MDEQ its first modern, state of the art environmental laboratory. The combined area of the two labs is approximately 21,000 square feet. It provides staff chemists and biologists with separate lab and office areas. It is equipped with a loading dock, floor drains, and safety showers that make for a safer, more functional work environment. The new building has a central exhaust system that has doubled our fume hood capacity and solved a chronic problem in the old lab due to solvent contamination of volatiles samples caused by inadequate ventilation in the organic extraction lab. It has a walk-in cooler for sample storage and a walk-in freezer for fish tissue samples.

The lab had begun to upgrade its equipment in the early 1990's, and our inventory now includes the following major pieces of analytical equipment: four gas chromatographs (GC), two atomic absorption spectrometers (AA), one inductively coupled plasma spectrometer, two GC/mass spectrometer (GCMS), one gel permeation chromatograph (GPC), one accelerated solvent extractor (ASE), two flow injection auto analyzers, and a total organic carbon analyzer. We have improved our computer capabilities by installing local area networks LANs)at both the chemistry and biology labs and at the regional offices. All the Field Services locations are connected to MDEQ main offices at Southport Mall via a wide area network (WAN). We purchased a new laboratory information management system in 1998 to improve our data handling and sample tracking capabilities. We also purchased several microscopes which greatly improved our macroinvertebrate taxonomy capabilities for rapid bioassessments, and two electrofishing boats which improved our fish collecting abilities.

The laboratory has an excellent staff of scientists and technicians, and is currently staffed as follows:

Lab Director	1
Section Supervisors	2
Chemists	9
Biologists	7
Technician	1
LIMS Manager	1
LAN Administrator	1
Secretary/Data Control	1
	23

The use of biological monitoring by this agency has increased tremendously over the past several years. We have used it effectively for Environmental Damage Assessments and for evaluating the impact of industrial and municipal discharges on receiving waters. It serves as the basis for our new basin monitoring strategy and is the primary tool used to examine 303d listed waters. This is the single most effective water quality monitoring tool for many situations.

To meet the growing need for biological data, the agency hired three senior level biologists in 1996 and placed them in the regional offices. These biologists were charged with ambient chemical and biological monitoring in their region. In addition, they handled fish kill and complaint investigations, and served as the principal investigators for special studies conducted in their region. As we added these scientists, we also expanded our ambient monitoring network from rivers and streams to include lakes, reservoirs, the Mississippi River, and the Mississippi Sound.

This regional biologists program has been very successful in expanding our monitoring coverage and increasing our technical expertise in the field. To augment this program and to help handle the expected increased workload due to TMDL's, the agency has hired three additional biologists to assist the senior regional biologists. We are also in the process of hiring some contract workers to serve as technicians to assists the regional biologists.

The primary staffing needs at the lab are a microbiologist to expand our bacteriological testing capabilities, a scientist to handle the new PM 2.5 analyses, and an additional scientist to work in wet chemistry. In addition, technicians are needed in every section of the lab to increase productivity by allowing the senior staff to focus on their areas of specialization.

Quality Assurance/Quality Control Program

Many of the decisions made by the OPC in its pollution control programs are based on analytical data obtained by its field and laboratory staff. Therefore, it is imperative that the validity of the data be assured and documented. A strong program of quality assurance helps provide that assurance and is an absolute necessity for operation of an effective water quality monitoring program. This validation of data is the foundation of the entire analytical process, from the planning stages through sample collection, analysis, and dissemination of data. Quality assurance and validity of results are stressed in all monitoring program activities undertaken or reviewed by the agency. All areas of environmental monitoring require rigorous adherence to the use of validated methods and repetitive quality control procedures.

The central element in an effective quality assurance program is the routine and rigorous use of standard operating procedures. The OPC laboratory serves as the focal point of the agency quality assurance program, and its staff has developed and updated a detailed and effective standard operating procedure manual, the MSOPC "Standard Operating Procedures and Quality Assurance Manual" Vol. IV. The manual was originally reviewed and approved by EPA in 1983 and is periodically updated to reflect changes in analytical methodologies and in the Code of Federal Regulations. The latest revision was completed in November 1991, and was reviewed by EPA in 1993. All measurements are made using EPA approved methods and are completed within required holding times unless noted on reports. All proper preservation techniques are employed. A sub-set of this manual is a detailed field manual and is provided to each staff member.

The following specifics of an overall quality assurance program are emphasized by the Office of Pollution Control.

1. All sampling equipment, flow measuring devices, field instruments, etc. are calibrated according to the manufacturer's specifications immediately prior to their use at each site. Calibrations are recorded on the sampling sheet or in the personal log and initialed by the person performing the calibration.

2. Assurance of representative sampling techniques, use of proper containers and preservatives, and transport and storage of samples are assured by the proper training of field personnel as to acceptable methods of sample collection including the minimum amount of sample needed, the proper containers and preservatives, and the maximum holding times for the various analyses performed. The laboratory staff will void any sample that is not properly collected, preserved or shipped. Members of the laboratory staff will occasionally accompany field crews to ensure quality performance and assure that all field measurements are made using approved sample collection and analytical methods and in compliance with recommended holding times and preservation techniques. (NPDES, 40 CFR Part 136, October 1995; Ambient, 40 CFR 35 Subpart G, Appendix A; OPC Standard Operating Procedures for Field Monitoring, 1991).

3. Each field person must attend at least one laboratory training session every other year.

4. A documented, aggressive laboratory quality control program that includes the following features, is utilized to assure accepted analytical procedures:

   a) The lab has a designated quality assurance coordinator.

   b) Proper calibration and maintenance of laboratory instruments and equipment are performed according to the manufacturer's specifications at regular intervals.

5. Analyses of samples are performed by approved methods. All samples are analyzed according to the currently accepted edition of Standard Methods for the Examination of Water and Wastewater, Methods for Chemical Analysis of Water and Wastes, or as prescribed by the Federal Register, 40 CFR Part 136, October 1995.

   a) Daily results are verified by the use of blanks, standards, audit samples, replicates, and spiked samples. The laboratory runs a minimum of 10% duplicate and 10% spiked samples and results of these analyses are permanently documented and retained. Spiked samples and quality assurance performance evaluation standards are analyzed by the laboratory regularly.

b) Laboratory instrumentation is serviced by factory trained technicians on a regular basis. Laboratory staff is responsible for routine preventative maintenance and service. Part of each staff member's evaluation includes certain criteria for loss of data due to avoidable instrument downtime.

c) The laboratory participates in inter-laboratory investigations and evaluations of analytical methods conducted by EPA. This includes continuing participation in the EPA laboratory performance audit program.

d) All field and laboratory personnel responsible for the recording, storage, and retrieval of data keep a copy of the records of samples they have collected or analyzed. Completed data sheets are forwarded to the Jackson office, where they are screened, validated, and entered into STORET.

e) Taxonomic identifications are routinely verified by outside experts, and records are maintained.

f) Training within each staff member's area of expertise is required on at least a yearly basis.

g) The lab is audited by EPA, Region IV, personnel on a regular basis.

Data Acquisition/Data Sharing With Other Agencies

In addition to the previous ambient monitoring components outlined in this strategy and implemented by OPC, extensive monitoring is performed by other government agencies and institutions throughout Mississippi. A considerable effort has been made by OPC's Water Quality Assessment Branch (WQAB) to identify and obtain information from the many other organizations collecting water quality data. This not only provides additional monitoring data for use in assessing state waterbodies, but also reduces, if not eliminates, replication of services and ensures efficient use of OPC's limited surface water monitoring resources. These other monitoring organizations include state and federal agencies such as the United States Geological Survey (USGS), U.S. Army Corps of Engineers (USACE), Tennessee Valley Authority (TVA), EPA, National Oceanic and Atmospheric Administration (NOAA), Department of Marine Resources (DMR), Gulf Coast Research Laboratory (GCRL) as well as other government agencies, research institutions and universities.

U.S. Geological Survey - Water Resources Division

For many years, a significant amount of water quality data has been provided by the USGS, Water Resources Division. Through the years, the USGS monitoring program in Mississippi consisted of as many as seven long-term USGS National Stream Quality Accounting Network (NASQAN) and Hydrologic Benchmark (HBM) Program stations as well as specially funded stations. However, in 1995, sampling at all but two NASQAN and one HBM stations was discontinued. Sampling at the NASQAN stations were discontinued completely at the end of FFY 1995. Sampling at the HBM station was discontinued at the end of FFY 1996.

The majority of ambient stream monitoring performed by the USGS is done in cooperation with the USACE. The Demonstration Erosion Control (DEC) Project in the Yazoo River basin has been an on-going joint-agency program since 1988. The USGS, in cooperation with the USACE Vicksburg District, has been collecting water-quality and bottom-material-chemistry data for this project at several sites in the bluffline hills above the Mississippi River alluvial plain. (for additional information, see Other Agency Surveys, Yazoo River Basin, p.245). The USGS also periodically performs ambient monitoring for the USACE Mobile District in the Tombigbee River Basin. The USGS sampled 13 stations for the USACE Mobile District in the Tennessee-Tombigbee Waterway (TTW) area in 1994 and 1995. Suspended sediment samples were collected at 6 sites in the 1998 water year in the TTW for the Mobile District.

Since 1991, the USGS Mississippi District Office has also conducted intensive sampling in the Yazoo River Basin in support of the USGS National Water Quality Assessment (NAWQA) program. This USGS comprehensive status and trends sampling program for water chemistry, sediment, fish, macroinvertebrates and algae is being performed throughout the nation. For a more complete description of the NAWQA program activities in Mississippi, see Other Agency Water Quality Surveys, Yazoo River Basin, p.245).

USGS fixed stations monitored routinely in Mississippi from 1992 - 1997 are shown in the figures presented in the Basin/Waterbody Information section beginning on page 157. The list of parameters covered at these stations is too extensive to be included as part of this report. However, most stations include alkalinity, turbidity, residue, the nutrient series, polyvalent cations, pesticides, and other organic compounds. All of the data are entered into the USGS database, WATSTORE and eventually transferred to STORET.

U.S. Army Corps of Engineers - Vicksburg District

The USACE also conducts monitoring activities firsthand within the state. The Vicksburg District conducted extensive monitoring on its four flood control reservoirs (Arkabutla, Sardis, Enid and Grenada) as well as on streams and rivers feeding the lakes and at sites located downstream. This contract was canceled, in 1993, however, and monitoring was stopped. Periodically, special studies are undertaken by the district such as the Upper Yazoo River and Steele Bayou Basins project in 1990-1991 and the Big Sunflower River maintenance Project in 1992-1993. Water quality data for these projects included chemical parameters for water column, sediment and fish tissue. All data except fish tissue are entered directly into STORET.

1998 Narrative Summary

The water quality monitoring program in the Vicksburg District for 1998 consisted of monitoring on the following rivers and streams: Pearl River, Yazoo River, Main Canal, and Black Bayou. Monitoring on Black Bayou, Main Canal, the Pearl River, and the Yazoo River was performed by CEMVK-ED-HW personnel. There were also sediment, water, and fish tissue samples taken and analyzed for various pollutants for the Mississippi River Levees Project by the USACE Waterways Experiment Station (WES). Other sampling activities are described below under "Sampling Program". The water quality (WQ) portion of the Environmental Assessment for the Sardis Lake, Shady Cove Marina was completed. The WQ appendices for MS River Levees Project SEIS and the Yazoo Backwater Project Draft SEIS were completed in 1998. Additional Water Quality monitoring contracts will be awarded in 1999.

Sampling Program

LITTLE SUNFLOWER RIVER - Sediment cores were taken from the channel bottom to a sediment depth of 3-4 feet and analyzed for pesticides.

PEARL RIVER - Mercury monitoring was performed during construction of the Walkiah Bluff Wetland Restoration Project.

SARDIS LAKE, SHADY COVE MARINA - Elutriate samples were taken in the proposed project area and analyzed for herbicides .

STEELE BAYOU PROJECT B Turbidity and nutrient levels were monitored monthly.

YAZOO RIVER DREDGING - Turbidity readings were taken in the Yazoo River upstream and downstream of the effluent return structure of the confined disposal facilities.

Outside Assistance

Samples to be analyzed for pollutants were sent to Analytical Laboratory Group, WES. Sediment particle size determinations and agricultural analyses of sediment samples were performed by Pettiet Agricultural Services, Leland, MS by purchase order. The USGS also performed WQ monitoring on the DEC Project. Argus Analytical, Jackson, MS, was contracted to collect and analyze water samples, from the Yazoo River near mile 150, for fecal coliform and fecal streptococcus.

U.S. Army Corps of Engineers - Mobile District

The U.S. Army Corps of Engineers operated five continuous water quality monitors (monitors) along the Tennessee-Tombigbee Waterway from 1992 to 1997. The monitors are located at Bay Springs, Lock C, Lock A, Aberdeen and Columbus. Each monitor is equipped with a pumping assembly consisting of an electric submersible pump, piping and valving. Water is continuously pumped from the river into a building containing a monitor and returned to the river by gravity flow through a pipe. The monitors are Schneider Instruments and four different probes measure dissolved oxygen, pH, temperature and conductivity. A computer is connected to each monitor and digitally displays readings of the four parameters continuously. The computer runs a program which can write data to an electronic file in 15-minute, 30-minute or hourly intervals. At the end of each month the data is downloaded to a 5.25" floppy disk. Each computer also has a modem which can be used by the contractor and Mobile District personnel to verify that the monitor is operating satisfactorily. Mobile District Field Office personnel perform chemical tests weekly and compare them to the current readings on the monitor to ensure accurate readings. Data are available from the Mobile District.

In addition to water quality monitoring, the District has performed bulk sediment analyses (chemistry), bioassay, and bioaccumulation tests on sediments proposed to be dredged at Pass Christian Small Boat Harbor, Bayou Portage Channel, Gulfport Harbor, and Pascagoula Harbor/Bayou Casotte. Other special assessments have also been periodically conducted such as bathing beach monitoring at USACE - managed beaches (see the Public Health/Aquatic Life Concerns section, page 135). All of these data are available from the District.

Other Agency Monitoring

The USACE Memphis and Nashville District offices conduct very limited monitoring in the state and primarily only in conjunction with special projects. Monitoring data for these USACE districts are not entered into STORET and are only available through publications.

The U.S. Forest Service (USFS) also conducts water quality monitoring activities in Mississippi. Periodic monitoring by the USFS occurs on waters located in National Forest Service lands. Data from these monitoring activities are available through STORET.

TVA, as part of its Water Resources and Ecological Monitoring Program, began a Reservoir Vital Signs Monitoring Program in 1989. This program involves long-term, systematic sampling of all major TVA reservoirs. Pickwick Reservoir in extreme northeast Mississippi is one of the reservoirs included in this program. Data collected includes physical, chemical, and bacteriological water column and sediment information, benthic macroinvertebrate community and fish community assessments. Physical/chemical/ bacteriological data is input into STORET. The other information is available from TVA.

EPA's Environmental Monitoring and Assessment Program (EMAP) began its annual estuarine surveys for Mississippi in 1991. EMAP is a long-term interagency environmental monitoring program which focuses on assessing ecosystem or ecological health. The near-coastal component of the program (EMAP-NC) which is investigating estuarine fish, bottom-dwelling animals and sediment chemistry collected samples at sixteen stations in Mississippi coastal waters. From 1992 to 1994, approximately ten randomly selected coastal stations were sampled each year by EMAP-NC. In addition, in 1992, a special estuarine characterization study was conducted in the Back Bay of Biloxi (see Basin /Waterbody Information, Coastal Streams Basin, p.165). Data findings may be obtained through EPA.

The Shellfish Sanitation Program in Mississippi, which includes the Shellfish Water Classification and Monitoring Program, is administered by the Mississippi Department of Marine Resources (See Chapter Five: Estuary and Coastal Water Quality Assessment, Shellfish Waters, p.126). This monitoring program consists of monthly sampling by DMR for fecal coliform bacteria at approximately 110 sites in the Mississippi Sound and the coastal bays. Sampling is increased during the harvesting months of October through April. Data from the sampling are kept in an in-house database at DMR.

Mississippi has adopted a Marine Biotoxin Contingency Plan carried out by the Department of Marine Resources. Aerial surveys are conducted periodically over Mississippi's shellfish growing areas to search for blooms of dinoflagellate phytoplankton. Identification of *Gymnodinium brevis* in concentrations greater than 1,000 cells/liter triggers an immediate closure of all shellfish growing waters in the state. Oyster harvest will remain prohibited until concentrations drop below 1,000 cells/liter.

Additional estuary and near-coastal ambient monitoring is also being conducted by NOAA, Mississippi State University’s Coastal Research and Extension Center and the Gulf Coast Research Lab. Five sites in the Mississippi Sound are included in NOAA's National Status and Trends Program for Marine Environmental Quality. This program which began in 1984 strives to define the geographic distribution and temporal trends of contaminant concentration in biological tissues (i.e., fish, mussels and oysters) and in sediments and the biological responses to that contamination. Sampling is conducted annually. Data is available through NOAA. As part of this program, the USGS installed a continuous water quality monitor to collect temperature, specific conductance, and salinity in the Gulf of Mexico near Biloxi Bay in the 1998 water year.

Mississippi State University’s Coastal Research and Extension Center conducts periodic monitoring activities in support of special projects in the Gulf Coast region of Mississippi. One such project entitled the ABangs Lake Shellfish Growing Water Restoration Project was conducted in 1995 and 1996. This study sponsored by Jackson County, the EPA Gulf of Mexico Program, and DMR investigated the impact of fecal coliform bacteria in Bayou Cumbest, Bangs lake and in Point Aux Chenes Bay near Pascagoula (see Basin /Waterbody Information, Coastal Streams Basin, p.165).

The Gulf Coast Research Lab (GCRL) located in Ocean Springs is affiliated with the University of Southern Mississippi and provides teaching and research opportunities in marine science. In addition, GCRL's role has evolved into investigative research dealing with problems in the marine environment. GCRL served as contractor for OPC on the Back Bay of Biloxi Water Quality Study from 1992-1995 and currently serves as OPC's contractor for the Coastal Beach Monitoring Program (see Coastal Beach Monitoring Program, p.125). In addition, GCRL provides bacteriological services for OPC’s Surface Water Monitoring Program and NPDES compliance monitoring activities in south Mississippi. Various other contracts and grants include the collection and/or analysis of environmental data in Mississippi's coastal waters.

Data Management, Assessment and Reporting

The dissemination of accurate information is a major objective of any monitoring program. To meet this need, the Water Quality Assessment Branch (WQAB) compiles surface water monitoring data collected by the various divisions of OPC (Field Services, Hazardous Waste, Surface Water) for ready access to facilitate data entry into and retrieval from computer databases (i.e. GIS, Waterbody System, STORET). In addition, information on monitoring programs being conducted throughout the state by other agencies and institutions is being identified and information contacts for these programs are made available through the Branch. With a central repository for monitoring data, information requests can be more easily supplied to OPC staff, federal and state agencies and the public. Water quality monitoring assessments can also be more easily conducted and water quality summary reports generated. Two such reports are the state's biennial Section 305(b) Water Quality Report to Congress which involves the reporting and evaluation of all surface water and groundwater monitoring data collected in the state and the Section 303(d) list of impaired waters.

Data Handling

All physical, chemical and bacteriological data collected under OPC’s Surface Water Monitoring Program are entered on surface water monitoring forms as analyses are completed in the field and in the laboratory. These multi-sheet forms are specifically designed for ambient surface water data and EPA STORET database entry. Once sampling and laboratory analyses are completed and the results entered on the forms, these forms are then transmitted to the Water Quality Assessment Branch (WQAB) for screening, validating, and sorting. Copies of the original form as completed in the field and the lab are kept by all persons performing sampling and/or analysis. After review, copies of fixed station network forms are also sent to the MDEQ's Office of Land and Water Resources for flow calculations based on stream level measurements recorded by the sampling teams. All physical, chemical and bacteriological surface water data is then entered by the Water Quality Assessment Branch into EPA's STORET data base. The hard copy data forms are kept on file in the WQAB.

In 1991, OPC's developed an in-house STORET data entry system. This user-friendly system was created by the Water Quality Assessment Branch and data processing personnel from MDEQ's Office of Administrative Services. The data entry computer screen for this system matches the surface water monitoring form in format expediting the transfer of data into the computer. Following this step, the data is simply uploaded from OPC's computer into STORET which is housed on EPA's mainframe computer. Using OPC's system as an intermediate step also allows error-checking to be accomplished on the data sheets prior to entry into the actual STORET data base. All water quality data is in STORET within 60 days after the data are reviewed and approved. With EPA's development of the new STORET system, STORET X, OPC will be modifying its data entry process to adapt to this system in the future.

Biological data such as macroinvertebrate taxonomic, distributional and habitat information and fish tissue data are entered into WordPerfect and Lotus files at the OPC Central Laboratory and transferred to the WQAB. These data are then maintained in an in-house database and used in the biennial water quality assessment process. When the EPA NEW STORET database becomes operational, the biological and fish tissue data will also be entered into this database with OPC's other water quality data.

Surface Water Geographic Information System

In February of 1987, the Department of Natural Resources, (now Department of Environmental Quality), coordinated with Department of Archives and History, and Mississippi Automated Resource Information Service (MARIS) to expand an existing GIS data base of the Bayou Pierre drainage basin, developed by the Department of Wildlife Conservation's National Heritage Program. The discussions and recommendations provided, formed the bases of future GIS development.

In January of 1991, the Water Quality Assessment Branch (WQAB) in OPC's Surface Water Division entered into a contract (IHL91-14R) with the Mississippi Automated Resource Information System (MARIS) to develop two geographic information system (GIS) data bases in ARC/INFO format. The two data bases are the NPDES Outfall and Surface Water Monitoring Station data bases. The contract included converting of data bases, data entry, digitizing, ARC macro development and training. Contract modifications allowed for NPDES Outfall application enhancements and map products, with the Surface Water Monitoring Stations coverage set aside for future development. Incorporating the additional enhancements, the NPDES Outfall data base and applications were completed in May of 1993. Updating the data set with Permit Compliance System (PCS) additions and changes are on-going.

The NPDES Outfall GIS data base was developed using information initially found in PCS. The data, including information such as permit number, treatment type, presence of disinfection and dechlorination, type of waste, receiving water, and locational information such as latitude and longitude, was field verified for each permitted outfall. Locations were digitized for both hard copy and digital mapping applications. Field verified data made it possible to enhance and expand existing PCS data.
Generally, the NPDES GIS project consists of five basic steps: download of PCS information, field verification of data, data entry (corrections, digitizing, value added data), review and use implementation. Uses of the GIS data bases include the enhancement of PCS data, producing complex waste load allocations, locating ecoregion reference sites, resource analyses, basin/watershed analyses, developing monitoring strategy and report generation. The data is available on a county, basin, or statewide basis.

The Surface Water Monitoring Station application was developed in-house by WQAB Staff members. This effort was initiated in February 1993 and initial monitoring stations completed by June 1994. The Surface Water Monitoring Station GIS application features related files to the GIS coverage to include monitoring station identification, locational information, a history of parameters monitored, bibliography cross reference, collection schedule, biological lab reference, monitoring station criteria, modifications to EPA's Reach File 3 (RF3), and a monitoring reference index. Station identification and locational information are the primary data sets, they include such items as station number, station type, location name, latitude/longitude, and station description. Actual water quality data will continue to reside in STORET or in-house data bases, yet may be linked via the monitoring station ID. The application was accessed and utilized in the further expansion and development of the Ambient Monitoring Program as well as special studies such as MDEQ'-s Pascagoula River Water Supply Study (page 198) and the Back Bay of Biloxi Water Quality Modeling Project (page 166).

To enhance water quality assessment, Mississippi adopted the Soil Conservation Service's (SCS), now National Resource Conservation Service (NRCS), watersheds as the basis for its waterbodies in EPA's Assessment Data Base, or ADB (this was formerly the Waterbody System, or WBS. See the section "Assessment Methodology - Waterbody System (WBS)", on page 91.). SCS watersheds were digitized in June 1993 from 1:250K base maps then corrected utilizing the RF3, completing the initial step of integrating the ADB data and allowing for additional analyses. Completion of this initial step and existing DLG (USGS Digital Line Graph hydrography) information allows for the tallying of stream miles by class and total lake acreage by size within each newly delineated waterbody. Hydrologic unit codes (HUCs) were then derived from the SCS coverage as an additional coverage.

In March 1995, a wetland permitting application was initiated to incorporate the Water Quality Certification System developed by MDEQ, for the tracking of data from the 401 Certification Program as a portion of the 404 Permit process. Initial development included the incorporation of existing data for digitization. Future development included integrating wetland information into EPA's ADB, identification of sources and causes and the identification of dynamic hydrologic flow regimes with the wetland area.

Surface Water Information Management System (SWIMS)

In July 1996, the Water Quality Assessment Branch (WQAB) of MDEQ and Mississippi Automated Resource Information System (MARIS) entered into a contract (SPB-33) to determine the best GIS methodology to model the Surface Water Division system and to identify, gather information about and study the various databases involved with the Surface Water Division, incorporating PCS, STORET, the National Hydrologic Dataset (NHD) and ADB (formerly WBS). The resulting document, "Surface Water Information Management System (SWIMS)," prepared September 1997, provides the strategy and design for the future of the Surface Water Division GIS as an integrated part of the Division's spatial and tabular information network. Pursuant to this study, MDEQ has contracted with Tetra Tech to implement the SWIMS project.

The proposed SWIMS is described as a graphical user interface (GUI) linking the spatial and tabular data maintained within the SWD. In addition to graphical and tabular data maintenance, queries, and reporting in a networking environment, its functionality will include identifying, analyzing, and reporting assessment, permitting, and compliance data as it passes along stream flow routes over time.

PCS, STORET, NHD, ADB, and GIS all have primary roles in the SWIMS GUI. PCS is a national computerized information management system tracking tabular water-discharge permit data pertaining to facilities regulated under NPDES. STORET, maintained by USEPA, provides computerized storage and retrieval of tabular chemical, physical, and biological data pertaining to the waterways within the contiguous United States. This data is linked to what STORET calls "stations" at the waterways where the data was collected. The NHD is a nationwide spatial and tabular database describing the surface waters of the continental

United States. It uses the USGS Digital Line Graph hydrography files (DLG) to add detail and accuracy to the USEPA RF3's hydrologic ordering, hydrologic navigation, and unique identifier (reach code) for surface water features. NHD data for Mississippi resides as a coverage in SWD's GIS. The ADB is a computer database used by MDEQ to store and report tabular data assessing use support for uniquely identified surface waters in Mississippi. Within SWIMS the SWD's GIS is intended to function as the central part of an integrated graphical and tabular data system incorporating PCS, STORET, NHD and ADB. This will be accomplished by porting the above modules into ESRI's Arc/Info for spatial manipulation, using Oracle as a warehouse for the tabular data. Building SWIMS is anticipated to be an ongoing project during the next few years.

Water Quality Assessment and 305(b) Reporting

Surface waters in Mississippi are used for a number of purposes. Waters are used for drinking and food processing, shellfishing, recreation and for fishing and aquatic life use support. A waterbody (part or all of a stream, river, lake, estuary or coastline) is normally required to support one or more of these uses. MDEQ/OPC comprehensively assesses the waters of the state routinely to determine if their designated uses are supported.

Each designated use assessed for a waterbody is determined to be either Fully Supported, Fully Supported but Threatened, Partially Supported, or Not Supported in accordance with its water quality standards and EPA guidelines for assessments pursuant to Section 305(b) of the Clean Water Act. A waterbody's use is said to be impaired when, based on current and reliable site-specific data, it is only partially supported or not supported at all. MDEQ assesses the state's streams, rivers, lakes, estuaries and coastlines using all existing and readily available information. Assessments to determine use support on a waterbody are based either on monitoring data, on evaluated information (information other than current site-specific ambient monitoring data), or on both. However, having actual and sufficient (both in quantity and quality) ambient monitoring data provides the highest degree of confidence in an assessment determination for a waterbody. For a complete description of the methodology used in conducting this assessment, see Assessment Methodology and Summary Data, page 85.

Monitoring data and the waterbody use support conclusions drawn from them are summarized and made available to the public, Congress, EPA and other state and federal agencies in the State's Water Quality Assessment Report (Section 305(b) Report). OPC develops this report biennially and it serves as the primary assessment of state water quality. The report includes (1) a description of the water quality of all of the state's waters assessed (streams, rivers, lakes, estuaries, wetlands, and ground water); (2) a description of the state's water pollution control programs; (3) an estimate of the extent to which Clean Water Act (CWA) control programs have improved water quality; (4) an estimate, if data is readily available, of the environmental, economic, and social costs and benefits needed to achieve the objectives of the CWA; and (5) a description of the nature and extent of nonpoint source pollution. In addition, OPC also identifies and lists biennially certain waters whose uses are impaired and that still require total maximum daily loads (TMDLs). This list is prepared pursuant to Section 303(d) of the Clean Water Act (see Section 303(d) Waters, p. 92). The Water Quality Assessment Branch is responsible for the development of both of these reports.

CHAPTER TWO

ASSESSMENT METHODOLOGY AND SUMMARY DATA

Assessment Methodology - Introduction

Surface waters in Mississippi are used for a number of purposes. Waters are used for drinking and food processing, shellfishing, recreation and for fishing and aquatic life support. A waterbody (part or all of a stream, river, lake, estuary or coastline) is normally required to support one or more of these uses. The Mississippi Department of Environmental Quality (MDEQ) comprehensively assesses the waters of the state every two years to determine if their designated uses are supported. Each use assessed for a waterbody is determined to be either Fully Supported, Fully Supported but Threatened, Partially Supported, or Not Supported in accordance with its water quality standards and EPA guidelines for assessments pursuant to Section 305(b) of the Clean Water Act. A waterbody’s use is said to be impaired when, based on current and reliable site-specific data, it is only partially supported or not supported at all.

For the 1998 Water Quality Assessment Report, MDEQ assessed the state's streams, rivers, lakes, estuaries and coastlines using all existing and readily available information. Two types of assessments were made: "evaluated" assessments and "monitored" assessments. "Evaluated" assessments are based on information other than current site-specific ambient monitoring data. This type of information includes such things as land use data, surveys and questionnaires, location of potential pollution sources and monitoring data greater than five years old. "Monitored" assessments are based primarily on current site-specific ambient monitoring data believed to accurately portray existing water quality conditions. Assessments to determine use support on a waterbody were based either on monitoring data, on other evaluated information, or on both.

Assessment Methodology - Monitored Assessments

Whenever possible, assessments were made using current site-specific monitoring data. Current site-specific ambient monitoring data are believed to most accurately portray water quality conditions. A waterbody was considered monitored if sufficient (both in quantity and quality) physical, chemical, biological, bacteriological, and/or fish tissue data were collected on the waterbody at any time within the appropriate data window. The table below shows the data windows used for this report for each of the data types.

Data Type	Data Window
Physical	Oct 1991 - Sep 1996
Chemical	Oct 1991 - Sep 1996
Biological	Oct 1991 - Dec 1997
Bacteriological	Oct 1991 - Sep 1996
Fish Tissue	Oct 1991 - Sep 1996

Physical and chemical data include such parameters as pH, temperature, dissolved oxygen, suspended solids, turbidity, specific conductance, and certain water column toxicants. Biological data include the community structure of aquatic insects and other macroinvertebrates and the condition of biological habitat on the waterbody. Bacteriological data include water column surveys for fecal coliform bacteria. Fish tissue data include the analyses of fish flesh for the presence of toxic organic chemicals and metals. The length of record of the data, the type of data and the frequency at which the data were collected were considered when making use support determinations. For example, EPA 305(b) guidance states that for waterbodies to be considered monitored based on fixed station chemical/physical data, the data needs to have been collected quarterly or more frequently. In general, the data were collected, analyzed, and interpreted in a manner consistent with state/EPA guidelines.

MDEQ assessed all existing and readily available information on the quality of the State's waters. Information and monitoring data were acquired from various resource agencies and institutions. Research conducted or reported by local, state, or federal agencies; members of the public; and/or academic institutions was considered. Agencies contributing information for this report were the Mississippi Department of Environmental Quality (MDEQ), US Army Corps of Engineers (USACE), Tennessee Valley Authority (TVA), US Geological Survey (USGS), Environmental Protection Agency (EPA), USDA Natural Resources Conservation Service (NRCS), US Forest Service (USFS), Mississippi Department of Marine Resources (DMR), University of Southern Mississippi - Gulf Coast Research Lab (GCRL), US Forest Service (USFS), and the National Oceanic and Atmospheric Administration (NOAA). Most of the data were compiled and analyzed using EPA's STORET database. The remaining data were compiled and analyzed manually.

Monitoring data were compared to applicable State water quality numeric criteria as found in the Office of Pollution Control (OPC) document State of Mississippi Water Quality Criteria for Intrastate, Interstate and Coastal Waters (see Appendix A). This allowed MDEQ/OPC to determine which pollutant specific numeric criteria were violated. In addition, for select water quality parameters having no specified numeric criteria, data were compared to target values which, based on best professional judgement, indicate threshold levels of water quality concern. These target values are based on "literature" or scientific "rules of thumb" that are used as potential indicators of water quality degradation. The specific water quality criteria and target values used for various parameters are shown in Table III-7.

The size of a waterbody represented by a single monitoring site was determined based on EPA guidance. In general, data from a monitoring site on a wadeable stream represent no more than five to ten miles. Data from a monitoring site on a larger stream represent about 25 miles. For large rivers, data from a monitoring site represent 50 to 75 miles. At times during the assessment process, these guidelines were modified slightly to account for point source outfalls, major tributaries and change in land cover. For lakes, data from a monitoring site were considered representative of the entire lake for small lakes. For larger lakes, data from a monitoring site were considered representative of part of the lake. In the absence of a specific guideline, best professional judgment was used to determine the portion of the lake represented by the monitoring site. In the case of estuarine and coastal waters, data from a monitoring site were considered to represent an area within a four mile radius for open water stations. Radii of two miles and a half mile were used for bay monitoring sites and sheltered bay sites, respectively.

TABLE III-7
Target Levels and Water Quality Criteria for Use Support Decisions
Rivers, Streams, Lakes, and Estuaries

WATER QUALITY CATEGORY/PARAMETERS	UNITS	ACCEPTABLE TARGET LEVEL	AQUATIC LIFE CRITERION (FRESH WATER)	AQUATIC LIFE CRITERION (SALT WATER)	COMMENTS
GENERAL					
Temperature	C		< 32.2	< 32.2	
pH	Standard		6.5 - 9.0	6.5 - 9.0	
DISSOLVED OXYGEN					
Dissolved Oxygen	mg/l		> 4.0	> 4.0	
OXYGEN DEMAND					
Biochemical Oxygen Demand	mg/l	< 5			
Chemical Oxygen Demand	mg/l	< 50			
Total Organic Carbon	mg/l	< 15			
NUTRIENTS					
Total Kjeldahl Nitrogen	mg/l as N	< 1			
Nitrate and Nitrite	mg/l as N	< 1			PWS < 10 (Nitrate)
Total Phosphorus	mg/l as P	< 0.2			
WATER CLARITY					
Turbidity	NTU	< 100			Not >50 over backgrnd
Total Suspended Solids	mg/l	< 80			
Transparency, Secchi	meters	> 0.2			
Chlorophyll a	mg/cu mtr	< 10			<40 Lakes & Estuaries
DISSOLVED SUBSTANCES					
Conductivity	umhos/cm		< 1000		PWS < 500
Total Dissolved Solids	mg/l		< 1500		PWS <500, MS R. <400
Chlorides	mg/l		-		PWS , <230, MS R. <60
BACTERIA					
Fecal Coliform (upper limit)	#/100 ml		< 4000	< 4000	PWS, FW (Nov.-Apr.)
Fecal Coliform (lower limit)	#/100 ml		< 400	< 400	SHL < 43
WATER COLUMN TOXICANTS*					
Arsenic (III), Total	ug/l		< 360	< 69	(CMC) PWS < 0.0175
Cadmium, Total	ug/l		< 1.8	< 44	(CMC) PWS < 10
Chromium (III), Total	ug/l		< 984	-	(CMC)
Copper, Total	ug/l		< 9.22	< 2.5	(CMC)
Lead, Total	ug/l		< 34	< 235	(CMC) PWS < 50
Mercury (II), Total	ug/l		< 2.4	< 2.1	(CMC) PWS < 0.151
Nickel, Total	ug/l		< 789	< 75.2	(CMC)
Phenol, Total	ug/l		< 0.3	< 0.3	(CMC) PWS < 0.001
Selenium, Total	ug/l		< 21.7	< 325	(CMC) PWS < 10
Zinc, Total	ug/l		< 65	< 92	(CMC)

Key:

PWS- Public Water Supply
FW- Fish & Wildlife
SHL- Shellfish Harvesting
CMC- Criteria Max. Conc.

* Aquatic life criteria for metals was calculated by converting total dissolved CMC (acute) criteria as stated in the State of Mississippi Water Quality Standards (proposed amendments, August 1995), to total recoverable acute criteria using conversion factors published in the 1996 305(b) guidance document. Hardness-dependent criteria are based on a hardness less or equal to 50 mg/l as CaCo3.

The degree of use support determination was made based on guidance provided by EPA (EPA 841 B-97-002B, September, 1997). Different guidelines were used for the categories of Designated Use Fully Supported (FS), Designated Use Fully Supported but Threatened (T), Designated Use Partially Supported (PS) and Designated Use Not Supported (NS). The guidelines for each overall use support category are given below. The various uses for which criteria are shown are: drinking water supply (DW); propagation of shellfish, shellfishing and shellfish consumption (SHL); contact recreational activities (CR); secondary contact recreation (SR); fishing and fish consumption (FC); and aquatic life support (AQ).

Designated Use Fully Supported

DW No drinking water source restrictions or advisories in effect, and/or contaminants do not exceed water quality criteria.

SHL Waters classified for shellfish harvesting listed as 'Approved' by DMR's Shellfish Sanitation Program; no shellfish restrictions or bans are in effect.

CR No bathing area closures or restrictions in effect during the reporting period; or not more than 10 percent of the fecal coliform samples examined exceed a density of 400 per 100 ml.

SR For the months of May through October, not more than 10 percent of the fecal coliform samples examined exceed a density of 400 per 100 ml; and for the months of November through April, not more than 10 percent of the fecal coliform samples examined exceed a density of 4000 per 100 ml.

FC No fish consumption restrictions or bans are in effect.

AQ The criterion exceeded in less than or equal to 10 percent of measurements for any one physical or chemical pollutant or stressor for which a state numerical water quality standard applies.

Reliable data indicate functioning, sustainable biological communities (e.g., fish, macroinvertebrates, or algae) none of which has been modified beyond the natural range of the reference condition.

Designated Use Fully Supported but Threatened

The criteria given above for each use for Fully Supported apply in the Fully Supported but Threatened category as well. However, this category is used for a waterbody when the potential for water quality degradation is known to be present in the immediate vicinity or watershed.

Designated Use Partially Supported

DW Drinking water use restrictions resulted in the need for more than conventional treatment and/or contaminant concentrations exceed water quality criteria intermittently.

SHL Waters classified for shellfish harvesting but listed as 'Restricted' by the Department of Marine Resources’(DMR) Shellfish Sanitation Program; or the presence of a 'Restricted Consumption' advisory; or a shellfish ban in effect for a subpopulation that could be at potentially greater risk, for one or more shellfish species.

CR On average, one bathing area closure per year of less than 1 week's duration; or fecal coliform exceed 400 per 100 ml in more than 10 percent of the samples examined, but not more than 10 percent of the samples examined exceed 2000 per 100 ml.

SR For the months of May through October, fecal coliform exceed 400 per 100 ml in more than 10 percent of the samples examined, but not more than 10 percent of the samples examined exceed 2000 per 100 ml; and for the months of November through April, fecal coliform exceed 4000 per 100 ml in 11 to 25 percent of the samples examined.

FC Waters used for fishing, but listed by the Commission on Environmental Quality as having a 'Restricted Consumption' advisory.

AQ The criterion exceeded in 11 to 25 percent of measurements for any one physical or chemical pollutant or stressor for which a state numerical water quality standard applies.

At least one biological assemblage (e.g., fish, macroinvertebrates, or algae) indicates less than full support with slight to moderate modification of the biological community noted.

Designated Use Not Supported

DW Drinking water use restrictions resulted in closures and/or contaminants exceed water quality criteria consistently.

SHL Waters classified for shellfish harvesting but listed as 'Prohibited' by DMR's Shellfish Sanitation Program; or the presence of a 'No Consumption' ban in effect for the general population for one or more shellfish species; or commercial shellfishing ban in effect.

CR On average, one bathing area closure per year of greater than 1 week's duration; or more than one bathing area closure per year; or fecal coliform exceed 2000 per 100 ml in more than 10 percent of the samples examined.

SR For the months of May through October, fecal coliform exceed 2000 per 100 ml in more than 10 percent of the samples examined; and for the months of November through April, fecal coliform exceed 4000 per 100 ml in greater than 25 percent of the samples examined.

FC Waters used for fishing, but listed by the Commission on Environmental Quality as having a 'No Consumption' advisory; or a 'Commercial Fishing' ban.

AQ The criterion exceeded in greater than 25 percent of measurements for any one physical or chemical pollutant or stressor for which a state numerical water quality standard applies.

At least one biological assemblage (e.g., fish, macroinvertebrates, or algae) indicates non-support with severe modification of the biological community noted.

<u>Assessment Methodology - Evaluated Assessments</u>

The Mississippi Nonpoint Source Pollution Assessment Report was the primary source for evaluated assessments in 1998 just as it had been utilized in the 1996 305(b) assessment cycle. Nonpoint source (NPS) pollution is defined in general as pollution from diffuse sources that are not regulated as point sources. NPS pollution is normally associated with agricultural, silvicultural and urban runoff, and runoff from construction activities. The NPS Pollution Assessment Report, completed in 1989 by the OPC Water Quality Management Branch and prepared pursuant to Section 319 of the Clean Water Act, was an assessment made of all waters of the State using either current (at that time) monitoring data, or factors such as land use, location of pollution sources or citizen complaints. The purpose of the NPS Pollution Assessment Report was to identify state waters which, without additional action to control nonpoint source pollution, could not reasonably be expected to attain or maintain applicable water quality standards. The report also listed pollutants or causes of impairment and the sources of the pollutants for each identified waterbody or watershed. Information regarding nonpoint source pollution was also solicited from various state and federal agencies, interested groups and citizens. The main contributors of information were the Mississippi Soil and Water Conservation Commission, the Mississippi Forestry Commission, the Mississippi Department of Health, the U.S. Department of Agriculture-Natural Resources and Conservation Service (NRCS), and the U.S. Forest Service. With the lack of extensive statewide ambient monitoring data, the majority of information received for this report was largely in the form of surveys returned to MDEQ by NRCS field personnel. Consequently, the report focuses mainly on information regarding potential agricultural, silvicultural, and urban sources of nonpoint pollution and includes many waterbody segments for which no known monitoring data exists indicating impairment. For more information on the report, refer to the <u>Nonpoint Source Control Program</u> section on page 10, 36.

Because the NPS Pollution Assessment Report listed entire watersheds or drainage areas as well as discrete stream segments, extra care was taken in 1996 not to apply the identified NPS pollutant described in the report to an entire watershed, if unwarranted. To do this, each watershed listed in the NPS Pollution Assessment Report was marked on quadrangle maps. Next, the land cover shown on the maps was reviewed to determine if the cause and source of pollution under consideration was typical of the entire watershed or only a part of the watershed. If only a part, the percentage of stream miles “assessed” in the watershed was determined using best professional judgment. Applying this percentage to the total stream miles in the watershed (taken from EPA's Reach File 3) prevented NPS impacts from being assigned in an unwarranted way.

Waters listed in the NPS Pollution Assessment Report were considered partially supporting of their uses for the 1998 305(b) Report. However, it should be pointed out that most of the waters listed in the Nonpoint Source Assessment Report were not monitored and therefore, no known impairment exists. Consequently, the partially supporting determination for these waters is based strictly on evaluation. OPC considers these evaluated waterbody segments (in many cases, large portions of or entire NRCS watersheds) as NPS “waters of concern” warranting further investigation. These NPS-evaluated waters make up the majority of the evaluated waters reported in this 305(b) Assessment Report.

In addition to the information in the NPS Pollution Assessment Report, evaluated assessments were made using other information as well. Evaluated assessments were made using the locations of point sources significantly out of compliance with their permit limits during the past two years. Also, the locations of fish kills during the past two years were used. Data collected by volunteer monitors under the Adopt-A-Stream Mississippi program were also used for evaluated assessments. In addition, available monitoring data greater than five years old from other state and federal agencies and MDEQ were used and assessed as evaluated.

Assessment Methodology - Waterbody System (WBS)

All information collected during the assessment process was placed in EPA's Waterbody System version WBS97. By the time we next report, we expect to be using the next version of WBS. This system has been extensively revised, and will be called the 305(b) Assessment Data Base (ADB). Our proposed use of ADB is discussed under the Section, "Surface Water Information Management System (SWIMS)", on page 83. WBS97 was useful for maintaining the quality and consistency of our assessments. Some of the information placed in WBS97 for each waterbody included location and description, assessment types, assessment category (evaluated or monitored), use support determinations, causes of impairment, and sources of impairment. WBS97 allows for the linking of impairment causes and sources. However, we did not have the information or resources to link causes and sources of impairment. WBS97 was used to generate the various required summary tables for each waterbody type. These tables include: Summary of Fully Supporting, Threatened, and Impaired Waters; Individual Use Support Summary; Total Sizes of Waters Impaired by Various Cause Categories; and Total Sizes of Waters Impaired by Various Source Categories. Tables discussing assessments of: rivers (reported in miles); lakes (reported in acres); estuaries (reported in square miles); and coastal waters (reported in shore miles) are presented in the following sections. Assessment information is not available at this time to report on freshwater and tidal wetlands. The WBS files for this assessment have also been submitted electronically to EPA as recommended by the State/EPA 305(b) Consistency Workgroup.

Assessment Methodology - General Discussion

A review of the assessment tables in the following sections indicates that an extensive size of the rivers and lakes assessed are listed as impaired. Like the 1996 assessment, this high percentage of listed impairment for both rivers and lakes is due to the use of the previously mentioned NPS-evaluated waters (especially the large number of watershed mileages) from the NPS Assessment Report as well as focusing monitoring activities on problem areas.

Monitoring data, even at ambient fixed sites, often does not adequately take into account temporal variations such as seasonal variation and rain events. This is especially true at sites where the data collection is not frequent and the period of record is short-term and/or sporadic. This limited amount of data is also problematic for the assessment process when assessing criterion use support according to the EPA guidance if only the minimum amount of data to be considered monitored (quarterly for fixed stations) was collected. For example, only one violation of the criterion for a particular conventional pollutant will cause the overall percentage of measurements collected only quarterly to equal 25%. Consequently, according to 305(b) assessment guidance, the waterbody would be considered partially supporting and therefore, impaired. We also recognize that most ambient data certainly does not take into account diurnal variations. An exception to this is intensive water quality studies for wasteload allocation and total maximum daily load development. This will most significantly bias dissolved oxygen averages in waterbodies with considerable diurnal variation. Sufficient resources are not available to conduct the level of monitoring necessary to remove such biases. Mississippi's dissolved oxygen criterion of an instantaneous minimum of 4 mg/l was used for assessing use support (see Table III-7).

Mississippi has a stream classification known as Ephemeral (see the State's water quality standards in Appendix A). This classification is listed on the Individual Use Support Summary tables in the following sections. An ephemeral stream is a natural or manmade conveyance which only flows in direct response to a rain event. The Ephemeral classification is formally assigned by the Commission on Environmental Quality. All ephemeral streams in Mississippi fully support their designated use and are free of nuisance conditions. Consequently, no use support determination screening criteria are listed above.

The main emphasis of the 1998 Water Quality Assessment Report is the use support status of Mississippi's surface and ground waters. For surface waters, use support status is found in the Individual Use Support Summary tables in the following sections. However, attainment of Clean Water Act goals may also be implied from the use support information. Uses appropriate to Mississippi's waters include Aquatic Life Support, Fish Consumption, Shellfishing, Swimming, Secondary Contact, Drinking Water, and Ephemeral. Because the State has formal classifications of Fish and Wildlife, and Recreation, these are also shown as uses. All waters classified higher than Fish and Wildlife are also intended to adequately support fish and wildlife. For the most part, use support assessments for Aquatic Life Support are duplicated under the Fish and Wildlife use. Use support assessments for Contact Recreation and Secondary Contact are duplicated under Swimming. The fishable goal of the Clean Water Act is reported under, Fish Consumption, Shellfishing, and Aquatic Life Support uses. The swimmable goal is reported under the Swimming and Secondary Contact uses.

Both the State's Section 305(b) Water Quality Assessment Report and the Section 303(d) list (discussed below) are the overall responsibility of the Office of Pollution Control's Water Quality Assessment Branch.

Assessment Methodology - Basin Assessments and Maps

A summary of the water quality of Mississippi's ten major river or drainage basins follows the assessment discussions for the various waterbody types (see Basin/Waterbody Information, p.157). The ten basins are the Big Black River Basin, the Coastal Streams Basin, the Mississippi River Basin, the North Independent Streams Basin, the Pascagoula River Basin, the Pearl River Basin, the South Independent Streams Basin, the Tennessee River Basin, the Tombigbee River Basin and the Yazoo River Basin. The basins' boundaries are shown in Figure III-8 in the Basin/Waterbody Information section, p.158. Tables listing monitoring stations used for the 1998 assessment and showing use support information based on the type of data collected are also included in this section as well as maps showing the locations of the monitoring stations.

Section 303(d) Waters

Section 303(d) of the Clean Water Act and the implementing federal regulations at 40 C. F. R. ' 130.7 require the State to:

identify and list waterbody segments that are *known* to be water quality limited or that are otherwise expected to be water quality limited (40 C.F.R. ' 130.2(j));

establish a priority ranking for the impaired waters taking into account the severity of the pollution and the importance of the water's impaired use; and develop TMDLs for those pollutants impairing any use of the waterbody, establishing pollutant level reductions that will cause the impaired use to be fully supported.

In 1996, Mississippi's Section 303(d) List of Impaired Waterbodies included not only monitored segments, but also evaluated segments for which MDEQ lacked monitoring data. MDEQ had obtained some form of information, usually anecdotal information, not of water quality impairment, but of predominant land-use activities in an area from organizations and groups who were actively solicited for research they may be conducting or reporting. This information, received largely in the form of surveys returned to MDEQ by NRCS field personnel, previously had been used to compile Mississippi's Clean Water Act ' 319 assessment. These evaluated segments were taken primarily from MDEQ's 1989 Nonpoint Source Assessment document that included numerous NRCS delineated watersheds. These segments were not (and are not) known to be impaired, but were (and remain) on the list based upon the information gleaned from the surveys and questionnaires completed in 1984. Placing these evaluated segments on the 1996 list produced a very long list that included both monitored waterbody segments with known impairment and merely evaluated segments (most of them entire watersheds) for which no known monitoring data indicated impairment and for which MDEQ was unable to perform any type of quality control analysis regarding the validity of the survey/questionnaire responses.

In 1998, MDEQ again listed the evaluated segments on the Section's 303(d) list. However, continued listing of a merely evaluated segment on the 1998 Section 303(d) list may lead to the assumption that a NPDES permit issued allowing a discharge of a pollutant into the listed segment would "cause or contribute to a violation of water quality standards" in violation of 40 C.F.R. ' 122.4(i). This assumption is not valid for evaluated (unmonitored) segments. While it is appropriate to list segments based on anecdotal evidence and broad assumptions when the purpose of the list is to reflect a commitment to monitor the segment, it is not justifiable to use those assumptions regarding evaluated segments to deny a permit to which the applicant otherwise is entitled. This denial would be both an arbitrary and capricious decision of the Mississippi Environmental Quality Permit Board and a violation of the applicant's right to due process. This problem in "translation" between the commitment of an agency to monitor waters and that agency's permitting process causes MDEQ now clearly to distinguish the import of a segment's listing as either monitored or evaluated. In short, for permitting purposes no presumption of impairment arises due to a segment's listing as "evaluated". MDEQ, however, will use site-specific and application-specific data to determine whether any evaluated segment should undergo additional water quality modeling or monitoring prior to the issuance of any permit for discharge into that segment.

Because of the significant difference between monitored and evaluated segments, MDEQ no longer blends the monitored waters and the evaluated waters in its Section 303(d) list. For this reason, the 1998 list differs from the list developed in 1996; however, this modification has not caused the removal of any segment found on the 1996 list. For 1998, evaluated waters (based on evaluation only, no monitoring data) are now shown after the monitored waters in a second section of the list. MDEQ is committed to determining whether these evaluated waters actually are impaired. MDEQ will monitor these waters as it implements and proceeds through the State's Basinwide Approach to Water Quality Management. If monitoring data indicates a waterbody segment is impaired, the segment will be moved to the State's monitored part of the list. Conversely, if monitoring indicates the water's uses are fully supported, the segment will be removed from the list.

Mississippi has fulfilled its obligation with respect to Section 303(d) of the Federal Clean Water Act. The document developed to meet the State's Section 303(d) requirements includes Mississippi's List of Waterbodies, and an identification of pollutants causing (or potentially causing for evaluated segments) the use impairment.

Impaired streams, rivers, lakes, estuaries, and coastlines, (where monitoring data indicate impairment) on the List of Waterbodies as well as the evaluated portion of the list are sorted according to Mississippi's ten major river or drainage basins. These are:

Big Black River Basin	Coastal Streams Basin
Mississippi River Basin	North Independent Streams Basin
Pascagoula River Basin	Pearl River Basin
South Independent Streams Basin	Tennessee River Basin
Tombigbee River Basin	Yazoo River Basin

MDEQ has included a location description within the list for each waterbody segment. The drainage areas on the list are identified by the nearest community to the mouth of the watershed. Additionally, the 1998 Mississippi Section 303(d) List of Waterbodies includes a Priority Ranking of Waterbodies. The document also includes a discussion of the waterbodies targeted for TMDL development during 1998 and 1999. Also available is a companion document listing pollution causes delisted from the 1996 Section 303(d) list, along with the rationale for making the delisting decision.

The State submitted its draft Section 303(d) list to EPA in February 1998 at the beginning of the public notice period required for the list. MDEQ received comments from the public and EPA regarding the initial 1998 list. Also, during that review period, NPDES permitting in Mississippi began to be questioned in reference to the 303(d) list. These new ramifications for the list required additional time for EPA and Mississippi to work out the future NPDES permitting and the 303(d) list. Also, the lawsuit between EPA and Earthjustice was settled. In January, 1999, Mississippi submitted a revised Section 303(d) List of Waterbodies to EPA for approval. EPA's comments which generally only requested clarification have been reviewed and addressed. A final 1999 Section 303(d) list was submitted to EPA in April 1999. A copy of the 1998 Section 303(d) List of Waterbodies and the delisting package for 1996 are available by contacting MDEQ. They are not included in this report.

CHAPTER THREE

RIVERS AND STREAMS WATER QUALITY ASSESSMENT

Designated Use Support

For the 1998 Water Quality Assessment Report, the Mississippi Department of Environmental Quality (MDEQ) assessed approximately 46% (39,080 miles) of Mississippi's total 84,003 miles of streams and rivers. The status of water quality on the remaining 54% (44,977 miles) of the state's rivers and streams is unknown. Of the amount assessed, evaluated assessments made up approximately 93%, while monitored assessments made up about 7%. This low percentage of monitored assessments is reflective of the MDEQ's historically limited resources available for the ambient monitoring program. In addition, during the assessment process, no distinction was made between perennial and intermittent streams. With 65% (54,862 miles) of Mississippi's waters classified as intermittent and the agency's ambient monitoring capability focusing on perennial waters, the percentage of total waters monitored is significantly reduced.

A summary of use support for the state's assessed rivers and streams is found in Table III-8 and Figure III-3. For waterbodies with multiple assessed uses, the EPA Waterbody System (WBS) summary for this table can under- or over-represent the actual amount of fully supporting mileage assessed. Table III-9 gives a summary of use support according to the individual uses assessed.

Of Mississippi's assessed stream and river miles, approximately 2% fully support all assessed uses. Another 2.0% also fully support all assessed uses, but support is threatened for at least one use. Approximately 96% are listed as impaired for one or more uses. For most of the impaired rivers and streams, nonpoint source activities are indicated as the main sources of pollutants. The current assessment includes all streams, rivers, and watersheds listed in the most current Nonpoint Source Assessment Report. Due to limited ambient statewide monitoring and the large mileage associated with these NPS - evaluated waters, these waters make up over 92% of the river and stream mileage assessed in this 305(b) cycle. However, as discussed in the Assessment Methodology section on page 90, most of the waters included in this nonpoint source report were not directly monitored and the partially supporting classification given to these potentially NPS - impaired waterbodies for the 305(b) assessment is based strictly on evaluation. Consequently, the majority of Mississippi's assessed rivers and streams (93%) were evaluated and not monitored. Monitoring of all these NPS - evaluated streams, rivers, and watersheds to verify water quality impacts is on-going or is being targeted through MDEQ's Basinwide Approach to Water Quality Management.

TABLE III-8

Summary of Fully Supporting, Threatened and Impaired Waters

Rivers and Streams

11-30-98

(All size units are in Miles)

Degree of Use Support	Assessment Basis: Evaluated	Assessment Basis: Monitored	Total Assessed Size
Size Fully Supporting All Assessed Uses	188.20	547.30	735.50
Size Fully Supporting All Assessed Uses but Threatened for At Least One Use	219.60	439.50	659.10
Size Impaired for One or More Uses	35990.40	1641.10	37631.50
Size Not Attainable for Any Use and Not Included in the Line Items Above	54.30	0.00	54.30
TOTAL ASSESSED	36452.50	2627.90	39080.40

Size Not Assessed 44,977

Figure III-3
Use Support Summary Percentages
Rivers and Streams

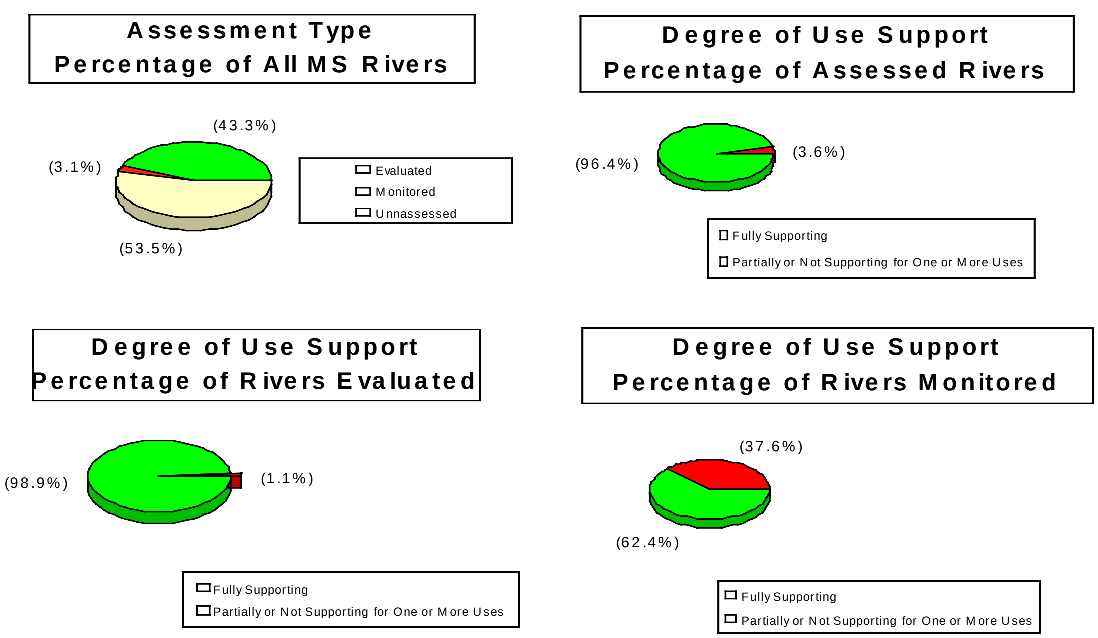


TABLE III-9

Individual Use Support Summary Table

Rivers and Streams

11-30-98

(All size units are in Miles)

Use	Supporting	Supporting but Threatened	Partially Supporting	Not Supporting	Not Attainable
OVERALL USE SUPPORT					
AQUATIC LIFE SUPPORT	832.60	1148.40	36470.50	204.70	54.30
FISH CONSUMPTION	447.20	262.80	228.40	22.60	
SHELLFISHING		6.00			
SWIMMABLE	139.30	172.30	11145.10	537.10	
SECONDARY CONTACT REC	102.20	154.60	10932.20	381.90	
DRINKING WATER SUPPLY	11.10	12.80			
AGRICULTURE					
CULTURAL/CEREMONIAL					
FISH/WILDLIFE	832.60	1148.40	36470.50	204.70	54.30
CONTACT RECREATION	37.10	17.70	212.90	155.20	
EPHEMERAL	131.80				

Causes and Sources of Impairment of Designated Uses

Causes and sources of impairment were evaluated for streams and rivers having one or more uses impaired. Total assessed sizes of streams and rivers affected by various cause categories are given in Table III-10. For the majority of miles of monitored assessed rivers with major environmental impacts, impairment is caused by pathogens, nutrients, and unknown pollutants contributing to biological impairment. In these latter cases, actual monitoring has detected biological impairment but the exact pollutant cause has yet to be determined. To a lesser extent, major impacts are also attributed to metals, solids, organic enrichment/low D.O., turbidity, salinity, and priority organics. For the stream miles with moderate or minor impacts, potential impairment is caused by generally these same categories along with pesticides, siltation, pH, other habitat alterations, unknown toxicity, and oil and grease.

Total sizes of rivers and streams affected by various source categories are given in Table III-11. Agricultural nonpoint sources contribute pollutants to the majority of river miles considered to have major and moderate/minor source contributors. Lesser numbers of miles have pollutants contributed by urban runoff, land disposal, silviculture, industrial and municipal point sources, resource extraction, unknown sources and natural sources. The natural sources category is utilized for such waters as Mississippi's "blackwater" streams found predominantly in south Mississippi where low pH in the streams is a result of the leaching of tannic acid from the type of woody vegetation natural to this part of the state.

TABLE III-10
Total Sizes of Waters Impaired by Various Cause Categories
Rivers and Streams
11-30-98

Sizes of Waterbodies Not Fully Supporting Uses Affected by Various Cause Categories

(All sizes are in Miles)

Cause Categories	Major Impact	Moderate/Minor Impact
0000 Cause Unknown	3.20	6.60
0100 Unknown toxicity	0.00	97.50
0200 Pesticides	0.00	32571.80
0300 Priority organics	22.60	68.90
0400 Nonpriority organics	0.00	18.30
0500 Metals	14.10	858.70
0600 Unionized Ammonia	0.00	1.00
0700 Chlorine	1.50	2.00
0900 Nutrients	116.10	34874.30
1000 pH	0.00	962.40
1100 Siltation	0.00	34388.70
1200 Organic enrichment/Low DO	56.70	30943.00
1300 Salinity/TDS/chlorides	21.20	291.40
1400 Thermal modifications	0.00	6.80
1500 Flow alteration	31.60	3.70
1600 Other habitat alterations	0.00	211.40
1700 Pathogens	588.30	10711.30
1900 Oil and grease	0.00	86.30
2100 Suspended solids	88.10	377.70
2400 Total toxics	3.20	23.30
2500 Turbidity	79.20	206.10
8600 Other (Bio Impairment)	207.20	204.30

TABLE III-11
Total Sizes of Waters Impaired by Various Source Categories
Rivers and Streams
11-30-98

Sizes of Waterbodies Not Fully Supporting Uses Affected by Various Source Categories

(All sizes are in Miles)

Source Categories	Major Impact	Moderate/Minor Impact
0100 INDUSTRIAL POINT SOURCES	34.10	416.80
0200 MUNICIPAL POINT SOURCES	23.80	877.20
0900 DOMESTIC WASTEWATER LAGOON	0.00	23.70
1000 AGRICULTURE	139.50	34883.60
2000 SILVICULTURE	0.00	2120.70
3000 CONSTRUCTION	0.00	85.90
4000 URBAN RUNOFF/STORM SEWERS	49.80	801.30
5000 RESOURCE EXTRACTION	28.40	407.50
6000 LAND DISPOSAL	67.50	535.30
7000 HYDROMODIFICATION	15.80	172.60
7900 MARINAS	0.00	11.90
8500 CONTAMINATED SEDIMENTS	0.00	51.50
8600 NATURAL SOURCES	0.00	195.90
9000 SOURCE UNKNOWN	351.80	809.00

CHAPTER FOUR

LAKES WATER QUALITY ASSESSMENT

Background

Mississippi is covered with hundreds of publicly owned lakes, reservoirs, and ponds totaling approximately 500,000 acres. The largest lakes are man-made reservoirs. Four reservoirs in the Yazoo Basin used for flood control are: Grenada Reservoir; Enid Reservoir; Sardis Reservoir and Arkabutla Reservoir. The Ross Barnett Reservoir, near Jackson, is used for flood control and for the City's drinking water. All of these large reservoirs also support numerous recreational activities. Pickwick Lake, in the state's northeastern corner, is part of the Tennessee River and is shared with Alabama and Tennessee. Numerous other smaller lakes and reservoirs are maintained by cities, counties, water districts, state parks and conservation agencies. Mississippi has about 129 "significant" public lakes and reservoirs with a total surface area of approximately 326,000 acres.

Designated Use Support

MDEQ assessed approximately 58% of its estimated 500,000 acres of freshwater lakes. Of the amount assessed, evaluated assessments made up approximately 6% while monitored assessments made up about 94%. Based on the total size, Mississippi monitored approximately 55% of its lake acreage. Another 3% was evaluated. The water quality status of the remaining 42% is unknown.

A summary of use support for the State's assessed lakes is found in Table III-12, and Figure III-4. For waterbodies with multiple assessed uses, the EPA Waterbody System (WBS) summary for this table can under- or over-represent the actual amount of fully supporting mileage assessed. In the case of Mississippi’s lakes, this summary table originally over-reported the fully supporting lake acreage and under-reported the fully but threatened acreage. For Table III-12 and the percentages given below, this acreage has been corrected using the WBS individual use support data. Table III-13 gives a summary of use support according to the individual uses assessed.

Of Mississippi's assessed lake acreage, approximately 41% fully support all assessed uses. Another 47% fully support all assessed uses, but support is threatened for at least one use. Approximately 12%, are listed as impaired for one or more uses. As in the case of rivers, lakes are impaired due primarily to nonpoint source pollution. The lakes listed in the most current Nonpoint Source Assessment Report are included in this assessment along with the Clean lakes Program data. However, some of the lakes listed in the Nonpoint Source Assessment Report received only limited monitoring, or none at all. Consequently, the partially supporting classification for these lakes is based strictly on evaluation. However, unlike rivers, where over 90% of the assessments are evaluations, over 90% of the lake assessments are by monitoring. With the implementation of control measures, most, if not all, of Mississippi's lakes could support their uses and attain the fishable and swimmable goals of the Clean Water Act.

Causes and Sources of Impairment of Designated Uses

Causes and sources of impairment were evaluated for lakes having one or more uses impaired. Total assessed sizes of lakes affected by various cause categories are given in Table III-14. Pollutants causing major impacts to lakes are relatively few in relation to the total lake acreage impacted in the state. A major fish kill due to pesticides occurred in one lake in the Yazoo River Basin. Another small lake is significantly impaired by priority organics. Moderate or minor impacts on lakes are due to metals, pesticides, nutrients, siltation, and organic enrichment.

Total sizes of lakes affected by various source categories are given in Table III-15. Significant sources of major and moderate/minor impacts in lakes are agricultural nonpoint sources and unknown sources for which resources have not been available to determine the exact source. Most of the lake acreage in this source category comes from one lake, Enid Reservoir, due to the presence of mercury in fish tissue of which the exact source has not been determined. Other nonpoint sources such as land disposal, urban runoff, and construction activities contribute pollutants to a lesser degree.

Clean Lakes Program

Mississippi initiated its Clean Lakes Program during the summer of 1982 by conducting a Clean Lakes Classification Survey on 34 public lakes. These lakes were selected by the Office of Pollution Control (OPC) and Mississippi Department of Wildlife, Fisheries and Parks personnel.

After completion of the 1982 Clean Lakes Classification Survey, an application for a Phase I Diagnostic - Feasibility Study on Wolf Lake was submitted to the Environmental Protection Agency (EPA). Wolf Lake was proposed for this study because of public interest and its high priority ranking for restoration. However, funding for new Phase I studies was discontinued and a grant was not received.

With passage of the 1987 amendments to the Clean Water Act, new emphasis was placed on the Clean Lakes Program. The State submitted applications for three Phase I Diagnostic-Feasibility Studies. Applications were submitted for Wolf Lake in Yazoo County, Lake Washington in Washington County, and Moon Lake in Coahoma County. Grants were received to study each of these lakes. A contractor was selected and the studies were initiated in May 1989. The OPC analyzed samples and provided overall coordination of the projects. The Diagnostic-Feasibility Studies were completed in early 1991. In addition, a Phase II Diagnostic-Feasibility Study has been completed on Lake Washington.

Through 1996, the State maintained and benefitted from a Lake Water Quality Assessment (LWQA) Program, which was supported by Section 314 grants. From 1991 through 1996, many of the original lakes studied in the 1982 Clean Lakes Study were reassessed as part of the LWQA Program. This study, under contract to the University of Southern Mississippi from 1991 through 1994, targeted up to 20 lakes for characterization of trophic level and water quality status. Results from 1991 were submitted to OPC in the form of a report. Data from the remaining three years were obtained by OPC, and used in the 1996 and 1998 water quality assessments. A list of lakes included in the USM study is found in Table III-16. The OPC's Water Quality Management Branch administered program grants through 1992. In 1993, the Biological Services Section of the OPC

Laboratory began administering the grants and began conducting field sampling that same year.

TABLE III-12

Summary of Fully Supporting, Threatened and Impaired Waters
Lakes

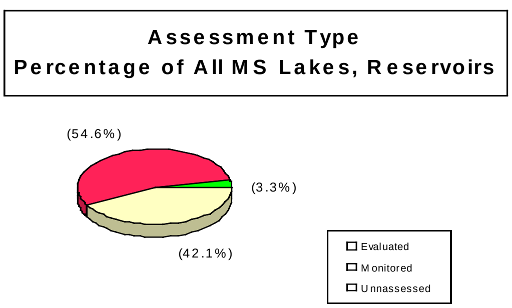
11-30-98

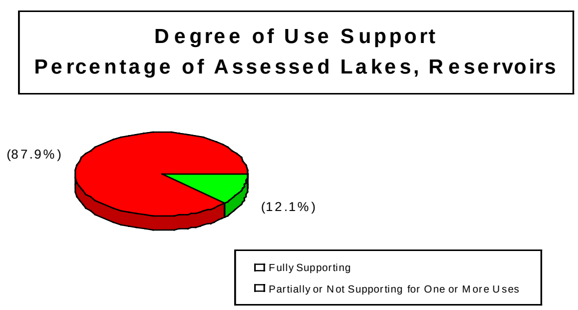
(All size units are in acres)

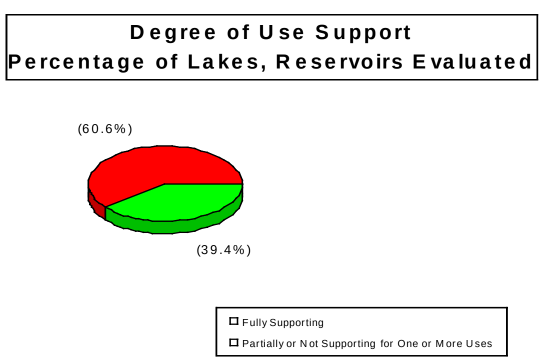
Degree of Use Support	Assessment Basis: Evaluated	Assessment Basis: Monitored	Total Assessed Size
Size Fully Supporting All Assessed Uses	8206.23*	108990.2*	117196.43
Size Fully Supporting All Assessed Uses but Threatened for At Least One Use	1725.80	135455.23*	137181.03
Size Impaired for One or More Uses	6452.73	28438.50	34891.23
Size Not Attainable for Any Use and Not Included in the Line Items Above	0.00	0.00	0.00
TOTAL ASSESSED	16384.76	272883.93	289268.69
Size Not Assessed 210,731*			

*Note: The WBS Summary above originally over-reported the acres of Mississippi lakes and reservoirs assessed as fully supporting (by about 41000 acres). It under-reported about the same amount of acres assessed as threatened. The numbers above have been corrected manually using WBS use support data.

Figure III-4
Use Support Summary Percentages
Lakes & Reservoirs







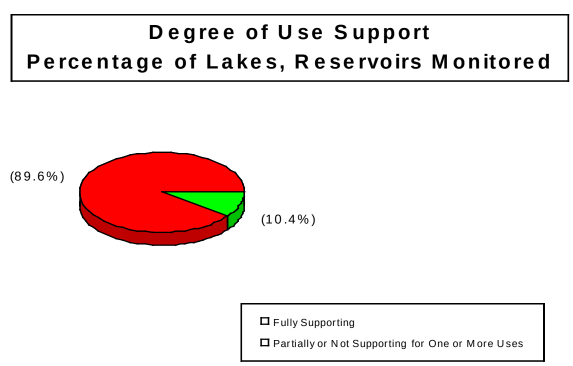


TABLE III-13

Individual Use Support Summary Table

Lakes and Reservoirs

11-30-98

(All size units are in acres)

Use	Supporting	Supporting but Threatened	Partially Supporting	Not Supporting	Not Attainable
OVERALL USE SUPPORT					
AQUATIC LIFE SUPPORT	180228.03	87823.80	6445.50		15040.40
FISH CONSUMPTION	126781.71	117109.23	28399.73	46.00	
SHELLFISHING					
SWIMMABLE	31823.34		100.00		
SECONDARY CONTACT REC	18521.34		100.00		
DRINKING WATER SUPPLY					
AGRICULTURE					
CULTURAL/CEREMONIAL					
FISH/WILDLIFE	180228.03	87823.80	6445.50		
CONTACT RECREATION	13302.00				
EPHEMERAL					

TABLE III-14

Total Sizes of Waters Impaired by Various Cause Categories

Lakes and Reservoirs

11-30-98

(All sizes are in acres)

Cause Categories	Major Impact	Moderate/Minor Impact
0200 Pesticides	271.40	5331.70
0300 Priority organics	46.00	0.00
0500 Metals	0.00	28399.73
0600 Unionized Ammonia	22.20	0.00
0900 Nutrients	0.00	6445.50
1000 pH	0.00	101.00
1100 Siltation	0.00	5737.70
1200 Organic enrichment/Low DO	0.00	2885.50
1400 Thermal modifications	0.00	659.00
1700 Pathogens	0.00	100.00
2100 Suspended solids	0.00	82.00
8600 Other	24.90	0.00

TABLE III-15

Total Sizes of Waters Impaired by Various Source Categories

Lakes

11-30-98

(All sizes are in acres)

Source Categories	Major Impact	Moderate/Minor Impact
0100 INDUSTRIAL POINT SOURCES	15.60	0.00
1000 AGRICULTURE	0.00	6323.50
3000 CONSTRUCTION	0.00	22.00
4000 URBAN RUNOFF/STORM SEWERS	46.00	22.00
6000 LAND DISPOSAL	0.00	100.00
7000 HYDROMODIFICATION	0.00	22.00
8600 NATURAL SOURCES	0.00	581.80
9000 Source Unknown	289.40	28399.73

In the LWQA program, fish tissue analysis was used as the primary indicator of lake water quality. Nutrient analyses, as well as basic physical and chemical analyses, complemented the fish tissue data. In 1995, sampling for chlorophyll a was added to also complement the fish tissue data, and to help with trophic classification. In 1996, analysis of fish tissue for metals and organo-chlorine contaminants were determined for only seven lakes. This sampling effort marked the end of the Clean Lakes program. Lakes sampled during 1993 to 1996 are listed in Table III-16.

Ambient Lake Monitoring Activities

Routine lake monitoring is now performed through OPC's new Ambient Fixed Station Monitoring Program which began in 1997. Lakes in the Primary Fixed Station Network are sampled on a quarterly basis for physical, chemical and bacteriological parameters. Many of these lakes have multiple sites within the lake and fish are also collected annually from some for tissue contamination analysis. This monitoring network began in April 1997 and is ongoing. In addition, periodic lake sampling is also conducted at lake Basin Fixed Network sites under OPC's Basinwide Approach (see Basin Fixed Network, p.51, 62) and for special study monitoring such as the OPC Mercury Contamination Study (see Statewide Mercury Contamination Study, p.137).

Fish not only provide information about the condition of the lake, but also provide valuable information about the health risk of fish consumption. Using the fish tissue analysis approach, Enid Reservoir and Bee Lake were found to be significantly impaired by mercury and DDT (and its derivatives), respectively (see Public Health and Aquatic Life Concerns, p.135). A fish consumption advisory has been placed on Enid Reservoir.

In December 1994, the Pearl River Valley Water Supply District contracted with the OPC's Biological Services Section to begin monthly chlorophyll a analysis at a single station on the Ross Barnett Reservoir. In January 1995, the first of twelve such analyses was performed. The chlorophyll a values ranged from a low of 2.67 µg/L in November 1995 to a high of 39.18 µg/L in April 1995. The chlorophyll a values measured did not indicate enrichment problems and seasonal variation was typical for the water body. Sampling is continuing.

TABLE III-16
Lake Water Quality Assessment Program
Sampling Schedule
1991-1996

LAKE	COUNTY	1991	1992	1993	1994	1995	1996
Aberdeen Lake	Monroe	X					
Archusa Creek Water Park Lake	Clarke	X				X	
Arkabutla Reservoir	Tate, Desoto	X		X	X	X	X
Bailey Lake	Carroll					X	
Bay Springs Lake	Tishomingo			X	X	X	X
Bee Lake	Holmes			X	X	X	
Big Lake	Harrison			X			
Bluff Lake	Noxubee			X			
Buzzard Bayou Lake	Tallahatchie						
Chewalla Lake	Marshall		X		X		
Chickasaw Bayou	Warren				X		
Choctaw Lake	Choctaw				X		
Columbus Lake	Lowndes	X	X				
Davis Dead River Lake	Stone				X	X	
Davis Lake	Chickasaw					X	
Desoto Lake	Coahoma		X				
Dixie Springs Lake	Pike						
Dump Lake (Lake Dick)	Yazoo		X				
Eagle Lake	Issaquena	X	X	X			
Enid Reservoir	Yalobusha	X	X		X		
Flint Creek Reservoir	Perry	X				X	
Ford's Creek Lake	Lincoln					X	
Gee Lake	Carroll						
Grenada Reservoir	Grenada	X		X	X		
Gulfport Lake	Harrison				X		
Hampton Lake	Tallahatchie			X			
Horn Lake	Desoto				X		
Horseshoe Lake	Holmes					X	
Jefferson Davis State Fishing Lake	Jefferson Davis					X	
Lake Albermarle	Issaquena		X		X		
Lake 99	Lee						
Lake Bailey	Carroll					X	
Lake Beulah	Bolivar	X	X				
Lake Bolivar	Bolivar		X				
Lake Bogue Homo	Jones	X					
Lake Catch-em All	Jackson					X	
Lake Chotard	Warren, Issaquena	X					
Lake Columbia	Marion			X			
Lake Ferguson	Washington		X				
Lake Hico	Hinds						
Lake Lincoln	Lincoln	X					
Lake Lamar Bruce	Lee				X		
Lake Lee	Washington		X				
Lake Mary	Wilkinson		X	X			X
Lake Mary Crawford	Lawrence						
Lake Mike Conners	Covington				X		
Lake Monroe	Monroe				X		
Lake Percy Quin	Pike	X	X				
Lake Tom Bailey	Lauderdale				X		

LAKE	COUNTY	1991	1992	1993	1994	1995	1996
Lake Waller	Marion						
Lake Walthall	Walthall				X		
Lake Washington	Washington			X	X	X	X
Lake Whittington	Bolivar					X	X
Little Black Creek Water Park Lake	Lamar						
Long Creek Reservoir	Lauderdale					X	
Matthews Brake	Leflore				X		
Maynor Creek Water Park Lake	Wayne					X	
Moon Lake	Coahoma				X	X	
Okatibbee Reservoir	Lauderdale		X	X	X		X
Oktibbeha County Lake	Oktibbeha	X				X	
Old Natchez Trace Park Lake	Pontotoc				X		
Parker Bayou Lake	Pearl River					X	
Pickwick Lake	Tishomingo		X			X	
Pontotoc Lake	Pontotoc						
Puskus Lake	Lafayette				X		
Rankin County Lake	Rankin				X		
Rodney Lake	Adams					X	
Roebuck Lake	LeFlore					X	
Ross Barnett Reservoir	Madison, Rankin	X	X	X			
Sardis Reservoir	Panola, Yalobusha	X	X		X		
Shadow Lake, Roosevelt State Park	Scott				X		
Spains Lake	Marion						
Spring Lake, Wall Doxey State Park	Marshall				X		
Swan Lake	Coahoma				X		
Tangipahoa Lake	Pike					X	
Tchula Lake	Holmes				X		
Thompson Lake	Warren				X		
Tombigbee State Park Lake	Lee					X	
Town Creek Structure #6	Lee	X	X				
Tunica Cutoff	Tunica	X			X	X	X
Turkey Fork Reservoir	Green	X	X				
Wasp Lake	Humphreys	X					
Wolf Lake	Yazoo, Humphreys		X	X		X	

Long-term water quality monitoring data has also been collected by other agencies on several other lakes and reservoirs in Mississippi. Mobile and Vicksburg U.S. Army Corps of Engineers (USACE) District Offices currently collect pH, temperature, nutrient and bacteriological data routinely at Arkabutla, Enid, Grenada, Sardis, and Okatibbee Lakes and at selected USACE-managed lake recreational areas on the Tennessee-Tombigbee Waterway. The Tennessee Valley Authority (TVA) conducts comprehensive water quality monitoring on Pickwick Reservoir. The Mississippi Department of Wildlife, Fisheries, and Parks samples 21 state owned lakes on a three year cycle, and performs routine fish surveys. The data acquired by these agencies are used by the OPC in the evaluation of designated use support and assessment status for these lakes.

Section 314 Lake Water Quality Assessment

Section 314 of the Clean Water Act, as amended by the Water Quality Act of 1987 requires the State to submit a biennial assessment of their lake water quality as part of their Section 305(b) report. In particular, "significant" publicly owned lakes are to be assessed. Mississippi considers public lakes that are over approximately 20 acres in size to be significant. Some lakes less than 20 acres are also considered significant, if managed by resource agencies. Table III-19, found at the end of this chapter, gives the individual assessments for the state's "significant" publicly owned lakes and includes the following required information:

1. An identification of all publicly owned lakes, classified according to trophic condition;

2. A listing of these lakes known to be impaired;

3. A listing of lakes in which water quality has deteriorated as a result of high acidity that may reasonably be due to acid rain and/or acid mine drainage; and

4. A general assessment of status and trends of water quality in lakes.

Assessment information for individual lakes was placed in the State's Waterbody System.

Trophic Status

In the 1982 Clean Lakes Classification Survey, the trophic status of each lake was determined using the Carlson Trophic State Index. All 34 lakes were found to be eutrophic. The term eutrophic generally has negative connotations. However, this index is probably not appropriate for Mississippi. Lakes in Mississippi with that designation often support excellent fish populations and heavy recreational activity. Therefore, relative trophic rankings were determined using transparency, total phosphorus, chlorophyll-a, and algal growth potential. In addition, these lakes were assigned priority rankings for further study.

Trophic status designations for the 1998 water quality assessment were derived from the Clean Lakes Classification Survey completed in 1982, Clean Lakes Phase I studies, a Phase II study on Lake Washington, and LWQA Program studies conducted from 1991 to 1996. A summary of the trophic status of significant publicly owned lakes is found in Table III-17.

TABLE III-17

Trophic Status of Significant Publicly Owned Lakes

08-30-98

	Number of Lakes	Acreage of Lakes
Total Number of Lakes	114	305703.59
Oligotrophic	0	0.00
Mesotrophic	10	236850.00
Eutrophic	10	14214.00
Hypereutrophic	0	0.00
Dystrophic	0	0.00
Unknown Trophic Status	0	0.00
Trophic Status Not Assessed	94	54639.59

Acid Effects

No lakes have currently been identified as being affected by high acidity in Mississippi. Low pH was noted in two small lakes.

Toxic Effects

A major source of toxic pollutants in Mississippi is agricultural chemicals. These chemicals are concentrated primarily in the Delta region of the state. Section 314 LWQA studies have indicated high levels of DDT and breakdown products in fish tissue from Bee Lake. Other significant toxics problems in lakes have occurred from industrial spills. Fish consumption advisories are currently in effect for Lake Susie near Batesville (PCBs) and Country Club Lake near Hattiesburg (dioxin and PCP) due to runoff from a gas compressor station and a wood preserving facility, respectively (see Basin/Waterbody Information, Yazoo River Basin, page 239 and Pascagoula River Basin, page 195, respectively). A state-wide mercury survey being done by the OPC's Biological Services Section (see Statewide Mercury Contamination Study, p.137) has shown elevated levels of mercury in fish tissue in several lakes. A limit consumption advisory was issued for Enid Reservoir in May 1995 and Archusa Creek Reservoir near Quitman in 1996.

Trends

Sufficient data has not been collected to make an accurate determination of water quality trends in all of the major lakes within the state. However, data from the Lake Classification Survey of 1982, various Section 314 Phase I studies, the Phase II study on Lake Washington, LWQA data collected from 1991-1996, and data collected by other governmental agencies, most notably the MS Department of Wildlife Fisheries and Parks (DWFP), were used to establish use support status, and where data permitted, trends. In general, the water quality of lakes in Mississippi is either stable or improving. Annual reports issued by the DWFP have documented improvements in the bass fishery in the oxbow lakes of the Mississippi Delta Region, due to the use of less persistent pesticides. A summary of trends in significant publicly owned lakes is found in Table III-18.

TABLE III-18
Trends in Significant Publicly Owned Lakes
08-30-98

	Number of Lakes	Acreage of Lakes
Assessed for Trends	20	74494.00
Improving	0	0.00
Stable	20	74494.00
Degrading	0	0.00
Trend Unknown	0	0.00

Lake Pollution Control Methods

Sources polluting lakes in Mississippi are controlled through several state and local programs. Point sources are regulated by the OPC through issuance and enforcement of NPDES permits that insure that lake water quality complies with Mississippi's water quality standards. These standards apply to all state waters, including lakes. If an existing or proposed point source discharge is found to be detrimental to a lake's water quality, alternative discharge sites are investigated. Also, if failing septic tanks are a problem, the OPC investigates options for sewage collection and treatment with discharge directed away from the lake.

Nonpoint source pollution is by far the major source of pollution to Mississippi's lakes. Several lakes have been targeted for demonstration projects in the Nonpoint Source (NPS) Program. Mississippi's NPS Program has identified control measures to address nonpoint source problems as well as the agencies and groups which will implement the measures.

Local units of government may play an important role in protecting lakes. Counties or municipalities may adopt land use ordinances or regulations that can be more effective than statewide programs in protecting lakes.

The OPC's Wetlands Program also plays a role in protecting lakes. Wetlands serve as valuable fish and wildlife habitat, and as effective natural filters of pollutants entering streams and lakes. The OPC strives to minimize wetlands losses around lakes. In addition, the creation or restoration of wetland areas is a measure to control NPS pollution entering lakes.

Restoration and Protection Efforts

Routine lake monitoring has been recognized for some time as a specific need in the state's ambient monitoring program. However, for the past decade, lake monitoring by the OPC has been confined to the Clean Lakes Program, complaint and fish kill investigations and a recent Phase II Diagnostic - Feasibility Study for a NPS project. Consequently, Mississippi does not have a comprehensive statewide lake monitoring database, or restoration effort. However, routine status and trends monitoring for lakes is now being addressed at several major state lakes with the re-design and expansion of OPC’s Ambient Surface Water Monitoring Network but statewide lake restoration efforts are still not underway. Pollution to lakes is controlled, however, on an individual basis as discussed above under the Control Methods section. First efforts by the OPC at lake restoration have occurred at Lake Washington and Lake Hazle. Both projects, discussed below, were successful.

A Phase I Diagnostic-Feasibility Study on Lake Washington was completed in 1990. During the past several years (beginning in 1992), a major restoration project has been underway at Lake Washington. This effort, funded by Section 319 monies, is encouraging and funding the use of Best Management Practices on agricultural lands draining to the lake. These practices will reduce nutrient and silt contributions to the lake. Significant progress has been made in establishing no-till and minimum till agricultural practices, cover crops, vegetated buffer strips and water control structures (see table below). In addition, a new wastewater collection and treatment system has been constructed in the Glen Allan community. The system was built with Farmers Home Administration monies and has removed many sources of poorly treated domestic wastewater from the Lake Washington drainage area.

The effectiveness of the BMPs and the wastewater treatment facility on the water quality of Lake Washington was evaluated as part of a Phase II Diagnostic - Feasibility Study. This study, by the OPC's Biological Services Section, began in July 1994. Section 314 Phase II funds were utilized to conduct in-lake monitoring to determine improvements in water quality. A report has been written and comparisons were made with the Phase I data.

Overall, the Lake Washington Watershed NPS Project has been very successful. Numerous land owners have cooperated and the lake's water quality has greatly improved. In recognition of this success, the project won a Certificate of Environmental Achievement from the National Awards Council for Environmental Sustainability. The project is also listed in the Renew America 1996 Environmental Success Index. For additional information on the study, see the Basin/Waterbody Information section, Yazoo River Basin, p.239).

Acres in BMPs in the Lake Washington Watershed

4/1/92 through 5/31/94

Practice Name and Number	Acres Affected	Soil Saved (tons/acre)	Cost
SEC-12 Cover Crop	4,205	1.4	$101,771
SEC-9 Grade Stabilization Structure	44	21.0	$79,044
SEC-7 Critical Area Planting	3	17.0	$182
SEC-11 Reduced-till Cotton	1,174	2.9	$22,243
SEC-11 Reduced-till Corn	58	3.5	$517
SEC-11 Reduced-till Soybeans	769	3.1	$10,109

Lake Hazle is a 22 acre lake located within the city limits of Hazlehurst, Mississippi, in Copiah County. The lake was targeted for improvement under a FFY'90 NPS grant. The project's purpose was to identify and correct the impacts of urban nonpoint source runoff in order to enhance the lake's aesthetic and recreational value. The OPC began monitoring the lake in 1991 as part of an effort to improve water quality. Sampling, to document water quality changes, was carried out before and after best management practices were implemented. Data indicate that BMP's implemented in the Lake Hazle watershed have had a positive effect on water quality. For additional information on the study, see th Basin/Waterbody Information section, South Independent Streams Basin, p. 221.

TABLE III-19

Section 314 Inventory and Assessment of Mississippi Public Freshwater Lakes

LAKE	COUNTY	SIZE (Acres)	USE CLASS	OWNER OR MGR	TROPHIC STATUS	USE SUPPORT	POLLUTION SOURCE
Aberdeen Lake	Monroe		R	COE	U	F	
Albermarle Lake	Issaquena	563	FW	PA	E	F	
Archusa Creek Water Park	Clarke	450	R	PHW	E	F	
Arkabutla Reservoir	Tate	33,400	R	COE	E	F	
Bay Springs Lake	Prentiss, Tishomingo	6,200	R	COE	U	F	
Bee Lake	Holmes	1,334	FW	PA	U	P	NPS-10
Blue Lake	Leflore	3.2	FW	PA	U	U	
Bonita Reservoir	Lauderdale	50	D		U	U	
Chewalla Lake (LT-A-1)	Marshall	259	R	USFS	E	F	
Choctaw Lake	Choctaw	90	R	USFS	U	U	
Clear Springs Lake	Franklin	13	R	USFS	U	U	
Columbus Lake	Lowndes	1,000	R	COE	U	F	
Conservation League L. (Bolivar Co. L.)	Bolivar	512	FW	DWFP	U	F	
Country Club Lake	Forrest	60	FW	PA	U	P	
Crystal Lake	Rankin	200	FW	PA	E	T	POINT-01
Cypress Lake	Issaquena	190	FW	PA	U	P	NPS-10
Davis Lake	Chickasaw	182	R	USFS	U	U	
Desoto Lake	Coahoma	1,524	FW	PA	E	F	
Dixie Springs Lake	Pike	100	R	DWFP	U	U	
Dumas Lake	Tippah	32	R	DWFP	U	U	
Dump Lake	Yazoo	415	FW	PA	E	P	NPS-10
Eagle Lake	Warren	4,599	FW	PA	E	P	NPS-10
Enid Reservoir	Yalobusha	28,000	R	COE	E	P	
Flint Creek Water Park	Stone	600	D,R	PHW	E	F	
Four-Mile Lake	Leflore	134	FW	PA	U	P	NPS-10
Geiger Lake (Paul B. Johnson St. Park)	Forrest	250	R	DWFP	U	P	
Grassy Lake	Tallahatchie	400	FW	PA	U	P	NPS-10
Grenada Reservoir	Grenada	64,600	R	COE	E	P	
Hampton Lake	Tallahatchie	115	FW	PA	U	P	NPS-10
Holmes Co. State Park Lake	Holmes	100	FW	DWFP	U	P	
Horn Lake	Desoto	1,200	R	PA	E	F	
Horseshoe Lake (Stovall Lake)	Coahoma	269	FW	PA	E	T	
Horseshoe Lake	Holmes	743	FW	PA	U	P	
Ivy Lake (Clark County State Park)	Clarke	60	R	DWFP	U	U	
Jeff Davis Lake	Jefferson Davis	164	R	DWFP	U	U	

LAKE	COUNTY	SIZE (Acres)	USE CLASS	OWNER OR MGR	TROPHIC STATUS	USE SUPPORT	POLLUTION SOURCE
Lake Ross Barnett	Smith	87	R	DWFP	U	U	
Lake Washington	Washington	2,937	R	PA	E	P	NPS-10
Lake Monroe	Monroe	111	R	DWFP	U	U	
Lake Mary	Wilkinson	2,250	R	PA	E	F	
Lake Tillatoba	Yalobusha	65	R	DWFP	U	U	
Lake Bolivar	Bolivar	662	FW	PA	E	P	NPS-10
Lake Tangipahoa (Percy Quinn State Park)	Pike	700	R	DWFP	E	F	
Lake Bogue Homa	Jones	1,200	R	DWFP	E	P	NPS-55
Lake (Tom) Watts	Marion	12	FW	DWFP	U	U	
Lake George	Yazoo	416	FW	PA	U	P	NPS-10
Lake Lowndes	Lowndes	150	R	DWFP	U	U	
Lake Mike Conner	Covington	88	R	DWFP	U	U	
Lake Mary Crawford	Lawrence	135	R	DWFP	U	U	
Lake Beulah	Bolivar	981	FW	PA	E	F	
Lake Lee	Washington	1,097	FW	PA	E	P	
Lake Jackson	Washington	290	FW	PA	U	P	NPS-10
Lake Hazle	Copiah	22	FW	PA	U	P	
Lake Henry	Leflore	74	FW	PA	U	P	NPS-10
Lake Walthall	Walthall	62	R	DWFP	U	U	
Lake Lincoln	Lincoln	496	FW	PA	E	F	
Lake Ferguson	Washington	1,438	FW	PA	E	F	
Lake Chotard	Warren, Issaquena	981	FW	PA	E	F	
Lake Dockery	Hinds	55	R	DWFP	U	U	
Lake Columbia	Marion	90	R	DWFP	U	U	
Lake Claude Bennett (St. Park)	Jasper	71	R	DWFP	U	U	
Lamar Bruce	Lee	300	R	DWFP	U	U	
Leroy Percy St. Park	Washington	20	FW	DWFP	U	U	
Little Black Cr. Water Park	Lamar	500	FW	PHW	U	U	
Little Eagle Lake	Humphreys	162	FW	PA	U	F	
Long Creek Reservoir	Forrest	300	D	DWFP	U	U	
LT-7-4	Benton	247	FW	USFS	U	U	
LT-7-2	Benton	457	FW	USFS	U	U	
LT-7-11	Benton	21	FW	USFS	U	U	
LT-15-1	Lafayette	117	FW	USFS	U	U	
LT-6-3	Tippah	41	FW	USFS	U	U	
LT-6-5	Benton	47	FW	USFS	U	U	
LT-7-5	Benton	27	FW	USFS	U	U	
LT-7-10	Benton	16	FW	USFS	U	U	
LT-8-8	Benton	47	FW	USFS	U	U	

LAKE	COUNTY	SIZE (Acres)	USE CLASS	OWNER OR MGR	TROPHIC STATUS	USE SUPPORT	POLLUTION SOURCE
LT-14-A-3	Lafayette	148	FW	USFS	U	U	
LT-14-A-2	Lafayette	61	FW	USFS	U	U	
LT-14-A-4	Lafayette	42	FW	USFS	U	U	
LT-7-7	Benton	42	FW	USFS	U	U	
LT-5-8	Benton	16	FW	USFS	U	U	
LT-7-8	Benton	68	FW	USFS	U	U	
LT-8-17	Benton	44	FW	USFS	U	U	
Macon Lake	Sunflower	39	FW	PA	U	P	NPS-10
Marathon Lake	Smith	67	R	USFS	U	U	
McIntyre Lake	Leflore	119	FW	PA	U	P	NPS-10
Moon Lake	Coahoma	2,300	R	PA	E	P	NPS-10
Mossy Lake	Leflore	225	FW	PA	U	P	NPS-10
Okatibbee Reservoir	Lauderdale	3,800	D,R	PHW	U	U	
Oktibbeha County Lake	Oktibbeha	699	R	PA	E	F	
Perry Lake	Perry	125	R	DWFP	U	U	
Pickwick Lake	Tishomingo	46,800	FW	COE	U	P	
Pinchback Lake	Holmes	178	FW	PA	U	P	NPS-10
Pontotoc Lake (Chiwapa Res. Str. # 3)	Pontotoc	65	R		U	U	
Pool B (Tenn-Tom Waterway)	Monroe, Itawamba	1,900	R	COE	U	F	
Pool C (Tenn-Tom Waterway)	Itawamba	1,300	R	COE	U	F	
Pool A (Tenn-Tom Waterway)	Monroe	600	R	COE	U	F	
Pool D (Tenn-Tom Waterway)	Itawamba	1,800	R	COE	U	F	
Pool E (Tenn-Tom Waterway)	Prentiss	700	R	COE	U	F	
Puskus LT-14 A-1	Lafayette	431	FW	USFS	U	U	
Roebuck Lake	Leflore	580	FW	PA	U	P	NPS-10
Ross Barnett Reservoir	Madison, Rankin	33,000	D,R	PRVWSD	E	F	
Sardis Reservoir	Panola	58,500	R	COE	E	T	
Shadow Lake (Roosevelt State Park)	Scott	180	R	DWFP	U	U	
Six Mile Lake	Sunflower, Leflore	110	FW	PA	U	P	NPS-10
Sky Lake	Humphreys	124	FW	PA	U	P	NPS-10
Spring Lake (Wall Doxey State Park)	Marshall	70	R	DWFP	U	U	
Swan Lake	Tallahatchie	100	FW	PA	U	P	NPS-10
Tchula Lake	Holmes	464	FW	PA	E	P	NPS-10
Texas Lake (Y-19-C-3)	Yalobusha	235	FW	USFS	U	U	
Threemile Lake	Sunflower	40	FW	PA	U	P	
Tippah County Lake	Tippah	160	FW	DWFP	U	U	
Tishomingo State Park Lake	Tishomingo	60	FW	DWFP	U	U	
Tom Bailey Lake	Lauderdale	234	R	DWFP	U	U	
Tombigbee St. Park Lake	Lee	100	R	DWFP	U	U	

LAKE	COUNTY	SIZE (Acres)	USE CLASS	OWNER OR MGR	TROPHIC STATUS	USE SUPPORT	POLLUTION SOURCE
Town Cr. Structure #6	Lee	331	FW	PA	E	F	
Tunica Cut-off	Tunica	3,152	FW	PA	E	F	
Turkey Fork Reservoir	Greene	259	R	PA	E	F	
Upper Six-Mile Lake	Leflore	179	FW	PA	U	P	NPS-10
Veterans Lake (Simpson Co. Legion)	Simpson	94	R	DWFP	U	U	
Wasp Lake	Humphreys	352	FW	PA	E	P	NPS-10
Wolf Lake	Yazoo, Humphreys	724	FW	PA	E	P	NPS-10
Y-19-A-1	Yalobusha	57	FW	USFS	U	U	
Y-14-3	Lafayette	61	FW	USFS	U	U	
Y-14-4	Lafayette	35	FW	USFS	U	U	
Y-19-C-2	Yalobusha	35	FW	USFS	U	U	
Y-19-A-2	Yalobusha	34	FW	USFS	U	U	
Y-19-A-3	Yalobusha	25	FW	USFS	U	U	
YO-26-8	Yalobusha	33	FW	USFS	U	U	
YO-29-10	Yalobusha	60	FW	USFS	U	U	
YO-26-11	Yalobusha	97	FW	USFS	U	U	

CHAPTER FIVE

ESTUARY AND COASTAL WATER QUALITY ASSESSMENT

Designated Use Support - Estuaries

Mississippi has approximately 760 square miles of estuaries. Inland or bay type estuaries include St. Louis Bay, Back Bay of Biloxi, and Pascagoula Bay. The state's largest estuary (550 square miles) is the Mississippi Sound which extends from the southern edge of the state's contiguous land mass to its Barrier Islands. The state also considers the Gulf of Mexico an estuary for three miles south of the Barrier Islands. MDEQ assessed approximately 40% of the state's total square miles of estuary. Of the amount assessed, evaluated assessments made up less than 1% while monitored assessments made up about 99%. Although a large percentage was monitored, many of these estuarine waters were only monitored for bacteria.

A summary of use support for the State's assessed estuaries is found in Table III-20, and Figure III-5. For waterbodies with multiple assessed uses, the EPA Waterbody System (WBS) summary for this table can under- or over-represent the actual amount of fully supporting mileage assessed. In the case of Mississippi’s estuaries, one large multi-use waterbody, Mississippi Sound, makes up 550 of the total 760 square miles of estuary mileage in Mississippi waters. Since the only impairment noted for the Mississippi Sound was in the aquatic life use, the WBS would report only 17.6 miles monitored as fully supporting for the entire waterbody in Table III-20 when it is actually only the amount monitored as fully supporting under the aquatic life use. Additional miles were monitored in the Sound and found to be fully supporting for other uses including swimming, fish consumption, and shellfish harvesting. For Table III-20 and the percentages given below, this additional mileage is taken into account. Table III-21 gives a summary of use support according to the individual uses assessed.

Of Mississippi's assessed estuaries, approximately 32% fully support all assessed uses. Another 48% fully support all assessed uses, but support is threatened for at least one use. Approximately 20% are listed as impaired for one or more uses. In addition to OPC monitoring data, the current assessment includes all estuaries listed in the most current Nonpoint Source Assessment Report as well as assessment of estuarine waters monitored under the Shellfish Sanitation Program administered by the Mississippi Department of Marine Resources. These estuarine waterbodies are periodically impacted primarily by urban nonpoint source runoff and failing septic tanks. With the implementation of control measures, most, if not all, of these waters could support their uses and attain the fishable and swimmable goals of the Clean Water Act.

Designated Use Support - Coastal Shorelines

Mississippi has approximately 245 miles of coastal shoreline. This distance includes the shoreline of its inland bays, the shoreline along the Mississippi Sound, and the shoreline of its Barrier Islands. Many shoreline miles along the Mississippi Sound are used for recreational activities. MDEQ assessed approximately 74% of its total 245 miles of coastal shoreline. Of the amount assessed, evaluated assessments made up approximately 38%, while monitored assessments made up about 62%. Although a large area was monitored, many of the state's shorelines were only monitored for bacteria. The use support status of the remaining 26% is unknown.

A summary of use support for the state's assessed coastal shoreline is found in Table III-24 and Figure III-6. As described for the estuary use support summary table above, for waterbodies with multiple assessed uses, the EPA WBS summary for this table can under- or over-represent the actual amount of fully supporting mileage assessed by only reporting fully supporting mileage for the use which includes the greatest impaired mileage. For Table III-24 and the percentages given below, the additional mileage monitored in the Mississippi Sound is taken into account. Table III-25 gives a summary of use support according to the individual uses assessed.

Of Mississippi's assessed shoreline, approximately 15% fully support all assessed uses. Another 45% fully support all assessed uses, but support is threatened for at least one use. Approximately 40% are listed as impaired for one or more uses. The miles of coastal shoreline impaired are impacted mainly by urban nonpoint source pollution and failing septic tanks. With the implementation of control measures, most, if not all, of these waters could support their uses and attain the fishable and swimmable goals of the Clean Water Act.

Causes and Sources of Impairment of Designated Uses

Causes and sources of impairment were evaluated for estuaries having one or more uses impaired. Total assessed sizes of estuaries affected by various cause categories are given in Table III-22. There are no known pollutants significantly impairing the state's estuaries. Mostly moderate or minor impacts occur resulting from turbidity, pH, unknown toxicity, pathogens, metals, organic enrichment/D.O., nutrients, and organics (priority and nonpriority).

Total sizes of estuaries affected by various source categories are given in Table III-23. Sources of moderate/minor impacts in estuaries are urban runoff, industrial and municipal point sources, natural sources (mostly for turbidity in Mississippi Sound attributable to the trapping of sediments deposited from riverine inputs and the frequent resuspension of this sediment due to wind-induced mixing in the shallow waters of the Sound), construction, contaminated sediments, land disposal, marinas and unknown sources.

Causes and sources of impairment were also evaluated for coastal shoreline having one or more uses impaired. Total assessed sizes of coastal shoreline affected by various cause categories are given in Table III-26. No major impacts from pollutants are known along coastal shorelines. Moderate or minor impacts are caused especially by pathogens and to a lesser extent by nutrients, turbidity, organic enrichment/low D.O., pH, priority and nonpriority organics, and metals.

Total sizes of coastal shoreline affected by various source categories are given in Table III-27. Sources of moderate or minor impacts in coastal waters are primarily industrial and municipal sources, urban runoff, land disposal, and construction activities.

TABLE III-20

Summary of Fully Supporting, Threatened and Impaired Waters

Estuaries

11-30-98

(All size units are in Square Miles)

Degree of Use Support	Assessment Basis Evaluated	Assessment Basis Monitored	Total Assessed Size
Size Fully Supporting All Assessed Uses	0.00	90.90*	90.90
Size Fully Supporting All Assessed Uses but Threatened for At Least One Use	0.80	136.60*	137.40
Size Impaired for One or More Uses	0.60	56.20	56.80
Size Not Attainable for Any Use and Not Included in the Line Items Above	0.00	0.00	0.00
TOTAL ASSESSED	1.40	283.70	285.10
Size Not Assessed 474.9*			

*Note: In MS Sound alone, over 200 square miles was actually monitored (for Contact Recreation, Swimming, Fish Consumption, and Shellfishing). These showed no impairment. The WBS Summary above originally only reported, for the entire Sound, the fully supporting mileage (17.6 square miles) on the one use (Aquatic Life) which also reported mileage impaired. The numbers above have been corrected manually using WBS data.

Figure III-5
Use Support Summary Percentages
Estuaries
11/30/98

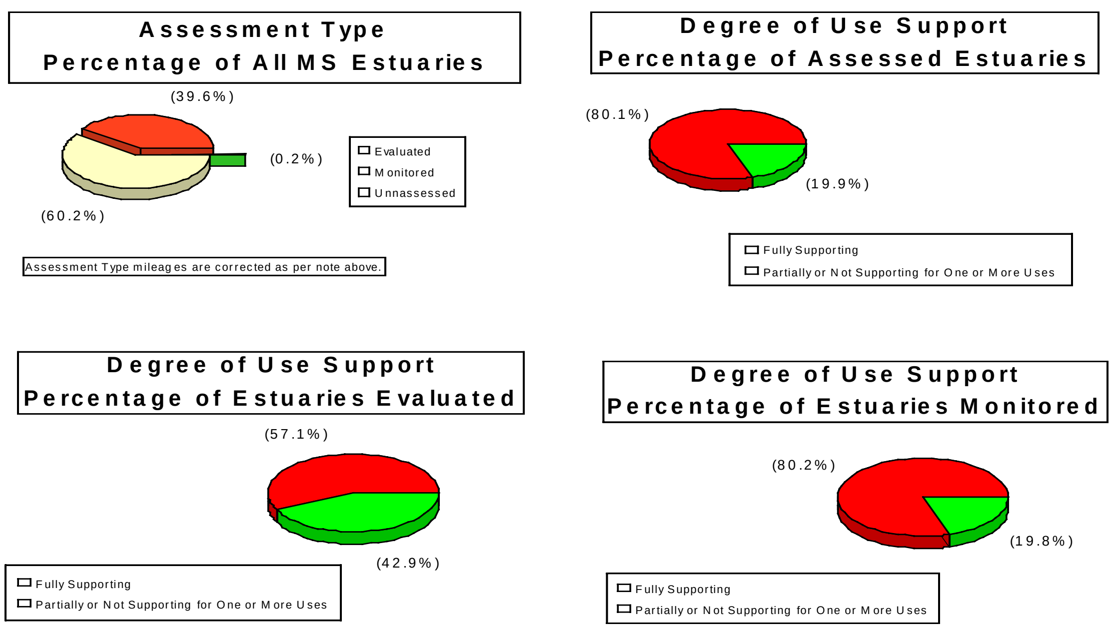


TABLE III-21

Individual Use Support Summary Table

Estuaries

11-30-98

(All size units are in Square Miles)

Use	Supporting	Supporting but Threatened	Partially Supporting	Not Supporting	Not Attainable
OVERALL USE SUPPORT					
AQUATIC LIFE SUPPORT	20.70	158.40	20.30		
FISH CONSUMPTION	21.40	28.50			
SHELLFISHING	14.60	2.30	26.20		
SWIMMABLE	219.20	94.80	25.10		
SECONDARY CONTACT REC		1.00	10.30		
DRINKING WATER SUPPLY					
AGRICULTURE					
CULTURAL/CEREMONIAL					
FISH/WILDLIFE	20.70	158.40	20.30		
CONTACT RECREATION	219.20	93.80	14.80		
EPHEMERAL					

TABLE III-22

Total Sizes of Waters Impaired by Various Cause Categories

Estuaries

11-30-98

(All size units are in Square Miles)

Cause Categories	Major Impact	Moderate/Minor Impact
0100 Unknown toxicity	0.00	41.20
0300 Priority organics	0.00	10.90
0400 Nonpriority organics	0.00	21.80
0500 Metals	0.00	29.70
0600 Unionized Ammonia	0.00	0.50
0800 Other inorganics	0.00	0.50
0900 Nutrients	0.00	22.60
1000 pH	0.00	51.80
1200 Organic enrichment/Low DO	0.00	27.70
1400 Thermal modifications	0.00	2.20
1700 Pathogens	0.00	36.50
2400 Total toxics	0.00	0.60
2500 Turbidity	0.00	105.40
8600 Other	0.00	1.00

TABLE III-23
Total Sizes of Waters Impaired by Various Source Categories
Estuaries
11-30-98

(All size units are in Square Miles)

Source Categories	Major Impact	Moderate/Minor Impact
0100 INDUSTRIAL POINT SOURCES	0.00	37.10
0200 MUNICIPAL POINT SOURCES	0.00	36.50
3000 CONSTRUCTION	0.00	22.90
4000 URBAN RUNOFF/STORM SEWERS	0.00	115.90
6000 LAND DISPOSAL	0.40	10.30
7000 HYDROMODIFICATION	0.00	0.50
7900 MARINAS	0.00	14.50
8500 CONTAMINATED SEDIMENTS	0.00	22.90
8600 NATURAL SOURCES	0.00	130.10
9000 SOURCE UNKNOWN	0.00	82.40

TABLE III-24
Summary of Fully Supporting, Threatened and Impaired Waters
Coastal Shoreline
11-30-98

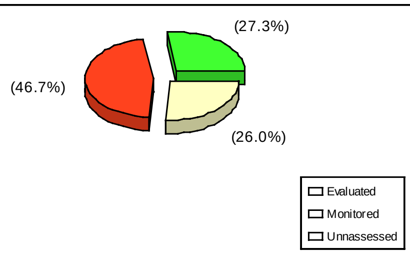
(All size units are in miles)

Degree of Use Support	Assessment Basis Evaluated	Monitored	Total Assessed Size
Size Fully Supporting All Assessed Uses	0.00	28.30*	28.30
Size Fully Supporting All Assessed Uses but Threatened for At Least One Use	22.50*	58.80*	81.30
Size Impaired for One or More Uses	44.40	27.40	71.80
Size Not Attainable for Any Use and Not Included in the Line Items Above	0.00	0.00	0.00
TOTAL ASSESSED	66.90	114.50	181.40
Size Not Assessed 63.60*			

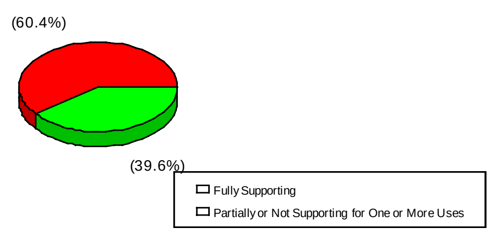
*Note: The WBS Summary above originally under-reported the miles of Mississippi coastline assessed. The numbers above have been corrected manually using WBS use support data.

Figure III-6
Use Support Summary Percentages
Coastal Shoreline
11/30/98

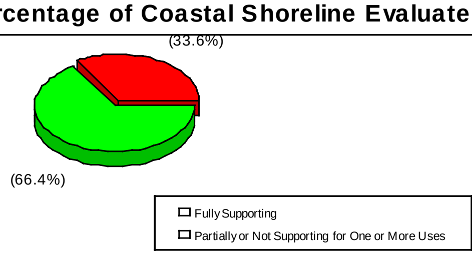
Assessment Type
Percentage of All MS Coastal Shoreline



Degree of Use Support
Percentage of Asssessed Coastal Shoreline



Degree of Use Support
Percentage of Coastal Shoreline Evaluated



Degree of Use Support
Percentage of Coastal Shoreline Monitored

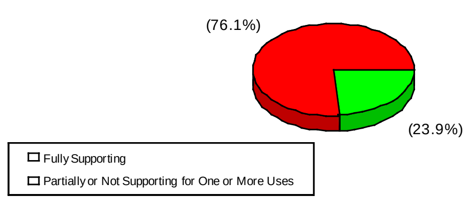


TABLE III-25

Individual Use Support Summary Table

Coastal Shoreline

11-30-98

(All size units are in miles)

Use	Supporting	Supporting but Threatened	Partially Supporting	Not Supporting	Not Attainable
OVERALL USE SUPPORT					
AQUATIC LIFE SUPPORT	32.70	34.80			
FISH CONSUMPTION		13.10			
SHELLFISHING			46.30		
SWIMMABLE	28.30	98.50	51.40		
SECONDARY CONTACT REC		5.80	25.50		
DRINKING WATER SUPPLY					
AGRICULTURE					
CULTURAL/CEREMONIAL					
FISH/WILDLIFE	32.70	34.80			
CONTACT RECREATION	28.30	92.70	25.90		
EPHEMERAL					

TABLE III-26

Total Sizes of Waters Impaired by Various Cause Categories

Coastal Shoreline

11-30-98

(All size units are in miles)

Cause Categories	Major Impact	Moderate/Minor Impact
0300 Priority organics	0.00	6.20
0400 Nonpriority organics	0.00	6.20
0500 Metals	0.00	5.00
0900 Nutrients	0.00	25.50
1000 pH	0.00	25.50
1200 Organic enrichment/Low DO	0.00	26.50
1700 Pathogens	0.00	85.90
2500 Turbidity	0.00	25.50

TABLE III-27

Total Sizes of Waters Impaired by Various Source Categories

Coastal Shoreline

11-30-98

(All size units are in miles)

Source Categories	Major Impact	Moderate/Minor Impact
0100 INDUSTRIAL POINT SOURCES	0.00	42.70
0200 MUNICIPAL POINT SOURCES	0.00	85.00
3000 CONSTRUCTION	0.00	25.50
4000 URBAN RUNOFF/STORM SEWERS	0.00	69.90
6000 LAND DISPOSAL	0.00	59.90
7900 MARINAS	0.00	3.20
8500 CONTAMINATED SEDIMENTS	0.00	6.20
8600 NATURAL SOURCES	0.00	9.30
9000 SOURCE UNKNOWN	0.00	9.40

EPA Gulf of Mexico Program

The Gulf of Mexico has long been recognized as an important national resource. The U.S. actively utilizes the extensive marine resources of the Gulf along its 1,613 miles of coastline. These resources are both biological and mineral; for example:

1. The Gulf produces approximately 40% of the U.S. commercial fish yield;

2. The Gulf shrimp fishery is the most valuable fishing in the U.S.;

3. The Gulf provides critical habitat for 75% of the migrating waterfowl traversing the U.S.;

4. Gulf Coastal wetlands comprise about half of the national total;

5. Offshore oil and gas from the Gulf account for 90% of U.S. production;

6. Gulf ports handle 45% of U.S. import-export shipping tonnage; and

7. More than $76 billion in federal revenues were generated as a result of Outer Continental Shelf oil and gas development in the Gulf between 1956 and 1984. Further, the Department of the Interior estimates that 78% of the domestic supply of offshore oil and gas potentially available will be found in the Gulf of Mexico.

The Gulf of Mexico has been viewed as one of the least altered and most healthy and productive of our coastal marine environments. However, during the past few decades the Gulf has begun to show signs of environmental deterioration. Increased human population in coastal areas has contributed to this trend. Approximately one-sixth of the U.S. population now lives in coastal states. Further, these states accounted for 35% of the U.S. population growth between 1980 and 1985. From 1970 to 1980, the population in coastal counties along the

Gulf increased by 35%. Additionally, most of the Gulf is influenced by the seasonal influx of tourists and part-time residents enjoying the popular beaches. The Gulf of Mexico is also affected by activities throughout much of the nation. Over 66% of the area of the contiguous U.S. drains into the Gulf washing nutrients, wastes and soils into its waters.

The growing population along the Gulf and large upland drainage area have resulted in a number of environmental problems in the Gulf of Mexico. These problems include nutrient over-enrichment, toxicants and pesticides, habitat degradation, freshwater diversion, and public health. Nutrients, in the form of nitrogen and phosphorus, enter the Gulf from agricultural runoff and waste inputs. Excess nutrients cause blooms of microscopic plant life that decompose and deplete the dissolved oxygen supply. This can result in fish kills if the oxygen level falls too low. Also, nutrient over-enrichment can cause blooms of noxious phytoplankton that have toxic effects on other marine organisms or humans consuming tainted seafood. The Gulf receives toxic materials from petroleum, chemical, and other industries. Also, pesticide contamination has increased in coastal waters as a result of runoff from agricultural and residential areas.

Mississippi shares Louisiana's concern about the large area of oxygen-depleted waters that develop seasonally each year in the nearshore Gulf of Mexico near the mouth of the Mississippi River. The size of the oxygen depleted area varies from year to year and has extended from the mouth of the Mississippi River west to near the Texas border. To date, State of Mississippi waters have not been included in the affected area. The oxygen-depletion is typically associated with the bottom waters but can extend above the bottom. The area of oxygen depletion in the Gulf is appropriately called "hypoxia" or "hypoxic waters" which refers to waters with dissolved oxygen concentrations of less than 2 parts per million (ppm).

The EPA Gulf of Mexico Program has been studying the northern Gulf of Mexico oxygen problem for several years. The presently available research has shown a relationship between the Mississippi River flow, river-borne nutrients, plankton productivity and bottom water hypoxia. The hypoxia is believed due to both the effects of stratification of the fresh and marine waters that restricts vertical reoxygenation of bottom waters and the oxygen consuming breakdown of organic material mostly derived from the river stimulated plankton. The hypoxic conditions vary spatially and seasonally depending on the phasing and amplitude of the Mississippi River discharge but are also affected by physical features such as water circulation patterns, density stratification, wind mixing, tropical storms and thermal fronts.

Coastal wetlands have been lost at a rapid rate along the Gulf of Mexico. Loss has occurred because of agricultural and industrial runoff and dredge and fill activities related to increased urban and residential development. Freshwater diversions have resulted in saltwater intrusion into estuaries. Saltwater intrusion causes a reduction in flushing of pollutants, the decimation of shellfish beds and loss of salt-intolerant wetland vegetation. Public health is another important concern in Gulf coastal waters. For example, poorly treated wastewater from septic tanks increases health risks from consumption of raw or improperly cooked shellfish. Also, the risk of illness from recreational activities in the water is increased.

The Gulf of Mexico Program was created to look at the problems of the Gulf from a regional perspective. The program has two principal goals:

1. Provide a mechanism for resolving complex environmental problems associated with man's use of the Gulf of Mexico; and

2. Establish a framework-for-action for implementation of management options for pollution controls, remedial and restoration measures for environmental losses, and for research direction, environmental direction and environmental monitoring protocol.

Currently, four issue areas have been identified for activities in the Gulf of Mexico Program. These are Public Health, Nutrient Enrichment, Non-Indigenous Species and Habitat.

For more information on the Gulf of Mexico Program, contact Mr. Jim Giatina, Director, at 601/688-3726 or write:

U.S. Environmental Protection Agency
Gulf of Mexico Program Office
Building 1103,Room 202
John C. Stennis Space Center
Stennis Space Center, Mississippi 39529-6000

Ambient Coastal Monitoring Activities

The Office of Pollution Control (OPC) as well as other agencies and institutions, conduct routine ambient water quality monitoring in Mississippi coastal and estuarine waters. These monitoring programs are valuable in providing status and trend data to be used in the overall assessment of the State's water quality. Monitoring information may include physical, chemical, bacteriological, toxicological and biological parameters. The number of stations and sampling frequency vary by agency and program. From 1992 - 1997, the following agencies and institutions in addition to OPC are known to have continued on-going or initiated ambient routine water quality monitoring in coastal waters:

- Mississippi Department of Marine Resources
  Shellfish Sanitation Program
- U.S. Environmental Protection Agency
  Environmental Monitoring and Assessment Program (EMAP)
- U.S. Geological Survey
- Gulf Coast Research Laboratory
- National Oceanic and Atmospheric Administration (NOAA)
  Status and Trends Program
- MSU Coastal Research and Extension Center

For a brief description of these programs, refer to the Surface Water Monitoring Program section, Data Acquisition/Data Sharing with Other Agencies on page 77 in this report. Data from these programs are used in the overall assessment of the State's estuarine and coastal waters.

Historically, routine coastal monitoring by OPC for status and trends data has been limited to coastal bays and tidal rivers primarily at bridge crossings. Beginning in 1997 with the expansion and re-design of OPC’s Ambient Surface Water Monitoring Program, increased open-water monitoring in Mississippi’s coastal and estuarine waters is being conducted. Presently, ten of the seventeen estuarine stations in the Primary Fixed Station Network are located in open estuarine waters. Seven of these ten are located in two of Mississippi’s significant bays, St. Louis Bay and the Biloxi Bay system and the remaining three fixed stations are located in the waters of the Mississippi Sound between the offshore barrier islands and the mainland coastline. These stations are visited quarterly and sampled for water chemistry and bacteria. Selected stations are also sampled for fish tissue, chlorophyll a and sediment toxics. For a complete description of the OPC ambient monitoring network, see Surface Water Monitoring Program, p.50. In addition, periodic coastal and estuarine sampling is also conducted at estuarine Basin Fixed Network sites under OPC's Basinwide Approach (see Basin Fixed Network, p.51, 62) and for special study monitoring such as for mercury, dioxin or other parameters of concern.

Mississippi Coastal Beach Monitoring Program

Although the linear distance from state line to state line across the Mississippi Gulf Coast is only about seventy miles, there are approximately three hundred miles of coastal and estuarine shoreline that are subject to direct tidal influence. Of these three hundred miles of shoreline, there are approximately ninety miles on the mainland that are in direct contact with the Mississippi Sound, the remaining shore miles are either insular, along rivers, or located in bays.

Of these ninety miles of shoreline, approximately forty are maintained as public access sand beaches for swimming and sun-bathing. These public beaches are typically maintained by county and/or municipal agencies and are typically associated with seawall projects along state coastal highways, hence by their very design, Mississippi beaches are highly accessible to the public at large.

In response to increased concern over the lack of routine bacteriological monitoring on Mississippi's coastal bathing beaches, OPC in 1997 cooperated with the Gulf Coast Research Laboratory (GCRL) and EPA's Gulf of Mexico Program to reestablish a coastal beach monitoring program to address this concern. The OPC historically maintained surveillance of the water quality along these public beaches. From 1971 to 1989, OPC and the Mississippi Department of Health conducted beach monitoring each summer to determine bacterial levels in swimming areas along the Mississippi Gulf Coast. Such effort was maintained until budgetary constraints dictated that MDEQ's efforts be re-directed toward other environmental concerns. These studies indicated that the principal cause of elevated bacteria levels is urban stormwater runoff.

Year-round weekly monitoring for bacteriological parameters and monthly sampling for other water quality parameters at 20 stations along the Mississippi Gulf Coast began in July 1997 with sampling being conducted by GCRL staff. Stations are sampled by wading , and samples and observations are made when sampling personnel are in one meter of water with samples and readings taken at mid-depth. Bacteriological parameters being monitored include fecal coliform (MPN and MF), *E. coli* and enterococci. Other water quality parameters being collected include dissolved oxygen, temperature, salinity, pH, turbidity, nutrients and chlorophyll a. In addition, tide, river stage and rainfall data are being collected from an array of gauges along the coast for correlation with the water quality data. Laboratory services are being provided by both GCRL and the OPC laboratory.

To address public health issues regarding the program and for overall program planning, a multi-agency task force was created composed of representatives from OPC, Mississippi Department of Health, Mississippi Department of Marine Resources, the Gulf Coast Research Laboratory and the EPA

Gulf of Mexico Program. Monitoring continued in 1998 and is presently on-going. OPC is presently seeking additional funding to continue this comprehensive beach monitoring program.

Shellfish Waters

The shellfish growing waters in the Gulf of Mexico are among the most productive in the United States with approximately 35% of shellfish produced in the United States coming from Gulf waters. Mississippi's shellfish growing waters number almost 500,000 acres. A map of shellfish growing areas in Mississippi is shown in Figure III-7 (p.153). According to criteria established by the National Shellfish Sanitation Program, these waters are classified as Approved, Conditionally Approved, Restricted or Prohibited. Approved waters can be harvested for direct marketing of shellfish at all times. Conditionally Approved waters do not meet criteria for Approved waters at all times, but may be harvested when criteria are met. Restricted waters may be harvested if shellfish are subjected to a suitable purification process. Prohibited waters cannot be harvested at any time. Typical of the shellfish waters in the Gulf of Mexico, most of the major harvest areas in Mississippi waters are classified as conditionally approved or restricted. This is due primarily to the effects of nonpoint source pollution. According to a recent report by NOAA entitled "The Quality of Shellfish Growing Waters in the Gulf of Mexico", of the waters listed as impaired, 120,083 acres were listed as approved/conditionally approved, 171,213 acres as restricted and 95,989 acres as prohibited. This would indicate approximately 100,000 acres as approved. It should be noted that buffer zones around shipping channels presently account for the closure of 20% of harvest-limited waters in the Mississippi Sound.

The Shellfish Sanitation Program in Mississippi, which includes the Shellfish Water Classification and Monitoring Program, as well as the Plant Inspection Program and Shellplanting Program is administered by the Mississippi Department of Marine Resources. The Shellfish Sanitation Program conducts a Sanitary Surveys of all Mississippi Shellfish Growing Waters and updates these surveys annually. The water inspection records are now maintained in a computerized database. In addition, computerized data retrieval, data analysis and statistical modeling have dramatically increased the program's proficiency.

The NOAA report noted major trends in Mississippi's shellfish waters between 1971 and 1985. These were the designation of ship channels as prohibited and the addition of conditional waters. The first closure line was established in 1945 in Biloxi Bay and was advanced outward until the entire bay was closed in 1967. Pascagoula Bay was closed in 1936 due to an outbreak of hepatitis, and has remained closed to harvest due to the large number of industrial sewage treatment plants and seafood processing discharges and shipyards in the area. Fecal coliform studies have shown wide fluctuations in fecal counts (MPN) due to rainfall and/or high river stages. This continues despite improvements in wastewater treatment and collection. These fluctuations are likely a result of private septic systems located in each area's watershed. The regionalization concept for municipal wastewater treatment in Harrison County and Jackson County has made improvements in water quality, by taking small inefficient plants off-line. However, coliform levels are frequently above National Shellfish Sanitation Program standards following heavy rains and/or high river stages. Coliform levels have declined in Biloxi Bay due to the abandonment of the Ocean Springs wastewater treatment facility, and several other smaller plants. However concerns still exist due to the large number of permitted and non-permitted discharges in this Bay. According to a study conducted in the summer of 1987 by

NETSU, the Food and Drug Administration's Northeast Technical Services Unit, these waters are now classified as restricted, and as such, suitable for relaying or depuration purposes, but can not be opened for direct harvest.

Increased efforts by the Department of Marine Resources' Shellfish Sanitation Program have resulted in more consistent classification of shellfish waters along Mississippi's Gulf Coast. However, inconsistencies are still a problem at the boundary with Louisiana. In the western Mississippi Sound, Mississippi waters are classified as conditionally approved, and managed in response to rainfall and high river stages along the Pearl River, both of which have been shown by extensive sampling data to adversely affect water quality in the area, while Louisiana waters, in the same area, are managed solely on the Pearl River stage, with no emphasis on rainfall, even under extreme conditions. This discrepancy must be corrected in order to avoid confusion when areas are opened or closed, and to adequately protect the public.

Habitat Modification

Prior to 1973, man significantly altered the shorelines and wetlands of the Mississippi Gulf Coast. The primary impacts were associated with residential development and industrial expansion into wetland areas. In 1973, the Mississippi Legislature passed the Coastal Wetlands Protection Law. This law established a regulatory program for wetland protection and curtailed man's encroachment into the wetland areas. Subsequent to the wetlands law, the legislature enacted the Mississippi Coastal Program which further strengthened the State's ability to protect the coastal environment.
According to the Department of Marine Resources, prior to 1973 Mississippi had lost approximately 10,000 acres of wetlands to man induced activities. Since 1973, less than 20 acres of tidally influenced; coastal wetlands have been altered.

The role of the public in protecting the wetlands and the interest for developing wetlands has changed. A keen public interest has developed in protecting coastal wetland resources. In addition, development interests also understand the value of avoiding wetland impacts.

CHAPTER SIX

WETLANDS ASSESSMENT AND PROTECTION

Wetlands Information - Summary

In Mississippi, wetlands are defined as "waters of the State", although, the State does not have separate use classifications nor numeric criteria for different types of wetlands. Narrative criteria are, however, considered applicable to wetlands. The State does not have legislation protecting wetlands statewide. However, activities in the three Gulf Coast counties that impact tidally influenced wetlands must be found to be consistent with the Mississippi Coastal Program, managed by the Mississippi Department of Marine Resources (DMR).

The State has not been delegated Section 404 permit authority and is not considering assumption of the Section 404 program. Section 404 of the Clean Water Act addresses a single class of water pollutants called dredge and fill material. The U.S. Army Corps of Engineers (USACE) administers this program. Wetlands regulated under Section 404 do, however, receive protection in Mississippi. An applicant needing a permit from the USACE must first receive a Section 401 Water Quality Certification from the Office of Pollution Control's (OPC) Water Quality Management Branch. Projects are reviewed for certification according to formal policies and guidelines developed by the OPC. These policies and guidelines are discussed below. If this certification is denied, the USACE's permit cannot be issued. The State may also use its anti-degradation policy to deny Section 401 Water Quality Certification. During project review, the OPC attempts to avoid any wetland losses by requesting that alternatives be considered. If practicable alternatives cannot be found, the OPC works to minimize the impacts of the project. Finally, for unavoidable losses, the OPC requests mitigation. Projects along the Gulf Coast must also be found to be consistent with the Mississippi Coastal Program, managed by the DMR. The OPC has a Memorandum of Agreement with the DMR that enables us to comment on coastal projects. The OPC also coordinates with the state's agriculture and forestry agencies when wetland projects are proposed.

Mississippi has not developed a comprehensive planning mechanism for identifying and protecting wetland resources, nor does the State require wetland resource inventories by local jurisdictions.

Mississippi has approximately 4,001,000 acres of freshwater wetlands (National Wetlands Inventory, June 1989) and approximately 66,000 acres of tidal wetlands. Figures on actual losses are not readily available. However, nationally, agricultural development was responsible for 87% of recent wetland losses, while urban development and other development caused only 8% and 5% of the losses, respectively. As a result of the adoption of a Unified Federal Methodology, and no net loss policy, wetland provisions in the Farm Bill and the Wetland Reserve Program, wetlands losses have been greatly reduced.

The most significant losses of wetlands in Mississippi have been caused by land conversion for agriculture, particularly in the Delta Region. Other losses are due to residential developments, industrial sites or ports, marinas, highway projects and flood control projects. Several large wetland areas are protected by the Natural Heritage Program under the Mississippi Department of Wildlife, Fisheries and Parks. The State has obtained these areas through purchases, gifts, or as mitigation for projects impacting other wetlands.

Requirements

Section 401 of the Federal Clean Water Act requires any applicant for a federal license or permit to conduct any activity which may result in any discharge into the waters of the Unites States to provide the licensing or permitting agency a water quality certification from the State. Federal permits or licenses for which certifications have been required in the past are:

1. individual, general or nationwide federal permits issued pursuant to Section 404 of the Federal Clean Water Act;

2. federal permits issued pursuant to Section 10 of the Federal Rivers and Harbors Act; and

3. permits or licenses issued by the United States Coast Guard, Bridge Administration Branch.

Regulations

One of Mississippi's significant accomplishments in the wetlands programs has been completion of Section 401 implementing regulations. These comprehensive regulations have gone through public review and were adopted on February 24, 1994 (available from OPC). However, a portion of the regulations pertaining to the mining of sand and gravel were not initially adopted due to objections from the industry. After over a year of additional review and input from the public, the sand and gravel industry and environmental organizations, sand and gravel mining regulations were adopted on August 10, 1995. A major part of these regulations involves buffer or riparian zones. The OPC believes these riparian zones are crucial to the protection and enhancement of water resources. Riparian zones are extremely complex ecosystems that help control nonpoint source pollution. Used as a component of an integrated management system including nutrient management and sediment and erosion control practices, stream-side forests can have a number of beneficial effects on the quality of water resources. Riparian forests can be effective in removing excess nutrients and sediment from surface runoff and shallow groundwater and in shading streams to optimize light and temperature conditions for aquatic plants and animals. Stream-side forests also ameliorate the effects of some pesticides and directly provide dissolved and particulate organic food needed to maintain high biological productivity and diversity in the adjoining stream. In addition, this buffer will reduce the risk of the waterbody flooding a mining pit during high water.

In addition, the definition of "waters of the State" now includes wetlands, as well as an extensive list of waters which cover all types of aquatic systems found in Mississippi. "Waters of the State" means all waters within the jurisdiction of this State, including all streams, lakes, ponds, wetlands, impounding reservoirs, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, situated wholly or partly within or bordering upon the State, and such coastal waters as are within the jurisdiction of the State, except lakes, ponds, or other surface waters which are wholly landlocked and privately owned, and which are not regulated under the Federal Clean Water Act (33 U.S.C. 1251 et seq.).

Certification Activity

Table III-28 is a summary of Section 401 actions for 1996 and 1997.

TABLE III-28
Section 401 Actions
1996-1997

Activity	1996	1997
Individual Projects Filed (401/10)	131	121
Nationwide Predischarge Notifications	106	63
Violations Received	14	8
Site Inspections	53	33
Certifications	76	82
Certifications with Project Modifications	68	51
Withdrawals	13	8
Denials	0	0
Letters of Comment	168	95
Projects with mitigation	54	48

Nonpoint Source Control

Control of stormwater runoff is an integral part of the State's Section 401 program and is specifically listed in our implementing regulations. If stormwater runoff controls are deemed necessary to protect water quality, the guidelines are followed, regardless of the size of the project.

Wetland Grants

The Department of Environmental Quality has received two grants from the Section 104(b) State Wetland Grant Program. Work on both grants is now completed. The first project is entitled the "Lower Yazoo Basin Mississippi Alluvial Plain - A Watershed Protection Demonstration Project and Wetlands Assessment". The objectives of this project were to:

* Utilize existing databases to complete a bio-diversity assessment for the Lower Yazoo Basin.

* Develop a GIS database and mapping products of critical features, land use, public ownership, bio-diversity elements, etc., that will support coordinated wetland protection and restoration efforts.

* Develop wetland management strategies for the basin, which afford community input and review.

* Through the state's water quality certification programs, review all proposed Section 404 projects and monitor losses, insuring sequential

avoidance, minimization, and effective mitigation to offset wetland losses incurred.

* Assess farm and forest landowner perspectives on environmental issues and existing conservation programs and develop recommendations to improve existing programs and interagency cooperation to support wetland protection and restoration efforts.

The second project was to develop up-to-date land use data sets and maps of the state via satellite and image processing techniques. Approximately 12 types of wetlands will be mapped. These maps will enable MDEQ, as well as the Mississippi Department of Transportation, Mississippi Forestry Commission, Department of Wildlife, Fisheries and Parks, and Mississippi Automated Resource Information System (MARIS), to better protect and manage state wetland resources.

Other Mechanisms Used in Protecting Wetlands

MDEQ is participating in the Special Management Area Plan for the Port of Pascagoula in Jackson County, Mississippi. This plan is a very effective mechanism to identify and avoid high value wetlands while allowing planned development in areas that are under tremendous developmental stress (this process also identifies mitigation requirements). In addition, the Wetland Reserve Program was, and hopefully continues to be, a most effective mechanism for protecting wetlands.

Extent of Wetland Resources

"Wetland losses in the United States 1780's to 1980's" (Dahl, T. E. 1990) estimated wetlands remaining in Mississippi at 4,067,000 acres. This is a 59% decrease in wetlands from the estimated 9,872,000 acres existing in colonial times.

The MDEQ is developing current (1991) land use data sets and maps of the state via satellite image processing techniques (made possible by the 104(b) State Wetland Grant Program). When the process is completed, an accurate picture of the state's existing wetland resources will exist and reporting net loss or gain of different wetland types will be possible. Approximately 12 wetland types will be mapped using the Cowardin classification system. They are as follows:

Fresh Water
Estuarine Water
Marine Water
Farmed Wetlands
Estuarine Emergent (Salt Marsh)
Estuarine Woody (Coastal Scrub/Shrub)
Palustrine Emergent (Freshwater Marsh)
Bottomland Hardwood Forest
Swamp
Pine Savannah/Wet Pine Flatwoods
Freshwater Scrub/Shrub
Cutover Wetland

The State has maintained a database of Section 401 certification actions for a number of years. This database includes certification requests, wetland impacts, location, certifications issued, significant modifications of projects, violations, inspections, and mitigation requirements. For 1996, projects that went through the individual Section 404 permit process show a net gain of approximately 701.4 acres of wetlands. For 1997 the net gain is 620.1 acres. For 1996, projects that have gone through the nationwide permit process show a net gain of 119.4 acres and for 1997 a net gain of 21.9 acres. These gains reflect wetlands acres enhanced or protected through conservation easements.

Wetland Water Quality Standards

Mississippi is currently considering water quality standards for wetlands. At present, standards are in place for all "State Waters". Wetlands are included in the definition of State Waters and therefore are covered by current standards. In general, wetlands in Mississippi would be currently classified for Fish and Wildlife use unless they are associated with waters classified as Recreational, Public Water Supply or Shellfish Harvesting. Criteria for these use classifications would apply. The MDEQ is evaluating the need for a specific use classification or narrative criteria for wetlands, however, existing narrative criteria in previous Section 401 water quality certifications have been used. The narrative criterion reads "there shall be no degradation of wetlands such that the flora and fauna are changed to the extent that the ability of the wetlands to function in the propagation and maintenance of health, well-balanced populations of fish and wildlife is impaired, or the ability of the wetlands to be effective in the assimilation of waterborne pollutants is substantially reduced."

In addition, the State may use its anti-degradation policy to deny Section 401 Water Quality Certification by requiring the sequential mitigation (avoid-minimize-mitigate) of wetland impacts in a manner similar to the Section 404(b)(1) guidance.

Wetlands Monitoring Program

The OPC's Water Quality Management Branch has requested considering the integration of wetlands' monitoring into the Ambient Monitoring Program. The addition of wetland sites is contingent on increases in state funding requested initially during the 1996 State legislative session.

On several past certifications, specific monitoring of wetlands receiving point source discharges has been required. The monitoring requirements were as follows:

Water Quality Monitoring: Monthly monitoring for BOD, TSS, NH_3-N, D.O. and fecal coliforms for a period of one year.

Wetland Biological Monitoring: Biological information on the wetland community should be collected so that any signs of impact can be interpreted. The following requirements have been formulated by the State of Florida, Department of Environmental Regulation and have been used in Mississippi:

1. The flora and fauna of the wetland shall not be changed to the extent that the ability of the wetland to function in the propagation and maintenance of health, well-balanced populations of fish and wildlife is impaired, or the ability of the wetland to be effective in wastewater treatment is substantially reduced.

2. Benthic Macroinvertebrates

a. The Shannon-Weaver diversity index of benthic macroinvertebrates should not be reduced to less than 50% of background levels as measured using organisms retained by a U.S. Standard No. 30 sieve that have been collected and composited from either Hester-Dendy type artificial substrate samplers of 0.10 to 0.15 square meters each, incubated for a period of four weeks; or measured using organisms retained by a U.S. Standard No. 30 sieve collected and composited from natural substrate samples, such as benthic grabs or coring devices.

If grabs or cores are to be taken, Ponar, Ekman, or Peterson-type samplers with minimum sampling areas of 225 square centimeters or coring devices with minimum sampling areas of 45 square centimeters shall be used. The minimum number of samples necessary at a given station shall be that number needed to be 90% certain of being within 15% of the mean diversity of the population. At a minimum, sampling sites should include the discharge site, a background site for control, and downstream sites as needed. Baseline and monitoring data should be taken annually during low-flow periods (August-September).

b. Once a determination of the needed number of samples is made at a station for a given sampling method, that number of samples shall continue to be used at that station. Determinations of reductions in the Shannon-Weaver diversity index of benthic macroinvertebrates shall be made using a single type of sampler, either coring device, grab, or Hester-Dendy.

3. Fish

In a treatment wetland that contains fish populations, an analysis of covariance should be conducted semi-annually by species using water depth as a covariant and biomass as a dependent variable. Where significant (less than or equal to 0.15) changes from baseline data in biomass occur, the permittee shall determine the cause of this change. It shall constitute a violation of this rule if the discharge caused a 10% decrease in the biomass of sport and commercial or of forage fish or a 25% increase of rough fish, unless the ratio of sport and commercial fish to rough fish is maintained. All data shall be collected at time when standing water is present in the treatment wetland. Standardized fish samples shall be collected using an electroshocking device along a parallel series of transects spaced 100 meters apart and running perpendicular to the long axis of the treatment wetland, or using a Wegener Ring thrown at 30 meter intervals along a parallel series of transects spaced 100 meters apart and running perpendicular to the long axis of the treatment wetland; or any other similar method approved by the Mississippi Department of Wildlife, Fisheries and Parks. In addition, transects shall be visually monitored at the time of fish monitoring for fish kills which will be reported immediately to the OPC.

CHAPTER SEVEN

PUBLIC HEALTH/AQUATIC LIFE CONCERNS

Surface Waters Affected by Toxicants

Toxic pollutants in our environment are a widespread and growing public concern. As MDEQ turns its attention more toward risk assessment and public health, levels of toxic pollutants in water, sediment and fish tissue become increasingly important. Contamination from agricultural, silvicultural, industrial and municipal sources has been documented in several areas of the state. This information was gathered through various monitoring activities of the Office of Pollution Control (OPC) and some federal agencies.

In the past, monitoring for toxins in surface waters has been primarily confined to fish tissue collected by the OPC Laboratory through the ambient fixed station monitoring program and special studies. Historically, routine ambient monitoring by the OPC for water column and sediment toxicants was not conducted due to limited resources. However, in 1991, monitoring for water column toxicants was reintroduced in the OPC's ambient monitoring program for the first time since 1976. In 1997, sampling frequency on surface water was increased to quarterly for selected metals and phenols at fixed stations across the state.

Routine sampling of sediments has been incorporated into the OPC ambient monitoring program since 1997, with collections at a limited number of sites. Sediment collections are now included in the sampling region for whole basin studies. Sediment sampling for toxicants is also conducted during special studies and investigations at pollution incidents (spills) or hazardous waste sites (see Surface Water Monitoring Program, Source Compliance and Environmental Damage Assessment Monitoring, p.68). One of the most intensive studies involving sediment sampling has been the Mississippi Mercury Study (see Statewide Mercury Contamination Study, p.137). This study has been ongoing since 1997 and has involved sampling of sediments with analysis for mercury at approximately 40 sites.

Bioassay information, concerning the potential acute and chronic toxicity of various industrial and municipal effluents to their receiving streams is being generated by a number of NPDES permittees required to perform Whole Effluent Toxicity tests as part of their permit or for monitoring purposes. In the past, the OPC lab also performed WET tests for compliance monitoring but due to budget constraints in 1994 this monitoring ceased. It was made aware to OPC by EPA that our requirement for WET tests are only 10% of the permitted facilities. Since the WET requirement is minimal throughout the NPDES permits in Miss. we are only required to do 3-4 tests per year. Other avenues of meeting this requirement by EPA are being discussed, one option is contracting out these 3 or 4 tests per year to an approved WET testing laboratory. The section, Whole Effluent Toxicity (WET) Testing and Monitoring in Part II details the specific problems related to each facility and its receiving waters.

Toxicants in Fish Tissue

In Mississippi, numerous lakes and streams have been impaired in the past due to toxicants in fish tissue. Pesticides continue to be of concern in the Yazoo River Basin (Delta region). Recent MDEQ concern about mercury contamination in fish tissue was confirmed by fish tissue sampling in 1993 to 1997. Samples showed elevated mercury levels in fish tissue in several areas of the state.

Concern over dioxin has declined as the paper industry has virtually eliminated dioxin formation in its processes. The dioxin advisory on the Leaf River, which originated in 1989, was removed in 1995. Dioxin concentrations in the Escatawpa River declined as well, and the Limit Consumption Advisory for fish was removed in 1996. A No Consumption Advisory, however, remains for Country Club Lake near Hattiesburg for dioxin and PCPs. For more information, see Dioxin Studies, page 139.

Most of the waterbodies in Mississippi with elevated levels of toxicants have some form of the toxicant present in the fish tissue. The OPC's large fish tissue database substantiates concern that DDT and toxaphene levels should be closely monitored in future sampling efforts.

From 1993-1995, there were no fixed ambient fish tissue sites visited. The majority of the organo-chlorines and mercury data was obtained though the 1993-1995 Clean Lakes Program. There were 65 sites visited in the Clean Lakes Program and 143 fish tissue samples collected. DDT was found in 81 of these samples and toxaphene was found in 9. Total DDT levels continue to be highest in the Delta region with levels in composites of fish fillets exceeding FDA action levels for four samples. Toxaphene was also found in fish tissue in certain surface waters of the Delta. Levels of concern have been detected exclusively in the Yazoo River Basin. Toxaphene and DDT levels exceeding FDA action levels, are listed in Table III-29.

In 1996, the fixed ambient fish tissue network was modified and reinstated as part of the new Ambient Monitoring Network. There were 19 fish tissue sites visited and 44 samples collected. DDT was found in 24 of these samples and toxaphene was found in 1 sample. There were no samples that exceeded the FDA action levels for DDT or toxaphene.

Since action levels have only been established by FDA for one metal (1.0 ppm for mercury), the OPC has established "levels of concern" for the remaining five heavy metals analyzed in our fish tissue monitoring program. These "levels of concern" are not regulatory levels and there are no known health risks associated with them. These are simply levels that were selected for use in screening the data and for regional comparison of the data. The levels of concern are 1.0 ppm for arsenic (As), lead (Pb), cadmium (Cd), and chromium (Cr), and 5 ppm for copper (Cu). Mercury was the only heavy metal analyzed during the 1993-1995 Clean Lakes Studies. Data that exceed these levels for the five heavy metals other than mercury are shown in Table III-30.

TABLE III-29

Fish Tissue Exceeding FDA Action Levels for Organo-chlorines

(Analyses Performed from 1993 through 1996)

Year Sampled	Location	Species	Contaminant	Level (ppm)
1993	Bee Lake	Buffalo SPP.	Total DDT	8.46
1994	Moon Lake	Buffalo SPP.	Total DDT	5.62
1994	Moon Lake	Channel Catfish	Total DDT	6.19
1995	Roebuck Lake	Bigmouth Buffalo	Total DDT	5.64
1995	Roebuck Lake	Bigmouth Buffalo	Toxaphene	11.50

TABLE III-30

Fish Tissue Exceeding FDA Action Levels and MDEQ Concern Levels for Heavy Metals

(Analyses Performed In 1996)

Year Sampled	Location	Species	Contaminant	Level (ppm)
1996	Lake Whittington	Largemouth Bass	Pb	1.08

Fish Consumption Advisories and Fishing Bans

The fish consumption advisories and commercial fishing bans presently in effect are listed in Table III-31.

Statewide Mercury Contamination Study

Because of regional and national concern over mercury contamination in fish, the OPC began intensively monitoring the state's fisheries for mercury in 1993. During the past five years, approximately 700 fish tissue samples from 130 sites have been analyzed. Based on results obtained in 1993 and 1994, an interagency task force was convened to address mercury contamination in Mississippi. Members of the task force are from the MDEQ, the Department of Health, and the Department of Wildlife, Fisheries and Parks. In May 1995, advisories were issued for four waterbodies having fish with average levels of at least 1 part per million of mercury. In 1996, three additional advisories were issued. An advisory was placed on King Mackerel in the Mississippi Gulf in 1998. A list of the advisories is given in Table III-31. Advisories will be added or modified as needed.

TABLE III-31

Fish Consumption Advisories and Fishing Bans

11/30/98

WATERBODY	LOCATION	CONTAMINANT	AREA AFFECTED	TYPE RESTRICTION	START DATE
Yockanookany River	near Kosciusko	PCBs	12 Miles	Commercial Fishing Ban No Consumption" Advisory All Species	1987
Conehoma Creek	near Kosciusko	PCBs	0.3 Miles	Commercial Fishing Ban No Consumption" Advisory All Species	1987
Country Club Lake	near Hattiesburg	PCP & Dioxins	46 Acres	No Consumption" Advisory All Species	1990
Old Little Tallahatchie River & Lake Suzie	near Batesville	PCBs	8 Miles	Commercial Fishing Ban No Consumption" Advisory All Species	1989
Escatawpa River	southeast Mississippi	Mercury	30 Miles	Limit Consumption" Advisory Catfish > 10 lbs & Bass	1995
Enid Reservoir	near Enid	Mercury	28,000 Acres Full Pool	Limit Consumption" Advisory Catfish > 10 lbs & Bass	1995
Bogue Chitto River	southwest Mississippi	Mercury	Entire Length 70 Miles	Limit Consumption" Advisory Catfish > 10 lbs & Bass	1995
Pascagoula River	southeast Mississippi	Mercury	Entire Length	Limit Consumption" Advisory Catfish > 10 lbs & Bass	1996
Archusa Creek Lake	near Quitman	Mercury	371 Acres	Limit Consumption" Advisory Catfish > 10 lbs & Bass	1996
Yockanookany River	near Ofahoma	Mercury	Entire Length	Limit Consumption" Advisory Catfish > 10 lbs & Bass	1995
Yocona River	near Enid	Mercury	Enid Spillway to Confl. w/ L. Tal. R.	Limit Consumption" Advisory Catfish > 10 lbs & Bass	1996
Gulf Of Mexico	Gulf Coast	Mercury	Entire Mississippi Gulf	<33 inches: No Restrictions 33-39 inches: Limit Consumption >39 inches: No Consumption	1998

When monitoring a fishery for mercury, a two phased approach is utilized. The first phase is a screening phase in which a site is sampled for bass or large catfish, both of which tend to accumulate high levels of mercury. If elevated levels of mercury are found, a second, more intensive phase is initiated. The site is revisited and several species and size classes are sampled. Based on the levels of mercury found, a determination is made as to the necessity of an advisory.

No point sources discharges of mercury have been identified in Mississippi. The majority of the scientific community believes that elemental mercury is widely distributed in the environment due to a combination of natural geologic conditions, old industrial sources, and atmospheric deposition from coal fired power plants and incinerators. It is further believed that water quality conditions in certain waterbodies favor the conversion of this elemental mercury, which is relatively inert, through a process known as methylation to the more toxic methyl mercury. Methyl mercury is much more bioavailable, and therefore enters the food web more readily.

Dioxin Studies

Introduction

The compound most often described as dioxin is actually 2,3,7,8-tetrachlorodibenzo-para-dioxin (TCDD), but there are 75 other congeners of chlorinated dioxins and furans, with varying toxicity and bioaccumulation potential. TCDD is not a commercially manufactured product, but rather a contaminant of certain chemical syntheses and treatment processes.

TCDD below bleach kraft pulp facilities has been a concern in Mississippi since the initial results of EPA's Bioaccumulation Study were received in 1989. Since that time, MDEQ has undertaken an aggressive fish tissue monitoring program below these facilities. In 1989 MDEQ staff developed guidance and performed an oversight role for the "Mississippi Cooperative Dioxin Study", in which fish were collected and analyzed for TCDD and 2,3,7,8-tetrachlorodibenzo-para-furan (TCDF) below five pulp facilities in the state, including two mills that were under construction at the time.

Results from the Mississippi Cooperative Study confirmed that two areas in the state had elevated levels of dioxin. First, significant levels were found in channel catfish from the Leaf River below New Augusta. Subsequently a consumption advisory was issued by MDEQ for 15 miles of the Leaf River from Highway 29 at New Augusta to Highway 15 at Beaumont for bottom feeding fish. The Mississippi Department of Wildlife, Fisheries and Parks (DWF&P) also issued a commercial fishing ban for the same area.

In addition, levels of concern were measured in bluegill and striped mullet from the Escatawpa River near Moss Point. There were no catfish collected below this mill's discharge, and additional sampling in this area was requested.

Country Club Lake

A fish consumption advisory was issued for this lake in 1987 following several fish kills due to spills of wood treating material including pentachlorophenol. Dioxin contamination has been documented in this lake, and fish have been analyzed for dioxin on four occasions, the most recent of which was September and October 1997. MDEQ is considering removal of the Dioxin advisory, however a PCP advisory is still in effect. Right side fillets collected for the dioxin study will be used to determine what levels of PCP's persist in the fish. The results are given in Table III-32 and indicate that dioxin is declining in fish in the lake.

Escatawpa River Study

A similar advisory was issued for the lower Escatawpa River in 1990, and intensive fish tissue monitoring began on the Escatawpa River in 1991. This monitoring documented a similar decline in dioxin, and in July 1996, all fish consumption advisories were lifted from the lower Escatawpa River. Fish tissue was collected in 1996 and 1997. Tables III-33a and III-33b show all of the data collected in 1996 and 1997.

International Paper continues to collect fish tissue data as required in their NPDES permit.

Leaf River Study

MDEQ conducted intensive fish tissue monitoring annually from 1990 through 1996. This monitoring showed a steady decline in dioxin concentrations in Leaf River fish and, in April 1995, all fish consumption advisories were removed from the Leaf River. Additional sampling in 1996-1997 was conducted, but on a smaller scale than during previous years. Sampling was conducted on the three sites closest to the mill. MDEQ concentrated sampling efforts on Channel Catfish, but Flathead Catfish were collected when available. Tables III-34a and III-34b show all of the data collected in 1996 and 1997.

The Mississippi Department of Environmental Quality will continue to collect fish tissue samples a under contract with Georgia Pacific for the next three years. MDEQ requires this fish tissue monitoring from Georgia Pacific to satisfy permit requirements.

Tombigbee River

Weyerhaeuser, Inc. began operation of a new bleach kraft facility near Columbus in May of 1990. Their discharge enters the Tennessee-Tombigbee Waterway in southern Lowndes County. Weyerhaeuser participated in the 1989 "MS Cooperative Study", and the results were used to establish background levels. A condition of their NPDES permit requires the collection and analysis of fish tissue for TCDD and TCDF on a yearly basis. Data from the 1996 and 1997 study are given in Tables III-35a and III-35b. There have been no dioxin problems observed in this system to date.

TABLE III-32
Dioxin in Fish Tissue
Country Club Lake
1997

12/5/97 CCLK97.WK4

OPC #	Species	Weight			Dioxin		
		Min	Max	Avg.	2,3,7,8 TCDD	2,3,7,8 TCDF	TEQ
DF97025	Largemouth Bass	184	232	207	<0.29	0.29	0.03
DF97026	Largemouth Bass	330	390	363	0.25	0.44	0.29
DF97029	Channel Catfish	3326	3326	3326	2.7	2.2	2.92

TABLE III-33a
Dioxin In Fish Tissue
Escatawpa River
1996

01/05/98 E96SUM

SITE	COMMON NAME	# SAMPLE	WEIGHT			DIOXIN (ppt)		
			MAX	MIN	MEAN	2378 TCDD	2378 TCDF	TEQ
2	Blue Catfish		6.6	5.5	5.9	1.11	1.26	1.24
2	Flathead Catfish	11	11.5	6.6	8	0.252	0.004	0.38
2	Smallmouth Buffalo	10	15.5	11.9	13.15	1.2985	15.674	2.866
3	Blue Catfish	8	10.2	6.2	7.58	1.138	0.7947	1.22
3	Flathead Catfish	10	22	6.3	10.96	3.3287	1.6147	3.49
3	Smallmouth Buffalo	1	11.6	11.6	11.6	1.54	8.5	2.39

TABLE III-33b
Dioxin in Fish Tissue
Escatawpa River

1997 08/12/98ESC97SUM.WK4

SITE	COMMON NAME	# SAMPLE	WEIGHT (LBS.)			DIOXIN (ppt)		
			MAX	MIN	MEAN	2378 TCDD	2378 TCDF	TEQ
2	Smallmouth Buffalo	5	15.6	12	13.9	0.72	4.4	1.16
2	Smallmouth Buffalo	5	11.5	9.4	10.5	0.53	7.1	1.24
2	Flathead Catfish	4	14.5	11.1	12	<0.51	0.33	0.03
2	Flathead Catfish	5	10.3	8.3	9	0.3	0.34	0.334
3	Smallmouth Buffalo	2	20.8	16.1	18.4	<1.3	15	1.5
3	Smallmouth Buffalo	3	14.9	11.9	13.3	1.1	22.9	3.39
3	Flathead Catfish	3	10.7	9.5	10	1.5	0.97	1.6
3	Flathead Catfish	4	8.9	8.2	8.4	<0.56	<0.73	0
3	Blue Catfish	2	15.2	12.5	13.8	<1.3	<0.78	0
3	Blue Catfish	3	11	10	10.5	1.4	1.4	1.54

LRSUM96.WK4

TABLE III-34a
Dioxin in Fish Tissue
Leaf River
1996 Sample Summary

OPC # DF96-	SITE	COMMON NAME	# SAMPLE	WEIGHT (LBS)			% LIPIDS	DIOXIN (ppt)		
				MIN	MAX	MEAN		TCDD	TCDF	TEQ
5	0.5	Flathead Catfish	5	9.2	12.2	10.6	6.55	0.981	0.420	1.023
6	0.5	Flathead Catfish	3	5.5	6.7	6.1	2.15	0.295	0.356	0.3306
7	1.5	Flathead Catfish	2	18.5	22.9	20.7	3.6	1.280	<0.210	1.28
8	1.5	Flathead Catfish	5	9.4	12.0	10.7	2.35	0.666	0.174	0.6834
9	1.5	Flathead Catfish	4	6.3	7.9	6.9	1.4	0.391	0.353	0.4263
10	2	Flathead Catfish	2	6.9	7.5	7.2	0.79	0.417	0.042	0.4212
11	2	Flathead Catfish	3	5.5	6.2	5.9	0.7	0.508	0.225	0.5305
12	2	Channel Catfish	5	1.0	1.5	1.2	1.35	0.273	<0.0036	0.273
13	4	Flathead Catfish	1	22.0	22.0	22.0	17.05	1.150	0.140	1.164
14	4	Flathead Catfish	1	9.7	9.7	9.7	3.6	1.130	<0.202	1.13
15	4	Flathead Catfish	4	5.3	6.0	5.7	1.23	0.502	0.089	0.5109
16	4	Channel Catfish	5	1.3	1.8	1.6	1.36	<0.351	<0.055	0
17	5	Flathead Catfish	1	22.5	22.5	22.5	3.44	10.200	0.292	10.2292
18	5	Flathead Catfish	3	8.6	11.7	9.9	2.01	1.480	<0.096	1.48
19	5	Flathead Catfish	5	6.1	7.9	6.8	1.84	1.210	0.126	1.2226

TABLE III-34b
Dioxin in Fish Tissue
Leaf River
1997 Sample Summary

12/05/97LRSUM97.WK4

SITE #	OPC #	SPECIES	WEIGHT			2,3,7,8 TCDD	2,3,7,8 TCDF	TEQ
			MIN	MAX	AVG			
1.5	DF97023	Channel Catfish	546	695	599	<1.00	<1.00	0
1.5	DF97024	Channel Catfish	455	537	499	1.3	<1.00	1.3
2	DF97021	Channel Catfish	543	721	639	ND	ND	0
2	DF97022	Channel Catfish	455	534	480	<1.00	<1.00	0
4	DF97018	Channel Catfish	834	1038	964	ND	ND	0
4	DF97019	Channel Catfish	613	779	699	ND	<1.00	0
4	DF97020	Flathead Catfish	2020	2844	2372	ND	<1.00	0

TABLE III-35a
Dioxin in Fish Tissue
Tombigbee River
1996

Site	Common Name	# In Sample	Weight(LBS)			DIOXIN(ppt)			Weight		
			MAX	MIN	MEAN	2378 TCDD	2378 TCDF	TEQ	MAX	MIN	MEAN
1	Channel Catfish	6	1.23	0.78	0.93	0.19	ND	0.19	560	356	424
1	Largemouth Bass	5	0.94	0.46	0.71	ND	ND	0	428	210	320
2	Channel Catfish	5	2.69	0.52	1.66	0.24	ND	0.24	1220	238	752
2	Channel Catfish	5	2.69	0.52	1.66	0.21	0.079	0.22	1220	238	752
2	Largemouth Bass	4	1.21	0.63	0.81	ND	0.26	0.026	548	288	368
3	Channel Catfish	4	1.15	0.57	0.88	ND	0.27	0.027	522	258	400
3	Largemouth Bass	5	1.58	0.65	0.91	ND	ND	0	716	296	414
4	Channel Catfish	4	0.86	0.66	0.79	0.16	ND	0.16	390	301	358
6	Largemouth Bass	6	0.86	0.40	0.72	ND	ND	0	392	182	327

TABLE III-35b
Dioxin in Fish Tissue
Tombigbee River
1997

Site	Common Name	# In Sample	Weight(LBS)			DIOXIN(ppt)			Weight		
			MAX	MIN	MEAN	2378 TCDD	2378 TCDF	TEQ	MAX	MIN	MEAN
1	Channel Catfish	5	0.87	0.58	0.78	ND	ND	0	395	265	352
1	Largemouth Bass	6	1.00	0.67	0.82	ND	ND	0	455	305	372
2	Channel Catfish	6	1.30	0.61	0.82	ND	ND	0	590	275	373
2	Channel Catfish	6	1.30	0.61	0.82	ND	ND	0	590	275	373
2	Largemouth Bass	2	1.11	0.47	0.65	ND	ND	0	505	215	296
3	Channel Catfish	3	0.91	0.46	0.72	0.18	0.05	0.19	415	210	328
3	Largemouth Bass	3	0.93	0.57	0.75	ND	ND	0	420	260	339
4	Channel Catfish	4	1.14	0.49	0.75	ND	0.06	0.006	515	220	341
4	Largemouth Bass	4	0.89	0.61	0.80	ND	ND	0	405	275	365

Fish Kills

From January 1996 through December 1998, the Office of Pollution Control (OPC) investigated 59 fish kills. Thirty-nine percent of these were associated with naturally occurring low dissolved oxygen levels. Twenty-five percent of the investigations could not be determined and 17% were associated with pesticides. The remaining 19% were those related to runoffs, sewage leaks and other unpermitted discharges. Fish kills investigated for this period and since January 1990 are listed in Table III-36. Since 1990, the OPC Biology Section has investigated a total of 167 fish kills for an average of 18.5 kills per year with 74% occurring during the spring and summer. For each kill, the number of fish, area affected, and cause and source of the kill are given, if known. The annual or monthly precipitation is not indicated in the table, however, a direct correlation between summer rain events and pesticide related fish kills, particularly in the Mississippi Delta Ecoregion has been noted.

Many fish kills investigated were the result of natural causes such as low dissolved oxygen in backwater areas, or parasites and diseases. In these cases the cause is listed as "natural". By the time many kills are reported the dead fish have deteriorated to the point that the cause is difficult to discern. When the cause can not be determined the kill is categorized as "unknown".

TABLE III-36
Reported Fish Kills
1990-1998

WATERBODY	DATE	# FISH	AREA AFFECTED	CAUSE	SOURCE
Escatawpa Rvr, Jackson Co	12-Feb-90	>2000	unknown	Temp. Shock	N/A
Buelow Pond, Warren Co	13-Feb-90	113	<1 acre	unknown	N/A
Recon League Lake, Bolivar Co	22-Mar-90	>300	unknown	unknown	unknown
Long Lake, Bolivar Co	29-Mar-90	>50	unknown	oil	Janoush Bro.Marine
Brickyard Bayou, Harrison Co	17-Apr-90	>50	unknown	unknown	unknown
Private Pond, Hinds Co	19-Apr-90	~150	unknown	Low D.O.	unknown
Ross Barnett Res., Hinds/Rankin Co	29-Apr-90	~250	unknown	Spawning Stress	natural
Gum Branch, Perry Co	18-Jun-90	>100	1.5 miles	Sodium Sulfite	G.P.
Lead Bayou, Bolivar Co	08-Jul-90	12	<0.25 acres	Low D.O.	Cleveland WWTP
Lynch Creek, Hinds Co	16-Jul-90	~100	1.3 miles	Low D.O.	Jackson WWTP
Deer Creek, Washington Co	25-Jul-90	>50	1.25 miles	Low D.O.	nonpoint
Roosevelt Lake, Scott Co	02-Aug-90	unknown	unknown	unknown	unknown
Buck Haven Rest, Leflore Co	02-Aug-90	~500	unknown	Low D.O.	natural
Greenbrook Subdivision, Desoto Co	17-Aug-90	>1000	unknown	Low D.O.	natural
Pearl River, Pearl River Co	24-Aug-90	~6500	unknown	Low D.O.	low flow
Crossgates Lake, Rankin Co	04-Sep-90	>5000	unknown	Low D.O.	natural
Bayou Pierre, Claibourne Co	16-Sep-90	unknown	1.5 miles	unknown	unknown
Escatawpa Rvr, Jackson Co	08-Oct-90	unknown	unknown	unknown	unknown
Sunflower Rvr, Coahoma Co	09-Oct.-90	<35	unknown	unknown	unknown
Escatawpa Rvr, Jackson Co	15-Oct.-90	unknown	unknown	stress	natural
Tchoutacabouffa River, Harrison Co	16-Oct-90	<10	unknown	natural	unknown
Tchoutacabouffa River, Harrison Co	16-Oct-90	>200	~1 acre	unknown	unknown
Beaver Creek, Amite Co	20-Nov-90	~100	unknown	unknown	unknown
Pearl River, Pearl River Co	20-Apr-91	unknown	unknown	parasite	natural
Blue Lake, Leflore Co	23-May-91	unknown	unknown	Low D.O.	natural
Old Pearl River, Hinds Co	14-Jun-91	unknown	unknown	drainage	flood control
Townsend Lake, Humphreys Co	14-Jun-91	>30	unknown	Low D.O.	natural
Williams Lake, Rankin Co	14-Jun-91	>100	~3 acres	ammonia	Poultry Farm
Six Mile Lake, Bolivar Co	20-Jun-91	<50	~2 miles	herbicide	nonpoint
Whittington Lake, Bolivar Co	24-Jun-91	>3750	1.5 miles	unknown	unknown
Sardis Lake, Panola Co	30-Jun-91	>2000	unknown	Disease	natural
Little Copiah , Copiah Co	18-Jul-91	15	unknown	Low D.O.	WWTP
Private Pond, Quitman Co	30-Jul-91	~150	~0.5 acres	Low D.O.	natural
Eagle Lake, Issaquena Co	05-Sep-91	~750	unknown	Low D.O.	Draw Down
Purple Creek, Hinds Co	05-Sep-91	unknown	unknown	Muncpl runoff	nonpoint
Dabbs Creek, Rankin Co	03-Oct-91	<50	unknown	unknown	unknown

WATERBODY	DATE	# FISH	AREA AFFECTE D	CAUSE	SOURCE
Big Canal, Scott Co	15-Oct-91	unknown	unknown	unknown	unknown
Diamond Head, Hancock Co	28-Feb-92	242	Entire Lake	Pesticide	Runoff
Pearl River, Pearl River Co	29-May-92	unknown	Sm. Lake	Low D.O.	Natural
Deer Creek, Sharkey Co	19-Jun-92	unknown	unknown	Low D.O.	Natural
Leaf River, Perry Co	24-Jul-92	117929	~15 Miles	Sus. Part.	G.P. Mill
Coleman's Bayou, Jackson Co	01-Aug-92	unknown	unknown	Low D.O.	Natural
Deer Creek, Washington Co	10-Aug-92	>152352	~12 Miles	Insecticide	Agric. Runoff
Airplane Lake, Warren Co	11-Aug-92	unknown	unknown	unknown	unknown
Bunker Hill Lake, Marion Co	02-Sep-92	>1000	Entire Lake	Low D.O.	Natural
Pelahatchie Crk, Rankin Co	04-Jan-93	unknown	Sm. Area	unknown	unknown
Quitman's Ind. Pk., Clarke Co	23-Mar-93	<20	Sm. Area	unknown	unknown
Pearl River, Lawrence Co	02-Jun-93	unknown	~25 Miles	Disease	unknown
Pearl River, Copiah Co	07-Jun-93	unknown	unknown	Disease	unknown
Cassidy Bayou, Coahoma Co	30-Jun-93	unknown	unknown	unknown	unknown
Denman's Lake, Tallahatchie Co	04-Jul-93	>5000	Entire Lake ~50 acres	Pesticides Guthion	Agric. Runoff
Nolan Pond, Rankin Co	13-Jul-93	~80	Entire Lake	Low D.O.	Natural
Moore's Pond, Hinds Co	22-Jul-93	unknown	Entire Lake	Low D.O.	Natural
Lk Jackson, Washington Co	05-Aug-93	unknown	Entire Lake	Low D.O.	Natural
Steele Bayou, Issaquena Co	13-Aug-93	~3000	Entire Lake	Suspctd Pesticide	unknown
Black Bayou, Washington Co	10-Aug-93	~1200	~1 Mile	unknown	unknown
Hurricane Creek, DeSoto Co	25-Aug-93	~150	unknown	Suspctd Pesticide	unknown
Lake Washington, Washington Co	27-Aug-93	>50	unknown	Low D.O.	Natural
Sunflower River, Coahoma Co	03-Sep-93	unknown	unknown	Suspctd Pesticide	unknown
Lk Albermarle, Issaquena Co	05-Sep-93	unknown	unknown	Low D.O.	Natural
McGuffe Lake, Hinds Co	20-Sep-93	unknown	unknown	unknown	unknown
Twentymile Creek, Lee Co	25-Sep-93	unknown	unknown	unknown	unknown
Indian Bayou, Sunflower Co	28-Sep-93	unknown	unknown	Low D.O.	Natural
Shaw Pond, Hinds Co	07-Nov-93	unknown	Entire Lake	Low D.O.	Natural
Woodward Creek, Noxubee Co	13-Jan-94	~10,000	unknown	unknown	unknown
"The Port" nr Grand Gulf, Claiborne Co	18-Feb-94	~1000	unknown	unknown	unknown
King's Creek, Lawrence Co	23-Jan-94	150-200	unknown	Disease	Natural
Lk Ferguson, Washington Co	01-Mar-94	undetermined	unknown	Temperature	Natural
Lakeside Villa, Hinds Co	25-Mar-94	8-10	unknown	Low D.O.	Natural
Bay Point Golf Club, Rankin Co	19-Apr-94	undetermined	unknown	Chlorpyrifos	Construction runoff
Eagle Lake, Warren Co	28-Apr-94	ca 300	unknown	Low D.O.	Natural
Ross Barnett, Rankin Co	28-Apr-94	12	unknown	Bowfishing	Bowfishing
Shady Grove, Jones Co	02-June-94	50	unknown	Chicken Feces	Agric. runoff
Tchula Lake, Holmes Co	20-June-94	60-70	unknown	Pesticides	Agric. runoff

WATERBODY	DATE	# FISH	AREA AFFECTE D	CAUSE	SOURCE
Lake Washington, Washington Co	21-June-94	unknown	unknown	Low D.O.	Natural
Tchula Lake, Holmes Co	18-July-94	ca 75000	unknown	Profenofos (34-51 ppb)	Agricultural runoff
Lake Roebuck, Leflore Co	21-July-94	300+	unknown	Profenofos (6.09 ppb)	Agricultural runoff
Deer Crk. nr Hollandale (6 miles), Washington Co	25-July-94	300-500	unknown	Profenofos (1.11-2.23 ppb)	Agricultural runoff
Deer Crk @ Scott (4 miles), Bolivar Co	25-July-94	420-625 2 dead birds	unknown	Profenofos (1.05-3.41 ppb)	Agricultural runoff
Fourmile Lake, Leflore/Humphreys	28 July-94	500-600	unknown	Profenofos (.38-.71 ppb)	Agricultural runoff
Cane Cr @ Barnett Res, Rankin Co	12-Aug-94	3054	unknown	(*)Profenofos (.6-36.4 ppb)	Agricultural runoff
Eagle Lake, Warren Co	16-Aug-94	650	unknown	(H)unknown	unknown
Lk Ferguson, Washington Co	22-Aug-94	2000-3000	unknown	unknown	unknown
Perry Cr @ Grenada L, Grenada Co	28-Aug-94	^?	unknown	unknown	unknown
Tallahala Crk, Jones Co	03-Sept-94	<100	unknown	unknown	unknown
1st Chem. Indust. Canal, Jackson Co	06-Sept-94	Blue Crabs	unknown	Low pH	Chemical spill
Private Pond, Madison Co	12-Dec-94	~400	0.5 acres	disease	natural
Compress Lake, Marion Co	23-Jan-95	unknown	unknown	Ammonia NH4	refrigerant disposal
Private Pond, Union County	21-Mar-95	~25	unknown	unknown	unknown
Wasp Lake, Humphreys Co	12-Apr-95	>400	unknown	unknown	unknown
Woodgate Lake, Rankin Co	29-Apr-95	>5000	~10 acres	disease	natural
Pearl River, Hinds County	01-Jun-95	unknown	unknown	unknown	unknown
Mullato Bayou, Hancock Co	16-Jun-95	unknown	unknown	ferrous sulfate	barge spill
Ross Barnett Reservoir, Madison Co	16-Jun-95	unknown	unknown	low D.O.	natural
Broadwater Marina, Harrison Co	19-Jun-95	~10,000	unknown	low D.O./turbid	tugboat turbidity
Lake Archer, Arkansas	29-Jun-95	~500	unknown	low D.O.	natural
Private Pond, Grenada Co	07-Jul-95	42	~1 acre	low D.O.	natural
Big Black River, Webster Co	14-Jul-95	unknown	unknown	sewage/low D.O.	broken sewage line
Burney Branch, Lafayette Co	17-Jul-95	~100	unknown	unknown	unknown
McKinley Crk, Monroe Co	28-Jul-95	~1000	3 miles	pesticide/ Curacron	agricultural run-off
Porters Bayou, Bolivar Co	02-Aug-95	unknown	unknown	unknown	unknown
Porters Bayou, Sunflower Co	02-Aug-95	unknown	unknown	unknown	unknown
unnamed stream, Newton Co	10-Aug-95	unknown	unknown	sewage/ low D.O.	overflowing manhole
Private Pond, Covington Co	14-Aug-95	~2000	~1 acre	pesticide/ chlorpyrifos	unknown
unnamed bayou, Quitman Co	02-Sep-95	~1000	~.25 miles	unknown	unknown

WATERBODY	DATE	# FISH	AREA AFFECTED	CAUSE	SOURCE
unnamed bayou, Yazoo Co	20-Sep-95	unknown	unknown	low D.O.	natural
Lead Bayou, Bolivar County	19-Oct-95	~2100	~.5 miles	lack of water	homeowner irrigation
Bogue Chitto River, Lincoln County	14-Dec-95	~<50	unknown	unknown	unknown
Old River Chute, Issaqueena County	16-Jan-96	~200	unknown	unknown	unknown
Private Pond, Rankin County	06-Mar-96	>100	entire pond	low D.O.	natural
Tallahala Creek, Jones Co	29-Mar-96	~50	~2 miles	low D.O.	natural
Private Lake, Panola County	12-Apr-96	~700-1000	unknown	unknown	unknown
Sardis Res, Lower Lake, Panola Co	02-May-96	~200,000	entire lake	low D.O.	natural
Private Pond, Rankin County	02-May-96	500-600	entire pond	low D.O.	Castlewoods lagoon
Yazoo Lake, Yazoo County	02-May-96	~300	n. section	ammonia	Helena Corp. runoff
Private Pond, Lincoln County	14-May-96	~500	entire pond	low D.O.	unknown
Private Pond, Desoto Co	22-May-96	unknown	entire pond	low D.O.	natural
Private Pond, Smith County	13-May-96	~1000	entire pond	low D.O.	natural
Eastover Lake, Hinds Co	31-May-96	~2000	entire lake	low D.O.	natural
Tallahala Creek, Jones Co	05-May-96	unknown	unknown	unknown	unknown
North Pointe Lk, Madison Co	21-June-96	~4000	entire lake	Chlorpyrifos	construction runoff
Steele Bayou, Issaqueena Co	03-July-96	unknown	at control structure	low D.O.	natural
Private Pond, Issaqueena Co	05-July-96	~50	entire pond	low D.O.	natural
Un-named Trib. @ Ceres Ind. Park Lagoon, Warren County	20-July-96	50-100	500 yards	unknown possbly low D.O.	lagoon runoff
Compress Lake, Marion Co	22-July-96	~500	entire lake	ammonia	refrigerant disposal runoff
Broad Lake, Yazoo County	30-July-96	~500	~entire lake	suspect Curacron	agricultural runoff
Pearl River-Backwater @Fortification St., Hinds Co	02-Aug-96	75-100	entire area	unknown	unknown
Private Pond, Washington Co	08-Aug-96	unknown	unknown	unknown	unknown
Private Pond, Madison Co	23-Aug-96	40-60	entire pond	unknown	unknown
Clear Creek, Madison Co	29-Aug-96	unknown	unknown	unknown	unknown
Horn Lake, Desoto Co	06-Sept-96	~50	unknown	unknown	unknown
Eastover Lake, Hinds Co	17-Sept-96	25-30	unknown	low D.O.	natural
Private Pond, Scott County	11-Oct-96	<10	entire pond	low D.O.	sewage runoff- Morton WWTP
American Legion L, Chickasaw Co	22-May-97	~300	entire lake	low D.O.	natural
Private Pond, Lincoln Co	28-May-97	>50	entire pond	low D.O.	runoff related
Bayou Portage, Harrison Co	2-June-97	200-300	unknown	unknown	unknown
Private Pond, Desoto Co	17-June-97	~200	entire pond	Chlorpyrifos	runoff- home termite trtmnt
Private Pond, Jackson Co	09-July-97	~400	entire pond	low D.O.	natural

WATERBODY	DATE	# FISH	AREA AFFECTED	CAUSE	SOURCE
Private Lake, Desoto Co	15-July-97	unknown	unknown	possible low D.O.	possible stormwater runoff
Main Canal, Washington Co	18-July-97	>1000	3 miles	low D.O.	surfactants
Desoto Lake-Sherman Chute, Coahoma County	24-July-97	unknown	3 miles	low D.O.	natural
Hennessey Bayou, Warren Co	31-July-97	3,000-5,000	unknown	low D.O.	natural
Eagle Lake, Warren Co	03-Aug-97	~1,000	Muddy Bayou nr mouth	low D.O.	unknown
Un-named Trib. of Stinson Creek, Lowndes County	05-Aug-97	10-12	unknown	low D.O.	natural
Eagle Lake, Warren Co	10-Aug-97	~2,000	"Float Row" vicinity	possible pesticides	unknown
Cassidy Bayou, Tallahatchie County	14-Aug-97	1,000-4,000	near Webb, MS	possible pesticides	unknown
Snake Creek, Bolivar Co	18-Aug-97	8-9	unknown	unknown	unknown
Tchula Lake, Holmes Co	20-Aug-97	100	unknown	possible pesticides	unknown
Deer Creek, Washington Co	25-Aug-97	~1,000	7 stream miles	Profenofos	drift from aerial applicator
Private Pond, Desoto County	12-Sept-97	~1,000	entire pond	Chlorpyrifos	runoff- home termite trtmnt
Eagle Lake, Warren Co	29-Sept-97	~3,000	Winthrop Chute	low D.O.	natural
Un-named Trib., Copiah Co	24-Nov-97	12	unknown	unknown	unknown
Eastover Lake, Hinds County	04-May-98	~100	entire lake	Chlorpyrifos	construction runoff
Private Pond, Hinds County	05-May-98	>500	entire lake	low D.O.	natural
Keegan's Bayou nr. Biloxi Bay, Harrison County	09-May-98	>40,000	s. shore of Keegan's Bayou	ammonia	unknown
Pascagoula Beach on Beach Blvd.	29-May-98	>300	2 mile of beach	trawl nets	fishermen
Private Lake, Simpson Co	21-June-98	5632	entire lake	unknown	unknown
Deer Creek, Warren County	12-June-98	unknown	unknown	low D.O.	natural
Deer Creek, Warren County	23-June-98	unknown	unknown	low D.O.	natural
Tallahala Creek, Hinds Co	30-June-98	>200	unknown	low D.O.	natural
Private Pond, Neshoba Co	17-July-98	~100	entire pond	low D.O.	natural
Private Pond, Harrison Co	22-July-98	unknown	entire pond	low D.O.	sewage leak
Cassidy Bayou, Tallahatchie County	28-July-98	unknown	unknown	unknown	unknown
Yazoo Pass nr. Moon Lake,			Confl.		

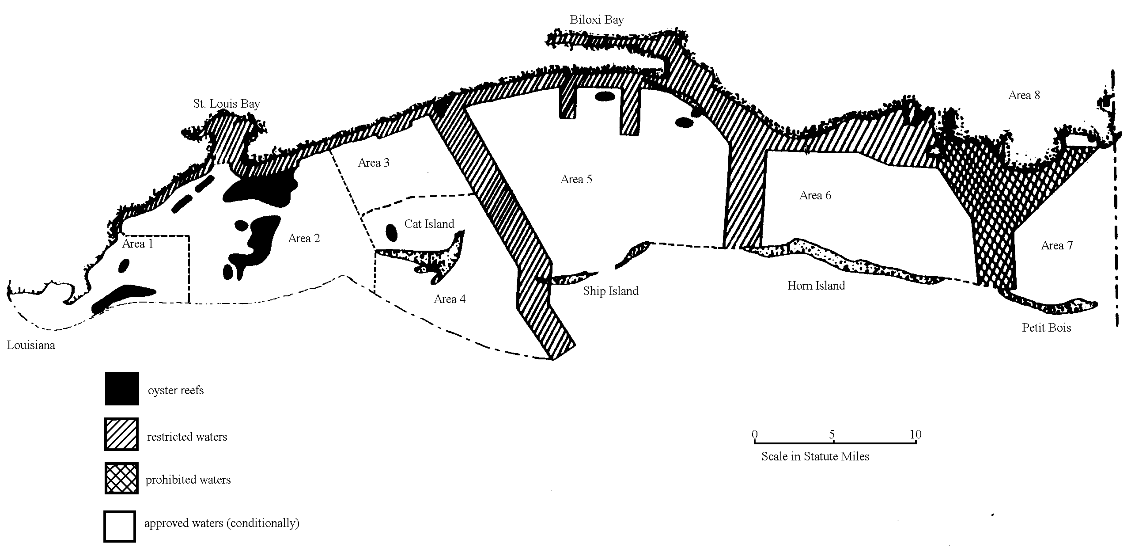
WATERBODY	DATE	# FISH	AREA AFFECTED	CAUSE	SOURCE
Coahoma Co	14-Aug-98	~100	Yazoo Pass / Moon Lk.	low D.O.	natural
Horsehoe Lake, Holmes Co	17-Aug-98	~5,000	4 mile stretch	pesticides	pesticide runoff
Lake Whittington Bolivar Co	09-Oct-98	~1,000	Confl. Lk. Whittington / MS Rvr.	unknown	unknown
Biloxi Bay Harrison Co	09-Oct-98	~3,000	Canal btwn Palace Casino & boat yard	low D.O.	Industrial discharge

Shellfish Restrictions

Most of the major shellfish harvesting areas in Mississippi waters are classified as conditionally approved or restricted. The restrictions are due primarily to the effects of nonpoint source pollution from urban runoff and unsewered communities. A map of shellfish growing areas and their classifications is given in Figure III-7. Fecal coliform studies have shown wide fluctuations in fecal counts (MPN) due to rainfall and/or high riverstages. This continues despite improvements in wastewater treatment and collection. These fluctuations are likely a result of private septic systems located in each area's watershed. However, coliform levels are frequently above water quality standards, and oyster harvesting is halted until approved conditions are met.

FIGURE III-7

Shellfish Growing Areas



Sediment Contamination

At present, limited data is available from Mississippi waterbodies on sediment contamination due to toxicants. However, elevated levels of agrichemicals would be expected in sediments of lakes in the Delta region due to past agricultural activities. Likewise, contamination in sediments of waterbodies in certain industrial areas of the state could also be expected.

Routine ambient sampling of sediments has only recently become incorporated into the monitoring program at MDEQ. Beginning in 1996, sediment samples were specified for collection as the OPC Surface Water Ambient Monitoring Network was re-designed. Actual sampling began in 1997 with sediments analyzed for heavy metals and organics at selected Primary Ambient Network sites. By far the most intensive sediment sampling done to date by MDEQ has occurred as a part of the Mississippi Mercury study, and has involved collection of sediments for mercury analysis from nearly 140 sites throughout the state.

OPC's Hazardous Waste Division and Field Services Division periodically conduct emergency response or hazardous waste sampling investigations in which sediment samples may be taken. When such investigations are done, they may typically include the collection of on-site soil or water samples, groundwater samples from temporary monitoring wells or nearby potable water wells, and sediment and/or surface water samples from ditches or streams in close proximity to the site. Additional available ambient sediment information is provided mainly by the federal agency nearshore coastal monitoring efforts of National Oceanic and Atmospheric Administration (NOAA) and EPA's Environmental Monitoring and Assessment Program (EMAP). Another source of sediment information, which provides additional site-specific data, is special project monitoring such as that carried out by the U.S. Army Corps of Engineer (USACE) Districts and the U.S. Geological Survey.

Sampling from NOAA's Status and Trends Program has revealed sediment contamination from total PAH (polynuclear aromatic hydrocarbons) at a site in Biloxi Bay. EPA's EMAP sampling in 1991 and 1992 has indicated potential low-level sediment toxicity at a few stations in the Mississippi Sound.

The USACE Vicksburg District conducted sediment monitoring for the Big Sunflower River Maintenance Project in 1992-1995, in Steele Bayou in 1995 and in the Little Sunflower River in 1998.

During 1994-95, the USACE Mobile District evaluated sediments from Pass Christian Harbor and Bayou Casotte/Upper Mississippi Sound following procedures outlined in the EPA/CE Inland and Ocean Disposal Testing Manuals. Results of these evaluations, which included bulk sediment chemistry, toxicity, and bioaccumulation analyses, indicated that disposal of materials dredged from these projects would not violate applicable standards. As compared to a reference site in the Grand Bay, Alabama area, sediments from the Bayou Casotte showed some enrichment in heavy metals including arsenic, beryllium, cadmium, chromium, copper, lead, nickel, and silver. However, values were within one order of magnitude of the reference station concentrations. In addition, analyses at one Bayou Casotte station revealed low levels of several PAH compounds.

For the 10-day bioassay, survival of the amphipod, Ampelisca abdita, was between 94 and 100 percent for the test stations, 95 percent for the reference, and 99 percent for the control. For Nereis virens, survival in both 10-day and 28-day tests was at least 96 percent for all test, reference, and control samples. Twenty eight-day bioassays performed using Macoma nastuta showed survival between 98-99 percent for the Bayou Casotte samples, 89 percent for the reference, and 90 percent for the control. Tissue samples of M. nastuta and N. virens, exposed in 28-day bioaccumulation tests, were analyzed for ten metals and cyanide. With two minor exceptions, tissue concentrations detected in organisms from the Bayou Casotte exposure were not significantly different from tissue concentrations in animals from the reference sediments. Only lead was shown to be significantly different from the reference in Macoma tissue from two test sediment locations. Concentrations (in mg/kg) were 1.8 and 1.6 as compared to 1.1 in the reference.

Sediments from seven locations within Pass Christian Harbor were analyzed for priority pollutants. These sediments were found to have relatively low concentrations of PAH compounds and metals. Most chemicals on the target list were below detection limits. PAH compounds were within an order of magnitude of the laboratory MDL. Most metal concentrations were within an order of magnitude of the reference values. An elutriate study was performed on beryllium, which was detected at concentrations of 0.63-1.8 mg/kg. Results of the elutriate analyses indicated that the potential for beryllium release during dredging was minimal. Elutriate concentrations ranged from <0.1 ug/L (laboratory MDL) to 0.13 ug/L.

Closures of Surface Drinking Water Supplies

No surface drinking water supplies were temporarily or permanently closed during the 1992 through 1997 reporting period due to toxic or conventional pollutants. All surface waters (three river segments and two reservoirs) currently used for public water supplies fully support this use according to finished water monitoring data. There are no Maximum Contaminant Level exceedances, no advisories, and no closures. All water treatment systems use only conventional treatment practices.

Closures of Bathing Areas

Until recently, on-going routine bathing beach monitoring in Mississippi has mostly been confined to several U.S. Army Corps of Engineers (USACE) and U.S. Forest Service (USFS) lake recreational areas. Beginning in 1997, in response to increased concern over the lack of routine bacteriological monitoring on Mississippi’s coastal bathing beaches, OPC cooperated with the Gulf Coast Research Laboratory (GCRL) and EPA's Gulf of Mexico Program to reestablish a coastal beach monitoring program to address this concern. Sampling is occurring weekly to monthly along the entire length of Mississippi’s Gulf Coast public beaches. In addition, a multi-agency task force was created composed of representatives from OPC, Mississippi Department of Health, Mississippi Department of Marine Resources, GCRL and the EPA Gulf of Mexico Program to address public health issues regarding the program. For more information on the

OPC beach monitoring program, see the Coastal Beach Monitoring Program section on page 125.

The USACE Mobile District bathing beach monitoring began in 1990. Sampling occurs weekly to monthly during the recreation season at all USACE managed beaches on Okatibbee Lake and on the Tennessee-Tombigbee Waterway. The frequency of testing is determined by prior site history, location, use, and site manager preference.

The USFS presently monitors recreational lakes on National Forest Service lands weekly during the summer for total and fecal coliform bacteria. Results to date from these programs have yielded no fecal coliform levels of concern.

For the period 1992-1997, no incidents or closures of bathing areas have been reported at any public lake or along the beaches of the Gulf Coast based on sampling. One lake voluntarily closed following a cluster of at least 14 shigellosis cases in persons using the facility.

Incidents of Waterborne Disease

The only documented incidents of waterborne disease were the shigellosis cases sited above and vibrio infections. These vibrio cases were wound infections from exposure to waters along the Gulf Coast or from the ingestion of raw or undercooked shellfish. Vibro species reported included *V. vulnificus*, and *V. parahaemolyticus*. No *V. vulnificus* cases were reported from consumption of raw shellfish harvested from Mississippi costal waters. The State averages 6-9 cases of all noncholera Vibrio cases annually with about one-half wound related and the other half from ingestion of raw or undercooked shellfish.

CHAPTER EIGHT

BASIN/WATERBODY INFORMATION

Introduction

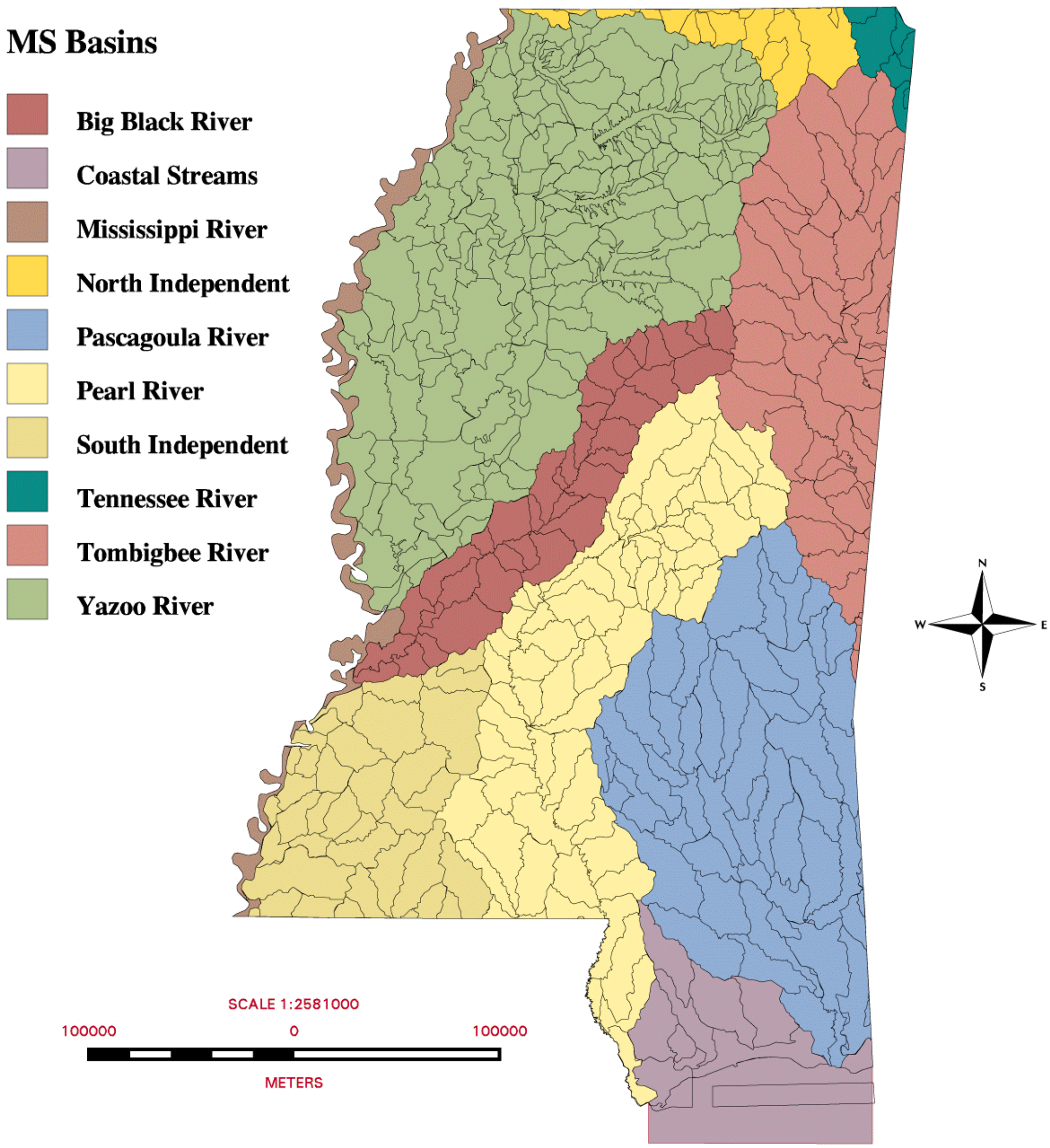
The waters of Mississippi are divided into ten (10) major basins. The ten basins are the Big Black River Basin, the Coastal Streams Basin, the Mississippi River Basin, the North Independent Streams Basin, the Pascagoula River Basin, the Pearl River Basin, the South Independent Streams Basin, the Tennessee River Basin, the Tombigbee River Basin and the Yazoo River Basin. The basins' boundaries are shown in Figure III-8.

In this section, a brief description of the hydrology and the general water quality of each basin is given. In addition, special waterbody classifications, permitted major sources, noteworthy items, recent environmental damage assessments and recent water quality surveys by MDEQ and other agencies are given. Tables listing monitoring stations used for the 1998 assessment and showing use support information based on the type of data collected are included. Monitoring data were compared to applicable State water quality numeric criteria. In addition, for select water quality parameters having no specified numeric criteria, data were compared to target values which, based on best professional judgement, indicate threshold levels of water quality concern. These target values are based on “literature” or scientific “rules of thumb” that are used as potential indicators of water quality degradation. Parameter-specific use support determinations were then made according to EPA guidance and the data rated as fully supporting, fully supporting but threatened, partially supporting, or not supporting. Maps showing the locations of the monitoring stations are also provided.

Use support decisions were made based on a cumulative evaluation of all the monitoring data coupled with the Section 319 Nonpoint Source Assessment Report listing and other existing and readily available information. Since biological assessments reflect chronic, synergistic water quality effects, greater weight was given to the biological rating for the aquatic life support use support decision. A complete discussion of the use support decision-making process is found in the Assessment Methodology and Summary Data section beginning on page 85.

FIGURE III-8
State of Mississippi

Basins & Watersheds



Source: MDEQ 1996

BIG BLACK RIVER BASIN

Description

The Big Black River Basin lies totally within the state and is composed of 3,400 square miles. The basin is 155 miles long, averages 22 miles in width and has approximately 6,360 linear miles of river and streams. This basin originates in north-central Mississippi and flows southwesterly to the Mississippi River. The Big Black River itself enters the Mississippi River just south of Vicksburg after flowing approximately 300 miles. Major tributaries to the Big Black River include Big Bywy Ditch, Zilpha Creek, Apookta Creek, Doaks Creek, Bear Creek, Bogue Chitto Creek and Fourteen Mile/Bakers Creek. The basin is sparsely populated and is hilly to gently rolling and largely forested. However, significant amounts of cattle ranching and farming are present. Oil and gas production is a major industry in the area. The Big Black River Basin does not have large scale development and most of its tributaries are wild and undeveloped, and thus are in a relatively natural condition. Some tributaries in this basin, however, are impacted by high chloride concentrations from oil field wastes. Others are subject to agricultural impacts.

Generally, the Big Black River and most of its tributaries, especially in the northern part of the basin, carry large amounts of suspended sediment and are very turbid most of the time. Some of the streams in the basin are muddy and slow-flowing, while others have relatively clear water and are swift with sandy bottoms. Overall, the water quality in the basin is rated as fair.

Special Classifications

None.

Permitted Major Sources

Canton HCR Site	MS0042455	Bear Creek	Canton
Winona POTW	MS0021024	Hays Creek	Winona

Noteworthy Items

1. Bogue Chitto Creek NPS project completed.
2. MDEQ Basinwide Approach management cycle begins in 1998 for Big Black River Basin

OPC Environmental Damage Assessments

None.

OPC Intensive Water Quality Surveys and Special Studies

1. Bogue Chitto Creek Watershed NPS Project (Hinds/Madison Counties, 1991-1995)

In 1991, the OPC began a five-year NPS monitoring project in the Bogue Chitto Creek Watershed located in northwest Hinds and southwest Madison counties. Cooperating agencies for the project included the Mississippi Soil and Water Conservation Commission (MSWCC) and the USDA Natural Resources Conservation Service (NRCS).

The watershed contains a total of 110,347 acres. Of this acreage, approximately 60% is in agricultural use and 32% is forested. The remainder is made up of urban and other miscellaneous land uses.

The project's primary goal was to improve water quality within the watershed through the implementation of terraces and buffer strips. These BMPs are designed to slow the rate of soil erosion. Besides improving water quality, the long term objective of the project was to make the public aware of what can be accomplished in the watershed by the use of BMPs. It was then anticipated that landowners would voluntarily implement BMPs on their land.

With assistance from EPA Region IV-Environmental Services Division, a water quality monitoring plan was developed and carried out by the OPC's Water Quality Assessment Branch (WQAB). This plan called for the selection of a smaller watershed (a sub-watershed) within the Bogue Chitto watershed to serve as a demonstration area. A pre-BMP versus post-BMP stormwater monitoring strategy was selected to make comparisons of water quality in runoff from a selected field. Quarterly basin monitoring, using a biological assessment approach at a single downstream station on Bogue Chitto Creek, was conducted before and after BMP implementation.

Basin monitoring consisted of six (6) surveys from the fall of 1991 through the fall of 1993. During the first survey, total phosphorus, total Kjeldahl nitrogen, total suspended solids and turbidity were measured. Basic field measurements such as pH, water temperature, dissolved oxygen, specific conductivity and stream stage were also taken. An additional two surveys included field parameters only. The remaining three surveys consisted of Rapid Biological Assessments (RBAs) along with measurement of field parameters.

Pre-BMP monitoring indicated that documenting water quality improvements in the Bogue Chitto Creek watershed would be very difficult, if not impossible. Runoff from land without BMPs masks some, if not all, of the water quality benefits resulting from the overall basin monitoring program. Much of the watershed is without BMPs since BMP installation is strictly voluntary. Therefore, basin monitoring was limited to annual RBAs and field measurements in 1993. Data were compared to 1991 data and a determination was made as to changes in water quality through the implementation of BMPs.

In the spring of 1993, a suitable pre-BMP/post-BMP demonstration farm was selected within the Bogue Chitto Creek watershed. Because of weather and resource constraints, only two rain events were monitored in 1993. Stormwater runoff samples were analyzed for herbicides, pesticides, solids and nutrients.

These pollutants were analyzed to determine stream loading due to runoff from conventional farming practices (without BMPs) employed on the field. BMP installation (terracing) was implemented in Spring, 1994 at the demonstration field. Post-BMP monitoring of two additional rain events was planned for 1994 during the same time period as the pre-BMP monitoring of 1993. However, due to staffing limitations, monitoring was delayed until July, 1995. Two rain events were monitored in 1995, one in July and one in December. Parameters described above were analyzed and compared to existing pre-BMP data. A final report discussing the effectiveness of terracing for improving water quality in the Bogue Chitto watershed has been completed.

A "Bogue Chitto Water Quality Field Day" was held in November 1993 by the MSWCC in cooperation with the USDA/NRCS, MDEQ and EPA. The purpose was to show farmers and citizens the types of cost effective BMPs that can be installed on agricultural fields to reduce pollutant loadings to neighboring streams. Over 15 farmers and citizens from the surrounding area toured the watershed to view BMPs.

Other Agency Water Quality Surveys

None known.

TABLE III-37
SUMMARY OF MONITORING DATA (1992 - 1997)
BIG BLACK BASIN

Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	PHYSICAL/CHEMICAL DATA Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	Fsh	Bio Stat	USE SUPPORT AQ	FC	SHL	SC	CR	DW
MS441BE1	BAKERS CREEK NEAR CLINTON	VMB003V02-BC1	F	F	P						F								P					
MSLBGBKRM1	BIG BLACK RIVER NEAR CANTON AT HWY 16	D07289540	F	P	F	F	F	N	F	N	N	P	F	P	P	F			P			P		
MSLBGBKRM2	BIG BLACK RIVER NEAR BOVINA AT HWY 80	D07290000 G07290000	F	F	F			N	F	N	N		F	F	P			P	T			P		
MSUBGBKRE	BIG BLACK RIVER NEAR KILMICHAEL BELOW HWY 413	D07289220-40															F			F				
MS422M1	BIG BLACK RIVER, UNNAMED TRIBUTARY OF AT DURANT ABOVE DURANT POTW OUTFALL	DBB001D00-DUR1																N	N					
MS422M2	BIG BLACK RIVER, UNNAMED TRIBUTARY OF AT DURANT BELOW DURANT POTW OUTFALL	DBB001D00-DUR2																N	N					
MS422M3	BIG BLACK RIVER, UNNAMED TRIBUTARY OF AT DURANT WEST END OF CHANNELIZED DITCH	DBB001D00-DUR3																N	N					
MS436M	BOGUE CHITTO CREEK NEAR FLORA AT HWY 22	D07289755	F	P	N								F					P	P					
MS409M1	PIGEON ROOST CREEK, UNNAMED TRIBUTARY OF AT MABEN ABOVE MABEN POTW OUTFALL	DMB002D05-UT1	F	F	F		F	F	F	F		F	F					N	N					
MS409M2	PIGEON ROOST CREEK, UNNAMED TRIBUTARY OF AT MABEN BELOW MABEN POTW OUTFALL	DMB002D05-UT3	F	F	N		N	N	F	N		F	F					N	N					
MS413PM1	POPLAR CREEK AT FRENCH CAMP ABOVE FRENCH CAMP POTW OUTFALL	DMB002D04-P1	F	F	F		F	F	F	F		F	F					P	P					
MS413PM2	POPLAR CREEK AT FRENCH CAMP BELOW FRENCH CAMP POTW OUTFALL	DMB002D04-P3	F	F	F		F	F	F	F		F	F					P	P					
MS419ZM	SCOOBACHITA CREEK NEAR HESTERVILLE	D07289333																T	T					
MS440E1	SHILOH CREEK NEAR EDWARDS	VMB003V01-SC1	F	F	F						F							F	F					
MS435M1	TOWN CREEK AT BENTONIA ABOVE BENTONIA POTW OUTFALL	DMB002D01-TC1	F	F	F		F	F	F	F		F	F					P	P					

HEADER ABBREVIATIONS: Tmp-Temperature, pH-Acidity/Alkalinity, DO-Dissolved Oxygen, COD-Chemical Oxygen Demand, TOC-Total Organic Carbon, TKN-Kjeldahl Nitrogen, N+N-Nitrite & Nitrate, TP-Total Phosphorus, Turb-turbidity, TSS-Total Suspended Solids, Cndct-Conductivity, FCU-Fecal Coliform (Upper Limit), FCL-Fecal Coliform (Lower Limit), TOX-Toxicants, Wtr-in Water Column, Fsh-in Fish Tissue, BIO Stat-Biological Rating (macroinvertebrates)

10/20/99

USE SUPPORT STATUS: F-Fully Supported, T-Fully Supported but Threatened, P-Partially Supported, N-Not Supported, *-Fish Advisory

WATERBODY (WB) USE CLASSIFICATIONS: AQ-Aquatic Life Support, FC-Fish Consumption, SHL-Shellfish Harvesting, SC-Secondary Contact Recreation, CR-Contact Recreation, DW-Raw Water Supply

AGENCY ABBREVIATIONS: C-USACE, D-MSDEQ, E-USEPA, F-USFS, G-USGS, I-Inst. of Higher Learning, M-DMR, N-NOAA, T-TVA, V-Volunteer Monitor

TABLE III-37
SUMMARY OF MONITORING DATA (1992 - 1997)
BIG BLACK BASIN

Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	PHYSICAL/CHEMICAL DATA Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	Fsh	Bio Stat	USE SUPPORT AQ	FC	SHL	SC	CR	DW
MS435M2	TOWN CREEK AT BENTONIA BELOW BENTONIA POTW OUTFALL	DMB002D01-TC3	F	F	F		F	F	F	N		F	F					P	P					

HEADER ABBREVIATIONS: Tmp-Temperature, pH-Acidity/Alkalinity, DO-Dissolved Oxygen, COD-Chemical Oxygen Demand, TOC-Total Organic Carbon, TKN-Kjeldahl Nitrogen, N+N-Nitrite & Nitrate, TP-Total Phosphorus, Turb-turbidity, TSS-Total Suspended Solids, Cndct-Conductivity, FCU-Fecal Coliform (Upper Limit), FCL-Fecal Coliform (Lower Limit), TOX-Toxicants, Wtr-in Water Column, Fsh-in Fish Tissue, BIO Stat-Biological Rating (macroinvertebrates)

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USE SUPPORT STATUS: F-Fully Supported, T-Fully Supported but Threatened, P-Partially Supported, N-Not Supported, *-Fish Advisory

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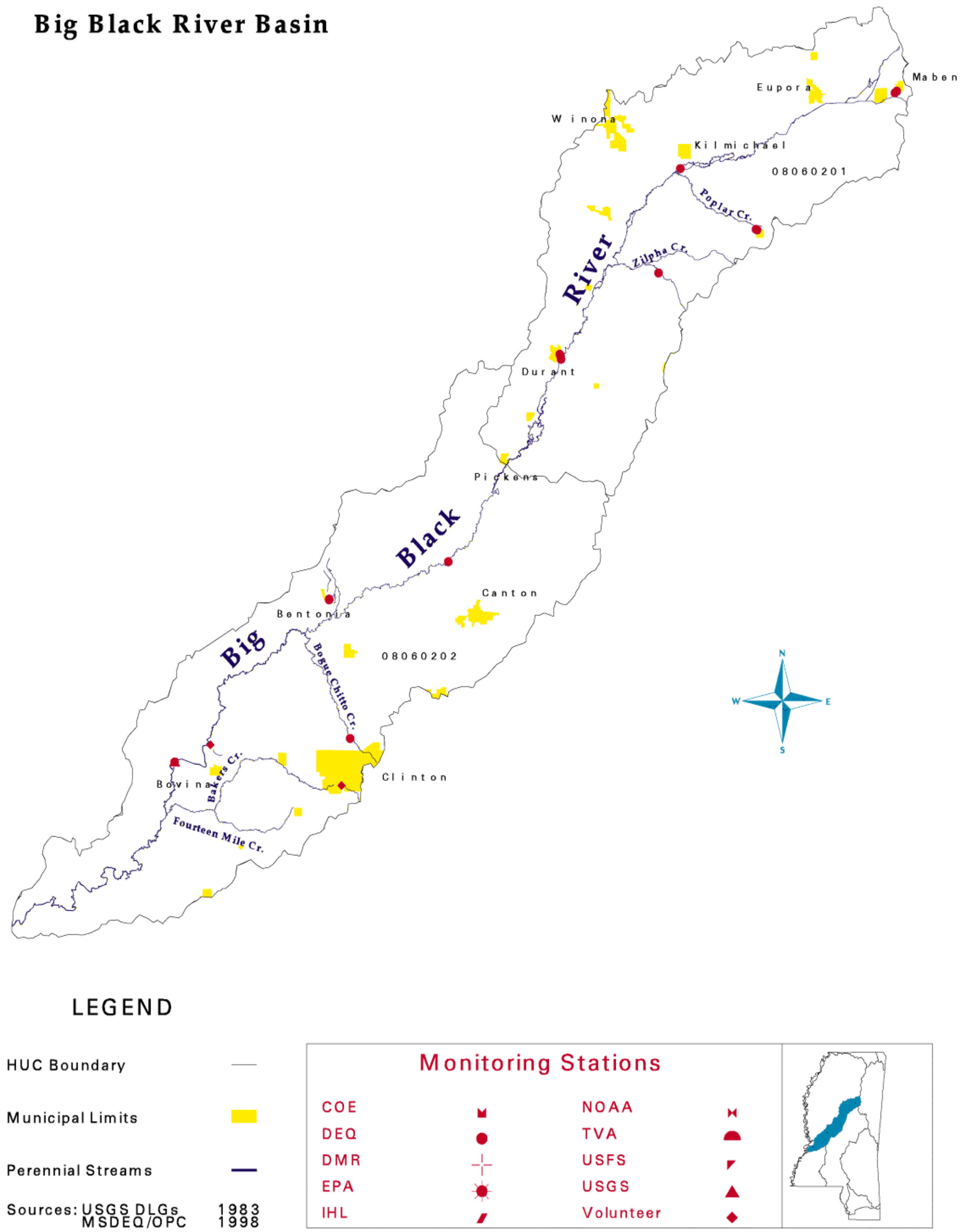
AGENCY ABBREVIATIONS: C-USACE, D-MSDEQ, E-USEPA, F-USFS, G-USGS, I-Inst. of Higher Learning, M-DMR, N-NOAA, T-TVA, V-Volunteer Monitor

FIGURE III-9

Locations of Monitoring Stations



COASTAL STREAMS BASIN

Description

The Coastal Streams Basin includes 1,545 square miles of southern Mississippi. The inland areas of this basin are predominately rural with agriculture and silviculture being the major land uses, while the area along the coast has heavy urban, industrial, and recreational developments. The topography ranges from extensive pine forests and low rolling hills in the upper basin to low-lying flatlands and salt marsh on the coast. This basin includes the Biloxi Bay, St. Louis Bay, and Mississippi Sound estuaries. Other major waterways include the Tchoutacabouffa, Biloxi, Wolf, and Jourdan Rivers. Typically streams and rivers are shallow and clear, with moderate flow in the upper reaches and gradually become wider and deeper with more sluggish flow toward the coast due to tidal influence and the change in topography. Water quality tends to be good to excellent for the freshwater portion of the basin. Along the coast, overall water quality is rated as fair to good, with impacts occurring primarily due to elevated nutrient and bacteria levels. Impacts occur from the many point and nonpoint pollution sources concentrated in this heavily populated area.

Special Classifications

Bangs Lake	Shellfish Harvesting	From Hdwtrs to Mississippi Sound
Bayou Cumbest	Shellfish Harvesting	From Hdwtrs to Mississippi Sound
Biloxi Bay	Shellfish Harvesting	From Hwy 90 Bridge to Miss. Sound
Davis Bayou	Shellfish Harvesting	From Hdwtrs to Biloxi Bay
Graveline Bay	Shellfish Harvesting	From Hdwtrs to Graveline Bayou
Graveline Bayou	Shellfish Harvesting	From Graveline Bay to Miss. Sound
Mallini Bayou	Shellfish Harvesting	From Hdwtrs to St. Louis Bay
Pass Christian Reef-	Shellfish Harvesting	Mississippi Sound Henderson Point
St. Louis Bay	Shellfish Harvesting	Harrison-Hancock Counties
Jourdan River	Recreation	From Confluence of Dead Tiger Cr. and Catahoula Cr. to Hwy 43
Jourdan River	Recreation	From Hwy 43 to St. Louis Bay
Mississippi Sound	Recreation	From LA to AL Statelines
Tchoutacabouffa River	Recreation	From Hdwtrs to Back Bay of Biloxi
Tuxachanie Creek	Recreation	From Hdwtrs to Tchoutacabouffa R.
Wolf River	Recreation	From Hwy 26 to St. Louis Bay

Permitted Major Sources

Chevron USA Products Co	MS0001481	MS Sound/Bayou Cassotte	Pascagoula
Diamondhead Water/Sewer Dist.	MS0046078	Jourdan River	Bay St. Louis
E I DuPont De Nemours-DeLisle	MS0027294	St. Louis Bay	DeLisle
GC/West Jackson County POTW	MS0045446	Costapia Bayou	Pascagoula
HC/D'Iberville POTW	MS0042340	Back Bay of Biloxi	D'Iberville
HC/East Biloxi POTW	MS0023159	Back Bay of Biloxi	Biloxi
HC/Gulfport POTW	MS0023345	Bernard Bayou	Gulfport
HC/Long Beach-Pass Christian	MS0043141	Bayou Portage	Gulfport
HC/West Biloxi POTW	MS0030333	Back Bay of Biloxi	Biloxi
Miss. Army Ammunition Plant	MS0040797	Mike's River	Bay St. Louis
Mississippi Phosphates Corp.	MS0003115	Bayou Casotte	Pascagoula
Mississippi Power Company	MS0002925	Back Bay of Biloxi	Gulfport
SRWMD/Waveland POTW	MS0027847	Edwards Bayou	Waveland

Sterling Drug/Ash Corp. MS0002020 Brickyard Bayou Gulfport

Noteworthy Items

1. Back Bay of Biloxi Water Quality Modeling Project completed
2. Environmental impact of casinos on wetlands questioned
3. MDEQ beach monitoring program reestablished in 1997
4. MDEQ Ambient Basinwide Monitoring begins in 1998

OPC Environmental Damage Assessments

None.

OPC Intensive Water Quality Surveys and Special Studies

1. Back Bay of Biloxi Water Quality Modeling Project (1991-1996)

The Back Bay of Biloxi, located on the Mississippi Gulf Coast, is an estuarine system which lies principally in Harrison and Jackson Counties. The Bay is tidally influenced, with saline conditions often extending several miles inland. The major tributaries of the Bay, which provide freshwater inflow but are also tidally influenced, include Bernard Bayou, Biloxi River, Tchoutacabouffa River, and Old Fort Bayou. Waters in the Back Bay area are used for recreational activities and support fish and aquatic life. In addition, these waters receive the effluents of numerous industrial, municipal, and commercial wastewater facilities. The Bay and its tributaries also receive nonpoint source pollutants from surrounding rural and urban areas.

Federal and State laws require that the Back Bay of Biloxi and its tributaries support their designated uses by meeting appropriate water quality criteria. Shellfish harvesting, an important designated use in the Back Bay area, was banned about twenty years ago because of bacterial contamination. The discharge of pollutants must be regulated to eliminate or minimize adverse impacts upon the receiving waters. To achieve this, the Office of Pollution Control (OPC) must determine the maximum waste assimilative capacity for the Bay and its tributaries. With proper regulation, it is hoped, shellfish harvesting can be eventually restored in the Back Bay.

An important tool in allocating assimilative capacity among dischargers is the water quality model. The empirical water quality model currently used for the Bay is neither calibrated nor verified, and is outdated. Consequently, setting appropriate effluent limits and determining the impact of dischargers upon the Bay is difficult. Recognizing this limitation, the OPC is presently working on the development of a calibrated and verified mathematical model for the tidally influenced portion of the Back Bay of Biloxi and its tributaries. Secondary results of the work will be to define the existing water quality within the study area and evaluate the impact of existing point and nonpoint discharges of pollutants.

In 1991, the OPC requested and received a two-year grant for $250,000 from EPA (Region IV) to assess the water quality of the Back Bay. Preliminary water quality data (dissolved oxygen, temperature, salinity/conductivity) were collected by the OPC on two occasions in October 1991 at approximately sixteen sites in the Back Bay. A limited data search and contacts with other agencies and private interests in the Back Bay area were undertaken to acquire information concerning the problems and needs of the area. The OPC staff also visited all NPDES permitted facilities in the Back Bay area and pinpointed the outfall locations.

In July 1992, the OPC presented a request for proposal (RFP) to the Research Consortium of the Mississippi Institutions of Higher Learning. The objectives of the RFP were: 1) to develop a calibrated and verified comprehensive water quality model to be used essentially to determine the waste assimilative capacity of the Back Bay and its tidally influenced tributaries, and 2) to document the existing water quality of the Back Bay and its tributaries. Also, in 1992, a separate but related water quality study, The Back Bay of Biloxi Characterization Study, was conducted through the EPA-EMAP Program which provided additional environmental data on the Bay (see writeup below).

The Research Consortium organized a modeling applications task force consisting of the OPC, the Gulf Coast Research Laboratory (GCRL) and representatives from various universities under the Consortium. In addition, EPA Region IV was represented by Mr. Jim Greenfield (Water Management Division) and Dr. Steve McCutcheon, (Center for Water Quality Modeling, Athens, Georgia). Several meetings of the task force were held. In March 1993, EPA Region IV recommended specific actions to be taken by the OPC and the task force to accomplish the project's objectives.

To develop the overall water quality model, EPA recommended two separate sub-groups; one for the water quality model and another for the hydrodynamic model. The water quality sub-group is also responsible for interfacing the two models and developing the final model. EPA also recommended the services of a fish management expert to advise on the shellfishing issues of concern.

Based on these recommendations, the OPC refocused the scope of the project and reorganized the task force. In September 1993, the OPC requested and received a grant increase, bringing the total grant amount to $800,000. The prime objective is to develop a calibrated and verified comprehensive water quality model of the Back Bay of Biloxi.

In June 1993, a fresh water inflow study was initiated. This study was conducted by the OPC's Water Quality Assessment Branch (WQAB) and the Office of Land and Water Resources (OLW). The purpose of the study was to develop stage discharge relationships and determine water quality of the freshwater inflows into the Back Bay of Biloxi. The seven streams that provide significant freshwater inflow into the Back Bay are Turkey Creek, Bayou Bernard, Little Biloxi River, Biloxi River, Saucier Creek, Tuxachanie Creek, and Tchoutacabouffa River. All seven streams were sampled on a monthly basis above the zone of tidal influence . The data collected included stream flow, $CBOD_5$, TOC, COD, Nutrients, temperature, pH, D.O., TSS, conductivity, fecal coliform, E. Coli, and chlorophyll-a/pheophytin-a. This data will be used along with the data from the intensive sampling program. The freshwater inflow monitoring program continued through the spring of 1995.

In October 1993, the OPC executed a contract with the GCRL to develop the Back Bay model. GCRL subcontracted with Mississippi State University to develop the water quality model and tie it to the hydrodynamic model to be developed by the University of Southern Mississippi, Center for Ocean and Atmospheric Modeling (COAM) group. The spring of 1994 was spent in planning all the details of the project and other preliminary work. A tasks list for field data collection was finalized. Equipment was procured and calibrated, and staff were trained in the use of the equipment. Sampling points were selected.

The water quality and the hydrodynamic sub-groups had several meetings to finalize the grid size, coordinates, and resolution to make both models compatible. After consultations with EPA's ESD and ORD groups, the water quality sub-group decided to use the WASP model.

The protocols for sampling, laboratory analysis, and data recording were finalized in consultation with EPA's ESD group. The GCRL deployed weather stations and tide gauges and completed the bathymetric data collection for the hydrodynamic model. Fathometer, LORAN and GPS readings were taken along six transects.

Three intensive sampling surveys were conducted; one in September 1994, another in April 1995, and a final one in September 1995. During these intensive surveys, water quality and hydrodynamic data were collected simultaneously. EPA-ESD participated in the water quality data collection. The OPC-WQAB, OLW, and GCRL collected the hydrodynamic data. The OPC's laboratory, in cooperation with GCRL, provided the analytical services for the project.

The first intensive study, conducted from September 12 to 20, 1994, consisted of simultaneous hydrodynamic and water quality monitoring during the eight days of the survey. Hydrodynamic data collection for current velocity/direction, conductivity/salinity, and temperature occurred during two separate 24-30 hour continuous sampling windows, at a total of 20 stations in the Bay. Water quality sampling was conducted concurrently and at additional periods throughout the study at 21 stations. This sampling included water column sampling for CBOD ultimate, filtered and unfiltered $CBOD_5$, TOC, and nutrients, bacteria (fecal and total coliform), chlorophyll-a, and conventional field-measured parameters (D.O., temperature, specific conductance/salinity, and pH). The field parameters were measured through periodic longitudinal and cross-sectional depth profiling and continuous 36 hour Datasonde deployments. In addition, effluent sampling for the same parametric constituents was also conducted during the study period at five major municipal discharges, three major industrial/commercial discharges, and three seafood processors, which empty into the Back Bay of Biloxi.

The second intensive study, conducted during April 24 to 30, 1995, also consisted of simultaneous hydrodynamic and water quality monitoring during the seven days of the survey. Hydrodynamic data collection for tidal current velocity/direction occurred through long-term deployment of Endeco current meters, at approximately eight stations in the Bay. In addition, a circulation and dilution dye study was conducted on the City of Biloxi's (Keegan Bayou) POTW effluent, discharging into the Back Bay. Water quality sampling was conducted concurrently throughout the study at the same 21 stations and for the same parameters collected in the Bay during the low-flow study in September, 1994.

Field-measured parameters (D.O., temperature, specific conductance/salinity and pH) were again measured through both depth profiling and continuous 24-36 hour Datasonde deployments. In-situ sediment oxygen demand and light/dark bottle measurements for photosynthesis/respiration were added as new parameters for this intensive study. Effluent sampling was also repeated during this second study, with the five major municipal discharges and seven major industrial/commercial facilities which discharge into the Back Bay of Biloxi being sampled.

The third intensive study was conducted during September 26 to 28, 1995, by EPA-ESD with assistance from OPC-WQAB and GCRL. During this final survey additional work was done to determine chlorophyll-a, water column gross primary production (GPP), respiration(R), sediment oxygen demand (SOD), and diffusion and reaeration rates. Meteorological (wind speed and direction) and tidal data were also collected. As in the previous studies, ambient water quality (pH, DO, salinity, conductivity and temperature) at several locations in the Back Bay was determined. A circulation and dilution dye study was also conducted on Gulfport's POTW effluent discharging to the Gulfport Lake portion of Bernard Bayou.

In the development of a water quality model for the Back Bay of Biloxi, the Water Quality Analysis Simulation Program-5 (WASP5) was used. This model is capable of interpreting and predicting water quality responses to natural phenomena and man-made pollution.

The WASP5 system consists of three stand-alone computer programs, DYNHYD5, EUTRO5, and TOXI5, that can be run in conjunction or separately. The hydrodynamic program, DYNHYD5, simulates the movement of water by solving the one-dimensional equations of continuity and momentum, while the water quality program, EUTRO5, simulates the movement and interaction of pollutants within the water. TOXI5 can simulate the transport and transformation of one to three chemicals and one to three types of solids classes. The application of TOXI5 to the Back Bay of Biloxi is limited to the simulation of salinity as a conservative tracer. The models are considered to be the recommended EPA standard for dynamic analysis and are updated by the U.S. EPA Center for Exposure Assessment Modeling in Athens, Georgia. WASP5 is a dynamic compartment model that can be used to analyze a variety of water quality problems for aquatic systems, including both the water column and the underlying benthos. The time varying processes of advection, dispersion, point and non-point mass loading, and boundary exchange are represented in the basic program. WASP5 was chosen because of its flexibility in specifying the variable inputs, such as flows, loads, boundary conditions, and exogenous variables, such as extinction coefficient, temperature, etc., required to run the model. The most important reason for using WASP5 is the ease with which one is able to develop or modify the kinetic structure of the model. WASP5 was selected because of its detailed state-of-the-art kinetic formulations, the availability of technical support through EPA in Athens, Georgia, and the extensive testing and application of the model.

In early 1995 a preliminary trial model was calibrated to a set of 1977 historic field data and verified to another set of 1972 data from the Back Bay of Biloxi. The water quality constituents simulated by the model were carbonaceous biochemical oxygen demand, dissolved oxygen, ammonia nitrogen, nitrate nitrogen, organic nitrogen, total nitrogen, total phosphorus, and chlorophyll-a. The kinetics of major physical, chemical and biological processes which link these water quality constituents were modeled in each of the 376 segments of two-dimensional vertically mixed system. The results indicated that the model can predict trends and the concentrations of water quality constituents in the range of observed data taken at low and high tide conditions, but not absolute values in all cases.

This model was later modified using the data from the intensive survey of September 1994. The results from this model trial run indicated that the water quality of the Back Bay is controlled by the nitrogen input. The final model was calibrated and verified using the field data from the intensive surveys of September 1994 and April 1995. The water quality model was calibrated with the September data and verified with the April data. Results of these studies indicate that water quality in the Back Bay and tributaries, except for Gulfport

Lake, Bernard Bayou and Industrial Seaway, meet the criteria specified for the fish and wildlife designated use.

Long term goals for the Back Bay of Biloxi include modeling for storm events and bacteria. Additional data collection and funding will be required to implement management tools and achieve long range project goals. All water quality data collected during this project is being entered into STORET.

2. Back Bay of Biloxi Characterization Study (1992)

In August 1992, a cooperative effort involving the Gulf Coast Research Laboratory, U.S. EPA-Gulf Breeze Laboratory, U.S. EPA-EMAP (Near Coastal Program) and the OPC resulted in the Back Bay of Biloxi Characterization Study. This study attempted to characterize the water quality and overall ecosystem health of the Back Bay. Assessment procedures for differentiating estuarine sites impacted by chemical contaminants from pristine sites were also field tested. Sampling was conducted on approximately 25 stations located throughout the bay. Parameters measured included depth-profiled water quality parameters (dissolved oxygen or DO, temperature, salinity, pH and photosynthetically active radiation); continuous diurnal bottom measurements of DO, temperature, salinity, and pH; water column chemistry (total organic carbon or TOC, total phosphorus, and nitrogen series including ammonia); sediment samples for acid volatile sulfides, TOC, chemical contamination, toxicity, and general characterization for benthic evaluations; and fish tissue for species composition abundance, tissue chemistry and pathological aberrations. Water-column profiling and chemistry data were entered into STORET while the remainder of the data resides in the EPA EMAP Program database. Data are available through the EPA EMAP-NC Program in Gulf Breeze, Florida.

3. Study on Bayou DeLisle and Tributaries (1996)

A total of four sites in this watershed were bioassessed by the Biological Services Section during 1996 to determine the effects of the discharge from a landfill on this system. The water quality of Bayou DeLisle was also of interest due to a wasteload allocation request concerning a proposed casino development in the area. Bayou DeLisle drains into St. Louis Bay north of Pass Christian. Dissolved oxygen, pH, conductivity, and turbidity were among the parameters measured to provide supporting data for the bioassessment. An obvious difference in coloration of the water was noted at the sites below the landfill. Based upon comparisons made among these sites and a control, two of the sites below the landfill were judged to be partially supporting, and the site most removed from the landfill discharge was judged to be fully supporting but threatened.

4. Edwards Bayou Water Quality Study (1996)

In September 1996, the Water Quality Assessment Branch conducted a water quality study on Edwards Bayou near Waveland as part of a wasteload allocation (WLA) investigation. The purpose of this study was to gather a set of baseline data on the existing dissolved oxygen (DO) levels in the estuarine bayou below the existing 2.5 MGD wastewater discharge from the Southern Regional Wastewater District - Waveland Activated Sludge facility. Following a future expansion to 5.0 MGD, a follow-up study would be performed to assess any impact from this increased discharge flow. OPC had previously conducted a model calibration study on Edwards Bayou in 1984 which led to the construction of the existing Waveland Facility. In 1989, a follow-up survey was conducted to assess the impact of this upgraded facility on the water quality of the bayou. Water quality improvements were noted in Edwards Bayou compared to the 1984 study.

The study area for 1996 encompassed Edwards Bayou and two nearby bayous - Watts Bayou and Catfish Bayou. A total of 11 stations were monitored throughout the study area as well as the Waveland POTW effluent. These stations were sampled at four to six hour intervals over two tidal cycles. Parameters measured included depth-profiled in situ water quality parameters (DO, temperature, ph, specific conductance and salinity) and secchi transparency. Tidal sampling on high and low slack tides was conducted and the samples analyzed for TOC, nitrogen series, total and ortho-P, chlorophyll a and fecal coliform. Effluent monitoring was accomplished by a 24 hour composite and included the same parameters plus BOD5. Hydrolab multi-parameter data loggers were also deployed at 3 stations to monitor continuous DO, temperature, pH, specific conductance and salinity levels over the 48 hour period. Due to resource constraints, assessment of the study data was postponed. Post-expansion monitoring has not been scheduled as of this writing.

5. Basinwide Approach Monitoring - Coastal Streams Basin

As part of the Basinwide Approach to Water Quality Management, a basin fixed station network was established by OPC in the Coastal Streams Basin for 1998. Macroinvertebrate sampling, fish collection for fish tissue analysis, phytoplankton sampling for chlorophyll a analysis and water chemistry sampling was conducted at a total of 50 sites in addition to the Primary Ambient Network stations in the basin. Results are pending.

Other Agency Water Quality Surveys

1. Bangs Lake Shellfish Growing Water Restoration Project - MSU Coastal Research and Extension Center

The Bangs Lake Shellfish Growing Water Restoration Project was conducted in 1995 and 1996 by the Mississippi State University's Coastal Research and Extension Center. This study was sponsored by Jackson County, the EPA Gulf of Mexico Program, and the Mississippi Department of Marine Resources with support from the Mississippi Department of Health and the Jackson County Soil and Water Conservation District. This project investigated the impact of fecal coliform bacteria in Bayou Cumbest, Bangs lake and in Point Aux Chenes Bay near Pascagoula. Of special interest was the effectiveness of residential rock reed wastewater treatment systems in reduction of fecal coliform levels to these waters in this unsewered community. A total of fourteen monitoring stations in these estuarine waters were selected and monitored bi-weekly as well as influent and effluent sampling from three rock reed systems. Water quality parameters measured included temperature, dissolved oxygen, pH, salinity, nitrogen series, phosphorus, BOD5, and fecal coliform. Information about this project can be obtained from the MSU Coastal Research and Extension Center in Biloxi.

TABLE III-38
SUMMARY OF MONITORING DATA (1992 - 1997)
COASTAL BASIN

Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	TOX Fsh	Bio Stat	USE SUPPORT AQ	FC	SHL	SC	CR	DW
MS118E02M2	BACK BAY OF BILOXI																		T	T		P		
	NEAR BILOXI AT POPPS FERRY BRIDGE 1.5 MILES NORTHWEST OF BILOXI AND HWY 90	D02481270	F	P	F		F	N	F	P	F	F		P	P									
	AT D'IBERVILLE AT I-110 (MID CHANNEL)	D02481279	F	F	F		F	F	F	F					T									
	AT OCEAN SPRINGS AT L & N RAILROAD BRIDGE	D024812999	F		F												T							
	AT OCEAN SPRINGS NORTHEAST OVERBANK AT L & N RAILROAD BRIDGE	D646BBB01	F		F																			
	AT BILOXI SOUTHWEST OVERBANK AT L & N RAILROAD BRIDGE	D646BBB02	F		F																			
	NEAR BILOXI (MID CHANNEL) BETWEEN CMR 4 AND CMR 6 SOUTHEAST OF BIG ISLAND	D646BBB05	F		F																			
	AT BILOXI (MID CHANNEL) AT CMR 8 NORTH OF RHODES POINT	D646BBB07	F		F																			
	NEAR BILOXI (SOUTH OVERBANK) SOUTHWEST OF CMR 10 SOUTH OF LITTLE ISLAND	D646BBB09	F		F																			
	AT BILOXI AT I-110 (SOUTH OVERBANK)	D646BBB11	F		F		F	F	F	F					F									
	AT BILOXI (SOUTH OVERBANK) SOUTH OF GOAT ISLAND	D646BBB12	F		F																			
	NEAR BILOXI (MID CHANNEL) AT CMR 14 NORTH OF PARKHURST POINT	D646BBB14	F		F																			
	NEAR D'IBERVILLE NORTHEAST OF CMR 16 SOUTH OF O'NEAL POINT	D646BBB15	F		F		F	F	F	F					P									
	NEAR BILOXI (MID CHANNEL) EAST OF CMR 16 AT KEESLER AFB	D646BBB16	F	F	F		F	F	F	F					F									
	AT BILOXI SOUTHEAST OF CMR 16 AT KEESLER AFB	D646BBB17	F		F		F	F	F	F					P									
	NEAR BILOXI (MID CHANNEL) AT CMR 18 SOUTH OF DAMPHMAN POINT	D646BBB18	F	F	F		F	F	F	F														
	NEAR BILOXI (MID CHANNEL) AT CMR 20 WEST OF DAMPHMAN POINT	D646BBB19	F		F																			
	NEAR BILOXI (NORTH OVERBANK) NEAR BRASHER BAYOU	D646BBB20	F		F		F	F	F	F					F									
	NEAR BILOXI (MID CHANNEL) BETWEEN CMR 22 AND CMR 20 OFF BAYOU LA PORTE	D646BBB21	F		F		F	F	F	F					F									
	NEAR BILOXI (MID CHANNEL) AT CMG 23 EAST OF	D646BBB22	F		F																			

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TABLE III-38
SUMMARY OF MONITORING DATA (1992 - 1997)
COASTAL BASIN

Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	TOX Fsh	Bio Stat	USE SUPPORT AQ	FC	SHL	SC	CR	DW
	POPPS FERRY																							
	NEAR BILOXI WEST OF CEDAR POINT	D646BBB23	F	F	F		F	F	F	F														
	AT D'IBERVILLE WEST OF AVERY POINT	D646BBB24	F	F	F		F	F	F	F														
	NEAR BILOXI NORTHWEST OF O'NEAL POINT IN MAGNOLIA BEND	D646BBB25	F	F	F		F	F	F	F														
	NEAR BILOXI (SOUTH OVERBANK) NORTHEAST OF KEEGAN BAYOU	D646BBB26	F	F	F		F	F	F	F														
	NEAR BILOXI (SOUTH OVERBANK) BETWEEN CMR 4 AND CMR 6 SOUTHEAST OF BIG ISLAND	D646BBB27	F	F	F			F	F	F														
	NEAR OCEAN SPRINGS OFF FORT POINT SOUTHEAST OF POINT ASCOT	D646BBB28	F	F	F	N	F	F	F	P														
	NEAR OCEAN SPRINGS NORTH OF CMG 3 SOUTHEAST OF CHANNEL ISLAND	D646BBB29	F	F	F		F	F	F	F														
	NEAR BILOXI SOUTHEAST OF CEDAR POINT	D646BBB30	F	F	F		F	F	F	F														
	NEAR BILOXI (SOUTH OVERBANK) WEST OF CMR 10 NEAR LITTLE ISLAND	D646BBB31	F	F	F		F	F	F	F														
	NEAR BILOXI (MID CHANNEL) WEST OF CMR 4 SOUTHWEST OF CHANNEL ISLAND	D646BBB32	F	F	F		F	F	F	F														
	NEAR BILOXI NEAR GOAT ISLAND	ELA91SI36	F	F	P																			
	NEAR BILOXI (MID CHANNEL) AT CMR 18 SOUTH OF DAMPHMAN POINT	ELA92ST11	F	F	F		F	F	F	F														
	NEAR BILOXI WEST OF CEDAR POINT	ELA92ST20	F	F	F		F	F	F	F														
	AT D'IBERVILLE WEST OF AVERY POINT	ELA92ST21	F	F	F		F	F	F	F														
	NEAR BILOXI NORTHWEST OF O'NEAL POINT IN MAGNOLIA BEND	ELA92ST27	F	F	F		F	F	F	F														
	NEAR BILOXI (SOUTH OVERBANK) NORTHEAST OF KEEGAN BAYOU	ELA92ST34	F	F	F		F	F	F	F														
	NEAR BILOXI (SOUTH OVERBANK) BETWEEN CMR 4 AND CMR 6 SOUTHEAST OF BIG ISLAND	ELA92ST37	F	F	F		F	F	F	F														
	NEAR OCEAN SPRINGS OFF FORT POINT SOUTHEAST OF POINT ASCOT	ELA92ST40	F	F	F	N	F	F	F	P														
	NEAR OCEAN SPRINGS NORTH OF CMG 3 SOUTHEAST OF CHANNEL ISLAND	ELA92ST48	F	F	F		F	F	F	F														
	NEAR BILOXI SOUTHEAST OF CEDAR POINT	ELA92ST50	F	F	F		F	F	F	F														
	NEAR BILOXI (SOUTH OVERBANK) WEST OF CMR 10	ELA92ST59	F	F	F		F	F	F	F														

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TABLE III-38
SUMMARY OF MONITORING DATA (1992 - 1997)
COASTAL BASIN

Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	PHYSICAL/CHEMICAL DATA Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	Fsh	Bio Stat	USE SUPPORT AQ	FC	SHL	SC	CR	DW
	NEAR LITTLE ISLAND NEAR BILOXI (MID CHANNEL) WEST OF CMR 4	ELA92ST60	F	F	F		F	F	F	F														
	SOUTHWEST OF CHANNEL ISLAND AT BILOXI 100 YARDS OFF CLAY POINT	MM/5-16A	F												F									
	INDUSTRIAL WELL AT BILOXI WEST OF TURN BEACON NORTH OF	MM/5-23	F												F									
	TRAIN BRIDGE NEAR D'IBERVILLE TIP OF FORT BAYOU	MM/5-24	F												F									
	AT BILOXI AT BEACON OF STANDARD OIL OFF RHODES POINT	MM/5-25	F												F									
	AT D'IBERVILLE NORTH OF ST. MARTIN BAYOU	MM/5-26	F												F									
	AT BILOXI 300 FEET EAST OF BILOXI AND D'IBERVILLE BRIDGE (I-110) DRAW	MM/5-27	F												F									
MS109E02M	BANGS LAKE																				T		T	
	NEAR ORANGE GROVE MIDDLE OF BANGS BAYOU	MM/8-06	F												F									
	NEAR PASCAGOULA NORTH END OF BANGS LAKE	MM/8-09	F												F									
	NEAR PASCAGOULA ABOVE STATION 8-09	MM/8-09A	F												F									
	NEAR PASCAGOULA NORTH OF STATION 8-9A	MM/8-09B	F												F									
MS109BCUM	BAYOU CUMBEST																				P		PT	
	NEAR ORANGE GROVE UPPER BAYOU CUMBEST	MM/8-01	F												P									
	NEAR ORANGE GROVE LOWER BAYOU CUMBEST	MM/8-02	F												F									
	NEAR ORANGE GROVE EAST OF BANGS ISLAND AT MOUTH	MM/8-05A	F												F									
MS109BHM	BAYOU HERON																					T		
	NEAR ORANGE GROVE JUNCTION OF BAYOU HERON AND MATTIE CLARK BAYOU	MM/8-12	F												F									
	NEAR ORANGE GROVE UPPER BAYOU HERON ABOVE MATTIE CLARK BAYOU	MM/8-13A	F												T									
MS118BBM2	BERNARD BAYOU																		T			N		
	NEAR LANDON AT CANAL ROAD 2.0 MILES WEST OF LANDON	D02481194	F	N	F	F	F	P	F	F			F	F	N									
MS118BBM3	BERNARD BAYOU																		N			N		
	NEAR LANDON AT THREE RIVERS ROAD	D02481210	F		F		F	P	F	F					N									
	NEAR GULFPORT AT MILE 7.5	D02481212	F		N		F	F	F	F														
	NEAR GULFPORT AT MILE 7.0 (GULFPORT LAKE)	D02481212-40	F	F	N		F	N	F	F														

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COASTAL BASIN

Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	TOX Fsh	Bio Stat	USE SUPPORT AQ	FC	SHL	SC	CR	DW
		D02481212-50	F	F	N		F	N	N	N					P									
	NEAR GULFPORT AT MILE 6.8 (GULFPORT LAKE)	D02481212-70	F	F	F		F	N	F	N														
	NEAR GULFPORT AT MILE 6.6 (GULFPORT LAKE)	D02481212-85	F	F	N		F	N	F	F														
	NEAR GULFPORT AT MILE 6.4 (GULFPORT LAKE)	D02481253	F	F	N		F	F	F	N														
MS118BBM4	BERNARD BAYOU																		T			N		
	NEAR GULFPORT AT MILE 5.5	D02481258-40	F		T		F	N	F	F					F									
	NEAR GULFPORT AT MILE 4.0	D02481259-60	F		T		F	P	F	F					F									
	AT HANDSBORO AT MILE 2.5	D02481266	F	F	T		F	F	F	F														
	NEAR GULFPORT AT HANDSBORO BRIDGE	D024812665	F	P	F		P	N	F	N	F	F		N	N									
	NEAR HANDSBORO AT MILE 1.3	D024812665-60	F	F	F		F	N	F	F														
	NEAR HANDSBORO AT MILE 0.7 AT POWER LINE	D02481267-30	F		F		F	F	F	F					F									
	NEAR HANDSBORO AT BIG LAKE	D02481268	F	F	F		F	F	F	F														
MS118E01M	BIG LAKE																		T	F		P		
	NEAR BILOXI (MID CHANNEL) AT CMR 32 WEST OF GOOSE POINT	D646BGLK03	F		F		F	F	F	F					P									
	NEAR BILOXI SOUTHWEST OF LONG POINT	D646BGLK04	F		F		F	F	F	F					F									
	NEAR BILOXI NORTH OF CMR 30 SOUTHEAST OF LONG POINT	D646BGLK06	F	F	F		F	N	F	F														
	NEAR BILOXI SOUTHWEST OF LONG POINT	DCS013D00-GPT1															F							
	NEAR BILOXI NORTH OF CMR30 SOUTHEAST OF LONG POINT	ELA92ST39	F	F	F		F	N	F	F														
MS118E03M	BILOXI BAY																		T		P		T	
	NEAR OCEAN SPRINGS (MID CHANNEL) AT CMR 22 NEAR MARSH POINT	D647BBY02	F		F		F	F	F	F					F									
	AT OCEAN SPRINGS AT HWY 90 (NORTH OVERBANK) NEAR OCEAN SPRINGS YACHT CLUB	D647BBY04	F		F		F	F	F	F					F									
	AT OCEAN SPRINGS AT HWY 90 (MID CHANNEL)	D647BBY05	F	F	F		F	F	F	F					T									
	AT BILOXI AT HWY 90 (SOUTH OVERBANK)	D647BBY06	F		F		F	F	F	F					F									
	AT OCEAN SPRINGS AT EAST CHANNEL AND OCEAN SPRINGS HARBOR CONFLUENCE	MM/5-12	F												F									
	AT BILOXI 1/2 MILE SOUTH OF BILOXI BRIDGE IN EAST CHANNEL	MM/5-12A	F												F									
	AT OCEAN SPRINGS AT EAST BILOXI CHANNEL TURN BEACON	MM/5-13	F												F									
	AT OCEAN SPRINGS AT EAST BILOXI CHANNEL #22	MM/5-14	F												F									

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TABLE III-3B
SUMMARY OF MONITORING DATA (1992 - 1997)
COASTAL BASIN

Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	PHYSICAL/CHEMICAL DATA Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	Fsh	Bio Stat	USE SUPPORT AQ	FC	SHL	SC	CR	DW
	AT BILOXI AT BEACON AT POINT CADET MARINA	MM/5-16	F												F									
	AT OCEAN SPRINGS AT DAVIS BAYOU MOUTH	MM/5-17	F												F									
	NEAR BILOXI AT INSIDE TIP OF EAST END OF DEER ISLAND	MM/5-20	F												F									
	NEAR OCEAN SPRINGS AT EAST BILOXI CHANNEL MARKER #16	MM/5-21	F												F									
	AT BILOXI BEHIND GRAND CASINO ON BEACH	MM5-22A	F												F									
	AT BILOXI NEAR HWY 90 BRIDGE	NCS012N00-MSBB1															T							
MS116M2	BILOXI RIVER																		T	F		P		
	NEAR WORTHAM AT OLD HWY 49 1.5 MILES NORTH OF WORTHAM	D02480990	F	N	F	F	F	F	F	F			F	F	N									
	NEAR LYMAN	D02481130	F		F		F	F	F	F					F									
	NEAR WOOLMARKET NORTH OF I-10	D02481150															F							
	NEAR LORAINE AT MILE 2.8	D02481170-25	F	F	F		F	N	F	F														
	NEAR BILOXI AT MILE 1.0	D02481170-80	F	F	F		F	F	F	F														
	NEAR BILOXI AT MILE 0.0	D02481269	F	F	F		F	F	F	F														
MS112E1	CATAHOULA CREEK																		F					
	NEAR SANTA ROSA	VMB003V04-CC1	F	N	F						F							F						
MS109M1	CROOKED BAYOU																					T		
	NEAR ORANGE GROVE EAST OF BAYOU CUMBEST	MM/8-02A	F												F									
MS114M2	DELISLE BAYOU																		P					
	NEAR DELISLE FROM HEADWATERS TO I-10	DCS014D00-BD1																P						
		DCS014D00-BD2																P						
MS114M4	DELISLE BAYOU																		T					
	NEAR DELISLE ABOVE LO BUOY RD FROM I-10 TO COUNTY RD BELOW LO BUOY RD	DCS014D00-BD3																T						
MS114M1	DELISLE BAYOU, UNNAMED TRIBUTARY																		P					
	NEAR DELISLE ABOVE CUNNINGHAM ROAD FROM HEADWATERS TO CONFLUENCE WITH DESLISLE BAYOU	DCS014D00-UT1																P						
MS118E03M	GRAND BAYOU																				P		T	
	NEAR BILOXI INSIDE DEER ISLAND	MM/5-15	F												F									
MS118E04M	GRAVELINE BAY																				T		T	
	NEAR GAUTIER AT MOUTH AT PASCAGOULA BAY	MM/6-05	F												F									
	NEAR GAUTIER ABOVE THE MOUTH OF GRAVELINE	MM/6-05A	F												F									

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	BAYOU																							
	NEAR GAUTIER MIDWAY OF GRAVELINE BAYOU	MM/6-06	F												F									
	NEAR GAUTIER AT HEAD OF GRAVELINE BAYOU	MM/6-07	F												F									
MSGULFMX	GULF OF MEXICO																		F			F		
	NEAR PASS CHRISTIAN SOUTH OF CAT ISLAND	ELA92LR18	F	F	F																			
	NEAR PASS CHRISTIAN AT CAT ISLAND 900 YARDS SOUTH SOUTHWEST OF THE WESTERN TIP OF CAT ISLAND	MM/4-01	F												F									
	NEAR PASS CHRISTIAN AT CAT ISLAND 900 YARDS WEST OF THE MOUTH OF SOUTH BAYOU	MM/4-02	F												F									
	NEAR PASS CHRISTIAN AT CAT ISLAND MIDDLE OF SOUTH BAYOY	MM/4-03	F												F									
MS115E01M	HERON BAY																		T				T	
	NEAR ANSLEY (EXTENT NEEDS TO BE HARD-COPY CHECKED)	ELA92SP14	F	F	F																			
	NEAR ANSLEY	ELA92SR14	F	F	F																			
	NEAR CLAIBORNE AT MOUTH OF PEARL RIVER AT LOUISIANA STATE LINE	MM/1-01	F												T									
	NEAR CLAIBORNE SOUTH OF CAMPBELL LAGOON ALONG PEARL RIVER DISCHARGE LINE	MM/1-02	F												F									
	NEAR ANSLEY SOUTH OF HERON BAY POINT ALONG PEARL RIVER DISCHARGE LINE ADJACENT TO INTRACOASTAL WATERWAY	MM/1-03	F												F									
	NEAR ANSLEY EAST SIDE OF HERON BAY	MM/1-04	F												F									
	NEAR ANSLEY WEST SIDE OF HERON BAY	MM/1-05	F												P									
MS118BBM5	INDUSTRIAL SEAWAY																		NP					
	NEAR GULFPORT AT CMG5 NORTHWEST OF HANDSBORO	D02481254	F	F	N		F	N	F	N														
	NEAR HANDSBORO AT MILE 2.7 NORTHWEST OF HANDSBORO	D02481254-25	F	F	F		F	N	F	N														
	NEAR GULFPORT AT MILE 1.7	D02481255-80	F	F	F		F	N	F	N														
	NEAR LORAINE AT WILKES BRIDGE	D02481256	F	F	N																			
	NEAR HANDSBORO AT MILE 1.1 NORTHEAST OF HANDSBORO AT POWER LINES	D02481256-30	F		P		F	F	F	F					F									
	NEAR HANDSBORO AT MILE 0.8 NORTHEAST OF	D02481256-50	F	F	F	N	F	F	F	F														

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	HANDSBORO																							
	NEAR HANDSBORO AT BIG LAKE	D02481257	F	F	N																			
MS112M1	JOURDAN RIVER																		T				P	
	NEAR KILN AT HWY 43 2.0 MILES SOUTH OF KILN	D02481660	F	N	F		F	N	F	F	F	F			P	F								
MS116M3	LITTLE BILOXI RIVER																		T			P		
	NEAR WORTHAM AT OLD HWY 49 2.0 MILES NORTH	D02481097	F	N	F	F	F	F	F	F			F	F	P									
	OF LYMAN																							
MS109E03M	MIDDLE BAY																					T		
	NEAR ORANGE GROVE MIDDLE OF MIDDLE BAY	MM/8-11	F												F									
	NEAR ORANGE GROVE AT MOUTH OF HERON BAYOU	MM/8-12A	F												F									
MSMSSOUNDM	MISSISSIPPI SOUND																		T	F				
	NEAR BILOXI NEAR SHIP ISLAND	ELA91LR12	F	T	T																			
	NEAR GAUTIER	ELA92LR15	F	F	P																			
	NEAR BILOXI NEAR DEER ISLAND	ELA92LR16	F	F	T																			
	NEAR BILOXI	ELA92LR17	F	F	F																			
	NEAR WAVELAND	ELA92LR19	F	F	F																			
	NEAR GAUTIER	ELA92ST13	F	F	F																			
	NEAR ANSLEY WEST END OF ST. JOSEPH POINT	MM/1-06	F												F									
	DREDGING REEF																							
	NEAR ANSLEY NORTH END OF ST. JOSEPH POINT	MM/1-07	F												F									
	DREDGING REEF																							
	NEAR ANSLEY OFFSHORE OF BAYOU BOLEN OVER	MM/1-08	F												F									
	SMALL SECTION OF REEF																							
	NEAR WAVELAND OFFSHORE OF BAYOU CADDY	MM/1-09	F												F									
	NEAR ANSLEY EAST OF ST. JOSEPH POINT	MM/1-10	F												F									
	DREDGING REEF ON INTRACOASTAL WATERWAY																							
	NEAR WAVELAND OFFSHORE AND EAST OF BAYOU	MM/1-11	F												F									
	CADDY 4.0 NAUTICAL MILES NW OF MARKER Q G 17																							
	FT 5 M "1" ON THE INTRACOASTAL WW																							
	NEAR ANSLEY OFFSHORE AND EAST OF THREE OAKS	MM/1-12	F												F									
	BAYOU																							
	NEAR ANSLEY NORTH OF THREE OAKS BAYOU AND	MM/1-13	F												F									
	SOUTH OF BAYOU BOLEN																							
	AT WAVELAND STORM DRAIN SERVICING AREA IN	MM/2-02	F												F									
	SOUTHWEST WAVELAND LOWER END OF WAVELAND																							

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	TONGING REEF																							
	AT BAY ST. LOUIS STORM DRAIN SERVICING AREA IN EAST BAY ST. LOUIS UPPER END OF ST. STANISLAUS REEF	MM/2-05	F												T									
	NEAR BAY ST. LOUIS DUE SOUTH OF ST.LOUIS BAY	MM/2-09	F												F									
	NEAR PASS CHRISTIAN SOUTH OF HENDERSON POINT HENDERSON POINT, PASS CHRISTIAN TONGING REEF	MM/2-10	F												F									
	AT PASS CHRISTIAN INSHORE OF STATION 2-10 SOUTH OF HENDERSON POINT	MM/2-10A	F												F									
	AT PASS CHRISTIAN STORM DRAIN SERVICING AREA IN PASS CHRISTIAN PASS CHRISTIAN TONGING REEF	MM/2-11	F												F									
	AT PASS CHRISTIAN INSHORE OF STATION 2-11 PASS CHRISTIAN TONGING REEF	MM/2-11A	F												F									
	AT PASS CHRISTIAN AT PASS CHRISTIAN HARBOR	MM/2-12	F												F									
	AT PASS CHRISTIAN INSHORE OF STATION 2-12 AT PASS CHRISTIAN HARBOR	MM/2-12A	F												F									
	NEAR PASS CHRISTIAN AT EDGE OF SQUARE HANKERCHIEF SHOAL	MM/2-13	F												F									
	NEAR PASS CHRISTIAN AT BEACON FL. G 4 S 17 FT. 5 M "15P" ON EDGE OF TELEGRAPH REEF	MM/2-13A	F												F									
	NEAR PASS CHRISTIAN SOUTH OF SQUARE HANKERCHIEF SHOAL	MM/2-13B	F												F									
	NEAR WAVELAND WEST OF STATION 13-A	MM/2-13C	F												F									
	NEAR PASS CHRISTIAN AT EDGE OF PASS CHRISTIAN TONGING REEF DUE SOUTH OF STATION 2-12	MM/2-14	F												F									
	NEAR PASS CHRISTIAN AT BEACON FL. R 2.5 SEC. 17 FT. 3M "4P" ON EAST SIDE OF PASS MARIANNE REEF	MM/2-14A	F												F									
	NEAR PASS CHRISTIAN EAST OF STATION 2-13A	MM/2-15A	F												F									
	NEAR LONG BEACH 900 YARDS OFFSHORE BETWEEN MENGE AVENUE AND ESPY AVENUE	MM/3-01	F												F									

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	NEAR LONG BEACH 1500 YARDS OFFSHORE FROM WHITE HARBOR ROAD	MM/3-02	F												F									
	NEAR LONG BEACH 900 YARDS OFFSHORE FROM WHITE HARBOR ROAD	MM/3-02A	F												F									
	AT LONG BEACH 900 YARDS OFFSHORE FROM BUENA VISTA DRIVE AT LONG BEACH OYSTER REEF	MM/3-03	F												F									
	AT LONG BEACH 900 YARDS OFFSHORE FROM BEACH PARK ROAD AND SOUTH OF USM GULF PARK PIER	MM/3-04	F												F									
	AT LONG BEACH WEST SIDE OF LONG BEACH HARBOR AT FIRST MARKER GOING INTO THE HARBOR	MM/3-05	F												F									
	AT BILOXI 500 YARDS OFF BEACH BEHIND TREASURE BAY EAST SIDE OF CHANNEL	MM/3-05A	F												F									
	AT GULFPORT SOUTH AND OUTSIDE OF THE GULFPORT SHRIMP HARBOR	MM/3-06	F												F									
	AT GULFPORT 3750 FEET SOUTH OF THE END OF THE GULFPORT HARBOR	MM/3-07	F												F									
	NEAR LONG BEACH SOUTH OF THE LONG BEACH OYSTER REEF AT THE WRECK BUOY	MM/3-09	F												F									
	NEAR PASS CHRISTIAN AT CAT ISLAND AT MOUTH OF SMALL BAYOU JUST WEST OF NORTH BAYOU	MM/4-06	F												F									
	NEAR PASS CHRISTIAN AT CAT ISLAND AT SPLIT IN SMALL BAYOU 500 YARDS INLAND OF 4-06	MM/4-06A	F												F									
	AT GULFPORT 200 YARDS OFF OF MOSES PIER	MM/5-01A	F												F									
	AT GULFPORT 900 YARDS OFFSHORE FROM COWAN ROAD	MM/5-02	F												F									
	AT GULFPORT 900 YARDS OFFSHORE FROM EDGEWATER MALL	MM/5-03	F												F									
	AT GULFPORT 3/4 MILE OFF BEACH FROM BROADWATER GOLF COURSE	MM/5-03A	F												F									
	AT BILOXI 900 YARDS OFFSHORE FROM BEAUVOIR AVENUE WEST OF THE MOUTH OF BILOXI HARBOR	MM/5-04	F												F									
	AT BILOXI CHANNEL MARKER #4 ON EAST SIDE OF BROADWATER CHANNEL	MM/5-05	F												F									
	AT BILOXI 900 YARDS OFFSHORE FROM RODENBURG AVENUE NEAR MIDDLE OF BILOXI WHITEHOUSE REEF	MM/5-06	F												F									

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	AT BILOXI 900 YARDS OFFSHORE FROM 2ND STREET ON THE EAST END OF BILOXI WHITEHOUSE REEF	MM/5-07	F												F									
	AT BILOXI 350 YARDS DUE SOUTH OF THE FIRST METHODIST CHURCH IN BILOXI AT THE WESTERN TIP OF THE BILOXI WHITEHOUSE REEF	MM/5-07A	F												F									
	AT BILOXI BILOXI CHANNEL MARKER FL. R 2.5S 17 FT. 3M "8"	MM/5-08	F												F									
	AT BILOXI 300 YARDS SOUTH OF SHORELINE WEST OF BILOXI TURN BEACON BY LIGHTHOUSE 200 YARDS WEST OF THE BILOXI CHANNEL	MM/5-08A	F												F									
	AT BILOXI OFFSHORE OF THE WESTERN TIP OF DEER ISLAND	MM/5-09	F												F									
	AT BILOXI 3/4 MILE SOUTH OF DEER ISLAND MIDDLEWAY OF ISLAND	MM/5-09A	F												F									
	AT BILOXI OFFSHORE OF THE EASTERN END OF DEER ISLAND	MM/5-10	F												F									
	NEAR OCEAN SPRINGS AT EAST CHANNEL TURN BEACON #10	MM/5-11	F												F									
	AT BILOXI AT WEST END OF BILOXI HARBOR	MM/5-22	F												F									
	NEAR OCEAN SPRINGS SOUTH OF BELLEFONTAINE POINT	MM/6-01	F												F									
	NEAR OCEAN SPRINGS SOUTH OF BELLEFONTAINE POINT AND ABOVE STATION 6-01	MM/6-01A	F												F									
	NEAR OCEAN SPRINGS SOUTH OF BELLEFONTAINE POINT AND EAST OF STATION 6-01A	MM/6-02A	F												F									
	NEAR OCEAN SPRINGS SOUTH OF BELLEFONTAINE POINT AND EAST OF STATION 6-02	MM/6-03	F												F									
	NEAR GAUTIER JUST SOUTH OF PASCAGOULA BAY EAST OF STATION 6-03	MM/6-13	F												F									
	NEAR PASCAGOULA SOUTH OF SINGING RIVER ISLAND	MM/6-14	F												F									
	NEAR PASCAGOULA EAST OF ROUND ISLAND	MM/6-15	F												F									
	AT PASS CHRISTIAN	NCS012N00-MSPC1															F							

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MS118M1	OLD FORT BAYOU																		F					
	NEAR FONTAINBLEAU ABOVE I-10 AT KOA	D024812975	F	N	F			F		F								F						
	NEAR FONTAINBLEAU AT I-10 WESTBOUND LANES (NORTH SIDE)	D02481298	F		F		F	F	F	F														
	AT OCEAN SPRINGS AT MILE 3.0	D024812988	F	F	F	F	F	F	F	F														
	AT OCEAN SPRINGS AT WASHINGTON STREET BRIDGE	D02481299	F	F	F		F	P	F	F														
	NEAR OCEAN SPRINGS (MID CHANNEL) AT CMR 18 AT MILE 0.9	D6460FB02	F	F	F		F	F	F	F														
		ELA92ST10	F	F	F		F	F	F	F														
	AT OCEAN SPRINGS AT WASHINGTON STREET BRIDGE	ELA92ST28	F	F	F		F	P	F	F														
MS118E05M	PASCAGOULA BAY																		T	T			T	
	NEAR GAUTIER SOUTH OF GRAVELINE BAY EAST OF STATION 6-02A	MM/6-04	F												F									
	AT GAUTIER 2700 FEET SOUTH OF THE MOUTH OF GRAVELINE BAY	MM/6-08	F												F									
	NEAR PASCAGOULA WEST OF SINGING RIVER ISLAND EAST OF STATION 6-09	MM/6-10	F												F									
	AT GAUTIER AT MOUTH OF WEST PASCAGOULA RIVER AT MOUTH OF COMYNE BAYOU	MM/6-12	F												F									
	NEAR PASCAGOULA SOUTHWEST OF INGALLS SHIPYARD	NCS012N00-MSPB1															T							
MS109E01M	POINT AUX CHENES BAY																		T				T	
	NEAR ORANGE GROVE	ELA92SR13	F	F	F																			
	NEAR ORANGE GROVE MIDDLE OF NORTH RIGOLETS BAYOU	MM/8-10	F												F									
MS116M1	SAUCIER CREEK																		T			P		
	AT WORTHAM ON EAST WORTHAM ROAD 1.0 MILES EAST OF WORTHAM	D02481050	F	N	F	F	F	F	F	F			F	F	P									
MSSTLUBAYM	ST. LOUIS BAY, incl. BAYOU PORTAGE																		T		P		P	
	NEAR PASS CHRISTIAN AT HENDERSON AVENUE 1.5 MILES NORTH OF PASS CHRISTIAN	D02481325	F	P	F		F	F	F	P	F	F			N									
	NEAR PASS CHRISTIAN NEAR MALLINI POINT SUBDIVISION BAYOU PORTAGE DISCHARGE	MM/2-08	F												P									
	NEAR PASS CHRISTIAN AT MOUTH OF BAYOU	MM/2-15	F												F									

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	PORTAGE AT BEACON FL. G 4S 17 FT. "7" OFF BAYOU PORTAGE																							
MS117M1	TCHOUTACABOUFFA RIVER																		F				P	
	NEAR LATIMER ON CC ROAD 8.0 MILES NORTH OF DIBERVILLE	D02480350	F	N	F	F	F	F	F	F			F		P			F						
	NEAR DIBERVILLE	D02480590	F		F		F	F	F	F					P									
	NEAR WOOLMARKET AT MILE 1.0	D024806108	F	F	F		F	F	F	F														
MS118BBM1	TURKEY CREEK																		P			P		
	NEAR LONG BEACH AT CANAL ROAD 2.5 MILES NORTH OF LONG BEACH	D02481240	F	N	F	F	F	P	F	F			F	F	P									
MS117M2	TUXACHANIE CREEK																		T				P	
	NEAR BILOXI AT OLD HWY 15 5.0 MILES NORTH OF DIBERVILLE	D02480500	F	N	F	F	F	F	F	F			F		P									
	NEAR LATIMER	VMB003V05-TC1	F	N	F						F							T						
MS111M1	WOLF RIVER																		T				N	
	NEAR LIZANA (LANDON) AT CABLE BRIDGE ROAD 8.0 MILES NORTH OF DE LISLE	D02481510	F	N	F	F	F	F	F	F	F	F	F		N	F								

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FIGURE III-10

Locations of Monitoring Stations

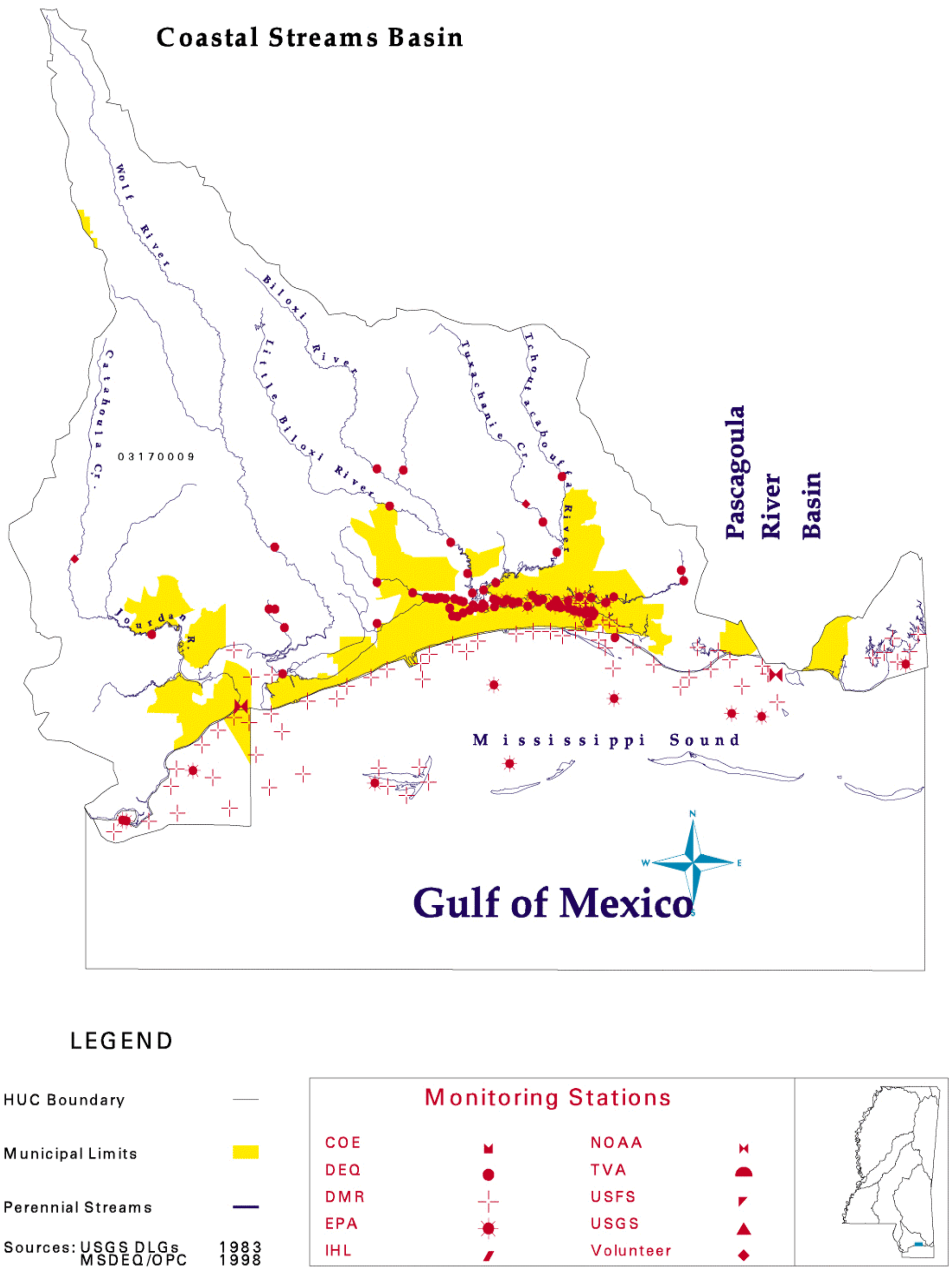
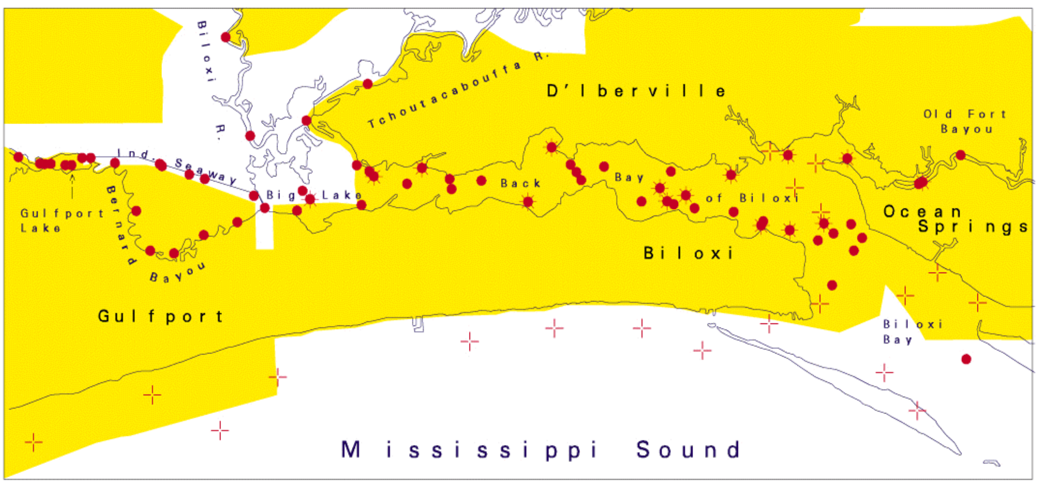


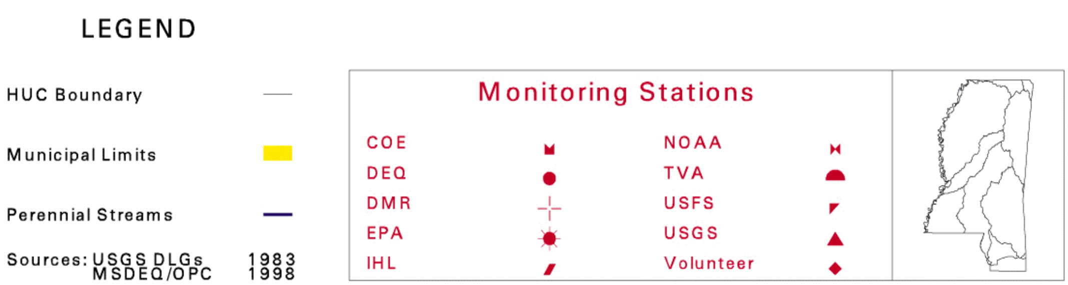
FIGURE III-11

Locations of Monitoring Stations

Coastal Streams Basin

Back Bay of Biloxi





MISSISSIPPI RIVER BASIN

Description

The Mississippi River is the major artery for waterborne commerce in the state and nation. However, in Mississippi, the Mississippi River Basin constitutes only a narrow band along the western boundary of the state from the Tennessee state line to the Louisiana state line. With an extensive levee system along the river in the northern half of the state, relatively little direct land drainage actually enters the river from Mississippi. Drainage into the river from the state comes principally from three of the state's other river basins: Yazoo River, Big Black River, and South Independent Streams. All of these are discussed later in this section. The primary land use in this basin and its sub-basins is agriculture. Due to the river's extensive size and length, the water quality of the river can vary over a wide range from its headwaters to its mouth depending on localized conditions and inputs from all adjacent states. Generally, the water quality along the Mississippi boundary is fair, due to the recurring problems of elevated toxics, nutrients, and sediment from agricultural land use activities and some urban sources of pollution. The Mississippi River is not significantly impacted by point source discharges from Mississippi. Most discharges are near Greenville, Vicksburg, and Natchez. However, nonpoint source discharges from the Yazoo River drainage area likely impact the river.

Special Classifications

None.

Permitted Major Sources

Greenville POTW	MS0020184	Mississippi River	Greenville
Greenville Manufacturing Inc.	MS0047759	Mississippi River	Greenville
International Paper Company	MS0000213	Mississippi River	Natchez
Mississippi River Corp.	MS0001309	Mississippi River	Natchez
Entergy Mississippi	MS0001261	Mississippi River	Greenville
Natchez POTW	MS0024252	Mississippi River	Natchez
Entergy Operations Inc.	MS0029521	Mississippi River	Grand Gulf
Vicksburg Chemical Company	MS0027995	Mississippi River	Vicksburg
Vicksburg POTW	MS0022381	Mississippi River	Vicksburg
Robinsonville-Commerce Utilty	MS0048691	Mississippi River	Robinsonville

Noteworthy Items

1. High School youth conduct water quality monitoring during nationwide "Mississippi River Project"

2. USGS continues National Water Quality Assessment (NAWQA) program

OPC Environmental Damage Assessments

1. Port of Rosedale - Tugboat Accident and Accidental Release of Diesel Fuel (1994)

A tugboat burned and capsized on June 7, 1994, spilling an undetermined amount of diesel fuel into the waters of the Port of Rosedale on the Mississippi River. Basic physical and chemical measurements and samples for analysis of diesel hydrocarbons were taken at four sites. Three of the sites were located in the vicinity of the Port. Site 1 was adjacent to the capsized tugboat and within the area enclosed by the booms used to contain the remaining spilled fuel. Site 2 was in the middle of the Port. Site 3 was situated at the confluence of the Port and the Mississippi River. Site 4 served as a control and was located in an oxbow lake, above the confluence of the harbor with the Mississippi River.

Fish were collected for tissue analysis at Site 4 and within the Port so as to encompass Sites 1-3. Samples were prepared for analysis and some were sent to a consulting lab at the request of the responsible party.

All physical and chemical measurements were within normal ranges for the Mississippi River. There were no differences detected among any of the sites. Likewise, no diesel hydrocarbons were detected in either the water column samples or the fish tissue. The leakage of the diesel fuel into the waters of the Port of Rosedale had little to no impact on the resident biota.

2. Environmental Damage Assessment on St. Catherine Creek NWR (1996)

The Biological Services Section of the OPC conducted a series of bioassessments in the vicinity of a February 1996 crude oil spill on the St. Catherine Creek National Wildlife Refuge. A ruptured pipeline caused an undetermined amount of crude oil and brine to enter a slough on the refuge. Based upon evidence compiled during the investigation, detrimental effects to the environment occurred primarily within the vicinity of the ruptured pipeline, and below the spill in the direction of the water flowing out of the slough. Effects were minimal at the upstream end of the slough.

Because these effects were not widespread, it appears that rain events and flooding from the adjacent Mississippi River will help dilute concentrations of residues, and that natural decomposition of these compounds will help to improve conditions over time.

Biological assessments conducted to assess the damage to the system yielded a single shell from the exotic zebra mussel, which undoubtedly entered the system during a flood from the Mississippi River.

OPC Intensive Water Quality Surveys and Special Studies

None.

Other Agency Water Quality Surveys

None known.

TABLE III-39
SUMMARY OF MONITORING DATA (1992 - 1997)
MISSISSIPPI RIVER BASIN

Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	PHYSICAL/CHEMICAL DATA Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	Fsh	Bio Stat	USE SUPPORT AQ	FC	SHL	SC	CR	DW
MS407ALM1	ALBERMARLE LAKE																		F	F				
	NEAR FITLER	DMR005D00-ALB1	F	F	F		F	F	F	F			F				F							
		IMR005D00-ALB1	F	F	P					F			F											
MS218DLM	DESOTO LAKE																		T					
	NEAR RENA LARA	IMR010D00-DES1	F	F	P					F			F											
MS403LFM	FERGUSON LAKE																		F					
	AT GREENVILLE	IMR012D00-FRG1	F	P	F					F			F											
MS218M	HUSHPUCKENA CREEK																		P					
	NEAR RENA LARA	DMS218M-1																P						
MS388LBM	LAKE BEULAH																		T					
	NEAR BEULAH	IMR008D00-BEU1	P	T	T					F			F											
MS471LMM1	LAKE MARY																			F				
	NEAR FORT ADAMS	D533LMY03															F							
MSSCLMSRE	MISSISSIPPI RIVER																			F				
	AT NATCHEZ AT HWY 84/65	D07290880															F							
	BELOW NATCHEZ	D07290880-05															F							
MSSCLMSRM	MISSISSIPPI RIVER																		T					
	AT VICKSBURG AT HWY 80	G07289000	F	F	F			P	N	P	F		F		F									
MSULMSRE	MISSISSIPPI RIVER																			F				
	NEAR SOUTHHAVEN AT TENNESSEE STATE LINE	D07032280-05															F							
	(HORSESHOE LAKE)																							
MS218TCM1	TUNICA CUTOFF																		T	T				
	NEAR TUNICA	DMR003D00-TUN1	F	F	P		F	N	F	F			F				T							

HEADER ABBREVIATIONS: Tmp-Temperature, pH-Acidity/Alkalinity, DO-Dissolved Oxygen, COD-Chemical Oxygen Demand, TOC-Total Organic Carbon, TKN-Kjeldahl Nitrogen, N+N-Nitrite & Nitrate, TP-Total Phosphorus, Turb-turbidity, TSS-Total Suspended Solids, Cndct-Conductivity, FCU-Fecal Coliform (Upper Limit), FCL-Fecal Coliform (Lower Limit), TOX-Toxicants, Wtr-in Water Column, Fsh-in Fish Tissue, BIO Stat-Biological Rating (macroinvertebrates)

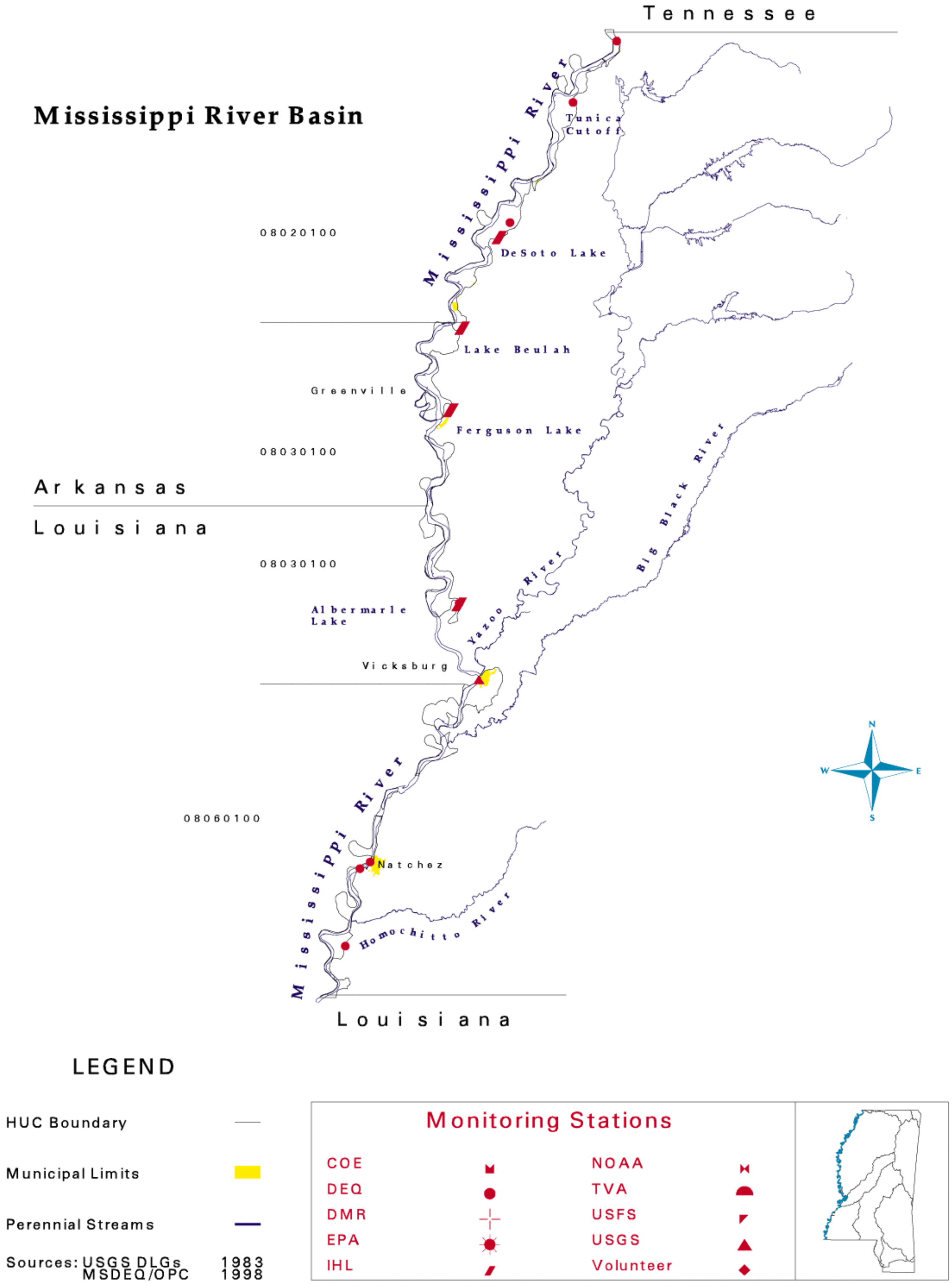
10/20/99

USE SUPPORT STATUS: F-Fully Supported, T-Fully Supported but Threatened, P-Partially Supported, N-Not Supported, *-Fish Advisory

WATERBODY (WB) USE CLASSIFICATIONS: AQ-Aquatic Life Support, FC-Fish Consumption, SHL-Shellfish Harvesting, SC-Secondary Contact Recreation, CR-Contact Recreation, DW-Raw Water Supply

AGENCY ABBREVIATIONS: C-USACE, D-MSDEQ, E-USEPA, F-USFS, G-USGS, I-Inst. of Higher Learning, M-DMR, N-NOAA, T-TVA, V-Volunteer Monitor

FIGURE III-12
Locations of Monitoring Stations



NORTH INDEPENDENT STREAMS BASIN

Description

The North Independent Streams Basin drains an area of Tennessee and 1,075 square miles in north Mississippi. Land use in this basin is primarily agriculture. Major streams include the Tuscumbia, Wolf, and Hatchie Rivers. These rivers are classified for fish and wildlife use in Mississippi. However, these streams serve recreational and public water supply roles in Tennessee. The Tuscumbia River system near Corinth receives considerable discharge from agricultural and point sources. Overall, water quality is relatively poor due to sediment, nutrient and pesticide problems. However, the Hatchie River, Wolf River, and their tributaries flow through mostly forested areas and, thus, are rated as having good to excellent water quality. In extreme northwest Mississippi, Horn Lake and its main tributary, Horn Lake Creek have fair water quality due to agricultural runoff and increasing urban runoff from suburbs of the Memphis metropolitan area. Streams in this basin vary greatly and may have sandy or muddy bottoms and fast or sluggish flow.

Special Classifications

Recreation	Horn Lake	DeSoto County

Permitted Major Sources

Booneville POTW	MS0042030	Tuscumbia River	Booneville
Corinth POTW	MS0021652	Elam Creek	Corinth
Kimberly-Clark Corp.	MS0035882	Seven Mile Creek	Corinth

Noteworthy Items

1. Muddy Creek Watershed NPS Project

2. MDEQ Ambient Basinwide Monitoring begins in 1998

OPC Environmental Damage Assessments

None.

OPC Intensive Water Quality Surveys and Special Studies

1. Muddy Creek Watershed 319 NPS Project (Tippah County, 1995-1996)

The Muddy Creek watershed, located in northeast Mississippi, has been ranked as a high priority for Section 319 NPS funding. High priority was given to the watershed for several reasons. First, most of the surrounding land use is agriculture. Second, initial field reconnaissance revealed an increasing presence of sediment and nutrients in the watershed's tributaries. Third, streams are becoming more channelized as vegetated lands are being converted to agricultural fields resulting in an increase in runoff as opposed to ground absorption. Finally, the Muddy Creek watershed was given a higher priority because of the limited number of Best Management Practices (BMPs) currently installed within the watershed. As BMPs are installed on agricultural fields throughout the watershed, pollutant reductions can be more easily documented.

The OPC's Water Quality Assessment Branch (WQAB) was given the task of tracking the effectiveness of a conservation tillage practice within the watershed. Pollutants monitored included total suspended solids, total organic carbon, total phosphorus, total Kjeldahl nitrogen, nitrate and nitrite, and ammonia nitrogen. Two sites were selected for monitoring runoff. Both are located on a cooperating farmer's field and drain into an unnamed tributary of the North Prong Creek (a sub-watershed of Muddy Creek). BMP monitoring at the field level was conducted using the Paired Watershed Approach. One field was used as a control and utilized a single conventional farming practice throughout the duration of the project. The second field was the treatment site and utilized the same conventional practice as the control site during the first growing season, however, a BMP was used on the treatment field during the second growing season. Using the control site as a reference during the second growing season, the WQAB was to determine the effectiveness of the BMP on reducing pollutant loads to the receiving stream. Further analysis was to predict potential reductions of pollutants on other similar fields within the watershed as a result of using this BMP. Stormwater runoff monitoring, at the demonstration farm site began during the 1996 growing season. Several storm events were monitored. Only a few storm events were monitored during the Post-BMP growing season the following year. During the Post-BMP monitoring period, the WQAB was unable to get access to the back field because a dam for a detention basin was placed at the access road. Given this unforeseeable circumstance and limited staff resources, the monitoring portion of the project was canceled.

An additional long-term monitoring station was to be established at the confluence of the unnamed tributary and North Prong Creek. Physical data was to be collected at this station monthly during the growing season for three years. This monitoring station would have provided data that would have established a trend in tributary water quality as BMPs were installed throughout the sub-watershed but given the limited staff resources, this monitoring portion of the project was also canceled.

2. Basinwide Approach Monitoring - North Independent Streams Basin

As part of the Basinwide Approach to Water Quality Management, a basin fixed station network was established in the North Independent Streams Basin for 1998. Macroinvertebrate assessments were done at 17 sites, with fish being collected at three sites for fish tissue analysis. Water chemistry sampling was also conducted twice a year at 20 stations. As of this writing, data are being analyzed and enumerated.

Other Agency Water Quality Surveys

None known.

TABLE III-40

SUMMARY OF MONITORING DATA (1992 - 1997)

NORTH INDEPENDENT BASIN

Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	TOX Fsh	Bio Stat	USE SUPPORT AQ	FC	SHL	SC	CR	DW
MS217HLE	HORN LAKE AT LAKEVIEW	D217HL003															F			F				
MS206M2	HURRICANE CREEK AT WALNUT AT HWY 15	D07029412	F	F	F								F					P	P					
MS206M1	MUDDY CREEK AT FALKNER AT COUNTY ROAD 0.2 MILES EAST OF FALKNER	D07029410.90	F	F	F								F					P	P					
MS203TM2	PARMICHA CREEK NEAR BIGGERSVILLE AT COUNTY ROAD 408	D07029278.70	F	F	F								F					P	P					
MS203TM1	TUSCUMBIA RIVER CANAL NEAR CORINTH AT SMITH BRIDGE 4.5 MILES WEST NORTHWEST OF CORINTH	D07029310	F	F	F	F	F	P	P	N	P	F	F	F	N	T			T			N		
MS203TE	TUSCUMBIA RIVER CANAL, UNNAMED TRIBUTARY OF NEAR RIENZI	VMB003V07-TR1	F	F	F						F							P	P					

HEADER ABBREVIATIONS: Tmp-Temperature, pH-Acidity/Alkalinity, DO-Dissolved Oxygen, COD-Chemical Oxygen Demand, TOC-Total Organic Carbon, TKN-Kjeldahl Nitrogen, N+N-Nitrite & Nitrate, TP-Total Phosphorus, Turb-turbidity, TSS-Total Suspended Solids, Cndct-Conductivity, FCU-Fecal Coliform (Upper Limit), FCL-Fecal Coliform (Lower Limit), TOX-Toxicants, Wtr-in Water Column, Fsh-in Fish Tissue, BIO Stat-Biological Rating (macroinvertebrates)

10/20/99

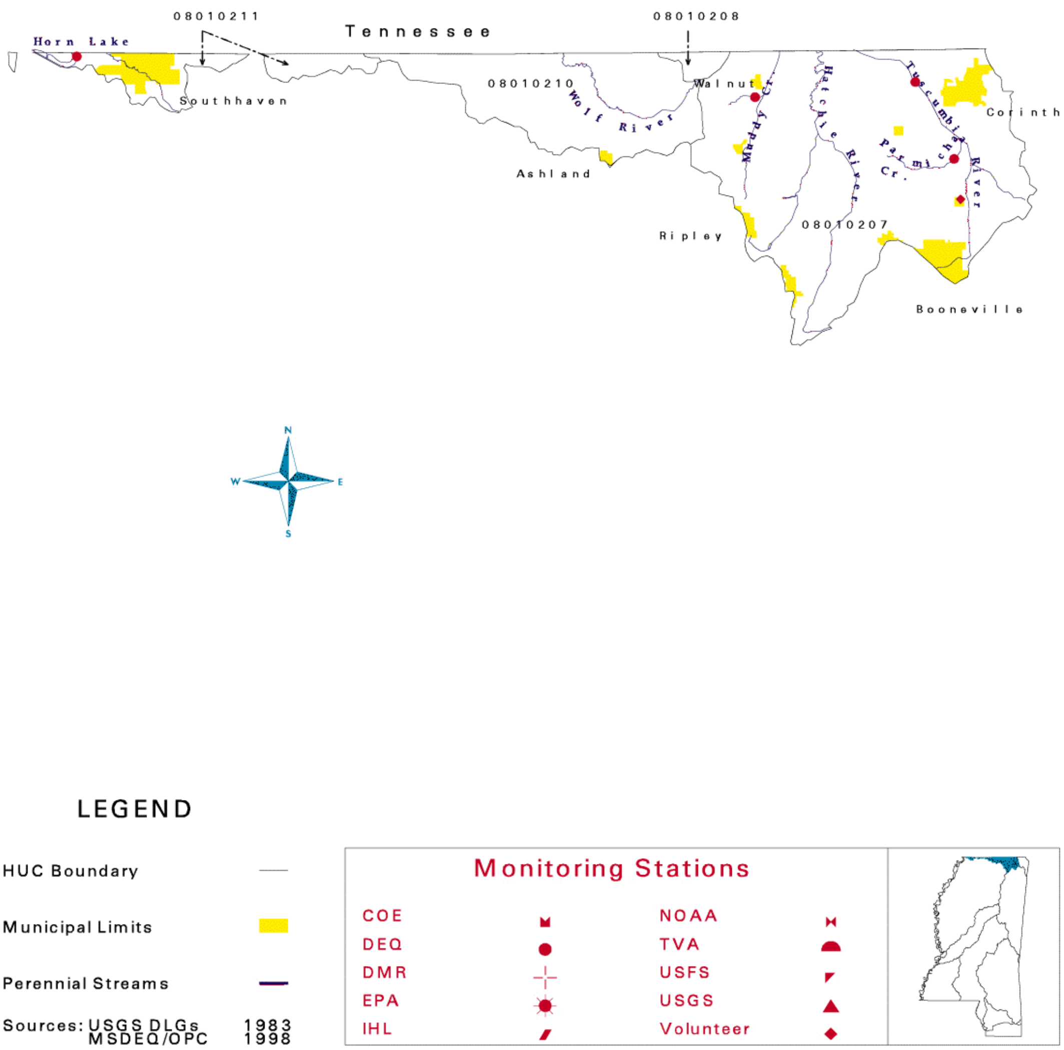
USE SUPPORT STATUS: F-Fully Supported, T-Fully Supported but Threatened, P-Partially Supported, N-Not Supported, *-Fish Advisory

WATERBODY (WB) USE CLASSIFICATIONS: AQ-Aquatic Life Support, FC-Fish Consumption, SHL-Shellfish Harvesting, SC-Secondary Contact Recreation, CR-Contact Recreation, DW-Raw Water Supply

AGENCY ABBREVIATIONS: C-USACE, D-MSDEQ, E-USEPA, F-USFS, G-USGS, I-Inst. of Higher Learning, M-DMR, N-NOAA, T-TVA, V-Volunteer Monitor

Figure III-13
Locations of Monitoring Stations

North Independent Streams Basin



PASCAGOULA RIVER BASIN

Description

The Pascagoula River Basin is the second largest basin in the state and comprises most of southeastern Mississippi and a small part of southwestern Alabama. The Pascagoula River system drains an area of about 9,700 square miles and empties into the Gulf of Mexico. The main headwater streams are the Leaf and Chickasawhay Rivers which meet and form the Pascagoula River. This basin is approximately 164 miles long and at most 84 miles wide.

Much of the Pascagoula River drainage basin and adjacent coastal area which drains directly into the Gulf is forested. Near the coast, drainage areas are low-lying flatlands, forested wetlands, and marshlands. Farther inland, the basin consists primarily of low, rolling hills and broad, flat, flood plains. The main land uses are agriculture, silviculture, oil production, and industry. The major streams are deep to moderately deep, fast-flowing and perennial. These streams include the Leaf, Chickasawhay, and Escatawpa Rivers. Other significant tributaries in the basin include Tallahala Creek, Okatibbee Creek, Okatoma Creek, Bowie River, Red Creek, Chunky River, Black Creek and Bogue Homa. Stream conditions are usually natural, or unmodified, in appearance with clear water. Some streams are considered "blackwater streams" because they are stained by tannic acid leached from vegetation. Water quality is generally good to excellent with only localized pollution problems. Historically, industrial point sources and urban runoff near major population centers such as Meridian, Laurel, Hattiesburg, and Pascagoula have caused problems.

Special Classifications

Bonita Reservoir	Public Water Supply	Lauderdale County
Long Creek Reservoir	Public Water Supply	Lauderdale County
Flint Creek Reservoir	Public Water Supply and Recreation	Stone County
Okatibbee Reservoir	Public Water Supply and Recreation	Lauderdale County
Archusa Reservoir	Recreation	Clarke County
Beaverdam Creek	Recreation	From Hdwtrs to Black Creek
Black Creek	Recreation	From Hwy 11 to Pascagoula R.
Bowie Creek	Recreation	From Hwy 589 to Bowie River
Bowie River	Recreation	From Bowie Creek to I-59
Chickasawhay River	Recreation	From Stonewall to Hwy 84
Chunky River	Recreation	From Hwy 80 to Chickasawhay R.
Clarke Lake	Recreation	Clarke County
Dry Creek W/S NRCS	Recreation	Covington Co Lake Site #3
Lake Bogue Homa	Recreation	Jones County
Lake Claude Bennett	Recreation	Jasper County
Lake Geiger	Recreation	Forrest County
Lake Marathon	Recreation	Smith County
Lake Mike Conner	Recreation	Covington County
Lake Perry	Recreation	Perry County
Lake Ross Barnett	Recreation	Smith County
Lake Shongela	Recreation	Smith County
Lakeland Park Lake	Recreation	Wayne County
Okatoma Creek	Recreation	From Hwy 590 to Bowie R.
Pascagoula River	Recreation	From 6 Mi. North of Hwy 26 to Cumbest Bluff
Pascagoula River	Recreation	Cumbest Bluff to Smear Bayou
Red Creek	Recreation	Hwy 49 to Big Black Creek
Simpson Co. Legion Lake	Recreation	Simpson County

Turkey Fork Reservoir	Recreation	Greene County
Escatawpa River	Fish/ Wildlife (DO variance)	From Mile 10 to Pascagoula R.
Tallahala Creek	Fish/Wildlife (DO variance)	From 1 Mi. North of Hwy 15 to Sholars

Permitted Major Sources

Burlington Industries Inc.	MS0001848	Bostic Branch	Stonewall
GC/Escatawpa - Act. Sludge	MS0021521	Robertson L./Escatawpa R.	Escatawpa
GC/Gautier POTW	MS0043010	West Pascagoula River	Gautier
GC/Pascagoula POTW	MS0020249	Pascagoula River	Pascagoula
Georgia Pacific Corporation	MS0031704	Leaf River	Perry County
Hattiesburg - North Lagoon	MS0020826	Bowie River	Hattiesburg
Hattiesburg - South Lagoon	MS0020303	Leaf River	Hattiesburg
Hercules Incorporated	MS0001830	Bowie River	Hattiesburg
Jackson Co. Port Authority	MS0002674	Escatawpa River	Pascagoula
Laurel - POTW #1	MS0024163	Tallahala Creek	Laurel
Laurel - POTW #2	MS0020176	Tallahala Creek	Laurel
Masonite Corp-Int'l Paper	MS0003042	Tallahala Creek	Laurel
Meridian POTW	MS0020117	Sowashee Creek	Meridian
Morton International Inc.	MS0001775	Escatawpa River	Moss Point
South MS Electric Power Assn.	MS0028258	Black Creek	Purvis
Waynesboro POTW	MS0024228	Chickasawhay River	Waynesboro
Zapata Protein (USA) Inc.	MS0002950	Escatawpa River	Moss Point

Noteworthy Items

1. Fish consumption advisory lifted on Leaf River; dioxin monitoring continues

2. Sand and gravel dredging impact of concern for Bowie and Leaf Rivers

3. Pascagoula River study for Jackson County water supply

4. Black Creek, Mississippi's only Designated Wild and Scenic River, threatened by urban sprawl

5. Fish "no consumption" advisory, due to PCP and dioxin, remains in effect for Country Club Lake

6. Fish “limit consumption” advisory due to dioxin lifted on Escatawpa River; "limit consumption" advisory due to mercury remains in effect

7. Fish “limit consumption” advisory due to mercury issued for Archusa Creek Water Park

8. Fish “limit consumption” advisory due to mercury issued for Pascagoula River

9. MDEQ Ambient Basinwide Monitoring conducted in 1997

10. Tallahala Creek TMDL development completed

OPC Environmental Damage Assessments

1. Country Club Lake and Mineral Creek near Hattiesburg (1990-1997)

A wood preserving facility was located in the watershed of this 60-acre impoundment in a subdivision northwest of Hattiesburg, Mississippi. From 1974 to 1987, the lake was severely impacted by discharges of pentachlorophenol (PCP). In 1987, a fish consumption advisory was issued for the lake. Fish were sampled from Mineral Creek (tailwaters of Country Club Lake) in June 1990. In June 1991, biologists returned to Mineral Creek just below the spillway of Country Club Lake. Three composite fish samples were collected. The samples were comprised of slightly larger fish than those collected in 1990 and dioxin levels were higher than those detected in the 1990 samples.

OPC biologists returned in 1993 and collected nine fish tissue samples, three each from the following sites: (1) Country Club Lake; (2) Dr. Phillip's Lake, on Mineral Creek downstream from Country Club Lake; and (3) the Bowie River below the confluence with Mineral Creek. Full congener analysis of these samples revealed that dioxin levels were very low or absent at the two downstream sites, but levels of concern persist in Country Club Lake. An advisory warning the public not to consume fish from Country Club Lake remains in effect and signs to that effect are posted on the shoreline.

The most recent collections of fish for tissue analysis were in September/October, 1997. MDEQ is considering removal of the dioxin advisory, however the PCP advisory will remain in effect. Right side fillets remaining from the dioxin study will be used to determine what levels of PCP's persist in the fish.

2. Little Eucutta Creek - Oil Spill (1994)

An Environmental Damage Assessment was conducted to determine if Big and Little Eucutta Creeks had been damaged after an accidental discharge of crude oil into Little Eucutta Creek on June 16, 1994. The spill occurred in Clarke and Wayne counties east of Eucutta, Mississippi. After a brief tour of the impacted area, water samples were collected from five sites (four sites on Little Eucutta Creek and an off-site control) for analysis for total petroleum hydrocarbons (TPHs) and VOCs. Other physical and chemical parameters, as well as habitat quality, were measured at each site. At three of the sites, rapid bioassessments were performed. Because the upper reaches of Little Eucutta Creek were markedly dissimilar to the segments affected by the oil spill, background biological conditions were defined by a biological assessment conducted at the off-site control. Results from this site were compared to biological assessments done at the point of heaviest oil contamination, and then downstream at Big Eucutta Creek, just below the confluence with Little Eucutta Creek (total distance of approximately 1 mile).

It was determined that a severe impairment had occurred where the oil contamination was greatest. However, a rapid recovery had taken place at the confluence of Big and Little Eucutta Creeks, as evidenced by a fauna nearly identical to that collected at the control sites. This rapid recovery, such a short distance downstream from the accident, was likely due to the rapid and thorough cleanup by the party responsible for the spill. Rain and natural decomposition should cleanse the affected segments of the stream, and a full recovery of the biota is likely.

3. Big Bogue Homo Creek - Oil Spill (1995)

A broken pipe resulted in the discharge of an undetermined amount of oil into Bogue Homo Creek in Heidleberg (Jasper County) on March 24, 1995. Reconnaissance revealed oil sheens on the water's surface at several sites along Big Bogue Homo Creek, so an EDA was conducted. A collection of water column samples was taken to test for toxicity, TPHs and chloride levels. On March 29, rapid bioassessments were conducted at four sites covering nearly 4.5 miles of stream. Additional water samples for chloride levels were also collected. These samples were not analyzed for TPHs nor subjected to toxicity testing because the previously collected samples showed no evidence of either.

Taxonomic analysis of the sampled fauna indicated that no adverse impacts had occurred in the system. As an interesting aside, an uncommon genera of caddisfly in Mississippi (Rhyacophila) was collected from the control site during this study. This record extends the known distribution of this genera within the state a considerable distance southward.

4. Oil Spill on West Tallahala Creek (1996)

On May 17, 1996 Biological Section staff responded to a request for an Environmental Damage Assessment on West Tallahala Creek and the upper Leaf River near Silverena. An initial site reconnaissance was made on this date for site selection and preliminary water samples were collected. It was decided that both macroinvertebrate-based bioassessments and fish community structure work were appropriate methods to assess the damage in this case. Biological assessments and fish collections were done several days later at 5 sites in West Tallahala Creek and the upper Leaf River. A diverse assembledge of fishes were collected. The macroinvertebrate community showed only minimal stress in relation to this spill event. No additional remedial action on the part of the responsible party was recommended.

5. Big Bogue Homo Creek Oil Spill EDA (1997)

An EDA was conducted on 3 June 1997 on four sites along Big Bogue Homo and Beaver creeks near Heidelberg in response to an oil spill which had occurred several days earlier. Chloride levels and TPHs were not elevated, and only a slight elevation was noted in specific conductance. All other physical and chemical parameters measured appeared normal.

Biological assessments were conducted at two of the four sites. The fauna of both sites was nearly identical, indicating that little if any damage had been done to the community as a result of the spill. No additional remedial action on the part of the responsible party was recommended.

OPC Intensive Water Quality Surveys and Special Studies

1. Pascagoula River Water Supply Study (1994)

During October 1994, OPC Water Quality Assessment Branch staff assisted the MDEQ's Office of Land and Water Resources (OLW) in a study on the Lower Pascagoula River. This study was a joint effort by the MDEQ; U.S. Geological Survey; MS Department of Wildlife, Fisheries, and Parks; MS Department of Marine Resources; and the Pat Harrison Waterway District. Data obtained in the study were used in the calibration of a DYNHD hydrodynamic model developed by Harza Engineering Company of Chicago, Illinois.

The study focused on an area of the river in Jackson County from Cumbest Bluff south to the Mississippi Sound. The purpose of the study was to determine the effect, on the ecosystem, of the upstream migration of the salt water wedge during water withdrawal at low-flow conditions. To determine this effect, hydrodynamic and water quality monitoring data were collected at approximately 20 stations throughout the tidally-influenced portions of the East and West Pascagoula Rivers. Hydrodynamic data included current velocity/direction using a Doppler acoustic flowmeter, water level, conductivity/salinity, and temperature. Water quality data included dissolved oxygen, temperature, conductivity/salinity, and pH.

The results of the study after model calibration showed there would be no apparent effect on the ecosystem during low-flow conditions due to flow characteristics or the upstream migration of the salt water wedge under the current permitted withdrawals.

2. Upper Leaf River near Moselle Complaint Investigation (1995)

A citizen complaint in September 1995 initiated this investigation to determine if effluent from a chicken processing facility was impairing the waters of the upper Leaf River. A control site was selected above the effluent; the second site was located at the outfall; and the final site was located approximately 100 yards below the confluence of the effluent with the river. Low water levels also allowed samples of the effluent to be collected just prior to entering the river.

Field determinations of pH and residual chlorine indicated that the effluent was in violation of its NPDES permit. However, all parameters measured had returned to ambient levels at the most downstream site. This indicates that the effluent is rapidly mixing with the river water or is rapidly being assimilated. Additionally, collections of several leaf pack accumulations just below the effluent outfall revealed an abundance of aquatic insect larvae known to be sensitive to pollution. Consequently, OPC staff concluded that the biota were not adversely affected by the effluent.

3. Leaf River - Background Study of Conditions Prior to the Beginning of Sand and Gravel Mining (1995-1996)

The OPC Surface Water Division requested that an upstream/downstream biological survey be done prior to the onset of in-stream sand and gravel mining in the Leaf River below Petal, MS. The OPC Biological Services Section is performing, under contract with the mining company, both a pre- and post-dredging biosurvey. The pre-dredging survey was completed in July 1995 with the follow-up originally scheduled for July 1996 (after the dredging operation has been in place for some time). In addition to the biological survey, water samples were also collected at both sites and tested for oil and grease, pH, dissolved oxygen, visible sheen, and turbidity. Results of the chemical and biological data indicate that no measurable difference existed between the upstream and downstream sites prior to the onset of mining activities at the proposed site. As of this writing, the follow-up study has not been completed due to a delay in start-up of the mining operation.

4. Tallahala Creek near Laurel TMDL Study (1996-1997)

During the summer of 1987, a water quality and biological study was conducted on Tallahala Creek near Laurel. The purpose of the study was to further document water quality conditions in those reaches of Tallahala Creek below the Laurel and Masonite wastewater discharges. The special focus of the study was to gather baseline biological data prior to the Laurel wastewater treatment system upgrade. Information about periphyton, macroinvertebrates, and phytoplankton was gathered. The pre-upgrade phase of this study was completed in 1989. Subsequent upgrades to the City of Laurel sewage treatment systems and improvements to Masonite’s wastewater treatment system were completed in the early 1990's.

Tallahala Creek is on the Mississippi 1996 Section 303(d) List of Impaired Waterbodies and was targeted for TMDL development beginning in 1996. In October 1996, the Tallahala Creek TMDL intensive low-flow synoptic survey was conducted by the Water Quality Assessment Branch with analytical support provided by the OPC laboratory. The purpose of the study was two-fold. The first was to develop a TMDL for oxygen-demanding pollutants in Tallahala Creek at and below the city of Laurel. The second purpose of this study was to investigate the feasibility of removing the dissolved oxygen (DO) water quality standards variance presently in place for an approximately 28 mile stretch of the stream. Data from the 1996 intensive survey was used to provide the hydrodynamic and water quality data for calibration of OPC's wasteload allocation model, AWFWUL1, for Tallahala Creek. AWFWUL1 is a model which has been used extensively by MDEQ and is promulgated in MDEQ regulations. It is a steady-state, daily average computer model that utilizes a modified Streeter-Phelps DO sag equation. Wastewater facilities investigated during the study included the City of Laurel POTW #1 and POTW #2, City of Ellisville South POTW, and the Masonite Corporation paper mill in Laurel.

Field activities included stream discharge measurements, a time-of-travel dye study, photosynthesis/respiration measurements, diurnal profiling for DO, temperature, pH, TDS, and specific conductance. Both semi-continuous monitoring with Hydrolab datasondes and spot profiling measurements were utilized. Sample collection was conducted for water chemistry analysis of nutrients, BOD5, BOD ultimates, solids, and chlorophyl a. A total of approximately 14 stream locations and 5 wastewater outfalls were monitored during the study. Laboratory analyses were completed and the data compiled, analyzed, and input into the model for model calibration.

A model verification study on Tallahala Creek was conducted in September 1997. The purpose of this study was to gather an additional data set under slightly different temperature and flow conditions to validate the computer model. Station locations and parametric coverage were very similar to that collected in 1996. Data from the 1997 study was used to validate, verify, and recalibrate the model so that it best represented the stream response to both sets of conditions.

Results from the intensive surveys and model development indicate that water quality has substantially improved in Tallahala Creek since the wastewater upgrades as compared to the pre-1990 data. The calibrated model was used to predict water quality at worst case conditions, which are low flow, high temperatures, and maximum loads of BOD allowed under existing permits. The minimum DO predicted by the model was approximately equal to that allowed by the variance. Therefore, the TMDL for BOD is the current load of BOD allowed by existing permits for the upper segment of Tallahala Creek into which the City of Laurel and Masonite discharge. However, monitoring and modeling in the lower segment of Tallahala Creek showed that the impairment has been sufficiently eliminated and that no TMDL for BOD was necessary. Consequently, removing the variance for the lower segment of Tallahala Creek is a possibility that will be addressed in the triennial review of water quality criteria conducted by MDEQ.

In addition, at the request of the WQAB, the biological sites visited in the pre-upgrade study were revisited in 1996 by the Biological Services Section and the majority of this study (excluding phytoplankton parameters) was repeated to further document the water quality of Tallahala Creek. Results collected by the Biological Services Section at this time confirmed that several of the sites which were most adversely affected prior to the upgrades showed improved water quality. Two sites used in these studies continue to be a part of the OPC's ambient biomonitoring network, Tallahala Creek at Runnelstown and Tallahala Creek at Ellisville, and are monitored on an annual basis.

5. Escatawpa River Water Quality Model Calibration Study (1997)

The Escatawpa River near Moss Point is a stratified estuarine river with historically low dissolved oxygen levels. A dissolved oxygen (DO) water quality standards variance is also in place for this portion of the river. As a result of this condition, the EPA is conducting a review of the Use Attainability Analysis (UAA) of the Escatawpa River. Within that estuary are several discharges including the largest and most significant, the Jackson County Port Authority release which includes the industrial wastewater from International Paper Company. The issue of present and future wasteload allocation is of crucial importance to any remediation plans to improve water quality.

In September 1997, a intensive survey was conducted on the Escatawpa River by EPA with assistance from MDEQ OPC Water Quality Assessment Branch, OPC Field Services Division - South Regional Office and OPC laboratory, and MDEQ Office of Land and Water Resources. The primary objective of this survey was to collect a calibration data set for the development of a water quality model for the Escatawpa River.

A total of 14 stations were established in the study area which included the Escatawpa River, Pascagoula River, West Pascagoula River and a station in the Mississippi Sound. Monitoring activities during the nine day study period included tide-phased water quality sampling for BOD5, ultimate BOD, nitrogen series, and total and ortho-phosphorus and in-situ profiling of DO, salinity and temperature. Other study components included effluent monitoring, continuous DO monitoring with Hydrolab multiparameter dataloggers, production and respiration measurements, sediment oxygen demand, diffusion/reaeration measurements, a dye dilution study as well as hydrological and meteorological monitoring.

A second intensive survey is tentatively scheduled for Spring 1999. The purpose of this study will be to collect an additional set of data for model calibration/verification.

6. Basinwide Approach Monitoring - Pascagoula River Basin

As a pilot project to support the development of MDEQ's Basinwide Approach to Water Quality Management, an effort to gather baseline physical/chemical and biological information on the Pascagoula River Basin was carried out during 1997. A basin fixed network of monitoring stations consisting of approximately 100 stations was established and monitored by OPC in 1997 in addition to the Primary Ambient Fixed Network stations already established in the basin. Primary station selection criteria included at least one site at the outlet of each of the NRCS 11-digit watersheds in the basin as well as a site on all 303(d)-listed waters assessed as monitored in 1996. Biological assessment consisted of screening level techniques on macroinvertebrates, fish sampling for fish tissue analysis and chlorophyll analysis. Chemical sampling for conventional pollutants was also conducted twice a year during a high flow and a low flow period at most stations. Analysis of the macroinvertebrate data generally indicated that the biological condition of most of the streams from the Pascagoula Basin 65E sub-ecoregion (see Ecoregion map, p.168) were fully supported/fully supported but threatened waterbodies. Biological conditions from the 65F ecoregion, however, suggested that a large portion of the streams on this area were partially supporting/non-supporting waterbodies.

Other Agency Water Quality Surveys

None known.

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MS063ACWPM	ARCHUSA CREEK WATER PARK																		F	P*				
	AT QUITMAN	DPA048D00-AC1															P							
MS099B2E1	BEAVERDAM BRANCH																		F					
	NEAR TALOWAH	VMB003V13-BDB1	F	N	F						F							F						
MS091M	BIG BOGUE HOMA CREEK																		T					
	AT HEIDELBURG OIL SPILL SITE 1	DPA043D00-BBH1																T						
	AT HEIDELBURG OIL SPILL SITE 2	DPA043D00-BBH2																F						
	AT HEIDELBURG OIL SPILL SITE 3	DPA043D00-BBH3																F						
	AT HEIDELBURG OIL SPILL SITE 4	DPA043D00-BBH4																F						
MS099B1M3	BLACK CREEK																		F					
	NEAR HICKORY GROVE WEST OF MELBA	D02479088	F	N	F		F	F	F	F			F					F						
MS099B2E2	BLACK CREEK																		F					
	NEAR BROOKLYN	VMB003V14-BC1	F	N	F						F							T						
MS099B2M1	BLACK CREEK																		T				N	
	NEAR PURVIS AT COUNTY ROAD 4.0 MILES EAST OF PURVIS	D02479102	F	N	F	F	F	F	F	F	F	F	F		N	F								
MS100BE1	BLACK CREEK																			F				
	AT BROOKLYN AT HWY 49	DMS100BE1-1															F							
MS084M	BOWIE CREEK																		F	T			P	
	NEAR HATTIESBURG AT HWY 49 SOUTHBOUND LANE ON WEST SIDE	D02472500	F	F	F	F	F	F	F	F	F	F	F		P		T							
MS085E2	BOWIE RIVER																			F				
	NEAR GLENDALE	DMS085E2-A															F							
	NEAR HATTIESBURG AT I-59	DMS085E2-B															F							
MS106E1	BRUSHY CREEK																		F					
	NEAR LUCEDALE	VMB003V16-BC1	F	N	F						F							F						
MS08001M	BURTONS CREEK																		T					
	NEAR COLLINS AT HWY 49	D02472780	F	N	F								F					T						
MS063M	CHICKASAWHAY RIVER																		P					
	AT ENTERPRISE AT HWY 513	D02477000	F	P	F	F	F	P	F	N	F	P	F											
MS065M	CHICKASAWHAY RIVER																		T			P		
	AT WAYNESBORO AT HWY 63 2.0 MILES SOUTH OF WAYNESBORO	D02477560	F	F	F	F	F	P	F	F	F	P	F	F	P	F								

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MS065M2	CHICKASAWHAY RIVER																			F				
	AT SHUBUTA	D02477350															F							
MSLCHKRE1	CHICKASAWHAY RIVER																			F				
	NEAR MERRILL AT HWY 98	D02478800															F							
	NEAR MERRILL	DMSLCHKRE1-1															F							
MS057M3	CHUNKY RIVER																			T				
	AT CHUNKY ABOVE COUNTY BRIDGE	D02475490															T							
MS096E2	CLARK BAYOU, UNNAMED TRIBUTARY OF																		T					
	NEAR COLL TOWN	VMB003V10-CB1	F	N	P						F							T						
MS085CCLM	COUNTRY CLUB LAKE																			N*				
	NEAR HATTIESBURG	DMS085CCLM-1															N							
MS101M1	CYPRESS CREEK																		T			P		
	NEAR JANICE	G02479155	F	N	F			F	F	F	F		F	F	P									
MS107M2	ESCATAWPA RIVER																		T	P*				
	NEAR ORANGE GROVE AT GOODES MILL ABOVE I-10	DMS107M2-1															P							
	NEAR ORANGE GROVE AT MILE 13.0 ABOVE I-10	G02480180	F	F	F								F											
MS107M3	ESCATAWPA RIVER																		P	T				
	NEAR ORANGE GROVE AT SITE 2.5 AT BLACK CREEK CONFLUENCE	DMS107M3-2.5															F							
	AT MOSS POINT AT JPA CANAL (SITE 3)	DMS107M3-JPA															F							
	NEAR ORANGE GROVE AT SHINGLE MILL	DMS107M3-SM															P							
	AT ORANGE GROVE	G02480181	F	P	N																			
	NEAR MOSS POINT AT MILE 10.0	G02480182	F	F	N																			
	NEAR MOSS POINT AT MILE 9.0	G02480183	F	F	N																			
	NEAR MOSS POINT AT MILE 8.0	G02480184	F	F	N																			
	AT MOSS POINT AT HWY 613 1.0 MILES NORTH OF MOSS POINT	G02480207	F	F	F																			
	NEAR ESCATAWPA AT MOUTH AT MILE 0.0	G02480208	F	F	N																			
	AT MOSS POINT AT MILE 3.0	G302455088313100	F	F	N																			
	AT MOSS POINT AT MILE 2.0	G302459088320800	F	F	N																			
	NEAR MOSS POINT AT MILE 6.0	G302512088292200	F	F	N																			
	NEAR MOSS POINT AT MILE 5.0	G302515088301300	F	F	N																			
	NEAR MOSS POINT AT MILE 4.0	G302528088304400	F	F	N																			
	NEAR MOSS POINT AT MILE 7.0	G302541088290100	F	F	N																			
	NEAR ORANGE GROVE AT MILE 11.0	G302628088271000	F	N	N																			

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10/20/99

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	NEAR ORANGE GROVE AT MILE 12.0 BELOW I-10	G302715088270700	F	N	P																			
MS065EM1	EUCUTTA CREEK																		P					
	NEAR EUCUTTA OIL SPILL SITE 5	DPA044D00-EC5																T						
	AT EUCUTTA OIL SPILL SITE 4	DPA044D00-EC4																P						
MS102FCRM1	FLINT CREEK RESERVOIR																		F	T				
	AT WIGGINS	DPA050D00-FCR1	F	F			F	F	F	F			F				T							
		IPA050D00-FCR1	F	F	F					F			F											
MS100BM1	GRANNY CREEK																		F					
	NEAR BROOKLYN	DAAS-2	F		F													T						
MS096E02E	KREBS LAKE																			T				
	AT PASCAGOULA	DMS096E02E-1															F							
MS091LBHM	LAKE BOGUE HOMA																		F					
	NEAR CLEO	IPA054D00-BH1	T	F	F					F			F											
MS096LCE	LAKE CATCH-EM-ALL																			T				
	NEAR PASCAGOULA	DPA045D00-CEM1															F							
MS102LTLE	LAKE TOC-O-LEEN																			F				
	NEAR STILLMORE	DPA051D00-TOL1															F							
MS075M	LEAF RIVER																			T				
	NEAR HEBRON AT HWY 84	D02472000															T							
MS075M2	LEAF RIVER																		F					
	NEAR CENTER RIDGE	DPA061D00-LR1	F	F	F								F					F						
		DPA061D00-LR2	F	F	F								F											
MS086M	LEAF RIVER																		T	T		N		
	AT HATTIESBURG 0.3 MILES SOUTHEAST OF HATTIESBURG BELOW HATTIESBURG POTW OUTFALLS BELOW BURKETTS CREEK	D02473130															F							
	NEAR PALMER AT SIMS BRIDGE 2.5 MILES SOUTHEAST OF PALMER	D02473260	F	P	F	F	F	N	F	F	F	P	F	F	N	T								
	NEAR MCCALLUM 1.5 MILES EAST OF MCCALLUM AT WELDY CREEK	D02473320															F							
	NEAR MAHNED	D02473360															F							
	NEAR HATTIESBURG	DLR-1	F								F	F						F						
		DLR-2	F								F	F						F						

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MS090M1	LEAF RIVER																		T	F		N		
	AT NEW AUGUSTA AT HWY 29 1.5 MILES NORTHWEST OF NEW AUGUSTA	D02474560	F	F	F	F	F	N	F	F	F	F	F	F	N	F	F							
	NEAR BEAUMONT AT WINGATE BRIDGE 1.5 MILES NORTH OF WINGATE	D02474680	F	F	F	F	F	N	F	F	F	F	F	F	N	F	F	F						
	AT BEAUMONT AT HWY 15 0.5 MILES NORTH OF BEAUMONT	D02474740	F	P	F	F	F	N	F	F	F	P	F	F	N	T	F	F						
MS094M1	LEAF RIVER																		T	F		P		
	NEAR MCLAIN AT OLD HWY 98 1.2 MILES EAST OF MCLAIN	D02475000	F	N	F	F	F	N	F	F	F	F	F	F	P	F	F	F						
	AT MERRILL AT MOUTH 1.0 MILES NORTHWEST OF MERRILL	D02475082	F	N	F	F	F	N	F	F	F	F	F	F	P	T	F	F						
MS090M2	LEAF RIVER, UNNAMED TRIBUTARY OF																		P					
	AT BEAUMONT BELOW HOOD INDUSTRIES OUTFALL	DPA035D00-4	F	N	F								F					P						
		DPA035D00-5	F	N	F								F											
MS090E1	MILKY CREEK																		F					
	AT NEW AUGUSTA	VMB003V09-MC1	F	P	F						F							F						
MS065EM2	MILL CREEK																		F					
	AT EUCUTTA OIL SPILL REFERENCE SITE (CONTROL)	DPA044D00-MC1																F						
MS085E1	MINERAL CREEK																			T				
	NEAR HATTIESBURG AT DR. PHILLIPS LAKE	DMS085E1-A															F							
MS099B1M2	MONROE CREEK																		F					
	NEAR OLOH	D02479089	F	P	F		F	F	F	F			F					F						
MS060M	OKATIBBEE CREEK																		T			N		
	AT ARUNDEL AT COUNTY ROAD 0.6 MILES SOUTHEAST OF ARUNDEL	D02476600	F	F	F	F	F	N	N	N	F	F	F	P	N	F		F						
MS0590KRE	OKATIBBEE RESERVOIR																			T			F	
	NEAR COLLINSVILLE AT COLLINSVILLE BEACH	CPA056C00-CB													F									
	NEAR COLLINSVILLE AT PINE SPRINGS BEACH	CPA056C00-PSB													F									
	NEAR COLLINSVILLE AT TWILTLEY BRANCH BEACH	CPA056C00-TBB													F									
	NEAR COLLINSVILLE AT WEST BANK BEACH	CPA056C00-WBB													F									
	NEAR COLLINSVILLE	DPA052D00-OK1															T							

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MS08002E1	OKATOMA CREEK																		F					
	AT SANFORD	D02472850	F	F	F		F	F	F	F								F						
	NEAR SANFORD	DPA062D00-OC1	F	F	F		F	F	F	F	F	F	F					F						
		VMB003V08-OC1	F	N	F						F							F						
MS08002M	OKATOMA CREEK																		T				N	
	AT SEMINARY AT HWY 590 0.1 MILES WEST OF SEMINARY	D02472820	F	P	F	F	F	P	P	P	F	F	F	N	N	T		F						
MSEPASRM1	PASCAGOULA RIVER																		T	P*				
	NEAR COLL TOWN AT MILE 13.0	G02479341	F	F	N																			
	NEAR COLL TOWN AT MILE 12.0	G02479342	F	F	N																			
	AT ESCATAWPA AT I-10 AT MILE 8.0	G02479343	F	F	N		P	F	F	F														
	NEAR ESCATAWPA AT MILE 7.0	G302526088333600	F	F	N																			
	NEAR ESCATAWPA AT MILE 9.0	G302648088340600	F	F	N																			
	NEAR ESCATAWPA AT MILE 10.0	G302725088333700	F	F	N																			
	NEAR ESCATAWPA AT MILE 11.0	G302822088332500	F	F	N																			
	NEAR COLL TOWN AT MILE 14.0	G302954088344000	F	F	N																			
	NEAR COLL TOWN AT MILE 15.0	G303018088351800	F	F	P																			
	NEAR COLL TOWN AT MILE 16.0	G303044088353000	F	F	F																			
MSPASRM1	PASCAGOULA RIVER																		F	P*			P	
	AT MERRILL	D02479000	F		F								F				F	F						
	NEAR BENNDALE AT BIG CREEK CONFLUENCE	D02479030	F		F								F				T	T						
	NEAR WADE AT BLACK CREEK CONFLUENCE	DMSPASRM1-1															F							
	NEAR BENNDALE AT HWY 26	G02479020	F	N	F			N	F	F	F		F		P									
MSPASRM2	PASCAGOULA RIVER																		F	P*				
	NEAR COLLTOWN AT MILE 17.3	D02479340	F	F	F								F											
	NEAR COLLTOWN AT MILE 17	D303048883355800	F	F	F								F											
	NEAR COLL TOWN AT MILE 19.8 AT POWER LINES	DMSPASRM2-MS3	F	F	F												P							
	NEAR COLLTOWN AT CUMBEST BLUFF	DPAPRCB1-SFD															P							
MSEPASRM1	PASCAGOULA RIVER, EAST																		T	P*				
	NEAR ESCATAWPA AT MILE 11.0	DMSEPASRM1-MS1	F	F	N																			
	NEAR COLL TOWN AT MILE 15.0	DMSEPASRM1-MS2	F	F	F																			
	NEAR ESCATAWPA AT MILE 10.0	DMSEPASRM1-PR1	F	F	F												F							
	NEAR COLLTOWN AT LITTLE RIVER MARINA	DPAPR1-SFD															P							
MSEPASRM2	PASCAGOULA RIVER, EAST																		P	P*				
	AT PASCAGOULA AT MILE 0.0 AT MOUTH	D02480215	F	F	F																			

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	AT PASCAGOULA ABOVE HWY 90	DMSEPASRM2-PE2	F	F	F																			
	AT PASCAGOULA AT HWY 90	G02480210	F	F	N		N	F	F	F	F													
	AT PASCAGOULA AT MILE 1.0	G02480212	F	F	N																			
	AT PASCAGOULA AT MOUTH AT MILE 0.0	G02480215	F	F	N		P	F	F	F														
	AT PASCAGOULA AT MILE 3.0	G302319088335400	F	F	N																			
	AT PASCAGOULA AT MILE 4.0	G302345088343800	F	F	N		N	F	F	F														
	AT PASCAGOULA AT MILE 5.0	G302430088350400	F	F	N																			
	AT MOSS POINT AT MILE 6.0	G302507088342800	F	F	N		P	F	F	F														
		PA034D00-PEM	F	F	F																			
MSWPASRM1	PASCAGOULA RIVER, WEST																		F	P*				
	NEAR COLL TOWN AT POTICAW CAMP	DMSWPASRM1-1															P							
	NEAR COLL TOWN AT MILE 15.0	DMSWPASRM1-MS4	F	F	F																			
MSWPASRM2	PASCAGOULA RIVER, WEST																		T	P*				
	AT GAUTIER IMMED ABOVE HWY 90	D02480285	F	F	F												P							
	NEAR GAUTIER ABOVE I-10	DMSWPASRM2-MS5	F	F	F												P							
	NEAR GAUTIER AT MOUTH AT MILE 0.0	DMSWPASRM2-PWM	F	F	F																			
	AT GAUTIER ABOVE HWY 90 BRIDGE	M/M6-11	F											F										
MS099B1M1	PERKINS CREEK																		T					
	AT CLYDE	VMB003V12-PC1	F	N	P						F							T						
MS057M1	POTTERCHITTO CREEK																		T					
	AT NEWTON AT NEWTON POTW ACCESS ROAD	DMB002D03-PC1																T						
MS103E1	RED CREEK																		F					
	NEAR BEATRICE	VMB003V15-RC1	F	P	F						F							F						
MS103RM	RED CREEK																		F	F			N	
	AT VESTRY AT COUNTY ROAD 0.5 MILES NORTH OF VESTRY	D02479300	F	F	F	F	F	F	F	F	F	F	F		N	F	F							
	NEAR VESTRY ABOVE CONFLUENCE WITH BLACK CREEK	DPARC1-SFD															F							
MS057M2	RICHARDSON MILL CREEK																		P					
	NEAR NEWTON UPSTREAM OF NEWTON POTW OUTFALL	DMB002D03-RM1																P						
	NEAR NEWTON DOWNSTREAM OF NEWTON POTW OUTFALL	DMB002D03-RM3																P						
MS087M1	TALLAHALA CREEK																		F					
	AT LAUREL AT DUNCANS BLUFF	D02473490-95																F						

HEADER ABBREVIATIONS: Tmp-Temperature, pH-Acidity/Alkalinity, DO-Dissolved Oxygen, COD-Chemical Oxygen Demand, TOC-Total Organic Carbon, TKN-Kjeldahl Nitrogen, N+N-Nitrite & Nitrate, TP-Total Phosphorus, Turb-turbidity, TSS-Total Suspended Solids, Cndct-Conductivity, FCU-Fecal Coliform (Upper Limit), FCL-Fecal Coliform (Lower Limit), TOX-Toxicants, Wtr-in Water Column, Fsh-in Fish Tissue, BIO Stat-Biological Rating (macroinvertebrates) 10/20/99

USE SUPPORT STATUS: F-Fully Supported, T-Fully Supported but Threatened, P-Partially Supported, N-Not Supported, *-Fish Advisory

WATERBODY (WB) USE CLASSIFICATIONS: AQ-Aquatic Life Support, FC-Fish Consumption, SHL-Shellfish Harvesting, SC-Secondary Contact Recreation, CR-Contact Recreation, DW-Raw Water Supply

AGENCY ABBREVIATIONS: C-USACE, D-MSDEQ, E-USEPA, F-USFS, G-USGS, I-Inst. of Higher Learning, M-DMR, N-NOAA, T-TVA, V-Volunteer Monitor

TABLE III-41
SUMMARY OF MONITORING DATA (1992 - 1997)
PASCAGOULA BASIN

Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	PHYSICAL/CHEMICAL DATA Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	Fsh	Bio Stat	USE SUPPORT AQ	FC	SHL	SC	CR	DW
MS087M2	TALLAHALA CREEK																		T					
	AT LAUREL AT HWY 15	D02473500																T						
	AT LAUREL BELOW MASONITE	DPA063D00-TCB1																P						
	AT LAUREL BELOW MASSEY STP	DPA063D00-TCB2																T						
	AT LAUREL ABOVE MASONITE	PPA030D1	F	F	F													T						
MS087M3	TALLAHALA CREEK																		T					
	NEAR MONTROSE	D02473395	F	F	F		F	N	F	F								T						
MS089M1	TALLAHALA CREEK																		T	F				
	AT ELLISVILLE AT COUNTY ROAD 0.5 MILES	D02474200	F	F	F	F	F	P	N	N	F	F	F					F						
	NORTHEAST OF ELLISVILLE																							
	AT ELLISVILLE AT HWY 29	D02474300															F							
MS089M2	TALLAHALA CREEK																		T	F		P		
	AT RUNNELSTOWN AT HWY 42	D02474480															F	T						
	NEAR RUNNELSTOWN AT COUNTY ROAD 3.0 MILES	D02474500	F	F	F	F	F	P	F	P	F	F	F	P	F	F								
	SOUTH OF RUNNELSTOWN																							
	NEAR UNION AT SHOLARS BRIDGE	P02474330	F	F	F																			
MS074M1	TALLAHALA CREEK, WEST																		F					
	NEAR CENTER RIDGE	DPA061D00-WTC1																F						
MS074M2	TALLAHALA CREEK, WEST																		F					
	NEAR CENTER RIDGE	DPA061D00-WTC2																F						
MS071TKRM	TURKEY FORK RESERVOIR																		F					
	NEAR CARSON CITY	IPA055D00-TF1	P	P	F					F			F											
MS096E1	VAUGHN BAYOU																		F					
	NEAR THREE RIVERS	VMB003V11-VB1	F	N	P						F							F						

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10/20/99

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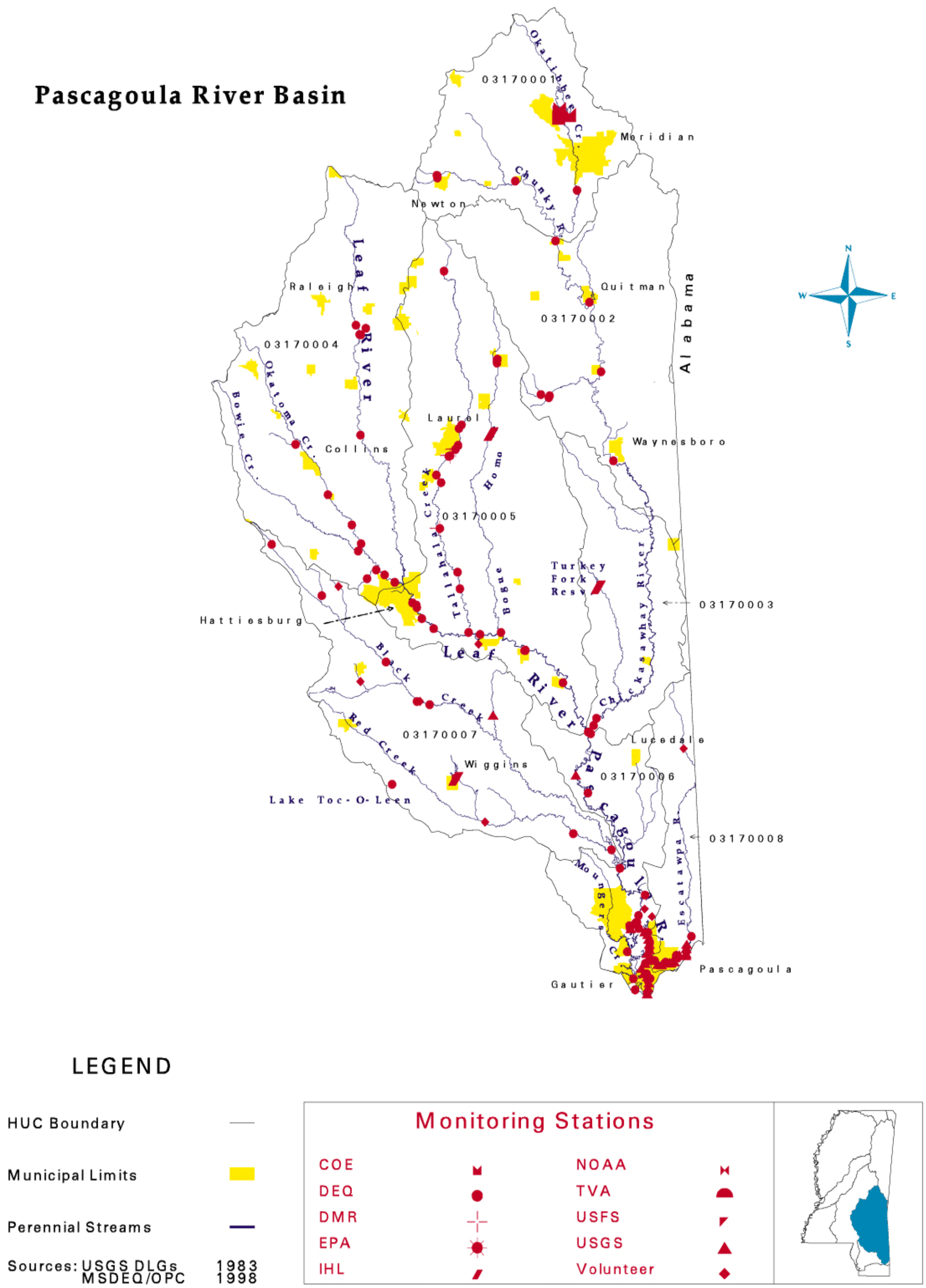
FIGURE III-14
Locations of Monitoring Stations



PEARL RIVER BASIN

Description

The Pearl River rises in east-central Mississippi, flows southwesterly to Jackson, then continues southeasterly to the Mississippi Sound. The river is about 490 miles long and drains an area of about 8,000 square miles. More than 60 percent of the basin is forested, and about 30 percent is farmed. Agriculture, silviculture, and industry are the principal land uses. Upstream of Jackson, the Pearl River flows into the Ross Barnett Flood Control Reservoir which is used extensively for recreation. The river is also used as water supply for the City of Jackson.

Much of the upper two-thirds of the Pearl River Basin consists of gently rolling to hilly terrain. Significant tributaries include the Yockanookany River, Bogue Chitto River and Strong River. Streams in this area have fairly fast, deep flows for a short time after rain and relatively shallow base flows. Turbidity is often a problem and streams are of fair water quality. In the southern part of the basin, the land is much flatter. These streams, which include the Bogue Chitto River from Brookhaven to the Louisiana state line, usually have a fast deep flow and fair to good water quality. Municipal and industrial point source discharges into the Pearl River are more prevalent from Jackson south to the Mississippi Sound. Water quality impacts are noted below Jackson and at Columbia due to point and nonpoint sources. On the lower end of the Pearl River, the majority of flow has historically been diverted to Louisiana due to channel alterations. This left the original river channel near Picayune essentially dry during low-flow conditions. This situation was addressed in 1997 and 1998 through a cooperative effort between the states of Mississippi, Louisiana and local entities which called for a flow restricting structure to be constructed to divert more water into the original channel. Near the coast, the river becomes estuarine, bounded by salt marsh and affected by tidal influence.

Special Classifications

Barnett Reservoir	Public Water Supply	From River Bend to between Township line 7N and 8N
Pearl River	Public Water Supply	From Barnett Reservoir to City of Jackson Water Intake
Barnett Reservoir	Public Water Supply and Recreation	From between Township 7N and 8 to Reservoir Dam N
Bogue Chitto R.	Recreation	From Hwy 570 to MS/LA Stateline
Lake Columbia	Recreation	Marion County
Lk. Dixie Springs	Recreation	Pike County
Magees Creek	Recreation	From Hwy 98 to Bogue Chitto River
Pearl River	Recreation	From Byram Bridge to Miss. Sound
Strong River	Recreation	From Hwy 49 to Pearl River

Permitted Major Sources

Brookhaven POTW	MS0024147	Halbert Branch	Brookhaven
Columbia POTW - South	MS0044164	Pearl River	Columbia
Forest POTW	MS0020362	Gordy Branch	Forest
Georgia Pacific Corporation	MS0002941	Pretty Branch/Pearl R.	Monticello

Hazlehurst POTW - Bahala Crk.	MS0023922	Bahala Creek	Hazlehurst
Jackson POTW - Savanna St.	MS0024295	Pearl River	Jackson
Jackson POTW- Trahon/Big Crk.	MS0044059	Big Creek	Jackson
Kosciusko POTW - South	MS0027774	Yockanookany R.	Kosciusko
Morton POTW	MS0036234	Strong River	Morton
Philadelphia HCR Site	MS0021156	Kentawka Creek	Philadelphia
Picayune POTW	MS0042161	East Pearl River	Picayune

Noteworthy Items

1. Lower Pearl River low-flow controversy addressed through cooperative Federal, State and local effort

2. Bogue Chitto River fish “limit consumption” advisory due to mercury continues

3. Fish "no consumption" advisory and commercial ban due to PCBs on portion of Yockanookany River remains in effect; “limit consumption” advisory for fish due to mercury issued for entire length

4. Due to PCBs, "no consumption" advisory and commercial ban for fish issued on a portion of Conehoma Creek

OPC Environmental Damage Assessments

1. Silver Creek Water Quality Assessment (1994)

OPC personnel conducted four macroinvertebrate assessments on Silver Creek in August 1994, after initially investigating complaints in the area in 1993 and 1994. The objectives of the study were to determine what impact, if any, runoff from the Miles Lumber Company, overflow from a sewage lagoon, and runoff from a sawdust storage area were having upon the water quality of Silver Creek. The sampling regime was as follows: (1) one sample was collected as an upstream control; (2) one sample was collected downstream of the saw mill; (3) a second downstream sample was collected below the Silver Creek (town) municipal lagoon; and (4) a third downstream sample was collected below a large field which has historically been used to store sawmill waste (e.g. sawdust and wood chips). A preliminary assessment of biotic integrity indicated outstanding water quality at the upstream control site. This portion of the stream should be considered as a reference site for this ecoregion.

2. Line Creek - Ethyl Acrylate Spill (1995)

A tractor-trailer accident along Interstate-20 near Morton on April 21, 1995, resulted in an undetermined amount of ethyl acrylate being spilled onto the ground. Heavy rains that night created the potential for the chemical to be washed into Line Creek. An investigation was conducted the following morning at four sites. Site 1, a control site, was located on Line Creek above the likely point of entry of the chemical into the stream. Site 2 was located just below the point of entry of the chemical into the stream. Sites 3 and 4 were located downstream some distance, and were chosen to document recovery, and to confirm that this chemical did not enter the Ross Barnett Reservoir.

Dissolved oxygen, pH, temperature, hardness, alkalinity, and specific conductance were measured at each site. Water column samples were collected and analyzed for VOCs and ethyl acrylate. Neither volatile organic contaminants nor ethyl acrylate were detected in the water samples. Thus, the planned biological assessments were not conducted at these sites.

3. Port Bienville - Leakage of Ferrous Sulfate (1995)

A large amount of ferrous sulfate leaked from a barge moored in Port Bienville near Pearlington, Mississippi on June 17, 1995. This caused a fish kill in the navigation canal and in the waters of Mulatto Bayou. Personnel from the OPC's Emergency Response Branch and Biological Services Section and the Office of Geology assisted NOAA, the U.S. Coast Guard, scientists from Beak, Inc., and the EPA in documenting damages and in the sampling effort. A total of 429 dead fish were counted, but due to tidal flushing and predation by shore birds, this is likely a gross underestimate of the actual number of fish affected. Sediment, macrobenthic, zooplanktonic, and water column samples were taken. A survey of emergent macrophytes revealed that much of the ferrous sulfate had settled onto these plants.

A Hattiesburg contract lab continued monitoring for several months after the investigation, and has prepared at least two reports for review. The latest report has insufficient and inadequate data that prevent sound conclusions about the degree of recovery of the waters affected.

4. Tallabogue and Shockaloo Creeks - Chicken Processing Wastewater Spill (1995)

In July 1995, the OPC Surface Water Division requested an Environmental Damage Assessment in the Tallabogue and Shockaloo Creek watersheds following a series of complaints and a reported spill of waste from a chicken processing plant. Samples were collected at 12 sites during the initial phase of the investigation. The chicken processing plant holds an NPDES Permit for discharge into the headwaters of Tallabogue Creek. Physical and chemical determinations made at two locations in the headwaters of Tallabogue and Shockaloo Creeks immediately adjacent to the industry documented high specific conductances (14,900 and 10,200 umhos). High levels of ammonia (53.8 and 64.6 mg/L) were also found at these sites. To ensure that the contamination from the discharge was not impacting the Pearl River, the sampling network extended the entire length of Tallabogue Creek and beyond its confluence with Tuscolometa Creek.

Results obtained from the chemical analyses were used to determine sites for biological assessments. Four sites, plus an off-site control were selected. Sediment samples were also collected at this time and analyzed for ammonia and other organic nutrients. Two of the sites were at the headwaters of Tallabogue and Shockaloo creeks, where impacts were expected. Field identifications of the benthic fauna at these two sites led to the conclusion that Shockaloo Creek (which had been subjected to spillage of chicken parts) had recovered after one half mile (ammonia levels 0.1 mg/L; specific conductance 47 umhos). Consequently, Shockaloo Creek was not bioassessed further downstream.

In contrast to Shockaloo Creek, the macrobenthos of Tallabogue Creek showed signs of moderate to severe impacts for a distance of about 8.5 miles below the point of entry of the permitted discharge into the stream. Specific conductance at the sampled sites was 1334 and 1664 umhos, and ammonia levels were 8.46 and 9.94 mg/L. Sampled sites on Tuscolometa Creek showed chemical characteristics near normal. Biological Services Section staff have recommended long-term monitoring be done at these sites to document that changes in treatment at the chicken processing plant are having the desired effects on the streams' water quality.

5. PCB Analysis in Fish Below Texas Eastern Pipeline Compressor Station at Kosciusko (1997-Present)

In June 1987, a fish tissue consumption advisory and a commercial fishing ban were issued for twelve miles of the Yockanookany River and its tributaries from Highway 35 at Kosciusko to Highway 429 near Thomastown. The advisory was issued after elevated levels of PCBs were found in fish tissue at several sampling sites. Ten sites were sampled from Kosciusko to the Ross Barnett Reservoir.

Additional monitoring is ongoing at the Kosciusko sampling site (see Table III-5) under an approved monitoring plan in effect until 1997. The fish consumption advisory will remain in effect until PCB concentrations return to safe levels. Analyses of fish tissue and sediment from watersheds with other Texas Eastern compressor stations indicated no significant PCB contamination of fish or sediment.

In 1998, additional sites on the Yockanookany River were sampled and data is currently being evaluated.

OPC Intensive Water Quality Surveys and Special Studies

1. Balls Mill Creek Investigation (1995)

The OPC received a citizen complaint alleging that construction of an oil rig near Columbia, Mississippi, was adversely affecting the portion of Ball Mill Creek flowing through his property. The complainant reported the formation of a viscous brown mat over the stream bottom as evidence of contamination. A sample of this material was submitted by the complainant for microscopic analysis. The material was found to be a conglomeration of filamentous algae, diatoms, sand, and some amorphous organic matter of undetermined origin. This was considered natural, and was found both above and below the construction site.

Continued dissatisfaction with the OPC findings by the complainant resulted in biologists making a site visit in September 1995 to collect samples for chemical specific analysis of total Kjeldahl nitrogen (TKN), total phosphorous, ammonia, nitrate plus nitrite, total dissolved solids (TDS), total suspended solids (TSS) and total solids. In addition, field determinations of dissolved oxygen, pH, total hardness, total alkalinity, and specific conductance were done at five sites ranging from above the construction site to the pond outfall on the complainant's property. Additional samples of the brown material, which had decreased greatly in abundance by this time, were also taken and returned to the laboratory for analysis. Laboratory determinations of the composition of this material were made.

The brown material differed little in composition among the sites, and was nearly identical to that submitted earlier. Chemical specific parameters were virtually identical throughout the sampling network, and were comparable to some of the reference streams from this ecoregion. No measurable impacts could be detected which could be attributed to the construction activities.

2. Lower Pearl River near Picayune Flow Loss Issue

A significant concern of MDEQ and the residents of the lower Peal River Basin, Pearl River County, is the loss of flow in the historic channel of the lower Pearl River near Picayune, Mississippi. Since the turn of the century, Wilson Slough has progressively captured an increasing amount of flow from the Pearl River, diverting it to the West Pearl River via the Bogue Chitto River. This loss of flow became critical in August of 1990. For the first time, flow completely ceased around the Walkiah Bluff area causing a major fish and mussel kill. This loss of flow continued through Wilson Slough and was measured at 92% during the summer of 1995. Concurrent with and compounding this loss of flow during periods of low flow is increased sedimentation in the historic channel. This has obstructed the channel, thereby reducing the volume of water past Wilson Slough at all stages. Hydrographic models had projected that, if unchecked, there would be no flow past Wilson Slough during periods of low flow by as early as 1997.

This reduction in flow has caused the loss or degradation of many of the system's unique environmental features and several miles of aquatic habitat. This is of particular concern since much of the area is shallow, sandy or gravel bottom substrate with excellent mussel habitat. As this reduction in flow occurs at higher and higher stages, there is also concern that wetlands along the historic channel are drying. Water-oriented recreation and commercial fishing have been adversely affected or curtailed because of this condition. The boat ramp and water park at Walkiah Bluff are unusable.

MDEQ and the Vicksburg District of the Corps of Engineers (COE) worked cooperatively to evaluate the feasibility of restoring dependable flows during low-flow conditions from Wilson Slough, through Walkiah Bluff to Holmes Bayou. This investigation was conducted under the authority of Section 307D of the Water Resources Development Act of 1990. The Act establishes a demonstration program for determining the feasibility of wetlands restoration, enhancement and creation.

The feasibility study involved several independent evaluations, including Hydraulics and Hydrology, Water Quality, Fisheries, Mussels, Terrestrial, Wetlands, Endangered Species, HTRW (hazardous, toxic or radiological waste) and Cultural Resource Evaluations.

Since the Pearl River is the boundary between the States of Mississippi and Louisiana, and borders a National Wildlife Refuge, an unprecedented amount of cooperation between a number of State, Federal and local entities was required. A steering committee has been established with representatives from MDEQ, LADEQ, MSDWF&P, LA Game & Fish & Wildlife, MS Wildlife Federation, LA Wildlife Federation and local sportsmen's clubs from both states. This Committee will investigated and recommended mutually beneficial solution to the problems identified in the area.

Plans were developed which called for a flow restricting structure to be constructed at the head of what is referred to as Wilson Slough (it is actually an old bendway of the Pearl River) and closures to be constructed in four other breakouts or distributaries between Wilson Slough and Walkiah Bluff.

Plans for the project were designed by a local engineering firm under contract to the Corps. Construction began in late June 1998 and the final inspection was held on November 19, 1998. It is anticipated that it will require two to four years for the original channel to redevelop.

Shortly after final inspection, rock slippage was observed downstream of the structure. In January, 1999 the contractor was directed to investigate the causes and develop corrective action. An ambient monitoring site in this area will be added to the fixed station network to document the anticipated recovery in this area.

Other Agency Water Quality Surveys

None known.

TABLE III-42
SUMMARY OF MONITORING DATA (1992 - 1997)
PEARL BASIN

Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	PHYSICAL/CHEMICAL DATA Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	Fsh	Bio Stat	USE SUPPORT AQ	FC	SHL	SC	CR	DW
MS185E	BIG BRANCH																		P					
	NEAR POPLARVILLE	VMB003V20-BB1	F	N	P						F							P						
MS187BE1	BIG CREEK																		T					
	AT BOGUE CHITTO	VMB003V21-BC1	F	P	N						F							F						
MSBGCHTRM1	BOGUE CHITTO RIVER																		P	P*		P		
	NEAR ENTERPRISE AT THAYER BRIDGE	D02490270	F	P	F	F	F	P	N	N	F	F	F	P	P		P							
MSBGCHTRM2	BOGUE CHITTO RIVER																			P*				
	AT BOGUE CHITTO	D02490310															P							
MSBGCHTRM3	BOGUE CHITTO RIVER																		T	P*			T	
	NEAR SUMMIT AT HWY 570	D02490360	F	N	F	P	F	F	F	F	F	F	F	F	F									
	NEAR MCCOMB AT HWY 44	D02490370	F	N	F	F	F	F	F	F	F	F	F	F	F									
	AT HOLMESVILLE	D02490390	F	N	F	F	F	F	F	F	F	F	F	F	F									
	NEAR HOLMESVILLE AT HWY 98	DMSBGCHTRM3-1															P							
MSBGCHTRM4	BOGUE CHITTO RIVER																		T	P*			N	
	NEAR LEHR	D02490900	F	P	F	F	F	P	F	F	F	F	F		N	F	P	F						
MS164CM	CANEY CREEK																		F					
	AT GREEN BARN CENTRAL INDUSTRIES SPILL	DPL015D00-CICC																F						
	REFERENCE SITE																							
MS189M	CLEAR CREEK																		T			F		
	NEAR MCCOMB AT HWY 44	DPL003D00-4	F	N	F	N	F	F	F	F	F	F	F	F	F			F						
MS156CLE	CRYSTAL LAKE																			F				
	AT FLOWOOD	156CLF01															F							
MS179M1	GULLY CREEK																		T					
	NEAR BAXTERVILLE	D02489238.50																T						
MS151FM1	HURRICANE CREEK																		N					
	NEAR LEESBURG	D02484735																N						
MS175WJDLE	JEFFERSON DAVIS LAKE																			F				
	NEAR PRENTISS	175JDL01															F							
MS126E2	KENTAWKA CANAL																		T					
	NEAR PHILADELPHIA	VMB003V19-KC1	F	N	F						F							T						
MS159LDE	LAKE DOCKERY																			F				
	NEAR BYRAM	159DOC01															F							

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MS169LLM	LAKE LINCOLN NEAR BEAUREGARD	DPL017D00-LN1															F			F				
MS190LWE	LAKE WALTHALL NEAR TYLERTOWN	190LWL01															F			F				
MS132M	LOBUTCHA CREEK NEAR RURAL HILL NEAR HWY 14	D02482292																T	T					
MS179M2	LOWER LITTLE CREEK NEAR BAXTERVILLE	D02489237																F	F					
MS157MLE	MAYES LAKE AT JACKSON	157MLL01															F			F				
MS147M1	OLD RIVER LAKE NEAR KOSCIUSKO AT YOCKANOOKANY RIVER	D02484013															N			N				
MSLMPRLRM	PEARL RIVER AT MONTICELLO AT HWY 84	D02488500															T			T				
MSLPRLRM4	PEARL RIVER NEAR BOGALUSA, LA AT HWY 26	D02489500															F		F	F			F	
		G02489500	F	P	F			F	F	F	F		F		F									
MSLPRLRM5	PEARL RIVER NEAR FOXWORTH AT HWY 35 1.5 MILES NORTH OF FOXWORTH	D02488940	F	F	F	F	F	N	F	F	F	F	F		N	F	F		F	F			N	
MSUMPRLR1M1	PEARL RIVER NEAR JACKSON AT ROSS BARNETT RESERVOIR	D02485601															F			F				
MSUMPRLR1M2	PEARL RIVER NEAR BYRAM AT OLD SWINGING BRIDGE 0.2 MILES EAST OF OLD BYRAM	D02486500	F	P	F	F	F	N	F	N	F	F	F		N	F		P	P				N	
MSUPRLRM1	PEARL RIVER AT EDINBURG AT HWY 16	D02482000	F	N	F	F	F	N	F	N	F	F	F	P	P				P			P		
MSUPRLRM2	PEARL RIVER NEAR OFAHOMA AT CONFLUENCE WITH YOCKANOOKANY RIVER	DMSUPRLRM2-1															F			T				
	NEAR GOOD HOPE AT HWY 25	DPLPR1-SFD															F							
MSLPRLRM1	PEARL RIVER, EAST AT PEARLINGTON AT HWY 90 1.0 MILES SOUTHWEST OF PEARLINGTON	D02492668	F	N	F		F	P	F	F	F	F			P	F	T		P	T			P	

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AGENCY ABBREVIATIONS: C-USACE, D-MSDEQ, E-USEPA, F-USFS, G-USGS, I-Inst. of Higher Learning, M-DMR, N-NOAA, T-TVA, V-Volunteer Monitor

TABLE III-42
SUMMARY OF MONITORING DATA (1992 - 1997)
PEARL BASIN

Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	PHYSICAL/CHEMICAL DATA Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	Fsh	Bio Stat	USE SUPPORT AQ	FC	SHL	SC	CR	DW
MS153PRCLE1	RANKIN COUNTY LAKE (PELAHATCHIE LAKE)																		F	F				
	NEAR PELAHATCHIE	DPL019D00-PEL1	F	N	F		F	N	F	F			F				F							
MS151FM2	RED CANE CREEK																		N					
	NEAR LEESBURG	D02484752-60																N						
MS161M	RHODES CREEK																		T					
	AT TERRY ABOVE TERRY POTW OUTFALL	DMB001D02-RC1	F	F	F													T						
	AT TERRY BELOW TERRY POTW OUTFALL	DMB001D02-RC3	F	F	F													T						
MS153PRSPLE	ROOSEVELT STATE PARK (SHADOW LAKE)																			F				
	NEAR MORTON	DPL018D00-SH1															F							
MSROSSBARM	ROSS BARNETT RESERVOIR																		F	F				
	NEAR JACKSON NEAR ROSS BARNETT SPILLWAY ABOVE DAM	DPL021D00-RB3															F							
	NEAR SAND HILL NEAR HWY 43	IPL021D00-RB1	F	F	F					F			F											
	NEAR MADISON	IPL021D00-RB2	F	F	F					F	F		F											
	NEAR JACKSON NEAR ROSS BARNETT SPILLWAY ABOVE DAM	IPL021D00-RB3	F	P	P					F	F		F											
	NEAR RATLIFF NEAR WILDLIFE MGMT AREA	IPL021D00-RB4	F	P	F					F			F											
MS143M2	SHOCKALOO CREEK																		N					
	NEAR HARPERVILLE CI SPILL SITE 12	DPL015D00-CI12																N						
	NEAR FOREST CI SPILL SITE 13	DPL015D00-CI13																N						
MSSTRONGM1	STRONG RIVER																		F	F				
	NEAR D'LO AT D'LO WATER PARK	D02487500	F	F	F		F	F	F	F			F				F	F						
MS142M2	TALLABOGUE CREEK																		N					
	NEAR FOREST CI SPILL SITE 11	DPL015D00-CI11																N						
	NEAR FOREST CI SPILL SITE 14	DPL015D00-CI14																N						
MS188TE1	TOPISAW CREEK																		T					
	AT HOLMESVILLE	VMB003V22-TC1	F	N	F						F							F						
MS166VLE	VETERANS LAKE (SIMPSON COUNTY LEGION LAKE)																			F				
	NEAR MENDENHALL	166SIM01															F							
MS181PM	WEST PUSHEPATAPA CREEK																		T					
	NEAR DEXTER	DPL010D00-PUC1	F	N	F								F					T						
MS126E1	WOLF CREEK																		P					
	NEAR PHILADELPHIA	VMB003V17-WC1	F	N	N						F							T						
		VMB003V18-WC1	F	P	N						F							P						

HEADER ABBREVIATIONS: Tmp-Temperature, pH-Acidity/Alkalinity, DO-Dissolved Oxygen, COD-Chemical Oxygen Demand, TOC-Total Organic Carbon, TKN-Kjeldahl Nitrogen, N+N-Nitrite & Nitrate, TP-Total Phosphorus, Turb-turbidity, TSS-Total Suspended Solids, Cndct-Conductivity, FCU-Fecal Coliform (Upper Limit), FCL-Fecal Coliform (Lower Limit), TOX-Toxicants, Wtr-in Water Column, Fsh-in Fish Tissue, BIO Stat-Biological Rating (macroinvertebrates) 10/20/99

USE SUPPORT STATUS: F-Fully Supported, T-Fully Supported but Threatened, P-Partially Supported, N-Not Supported, *-Fish Advisory

WATERBODY (WB) USE CLASSIFICATIONS: AQ-Aquatic Life Support, FC-Fish Consumption, SHL-Shellfish Harvesting, SC-Secondary Contact Recreation, CR-Contact Recreation, DW-Raw Water Supply

AGENCY ABBREVIATIONS: C-USACE, D-MSDEQ, E-USEPA, F-USFS, G-USGS, I-Inst. of Higher Learning, M-DMR, N-NOAA, T-TVA, V-Volunteer Monitor

TABLE III-42
SUMMARY OF MONITORING DATA (1992 - 1997)
PEARL BASIN

Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	PHYSICAL/CHEMICAL DATA Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	TOX Fsh	Bio Stat	USE SUPPORT AQ	FC	SHL	SC	CR	DW
MS147M1	YOCKANOOKANY RIVER																			PN				
	NEAR KOSCIUSKO AT OLD RIVER LAKE	D02484000-40															N							
	NEAR MCVILLE AT SANDERS CROSSING	D02484250															N							
	NEAR THOMASTOWN AT HWY 429	D02484300															N							
	NEAR OFAHOMA	D02484500-80															N							

HEADER ABBREVIATIONS: Tmp-Temperature, pH-Acidity/Alkalinity, DO-Dissolved Oxygen, COD-Chemical Oxygen Demand, TOC-Total Organic Carbon, TKN-Kjeldahl Nitrogen, N+N-Nitrite & Nitrate, TP-Total Phosphorus, Turb-turbidity, TSS-Total Suspended Solids, Cndct-Conductivity, FCU-Fecal Coliform (Upper Limit), FCL-Fecal Coliform (Lower Limit), TOX-Toxicants, Wtr-in Water Column, Fsh-in Fish Tissue, BIO Stat-Biological Rating (macroinvertebrates)

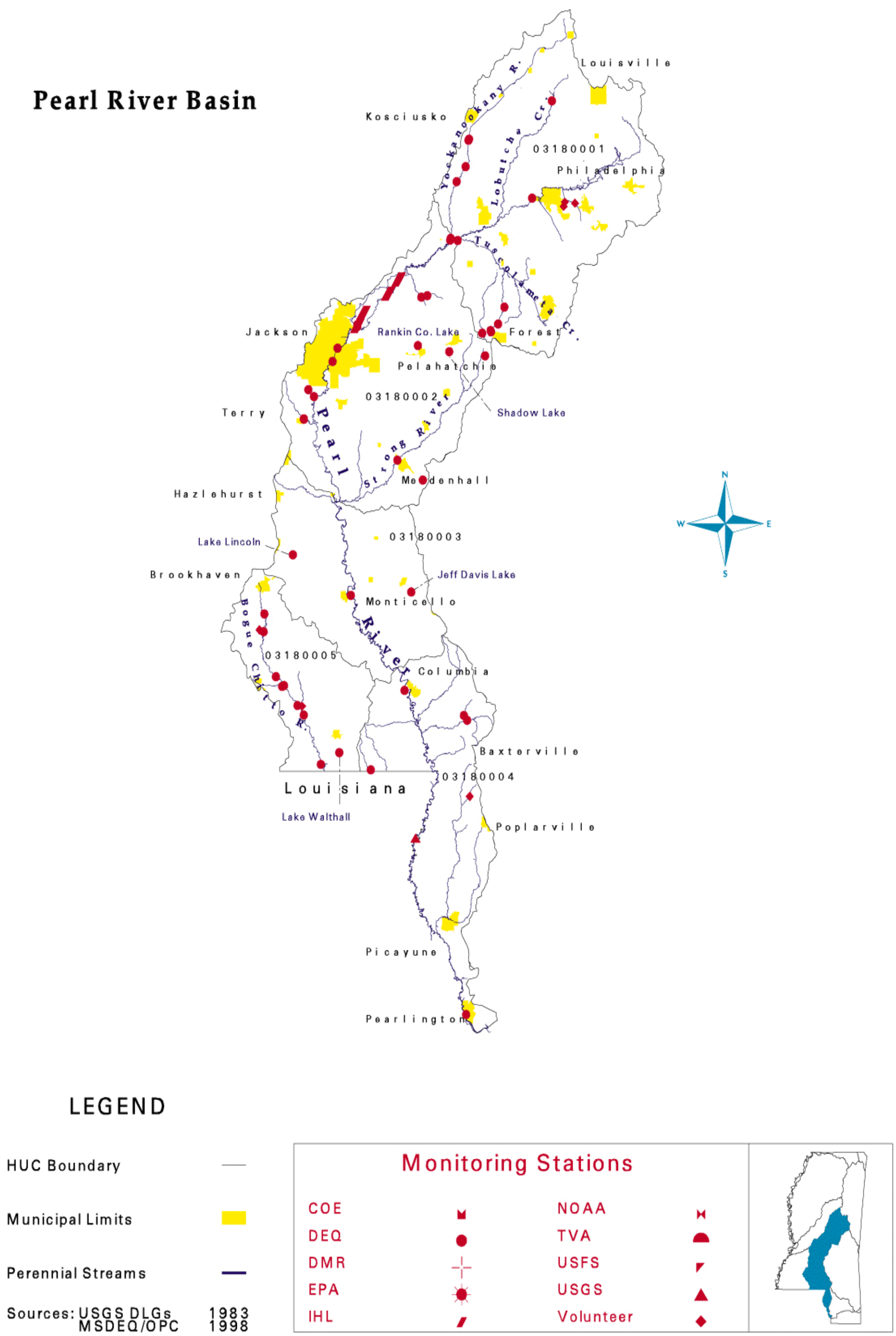
10/20/99

USE SUPPORT STATUS: F-Fully Supported, T-Fully Supported but Threatened, P-Partially Supported, N-Not Supported, *-Fish Advisory

WATERBODY (WB) USE CLASSIFICATIONS: AQ-Aquatic Life Support, FC-Fish Consumption, SHL-Shellfish Harvesting, SC-Secondary Contact Recreation, CR-Contact Recreation, DW-Raw Water Supply

AGENCY ABBREVIATIONS: C-USACE, D-MSDEQ, E-USEPA, F-USFS, G-USGS, I-Inst. of Higher Learning, M-DMR, N-NOAA, T-TVA, V-Volunteer Monitor

FIGURE III-15
Locations of Monitoring Stations



SOUTH INDEPENDENT STREAMS BASIN

Description

The South Independent Streams Basin drains an area of 4,418 square miles in southwestern Mississippi. Major streams in this basin include the Homochitto River, Bayou Pierre, Tangipahoa River and the east and west forks of the Amite River. Part or all of most of these streams are classified as Recreation. The one exception is the Tangipahoa River which is classified as Fish and Wildlife; however, in Louisiana the river is designated as Recreation. The principal land uses in the basin are agriculture and silviculture with some concentrated areas of industry at Natchez, Brookhaven, and McComb. Most streams in this basin have good flow, clear water, and sandy bottoms. In general, the streams are of fair to good water quality, especially those that flow through the Homochitto National Forest. Some tributaries in the basin, however, are impacted by chloride contamination from oil field activities and others experience localized problems with nutrients and bacteria from point sources and agricultural and urban runoff.

Special Classifications

Bayou Pierre	Recreation	From Headwaters to Mississippi River
Clear Springs Lake	Recreation	Franklin County
East Fork Amite River	Recreation	From Hwy 584 to MS/LA Stateline
Homochitto River	Recreation	From Hwy 84 to Hwy 98
Little Bayou Pierre	Recreation	From Headwaters to Bayou Pierre
Percy Quinn Lake	Recreation	Pike County
West Fork Amite River	Recreation	From Hwy 24 to MS/LA Stateline

Permitted Major Sources

McComb POTW - East Sand Filter	MS0025526	Town Creek	McComb

Noteworthy Items

1. Oil spill on South Fork of Coles Creek

2. Lake Hazle NPS Project completed

OPC Environmental Damage Assessments

1. South Fork of Coles Creek - Oil Spill (1994)

An oil spill of 11,130 gallons entered the South Fork of Coles Creek in Adams County in southwest Mississippi on March 5, 1994. On March 8, rapid bioassessments were done at two sites as a preliminary damage assessment. During April 11 to 14, three additional rapid bioassessments were done, and assessments were repeated at those sites sampled in March. This monitoring was done to document the extent of the environmental damage to the biota of Coles Creek, and to determine if this area was suitable habitat for two endemic Plecoptera (stoneflies) known to be in the vicinity.

In addition to the macrobenthic work, samples of drift material, leaf accumulations or "packs", riparian vegetation, and fish were sampled. The leaf packs, drift material, and riparian vegetation were analyzed for volatile organic contaminants (VOCs) and polynuclear aromatic hydrocarbons (PAHs). Fish were sampled for tissue analysis of the aforementioned compounds, and additional fish samples were collected for community analysis of the resident fish population. Additional qualitative searches of bottom substrates, riparian vegetation, and black-light trapping were done to document the presence or absence of the two endemic stoneflies thought to be present.

Benthic collections at some of the sites resulted in the taking of aquatic insects which were coated with crude oil. The rapid bioassessments indicated that below the point of entry of crude oil, the benthic fauna was slightly impaired for a distance of approximately nine stream miles, but recovery was documented further downstream (at 10 miles below the point of entry). It was concluded that the impacts to the system were of an acute nature; that the system should recover fully over time; and that the most deleterious impact was the coating of available habitat with crude oil, which rendered it useless for benthic colonization. One of the two endemic stonefly species was collected from the waters of Coles Creek in an area impacted by the oil spill. This indicated that the species was potentially affected by the accident.

No PAHs or VOCs were detected in any of the samples, although several of the samples from various locations were noted to contain crude oil residues. The fish tissue was likewise void of VOCs and PAHs, but 4,4'DDE was detected in all fish samples.

2. Sandy Creek - Oil Spill (1995)

On March 13, 1995, a pipeline broke spilling approximately 632 barrels of "#2 sweet medium grade crude". Most of the spill occurred over land. However, a small amount entered Sandy Creek. This stream, in Adams county near Natchez, is a small perennial tributary of the Homochitto River. An Environmental Damage Assessment was conducted.

Rapid bioassessments were conducted at three sites along Sandy Creek to assess environmental damage. Site 1, a control site, was situated 100 yards above the point of entry of the bulk of the oil. Site 2 was just below the spill. Site 3 was situated approximately 6.5 miles downstream of the spill and used as a reference site.

Results of the physical, chemical, and biological measurements indicated that there had been no impairment to the resident biota, and that only a small amount of crude oil had actually entered the stream. Runoff from three inches of rain the day following the spill served to flush the stream, and fouling of biological habitats was avoided. This undoubtedly minimized the impact on the biological community.

3. South Fork of Coles Creek - Oil Spill (1996)

On August 11 and 12, 1996 OPC Biology Section Personnel conducted a biological assessment of the South Fork of Cole’s Creek near Natchez. This was done in response to s ruptured pipeline which spilled 45-50 barrels of crude into the stream. A total of five sites was bioassessed as part of this investigation. Water samples were also collected to provide ancillary data. Results indicated that slight damage was done to the fauna at one site. Additional rainfall events should be sufficient to allow a full recovery of the system.

OPC Intensive Water Quality Surveys and Special Studies

1. Lake Hazle at Hazlehurst NPS Study (1991-1994)

In 1991, the OPC began monitoring Lake Hazle in Hazlehurst, Mississippi, as part of a cooperative effort to improve the water quality of the lake. The project is a cooperative effort between the OPC, the City of Hazlehurst, the Southwest Mississippi Resource Conservation and Development Office, the Mississippi Soil and Water Conservation Commission and the USDA Natural Resources Conservation Service (NRCS) to upgrade the recreational value of the lake by identifying and preventing urban NPS pollution.

Lake Hazle is a 22 acre lake located within the city limits of Hazlehurst. Nearly one-quarter of its 400-acre drainage area has been developed for commercial or residential use. Sources of potential contamination include service stations, auto repair shops, streets, highways and parking lots. Several nearby construction projects also contribute to NPS runoff and the significant sediment loading evident in the lake.

The USDA NRCS was responsible for the planning, design and installation of BMPs. Sediment basins, diversion ditches, critical planting areas, and grade stabilization structures were installed.

In conjunction with EPA Region IV-Environmental Services Division, a water quality monitoring plan was developed to be carried out by OPC's Water Quality Assessment Branch (WQAB). The lake was monitored at two locations before and after BMPs were installed. Field parameters measured include pH, water temperature, D.O., conductivity and transparency. Parameters for lab analyses included oil and grease, fecal coliform, total nitrogen, total phosphorus, total suspended solids, and algal growth potential. In addition to lake monitoring, storm event monitoring was conducted at four influent points around the lake twice before and twice after installation of BMPs. Storm event parameters analyzed included oil and grease, fecal coliform, total nitrogen, total phosphorus, and total suspended solids.

By August 1993, both lake and storm event pre-BMP monitoring was completed. All scheduled BMPs have been implemented including a sediment basin installed at the northernmost end of the lake. Post-BMP monitoring was initiated in February 1994 and completed in May 1994 and indicated that BMPs implemented around the Lake Hazle watershed had a positive effect on the water quality of the lake.

Other Agency Water Quality Surveys

None known.

TABLE III-43
SUMMARY OF MONITORING DATA (1992 - 1997)
SOUTH INDEPENDENT BASIN

Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	TOX Fsh	Bio Stat	AQ	FC	SHL	SC	CR	DW
MS476E	AMITE RIVER, WEST FORK																		P	T				
	NEAR STREET	DMS476E-1															F							
	TANYARD CREEK, NEAR LIBERTY	VMB003V24-TC1	F	N	N						F							F						
MS449M	BAYOU PIERRE																		T				N	
	NEAR WILLOWS AT COUNTY ROAD 1.7 MILES	D07290650	F	P	F	F	F	N	F	N	P	P	F		N	F		F						
	SOUTHEAST OF WILLOWS																							
MS464M3	CASTON CREEK																		F					
	NEAR O'NEAL SITE 3	D07291920	F	F	F		F	F	F	F			F					F						
MS453E	COLES CREEK, NORTH FORK																			F				
	NEAR MELTON OIL SPILL CONTROL SITE	DSI008D00-NFC															F							
MS454M1	COLES CREEK, SOUTH FORK																		P					
	NEAR LEESDALE OIL SPILL SITE 1	DSI008D00-SFC1																P						
	NEAR CANNONSBURG OIL SPILL SITE 2	DSI008D00-SFC2																P						
MS454M2	COLES CREEK, SOUTH FORK																		P	T				
	NEAR CHURCH HILL OIL SPILL SITE 3	DSI008D00-SFC3															F	P						
	NEAR CHURCH HILL OIL SPILL SITE 4	DSI008D00-SFC4															F							
	NEAR CHURCH HILL OIL SPILL SITE 5	DSI008D00-SFC5															F	P						
MS462M1	DRY CREEK																		F					
	NEAR MEADVILLE OIL SPILL SITE 1 ABOVE SPILL	DSI006D00-DC1																F						
MS462M2	DRY CREEK																		T					
	NEAR MEADVILLE OIL SPILL SITE 2 BELOW SPILL	DSI006D00-DC2																T						
MSHMCHTRM	HOMOCHITTO RIVER																		F	F		P		
	AT ROSETTA AT HWY 33	D07292500															F							
		G07292500	F	P	F			F		F	F		F	F	P									
MS446LHM	LAKE HAZLE																		P			F		
	AT HAZLEHURST	DSI003D00-L1	F	N	P			N	F	F		F	F	F										
		DSI003D00-L2	F	N	P			N	F	F		F	F	F										
MS481LTM1	LAKE TANGIPAHOA (PERCY QUIN LAKE)																		F	F				
	NEAR McCOMB	DSI010D00-TAN1							F	F			F				F							
		ISI010D00-TAN1	P	N	P		F						F											
MS475E1	LOVE CREEK																		F					
	NEAR PEORIA	VMB003V23-LC1	F	N	F						F							F						

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10/20/99

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TABLE III-43
SUMMARY OF MONITORING DATA (1992 - 1997)
SOUTH INDEPENDENT BASIN

Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	TOX Fsh	Bio Stat	AQ	FC	SHL	SC	CR	DW
MS468PM	PRETTY CREEK																		N					
	NEAR GARDEN CITY	FSI009F00-PC1											N											
MS468SM1	SANDY CREEK																		T					
	NEAR LEESDALE OIL SPILL SITE 3	DSI007D00-SC3																F						
MS468SM2	SANDY CREEK																		T					
	AT CRANFIELD OIL SPILL SITE 1	DSI007D00-SC1																F						
	AT CRANFIELD OIL SPILL SITE 2	DSI007D00-SC2																F						
MS481M3	TANGIPAHOA RIVER																			F				
	NEAR MAGNOLIA AT I-55	DMS481M3-1															F							
MS481M6	TANGIPAHOA RIVER																		T			P		
	NEAR GREENLAW, LA AT HWY 1054 1.5 MILES EAST OF GREENLAW, LA	D07375290	F	P	F	F	F	F	F	F	F	F	F	P	P	T		T						
MS466M	WELLS CREEK																		F					
	AT ROXIE ABOVE ROXIE POTW	D07293200-05	F	F	F								F					F						
	AT ROXIE BELOW ROXIE POTW	D07293200-10	F	F	F								F					F						

HEADER ABBREVIATIONS: Tmp-Temperature, pH-Acidity/Alkalinity, DO-Dissolved Oxygen, COD-Chemical Oxygen Demand, TOC-Total Organic Carbon, TKN-Kjeldahl Nitrogen, N+N-Nitrite & Nitrate, TP-Total Phosphorus, Turb-turbidity, TSS-Total Suspended Solids, Cndct-Conductivity, FCU-Fecal Coliform (Upper Limit), FCL-Fecal Coliform (Lower Limit), TOX-Toxicants, Wtr-in Water Column, Fsh-in Fish Tissue, BIO Stat-Biological Rating (macroinvertebrates)

10/20/99

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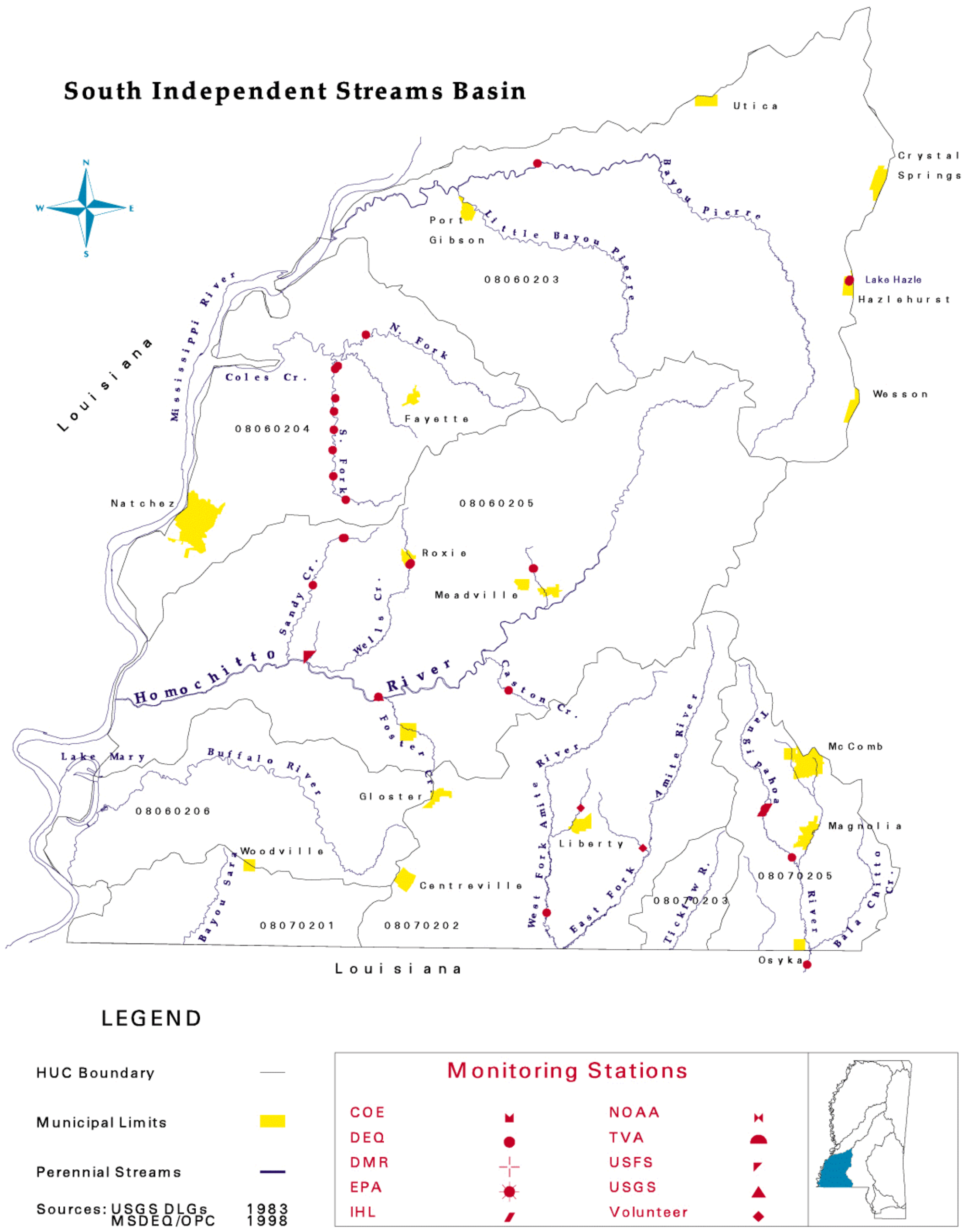
FIGURE III-16
Locations of Monitoring Stations



TENNESSEE RIVER BASIN

Description

The Tennessee River Basin drains an area in Mississippi of only 417 square miles in the northeastern corner of the state. This basin consists of a small portion of the Tennessee River, much of which is referred to as Pickwick Lake, a portion of Bear Creek which flows into and from Alabama, and the Yellow Creek segment of the Tennessee-Tombigbee Waterway. All of theses waters are used heavily for recreational activities. The State of Mississippi has classified a portion of the Tennessee River in Mississippi (Pickwick Lake) as Public Water Supply. This is because this portion of the river is classified as Public Water Supply in Tennessee; however, no streams in this basin are used as a public water supply by the people of Mississippi. Streams in this basin are generally fast flowing and clear with gravel, sand, and rock bottoms. Due to the higher elevations in this part of the state, some of the streams are spring-fed and have cold water year-round. Water quality in this basin is generally considered good to excellent, with some isolated problems from nonpoint sources of pollution.

Special Classifications

Tennessee River	Public Water Supply	MS/AL Stateline to MS/TN Stateline

Permitted Major Sources

None.

Noteworthy Items

1. MDEQ Ambient Basinwide Monitoring begins in 1998.

OPC Environmental Damage Assessments

None.

OPC Intensive Water Quality Surveys and Special Studies

1. Basinwide Approach Monitoring - Tennessee River Basin

As part of the Basinwide Approach to Water Quality Management, a basin fixed station network was established by OPC in the Tennessee River Basin for 1998. Macroinvertebrate sampling, fish collection for fish tissue analysis and water chemistry sampling was conducted at a total of 26 sites in addition to the Primary Ambient Network stations in the basin. Results are pending.

Other Agency Water Quality Surveys

1. Pickwick Reservoir - TVA

Pickwick Reservoir is one of several reservoirs monitored by the Tennessee Valley Authority. Most of this lake is located in Tennessee and Alabama. However, a small portion is located in extreme northeast Mississippi.

TVA began a Reservoir Vital Signs Monitoring Program in 1989 at all major TVA reservoirs. Pickwick Reservoir is one of the reservoirs included in this program. Data have been collected for physical, chemical, bacteriological and biological components of the aquatic system. These include physical and chemical characteristics of water and sediment, bacteria levels at recreational areas, benthic macroinvertebrate communities, and fish community evaluation. (Fish health is a part of the fish community assessment.)

Overall, monitoring results have revealed healthy conditions throughout the reservoir. The most undesirable condition found has been the presence of low levels of mercury in sediments and fish in the lake. According to the TVA, this metal was discharged into Pickwick Lake in great quantities from a chlor-alkali plant in Alabama between 1955 and 1970. Since then, studies have shown significant reductions in mercury in fish and sediment.

The TVA believes that Pickwick Reservoir also supports a better than average fish community compared to other Tennessee River reservoirs. Other water quality indices used by the TVA (bacteria, benthic macroinvertebrate, and algae) show fair to good water quality at all locations sampled. The only exceptions have been occasional summer algal blooms resulting in more algae than desirable in the lake. In the Bear Creek embayment portion of Pickwick Lake, poor benthic communities have been found as well as high algal populations, particularly during periods of low summertime stream flows. The overall health of aquatic resources in the lake is considered above average.

TABLE III-44
SUMMARY OF MONITORING DATA (1992 - 1997)
TENNESSEE BASIN

Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	TOX Fsh	Bio Stat	AQ	FC	SHL	SC	CR	DW
MS197BCEM	BEAR CREEK EMBAYMENT (PICKWICK LAKE)																		T			F		
	NEAR IUKA AT MILL CREEK RECREATION AREA AT MILE 1.0	T280028			T										F			T						
MS192IM2	INDIAN CREEK																		P					
	AT IUKA AT COUNTY ROAD BELOW IUKA POTW OUTFALL	D03592632																P						
MS192IM3	INDIAN CREEK																		T					
	AT IUKA ABOVE IUKA POTW OUTFALL	D03592630-55																T						
MS194M	McROE BRANCH																		F					
	NEAR DENNIS	DAAS-1	F	F	F						F							F						
MS192IM1	PICKENS BRANCH																		T					
	NEAR IUKA AT COUNTY ROAD 3.0 MILES NORTHEAST OF IUKA	D03592633	F	N	F								F					T						
MS192PLM	PICKWICK LAKE																		T	F		F		
	NEAR EASTPORT NEAR PICKWICK COVE MARINA	ITN002D00-PW1	F	P	F					F	F		F		F		F							
MS192ICEM	PICKWICK LAKE (INDIAN CREEK EMBAYMENT)																			F		F		
	NEAR IUKA AT J.P. COLEMAN STATE PARK	DTN002D00-PW3															F							
	NEAR IUKA AT J.P. COLEMAN STATE PARK AT MILE 1.2	T280017													F									
MS193YCEM	PICKWICK LAKE (YELLOW CREEK EMBAYMENT)																		F			F		
	NEAR PINE FLAT AT PICKWICK COVE MARINA	ITN002D00-PW2	F	F	F					F			F		F									
	NEAR PINE FLAT AT GOAT ISLAND RECREATION AREA	T280026													F									
	NEAR PINE FLAT AT AQUA YACHT HARBOR	TTN003T00-AYH													F									
	NEAR PINE FLAT AT HIGH POINT SUBDIVISION	TTN003T00-HPS													F									
	NEAR PINE FLAT AT PICKWICK COVE MARINA	TTN003T00-PCM													F									
	NEAR PINE FLAT AT SCRUGGS BRANCH	TTN003T00-SB													F									

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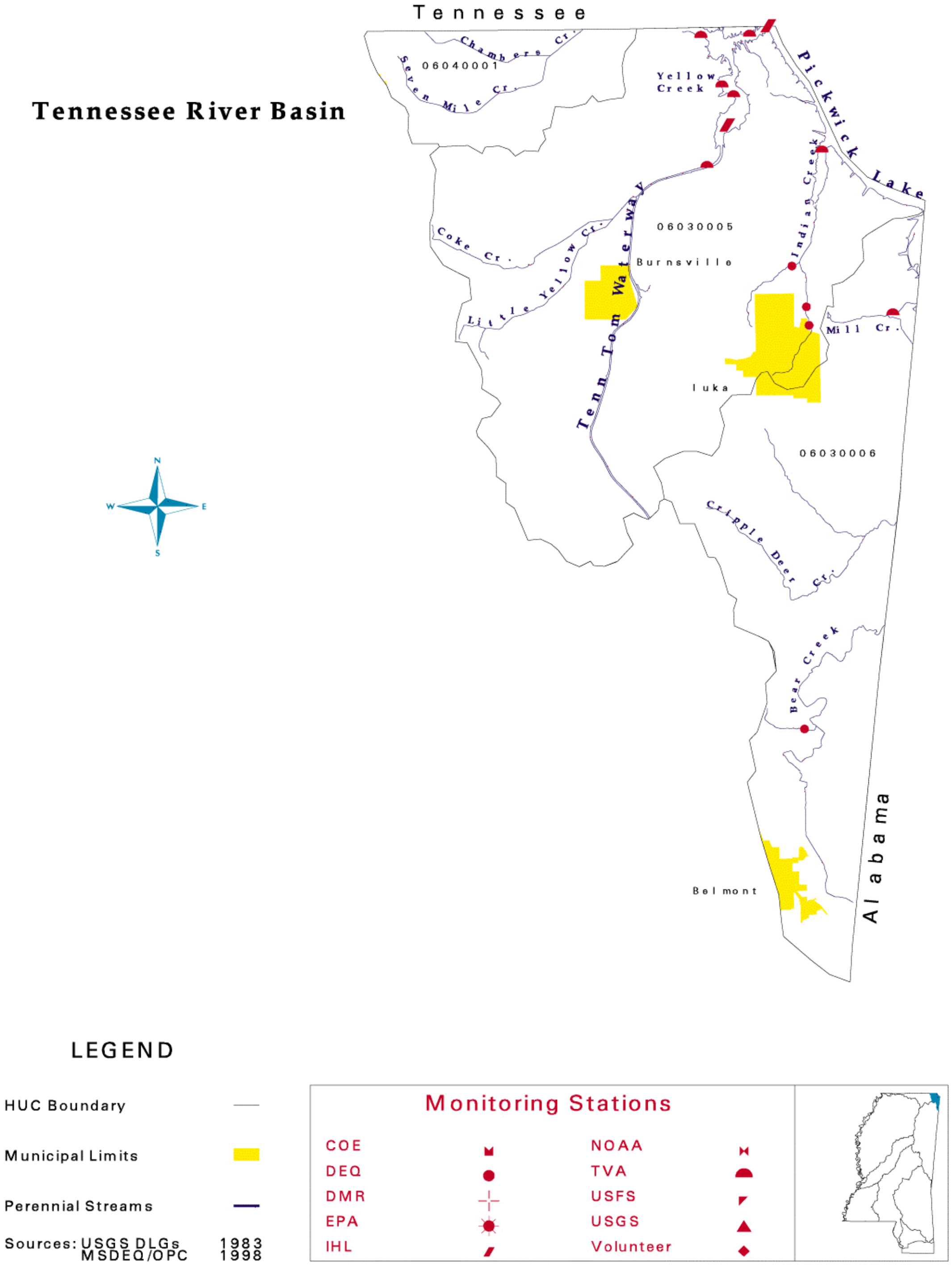
10/20/99

USE SUPPORT STATUS: F-Fully Supported, T-Fully Supported but Threatened, P-Partially Supported, N-Not Supported, *-Fish Advisory

WATERBODY (WB) USE CLASSIFICATIONS: AQ-Aquatic Life Support, FC-Fish Consumption, SHL-Shellfish Harvesting, SC-Secondary Contact Recreation, CR-Contact Recreation, DW-Raw Water Supply

AGENCY ABBREVIATIONS: C-USACE, D-MSDEQ, E-USEPA, F-USFS, G-USGS, I-Inst. of Higher Learning, M-DMR, N-NOAA, T-TVA, V-Volunteer Monitor

FIGURE III-17
Locations of Monitoring Stations



TOMBIGBEE RIVER BASIN

Description

The Tombigbee River system drains about 6,100 square miles in northeastern Mississippi and about 7,600 square miles in northwestern Alabama. The basin in Mississippi is about 190 miles long and averages 48 miles in width. The main headwater streams are Big Brown and Mackeys Creeks which converge to form the east fork of the Tombigbee River. Other major streams in the basin include Town Creek, Chuquatonchee Creek, Chiwapa Creek, Luxapallila Creek and the Buttahatchie, Sucarnoochee and Noxubee Rivers. The predominant surface water feature in the basin is the Tennessee-Tombigbee Waterway which connects the northward flowing Tennessee River with the southward flowing Tombigbee River. The Tenn-Tom Waterway, having a length of 137 miles in Mississippi, stretches from Tishomingo County at the northern end of the basin through Lowndes county, into Alabama. In Mississippi, the Waterway parallels and combines with the Tombigbee River from its headwaters to the Alabama state line. This Waterway consists of a series of interconnected lakes, locks, and pools whose primary usage is recreational. Commercial usage is slowly increasing. Water quality in the Tennessee-Tombigbee Waterway is rated as excellent.

The topography of the basin is mostly hilly and elevations in the headwaters are about 500 to 600 feet above sea level. The northeastern and southwestern portions of the basin are largely forested. Livestock production and row crop farming are major land uses in the central part of the basin. Stream channels are usually relatively shallow with impervious shale and chalk bottoms. Many streams are perennial and stream flow is greatly affected by high runoff discharges during rainstorms. This results in frequent flooding of lowlands. In the western part of the basin, turbidity resulting from nonpoint sources can be high, resulting in poor water quality in some areas. But in the upper reaches of many of these same streams, water quality is excellent. In the eastern part of the basin, streams are fast flowing with sandy bottoms. With some exceptions, these streams are in a relatively natural condition with good to excellent water quality.

Special Classifications

Luxapalila Creek	Public Water Supply	MS/AL Stateline to Hwy 50
Yellow Creek	Public Water Supply	MS/AL Stateline to Luxapalila Cr
Aberdeen Lake	Recreation	From Mile 355.5 to Mile 364.3
Bay Springs Lake	Recreation	From Mile 410.0 to Mile 419.0
Canal Section Pool "C"	Recreation	From Mile 389.0 to Mile 396.4
Chiwapa Reservoir	Recreation	Pontotoc County
Choctaw Lake	Recreation	Choctaw County
Columbus Lake	Recreation	From Mile 332.9 to Mile 355.5
Davis Lake	Recreation	Chickasaw County
Lake Lamar Bruce	Recreation	Lee County
Lake Lowndes	Recreation	Lowndes County
Lake Monroe	Recreation	Monroe County
Lake Tom Bailey	Recreation	Lauderdale County
Oktibbeha County Lake	Recreation	Oktibbeha County
Tombigbee St.Park Lake	Recreation	Lee County

Permitted Major Sources

Aberdeen POTW East	MS0024783	Tombigbee River	Aberdeen
Amory POTW	MS0045489	Tenn-Tom Waterway	Amory
Bryan Foods Incorporated	MS0001783	Town Creek	West Point
Columbus POTW	MS0023868	McCrary Creek	Columbus
Eka Chemicals Incorporated	MS0040215	Tenn-Tom Waterway	Columbus
Emhart Industries	MS0003158	Unnamed Ditch	Amory

Kerr-McGee Chemical Corp.	MS0002232	Tenn-Tom Waterway	Hamilton
Starkville POTW	MS0036145	Hollis Creek	Starkville
Tupelo POTW	MS0036111	Town Creek	Tupelo
Condea Vista	MS0001970	James Creek	Aberdeen
West Point POTW - West	MS0020788	Drain. Dtch to Town Crk	West Point
Weyerhaeuser Company	MS0036412	Tenn-Tom Waterway	Lowndes Co

Noteworthy Items

1. Luxapalila Creek Watershed NPS Monitoring Project - completed
2. MDEQ Basinwide Approach management cycle begins in 1998 for Tombigbee River Basin

OPC Environmental Damage Assessments

None.

OPC Intensive Water Quality Surveys and Special Studies

1. Luxapallila Creek at Columbus NPS Study (1994-1996)

The Luxapallila Creek Watershed, located in east-central Mississippi, consists of highly erodible soil. Over the past several years, the creek has been experiencing increased turbidity from high concentrations of sediment. The vast majority of this sediment is coming from agricultural field erosion within the watershed. To combat this soil erosion problem, funds have been earmarked for the installation of BMPs on agricultural fields within the watershed. BMPs include terracing, buffer strips, reduced till and no-till farming. The agencies participating in this project include the USDA/NRCS, MDEQ-OPC, MSWCC, EPA and the Mississippi Cooperative Extension Service.

The OPC-WQAB was assigned the task of assessing the effectiveness of BMPs in those sub-watersheds which contained significant agricultural lands. Initially, two farm sites were selected, however, one farmer decided not to participate in the program. Conservation tillage was the BMP picked for the pre- versus post- BMP monitoring on the one remaining farm. Conservation tillage will also be implemented throughout the entire watershed.

Monitoring of the farm site began in the Summer of 1994 and ended in the Summer of 1995. A remote automated monitoring station was used on the farm site to sample stormwater runoff from the field. Also, one sub-watershed instream monitoring station was selected on the Mayhew Creek tributary for determining overall water quality improvement due to conservation tillage. Basin monitoring at the Mayhew Creek station was completed and provided data for the AGNPS modeling project. The stormwater runoff at each monitoring site was analyzed for total suspended solids, total phosphorus, total Kjeldahl nitrogen, ammonia nitrogen, nitrate and nitrite and total organic carbon. Six pre-BMP stormwater runoff events were monitored on the demonstration farm site. Rainfall and runoff data collected from the post-BMP monitoring effort during the summer of 1995 was compared with pre-BMP data. This comparison was used to evaluate the efficiency of the BMP on reducing pollution in runoff. All data have been compiled and analyzed and a final report completed in 1996. Data from the monitoring project showed a significant reduction in sediment and nutrients with the implementation of a conservational tillage BMP.

2. Town Creek Biological Water Quality Assessment (1995)

To supplement an OPC investigation of the City of Tupelo's POTW, three sites on Town Creek were sampled in June, 1995 to determine if there were documentable adverse impacts to the biota as a result of the POTW's discharge. Physical habitat assessment, chemical specific sampling (D.O., pH, conductivity, hardness, alkalinity, and nutrients) and biological surveys were done at three sites: an upstream control; a site just below the discharge point; and a site several stream miles below the discharge. An effort to document the presence of sludge in Town Creek was also made. No sludge was found, however, possibly due to heavy rainfall which occurred prior to the investigation.

Based upon analysis of chemical and biological parameters, all sites were adversely impacted. Any effects of the POTW's discharge on the biota were obscured due to poor overall water quality in the receiving stream.

Other Agency Water Quality Surveys

None known.

TABLE III-45
SUMMARY OF MONITORING DATA (1992 - 1997)
TOMBIGBEE BASIN

Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	PHYSICAL/CHEMICAL DATA Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	Fsh	Bio Stat	USE SUPPORT AQ	FC	SHL	SC	CR	DW
MS008ALM	ABERDEEN LAKE																		F	F			F	
	AT ABERDEEN AT BLUE BLUFF RECREATION AREA	C02437000-95C													F									
	NEAR ABERDEEN	DTB021D00-ALD1	F		F			F	F	F							F							
	AT ABERDEEN ABOVE ABERDEEN LOCK AND DAM	ITB021D00-ALD1	N	F	P					F			F											
MS002BSLM	BAY SPRINGS LAKE																		F	T			F	
	NEAR DENNIS AT OLD BRIDGE BEACH	CTB022C00-OBB													F									
	NEAR DENNIS AT PINEY GROVE BEACH	CTB022C00-PGB													F									
	NEAR DENNIS	DTB012D00-BS1	F	F	F		F	P	F	F			F				T							
MS007M1	BULL MOUNTAIN CREEK																		F					
	NEAR TREMONT AT ALABAMA STATE LINE	D02432360																F						
MS019M	BUTTAHATCHIE RIVER																		T	F		P		
	NEAR ABERDEEN AT COUNTY ROAD 13.7 MILES SOUTHEAST OF ABERDEEN	D02439400	F	P	F	F	F	P	F	P	F	F	F	F	P	F								
	NEAR CALEDONIA	DMS019M-1															F							
MS009MM	CEDAR CREEK																		F					
	NEAR ABERDEEN	D02437295																F						
MS014C2M2	CHIWAPA CREEK																		P					
	AT SHANNON ABOVE SHANNON POTW OUTFALL	DTB004D00-1																P						
MS014C2M3	CHIWAPA CREEK																		P					
	AT SHANNON BELOW SHANNON POTW OUTFALL	DTB004D00-2																P						
MS014C2M1	CHIWAPA CREEK, UNNAMED TRIBUTARY OF																		N					
	AT SHANNON BELOW SHANNON POTW	DTB004D00-EFF																N						
MS035CLE	CHOCTAW LAKE																			F				
	NEAR ACKERMAN	D035CHT01															F							
MS012CLM	COLUMBUS LAKE																		F				F	
	NEAR COLUMBUS AT TOWN CREEK RECREATION AREA	CTB022C00-TCRA													F									
	NEAR COLUMBUS	ITB020D00-CLD1	F	F	F					N			F											
MS027M2	COOPER CREEK																		T					
	AT CALEDONIA AT HWY 12	D02443267																T						
MS020CDLE	DAVIS LAKE																			F				
		020DVS01															F							
MS005M	GREENWOOD CREEK																		F					
	NEAR EVERGREEN	D02433350																F						

HEADER ABBREVIATIONS: Tmp-Temperature, pH-Acidity/Alkalinity, DO-Dissolved Oxygen, COD-Chemical Oxygen Demand, TOC-Total Organic Carbon, TKN-Kjeldahl Nitrogen, N+N-Nitrite & Nitrate, TP-Total Phosphorus, Turb-turbidity, TSS-Total Suspended Solids, Cndct-Conductivity, FCU-Fecal Coliform (Upper Limit), FCL-Fecal Coliform (Lower Limit), TOX-Toxicants, Wtr-in Water Column, Fsh-in Fish Tissue, BIO Stat-Biological Rating (macroinvertebrates)

10/20/99

USE SUPPORT STATUS: F-Fully Supported, T-Fully Supported but Threatened, P-Partially Supported, N-Not Supported, *-Fish Advisory

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AGENCY ABBREVIATIONS: C-USACE, D-MSDEQ, E-USEPA, F-USFS, G-USGS, I-Inst. of Higher Learning, M-DMR, N-NOAA, T-TVA, V-Volunteer Monitor

TABLE III-45
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Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	TOX Fsh	Bio Stat	USE SUPPORT AQ	FC	SHL	SC	CR	DW
MS028M1	HOWARD CREEK																		P					
	NEAR STEENS AT WOODLAWN ROAD	D02443305																P						
MS028M2	HOWARD CREEK																		P					
	NEAR STEENS AT HWY 12	D02443310																P						
MS009JM1	JAMES CREEK																		N					
	AT ABERDEEN AT HWY 25 ABOVE VISTA CHEMICAL	DTB003D00-1																N						
MS009JM2	JAMES CREEK																		N					
	AT ABERDEEN BELOW VISTA CHEMICAL OUTFALL	DTB003D00-2																N						
MS031M	JAMES CREEK																		F					
	NEAR CLIFTONVILLE	D02443765																F						
MS038M	JOES CREEK																		N					
	AT BROOKSVILLE ABOVE BROOKSVILLE POTW	DTB002D00-1																N						
	AT BROOKSVILLE BELOW BROOKSVILLE POTW	DTB002D00-2																N						
MS051KCLE	KEMPER COUNTY LAKE																			F				
	NEAR DEKALB	TBKCL1-SFD															F							
MS013MLLBE	LAKE LAMAR BRUCE																			F				
	AT SALTILLO	TBLLB1-SFD															F							
MS009MLME	LAKE MONROE																			F				
	NEAR NEW WREN	TBML1-SFD															F							
MS056LTBE	LAKE TOM BAILEY																			F				
	AT TOOMSUBA	D056LTB01															F							
MS028E1	LUXAPALLILA CREEK																			F				
	AT COLUMBUS AT HWY 82	D02443600															F							
MS028M3	LUXAPALLILA CREEK																		F	T		P		T
	AT STEENS AT COUNTY ROAD 0.2 MILES SOUTHEAST OF STEENS	D02443000	F	F	F	F	F	F	F	F	F	F	F	P	P		T	F						
MS027M1	MAYHEW CREEK																		P					
	NEAR CALEDONIA AT HWY 12	D02443262																P						
	NEAR CALEDONIA AT HENRY WELLS ROAD	D02443263																						
	NEAR CALEDONIA AT BORDER SPRINGS ROAD	DTB006D00-LUX2																P						
MS023OCLM1	OKTIBBEHA COUNTY LAKE																		F	F				
	NEAR ADATON	DTB010D00-OK1	N	F	F			N	F	F			F				F							
		ITB010D00-OK1	N	F	F					N			F											

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MS014C1NTLE	OLD NATCHEZ TRACE LAKE																			F				
	NEAR FURRS	TBOTL1-SFD															F							
MS025E	SAND CREEK																		P					
	NEAR STARKVILLE	VMB003V26-SC1	F	F	F						F							P						
MS016TE	SHOAF CREEK																		T					
	NEAR BIGBEE	VMB003V25-SC1	F	F	F						F							T						
MS031ALM	TENN-TOM WATERWAY																			F				
	NEAR BIGBEE VALLEY AT ALICEVILLE LAKE	D0244053D															F							
MSUTNTMM3	TENN-TOM WATERWAY (CANAL)																			F				
	NEAR FULTON FROM LOCK E DAM TO LOCK D DAM (INCL POOL D)	DTBTTW2-SFD															F							
MSUTNTMM7	TENN-TOM WATERWAY (CANAL)																		F					
	NEAR AMORY AT AMORY LOCK A DAM ON TAILWATER SIDE	C287045	F	F	F								F											
MSUTNTMM11	TENN-TOM WATERWAY (RIVER)																		F	F				
	NEAR COLUMBUS AT COLUMBUS LOCK AND DAM AT MILE 334	C287030		F	F								F											
	AT COLUMBUS BELOW COLUMBUS LOCK AND DAM	D02441500-12D															F							
MSUTNTMM2	TENN-TOM WATERWAY (RIVER)																		F					
	NEAR DENNIS FROM BAY SPRINGS LOCK & DAM TO LOCK E DAM (INCL POOL E)	C287050		F	F								F											
MSUTNTMM8	TENN-TOM WATERWAY (RIVER)																		T	F				
	NEAR ABERDEEN AT ABERDEEN LOCK AND DAM ON TAILWATER SIDE NEAR RAILROAD CROSSING	C287040		P	F								F				F							
	AT ABERDEEN BELOW ABERDEEN LAKE	DTBTTW1-SFD															F							
MS032M1	TENN-TOM WATERWAY, UNNAMED TRIBUTARY OF																		P					
	NEAR COLUMBUS ABOVE EKA NOBEL EFFLUENT DITCH 002	DTB001D00-1																P						
	NEAR COLUMBUS BELOW EKA NOBEL EFFLUENT DITCH 002	DTB001D00-2																T						
	NEAR COLUMBUS ABOVE EKA NOBEL EFFLUENT DITCH 100/300	DTB001D00-4																P						

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MS032M2	TENN-TOM WATERWAY, UNNAMED TRIBUTARY OF NEAR COLUMBUS BELOW EKA NOBEL EFFLUENT DITCH 100/300	DTB001D00-5																P	P					
MS013TTSPLE	TOMBIGBEE STATE PARK LAKE NEAR PLANTERSVILLE	DTBTSPL1-SFD															F			F				
MS016TM	TOWN CREEK NEAR NETTLETON AT HWY 45 2.1 MILES SOUTH OF NETTLETON	D02436500	F	F	F	F	F	N	P	N	P	T	F	F	P	F			T			P		
MS013TCS6M	TOWN CREEK STRUCTURE #6 AT SALTILLO	ITB019D00-TCS1	N	F	F					N			F						F					
MS037M	YELLOW CREEK NEAR LYNN CREEK	D02447550-80																F	F					

HEADER ABBREVIATIONS: Tmp-Temperature, pH-Acidity/Alkalinity, DO-Dissolved Oxygen, COD-Chemical Oxygen Demand, TOC-Total Organic Carbon, TKN-Kjeldahl Nitrogen, N+N-Nitrite & Nitrate, TP-Total Phosphorus, Turb-turbidity, TSS-Total Suspended Solids, Cndct-Conductivity, FCU-Fecal Coliform (Upper Limit), FCL-Fecal Coliform (Lower Limit), TOX-Toxicants, Wtr-in Water Column, Fsh-in Fish Tissue, BIO Stat-Biological Rating (macroinvertebrates) 10/20/99

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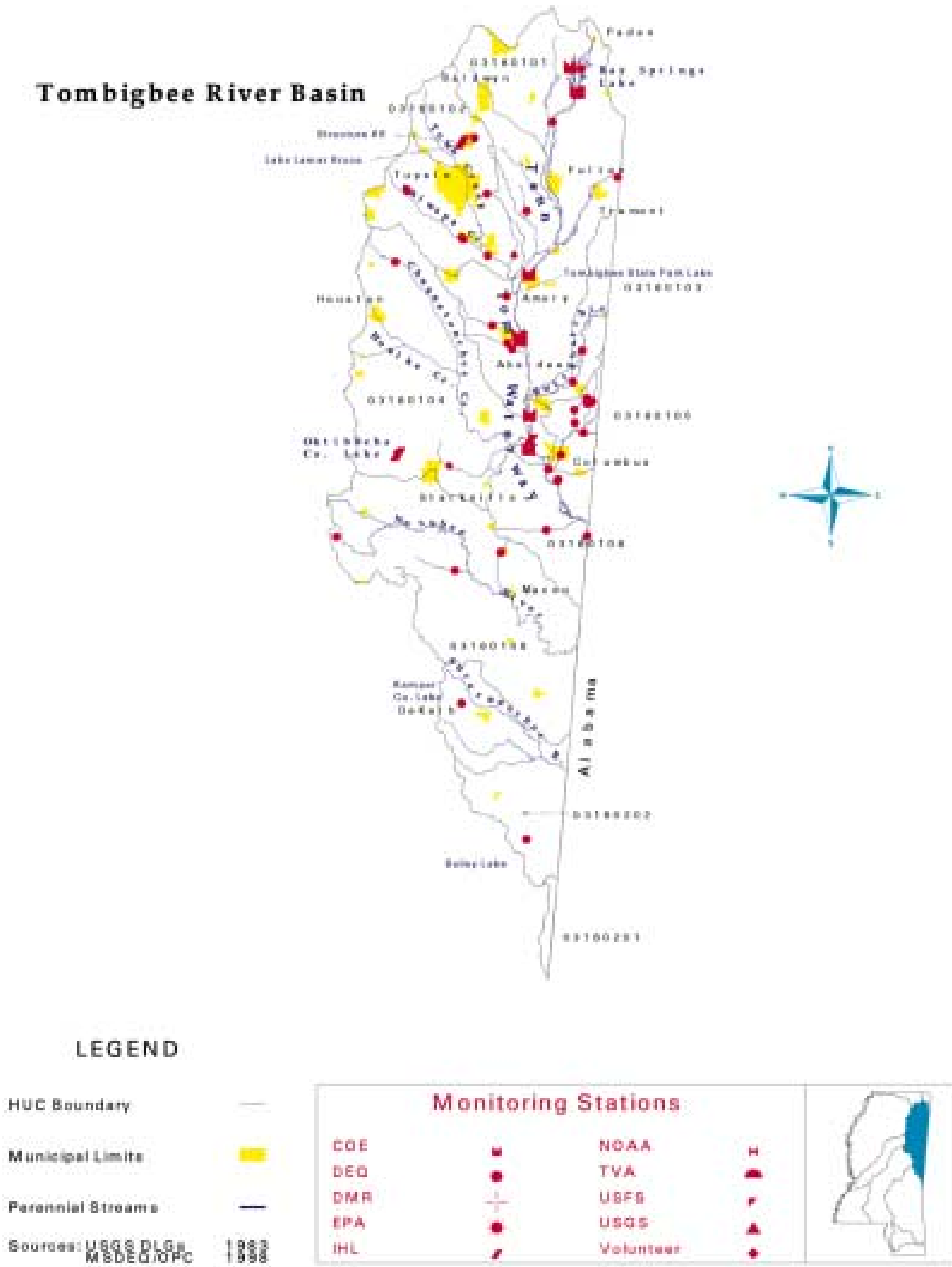
FIGURE III-18
Locations of Monitoring Stations



YAZOO RIVER BASIN

Description

The Yazoo River Basin, Mississippi's largest basin, lies totally within the state and is composed of 13,355 square miles which eventually drains into the Mississippi River. The basin is about 200 miles long with a maximum width of about 110 miles. Major streams in the basin include the Coldwater, Little Tallahatchie, Tallahatchie, Yocona, Yalobusha, Big Sunflower, and Yazoo Rivers. The basin includes a hilly upland in north-central Mississippi where four headwater tributaries originate, and extensive flat lowlands in the Mississippi Alluvial Plain, commonly referred to as the Delta. The upland part of the basin consists largely of forests, pastures, and small farms and is sparsely populated. In addition, the area is characterized by four large flood control reservoirs, whose recreational opportunities dominate the surface water usage of the upland area. Streams in the upland region tend to have muddy or sandy bottoms with sluggish to moderate flow, and water quality is generally fair.

The Delta Region of the Yazoo River Basin is part of the original flood plain of the Mississippi River and constitutes an area of almost 7,000 square miles. The Delta has some of the most fertile and productive farmland in the world. Due to the agricultural emphasis in the region, the Delta is sparsely populated. Streams in the Delta are typically sluggish with silt bottoms. Many streams and the river itself receive large amounts of sediment and other agricultural contaminants resulting in high turbidity, elevated nutrients, and periodic elevated toxics. This results in fair to poor water quality.

Special Classifications

Arkabutla Reservoir	Recreation	DeSoto-Tate Counties
Chewalla Reservoir	Recreation	Marshall County
Enid Reservoir	Recreation	Panola-Lafayette-Yalobusha Counties
Grenada Reservoir	Recreation	Grenada County
Lake Dumas	Recreation	Tippah County
Lake Washington	Recreation	Washington County
L. Tallahatchie River	Recreation	From Sardis Reservoir to Hwy 51
Moon Lake	Recreation	Coahoma County
Sardis Reservoir	Recreation	Panola-Lafayette Counties
Tillatoba Lake	Recreation	Yalobusha County
Wall Doxey State Park Reservoir (Spring Lake)	Recreation	Marshall County

Permitted Major Sources

Batesville POTW	MS0024627	L. Tallahatchie River	Batesville
Belzoni POTW	MS0020371	Yazoo River	Belzoni
Bunge Corporation	MS0000752	Coldwater River	Marks
Clarksdale POTW	MS0020311	Big Sunflower River	Clarksdale
Cleveland POTW	MS0020567	Lead Bayou	Cleveland
Greenwood POTW	MS0023833	Jennings Bayou/Yazoo R.	Greenwood
Grenada POTW	MS0020397	Yalobusha River	Grenada
Indianola POTW	MS0024619	Big Sunflower River	Indianola
International Paper Company	MS0000191	Yazoo River	Redwood
MS Chemical Corporation	MS0000574	Martin Creek/Yazoo R.	Yazoo City
New Albany POTW	MS0020044	Little Tallahatchie R.	New Albany

Newsprint South Incorporated	MS0043222	Yalobusha River	Grenada
Olive Branch POTW - Ross Road	MS0029513	Camp Creek	Olive Branch
Oxford POTW	MS0029017	Yocona River	Oxford
Piper Impact Incorporated	MS0000931	Jasper Creek	New Albany
Senatobia POTW	MS0021431	Arkabutla Lake	Senatobia
Textron Inc. Randall Division	MS0000671	Riverdale Creek	Grenada Co
Water Valley POTW	MS0022331	Otoucalofa Creek	Water Valley
Yazoo City POTW	MS0020389	Yazoo River	Yazoo City

Noteworthy Items

1. USGS continues NAWQA Project
2. Phase II monitoring portion of the Clean Lakes Study continuing on Lake Washington
3. A “no consumption” advisory and commercial fishing ban for fish due to PCB continues for Lake Susie and the Old Little Tallahatchie River Bayou
4. Brine contamination problem on Perry Creek from Tinsley Oil Field
5. Roebuck and Wolf Lake Watershed NPS Projects completed
6. Delta Water Supply Study initiated by the USDA/NRCS
7. Mississippi Delta Management Systems Evaluation Areas (MSEA) project continues
8. US Army Corps of Engineers continues work on Big Sunflower River and Steele Bayou Maintenance Dredging Projects
9. “Limit consumption” advisory for fish due to mercury continues for Enid Reservoir
10. “Limit consumption” advisory for fish due to mercury issued for Yocona River
11. Ground water quantity and quality concerns in Delta region

OPC Environmental Damage Assessments

1. PCB Analysis in Fish below Tennessee Gas Pipeline Compressor Stations near Batesville, Greenville, Columbus and Grenada (1988-Present)

In October 1988, the OPC's Hazardous Waste Division reported significant off-site contamination in sediments by PCBs from the Tennessee Gas Pipeline Compressor Station near Batesville, Mississippi. In response, OPC biologists sampled fish in Lake Susie, an oxbow lake of the Old Little Tallahatchie River. A central ditch runs downstream from the compressor station to the lake and carries a large percentage of the surface runoff from the compressor station. The results of the fish tissue analyses indicated significant contamination by PCBs, with levels of 80 to 90 ppm in whole carp and buffalo. These levels were many times higher than the FDA action level of 2 ppm for fillets, and the highest ever recorded in Mississippi fish. Therefore, the Mississippi Commission on Environmental Quality issued a consent order to Tennessee Gas Pipeline, effective March 1, 1989, requiring Tennessee Gas Pipeline to submit the procedures used for the collection of fish for the evaluation of PCB contamination in the watersheds of four compressor stations, including Batesville, Greenville, Columbus, and Grenada.

This extensive sampling program was approved by OPC and completed in 1989. Results confirmed high levels of PCB in fish tissue from Lake Susie, however, no levels of concern were found at below any of the other compressor stations.

Review of the high levels of PCB found in fish tissue from Lake Susie and the Old Little Tallahatchie River Bayou led to issuance of a fish consumption advisory. The Hazardous Waste Division, in conjunction with the State Department of Health, advised that fish not be consumed from this drainage basin from State Highway 6 to the south Panola County line. The Mississippi Department of Wildlife, Fisheries, and Parks also banned commercial fishing.

Additional monitoring is continuing (see Table III-5). The fish consumption advisory will stay in effect until the contamination has decreased to safe levels.

2. Perry Creek near Tinsley Brine Contamination Assessment (1994-1995)

A fish kill on Perry Creek near Tinsley, Mississippi in August 1989, was linked to a broken fiberglass pipe which allowed brine water mixed with oil to flow into the stream. Apparently such occurrences were so frequent from the Tinsley Oil Field, that a serious brine problem existed on Perry Creek, and some tributaries prior to the kill. Furthermore, salt deposits around oil wells, separating units, and evaporation ponds adjacent to Perry Creek and tributaries undoubtedly enter the streams as nonpoint source pollution during rain events. Consequently, additional monitoring was undertaken to assess the impacts of runoff from the oil field.

Ecosystems, Inc. submitted a detailed proposal to the OPC for instream monitoring of specific conductance, dissolved oxygen, pH, temperature, and chlorides within the Perry Creek watershed. Both routine and storm-event sampling were proposed. The monitoring began in early 1994 and split samples were provided to the OPC lab on two occasions.

The final report of this year-long monitoring effort was submitted to the OPC in April 1995. Data indicate that the major sources of contamination exist on several small tributaries of Perry Creek. A proposal for follow-up investigations, focusing heavily on locating the sources of contamination and installation of Best Management Practices, was reviewed by OPC in late summer. A final plan was developed and approved in 1995. An ambient monitoring site is planned for the Perry Creek watershed.

3. Pelucia Bayou - Spill of Gasoline and Diesel (1995)

On March 28, 1995, a spill of approximately 10 gallons of diesel entered an unnamed tributary and flowed into Pelucia Bayou, just north of Greenwood, Mississippi. On April 10, four sites were selected for sampling. Site 1 was situated about 50 yards downstream of the point of entry of the spilled material into the unnamed tributary of Pelucia Bayou. Site 2 was located at the confluence of the unnamed tributary and Pelucia Bayou. An additional site, Site 3, was about 50 yards below the point of entry of the unnamed tributary into Pelucia Bayou, and Site 4 was situated 100 yards above the confluence of the two streams in order to determine the background conditions of Pelucia Bayou.

Water column samples were collected and analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) and TPHs. Acute toxicity tests (48 hour Ceriodaphnia. dubia test) were performed on additional water samples collected at all sites. No acute toxicity or BTEX was found at any of the sites. Analysis for TPHs indicated levels of TPHs less than 5 mg/L at all sites.

Based on the data, the small amount of contaminant which entered the stream did not have toxic effects on the resident biota.

4. Oil Spill on Perry Creek (1997)

An Environmental Damage Assessment was conducted on 17 September 1997 on six sites along Perry Creek in Yazoo county in response to an oil spill which had occurred several days earlier. Chloride levels were elevated at all sites as was specific conductance. This, however, was more reflective of the years of widespread disturbance to the Perry Creek watershed than it was the current spill episode. Determinations of levels of oil and grease were below detection limits.

Biological assessments were also conducted by Biological Services Section staff at four sites. The fauna of this entire system was found to be depressed, again evidence of the widespread and chronic impacts to this system. It was determined that only slight damage to the benthic community had occurred downstream of the point of entry of the oil into Perry Creek. No further action was recommended as it was anticipated that recovery to background conditions was likely to occur rapidly.

OPC Intensive Water Quality Surveys and Special Studies

1. Lake Washington at Glen Allan (1990-Present)

Lake Washington has a surface area of approximately 482 acres and is surrounded by a watershed of approximately 4,453 acres. The lake, long known for its graceful beauty and antebellum mansions, is completely surrounded by fertile cotton and soybean fields. With this extensive agriculture has come many decades of pesticide mismanagement and extensive sediment runoff. Additionally, many homes and businesses along the lake had failing septic tank systems which discharged untreated wastewater directly into the lake. In 1994, a central wastewater treatment system was completed and most homes in the Glen Allan community are connected.

In 1990, Lake Washington experienced a bloom of toxic blue-green algae which covered the lake. This, along with the findings of a Clean Lakes Phase I study completed in 1990, prompted the action of the OPC to target the lake for restoration using money from the Clean Lakes and Nonpoint Source Programs. In addition, a grant was received from the Farmers Home Administration to construct a wastewater collection and treatment system for the Glen Allan community to replace the failing septic tank systems.

In 1991, the Clean Lakes Restoration Program began. The agencies involved in the project included the MSWCC, USDA/NRCS, MDEQ-OPC, MDWFP, EPA and the Cooperative Extension Service. The OPC's Water Quality Assessment Branch (WQAB) was given the task of selecting two demonstration farm monitoring sites on which to conduct NPS stormwater runoff monitoring.

Two demonstration farm sites were selected in the summer of 1993. Monitoring was conducted using the "paired watershed" approach. In order to make a comparison of runoff water quality characteristics, two fields were chosen which had similar slopes, soils, size and farming practices. One field was used as a control, while BMPs were installed on the other. Storm event monitoring of runoff from the fields was conducted using remote automated monitoring stations. Flow and rainfall readings were also collected.

The project's goal was to determine the effectiveness of slotted board risers on reducing sediment loading to Lake Washington. Two major stormwater runoff drainage ditches discharging directly to the lake were monitored for total suspended solids, total phosphorus, total Kjeldahl nitrogen, ammonia-nitrogen, nitrate-nitrite, and total organic carbon. These ditches were used to characterize instream water quality as a result of stormwater runoff inputs from surrounding land use and BMP activities. Due to resource constraints, monitoring did not commence until January 1994.

Storm event monitoring consisted of two monitoring periods: calibration and treatment. The calibration period consisted of collecting runoff from three rain events prior to BMP installation on both fields. The treatment period also consisted of collecting runoff from three rain events after BMPs were installed on one field. The runoff samples from these two periods were collected between January and May 1994. Data from the six stormwater runoff monitoring events has been compiled and analyzed and a final report written. The data show that slotted board risers are quite effective in preventing sediment laden runoff from reaching nearby streams.

In 1991, a Phase I Diagnostic/Feasibility Study was completed on Lake Washington by FTN Associates of Little Rock, Arkansas. The OPC Biological Services Section assumed responsibility for the Phase II monitoring portion of the Clean Lakes Study.

The Phase II study, began in July 1994, and will determine if the BMPs are achieving the desired results of improving water quality and enhancing the aesthetic appearance of the lake. A total of 17 months of water quality data have been collected thus far. Monthly measurements were made at five sites and include dissolved oxygen, temperature, conductivity, pH, hardness, alkalinity, secchi transparency, total Kjeldahl nitrogen, total phosphorous, ammonia, nitrate plus nitrite, total organic carbon, total suspended solids, chemical oxygen demand, total solids, total dissolved solids, and chlorophyll a levels. Quarterly sediment samples were also taken at these sites. Sediment elutriate bioassays, and chemical analysis of the sediments for concentrations of pesticides, mercury, and chromium were also conducted. Chironomids (non-biting midges) have also been collected from the sediments and checked for deformities of the menta. Deformities might indicate toxic effects, however, none were found. Six sites were chosen for fecal coliform analysis. Fish for tissue analysis were collected twice during the first twelve months of monitoring. One sampling of bass and channel catfish has been analyzed. The second sampling, consisting of the above species plus buffalo and carp, has not been analyzed.

A detailed report, outlining the findings of the first twelve months of the OPC study, comparisons with the FTN study of 1991, and conclusions is nearly complete. Copies of this report can be obtained by contacting:

Mr. Doug Upton
Biological Services Section
Office of Pollution Control
1542 Old Whitfield Rd.
Pearl, MS 39208.

2. Roebuck Lake Watershed 319 NPS Project (Greenwood, 1993-1998)

Roebuck Lake is a 580 acre oxbow lake situated just west of Greenwood, Mississippi in the center of Leflore County. Its primary designated use is fish and wildlife. Currently, only 46.7 acres have been evaluated.

On June 18, 1993, the OPC's Water Quality Assessment Branch (WQAB) conducted a reconnaissance around the perimeter of the lake. The majority of the land uses around the lake were irrigated and non-irrigated crop production. Chemical and physical measurements were taken at a bridge crossing at Itta Bena, Mississippi. Dissolved oxygen was 6.21 mg/L or 80.6% saturated two feet below the surface of the water. However, at ten feet below the surface (near the bottom) the dissolved oxygen reading was only 0.26 mg/L or 3.1% saturated. The lake also appeared very turbid. Secchi Disk transparency readings yielded approximately four inches of visibility.

Section 319 NPS funds were secured to assist farmers in installing structural and non-structural Best Management Practices (BMPs) on their fields. With the implementation of these practices, it is anticipated that a significant amount of sediment, nutrients and pesticides will be prevented from running off into the lake. The result should be an increase in clarity and dissolved oxygen throughout the lake.

In the December of 1996, the WQAB initiated monitoring of a slotted-board riser (SBR) BMP on a farmer's field. This BMP is used to flood the field during the winter months when precipitation is greatest. The flooded field acts as a sediment settling basin. The greatest advantage of SBRs is that essential nutrients, pesticides and top soil are not discharged into the lake, but are retained on the field for later use. An added benefit to the flooded field is the creation of temporary wintering waterfowl habitat.

The Roebuck Lake demonstration farm monitoring project consisted of two side-by-side fields with similar characteristics. One field was used as a control site and did not have an SBR. The other field was used as the treatment field. During the Winter of 1996-97 both fields were monitored without the SBR practice. This period is known as the Pre-BMP *or* calibration period. During the Winter of 1997-98, the SBR BMP was used on the treatment field. The control field remained the same. This period is known as the post-BMP *or* treatment period. After monitoring runoff for two winter seasons, data concluded that the SBR practice had a major impact on sediment and nutrient loading reductions. Should these BMPs be applied to similar fields in the Roebuck Lake watershed, similar reductions in sediment and nutrient loadings should be seen.

Additional ambient fixed station physical and chemical monitoring were considered at several bridge crossings around the lake; however, staff shortages and budget constraints would not allow the additional time required to perform a thorough analysis of the lake water quality.

3. Wolf Lake Watershed 319 NPS Project (Yazoo/Humphreys Counties, 1995-1997)

In 1995, the OPC began a four year NPS monitoring project within the Wolf Lake watershed located near Louise, Mississippi. Cooperating agencies for the project include the Mississippi Soil and Water Conservation Commission, Mississippi Department of Environmental Quality, USDA-Natural Resource Conservation Service and the Mississippi Cooperative Extension Service.

Wolf Lake is a 724 acre oxbow lake used primarily for aquatic life support and fishing. Approximately 75% of the drainage area is used for agriculture, 20% is a combination of forest and wetlands, and the remaining is urban and miscellaneous lands.

The project's primary goal will be to improve water quality within the watershed through the implementation of specific Best Management Practices (BMPs). In addition to improving water quality, the long term objective of the project will be to educate the public and the farming community of the water quality benefits of BMPs.

The OPC's Water Quality Assessment Branch initially developed a demonstration farm monitoring plan which included the selection of a farm site with two similar drainage points. Remote automated monitoring stations were to be installed at each site to monitor stormwater runoff. Total suspended solids and nutrients were be monitored throughout the growing seasons of 1996 and 1997. The data from the monitoring was going to be analyzed and compiled to determine loading reductions as a result of BMP installation. Due to staff shortages and a shift to a more holistic approach to watershed monitoring approach, the demonstration farm monitoring portion of the project had to be canceled.

4. Big Sunflower River Model Calibration Study (1997)

In October 1997, OPC and EPA Region IV's Science and Ecosystem Support Division provided field and laboratory analytical services in support of the Big Sunflower River Water Quality and Hydrodynamic Modeling Project. This multi-year project, being directed by MDEQ's Office of Land and Water Resources (OLWR), is being undertaken as a result of a gradual reduction in base river flows over the last several years from the historical 7Q10 in the river and the need to establish a new minimum established flow for protection of water quality in the river.

Phase 1, scheduled for 1997 and 1998, involves model development and field data collection to address low river flows and point source waste contributions only. The model, which is being developed by Mississippi State University (MSU), will be used to assess existing water quality conditions in the river at low-flow conditions and predict conventional water quality constituents at various flows and pollutant loadings. Phase 2, tentatively scheduled for 1999 and 2000, will incorporate high river flows, non-point sources and associated pollutant loads into the model. Hydrodynamic data collection efforts for this project are the primary responsibility of the U.S. Geological Survey, Yazoo-Mississippi-Delta Joint water Management District and MDEQ OLWR while the water quality data collection efforts are to be conducted by EPA and OPC.

OPC and EPA field activities in October 1997 included time of travel dye studies, sediment oxygen demand measurements, diffusion/reaeration studies, diurnal profiling for DO, temperature, pH, TDS and specific conductance utilizing both continuous monitoring with Hydrolab and YSI multi-probes and spot-profiling measurements, and sample collection for water chemistry analysis of nutrients, BOD5, BOD ultimate, solids, and chlorophyll a. A total of 33 river/stream locations covering approximately 90 miles of the Big Sunflower River and 7 wastewater outfalls were monitored during the one week low-flow study. Tributaries to the Big Sunflower River also monitored during this study included Harris Bayou, Black Bayou, Lead/Horseshoe Bayou, Quiver River and Bogue Phalia. OPC staff providing field support for this project included personnel from the Surface Water Division's Water Quality Assessment Branch and Field Services Division's Biological Services Section and North Regional Office. Laboratory analyses were performed by the OPC laboratory and data compiled and provided to MSU for model calibration.

Other Agency Water Quality Surveys

5. Mississippi Delta Comprehensive, Multipurpose Water Resource Plan, Study Phase - USDA/NRCS

The Mississippi Delta Comprehensive, Multipurpose Water Resource Plan Study was initiated by the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) at the request of the Yazoo Mississippi Delta Joint Water Management District (YMD) and local Soil and Water Conservation Districts. The purpose of the study was to determine the feasibility of stabilizing alluvial aquifer groundwater levels by augmenting irrigation water supplies using surface water delivery systems.

The Mississippi Delta stretches about 150 miles from the state line near Memphis, Tennessee to Vicksburg, Mississippi. It has an average slope of 0.5 feet per mile ranging in elevation in the north of 210 feet and 85 feet in the south. The Delta is fifty miles wide at its widest point between the towns of Greenville and Greenwood, and is bounded on the west by the Mississippi River and on the east by the bluff hills. It covers 4,886,896 acres.

Groundwater level declines have resulted in decreased baseflows of some interior Delta streams and rivers. Low baseflows potentially pose a threat to human health and safety and aquatic life if there is insufficient water to dilute permitted effluent loadings from wastewater treatment plants and industries. Fish can also be influenced by low flows. The loss of adequate fisheries habitat in combination with poor water quality may result in loss of species diversity and population declines. Therefore, this study was planned to add flows to internal streams and rivers for agricultural use and to maintain minimum low flows for environmental enhancement.

The water quality survey portion of this study was designed to provide background data for existing water quality in the major interior waterways in order to predict how supplementing flows would influence overall water quality. The objective of the sampling program was to chart water quality changes in response to the currently existing changes in steam flow and predict or monitor how proposed managed additions to stream flows would influence water quality. Sampling was done in the second or third week of each month beginning in October 1993 and continued through October 1996. No attempt was made to bracket rainfall, irrigation periods, or any other event. Sampling through major hydrologic events was not possible due to resource limitations. Thus, monthly sampling was chosen to remove some of the bias that limited-event sampling would induce. Monthly sampling also provides more complete background pictures because dry period data is collected. Ideally, monitoring would continue indefinitely to establish long term patterns or trends in water quality and monitor the effects of implemented practices. Realistically, all studies involve completion time tables and budget constraints that are not conducive to permanent monitoring efforts.

Monthly monitoring began at eight locations along Deer Creek, from Greenville to Valley Park, beginning in October 1993. In June 1994, sampling on ten additional sites, two each, on the Sunflower River, Coldwater River, Bogue Phalia, Quiver River, and one each at Yazoo Pass and Mill Creek began. Six Deer Creek sites were dropped in 1995 and one additional site on both the Bogue Phalia and Quiver River and two additional sites on the Sunflower River were added for monthly sampling. Data have been collected from a total of 22 locations representing the major internal Delta streams (Pennington, 1996).

Measurements performed on-site included dissolved oxygen, pH, temperature, conductivity, turbidity, and total dissolved solids. Stream stage, estimates of odor and color, and the general condition of the site were recorded during each site visit. Laboratory measurements on water samples included, total Kjeldahl nitrogen, nitrate plus nitrite nitrogen, total and orthophosphorus, alkalinity, total and suspended solids, total and fecal coliforms, and 88 pesticides (from selected samples from each site).

Results through 1996 indicate that turbidity, total solids, and total suspended solids reach maximum levels during winter and early spring runoff. Erosion control during these periods, in addition to preserving valuable farmland, would greatly benefit receiving water quality in the Delta. Concentrations of total nitrogen, nitrate plus nitrites nitrogen, and total phosphorus follow similar patterns at all sampling locations and do, at some time during the year, exceed State suggested target values for waters classified as Fish and Wildlife streams.

Water samples collected at eight locations on Deer Creek in June and September 1994, were tested for 88 pesticides at the Mississippi State Chemical Laboratory. Eleven herbicides were detected in June and ten (including one defoliant) in September. No insecticides were found. All of the herbicides found exhibit a low to very low toxicity to fish, birds and mammals and were not present in amounts that would result in damage to fish, birds or mammals. The defoliant although highly toxic to birds was not present in concentrations known to cause negative impacts to fauna.

The YMD also tested 19 fish tissue samples for 33 pesticides in 1993 to look at bioaccumulation as an indicator of long-term water quality. EPA established standards indicate that the actual levels of herbicides and defoliant detected in fish and water samples were well below harmful limits to fish, birds, and mammals including humans. Tests included 19 nitrogen-phosphorus pesticides (4 detected), 27 chlorinated pesticides (none detected), 11 cotton pesticides (1 detected), 12 chlorinated acids and phenols (3 detected), and 19 additional herbicides (3 detected).

NRCS has collected and tested 46 fish tissue samples from all water sampling locations. Fish tissue testing for 58 pesticides (18 Nitrogen-Phosphorus pesticides, 28 organochlorine pesticides, 12 pesticides used primarily on cotton) resulted in detection of quantifiable amounts of 9 organochlorine pesticides, chlordane, 4 forms of DDT, dieldrin, pendimethalin, toxaphene, and trifluralin. Results are discussed in the following paragraph.

FDA has not set action levels for all pesticides that might be found in fish tissues because there is insufficient data from which to work. A frame of reference to determine if levels of pesticides in fish samples from the Mississippi Delta are different from levels found in fish from other parts of the United States was needed to estimate anthropogenic effects. The National Contaminant Biomonitoring Program (NCBP) data (Schmitt et al., 1990) provided this reference for comparison based on testing a total of 321 composite fish samples from 112 stations throughout the nation for organochlorine pesticides. Comparisons do not provide judgments about the effects of levels of pesticides in fish, but do give an idea of the extent of contamination in the Delta compared to other regions (Pennington, 1997). No catfish fillet exceeded the FDA action levels for DDT or toxaphene. Fish levels for chlordane and dieldrin were low compared to NBCP levels. Levels of pendimethalin and trifluralin were below any level that could produce a toxic effect in rats.

Sediments from sample locations were tested for Mercury, Arsenic and selected pesticides. There are no EPA or FDA standard levels for mercury and arsenic in sediments. There is a proposed Resource Conservation and Recovery Act (RCRA) level of 80 ppm arsenic in soils (Meister, 1994). Concentrations of mercury and arsenic in the earth's crust and in virgin soils are commonly used reference points to estimate contamination since all sediments originate as soil. Sediment mercury levels ranged from 0.005 to 0.052 ppm with an average value of 0.03. These values fall at the low end of the estimated 0.03 to 0.08 ppm levels in the earth's crust (Jonasson & Boyle, 1971). Arsenic levels ranged from 1.3 to 4.3 ppm with an average value of 2.6 ppm. These values are also at the low end of the native arsenic levels in virgin soils which range from 0.2 to 40 ppm with an average of 5 ppm (Walsh & Keeney, 1975) and well below the proposed RCRA value.

Sediments were tested for 58 pesticides (18 Nitrogen-Phosphorus pesticides, 28 organochlorine pesticides, 12 pesticides used primarily on cotton). The only pesticides detected in quantifiable amounts were DDT and its metabolites. The most prevalent form was p,p'-DDE followed by p,p'-DDD indicating that DDT in this environment is continuing to degrade (Ware and Roan, 1985). Levels for total DDT ranged from 0.01 to 0.30 ppm with an average value of 0.11 ppm. Sediment levels of 0.35 ppm total DDT are thought to cause moderate effects to biota (NOAA 1990). The proposed RCRA level for DDT in soil is 2 ppm, DDE 2 ppm, and DDD 3 ppm. These were all higher than the maximum level found in study samples. Since DDT is a persistent but banned pesticide, only time will eliminate it from our streams. The US Department of Health and Human Services, Food and Drug Administration (FDA), considers this pesticide to be "unavoidably present" (Hardin, personnel communication).

The study phase of this report was completed in September 1998. NRCS and the local sponsors are preparing implementation actions for the installation phase of this project.

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2. National Water-Quality Assessment Program, The Mississippi Embayment - USGS (1991-Present)

In 1991, the U.S. Geological Survey (USGS) began the National Water Quality Assessment (NAWQA) program. The long-term goals of the NAWQA program are to describe the status of, and trends in, the quality of a large, representative part of the nation's water resources and to identify the major natural and human factors that affect the quality of these resources. In addressing these goals, the program will produce a wealth of water quality and ancillary information that will be useful to policy makers and managers at the national, state, and local levels.

The emphasis of the NAWQA program is on regional-scale water quality problems. Studies of 60 hydrologic systems that include parts of most major river basins and aquifer systems (study-unit investigations) are the building blocks of the national assessment. The 60 study units range in size from 1,900 square miles to more than 60,000 square miles and represent 60 to 70 percent of the nation's water use and population served by public water supplies. The Mississippi Embayment study area covers approximately 48,500 square miles and includes parts of Arkansas, Kentucky, Louisiana, Mississippi, Missouri, and Tennessee. The drainage area extends downstream from the confluence of the Mississippi and Ohio rivers to a point on the Mississippi River south of Vicksburg, Mississippi, and includes, in order of drainage area within the study area, the drainage basins of the Yazoo, Hatchie-Obion, St. Francis-Lower White, and Bayou Bartholomew-Tensas Rivers.

More than 75 percent of the land use in the study area consists of cropland with interspersed pasture, forest, and woodland. The area of the Mississippi River alluvium produces large amounts of cotton, soybeans, and rice. Aquaculture, specifically the farming of catfish in Mississippi and crayfish in Louisiana, is also an important economic activity in the study area. About 20 percent of the land use consists of woodlands with interspersed croplands and pasture. About 5 percent of the study area consists of forested wetlands of the Mississippi River.

The major water quality issues in the study area relate to land use. Potential nonpoint sources of pollution are irrigated and non-irrigated agriculture, grazing, and recreation. Potential point sources of pollution are agricultural-related industry, aquaculture, municipal wastewater treatment facilities and landfills. Anthropogenic water quality effects on lakes and reservoirs in the study area primarily result from agricultural and aquacultural-related activities.

The Mississippi Embayment (MISE) study unit of the NAWQA program encompasses a large part of the lower Mississippi Alluvial Plain Ecoregion, and smaller parts of the Southeastern Coastal Plains and the Mississippi Valley Loess Plains Ecoregions. Planning for assessment activities in the Mississippi Embayment study area began in 1994. Eight basic fixed sites were selected from the study unit in 1995 for intensive study during the high intensity phase of study. Fish tissue and bed sediments were collected at the basic fixed sites for contaminant analysis in 1995. Three of the eight basic fixed sites sampled were in Mississippi: the Skuna River near Bruce, the Bogue Phalia near Leland, and the Yazoo River below Steele Bayou near Long Lake. Surface water was also sampled at the basic fixed sites; sampling intervals varied for the sites but ranged from once weekly to once monthly. Water samples were analyzed for major ions, nutrients, turbidity, carbon, sediment, and dissolved pesticides. In addition, field measurements included secchi depth, temperature, dissolved oxygen, pH, conductivity, and alkalinity. Fish, macroinvertebrate, and algae communities were sampled annually at the basic fixed sites from 1996-98.

In 1997, the study was broadened and a synoptic approach was used to assess effects of different land-uses on water quality and in-stream biota in the Mississippi Alluvial Plain Ecoregion. The approach involved assessing macroinvertebrate communities at 30 sites (additional to the 8 based fixed sites) in conjunction with surface-water sampling in 1997, and sampling fish communities in 1998. Surface water was sampled for various physical and chemical parameters at the 38 sites during three phases of the growing season. Fish communities were sampled at the 38 synoptic sites in 1998 as planned, and fish tissue and bed sediment samples were collected at all sites for organo-chlorine analyses. Eight synoptic sites were sampled in Mississippi: the Coldwater River near Marks, the Cassidy Bayou at Webb, the Big Sunflower River at Sunflower, the Quiver River near Doddsville, the Big Sunflower River near Anguilla, the Silver Creek near Bayland, Deer Creek near Hollandale, and the Steele Bayou near Rolling Fork.

The low intensity phase of sampling will begin in 1999. Plans are to sample aquatic macroinvertebrate, fish, and algae communities at one site, the Yazoo River below Steele Bayou near Long Lake, Mississippi. Fish tissue and sediments will be sampled for contaminants and surface water will sampled monthly.

Data from the MISE study unit can be obtained from the USGS Mississippi District Office in Pearl, MS.

3. Demonstration Erosion Control (DEC) Project - USGS/USACE (1988-Present)

The Demonstration Erosion Control (DEC) Project in the Yazoo River basin in north-central Mississippi is an ongoing joint-agency program of planning, design, construction, monitoring, and evaluation to alleviate flooding, erosion, sedimentation, and water-quality problems by applying environmentally sound management practices in several watersheds located in the bluffline hills above the Mississippi River alluvial plain. Since February, 1988, the USGS, in cooperation with the USACE Vicksburg District, has been collecting water-quality and bottom-material-chemistry data for this project. The data are being collected prior to, during, and after watershed conservation and channel stability measures have been implemented in the study area. Routine biweekly water-quality sampling was being conducted at 10 sites for field determination of specific conductance, pH, temperature, and dissolved oxygen and laboratory determination of nutrients. Semiannually (during high and low flows), samples were collected for determination of common constituents and trace elements in water and trace elements in bottom material at seven of the ten sites. Annually, samples were collected for determination of herbicides and insecticides in water, and insecticides in bottom material at all 10 sites. The bi-weekly water-quality sampling at the 10 sites was discontinued in December of 1995. In 1994 and 1995, sediment and water-quality data was collected at a total of 12 fixed sites and 15 partial record sites. Tri-weekly water-quality sampling was conducted during the 1997 water year at 2 sites. All water-quality sampling was discontinued in December 1997. Suspended-sediment samples were collected at 6 sites in the DEC project in the 1998 water year for the Vicksburg District and is currently ongoing.

Intensive (once every 3 hours during a 48-hour period) sampling was conducted once a year for the DEC Project at 24 sites (including seven of the biweekly sampling sites); six sites in each of four watersheds (Otoucalofa Creek, Hickahala-Senatobia Creeks, Abiaca Creek, and Black Creek). Field determinations were performed and samples were collected for determination of nutrients and bacteria. Additional samples were collected at each of the seven biweekly sampling sites for the determination of trace elements, common constituents, and bottom material insecticides. This intensive phase of water-quality and suspended-sediment sampling was discontinued in December of 1995.

4. Mississippi Delta Management Systems Evaluation Areas (MSEA)

OPC is involved in a cooperative effort with the USGS to conduct the Mississippi Delta Management Systems Evaluation Areas (MSEA) project located in Sunflower and LeFlore Counties in northwestern Mississippi. This research effort is the culmination of several local, state, and federal agencies, as well as local universities and organizations, agreeing to work together to bring a comprehensive, five-year water quality project to the Mississippi Delta. The purpose of the Mississippi Delta MSEA project is to assess how agricultural activities affect the water in the Mississippi Delta and to increase the knowledge needed to design and evaluate management practices as components to farming systems. The management practices are being evaluated for their economic, management and environmental value. In addition, educational and public awareness programs will be developed to communicate those ideas that help to reduce potential agricultural impacts to ground and surface water.

The study is being conducted at sites within three Delta oxbow lake watersheds, which are primarily in cotton production. One watershed is a "control" with no (or very few) management practices; the second watershed contains management practices common to the region; and the third watershed contains management practices that may be considered more innovative or that require more research. The watersheds are "self-contained" and small enough so that the impact of the management practices can be monitored throughout the watersheds from the edges-of-fields to the lakes.

The Mississippi Delta MSEA Project is cooperatively administered by a consortium of local, state, and federal agencies and organizations. Participating agencies include, but are not limited to: USDA-Agricultural Research Service (ARS); United States Geological Survey (USGS); Mississippi State University (MSU); Mississippi Department of Environmental Quality (MDEQ); USDA-National Resources Conservation Service (NRCS, formerly SCS); USDA-Farm Service Agency (FSA, formerly ASCS); Mississippi Agricultural and Forestry Experiment Stations (MAFES); Yazoo Mississippi Delta Joint Water Management District (YMD); Mississippi Soil and Water Conservation Commission; Delta Council; and the Mississippi Farm Bureau Federation.

The USGS is assessing the effects of agricultural activities with respect to surface-water quality and will evaluate selected BMPs based on their ability to reduce peak surface-water concentrations of sediment, pesticides, and nutrients during storms. A total of nine water quality and stream monitoring stations have been established in each of the three watersheds. One of these stations in each watershed has been used to collect runoff samples every 5 minutes during storm events to define pollutant concentration distributions. Sampling for the other stations is using the more traditional approach of flow-weighted composite sampling. The project is in the fifth year of data collection, and a five-year extension has been requested by all research agencies.

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YAZOO BASIN

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MS355M1	ABIACA CREEK																		T			N		
	NEAR SEVEN PINES	G07287150	F	F	F		F		F	P			F	P	N	T								
	AT CRUGER	G07287160	F	F	F		F		F	N			F	P	N	F								
MS357M1	ABIACA CREEK																		T			N		
	NEAR COILA	G07287141	F	T	F		F		F	N			F	N	N									
MS357M2	ABIACA CREEK																		T			N		
	NEAR BLACK HAWK	G07287142	F	F	F				F	F			F	F	N									
MS357M3	ABIACA CREEK																		T			N		
	AT BLACK HAWK	G07287144	F	F	F		F		F	N			F	N	N									
MS303ARM	ARKABUTLA RESERVOIR																		F	T				
	NEAR EUDORA	D303ARK01	F	F	F		F	N	F	P			F				T							
MS340M	BATUPAN BOGUE																		F					
	AT GRENADA	G07285400	F	F	F		F		F	F			F											
MS354M3	BEAR CREEK																		T					
	NEAR MOORHEAD	G07287195	F		T								F											
MS358BLM1	BEE LAKE																			T				
	AT THORNTON	DYZ014D00-BEE1															T							
MSBIGSUNRM2	BIG SUNFLOWER RIVER																		P			P		
	AT SUNFLOWER AT COUNTY ROAD 1.0 MILES WEST OF HWY 49 IN SUNFLOWER	D07288500	F	T	F	F	F	N	N	N	N	N	F	F	P	T								
	AT SUNFLOWER	G07288500	F	P	N								F											
MSBIGSUNRM4	BIG SUNFLOWER RIVER																		P					
	NEAR ANGUILLA	CBS0202	F	F	F			N	G	N	N	N	F											
		G07288700	P	F	P								F											
MSBIGSUNRM5	BIG SUNFLOWER RIVER																		N			N		
	AT CLARKSDALE AT SECOND STREET IN CLARKSDALE	D07288000	F	F	P	F	F	N	F	N	N	N	F	F	N									
		G07288000	P	F	N								F											
MS403M4	BLACK BAYOU																		P					
	NEAR BURDETTE	DMS404M3-1	F		F		F	F	F	P			F					P						
	NEAR HOLLANDALE AT HWY 12	G07288830	F	F	F		F	N	F	N	N	N	F											
MS359M	BLACK CREEK																		T			N		
	AT BOWLING GREEN	G07287375	F	F	F		F		F	F			F	P	N									

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MS359M3	BLACK CREEK																		T			N		
	AT LEXINGTON	G07287400	F	F	F		F		F	P			F	F	N									
MS362M1	BLACK CREEK																		T			N		
	AT HOWARD	G07287405	F	F	F		F		F	N			F	F	N									
MS390M	BOGUE PHALIA																		T					
	AT LELAND	CBP0101	F	P				N	F	N	P		F											
		G07288650	F	F	F			N		N			F											
	NEAR ELIZABETH	G332554090503100	F										F											
MS392M	BOGUE PHALIA																		P					
	AT DARLOVE	CBP0102	F	P	F		P	N		N	N	N	F											
MS339M3	CANE CREEK																		T					
	NEAR HOLCOMB AT HWY 35	D07285735																T						
MS277M1	CASSIDY BAYOU																		P					
	AT WEBB	G07280900	F	P	P								F											
MS246CLE	CHEWALLA LAKE																			F				
	NEAR WHITES	DYZCL1-SFD															F							
MS259M	CLEAR CREEK																		P					
	NEAR OXFORD AT HWY 6	CS0628	F	N	F			F	F	P	F		F	F										
MS357M4	COILA CREEK																		T			N		
	AT SEVEN PINES	G07287147	F	F	F		F		F	N			F	N	N									
MS320M2	COLDWATER RIVER																		T					
	NEAR DARLING	07279900	F	F	F		F	N		N	N	N	F											
MSCOLDR2M2	COLDWATER RIVER																		T			P		
	AT PRITCHARD AT PRITCHARD ROAD	CA1028	F	F	F	F		F	F	F	F		F											
	AT PRITCHARD AT COUNTY ROAD 0.5 MILES EAST OF PRITCHARD	D07279300	F	F	F	F	F	N	F	N	N	P	F	P	P									
MS396M1	CYPRESS BAYOU																		P					
	NEAR SPANISH FORT	D07288798-07																P						
MS403M6	DEER CREEK																		N					
		G07288770	F	F	N																			
MS219ELM	EAGLE LAKE																		T	F				
	NEAR EAGLE BEND	DMR013D00-EGL1															F							
		IMR013D00-EGL1	F	F	P			F	F	F			F											

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MS288ELM	ENID RESERVOIR																		F	P*				
	NEAR ENID	DYZ020D00-EN1	F	N	F		F	F	F	F			F				P							
		IYZ020D00-EN1	P	F	F					T	F		F											
	NEAR ENID SOUTHWEST OF CHICKASAW HILL BOAT LANDING	IYZ020D00-EN2	F	P	F					F	F		F											
	NEAR ENID NEAR WATER VALLEY LANDING	IYZ020D00-EN3	F	F	F					T	F		F											
MS362M2	FANNEGUSHA CREEK																		T			N		
	NEAR HOWARD	G07287355	F	F	F		F		F	F			F	F	N	F								
MS403M5	GRANICUS BAYOU																		P					
	NEAR HOLLANDALE AT HWY 12	G07288842	F	F	F		P	N		N	N	N	P											
MS327GLM	GRENADA RESERVOIR																		T		T			
	NEAR GRENADA ABOVE GRENADA DAM	CG1028	F	P	F			F	F	F	F		F											
	NEAR GORE SPRINGS	DYZ021D00-GR2	F	T	F		F	P	F	P			F				T							
	NEAR GORE SPRINGS NEAR GRAYSPORT LANDING	IYZ021D00-GR2	P	F	F					T			F											
	NEAR GRENADA NEAR TORRANCE LANDING	IYZ021D00-GR4	F	F	F					F			F											
	NEAR GRENADA NEAR NORTH ABUTMENT	IYZ021D00-GR6	F	F	N					N			F											
MS359M2	HARLAND CREEK																		T			N		
	NEAR HOWARD	G07287404	F	F	F		F		F	N			F	F	N	F								
MS303M3	HICKAHALA CREEK																		P					
	NEAR COLDWATER AT HWY 51	CA0928	F	N	N			F	F	P	F		F	F										
MS303M4	HICKAHALA CREEK																		P			N		
	NEAR SENATOBIA	G07277700	F	P	F		F		F	F			F	N	N	T								
MS305M2	HICKAHALA CREEK																		P			N		
	NEAR INDEPENDENCE	G07277520	F	N	F		P		F	N			F	N	N									
	NEAR LOOXAHOMA	G07277530	F	N	F		F		F	N			F	N	N									
MS358HLE	HORSESHOE LAKE																			F				
	NEAR BUTLER	DYZHL1-SF															F							
MS262M	HOTOPHA CREEK																		T					
	NEAR BATESVILLE	G07273100	P	F	F		F		F	F			F											
MS396M2	HOWLETT BAYOU																		P					
	NEAR RED ROCK	D07288797.75																P						
MS303M1	HURRICANE CREEK																		P					
	NEAR EUDORA	CA0528	F	P	P			P	F	N	P		F	F										

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MS375M	HUSHPUCKENA RIVER																		P					
	NEAR HUSHPUCKENA	D07288150																P						
MS305M1	JAMES WOLF CREEK																		P			N		
	NEAR LOOXAHOMA	G07277548	F	N	F		P		P	N			F	N	N									
MS227M	KING CREEK																		F					
	AT NEW ALBANY	VMB003V28-KC1	F	F	F						F							F						
MS404LWM	LAKE WASHINGTON																		T	F				
	NEAR GLEN ALLAN	DLW-1	F	T	F	T		N	N	P		F	F				F							
		DLW-3	F	T	F	T		N	F	P			F				F							
	AT GLEN ALLAN	DLW-5	F	F	F	F		N		P		F	F				F							
MS250LM	LEE CREEK																		F					
	AT ABBEVILLE	D07270630	F	T	F		F	F	F	F			F					F						
MS228M	LITTLE TALLAHATCHIE RIVER																		T			N		
	AT ETTA AT HWY 30 0.8 MILES NORTH OF ETTA	D07268000	F	F	F	F	F	P	F	P	P	P	F	F	N	T								
MS249E1	LITTLE TALLAHATCHIE RIVER																			F				
	NEAR ABBEVILLE	DMS249E1-1															F							
MS249M1	LITTLE TALLAHATCHIE RIVER																		P	F				
	NEAR MALONE AT HWY 7	CS1028	F	N	F			F	F	P	F		F	F										
	NEAR MALONE AT GRAHAM LAKE	DYZLTR1-SFD															F							
		S1028C															F							
MS355MBE	MATHEWS BRAKE																			F				
		DYZMB1-SFD															F							
MS360E1	MILLSTONE CREEK, UNNAMED TRIBUTARY OF																		P					
	NEAR KIERN	VMB003V29-MSC1	F	F	F						F							P						
MS320MLM	MOON LAKE																			T				
	NEAR LULA	DYZ011D00-MN2															T							
MS386M	MOORHEAD BAYOU																		N					
	NEAR MOORHEAD ABOVE POTW	DYZ001D00-1	F	F	F								F											
	AT MOORHEAD ABOVE POTW	DYZ001D00-2	F	F	N								F					N						
	AT MOORHEAD BELOW POTW	DYZ001D00-3	F	F	N								F					N						
		DYZ001D00-4	F	F	N								F											
		DYZ001D00-5	F	F	N								F											

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MS306M	MUSSACUNA CREEK																		P					
	NEAR HERNANDO	CA0628	F	P	F			N	N	N	P		N	F										
MS2890M1	OTOUCALOFA CREEK																		F			N		
	NEAR PARIS	G07274235	F	F	F		F		F	F			F	P	N									
	AT PARIS	G07274237	F	P	F		F		F	F			F	P	N									
	NEAR WATER VALLEY EAST OF WATER VALLEY	G07274245	F	F	F		F		F	F			F	P	N									
MS2890M2	OTOUCALOFA CREEK																		T			N		
	NEAR WATER VALLEY EAST - SOUTHEAST OF WATER VALLEY	G07274247	F	F	F		F		F	P			F	P	N									
MS288M1	OTOUCALOFA CREEK CANAL																		P			N		
	NEAR WATER VALLEY AT BRIDGE	CE0728	F	T	F			F	F	N	F		F	F										
	NEAR WATER VALLEY	G07274252	F	P	F		F		F	N			F		N	T								
MS369M2	PERRY CREEK																		N					
	AT TINSLEY	DYZ007D00-OT1	F	F	F								N											
		DYZ007D00-PT1	F	F	F								N											
		PYZ007D00-PC1	F	F	F								N											
MS294M	PETERS CREEK																		F					
	NEAR POPE	G07275530	F	F	F		F		F	F			F											
MS297M	RED BANKS CREEK CANAL																		N					
	NEAR INGRAMS MILL	D07276970																N						
MS452RLE	RODNEY LAKE																			F				
	NEAR RODNEY	D452RDL01															F							
MS261SLCE	SARDIS LOWER LAKE																			F				
	NEAR SARDIS	DYZSLL1-SFD															F							
MS249SLM	SARDIS RESERVOIR																		F	F				
	NEAR SARDIS	DYZ022D00-SAR1	F	F	F		F	F	F	F			F				F							
		IYZ022D00-SAR1	P	F	P					P			F											
	NEAR WILLOW COVE	IYZ022D00-SAR2	F	P	F					F			F				F							
	NEAR SARDIS NEAR HUGHES CROSSING	IYZ022D00-SAR3	P	P	F					P			F											
	NEAR SARDIS NEAR CLEAR CREEK LANDING	IYZ022D00-SAR4	F	P	F					P			F											
	NEAR SARDIS NEAR EAST GOOSE VALLEY	IYZ022D00-SAR5	F	P	P								F											
	NEAR SARDIS NEAR PINEY POINT	IYZ022D00-SAR6	F	P	F					T														
MS304M1	SENATOBIA CREEK																		P			N		
	NEAR COMO	G07277715	F	N	F		P		N	N			F	N	N									

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MS304M2	SENATOBIA CREEK																		P			N		
	NEAR SENATOBIA	G07277730	F	P	F		F		P	N			F	N	N	T								
MS327M1	SKUNA RIVER																		T					
	NEAR BRUCE AT GUM CROSSING BRIDGE	CG0628	F	P	F			F	F	P	P		F											
MS333M1	SKUNA RIVER																		P					
	AT BRUCE	G07283000	F	N	F			P		P			F											
MS360E2	SPRING BRANCH																		P					
	NEAR KIERN	VMB003V30-SB1	P	F	F						F							P						
MS252SLE	SPRING LAKE (WALL DOXEY STATE PARK)																			F				
	AT WATERFORD	DYZ017D00-SPG1															F							
MS404M3	STEELE BAYOU																		T					
	NEAR PANTHER BURN	G330426090573900	F	F	F		P	N		N	N	N	F											
MS406M1	STEELE BAYOU																		F					
	NEAR ONWARD	G07288900	F	F	F								F											
MS404M4	STEELE BAYOU EAST PRONG																		P					
	NEAR ROLLING FORK AT HWY 14	G07288870	F	F	P								F											
MSTALARM1	TALLAHATCHIE RIVER																		T			P		
	AT SWAN LAKE AT COUNTY ROAD 1.0 MILES SOUTH OF SWAN LAKE	D07281000	F	F	F	F	F	N	F	N	N	N	F	F	P	F								
	AT SWAN LAKE AT COUNTY LINE ROAD 1.0 MILES SOUTH OF SWAN LAKE	G07281000	F	F	F		F	P	F	N	N	N	F											
MS369M3	THOMPSON CREEK																		N					
	AT TINSLEY	DYZ007D00-TC1	P	F	F								N											
MS249M2	TOBY TUBBY CREEK																		T					
	NEAR OXFORD	CS0728	F	P	F			F	F	P	F		F	F										
MS289TM	TOWN CREEK																		F			N		
	AT WATER VALLEY	D07274251	F	F	F		F		F	F			F	N	N									
MS385M	TURKEY BAYOU, UNNAMED TRIBUTARY OF																		N					
	NEAR SUNFLOWER	DYZ003D00-LQR4																N						
MS327M2	TURKEY CREEK																		F			F		
	NEAR COFFEEVILLE SOUTH OF COFFEEVILLE	CG0528	F	F	F			F	F	N	F		F	F	F									
MS336M1	TURKEY CREEK																		F					
	NEAR WATER VALLEY OFF HWY 32 SITE 1	D07283680																F						

HEADER ABBREVIATIONS: Tmp-Temperature, pH-Acidity/Alkalinity, DO-Dissolved Oxygen, COD-Chemical Oxygen Demand, TOC-Total Organic Carbon, TKN-Kjeldahl Nitrogen, N+N-Nitrite & Nitrate, TP-Total Phosphorus, Turb-turbidity, TSS-Total Suspended Solids, Cndct-Conductivity, FCU-Fecal Coliform (Upper Limit), FCL-Fecal Coliform (Lower Limit), TOX-Toxicants, Wtr-in Water Column, Fsh-in Fish Tissue, BIO Stat-Biological Rating (macroinvertebrates) 10/20/99

USE SUPPORT STATUS: F-Fully Supported, T-Fully Supported but Threatened, P-Partially Supported, N-Not Supported, *-Fish Advisory

WATERBODY (WB) USE CLASSIFICATIONS: AQ-Aquatic Life Support, FC-Fish Consumption, SHL-Shellfish Harvesting, SC-Secondary Contact Recreation, CR-Contact Recreation, DW-Raw Water Supply

AGENCY ABBREVIATIONS: C-USACE, D-MSDEQ, E-USEPA, F-USFS, G-USGS, I-Inst. of Higher Learning, M-DMR, N-NOAA, T-TVA, V-Volunteer Monitor

TABLE III-46
SUMMARY OF MONITORING DATA (1992 - 1997)
YAZOO BASIN

Waterbody ID	GEOGRAPHICAL INFORMATION Waterbody and Station Location(s)	STATION ID Agency/Station#	PHYSICAL/CHEMICAL DATA Tmp	pH	DO	COD	TOC	TKN	N+N	TP	Turb	TSS	Cond	FCU	FCL	TOX Wtr	Fsh	Bio Stat	USE SUPPORT AQ	FC	SHL	SC	CR	DW
MS336M2	TURKEY CREEK																		T					
	NEAR VELMA SITE 2	D07283725																T						
MS394M1	WADE BAYOU																		P					
	NEAR YAZOO CITY IN PANTHER SWAMP NWR	D07287466																P						
MS363WLM	WOLF LAKE																			T				
	NEAR LOUISE	DYZ015D00-WLF1															F							
		IYZ015D00-WLF1															T							
MS325YM1	YALOBUSHA RIVER																			F				
	NEAR CALHOUN CITY	D07282000															F							
MS339M1	YALOBUSHA RIVER																		P	T				
	NEAR GRENADA AT SPILLWAY BELOW GRENADA LAKE	CG0928	F	N	F			F	F	P	F		F											
	NEAR GRENADA AT SPILLWAY	DG0928C															T							
MS339M2	YALOBUSHA RIVER																		P			N		
	AT GRENADA AT MAIN STREET BRIDGE	D07285499	F	P	F	F	F	N	F	F	N	F	F	F										
	AT GRENADA AT HWY 51 0.2 MILES NORTH OF GRENADA	D07285500	F	P	F	F	F	F	F	F	F	P	F	F	N									
MS327GLM	YALOBUSHA RIVER (GRENADA RESERVOIR)																		T		T			
	NEAR GRENADA AT SPILLWAY	CG0728	F	F	F			F	F	P	F		F											
MS400M	YAZOO RIVER																		T	F				
	AT REDWOOD AT HWY 61	G07288800	F	F	F			F	F	P	F		F				F							
MS400M2	YAZOO RIVER																		P					
	NEAR LONG LAKE	G07288955	F	F	P			N		N	N		F	F										
MSYAZR3M1	YAZOO RIVER																		P			N		
	NEAR SHELL BLUFF AT COUNTY ROAD 3.5 MILES WEST OF SIDON	D07287120	F	P	F	F	F	N	F	N	N	N	F	F	N	T								
	AT GREENWOOD	G07287000	F	F	F		F	F		N	N	N	F											
MSYOCRM	YOCONA RIVER																			P*				
	NEAR ENID	DYZYK1-SF															P							

HEADER ABBREVIATIONS: Tmp-Temperature, pH-Acidity/Alkalinity, DO-Dissolved Oxygen, COD-Chemical Oxygen Demand, TOC-Total Organic Carbon, TKN-Kjeldahl Nitrogen, N+N-Nitrite & Nitrate, TP-Total Phosphorus, Turb-turbidity, TSS-Total Suspended Solids, Cndct-Conductivity, FCU-Fecal Coliform (Upper Limit), FCL-Fecal Coliform (Lower Limit), TOX-Toxicants, Wtr-in Water Column, Fsh-in Fish Tissue, BIO Stat-Biological Rating (macroinvertebrates) 10/20/99

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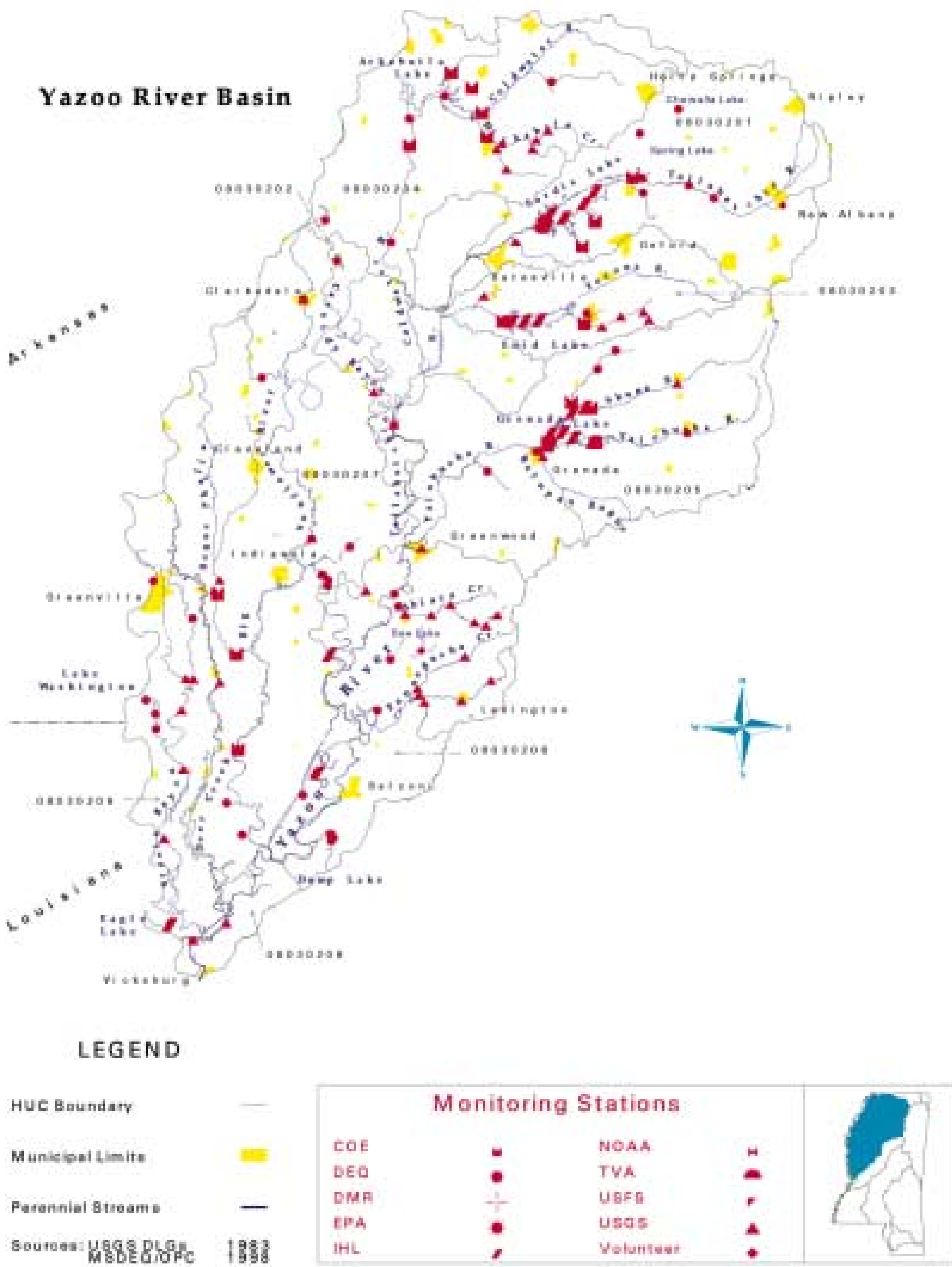
FIGURE III-19
Locations of Monitoring Stations



PART IV

GROUNDWATER ASSESSMENT

PART IV

GROUND WATER ASSESSMENT

OVERVIEW

Introduction

The overall quality of ground water resources in Mississippi remains very good. Extensive contamination of aquifers in the state or incidents of public water systems being impacted by ground water contamination are uncommon. The sporadic "boil water" notices periodically issued in the state are usually the result of inadequate system maintenance by public water systems (PWSs) or unforeseen natural disasters.

Section 106(e) of the Clean Water Act requests that each state monitor the quality of its ground water resources and report the status to Congress every two years in its State 305(b) report. To gain a more detailed overview of the ambient ground water quality in the various states, EPA revised the reporting criteria for the 305(b) report in 1996. The 1996 guidelines encouraged states to assess ground water quality within specific aquifers or hydrogeologic settings rather than defining the ground water quality for the entire state as in early 305(b) reports. This revised reporting format, which was carried over to the 1998 report as well, presents a significant challenge for Mississippi in attempting to fulfill its 305(b) reporting obligations. Most of the aquifer-specific ground water quality data available in the state consist of basic inorganic analyses conducted on samples collected by the United States Geological Survey (USGS) or the Mississippi Department of Environmental Quality's Office of Land and Water Resources (OLWR). Typically, assessment of ground water in Mississippi for known and suspected contaminants has not been conducted on an aquifer-specific basis.

EPA guidelines encourage the use of the best available data in reflecting the quality of the water resource. To obtain data required to provide an accurate and representative assessment of ground water quality, cooperation between multiple agencies is necessary. The information provided in this report represents the best available data that can be obtained in electronic format from the MDEQ, the Mississippi State Department of Health (MSDH) and the USGS.

The perplexing hydrogeology in many areas of the state contribute to a certain amount of additional difficulty in following the revised ground water assessment format. The rapid facies changes which often characterize the state's stratigraphy and the occurrence of perched ground water conditions in many areas of the state can make it difficult to distinguish between various aquifers.

Fourteen major aquifer systems and numerous minor aquifers are recognized in Mississippi. In attempting to comply with EPA's request for aquifer specific data, the ground water quality associated with the Mississippi River Valley alluvial aquifer was presented and discussed in the previous 305(b) report. At the time, this information represented the only aquifer-specific water quality data available. Information related to three other aquifers used in Mississippi are presented in this report -- the Paleozoic aquifer system, the Coffee Sand aquifer, and the Ripley aquifer. The basis for selecting these water-bearing units are that they represent major aquifers of limited areal extent.

The highest ground water priority in Mississippi remains the protection of its drinking water aquifers. Fortunately, most of the public water system wells in the state are screened in deep confined aquifers which are afforded some degree of natural protection. Source Water Protection and Wellhead Protection program components will address the management of significant point and non-point sources of pollution that may cause future degradation of ground water resources.

Investigations

The USGS has recently completed a multi-year study, "Geohydrology and Susceptibility of Major Aquifers to Surface Contamination in Mississippi." The related data are being adopted to a Geographic Information System (GIS) format which will allow the State to identify and protect the most vulnerable areas of the state from contamination of available aquifers. The information generated as a result of this investigation will also contribute to the final susceptibility assessments of PWSs, a final component of SWAPs.

Although the Office of Land and Water Resources (OLWR) is primarily involved in ground water quantity issues, the agency is currently engaged in two studies to monitor ground water supplies plagued by high chloride concentrations. One of these areas is situated along the Gulf Coast in southeastern Jackson County where fluctuating chloride concentrations in the local aquifers used for potable water supply may be an indication of saltwater encroachment. The OLWR also continues to monitor an area of Washington County in the Delta region of Mississippi where chloride concentrations in the Sparta and Cockfield aquifer systems remain a potential health concern. In both of these study areas, the degradation in water quality appears to be related to substantial ground water withdrawals occurring in the surrounding urbanized and industrialized regions.

The USGS, the OLWR, and the Yazoo-Mississippi Joint Water Management District continue development of a new ground water flow model of the Mississippi River Valley alluvial aquifer. This project was initiated because of the proven unreliability of an old MODFLOW model developed in the mid-1980s. The new flow model is incorporating updated hydrogeologic and water-use data that will allow the projection of water level declines in the aquifer based on various pumping scenarios. The investigation also should provide more detail regarding the ground water-surface water interaction in the region and the lateral extent and thickness of the clay cap that overlies the aquifer. This information can be used to concentrate ground water protection efforts in the most vulnerable areas of the Delta.

Mississippi River Valley Alluvial Aquifer

The Mississippi River Valley Alluvial Plain, known as the Delta, is an area of approximately 7,000 square miles located in northwestern Mississippi. This province is distinctly separated from the rest of the state by the Bluff Hills, a topographic feature that forms the eastern and southern boundaries of the area. The Mississippi River serves as the western boundary of the Delta. The virtually flat topography, rich soil and extensive water resources available throughout the alluvial plain have resulted in large tracts of the land being set aside for growing cotton, soybeans and rice.

The Mississippi River Valley alluvium in the Delta consists of Quaternary-aged beds of sand, gravel and clay. Although the distribution and arrangement of these sediments are not entirely homogenous, the clastics commonly are arranged in a fining-upward depositional sequence normally associated with alluvial deposits. The water-bearing sand and gravel strata in the alluvium comprise the Mississippi River Valley alluvial aquifer, the most extensive aquifer in the state. Wells tapping this prolific aquifer typically are drilled to depths ranging between 80 and 120 feet. Overlying the saturated zone of the aquifer is a clay cap that averages approximately 20 feet thick across the Delta. This cap serves as a confining layer for the shallow MRVA and has helped to protect it from agricultural chemicals widely used in the area.

A major dilemma in dealing with the Mississippi River Valley alluvial aquifer has been determining its various sources of recharge. Some recharge of the aquifer is realized when the Mississippi River and certain Delta streams reach high stages. However, this flow regime naturally reverses during the drier summer and fall months. Over the years, as irrigation and aquaculture have become more popular in the Delta, water levels in the alluvial aquifer have steadily declined in some areas. These declines have resulted in dramatic decreases in the baseflow contribution to some Delta streams. Determining the complex ground water-surface water interaction in the Delta and its seasonal variation has proven quite difficult. Additional investigations will be necessary before the ground water-surface water interaction can be understood.

Another important consideration facing the state in setting its ground water priorities is the protection of the Mississippi River Valley alluvial aquifer. Because of objectionable hardness and high iron concentrations, ground water from this shallow aquifer is no longer widely used for drinking water, however, over 100,000 acres of catfish ponds in the Mississippi Delta are totally dependent upon this water supply. Extensive contamination of this vital resource would not only have a profound impact on the aquaculture industry in the state but also the economy of the Mississippi Delta.

Paleozoic Aquifer System

One of the significant aquifers available in northeast Mississippi is the Paleozoic aquifer system. Many of the public water systems operating in the counties of Alcorn and Tishomingo, including the cities of Corinth and Iuka and some smaller water associations, are dependent on this aquifer. Water wells tapping this aquifer typically are drilled to depths in the 400 to 600 foot range. The OLWR estimates the average withdrawal from this aquifer at about 5.5 million gallons per day (MGD) with the City of Corinth being the principal center of pumping activity.

The related stratigraphy in this area of the state is commonly grouped together and referred to as the Paleozoic aquifer system. The limestones, cherts, and calcareous shales associated with this section crop out along the eastern edge of the state boundary with Alabama. These beds dip to the west and quickly become covered with younger beds which serve as protective layers to contamination. Recharge to the aquifer occurs primarily when precipitation occurs along the outcrop area and to some extent from its hydraulic interconnection with the upper Cretaceous-aged aquifers. Obtaining acceptable volumes of water from this aquifer has proved difficult because the water yields are dependent on finding locations which have been sufficiently weathered and have adequate secondary porosity.

Coffee Sand Aquifer

The Coffee Sand aquifer is a source of potable water supply in several counties located in northeast Mississippi. Although most wells in the Coffee Sand are low-yield domestic wells, the aquifer yields enough water to be the source of public water supply for wells in the counties of Alcorn, Lee, and Tippah. The estimated withdrawal of ground water from the aquifer is approximately 3.0 million gallons per day (MGD) according to the OLWR.

The Coffee Sand is composed of fine to medium-grained sands, silty sands and clays and occasionally thin beds of sandstone. Recharge to the aquifer is primarily by precipitation that occurs on sandy exposures along its north-south trending outcrop area. The beds associated with the Coffee Sand aquifer dip to the west where they become overlain by confining layers of the Demopolis Chalk.

Ripley Aquifer

Another ground water resource available in north Mississippi is the Ripley aquifer. The outcrop of this formation trends north-south in a belt from Tennessee into Alcorn and Tippah Counties. This exposure continues southward into Clay County before changing direction to the southeast and extending on into Alabama. North of Clay County the Ripley aquifer consists of various sand members interbedded with clays, marls, and limestone. The stratigraphic equivalents that exists south of Clay County contain little sand so the Ripley is not considered an aquifer in this region of the state. Recharge to the aquifer occurs as a result of precipitation on the exposed outcrop are The ground water flow direction is generally to the west following regional dip. Because of the limited width of the outcrop area and the westward dip of the related strata, the Ripley quickly becomes confined by the Porters Creek formation.

Some of the PWSs in the counties of Benton, Chickasaw, Lafayette, Marshall, Pontotoc, Tippah, and Union utilize the Ripley aquifer. The OLWR estimates that approximately 1.0 million gallons of water per day are withdrawn from the aquifer for public water supply. Because the Ripley is not a highly permeable unit, the yield obtained from the aquifer is dependent upon finding adequate sand thickness.

Ground Water Contamination Sources

The major sources of ground water contamination in Mississippi are leaky underground storage tanks (USTs) and faulty septic systems. In areas of the state where petroleum exploration and production are prevalent, brine (saltwater) contamination of shallow aquifers is a problem. Localized ground water contamination from hazardous waste has been detected at various commercial and industrial facilities across the state as well. Because many of the aquifers in the state are confined by overlying layers of clay, instances of ground water contamination is not widespread.

Table IV-1 identifies and sets priorities for not only the three established major sources of ground water contamination previously mentioned, but also recognizes seven potential contaminant sources in Mississippi.

TABLE IV-1
Major Sources of Ground Water Contamination

Contaminant Source	Ten Highest Priority Sources(T)	Factors Considered in Selecting a Contaminant Source	Contaminants
Agricultural Activities			
Agricultural chemical facilities			
Animal feedlots			
Drainage wells			
Fertilizer applications			
Irrigation practices			
Pesticide applications	Y	A, B, C, D, E	A, B
Storage and Treatment Activities			
Land application			
Material stockpiles			
Storage tanks (above ground)	Y	A, B, C, D, E	D
Storage tanks (underground)	YY	A, B, C, D, E	D
Surface impoundments			
Waste piles			
Waste tailings			
Disposal Activities			
Deep injection wells	Y	A, G	H, M
Landfills	Y	A, C, D, E	A, B, D, H
Septic systems	YY	A, B, C, D, E	J, L
Shallow injection wells			
Other			
Hazardous waste generators	Y	A, C, E	A, B, C, D, H
Hazardous waste sites	Y	A, C, E	A, B, C, D, H
Industrial facilities			
Material transfer operations			
Mining and mine drainage			
Pipelines and sewer lines			
Salt storage and road salting			
Salt water intrusion	Y	A, B, C, D, E	G
Spills			
Transportation of materials			
Urban runoff			
Oil and Gas Production Exploration/Production sources (please specify)	YY	A, B, C, D, E	G
Other sources (please specify)			

The factors considered in selecting a contaminant source in Table IV-1 include the following:

1. Human health and/or environmental risk (toxicity);
2. Size of the population at risk;
3. Location of the sources relative to drinking water sources;
4. Number and/or size of contaminant sources;
5. Hydrogeologic sensitivity;
6. State findings, other findings; and
7. Volume of waste injected.

The various contaminants or classes of contaminants are denoted in Table IV-1 by the following :

1. Inorganic pesticides;
2. Organic pesticides;
3. Halogenated solvents;
4. Petroleum compounds;
5. Nitrate;
6. Fluoride;
7. Salinity/brine;
8. Metals;
9. Radionuclides;
10. Bacteria;
11. Protozoa;
12. Viruses; and
13. Sulfides and acids.

State Ground Water Protection Programs

Table IV-2 summarizes the different ground water protection programs in Mississippi. The following abbreviations listed in the table correspond to the state agencies responsible for the various ground water protection programs:

1. MEMA - Mississippi Emergency Management Agency;
2. MDEQ - Mississippi Department of Environmental Quality;
3. MDAC - Mississippi Department of Agriculture and Commerce; and
4. MSDH - Mississippi State Department of Health.

In the past, ground water protection efforts in Mississippi has focused primarily on the development and implementation of the State Wellhead Protection Program (WHPP) at the local level. A considerable amount of time has been devoted to the development of various databases that will ensure compatibility with MDEQ’s GIS and enhance administration of the WHPP. Wellhead protection demonstration projects for several high priority public water systems in the state have been completed. The OPC intends to use the success of these demonstration projects to create interest in cross-program coordination of ground water protection activities in Mississippi.

The reauthorized Federal Safe Drinking Water Act (1996) requires States to develop and implement Source Water Assessment Programs (SWAPs) which identify potential contaminant sources in delineated Source Water Protection Areas. Although the MSDH regulates the public water systems in the state, the MDEQ has responsibility for development of the State SWAP. Since 1997, MDEQ has devoted a great deal of effort in developing an effective strategy to address all of the required program components. A draft of the State program plan will be submitted to EPA by the required deadline of February 6, 1999. Preliminary work on program implementation will continue until EPA approves Mississippi’s SWAP before

November, 1999. After this deadline, MDEQ and MSDH will work together to ensure that susceptibility assessments are made

TABLE IV-2
Summary of State Ground Water Protection Programs

Programs or Activities	Check (Y)	Implementation Status	Responsible State Agency
Active SARA Title III Program	Y	established	MEMA
Ambient ground water monitoring system	Y	established	MDEQ
Aquifer vulnerability assessment	Y	developing	MDEQ*
Aquifer mapping			
Aquifer characterization	Y	considering	MDEQ
Comprehensive data management system	Y	developing	MDEQ
EPA-endorsed Core Comprehensive State Ground Water Protection Program (CSGWPP)	Y	reevaluating participation	MDEQ
Ground water discharge permits	Y	established	MDEQ
Ground water Best Management Practices	Y	developing	MDEQ*
Ground water legislation	Y	established	MDEQ
Ground water classification			
Ground water quality standards	Y	established	MDEQ
Interagency coordination for ground water protection initiatives	Y	developing	MDEQ*
Nonpoint source controls	Y	developing	MDEQ*
Pesticide State Management Plan	Y	established	MDAC
Pollution Prevention Program	Y	established	MDEQ
Resource Conservation and Recovery Act (RCRA) Primary	Y	established	MDEQ
State Superfund	Y	established	MDEQ
State RCRA Program incorporating more stringent requirements that RCRA Primary	Y	established	MDEQ
State septic system regulations	Y	being revised	MSDH*
Underground storage tank installation requirements	Y	established	MDEQ
Underground Storage Tank Remediation Fund	Y	established	MDEQ
Underground Storage Tank Permit Program	Y	established	MDEQ
Underground Injection Control Program	Y	established	MDEQ
Vulnerability assessment for drinking water/wellhead protection	Y	developing	MDEQ
Well abandonment regulations	Y	established	MDEQ
Wellhead Protection Program (EPA-approved)	Y	established	MDEQ
Well installation regulations	Y	established	MSDH*

available to the public in a timely fashion. The management of potential contaminant sources identified during SWAP will be addressed later during source water protection activities.

All of Mississippi's waters have been declared to be among the basic resources of the State, therefore, broad legislation exists for the protection and management of ground water as well as surface water resources. All potential sources of ground water contamination are addressed to some extent by State and/or Federal regulations or statutes. The MDEQ and MSDH work together to address incidents involving contamination by defining the source(s), initiating appropriate remedial action and minimizing the potential impact on public health.

The information provided in Table IV-3 summarizes the type and number of contaminant sources present within the Mississippi Delta, the number of sites that are listed or have confirmed releases in the region, and the number of sites with confirmed ground water contamination of the Mississippi River Valley alluvial aquifer. The data required to complete similar tables is not readily available for the Paleozoic aquifer system, the Coffee Sand aquifer, and the Ripley aquifer. Inaccurate locations at many of the regulated facilities and the lack of Geographic Information System (GIS) coverages (layers) limits the effectiveness of this reporting criteria In many cases, the locations of facilities can only be identified by the counties in which they reside and related remediation sites are not aquifer specific. The MDEQ is working to address this spatial problem which should be corrected for the next 305(b) report.

TABLE IV-3
Ground Water Contamination Summary

Hydrogeologic Setting (1) Mississippi River Valley alluvial aquifer
Spatial Description (optional) (2) ____
Map Available (optional) (3) ____
Data Reporting Period (4) Through June 1998; *Through November 1995

Source Type (5)	Number of Sites (6)	Number of sites that are listed and/or have confirmed releases(6)	Number of sites with confirmed ground water contamination (6)	Contaminants (7)	Number of site investigations (optional)	Number of sites that have been stabilized or have had the source removed (optional)	Number of site with corrective action plans (optional)	Number of sites with active remediation (optional)	Number of sites with cleanup completed (optional)
NPL	0								
CERCLIS (Non-NPL)	151	67	14	CR, NI, SOCs, Benzene					
DOD/DOE									
LUST	987*	43*	8*	BTET, TPH					
RCRA Corrective Action									
Underground Injection	0	0	0						
State Sites	32*	9*	7*	VOCs, SOCs, TPH, AS					
Nonpoint Sources (5)									
Other (Specify)									
Totals	1,170	119	29						

NPL - National Priority List
CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
DOE - Department of Energy
DOD - Department of Defense
LUST - Leaking Underground Storage Tank
RCRA - Resource Conservation and Recovery Act

SUMMARY OF GROUND WATER QUALITY

Public Water Supply

The Safe Drinking Water Act requires the periodic sampling of public water systems. When collected, these samples are submitted to the Mississippi State Department of Health (MSDH) where they are analyzed for contaminants included in the National Primary Drinking Water Regulations. In the past, the resulting water quality data was maintained in files at the MSDH which did not designate specific aquifers or hydrogeologic settings. One of the initial efforts undertaken by MDEQ in addressing the development of the Source Water Assessment Program (SWAP) has been to assign aquifer designations to all public water system wells using the MSDH well identification (numbering) scheme.

The hydrogeologic setting of Mississippi is quite unique. Extensive areas of karst topography are absent in the state and most of the public water supply is obtained from deep confined aquifers. Because of this confinement, only fifteen public water systems in the state are required to analyze their ground water supply for synthetic organic compounds (i.e., pesticides).

Mississippi River Valley Alluvial Aquifer

Due to the elevated concentrations of iron and objectionable hardness that characterize water from the Mississippi River Valley alluvial aquifer, extensive treatment is required before it can be used for potable water supply. The cost of treating the water and the perceived susceptibility of the alluvial aquifer to surficial contamination have served to deter its use for public water supply. Only two of the over one hundred public water systems located in the Delta region of Mississippi presently utilize the alluvial aquifer for potable water supply. Deteriorating water quality associated with the deeper aquifers of northwestern Washington County, however, may force some public water systems to reconsider the shallow alluvial aquifer in the future.

The largest public water system presently using the Mississippi River Valley alluvial aquifer is the City of Vicksburg. Although the aquifer at Vicksburg appears to be under the direct influence of the Mississippi River, the Mississippi State Department of Health indicates no detections or incidents where Maximum Contaminant Levels (MCLs) were exceeded for the public water system. Eagle Lake Water District, the other public water system using the alluvial aquifer, is located in Warren County approximately 12 miles northwest of Vicksburg. The only detections of contaminants recorded for Eagle Lake involved three trihalomethanes associated with finished water that were recorded in 1988. These disinfection byproducts are associated with the mandated chlorination of potable water for all public water systems in the state.

Paleozoic Aquifer System

Both a sodium-chloride and sodium-bicarbonate type water are typical of the Paleozoic aquifer system. While the ground water quality associated with the aquifer normally meets drinking water standards, displeasing concentrations of iron are prevalent in some locations. The City of Corinth experienced some detections of volatile organic compounds in the past until several test holes and old wells were properly plugged and abandoned. Analytical results in the Mississippi State Department of Health (MSDH) database presently do not indicate any detections of ground water contamination in public water systems relying on the Paleozoic aquifer system.

Coffee Sand Aquifer

Ambient ground water quality associated with the Coffee Sand aquifer is good and total dissolved solids concentrations generally are less than 250 mg/l. However, displeasing concentrations of iron can be encountered locally. Ground water contamination has not been a problem for the 32 public water system wells using this aquifer according to the MSDH's analytical results.

Ripley Aquifer

The water quality associated with the Ripley aquifer is generally quite good with total dissolved solids concentrations usually less than 250 mg/l and iron concentrations not aesthetically displeasing. There are no indications of contamination events affecting the 16 public water system wells using this aquifer according to the MSDH.

Ambient Ground Water Monitoring Program

Mississippi's Agricultural Chemical Ground Water Monitoring (AgChem) Program serves as the State ambient ground water monitoring program. This program began in 1989 with an attempt by the Office of Pollution Control's Ground Water Division to locate and sample three shallow drinking-water wells or springs in each of the 82 counties in Mississippi. As a result of the difficulty experienced in locating shallow wells in certain areas of the state, some deep wells were sampled. The database maintained by this program includes aquifer designations for most of the sampled AgChem wells.

Through March 31, 1998, a total of 396 drinking water wells were sampled as part of the Agricultural Chemical Ground Water Monitoring (AgChem) Program. Four hundred and thirty-five samples from these 396 wells were analyzed for 96 pesticides and metabolites, 48 volatile organic compounds (VOCs) and 27 minerals, residues, nutrients, and metals.

During 1994, the ambient ground water monitoring program shifted strategies from a statewide approach to focus mainly on sampling irrigation and fish culture wells in the Delta. This change is a reflection of the overall importance of the Mississippi River Valley alluvial aquifer to the economy of the state and its perceived susceptibility to surficial contamination.

Mississippi River Valley Alluvial Aquifer

Eighty-one drinking water wells in the Delta region of Mississippi were included in the initial sampling phase of the AgChem Program. Analyses from these wells typically indicated some detections of pesticides and nitrates. However, only one well in Leflore County was found to exceed current MCLs. This particular well initially exceeded the MCL for 4,4-DDD, a metabolite of DDT. Sampling of the well on two subsequent occasions indicated concentrations below all MCLs. None of the other 80 samples had detections exceeding or even approaching MCLs for volatile organic compounds (VOCs), synthetic organic compounds (SOCs), nitrates or other inorganic constituents.

In addition to the 396 drinking water wells sampled as part of the AgChem Program, 267 samples from 231 irrigation and fish culture wells have been collected in the Mississippi Delta. These samples were analyzed for 96 pesticides and metabolites, chlorides and nitrates. Analysis for VOCs was not performed due to budget constraints. Seven pesticides were detected at extremely low levels in 25 of the 231 wells screened in the shallow Mississippi River Valley alluvial aquifer. Low concentrations of nitrates were detected in 71 of the wells sampled (see Table IV-4). These concentrations are not surprising in a region with high pesticide use.

The most frequently detected compound, pentachlorophenol, was found in 98 of the 396 drinking water wells and in 15 of the 231 irrigation/fish culture wells sampled. Pentachlorophenol is now restricted to wood use only and can probably be excluded as an agricultural chemical. Importantly, the lower level of detection established for pentachlorophenol in this study is 100 times lower than the Minimum Reporting Limit of 0.1 ppb used in the U.S. EPA National Pesticide Survey (NPS). If NPS guidelines had been followed during the analyses, all of the wells sampled as part of the state ambient ground water monitoring program would have reported concentrations of pentachlorophenol as "none detected."

Based on the results to date, there is no evidence that agricultural chemicals or other contaminants have significantly impacted the quality of ground water in the Mississippi River Valley alluvial aquifer. The MDEQ will continue its efforts to monitor and protect this valuable resource.

Paleozoic Aquifer System, Coffee Sand Aquifer, and Ripley Aquifer

The AgChem Program has sampled only one well using the Paleozoic aquifer system in northeast Mississippi. No detections of contaminants are were indicated in the Tishomingo County well.

The Coffee Sand aquifer was represented by samples collected from four wells by the AgChem Program. The three wells sampled in Alcorn County only showed low levels of pentachlorophenol; the constituent ranged in concentration between 0.009 and 0.029 parts per billion. Samples collected from one well in Union County indicated no detections of any constituents and very low nitrate concentrations.

Eleven Ripley aquifer wells have been sampled as part of the AgChem Program. No detections of contaminants were indicated in the analytical results obtained on the ground water samples collected from four wells in Chickasaw County, three wells in Pontotoc County, and two wells in Union County. Of the two Ripley wells sampled in Tippah County, one indicated no detections of constituents and one had a pentachlorophenol concentration of 0.092 ppb. None of the sampled Ripley wells had nitrate concentrations of note.

TABLE IV-4
Aquifer Monitoring Data

Hydrogeologic Setting (1) Mississippi River Valley alluvial aquifer
Spatial Description (optional) (2) Delta region of northwest Mississippi stretching from Vicksburg to Memphis
Map Available (3) Some spatial data exist but not available in map form at this time.
Data Reporting Period (4) Through December 1995

Monitoring Data Type	Total No. of Wells Used in the Assessment	Parameter Groups	Number of Wells: No detections of parameters above MDLs or background levels — ND (6)	Number of Wells: No detections … — Number of wells in sensitive of vulnerable areas (optional) (7)	Nitrate concentrations range from background levels to less than or equal to 5 mg/l. No detections of parameters other than nitrate above MDLs or background levels and/or located in areas that are sensitive or vulnerable — Nitrate # 5mg/l VOC, SOC, and other parameters not detected (8)	Nitrate concentrations range … — Number of wells in sensitive of vulnerable areas (optional) (9)	Nitrate ranges from greater than 5 to less than or equal to 10 mg/l. Other parameters are detected at concentrations exceeding the MDL but are less than or equal to the MCLs (10)	Parameters are detected at concentrations exceeding the MCLs (11)	Number of wells removed from service (12)	Number of wells requiring special treatment (13)	Background parameters exceed MCLs (14)
Ambient Monitoring Network (Optional)	141	VOC	141		0		0	0	0	0	0
		SOC (15)	0		119		22	0.00	0.00	0.00	0.00
		NO_3	0		141		0	0.00	0.00	0.00	0.00
		Other (16)	141		0		0	0	0	0	0
Raw Water Quality Data from PublicWater Supply Wells	12	VOC	0		0		0	0	0	0	0
		SOC (15)	0		0		0	0	0	0	0
		NO_3	0		0		0	0	0	0	0
		Other (16)	0		0		0	0	0	0	0
Finished Water Quality Data from Public Water Supply Wells		VOC									
		SOC (15)									
		NO_3									
		Other (16)									

TABLE IV-5
Aquifer Monitoring Data

Hydrogeologic Setting (1) Paleozoic aquifer system
Spatial Description (optional) (2) Northeast corner of Mississippi (Counties of Alcorn and Tishomingo)
Map Available (3) Some spatial data exist but not available in map form at this time.
Data Reporting Period (4) Through June 1998

Monitoring Data Type	Total No. of Wells Used in the Assessment	Parameter Groups	Number of Wells								
			No detections of parameters above MDLs or background levels		Nitrate concentrations range from background levels to less than or equal to 5 mg/l No detections of parameters other than nitrate above MDLs or background levels and/or located in areas that are sensitive or vulnerable		Nitrate ranges from greater than 5 to less than or equal to 10 mg/l Other parameters are detected at concentrations exceeding the MDL but are less than or equal to the MCLs (10)	Parameters are detected at concentrations exceeding the MCLs (11)	Number of wells removed from service (12)	Number of wells requiring special treatment (13)	Background parameters exceed MCLs (14)
			ND (6)	Number of wells in sensitive of vulnerable areas (optional) (7)	Nitrate # 5mg/l VOC, SOC, and other parameters not detected (8)	Number of wells in sensitive of vulnerable areas (optional) (9)					
Ambient Monitoring Network (Optional)	1	VOC	1		0		0	0	0	0	0
		SOC (15)	1		0		0	0.00	0.00	0.00	0.00
		NO_3	1		0		0	0.00	0.00	0.00	0.00
		Other (16)	1		0		0	0	0	0	0
Raw Water Quality Data from Public Water Supply Wells	27	VOC	25		0		0	0	0	0	0
		SOC (15)	N/A		N/A		N/A	N/A	0	0	0
		NO_3	0		0		0	0	0	0	0
		Other (16)	0		N/A		0	0	0	0	0
Finished Water Quality Data from Public Water Supply Wells		VOC									
		SOC (15)									
		NO_3									
		Other (16)									

TABLE IV-6
Aquifer Monitoring Data

Hydrogeologic Setting [1] Coffee Sand aquifer
Spatial Description (optional) [2] Northeast Mississippi (Outcrops in the Counties of Alcorn, Prentiss, and Lee)
Map Available [3] Some spatial data exist but not available in map form at this time.
Data Reporting Period [4] Through June 1998

Monitoring Data Type	Total No. of Wells Used in the Assessment	Parameter Groups	Number of Wells: No detections of parameters above MDLs or background levels — ND [6]	Number of Wells: No detections of parameters above MDLs or background levels — Number of wells in sensitive of vulnerable areas (optional) [7]	Number of Wells: Nitrate concentrations range from background levels to less than or equal to 5 mg/l; No detections of parameters other than nitrate above MDLs or background levels and/or located in areas that are sensitive or vulnerable — Nitrate # 5mg/l; VOC, SOC, and other parameters not detected [8]	Number of Wells: Nitrate concentrations range from background levels to less than or equal to 5 mg/l … — Number of wells in sensitive of vulnerable areas (optional) [9]	Nitrate ranges from greater than 5 to less than or equal to 10 mg/l; Other parameters are detected at concentrations exceeding the MDL but are less than or equal to the MCLs [10]	Parameters are detected at concentrations exceeding the MCLs [11]	Number of wells removed from service [12]	Number of wells requiring special treatment [13]	Background parameters exceed MCLs [14]
Ambient Monitoring Network (Optional)	4	VOC	4		0		0	0	0	0	0
		SOC [15]	3		0		0	0.00	0.00	0.00	0.00
		NO_3	4		0		0	0.00	0.00	0.00	0.00
		Other [16]	4		0		0	0	0	0	0
Raw Water Quality Data from Public Water Supply Wells	32	VOC	32		0		0	0	0	0	0
		SOC [15]	N/A		N/A		N/A	N/A	0	0	0
		NO_3	32		0		0	0	0	0	0
		Other [16]	32		0		0	0	0	0	0
Finished Water Quality Data from Public Water Supply Wells		VOC									
		SOC [15]									
		NO_3									
		Other [16]									

TABLE IV-7
Aquifer Monitoring Data

Hydrogeologic Setting [1] Ripley aquifer
Spatial Description (optional) [2] South trending outcrop from Alcorn County to Clay County before changing to a SE direction which runs to Alabama state boundary.
Map Available [3] Some spatial data exist but not available in map form at this time.
Data Reporting Period [4] Through June 1998

Monitoring Data Type	Total No. of Wells Used in the Assessment	Parameter Groups	Number of Wells: No detections of parameters above MDLs or background levels — ND [6]	Number of Wells: No detections of parameters above MDLs or background levels — Number of wells in sensitive of vulnerable areas (optional) [7]	Number of Wells: Nitrate concentrations range from background levels to less than or equal to 5 mg/l; No detections of parameters other than nitrate above MDLs or background levels and/or located in areas that are sensitive or vulnerable — Nitrate # 5mg/l; VOC, SOC, and other parameters not detected [8]	Number of Wells: Nitrate concentrations range from background levels to less than or equal to 5 mg/l … — Number of wells in sensitive of vulnerable areas (optional) [9]	Nitrate ranges from greater than 5 to less than or equal to 10 mg/l; Other parameters are detected at concentrations exceeding the MDL but are less than or equal to the MCLs [10]	Parameters are detected at concentrations exceeding the MCLs [11]	Number of wells removed from service [12]	Number of wells requiring special treatment [13]	Background parameters exceed MCLs [14]
Ambient Monitoring Network (Optional)	11	VOC	11		0		0	0	0	0	0
		SOC [15]	10		0		0	0.00	0.00	0.00	0.00
		NO_3	11		0		0	0.00	0.00	0.00	0.00
		Other [16]	11		0		0	0	0	0	0
Raw Water Quality Data from PublicWater Supply Wells	16	VOC	16		0		0	0	0	0	0
		SOC [15]	N/A		N/A		N/A	N/A	N/A	N/A	N/A
		NO_3	16		0		0	0	0	0	0
		Other [16]	16		0		0	0	0	0	0
Finished Water Quality Data from Public Water Supply Wells		VOC									
		SOC [15]									
		NO_3									
		Other [16]									

APPENDIX A

STATE OF MISSISSIPPI
WATER QUALITY CRITERIA FOR INTRASTATE, INTERSTATE AND COASTAL WATERS

Adopted November 16, 1995

MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF POLLUTION CONTROL
P. O. BOX 10385
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WATER QUALITY CRITERIA FOR INTRASTATE,
INTERSTATE AND COASTAL WATERS

STATE OF MISSISSIPPI

SECTION I. GENERAL CONDITIONS:

1. The policy inherent in the standards shall be to protect water quality existing at the time these water quality standards were adopted and to upgrade or enhance water quality within the State of Mississippi. Waters whose existing quality is better than the established standards will be maintained at high quality unless the Commission finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In no event, however, may degradation of water quality interfere with or become injurious to existing instream water uses. Further, in no case will water quality be degraded below (or above) the base levels set forth in these standards for the protection of the beneficial uses described herein. In addition, the State will assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control. Where the Commission determines that high quality waters constitute an outstanding National resource, such as waters of National and State parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected. For the purposes of this section, existing uses are defined as those uses actually attained in the waterbody on or after November 28, 1975, whether or not they are included in the Water Quality Criteria.

2. The limiting values of water quality herein described shall be measured by the Commission in waters under consideration as determined by good sanitary engineering practice and after consultation with affected parties. Samples shall be taken from points so distributed over the time of day and area and depth of the waters being studied as to permit a realistic appraisal of such actual or potential damage to water use as may exist. Samples shall be analyzed in accordance with the latest edition of "Standard Methods for the Examination of Water and Wastewater" or other methods acceptable to the Commission.

3. Certain waters of the State may not fall within desired or prescribed limitations as outlined. In such instances the Commission may authorize exceptions to these limits, under the following conditions:

   A. The existing designated use is not attainable because of natural background conditions; or

   B. the existing designated use is not attainable because irretrievable man-induced conditions; or

   C. the application of effluent limitations for existing sources is more stringent than those required pursuant to Section 301(b)(2)(A) and (B) of the Federal Water Pollution Control Act of 1972, as amended, in order to attain the existing designated use, would result in substantial and widespread adverse economic and social impact.

In no case shall it be permissible to deposit or introduce materials into waters of the State which will cause impairment of the reasonable or legitimate use of said waters.

4. In view of the fact that industry is continuing to produce new materials whose characteristics and effects are unknown at this time or for which incomplete national criteria have been established, for the purposes of setting water quality standards or permit limits on a case-by-case basis, such materials shall be evaluated on their merits as information becomes available to the Commission. Sources of information shall include, but not be limited to, the latest edition of Quality Criteria for Water, prepared by the Environmental Protection Agency pursuant to Section 304(a) of the Federal Clean Water Act.

5. All criteria contained herein shall apply to all stages of stream flow greater than or equal to the 7-day, 10-year minimum flow in unregulated, natural streams, and the legally guaranteed minimum flow in regulated streams, unless otherwise provided in these regulations. This requirement shall not be interpreted to permit any unusual waste discharges during periods of lower flow. Notwithstanding the above, a stream flow equal to the 7-day, 2-year minimum flow in unregulated natural streams shall be utilized in establishing permit limitations for storm water permits. In cases in which either (1) the data is indefinite or inconclusive, or (2) the 7-day, 2-year minimum flow and/or the 7-day, 10-year minimum flow are inappropriate because of the hydrology of the area, other appropriate State and federal agencies will be consulted in establishing the applicable stream flow.

6. In open ocean waters there shall be no oxygen demanding substances added which will depress the dissolved oxygen content below 5.0 mg/l.

7. The Mississippi River is classified for Fish and Wildlife use, but with the following additions to the criteria stated herein:

   Mineral Constituents: Not to exceed the following concentrations at any time:

   From Mississippi-Tennessee border to Vicksburg

Chlorides	60 mg/l
Sulfates	150 mg/l
T.D.S.	425 mg/l

   From Vicksburg south to the Mississippi-Louisiana border

Chlorides	75 mg/l
Sulfates	120 mg/l
T.D.S.	400 mg/l

8. It is recognized that limited areas of mixing are sometimes unavoidable; however, mixing zones shall not be used as a substitute for waste treatment. Mixing zones constitute an area whereby physical mixing of a wastewater effluent with a receiving water body occurs. Application of mixing zones shall be made on a case-by-case basis and shall only occur in cases involving large surface water bodies in which a long distance or large area is required for the wastewater to completely mix with the receiving water body.

The location of a mixing zone shall not significantly alter the designated uses of the receiving water outside its established boundary. Adequate zones of passage for the migration and free movement of fish and other aquatic biota shall be maintained. Toxicity and human health concerns within the mixing zone shall be addressed as specified in the Environmental Protection Agency Technical Support Document for Water Quality-Based Toxics Control (EPA-505/2-90-001, March 1991) and amendments thereof. Under no circumstances shall mixing zones overlap or cover tributaries, nursery locations, or other ecologically sensitive areas.

SECTION II. MINIMUM CONDITIONS APPLICABLE TO ALL WATERS:

1. Waters shall be free from substances attributable to municipal, industrial, agricultural or other discharges that will settle to form putrescent or otherwise objectionable sludge deposits.

2. Waters shall be free from floating debris, oil, scum, and other floating materials attributable to municipal, industrial, agricultural or other discharges in amounts sufficient to be unsightly or deleterious.

3. Waters shall be free from materials attributable to municipal, industrial, agricultural or other discharges producing color, odor, taste, total suspended solids, or other conditions in such degree as to create a nuisance, render the waters injurious to public health, recreation or to aquatic life and wildlife or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses. Specifically, the turbidity outside the limits of a 750-foot mixing zone shall not exceed the background turbidity at the time of discharge by more than 50 Nephelometric Turbidity Units (NTU). An exemption may be granted in cases of emergency to protect the public health and welfare.

4. Waters shall be free from substances attributable to municipal, industrial, agricultural or other discharges in concentrations or combinations which are toxic or harmful to humans, animals or aquatic life. Specific requirements for toxicity are found in Section II.9.

5. Municipal wastes, industrial wastes, or other wastes shall receive effective treatment or control in accordance with Section 301, 306 and 307 of the Federal Clean Water Act. A degree of treatment greater than defined in these sections may be required when necessary to protect legitimate water uses.

6. Dissolved Oxygen: Dissolved oxygen concentrations shall be maintained at a daily average of not less than 5.0 mg/l with an instantaneous minimum of not less than 4.0 mg/l in streams; shall be maintained at a daily average of not less than 5.0 mg/l with an instantaneous minimum of not less than 4.0 mg/l in estuaries and in the tidally affected portions of streams; and shall be maintained at a daily average of not less than 5.0 mg/l with an instantaneous minimum of not less than 4.0 mg/l in the epilimnion (i.e., the surface layer of lakes and impoundments that are thermally stratified, or five feet from the water's surface (mid-depth if the lake or impoundment is less than 10 feet deep at the point of sampling)) for lakes and impoundments that are not stratified.

   Epilimnion samples may be collected at the approximate mid-point of that zone (i.e., the mid-point of the distance or if the epilimnion is more than five feet in depth, then at five feet from the water's surface).

7. pH: The normal pH of the waters shall be 6.5 to 9.0 and shall not be caused to vary more than 1.0 unit; however, should the natural background pH be outside the 6.5 to 9.0 limits, it shall not be changed more than 1.0 unit unless after the change the pH will fall within the 6.5 to 9.0 limits, and the Commission determines that there will be no detrimental effect on stream usage as a result of the greater pH change.

8. Temperature: The maximum temperature rise above natural temperatures shall not exceed 5EF in streams, lakes and reservoirs nor shall the maximum water temperature exceed 90EF, except that in the Tennessee River the temperature shall not exceed 86EF. In lakes and reservoirs there shall be no withdrawals from or discharge of heated waters to the hypolimnion unless it can be shown that such discharge will be beneficial to water quality. In all waters the normal daily and seasonal temperature variations that were present before the addition of artificial heat shall be maintained. The discharge of any heated waste into any coastal or estuarine waters shall not raise temperatures more than 4EF above natural during the period October through May nor more than 1.5EF above natural of the months June through September. There shall be no thermal block to the migration of aquatic organisms. Requirements for zones of passage as referenced in Section I.8 shall apply. In addition to the general requirements of Section I.2, the temperature shall be measured at a depth of five feet in waters 10 feet or greater in depth; and for those waters less than 10 feet in depth, temperature criteria will be applied at mid-depth.
   In those specific cases where natural conditions elevate the temperatures in excess of the limits expressed herein, Section I.3 shall apply on a case-by-case basis.

9. Toxic Substances:

   A. Aquatic Life and Human Health Standards

      (1) Aquatic Life - The concentration of toxic substances shall not result in chronic or acute toxicity or impairment of the uses of aquatic life. Any levels in excess of these values will be considered to result in chronic or acute toxicity, or the impairment of the uses of aquatic life. Regardless of direct measurements of chronic or acute toxicity, the concentrations of toxic substances shall not exceed the chronic or acute values, except as provided for in Sections 9.E.(1) and 9.E.(2).

      (2) Human Health - The concentration of toxic substances shall not exceed the level necessary to protect human health through exposure routes of fish (and shellfish) tissue consumption, water consumption, or other routes identified as appropriate for the waterbody.

   B. Numeric criteria for all waters are established herein for the 34 toxic pollutants for which the Environmental Protection Agency (EPA) has published national criteria for the protection of aquatic life and human health pursuant to Section 304(a) of the Federal Clean Water Act and chlorine and are listed in Appendix A and are expressed as the dissolved phase of the parameter.

   C. Definitions: When applying acute or chronic toxicity or human health criteria, the following definitions shall apply:

(1) 7Q10 is the seven-day average low stream flow with a ten-year occurrence period.
(2) Mean Annual Flow is the total of daily mean flows for the full period of record divided by the total days for the period of record.

D. Application of Numerical Criteria:

(1) When evaluating human health effects all waters must comply with the organisms only criteria except for waters classified as public water supply and all stream segments within fifty (50) stream miles upstream of a drinking water intake. Stream segments which are classified as public water supply or are within fifty (50) miles upstream of a drinking water intake shall comply with the water and organisms criteria.

(2) When applying toxicity or human health criteria the following stream flows shall be used:

Acute Toxicity - 7Q10
Chronic Toxicity - 7Q10
Human Health - Mean Annual Flow

(3) Criteria for certain metals may be modified on a site-specific basis when a water effect ratio (WER) is conducted in accordance with VI.C.2.a. of Mississippi Wastewater Regulations for National Pollutant Discharge Elimination System (NPDES) Permits, Underground Injection Control (UIC) Permits, State Permits, Water Quality Based Effluent Limitations and Water Quality Certification. In these instances, the criterion for the specific metal in the affected waterbody shall be equal to the criteria concentrations calculated using the following equations: CMC = WER * Acute and CCC = WER * Chronic.

Where:
CCC = Criteria Continuous Concentration
CMC = Criteria Maximum Concentration
WER = Water Effects Ratio for a Specific Pollutant
Acute = Acute Criteria from Appendix A
Chronic = Chronic Criteria from Appendix A

When a WER has not been conducted, the criteria listed in Appendix A of this regulation shall apply as the value of the WER is presumed to equal one in the absence of data to indicate otherwise.

E. Discharge Specific Criteria:

(1) Existing Discharges

(a) The Commission may establish discharger specific alternative criteria for existing discharges if all of the following conditions are satisfied:

(i) Discharge existed prior to December 1, 1988.

(ii) Discharger performs acute and/or chronic bioassays and instream biological assessments and other evaluations as deemed appropriate by the Commission.

(iii) The designated use of the waters is maintained.

(b) All discharger specific alternative criteria will be subject to Mississippi public participation requirements for revisions to water quality standards and will be subject to review by the U. S. Environmental Protection Agency.

(2) New Source Discharges

(a) The Commission may establish discharger specific criteria for new source discharges if the discharger can demonstrate that established Water Quality Criteria is based on conditions not applicable to Mississippi such as, but not limited to, the use of species not indigenous to Mississippi.

(b) All discharger specific alternative criteria will be subject to Mississippi public participation requirements for revisions to water quality standards and will be subject to review by the U. S. Environmental Protection Agency.

F. Toxic and Human Health Parameters for which no Numeric Criteria have been Established:

(1) For those toxic and human health parameters for which no numeric criteria have been established, the Commission shall determine limitations using available references which shall include, but not be limited to, Quality Criteria for Water (Section 304(a)), Federal regulations under Section 307 of the Clean Water Act, and Federal regulations under Section 1412 of the Public Health Service Act as amended by the Safe Drinking Act (Pub. 93-523).

(2) Definitions:

(a) The not to be exceeded value for criteria published in 1980 or the one-hour average value for criteria published in 1985 or later shall be used as an acute toxicity number for calculating effluent limitations or reviewing ambient water quality data.

(b) The 24-hour average for criteria published in 1980 or the four-day average for criteria published in 1985 or later shall be used as a chronic toxicity number for calculating effluent limitations or reviewing ambient water quality data.

(c) If metals concentrations for criteria are hardness-dependent, the chronic and acute concentrations shall be based on 50 mg/l hardness if the ambient hardness is less than or equal to 50 mg/l. Concentrations shall be based on the actual mixed stream hardness if it is greater than 50 mg/l.

(d) If separate criteria are given for fresh and salt waters, they shall be applied as appropriate.

(e) For non-carcinogens, these concentrations will be determined using a Reference Dose (RfD) as published by the U. S. Environmental Protection Agency pursuant to Section 304(a) of the Federal Water Pollution Act as amended unless a more recent RfD is issued by the U. S. Environmental Protection Agency as listed in the Integrated Risk Information System (IRIS) file, in which case the more recent value will be used. Water quality standards or criteria used to calculate water quality-based effluent limitations (and for all other purposes of water quality criteria under Section 303(c) of the Clean Water Act) to protect human health through the different exposure routes are determined as follows:

(i) Fish tissue consumption:

WQS = (RfD) x Body Weight/(FCR x BCF)
where:

WQS = water quality standard or criterion;
RfD = reference dose;
FCR = fish consumption rate (6.5 gm/person-day);
BCF = bioconcentration factor.

BCF values are based on U. S. Environmental Protection Agency publications pursuant to Section 304(a) of the Clean Water Act. FCR values are average consumption rates for a 70 Kg adult for a lifetime of the population; alternative FCR values may be used when it is considered necessary to protect localized populations which may be consuming fish at a higher rate.

(ii) Water consumption and fish tissue consumption:

WQS = (RfD) x Body Weight/(WCR + (FCR x BCF))
where:

WQS = water quality;
RfD = reference dose;
FCR = fish consumption rate (6.5 gm/person-day);
BCF = bioconcentration factor;
WCR = water consumption rate (assumed to be 2 liters per day for adults).

The equations listed in this subparagraph will be used to develop water criteria or standards on a case-by-case basis for toxic substances which are not presently included in the water quality standards. Alternative FCR values may be used when it is considered necessary to protect localized populations which may be consuming fish at a higher rate.

(f) For carcinogens, the concentrations of toxic substances will not result in unacceptable health risk and will be based on a Carcinogenic Potency Factor (CPF). An unacceptable health risk for cancer will be considered to be more than one additional case of cancer per one million people exposed (10 -6 risk level). The CPF is a measure of the cancer-causing potency of a substance estimated by the upper 95 percent confidence limit of the slope of a straight line calculated by the Linearized Multistage Model according to the U. S. Environmental Protection Agency Guidelines (FR 51(185): 33992-34003, and FR 45(231 Part V): 79318-79379). Water quality standards or criteria used to calculate water quality-based effluent limitations (and for all other purposes of water quality criteria under Section 303(c) of the Clean Water Act) to protect human health through the different exposure routes are determined as follows:

(i) Fish tissue consumption:

WQS = (Risk) x Body Weight/(CPF x (FCR x BCF))
where:

WQS = water quality standard or criterion;
Risk = risk factor (10 -6);
CPF = cancer potency factor;
FCR = fish consumption rate (6.5 gm/person-day);
BCF = bioconcentration factor.

BCF values are based on U. S. Environmental Protection Agency publications pursuant to Section 304(a) of the Clean Water Act. FCR values are average consumption rates for a 70 Kg adult for a lifetime of the population; alternative FCR values may be used when it is considered necessary to protect localized populations which may be consuming fish at a higher rate.

(ii) Water consumption (including a correction for fish consumption):

WQS = Risk x Body Weight/(CPF x (WCR + (FCR x BCF)))
where:

WQS = water quality standard or criterion;
Risk = risk factor (10 -6);
CPF = cancer potency factor;
FCR = fish consumption rate (6.5 gm/person-day);
BCF = bioconcentration factor;
WCR = water consumption rate (assumed to be 2 liters per day for adults).

The equations listed in this subparagraph will be used to develop water criteria or standards on a case-by-case basis for toxic substances which are not presently included in the water quality standards. Alternative FCR values may be used when it is considered necessary to protect localized populations which may be consuming fish at a higher rate.

SECTION III. SPECIFIC WATER QUALITY CRITERIA:

1. PUBLIC WATER SUPPLY:

Water in this classification is for use as a source of raw water supply for drinking and food processing purposes. The water treatment process shall be approved by the Mississippi State Department of Health. The raw water supply shall be such that after the approved treatment process, it will satisfy the regulations established pursuant to Section 1412 of the Public Health Service Act as amended by the Safe Drinking Water Act (Pub. L. 93-523). Waters that meet the Public Water Supply Criteria shall also be suitable for secondary contact recreation. Secondary contact recreation is defined as incidental contact with the water, including wading and occasional swimming.

In considering the acceptability of a proposed site for disposal of bacterially-related wastewater in or near waters with this classification, the Permit Board shall consider the relative proximity of the discharge to water supply intakes.

A. Bacteria: For the months of May through October, when water contact recreation activities may be expected to occur, fecal coliform shall not exceed a geometric mean of 200 per 100 ml nor shall more than 10 percent (10%) of the samples examined during any month exceed 400 per 100 ml. For the months of November through April, when incidental recreational contact is not likely, fecal coliform shall not exceed 2000/100 ml as a geometric mean (either MPN or MF count) based on at least five samples taken over a 30-day period nor exceed a maximum of 4000/100 ml in any one sample.

B. Chlorides (Cl): There shall be no substances added which will cause the chloride content to exceed 230 mg/l in freshwater streams.

C. Specific Conductance: There shall be no substances added to increase the conductivity above 500 micromhos/cm for freshwater streams.

D. Dissolved Solids: There shall be no substances added to the waters which will cause the dissolved solids to exceed 500 mg/l for freshwater streams.

E. Threshold Odor: There shall be no substances added which will cause the threshold odor number to exceed 24 (at 60EC) as a daily average.

F. Phenolic Compounds: There shall be no substances added which will cause the phenolic content to be greater than 0.001 mg/l (phenol).

G. Radioactive Substances: There shall be no radioactive substances added to the waters which will cause the gross beta activity (in the known absence of Strontium-90 and alpha emitters) to exceed 1000 picocuries per liter at any time.

H. Specific Chemical Constituents: In addition to the provisions in Section II.3. and 9., the following concentrations (dissolved) shall not be exceeded at any time:

Constituent	Concentration (mg/l)
Arsenic (III)	0.0000175
Barium	1.0
Cadmium	0.01
Chromium (hexavalent)	0.05
Cyanide	0.20
Fluoride	1.2
Lead	0.05
Mercury	0.000151
Nitrate (as N)	10.0
Selenium	0.01
Silver	0.05

2. SHELLFISH HARVESTING

Waters classified for this use are for propagation and harvesting shellfish for sale or use as a food product. These waters shall meet the requirements set forth in the latest edition of the National Shellfish Sanitation Program, Manual of Operations, Part I, Sanitation of Shellfish Growing Areas, as published by the U. S. Public Health Service. Waters that meet the Shellfish Harvesting Area Criteria shall also be suitable for recreational purposes. In considering the acceptability of a proposed site for disposal of bacterially-related wastewater in or near waters with this classification, the Permit Board shall consider the relative proximity of the discharge to shellfish harvesting beds.

A. Bacteria: The median fecal coliform MPN (Most Probable Number) of the water shall not exceed 14 per 100 ml, and not more than ten percent (10%) of the samples shall ordinarily exceed an MPN of 43 per 100 ml in those portions or areas most probably exposed to fecal contamination during most unfavorable hydrographic and pollutional conditions.

3. RECREATION:

The quality of waters in this classification are to be suitable for recreational purposes, including such water contact activities as swimming and water skiing. The waters shall also be suitable for use for which waters of lower quality will be satisfactory. In considering the acceptability of a proposed site for disposal of bacterially-related wastewater in or near waters with this classification, the Permit Board shall consider the relative proximity of the discharge to areas of actual water contact activity.

A. Bacteria: Fecal coliform shall not exceed a geometric mean of 200 per 100 ml nor shall more than ten percent (10%) of the samples examined during any month exceed 400 per 100 ml.

B. Specific Conductance: There shall be no substances added to increase the conductivity above 1000 micromhos/cm for freshwater streams.

C. Dissolved Solids: There shall be no substances added to the water to cause the dissolved solids to exceed 750 mg/l as a monthly average value, nor exceed 1500 mg/l at any time for freshwater streams.

4. FISH AND WILDLIFE:

Waters in this classification are intended for fishing and for propagation of fish, aquatic life, and wildlife. Waters that meet the Fish and Wildlife Criteria shall also be suitable for secondary contact recreation. Secondary contact recreation is defined as incidental contact with the water, including wading and occasional swimming.

A. Bacteria: For the months of May through October, when water contact recreation activities may be expected to occur, fecal coliform shall not exceed a geometric mean of 200 per 100 ml nor shall more than 10 percent (10%) of the samples examined during any month exceed 400 per 100 ml. For the months of November through April, when incidental recreational contact is not likely, fecal coliform shall not exceed a geometric mean of 2000/100 ml, nor shall more than ten percent (10%) of the samples examined during any month exceed 4000/100 ml.

B. Specific Conductance: There shall be no substances added to increase the conductivity above 1000 micromhos/cm for freshwater streams.

C. Dissolved Solids: There shall be no substances added to the waters to cause the dissolved solids to exceed 750 mg/l as a monthly average value, nor exceed 1500 mg/l at any time for freshwater streams.

D. Phenolic Compounds: There shall be no substances added which will cause the phenolic content to exceed 0.300 mg/l (phenol).

5. EPHEMERAL STREAM:

Waters in this classification do not support a fisheries resource and are not usable for human consumption or aquatic life. Ephemeral streams normally are natural watercourses, including natural watercourses that have been modified by channelization or manmade drainage ditches, that without the influent of point source discharges flow only in direct response to precipitation or irrigation return-water discharge in the immediate vicinity and whose channels are normally above the groundwater table. These streams may contain a transient population of aquatic life during the portion of the year when there is suitable habitat for fish survival. Normally, aquatic habitat in these streams is not adequate to support a reproductive cycle for fish and other aquatic life. Wetlands are excluded from this classification.

Waters in this classification shall be protective of wildlife and humans which may come in contact with the waters. Waters contained in ephemeral streams shall also allow maintenance of the standards applicable to all downstream waters.

A. Provisions 1,2,3 and 5 of Section II (Minimum Conditions Applicable to All Waters) are applicable except as they relate to fish and other aquatic life. All aspects of provisions 4 and 9 of Section II concerning toxicity will apply to ephemeral streams, except for domestic or compatible domestic wastewater discharges which will be required to meet toxicity requirements in downstream waters not classified as ephemeral. Alternative methods may be utilized to determine the potential toxic effect of ammonia. Acutely toxic conditions are prohibited under any circumstances in waters in this classification.

B. Dissolved Oxygen: The dissolved oxygen shall be maintained at an appropriate level to avoid nuisance conditions.

C. Bacteria: The Permit Board may assign bacterial criteria where the probability of a public health hazard or other circumstances so warrant.

D. Definitions:

(1) Fisheries resources is defined as any waterbody which has a viable gamefish population as documented by the Mississippi Department of Wildlife Conservation or has sufficient flow or physical characteristics to support the fishing use during times other than periods of flow after precipitation events or irrigation return water discharge.

(2) "Not usable for human consumption or aquatic life" means that sufficient flow or physical characteristics are not available to support these uses.

(3) "Flow only in response to precipitation or irrigation return water" means that without the influence of point source discharges the stream will be dry unless there has been recent rainfall or a discharge of irrigation return water.

(4) "Protective of wildlife and humans which may come in contact with the waters" means that toxic pollutants shall not be discharged in concentrations which will endanger wildlife or humans.

(5) "Nuisance conditions" means objectionable odors or aesthetic conditions which may generate complaints from the public.

Recommendations for assignment of the Ephemeral Stream classification shall be made to the Commission on Environmental Quality by the Permit Board after appropriate demonstration of physical and hydrological data. The Ephemeral Stream classification shall not be assigned where environmental circumstances are such that a nuisance or hazardous condition would result or public health is likely to be threatened. Alternate discharge points shall be investigated before the Ephemeral Stream classification is considered.

SECTION IV. DESIGNATED USES IN STATE WATERS:

All of the State waters not specifically listed below shall be classified as Fish and Wildlife. State waters carrying other classifications are:

Waters	From	To	Classification
COASTAL BASIN			
Bangs Lake	Headwaters	Miss. Sound	Shellfsh Harvesting
Bayou Cumbest	Headwaters	Miss. Sound	Shellfsh Harvesting
Biloxi Bay	Headwaters U.S. Hwy 90 Bridge	Miss. Sound	Shellfsh Harvesting
Davis Bayou	Headwaters	Biloxi Bay	Shellfsh Harvesting
Graveline Bay	Headwaters	Graveline Bayou	Shellfsh Harvesting
Graveline Bayou	Graveline Bay	Miss. Sound	Shellfsh Harvesting
Jourdan River	Confluence of Dead	Highway 43	Recreation

	Tiger & Catahoula Crk		
Jourdan River	Highway 43	St. Louis Bay	Recreation
Mallini Bayou	St. Louis Bay	St. Louis Bay	Shellfsh Harvesting
Miss. Sound	Contiguous	Miss. Coastline	Recreation
Pass Christian Reef Henderson Point	Miss. Sound		Shellfsh Harvesting
St. Louis Bay	Harrison-Hancock Counties		Shellfsh Harvesting
Tchoutacabouffa River	Headwaters	Back Bay of Biloxi	Recreation
Tuxachanie Creek River	Headwaters	Tchoutacabouffa	Recreation
Wolf River	Ms. Hwy. 26	St. Louis Bay	Recreation

NORTH INDEPENDENT STREAMS BASIN

Bowden Sand Ditch (East Lagoon)	Ashland	Tubby Creek	Ephemeral
Drennan Sand Ditch (NW Lagoon)	Ashland	Robinson Bottom	Ephemeral
Horn Lake	DeSoto County		Recreation
Tubby Creek	Mile 5.2	Mile 2.8	Ephemeral

PASCAGOULA RIVER BASIN

Archusa Reservoir	Clarke County		Recreation
Beaverdam Creek	Headwaters Perry-Forrest Counties	Black Creek	Recreation
Black Creek	Highway 11	Pascagoula Rvr	Recreation
Bonita Reservoir	Lauderdale County		Public Water Sup
Bowie Creek	Ms. Hwy. 589	Bowie River	Recreation
Bowie River	Bowie Creek	Interstate 59	Recreation
Chickasawhay River	Stonewall Ms.	Hwy. 84	Recreation
Chunky River	U.S. Hwy. 80	Chickasawhay Rvr	Recreation
Clarke Lake	Clarke County		Recreation
Dry Creek Lake Site #3	W/S SCS	Covington County	Recreation
Escatawpa River	Mile 10	Pascagoula River	Fish and Wildlife
Flint Creek Res	Stone County		Pub Water Supply & Recreation
Lake Bogue Homa	Jones County		Recreation
Lake Claude Bennett	Jasper County		Recreation
Lake Geiger	Forrest County		Recreation
Lake Marathon	Smith County		Recreation
Lake Mike Conner	Covington County		Recreation
Lake Perry	Perry County		Recreation
Lake Ross Barnett	Smith County		Recreation
Lake Shongela	Smith County		Recreation
Lakeland Park Lake	Wayne County		Recreation
Long Creek Res	Lauderdale County		Public Water Sup
Okatibbee Reservoir	Lauderdale County		Pub Water Supply & Recreation
Okatoma Creek	Seminary (MS Hwy 590)	Bowie River	Recreation
Pascagoula River	6 Mi. North of MS Hwy 26 George County	Cumbest Bluff Jackson County	Recreation
Pascagoula River	Cumbest Bluff	Smear Bayou	Recreation
Red Creek	U.S. Hwy. 49	Big Black Creek	Recreation
Simpson County	Simpson County		Recreation

Legion Lake			
Talahala Creek	1 Mi. N. of Hwy. 15 (RM.54.5)	Sholars (RM.27.7)	Fish and Wildlife[2]
Turkey Fork Reservoir		Greene County	Recreation

PEARL RIVER BASIN

Barnett Reservoir	River Bend bet. T7N & T8N	Township Line	Public Water Sup
Barnett Reservoir bet. T7N & T8N	Township Line	Reservoir Dam	Pub Water Supply & Recreation
Bogue Chitto River	Ms. Hwy. 570	MS/LA State Line	Recreation
Lake Columbia	Marion County		Recreation
Lake Dixie Springs	Pike County		Recreation
Magees Creek	U.S. Hwy. 98	Bogue Chitto Rvr	Recreation
Pearl River	Barnett Reservoir	City of Jackson Water Intake	Public Water Sup
Pearl River	Byram Bridge	Miss. Sound	Recreation
Strong River	U.S. Hwy. 49	Pearl River	Recreation
Warrior Branch	Lake	Warrior Creek	Ephemeral

SOUTH INDEPENDENT STREAMS BASIN

Bayou Pierre	Headwaters	Mississippi Rvr	Recreation
Clear Springs Lake	Franklin County		Recreation
East Fork Amite River	MS Hwy 584	MS/LA State Line	Recreation
Homochitto River	U.S. Hwy 84	U.S. Hwy 98	Recreation
Little Bayou Pierre	Headwaters	Bayou Pierre	Recreation
Percy Quinn Lake	Pike County		Recreation
Unnamed Drainage Ditch	Woodville (Westside Heights)	Bayou Sara	Ephemeral
West Fork Amite River	MS Hwy 24	MS/LA State Line	Recreation

TENNESSEE RIVER BASIN

Tennessee River	Miss.-Ala. State Line	Miss.-Tenn. State Line	Public Water Sup

TOMBIGBEE RIVER BASIN

Aberdeen Lake Tenn-Tom Waterway	Mile 355.5 Normal Pool Elev 190.0	Mile 364.3	Recreation
Bay Springs Lake Tenn-Tom Waterway	Mile 410.0 Normal Pool Elevation 414.0	Mile 419.0	Recreation
Canal Section Pool "C" Tenn-Tom Wtrwy	Mile 389.0 Normal Pool Elev 270.0	Mile 396.4	Recreation
Chiwapa Reservoir	Pontotoc County		Recreation
Choctaw Lake	Choctaw County		Recreation
Columbus Lake Tenn-Tom Waterway	Mile 332.9 Normal Pool Elevation 163.0	Mile 355.5	Recreation
Davis Lake	Chickasaw County		Recreation
Lake Lamar	Bruce Lee County		Recreation
Lake Lowndes	Lowndes County		Recreation
Lake Monroe	Monroe County		Recreation

Lake Tom Bailey	Lauderdale County		Recreation
Luxapalila Creek	MS-AL State Line	Highway 50	Public Water Sup
Oktibbeha County Lk	Oktibbeha County		Recreation
Tombigbee State Park Reservoir	Lee County		Recreation
Yellow Creek	MS-AL State Line	Luxapalila Creek	Public Water Sup

YAZOO RIVER BASIN

Arkabutla Reservoir	DeSoto-Tate Counties		Recreation
Canal #12	Delta City	Big Sunflower Rvr	Ephemeral
Chewalla Reservoir	Marshall County		Recreation
Drainage Ditch #3	Rosedale	Lane Bayou	Ephemeral
Enid Reservoir	Panola-Lafayette-Yalobusha Counties		Recreation
Grenada Reservoir	Grenada County		Recreation
Lake Dumas	Tippah County		Recreation
Lake Washington	Washington County		Recreation
Little Tallahatchie River	Sardis Reservior	U.S. Hwy. No. 51	Recreation
Moon Lake	Coahoma County		Recreation
Nunnally Creek	Holly Springs (Lagoons A & #1)	Pigeon Roost Crk	Ephemeral
Sardis Reservoir	Panola-Lafayette Counties		Recreation
Straight Bayou Drainage Main Ditch "A"	Louise	Dowling Bayou	Ephemeral
Tillatoba Lake	Yalobusha County		Recreation
Unnamed Drainage Canal	Anguilla	Big Sunflower Rvr	Ephemeral
Unnamed Drainage Ditch	Town of Arcola	Black Bayou	Ephemeral
Unnamed Drainage Ditch	Town of Beulah	Leban Bayou	Ephemeral
Unnamed Drainage Ditch	Bobo	Annis Brake	Ephemeral
Unnamed Drainage Ditch	Crenshaw	David Bayou	Ephemeral
Unnamed Drainage Ditch (Hollandale)	Farm Fresh Catfish	Black Bayou	Ephemeral
Unnamed Drainage Ditch	Farrell	Overcup Clough	Ephemeral
Unnamed Drainage Ditch (Lagoon A)	Holly Springs	Nunnally Creek	Ephemeral
Unnamed Drainage Ditch (Lagoon #1)	Holly Springs	Nunnally Creek	Ephemeral
Unnamed Drainage Ditch (Lagoon #3)	Holly Springs	Big Spring Creek	Ephemeral
Unnamed Drainage Ditch	Lambert	Muddy Bayou	Ephemeral
Unnamed Drainage Ditch	Leland	Black Bayou	Ephemeral
Unnamed Drainage Ditch	Lurand	Big Sunflower Rvr	Ephemeral
Unnamed Drainage Ditch (East Lagoon)	Rolling Fork	L. Sunflower Rvr	Ephemeral
Unnamed Drainage Ditch (West Lagoon)	Rolling Fork	Indian Bayou	Ephemeral
Unnamed Drainage Ditch	Ruleville	Quiver River	Ephemeral
Unnamed Drainage	Shaw	Porter Bayou	Ephemeral

Ditch			
Unnamed Drainage Ditch	Shelby	Mound Bayou	Ephemeral
Unnamed Drainage Ditch	Simmons Farm Raised Catfish	Lake George (Yazoo County)	Ephemeral
Unnamed Drainage Ditch	Sledge	David Bayou	Ephemeral
Unnamed Drainage Ditch	Town of Tunica	Whiteoak Bayou	Ephemeral
Unnamed Drainage Ditch	Winstonville	Mound Bayou	Ephemeral
Wall Doxey State Park Reservoir (Spring Lake)		Marshall County	Recreation

[1] The following dissolved oxygen standard is applicable: The dissolved oxygen shall not be less than 3.0 mg/l.

[2] The following dissolved oxygen standard is applicable: The dissolved oxygen shall not be less than 3.5 mg/l at flows greater than or equal to the 7-day, 10-year low flow.

APPENDIX A2
Numeric Criteria for All Waters (ug/l)

Parameter	Fresh Water		Salt Water		Human Health	
	Acute	Chronic	Acute	Chronic	Organisms Only	Water & Organisms
Aldrin	3.0		1.3		0.00136	0.00127
Arsenic (III), Total Dissolved	360f	190f	69	36		
Arsenic, Total Dissolved					0.14	0.0175
Cadmium, Total Dissolved	1.74b,f	0.62b,f	43	9.3	168	10
Chlordane	2.4	0.0043	0.09	0.004	0.000588	0.000575
Chlorine	19	11	13	7.5		
Chromium (Hex), Total Dissolved	15.7f	10.6f	1100	50	3365	50
Chromium (III), Total Dissolved	311b,f	101b,f			673077	33300
Copper, Total Dissolved	8.85b,f	6.28b,f	2.4	2.4	1000	1000
Cyanide	22.0	5.2	1.0	1.0		200
4,4 DDT	1.1	0.001	0.13	0.001	0.00059	0.00059
Dieldrin	2.5	0.0019	0.71	0.0019	0.000144	0.000135
2,3,7,8 TCDD					1.0 ppq[d]	1.0 ppq[d]
Endosulfan	0.22	0.056	0.034	0.0087	1.99	0.932
Endrin	0.18	0.0023	0.037	0.0023	0.814	0.2
Heptachlor	0.52	0.0038	0.053	0.0036	0.000214	0.000208
Hexachlorocyclohexane (Lindane)	2.0	0.08	0.16		0.0625	0.0186
Lead, Total Dissolved	30b,f	1.18b,f	210	8.1		50
Mercury (II), Total	2.1f	0.012	1.8	0.025g		

Parameter	Fresh Water		Salt Water		Human Health	
	Acute	Chronic	Acute	Chronic	Organisms Only	Water & Organisms
Dissolved						
Mercury					0.153	0.151
Nickel, Total Dissolved	787b,f	87b,f	75	8.3	4584	607
			167e	18.5e		
Phenol	300	102	300	58	300	300
Pentachlorophenol	3.32c	2.1c	13c	7.9c	30	30
PCB 1242	0.2	0.014	1.0	0.03	0.000045	0.000044
PCB 1254	0.2	0.014	1.0	0.03	0.000045	0.000044
PCB 1221	0.2	0.014	1.0	0.03	0.000045	0.000044
PCB 1232	0.2	0.014	1.0	0.03	0.000045	0.000044
PCB 1248	0.2	0.014	1.0	0.03	0.000045	0.000044
PCB 1260	0.2	0.014	1.0	0.03	0.000045	0.000044
PCB 1016	0.2	0.014	1.0	0.03	0.000045	0.000044
Selenium, Total Dissolved	20f	5.0f	300f	71f		10
Silver, Total Dissolved	1.05b,f		1.9			50
Toxaphene	0.73	0.0002	0.21	0.0002	0.00075	0.00073
Zinc, Total Dissolved	63.6b,f	58.1b,f	90	81	5000	5000

b = Hardness dependent parameter all criteria are as indicated at hardness less or equal to 50 mg/l, as CaCo3. If hardness exceeds 50 mg/l, as CaCo3, then criteria is equal to result of hardness based equations as found in Quality Criteria for Water.

c = Criteria for Pentachlorophenol are based on a pH dependent equation as found in Quality Criteria for Water Values Listed are for a pH of 7.0 S.U.

d = Criteria for 2,3,7,8 TCDD based on a risk factor of one in one hundred thousand (10 -5).

e = Site Specific Criteria for Mississippi Sound.

f = Parameter subject to water effects ratio equations where "CMC = WER * Acute" and "CCC = WER * Chronic".

g = Expressed as total recoverable.

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