ARKANSAS'

NONPOINT SOURCE POLLUTION

ASSESSMENT REPORT

PREPARED PURSUANT TO SECTION 319(a)1(A,B,C,D)
OF THE FEDERAL WATER POLLUTION CONTROL ACT

ARKANSAS DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY
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Arkansas'
Nonpoint Source Pollution
Assessment Report

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EXECUTIVE SUMMARY/OVERVIEW

Surface Waters

Analysis of the data from the Ambient Water Quality Monitoring Network, the quarterly monitored stations, the Ambient Ground Water Quality Monitoring Network, and the Buffalo National River Water Quality Monitoring Project, other 319(h) projects, along with other pertinent data, was used in the preparation of this report.

Of the 11,885,8 stream miles in Arkansas that are currently identified in the National River Reach 1 Files, 8,667.7 miles were assessed for use attainment by either being directly monitored or evaluated. Of the assessed river miles, agriculture activities were determined to be the source of major impacts to 3197.1 miles and the source of minor impacts to on an additional 77.7 miles. Silviculture was the minor impact source on 218 miles of streams. Major and minor impacts from resource extraction was assigned to 210.9 miles and 112.3 miles, respectively. An unknown source was causing major impacts to 557.4 miles of streams and an additional minor impact on 46.9 stream miles. The cause of most of these unknown impacts was fish tissue contamination by mercury; the source has yet to be identified. Road construction/maintenance was causing major impacts on 147.3 miles and minor impacts on 58.7 stream miles. The total stream miles impacted by nonpoint sources of pollution in the state were 4112.7 of major impacts and 513.6 stream miles of minor impacts.

The data also indicates that the major causes of impacts from nonpoint sources of pollution is excessive turbidity and its associated silt load. Nutrients are also causing substantial nonpoint source impacts, although in most situations they are the minor cause to other nonpoint causes. Pathogen indicators indicate potential fecal coliform contamination from nonpoint sources were either a major or minor cause on a total of 909.5 stream miles. Minerals from nonpoint sources, usually from either soil erosion or runoff of mining or gas and oil extraction activities, has been identified as the major or minor cause of impacts on 324.8 miles of streams.

Twenty-seven stream segments totaling 540 stream miles were deleted from the nonpoint source impaired list of water bodies for this assessment. Many of these water bodies were included in the 1991 Assessment Report based on extrapolation methods of assessment. Most of them were tributaries to water bodies that had water quality data indicating nonpoint source impairments, thus they were included on the list. This report choose not to include such water bodies that did not, or do not have any water quality data collected from them. This report does include data collected from additional 100 water bodies in the state that had little to no previous water quality data. An additional seventy-five stream segments totaling 1,122 stream miles were added to the list of nonpoint source impaired water bodies. Most of these streams are impaired by heavy silt loadings effecting the aquatic life use. The major source of the silt is generally from agriculture activities.

Lakes

Water quality data collected from the eighty significant publicly-owned lakes in Arkansas indicate that several lakes may be impacted by nonpoint pollution sources. However, data has only been collected from these lakes on two occasions, for most of them. Two, single-point in time surveys constitute and inadequate data base to generate any definite conclusions; however the water quality data from some lakes coupled with the major land uses within their watersheds allows for a high degree of confidence in determining the sources of some of the pollutants.

Ground Water

Ground water continues to be one of Arkansas' most important natural resources. Between 1975 and 1980, ground water use increased from 2596 to 4056 million gallons per day. Several state and federal agencies monitor ground water for quality and quantity. The Department has established an ambient ground water monitoring program at various statewide locations. Although the overall quality of ground water in Arkansas appears to be good, widespread problems do occur. The presence of pesticides in aquifers in eastern Arkansas, nitrates in northern Arkansas aquifers, saline intrusion or brine contamination in southern Arkansas aquifers, and microbial contamination in isolated wells are the main areas of ground water quality concern in the state. Even though many of these problems tend to be localized, a few of them do warrant concern for the protection of drinking and irrigation water supplies.

Pesticides

Pesticides have been monitored from a number of surface and ground water sites from all across the state in the past several years. Even though numerous pesticides were detected from a number of surface water sites, none exceeded current and available toxicity levels. This does not indicate, however, that there are not any significant adverse effects to aquatic life occurring at the sites were the pesticides were detected. Pesticides can have a direct and/or an indirect effect in the aquatic environment, thus making it difficult to assess the impacts they may be inducing.

The monitoring for pesticides in ground water has increased significantly in the last four years within the state. An increase in the detection of pesticides has also occurred as monitoring has been directed largely toward vulnerable areas of the state. To date, no pesticide has been detected which exceeds current EPA maximum contaminant levels for drinking waters. Future ambient monitoring of ground water combined with site-specific studies is necessary to insure protection of our ground water resources.

Wetlands

The most severe impact to wetlands is still identified as the loss of wetlands by the physical destruction of clearing and draining, primarily for increased agriculture production acres. However, in 1992 the state made its first attempts to develop a comprehensive strategy for the protection of wetlands resources in the state. In 1993, the Governor developed the Wetlands Task Force as an advisory group. A group of State agencies formed later organized as the Multi-Agency Wetlands Planning Team to provide technical assistance to the Wetlands Task Force and began to utilize EPA Section 104(b) grant monies for wetlands planning and inventory activities.

1997 Report

This report was prepared based on the requirements of Section 319(h) of the Federal Water Pollution Control Act in cooperation with the Arkansas Soil and Water Conservation Commission. Data from this report will be used by the Arkansas Nonpoint Source Pollution Support Group to help set priorities for future nonpoint source pollution activities in the state.

INTRODUCTION

In 1987, Congress passed the Water Quality Act, amending the federal Clean Water Act, which states in part:

> ...it is the national policy that programs for the control of nonpoint sources of pollution be developed and implemented in an expeditious manner so as to enable the goals of this Act to be met through the control of both point and nonpoint sources of pollution.

Section 319 (Nonpoint Source Management Program) of the Water Quality Act required each state to submit to EPA by August, 1988 a State Nonpoint Source Assessment Report and a State Nonpoint Source Management Program.

The Assessment Report addressed the nature, extent, and the effect of nonpoint source pollution on state water quality, and the Management Program provided a process for solutions to the these problems. Together, these two documents provided an opportunity for a state to receive financial assistance to improve or eliminate nonpoint source pollution. In Arkansas, the Department of Pollution Control and Ecology (ADC&E) is the designated water pollution control agency and is responsible for preparing the assessment report and updating it. By a letter of agreement between ADC&E and the Arkansas Soil and Water Conservation Commission (ASWCC), the ASWCC is responsible for the management program and its updates. In addition, the ASWCC has been designated as the lead nonpoint source management agency for agriculture for the 319 grant program for the State. In addition, ASWCC currently responsible for the overall coordination and managment of the 319 program for the state. They are responsible for BMP implementation as it pertains to agriculture, the overall nonpoint source management plan for the state and grant funds administration. Through informal agreements, other governmental agencies in the state have agreed to be responsible for the management of 319 activities in other nonpoint source categories. They are: 1) The Department of Pollution Control and Ecology - Construction as it pertains to land development; Urban Runoff - jointly with the Municipal League; Resource Extraction; Land Disposal; Recreation; Other; and Unknown - as necessary; 2) Arkansas Forestry Commission - Silviculture; 3) Arkansas Highway Department - Construction as it pertains to highways and roadways; 4) Municipal League - Urban Runoff. In addition, all agencies have agreed to address the Hydrologic/Habitat Modification category as it pertains to their nonpoint source categories.

As new information and data are obtained, it becomes necessary to update both the assessment report and the management program. The first assessment was completed in August, 1988 and was updated in August, 1991. This assessment report is an update to the August 1991 assessment and has followed the same guidelines and requirements established in the Federal Clean Water Act.

REQUIREMENTS OF THE STATE ASSESSMENT REPORT

Section 319(a)1(A,B,C,D) requires State Assessment Reports to include the following four categories of information:

A. Identification of navigable waters within the State which, without additional action to control nonpoint sources of pollution, cannot reasonably be expected to attain or maintain applicable water quality standards or the goals and requirements of the Act.

B. Identification of categories and subcategories of nonpoint sources or, where appropriate, particular nonpoint sources which add significant pollution to each portion of the navigable waters identified under subparagraph (A) in amounts which contribute to such portion not meeting such water quality standards or such goals and requirements.

C. Description of the process, including intergovernmental coordination and public participation, for (1) identifying best management practices and measures to control each category and subcategory of nonpoint sources and, where appropriate, particular nonpoint sources identified under subparagraph (B) and (2) for reducing, to the maximum extent practicable, the level of pollution resulting from such category, subcategory, or source.

D. Description of state and local programs for controlling pollution added from nonpoint sources to, and improving the quality of, each such portion of the navigable waters including, but not limited to, those programs which will receive federal assistance under subsection (h) and (i).

A definition of navigable waters can be found in Appendix A.

GOAL AND IDENTIFICATION

The overall goal of the Section 319 of the Clean Water Act is to improve water quality and restore impaired uses in areas affected by nonpoint source pollution. For the purposes of implementing the nonpoint source provisions in the CWA, nonpoint source pollution is defined as follows:

Nonpoint Source (NPS) Pollution: NPS pollution is caused by diffuse sources that are not regulated as point sources and normally is associated with agriculture, silviculture and urban runoff from construction activities, etc. Such pollution results in the human induced alteration of the chemical, physical, biological and radiological integrity of water. In practical terms, nonpoint source pollution does not result from a discharge at a specific, single location (such as a single pipe) but generally results from land runoff, precipitation, atmospheric deposition, or percolation.

PROCESS FOR REPORT PREPARATION

This Assessment Report has been prepared based on many sources of information. These include 208 water quality management plans, water quality assessment documents (305(b) reports), fishery surveys, Clean Lakes Programs (314 reports), and the Rural Clean Water Program. In addition to these efforts, local health departments, the Natural Resource Conservation Service, and the United States Forest Service have produced many reports and plans describing the control of nonpoint source problems. Each of these agencies and many others have been consulted during the preparation, assessment, and report writing phase. Many of their comments and suggestions have been incorporated into this document.

PROCESS FOR BMP IDENTIFICATION AND IMPLEMENTATION

In 1990, Governor Bill Clinton appointed the ASWCC as the lead agency for agriculture NPS pollution management. ASWCC's responsibilities included the development of and revisions to the State's Agriculture Nonpoint Source Management Plan, selection of agriculture best management practices (BMPs) and the administration of the State's Section 319 demonstration and implementation programs. At that time, the States' EPA approved management plan covered only Subcategory 18, animal holding/management areas. In 1994, Category 10, Agriculture, was fully approved by EPA. Currently, a comprehensive management plan addressing all categories of nonpoint source pollution, Appendix B, has been sent to EPA for review and approval. Several state and local agencies were identified as lead NPS agencies dealing with specific NPS categories. The ASWCC remains as the lead agency for administrating all Section 319 grant funds and for coordinating all NPS activities in the state.

ASWCC and ADC&E, by a Memorandum of Agreement, will share in the responsibility for evaluating and selecting BMP's for each category identified as a source of water degradation. Additional state and local agencies assist the ASWCC and ADC&E in accomplishing this task. A list of BMPs will be prepared for each category and will be submitted for public comment and to EPA for approval as part of the NPS Management Plan. ASWCC will develop programs for implementation of BMPs as funds become available.

STATE, LOCAL, and FEDERAL NPS PROGRAMS

The nonpoint source assessment update identifies four categories of nonpoint source pollution impairments to state water bodies; agriculture, silviculture, road construction, and resource extraction. State, local, and federal programs for controlling these categories are as follows:

Agriculture

Federal: The United States Department of Agriculture, through its various agencies, provides technical assistance, monetary incentives and assistance, and educational support to the agriculture producers of the state.

State: The Department issues permits for farms generating animal waste that are handled in a liquid form. The permitting process has been developed by the Department and the Natural Resources Conservation Service (NRCS) as per memorandum of agreement in a cooperative effort to insure that waste handling, holding facilities, piping, debris basins, and holding ponds are either performed or constructed properly.

The Arkansas Livestock and Poultry Commission (AL&PC) has been given the legal authority by the Arkansas Legislature to regulate the disposal of dead animals.

The Arkansas Soil and Water Conservation Commission administers the Section 319(h) grant program of the Clean Water Act. They also coordinate and manage all activities pertaining the Section 319(h) as it pertains to the Agriculture NPS category. They also coordinate the overall 319 program and the other agencies with NPS responsiblities.

Local: Conservation Districts (CDs) are independent state government subdivisions and can receive assistance from all sources. They set priorities for, and administer technical and monetary assistance as provided by the Department, NRCS, and the ASWCC.

Silviculture

Federal: The United States Forest Service (USFS) is responsible for the management of the National Forest within the state. The USFS has developed and implemented forest management plans to control NPS pollution associated with silviculture activities.

State: The Arkansas Forestry Commission (AFC) is responsible for assisting forest managers in fire prevention and control, and encourage forest timber management under approved forestry practices. The AFC has implemented a continuing education program for the adoption and use of water quality related forestry BMPs by the timber industry, timber contractors and private land owners. They are also responsible for administering Section 319(h) funds through the ASWCC as they apply to forestry activities. In addition, the AFS has developed a Section 319(h) Silviculture Management Plan which is currently being reviewed by EPA and should be approved later this year.

Road Construction

Federal: Provides monetary and technical assistance for the construction of federal highway projects and innovated BMPs.

State: The Arkansas Highway and Transportation Department is responsible for assisting contractors in highway construction and maintenance, and BMP compliance and implementation on all state and federal highway projects.

Local: State counties are responsible for implementing and assisting contractors with BMP implementation and compliance.

Resource Extraction

Federal: The United States Department of the Interior has federal oversight and regulations for both mining and oil extraction activities.

State: The Department is responsible for both the coal and non-coal mining in the state. The coal mining role is conducted for the Department of the Interior. The non-coal mining is regulated under the Arkansas Open Cut Land Reclamation Act. In-stream Gravel Mining is regulated by State Regulation No. 15. In addition, the Mining Division at the ADC&E has developed a Section 319(h) management plan for NPS pollution associated with mining activities. The plan is currently being reviewed by EPA and should be approved sometime later this year.

The Oil and Gas Commission is responsible for the extraction activities of petroleum products in the state.

Ground Water Protection

Ground water protection in the State is divided between several state agencies. Each agency is responsible for the protection of ground water in the areas of their expertise.

The Department of Pollution control and Ecology has multiple responsibilities associated with the protection of ground water quality in the state. Specific regulations pertaining to monitoring, investigating, and remediating ground water contamination is found in various regulations associated with the management of solid and hazardous waste units, Brownfield and superfund UIC, mining, and underground storage tanks and waste lagoons. Ground water protection language is included in both NPDES and general State permits. Planning functions are numerous and include ground water quality standards development and implementation, overall assessment and monitoring of the State's ground water and the implementation and management of the SARA Title III program, RCRA Primacy, State Superfund and RCRA programs, Underground Storage Tanks installation requirements, permit and remediation program, Solid Waste Land Fill permitting, monitoring and remediation, and the Underground Injection Control program. The Department and the ASWCC cooperate in ground water classification and Nonpoint Source Controls programs.

The ASWCC is responsible for the preparation of the Arkansas Water Plan, critical ground-water area designations, conservation and education programs, collecting ground-water use reports and fees for registered wells statewide, the implementation of the Nonpoint Source Program, coordination of the Arkansas Ground-Water Protection and Management Committee, development of the Comprehensive State Ground-Water Protection Plan, development of ground-water related data bases and GIS data layers, and for carrying out administrative and regulatory functions of the Arkansas Water Well Construction Commission.

The Arkansas Department of Health is responsible for State Septic Tank Regulations, Vulnerability Assessment for Drinking Water/Wellhead Protection, EPA-approved WHPP, Well Installation Regulations, and the State Safe Drinking Water Standards.

The State Plant Board is responsible for pesticide management and regulations and development of the State Management Plan for Pesticides.

Several agencies cooperate in aquifer mapping, aquifer characterization, ground water BMP development and implementation, the development and implementation of the Pollution Prevention Program, and serve on the CSGWPP.

ASSESSMENT UPDATE

Water Quality Standards, Criteria, and Beneficial Uses

The ADC&E's Regulation No. 2, the "Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas", is the State's primary water quality regulation. The standards established by this document, including both the designated uses and the protective criteria, are the basis from which the assessments are made.

Methodology for Conducting the Nonpoint Source Assessment

The 1990 update of Arkansas' Nonpoint Source Pollution Assessment Report was prepared as part of the 1990 Arkansas Water Quality Inventory Report (305(b)) reporting process. The 305(b) report was prepared following EPA's national 305(b) guidance. The Department selected the river reach segments portion of the guidance for reporting because of the systems' better overall resolution. This allowed for more exact problem location by using the smallest designated water bodies possible.

The 305(b) guidance document required states to determine if a water body was fully meeting all designated uses. The emphasis was placed on fishable, swimmable and potable water supply uses. To make this determination, ambient water quality data was compared to state water quality standards which establish specific water quality standards and criteria to protect each designated use. If ambient water quality data clearly showed a quality less than the standards required, the specific stream reach from which the data was collected would be recorded as not fully meeting its uses. In some cases, professional judgement was used to extend either upstream or downstream of the monitoring station into other reaches that were not actually monitored. In such cases, the water body would be listed as being evaluated instead of monitored. If a water body did not have current monitoring data available, an evaluation was not made and the reach was listed as unknown.

If a reach was recorded as not meeting its uses, an attempt was made to determine the source causing the impairment. The first choice was whether the impairment was caused by a point source or a nonpoint source. Once this had been determined, subcategories of both choices had to be selected

to better define the source. For example, nonpoint sources could be agriculture, silviculture, resource extraction, etc., or a combination of activities. The final determination required was the actual parameter that was causing the use to be impaired. This could be more than one or more of a long list of parameters including, but not limited to, pH, silt, nutrients, pathogens, etc.

The Department maintains an ambient water quality monitoring network currently including 133 stations. Data are collected monthly from each station and many stations have more than ten years of continuous data, allowing for valuable trend determinations. In addition to the ambient water quality network, 100 quarterly monitoring stations were added to assess previously unassessed waters or waters that had not been monitored in several years. Also, many special projects on individual watersheds have been completed in the last several years. Additionally, water quality data is available from several agencies and organizations, however, this large data base does not adequately provide data for all waters of the state. Consequently, of the 11,885 RF1 stream miles within the current river reach system, sufficient data was available to assess only 8,668 (73%) stream miles. It is important to remember that many of the stations were located in areas of suspected contamination from either point or nonpoint pollution sources.

Based on the data compiled from all of the activities listed in the paragraph above, four categories of nonpoint source pollution were identified by the Department as causing impairments to state water bodies. These include agriculture, silviculture, road construction/county roads, and resource extraction. These does not mean that other categories of nonpoint source pollution are not causing impairments to state water bodies, it simply means that these other categories were not currently identified as causing impairments to designated uses to state water bodies. Additionally, the lack of a comprehensive data base prevents the Department from making a definite statewide assessment of impairments to ground water or wetlands. However, water bodies can be identified as being impaired by nonpoint sources of pollution and prioritized for more intensive assessment surveys from the data generated by the State's Ambient Water Quality Monitoring Network. This process allows the State to gather the most complete water quality data possible in the most economic manner and address those areas of the state with the highest concerns and needs.

Nonpoint Source Impaired Water Body Prioritization Method

This prioritization method of NPS impaired water bodies was developed through a cooperative effort between the Department, the ASWCC, and the AFC. It is based on the following five characteristics using the list of nonpoint source impaired water bodies listed in the 1996 305(b), Appendix B - Nonpoint Source Impaired Waters. A single water body can obtain a total of 36 points based on this prioritization method. A list of the nonpoint source impaired water bodies, as determined in the 1996 305(b) and the 1997 Nonpoint Source Assessment Report, were prioritized using this method.

Reach Assessment Method

Designated use attainment is determined by using either monitored data within a stream segment or by an evaluation of the stream segments above and below a monitoring station using the monitoring station data and best professional judgement. The stream segment with a monitoring station located in it is listed as *monitored*; a stream segment upstream or downstream of a monitoring station assessed using best professional judgement is listed as *evaluated*. The data confidence level is greater for those assessments utilizing actual monitored data. Therefore, those segments are rated higher than the stream segments assessed by evaluation.

TOTAL POINTS: Monitored - 4
Evaluated - 2

A single water body can obtain a total of 4 points in this category.

Stream Classification

Prioritizing water bodies based on their stream classification allows those bodies of water that have more ecological, sociological, and/or economical "importance" to the state to be ranked above those streams that do not have as much "importance" to the state. The following three classifications and the points allotted for each are:

1) Extraordinary Resource Water body - 2
2) Existing Water Supply - 4
3) Ecologically Sensitive Water body - 2

A single water body can obtain a total of 8 points in this category.

Degree of Impairment

Three use support categories are used in this assessment and 1 to 4 points are given to each category based of the degree of impairment. The three use support categories are aquatic life, swimming, and drinking water.

1) Fully Supporting - 0
2) Threatened - 1
3) Partial Supporting - 2
4) Not Supporting - 4

A single water body can obtain a total of 12 points in this category.

Cause of Impairment

Two causes of impairment are determined in the nonpoint source impaired water body list. These causes are identified as either the "major" cause or the "minor" cause of the use support impairment. When a water body is impaired by both point and nonpoint sources, it is included in the list. Therefore, it is important to differentiate between those water bodies that have major point source impacts and minor nonpoint source impacts versus those water bodies that have major nonpoint source impacts and minor point or nonpoint source impacts. A water body only receives points for nonpoint source impacts.

1) Major Nonpoint Source Impact - 4
2) Minor Nonpoint Source Impact - 2

A single water body can obtain a total of 6 point if it has been assessed as having both major and minor nonpoint source impacts. Minor impacts or not always determined. If a water body has a major point source impact and a minor nonpoint source impact, the water body will receive only 2 points. The majority of the water bodies with this type of rating are generally below waste water treatment plants.

Potential for Ground Water Contamination (DRASTIC)

Ground water contamination is assigned values based on the DRASTIC indexing method based on the following scale:

1) Highly Vulnerability (H) - 6
2) Moderate Vulnerability (M) - 4
3) Moderately Low Vulnerability (ML) - 2
4) Low Vulnerability - 0

A single water body can obtain a total 6 points in this category.

Each water body segment of the water bodies listed are given a score based on the categories listed above. Those water body segments are then ranked from those receiving the most points to those receiving the least points. Of those, the list is narrowed to only those water bodies having a total score of greater than thirty points.

Public Support/Participation

The final stage of the watershed prioritization is public support/participation. Even though a particular water body may be ranked as a high priority by the ranking system, it may not be listed as a targeted watershed if it was felt that there is a lack of public support. However, if public support would arise for that watershed, than a re-evaluation of the targeted water bodies for nonpoint source assessment and best management practice implementation activities would occur. A list of the NPS prioritized water bodies is located on ppg 117-123.

Categories of Nonpiont Source Pollution

Nonpoint source pollution comes from many sources. Uncontrolled storm-water runoff is a carrier of sediment, nutrients, pesticides, bacteria, oil, grease, metals, and other contaminants from different types of land use areas. The most prevalent source of pollution to the waterways in Arkansas is agriculture runoff. The following is a list of NPS categories recommended by the U.S. EPA and which the Department has adopted in preparation of this assessment: Agriculture, Silviculture, Construction, Urban Runoff, Resource Extraction/Exploration/Development, Land Disposal, Hydrologic Modification/Habitat Modification, Recreation, Unknown, and other. A complete list of these categories and their subcategories can be found in Appendix B.

Basin and Segment Division

The State of Arkansas is drained by six major river systems; each has been assigned a number by the Department for planning purposes. They are the Red River (1), Ouachita River (2), Arkansas River (3), White River (4), St. Francis (5), and the Mississippi River (6). Each river basin has been subdivided into subbasins called water quality planning segments based hydrological characteristics; human activities, geographical, biological and physical characteristics, etc. There are 39 water quality planning segments that are further subdivided into 492 smaller watersheds based on discrete hydrological boundaries as defined by the NRCS.

The assessments of the water quality within the 39 individual planning segments has been made utilizing the fixed ambient water quality monitoring network, the quarterly monitoring network, and data from the numerous special surveys conducted by the Department and other state agencies. Figure SW-1 depicts the locations of the Ambient Water Quality and Quarterly Water Quality monitoring stations. Table SW-1 list the Ambient and Quarterly Water Quality monitoring stations, their locations, and STORET identifiers. The support and non-support of the designated uses has been evaluated by reviewing monitoring data for specific criteria appropriate for those uses. Some professional judgement has been used in areas where inadequate data exists.

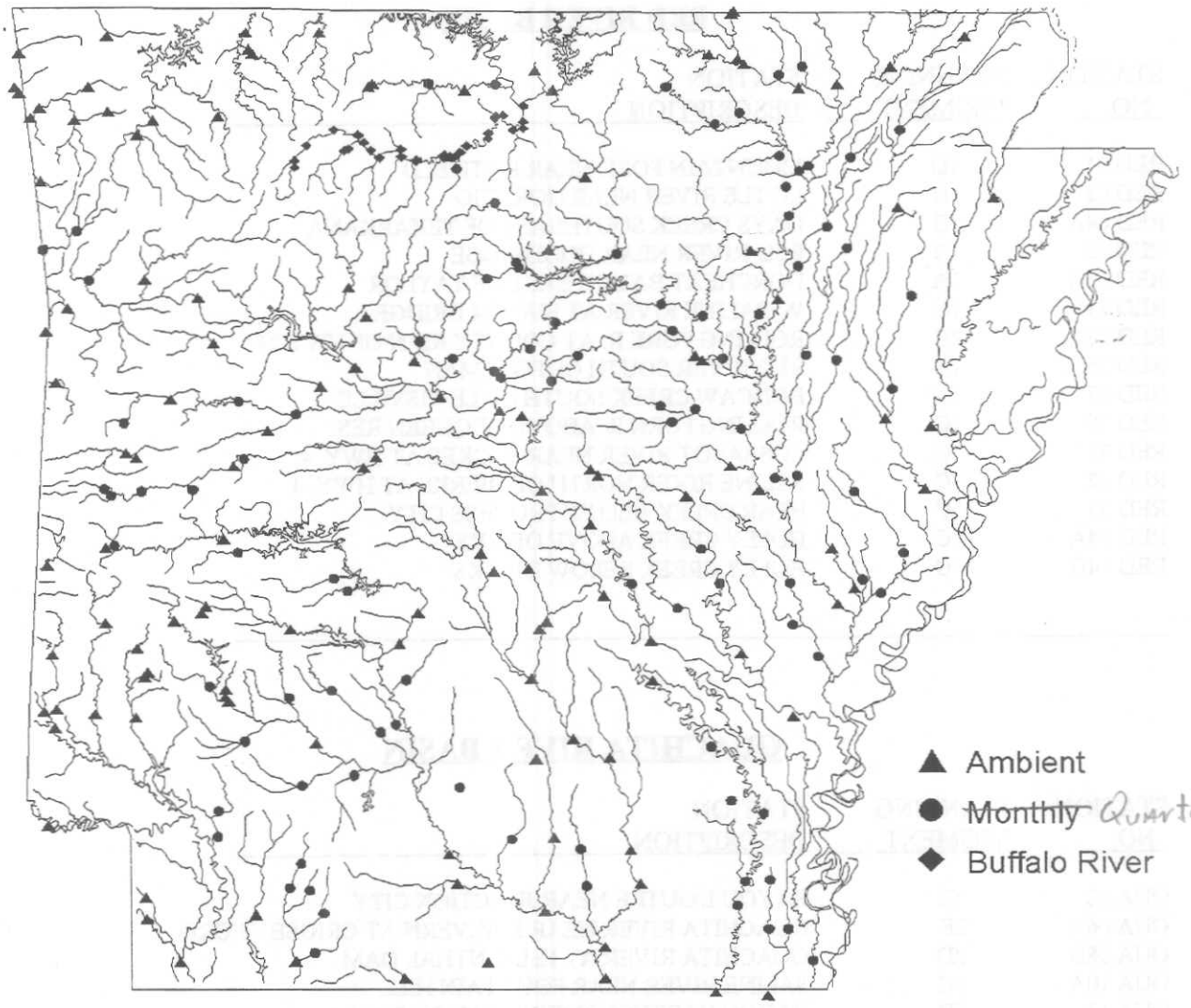
A segment-specific analysis has been conducted for each of the 39 planning segments. Figure SW-2 depicts the boundaries of each of the planning segments. The surface water being evaluated in this review are those currently listed within the EPA River Reach 1 File. At the end of each basin summary is a listing of the nonpoint source impaired waters in that basin, the use attainment of the water bodies in the basin, the impairment cause and suspected source.

Basin and Segment Assessments

The water quality assessments for each of the water quality planning segments is found in the following pages. A brief description of each basin segment and the water quality of the stream sections effected by nonpoint source pollution is discussed and tabulated. Lakes, groundwater, and wetlands are discussed in other sections of this document. A Surface water pesticide assessment follows the basin segment assessments.

FIGURE SW-1: ARKANSAS AMBIENT

WATER QUALITY MONITORING NETWORK



133 Ambient Water Quality Monitoring Stations
100 Quarterly Monitoring Stations
32 Buffalo National River Stations

TABLE SW-1

WATER QUALITY MONITORING STATIONS

MONTHLY AMBIENT STATIONS

RED RIVER BASIN

STATION NO.	PLANNING SEGMENT	STATION DESCRIPTION
RED 01	1D	MOUNTAIN FORK NEAR HATFIELD
RED 02	1C	LITTLE RIVER NEAR HORATIO
RED 04A	1B	DAYS CREEK SOUTHEAST OF TEXARKANA
RED 05	1B	RED RIVER NEAR DODDRIDGE
RED 15A	1A	DORCHEAT BAYOU EAST OF TAYLOR
RED 21	1C	W. SALINE RIVER AT HWY 24 BRIDGE
RED 22	2C	ROLLING FORK R. AT COUNTY RD N OF HWY 24
RED 25	1B	RED RIVER SOUTH OF FOREMAN
RED 27	1A	BODCAW CREEK SOUTH OF LEWISVILLE
RED 30	1C	ROLLING FORK R. ABOVE DEQUEEN RES.
RED 31	1C	COSSATOT RIVER NEAR WICKES AT HWY. 4
RED 32	1C	SALINE RIVER NORTH OF DIERKS AT HWY. 4
RED 33	1C	BEAR CREEK BELOW PROCESS CITY
RED 34A	1C	HOLLY CREEK ABOVE DIERKS
RED 34B	1C	HOLLY CREEK BELOW DIERKS

OUACHITA RIVER BASIN

STATION NO.	PLANNING SEGMENT	STATION DESCRIPTION
OUA 02	2E	BAYOU L'OUTRE NEAR JUNCTION CITY
OUA 06A	2F	OUACHITA RIVER NEAR MALVERN AT GRIGSBY FORD
OUA 08B	2D	OUACHITA RIVER AT FELSENTHAL DAM
OUA 10A	2C	SALINE RIVER NEAR FOUNTAIN HILL
OUA 13	2B	BAYOU BARTHOLOMEW NEAR JONES, LA
OUA 15A	2A	BOEUF RIVER NEAR AR-LA LINE
OUA 18	2C	BIG CREEK BELOW SHERIDAN
OUA 21	2F	OUACHITA RIVER NEAR PENCIL BLUFF
OUA 22	2G	LITTLE MISSOURI RIVER NEAR LANGLEY
OUA 23	2F	CADDO RIVER NEAR AMITY
OUA 26	2C	SALINE RIVER NEAR BENTON
OUA 27	2D	SMACKOVER CREEK NEAR SMACKOVER

continued

OUACHITA RIVER BASIN (continued)

STATION NO.	PLANNING SEGMENT	STATION DESCRIPTION
OUA 28	2D	OUACHITA RIVER NEAR DONALDSON
OUA 31	2C	HURRICANE CREEK NEAR SARDIS
OUA 33	2B	BAYOU BARTHOLOMEW NEAR LADD
OUA 35	2G	LITTLE MISSOURI RIVER NEAR BOUGHTON
OUA 37	2D	OUACHITA RIVER BELOW CAMDEN
OUA 39B	2G	LITTLE MISSOURI R. BELOW MURFREESBORO
OUA 40	2F	PRAIRIE CREEK BELOW MENA
OUA 41	2C	SALINE RIVER BELOW BENTON (SHAW)
OUA 42	2C	SALINE RIVER AT HWY 167 (SHERIDAN)
OUA 43	2C	BIG CREEK AT HWY 35
OUA 44	2F	SOUTH FORK OF CADDO RIVER AT FANCY HILL
OUA 47	2D	JUG CREEK BELOW FORDYCE
OUA 116	2C	SALINE RIVER AT OZMENT BLUFF
OUA 118	2C	SALINE RIVER AT HWY 79 BRIDGE
OUA 124B	2D	OUACHITA RIVER AT PIGEON HILL
OUA 44T	2F	N.L. BAROID TRIB TO S. FORK CADDO

ARKANSAS RIVER BASIN

STATION NO.	PLANNING SEGMENT	STATION DESCRIPTION
ARK 03	3J	SPAVINAW CREEK NORTH OF CHEROKEE, AR
ARK 04A	3J	FLINT CREEK NEAR W. SILOAM SPRINGS, OK
ARK 05	3J	SAGER CREEK NEAR SILOAM SPRINGS, AR
ARK 06A	3J	ILLINOIS R NEAR SILOAM SPRINGS (HWY 16)
ARK 07	3J	BARREN FORK AT DUTCH MILLS
ARK 10C	3J	CLEAR CREEK BELOW FAYETTEVILLE
ARK 11B	3H	SHORT MOUNTAIN CREEK BELOW PARIS
ARK 14	3H	POTEAU RIVER NEAR FORT SMITH
ARK 15	3I	JAMES FORK NEAR HACKETT
ARK 20	3A	ARKANSAS RIVER AT DAM #2
ARK 23	3B	BAYOU METO NEAR BAYOU METO
ARK 29	3D	ARKANSAS RIVER AT MURRAY LOCK & DAM(#7)
ARK 30	3D	ARKANSAS RIVER AT LOCK & DAM #8
ARK 31	3F	ARKANSAS RIVER AT LOCK & DAM #9
ARK 32	3F	ARKANSAS RIVER NEAR DARDANELLE
ARK 33	3H	ARKANSAS RIVER AT OZARK LOCK & DAM
ARK 34	3G	PETIT JEAN RIVER ABOVE BOONEVILLE

continued

ARKANSAS RIVER BASIN (continued)

STATION NO.	PLANNING SEGMENT	STATION DESCRIPTION
ARK 37	3E	FOURCHE LA FAVE RIVER NEAR GRAVELLY
ARK 38	3H	ARKANSAS RIVER NEAR FORT SMITH, AR
ARK 40	3J	ILLINOIS R NEAR SAVOY (ABOVE CLEAR CR)
ARK 41	3J	OSAGE CREEK NEAR ELM SPRINGS, AR
ARK 42	3H	MULBERRY RIVER AT INTERSTATE 40
ARK 43	3H	BIG PINEY CREEK AT HWY. 164
ARK 44	3F	ILLINOIS BAYOU NORTHWEST OF DOVER, AR
ARK 46	3C	ARKANSAS RIVER AT LOCK AND DAM #6(TERRY)
ARK 48	3C	ARKANSAS RIVER BELOW PINE BLUFF, L&D #4
ARK 49	3C	ARKANSAS RIVER ABOVE PINE BLUFF, L&D #5
ARK 50	3B	B. METO BELOW JACKSONVILLE AT HWY 161
ARK 51	3D	STONE DAM CREEK BELOW CONWAY
ARK 52	3E	S. FOURCHE LAFAVE RIVER ABOVE HOLLIS
ARK 52B	3E	S. FOURCHE LAFAVE BELOW CEDAR CREEK
ARK 53	3F	WHITE OAK CREEK NEAR ATKINS
ARK 54	3I	POTEAU RIVER ABOVE WALDRON
ARK 55	3I	POTEAU RIVER BELOW WALDRON
ARK 56	3J	TOWN BRANCH BELOW BENTONVILLE
ARK 57	3G	DUTCH CREEK BELOW SHARK
ARK 58	3G	CHICKALAH CREEK AT CHICKALAH
ARK 60	3B	B. METO AT W. MAIN ST. BRIDGE, JACKSONVILLE
ARK 67	3F	WHIG CREEK BELOW RUSSELLVILLE
ARK 97	3B	BAYOU TWO PRAIRIE AT HWY 13
ARK 103	3J	SPAVINAW CREEK NR.GRAVETTE

WHITE RIVER BASIN

STATION NO.	PLANNING SEGMENT	STATION DESCRIPTION
WHI 03	4G	BLACK R AT HWY 63, E. CORNING
WHI 04	4G	CURRENT RIVER NEAR POCAHONTAS
WHI 05B	4H	ELEVEN POINT RIVER NEAR POCAHONTAS
WHI 06A	4H	WARM FK SPRING RIVER NEAR THAYER, MO
WHI 11	4F	S. SYLAMORE CREEK BELOW LICK FORK CR
WHI 09A	4K	KINGS RIVER NORTH OF BERRYVILLE
WHI 21	4H	SPRING RIVER SOUTH OF RAVENDON
WHI 22	4H	SPRING RIVER AT LOW WATER BRIDGE NEAR HARDY
WHI 23	4H	SOUTH FORK OF SPRING RIVER NEAR SADDLE
WHI 24	4G	STRAWBERRY RIVER SOUTH OF SMITHVILLE
WHI 25	4G	BLACK RIVER AT POCAHONTAS

continued

WHITE RIVER BASIN (continued)

STATION NO.	PLANNING SEGMENT	STATION DESCRIPTION
WHI 26	4B	BAYOU DE VIEW WEST OF GIBSON
WHI 29	4F	WHITE RIVER AT OIL TROUGH
WHI 31	4A	WHITE RIVER AT ST. CHARLES
WHI 43	4E	M. FORK LITTLE RED RIVER NEAR SHIRLEY
WHI 46	4F	WHITE RIVER NEAR NORFORK, AR
WHI 48A	4I	CROOKED CREEK AT HWY 14 NEAR YELLVILLE
WHI 49A	4J	BUFFALO RIVER AT HWY 65 NEAR ST. JOE
WHI 51	4K	WEST FORK WHITE RIVER NEAR FAYETTEVILLE
WHI 52	4K	WHITE RIVER NEAR GOSHEN
WHI 59	4E	LITTLE RED RIVER BELOW SEARCY
WHI 65	4F	HICKS CREEK BELOW MOUNTAIN HOME
WHI 66	4I	CROOKED CREEK BELOW HARRISON
WHI 67	4I	CROOKED CREEK ABOVE HARRISON
WHI 68	4K	OSAGE CREEK ABOVE BERRYVILLE
WHI 69	4K	OSAGE CREEK BELOW BERRYVILLE
WHI 70	4K	HOLMAN CREEK BELOW HUNTSVILLE
WHI 71	4I	LONG CREEK BELOW DENVER
WHI 72	4D	WATTENSAW BAYOU NORTH OF HAZEN
WHI 73	4A	PRAIRIE CYPRESS CREEK AT HWY. 1
WHI 74	4A	BOAT GUNWALE SLASH AT HWY. 146
WHI 88	4H	SPRING RIVER AT TOWN BRIDGE IN HARDY
WHI 89	4H	MAMMOTH SPRING EAST BRIDGE AT SPILLWAY
WHI 103	4K	WHITE RIVER AT DURHAM
WHI 116	4K	WAR EAGLE CR AT HWY 45, N HINDVILLE
WHI 123	4K	KINGS RIVER NE ALABAM
WHI 138	4C	WHITE RIVER AT HWY 67, NEAR NEWPORT

ST. FRANCIS RIVER BASIN

STATION NO.	PLANNING SEGMENT	STATION DESCRIPTION
FRA 10	5B	L'ANGUILLE RIVER NEAR MARIANNA
FRA 12	5B	SECOND CREEK NORTH OF PALESTINE
FRA 13	5C	ST. FRANCIS RIVER AT HWY. 50
FRA 08	5C	ST. FRANCIES R AT HWY 18 E LAKE CITY

TABLE SW-1 (continued)

QUARTERLY MONITORING STATIONS

RED RIVER BASIN

STATION NO.	PLANNING SEGMENT	STATION DESCRIPTION
UWBCH01	1A	BEECH CREEK AT HWY 82 NR. WALDO
UWBDK01	1B	BOIS D'ARC CREEK AT HWY 67 NR. HOPE
UWBDK02	1B	BOIS D'ARC CR. AT CO. RD. 7 MI. NW OF CENTER PT.
UWBDT01	1A	BAYOU DORCHEAT AT HWY 355
UWBDT02	1A	BAYOU DORCHEAT AT HWY 82 6 MI. W. OF WALDO
UWBIG01	1A	BIG CREEK AT HWY 132 AT MAGNOLIA
UWHHC01	1A	HORSEHEAD CR. AT HWY 19 2 MI. N. OF WALKERVILLE

OUACHITA RIVER BASIN

STATION NO.	PLANNING SEGMENT	STATION DESCRIPTION
UWATR01	2G	ATOINE RIVER AT HWY 26 AT ATOINE
UWBFR01	2A	BOEUF RIVER AT HWY 278 4 MI. W. OF CHICOT
OUA32	2A	BIG BAYOU AT HWY 144
UWBGB01	2A	BIG BAYOU AT HWY 278 5 MI. E. OF PORTLAND
UWBYB01	2B	BAYOU BARTHOLOMEW AT HWY 82 NR. THEBES
UWBYB02	2B	BAYOU BARTHOLOMEW AT HWY 4 NR. MCGEHEE
UWBYB03	2B	BAYOU BARTHOLOMEW AT HWY 54 AT GARRETT BRIDGE
UWBYM01	2A	BAYOU MACON AT HWY 65 NR. EUDORA
UWBYM02	2A	BAYOU MACON AT HWY 65 5 MI. AB. MCMILLAN CORNER
UWCHC01	2D	CHAMPAGNOLLE CREEK AT HWY 4 NR. HAMPTON
UWCOC01	2B	CUT OFF CREEK AT CO. RD. N.E. OF BYDELL
UWCOC02	2B	CUT OFF CREEK AT HWY 4 10 MI. E. OF MONTICELLO
UWCYC01	2G	CANEY CREEK AT HWY 24 NEAR BLUFF CITY
UWDPC01	2F	DECEIPER CREEK AT CO. RD. 8 MI. S.E. OF GURDON
UWFRE01	2D	FREEO CREEK AT HWY 9 5 MI. W. OF BEARDEN
UWLEF01	2F	L'EAU FRAIS CREEK AT HWY 128 NR. JOAN
UWLGC01	2D	L'AIGLE CR. AT FARMVILLE RD. 2 MI. SE FARMVILLE
UWLGC02	2D	L'AIGLE CR. AT CO. RD. 2.5 MI. WEST OF INGALLS
UWMFC01	2G	MUDDY FORK AT CO. RD. OFF HWY 27 NR.MURFREESBORO
UWMZC01	2F	MAZARN CREEK AT HWY 227 NR. SUNSHINE
UWOAR01	2F	OUACHITA R. AT CO. RD. OFF HWY 88 NR. BOARDCAMP
UWOZC01	2G	OZAN CREEK AT HWY 24 NR. BLEVINS
UWSFM01	2F	LITTLE MAZARN CR. AT CO. RD. 1.5 MI. N. PETTYVIEW
UWSFO01	2F	S. FORK OUACHITA RIVER AT HWY 270 AT MT. IDA
UWTND01	2G	TERRE NOIR CR. AT HWY 53 2 MI. S. OF HOLLYWOOD
UWTNR01	2F	TERRE NOIR CR. AT HWY 51 2.5 MI. E. RED SPRINGS
UWTRC01	2G	TERRE ROUGE CR. AT HWY 19 5 MI. S. OF PRESCOTT

ARKANSAS RIVER BASIN

STATION NO.	PLANNING SEGMENT	STATION DESCRIPTION
UWBLF01	3E	BLACK FORK AT TAR 3.5 MI AB CL FK.
UWBMO01	3B	BAYOU METO AT CO. RD. S.E. OF SEATON DUMP
UWBMO02	3B	BAYOU METO AT HWY 79 2 MI S.W. OF STUTTGART
UWCCR01	3D	CADRON CREEK AT CO. RD. 5 MI. W. OF WOOSTER
UWCED01	3E	BIG CEDAR CR. AT HWY 28 3 MI. E. OF CEDAR CR.
UWCLF01	3E	CLEAR FK. AT TAR AB BLK. FK. 8 MI W OF BOYLES
UWCSC01	3D	CYPRESS CK. AT CO. RD. 2 MI S.E. OF HWY 92
UWEFC01	3D	EAST FK. CADRON CK. @HWY 287 3 MI SE GREENBRIER
UWEFC02	3D	EAST FORK CADRON CK. AT HWY 107 NR. BARNEY
UWEPR01	3F	EAST FK. PT. REMOVE CR. @HWY 95 NR HICKORY HILL
UWFLR01	3E	FOURCHE LAFAVE RIVER AT TAR NR. BOYLES
ARK47	3H	FROG BAYOU @ HWY 282
ARK08	3H	LEE CREEK @ HWY 59
UWGAF01	3E	GAFFORD CREEK AT HWY 28 NEAR BLUFFTON
UWLCK01	3H	LEE CK. AT HWY 220 10 MI N. OF CEDARVILLE
UWNCC01	3D	CADRON CREEK AT HWY 65
UWNCC02	3D	N. CADRON CK. AT CO. RD. .75 MI. N. HWY 124
UWPJR01	3G	PETIT JEAN RV. @ CO. RD. OFF HWY 71 AT ELM PARK
UWPJR02	3G	PETIT JEAN RV. AT HWY 309 NEAR WAVELAND
UWPJR03	3G	PETIT JEAN RV. AT HWY 10 AT DANVILLE
UWPMB01	3C	PLUM BAYOU 1 MI. W. OF HWY 15 NEAR TUCKER
UWWPR01	3F	WEST FK POINT REMOVE CR AT HWY 247 NR ATKINS
UWWSB01	3B	WABBASEKA BAYOU AT HWY 79 AT WABBASEKA

WHITE RIVER BASIN

STATION NO.	PLANNING SEGMENT	STATION DESCRIPTION
UWAFK01	4E	ARCHEY FK LITTLE RED R. AT HWY 65 AT CLINTON
UWBCK01	4E	BIG CK. OFF HWY 110 AR. HIRAM 1 MI AB. L RED R.
UWBCR01	4E	BIG CREEK AT HW;Y 16 NEAR LETONA
WHI56	4D	BAYOU DES ARC @ HWY 11
UWBDA01	4D	BAYOU DES ARC AT CO. RD. ABOVE CYPRESS BAYOU
UWBDV02	4B	BAYOU DEVIEW AT HWY 64 4 MI. E. OF MCCRORY
WHI37	4A	BIG CREEK @ HWY 318
WHI33	4A	BAYOU DEVIEW @ HWY 70
UWBGC02	4A	BIG CREEK AT HWY 49 NEAR POPLAR GROVE
UWBGC03	4A	BIG CREEK AT HWY 79 3 MI. W. OF MORO
UWBHC01	4E	BEECH FK. @ CO RD 2.5 MI SE OF HWY 263 NR. WOODROW
UWBKR01	4G	BLACK R. ABOVE STRAWBERRY R. NEAR SAFFELL
UWBKR02	4G	BLACK RIVER AT HWY 37 3 MI. S.E. OF CORD

(continued)

WHITE RIVER BASIN (continued)

STATION NO.	PLANNING SEGMENT	STATION DESCRIPTION
UWBLB01	4D	BULL CREEK AT HWY 367 NEAR BEEBE
UWBRK01	4J	BEAR CREEK AT HWY 65 4 MI. W. OF MARSHALL
UWCAC01	4G	CURIA CREEK AT HWY 25 2 MI. N. OF DOWDY
WHI32	4C	CACHE RIVER AT HWY 70
UWCHR02	4C	CACHE RIVER AT HWY 64 AT PATTERSON
UWCHR03	4C	CACHE RIVER AT HWY 18 NEAR GRUGGS
UWCHR04	4C	CACHE RIVER AT HWY 412 6.5 MI. E. OF WALNUT RIDGE
UWCKC01	4I	CROOKED CREEK AT HWY 62 AT PYATT
UWCKC02	4I	CROOKED CREEK AT HWY 101 2 MI. N. OF REA VALLEY
UWCPB01	4D	CYPRESS BAYOU AT HWY13 3 MI. S.E. OF BEEBE
UWCPC01	4A	BIG CYPRESS CREEK AT HWY 1 4 MI. N.E. OF CROSSROADS
UWDTC01	4F	DEPARTEE CREEK AT CO. RD. 1 MI. E. OF BRADFORD
UWGSC01	4F	GLAISE CREEK HWY 64 4.5 MI. E. OF BALD KNOB
UWJNC01	4H	JANES CREEK AT HWY 90 NEAR RAVENDEN SPRINGS
UWLGB01	4A	LAGRUE BAYOU AT HWY 33 AT LAGRUE
UWLGB02	4A	LAGRUE BAYOU AT HWY 17 AT LAGRUE SPRINGS
UWLLB01	4A	LITTLE LAGRUE BAYOU AT HWY 1 NEAR DEWIT
UWMFK01	4E	MIDDLE FORK LITTLE RED RIVER AT HWY 65 NR. LESLIE
UWMTC01	4H	MARTIN'S CREEK AT HWY 63 NEAR WILLIFORD
UWNBC01	4G	N. BIG CREEK @ CO. RD. OFF HWY 354 S.E. OF CENTER
UWOFC01	4E	OVERFLOW CREEK AT CO. RD. 1.5 MI. S.E. OF JUDSONIA
UWRDC01	4G	REEDS CREEK AT HWY 117 AT STRAWBERRY
UWSBR01	4G	STRAWBERRY R. AT CO. RD. OFF HWY 354 NR. WISEMAN
UWSBR02	4G	STRAWBERRY R. AT HWY 167 AT EVENING SHADE
UWSBR03	4G	STRAWBERRY R. AT HWY 361 NEAR SAFFELL
UWSRR01	4E	SOUTH FK. LITTLE RED R. AT HWY 95 NR. SCOTLAND
UWSRR02	4E	SOUTH FK. LITTLE RED R. AT HWY 65 AT CLINTON
UWTMC01	4E	TEN MILE CREEK AT HWLY 157 3 MI. N. OF PROVIDENCE
UWVGC01	4C	VILLAGE CREEK AT HWY 37 3 MI. E. OF TUCKERMAN
UWVGC02	4C	VILLAGE CREEK AT HWY 228 AT MINTURN
UWVGC03	4C	VILLAGE CREEK AT HWY 224 NR. NEWPORT

ST. FRANCIS RIVER BASIN

STATION NO.	PLANNING SEGMENT	STATION DESCRIPTION
UWLGR01	5B	L'ANGUILLE RIVER AT HWY 306 3 MI. W. OF COLT
UWLGR02	5B	L'ANGUILLE RIVER AT HWY 214 3 MI. W. OF WHITEHALL

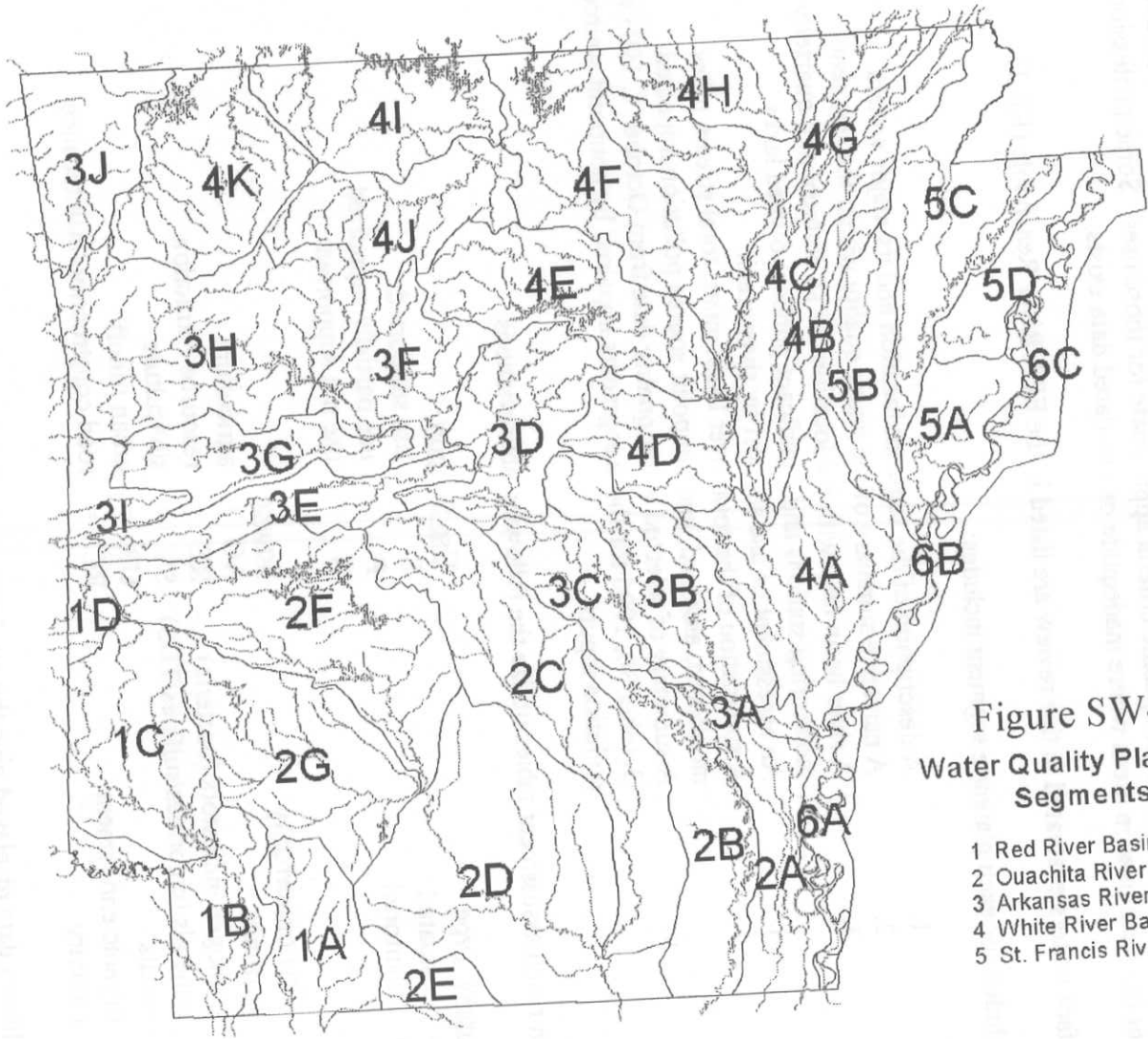


Figure SW-2

Water Quality Planning Segments

1 Red River Basin
2 Ouachita River Basin
3 Arkansas River Basin
4 White River Basin
5 St. Francis River Basin

SURFACE WATER ASSESSMENT

WATER BODY SPECIFIC INFORMATION BY RIVER BASIN

The assessment of water quality within the 39 individual planning segments utilized the ambient monitoring network stations, the quarterly monitoring stations, and other available data as described earlier in this document. The support or nonsupport of a designated use was assessed by reviewing monitoring data for specific criteria appropriate for those uses. Some professional judgment has been used in areas where inadequate or out-dated data exists.

The surface waters evaluated in this review are listed in the EPA River Reach File (RF-1).

Data included for each planning segment includes:

1. A description of the segment location and its major waters.
2. A narrative summary of the water quality within the segment.
3. A river basin map with the locations of all ambient and quarterly monitoring stations and significant publicly-owned lakes.
4. An assessment of use support by river reach.
5. A summation of the total river basin miles, total stream miles monitored, assessed, and nonpoint source pollution impacted.
6. A summary of selected water quality data from October 1, 1993 to October 30, 1996 for those segments impaired by nonpoint source pollution inputs.

The stream reach assessment tables utilize the following abbreviations:

Assessment Type
E = evaluated
M = monitored

Use Support
S = use supported
P = use partially supported
N = use not supported

Cause
SI = siltation/turbidity
NU = nutrients
PA = pathogen indicators (bacteria)
MN = minerals (chlorides/sulfates/TDS)
ME = metals
OE = organic enrichment
HG = mercury

Source
AG = agriculture
RE = resource extraction
SV = silviculture
UR = urban runoff
RC = road construction/maintenance

The fecal coliform data displayed give the maximum and minimum concentrations measured during the survey period. The figures in the STD. DEV. column, ie. "4(2)", illustrate the number of samples which had concentrations greater than 400 col/100 ml, "4," and the number of those samples that occurred between April 1 and September 30, "(2)".

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RED RIVER BASIN (1)

The Red River originates in eastern New Mexico and west Texas and flows east for approximately 450 miles before entering Arkansas along the Texas-Arkansas state line. The river makes an abrupt southward turn northeast of Texarkana, Arkansas and flows out of the state into Louisiana north of Shreveport, Louisiana. The Red River drains approximately 4478 square miles in Arkansas.

The principal tributaries of the Red River in Arkansas include the Little River, Sulphur River, Bodcau Creek and Bayou Dorcheat. All of theses tributaries are interstate streams with two originating outside of the state. The Little River, with headwaters in southeast Oklahoma, flows approximately 217 miles to its point of entry into the Red River near Fulton, Arkansas. Major tributaries to the Little River are the Cossatot, Saline, and Rolling Fork rivers draining parts of the Ouachita Mountains ecoregion. The Sulphur River originates in northeast Texas and enters the Red River approximately 10 miles above the Louisiana state line. Bodcau Creek and Bayou Dorcheat originate in Nevada and/or Hempstead county and flow southward into Louisiana draining portions of the Gulf Coastal Plains ecoregion..

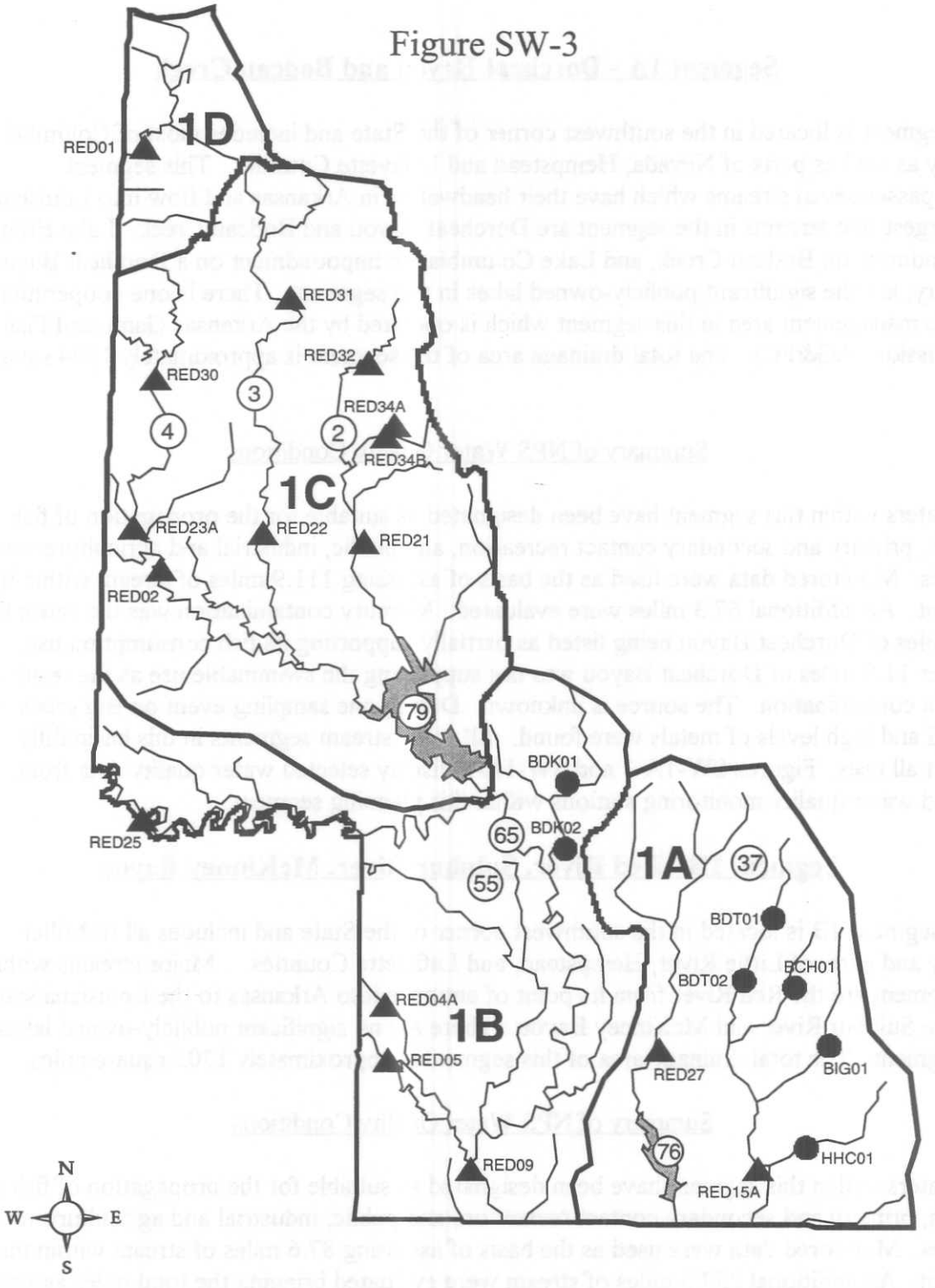
Silviculture dominates the land use within the Red River Basin in Arkansas. Most of this land is owned by private forestry companies. Pasture land for cattle grazing and hay production is also a major land use within the basin. There is also some row crop agriculture in the flatter terrain areas of the drainage basin. Confined animal operations, mainly poultry and swine facilities, have continued to increase in numbers in this region over the past ten years. Additional land use activities within the drainage basin include resource extraction (oil, gas, gravel, minerals), recreation and some urban.

There are nine publicly-owned lakes within the Red River drainage basin in Arkansas. A list of these lakes and their water quality status can be found in the Clean Lakes section of the report.

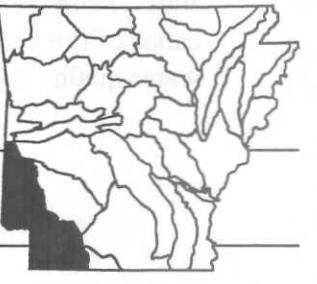
Figure SW-3 is a map of the Red River basin in Arkansas Depicting the Ambient Water Quality Monitoring Stations, the Quarterly monitoring stations used in this survey, and the significant publicly-owned lakes.

Table SW-2 lists the Red River segments, the status of their current designated uses attainments, and a lists of probable causes and possible sources of those WATER BODY segments not fully meeting their assigned designated uses.

Figure SW-3



▲ - Active Ambient Monitoring Stations
● - Quarterly Monitoring Stations
⑩ - Significant Publicly-Owned Lakes



Red River Basin Planning Segments

Segment 1A - Dorcheat Bayou and Bodcau Creek

This segment is located in the southwest corner of the State and includes most of Columbia County as well as parts of Nevada, Hempstead and Lafayette Counties. This segment encompasses seven streams which have their headwaters in Arkansas and flow into Louisiana. The largest two streams in the segment are Dorcheat Bayou and Bodcau Creek. Lake Erling, an impoundment on Bodcau Creek, and Lake Columbia, an impoundment on a Dorcheat Bayou tributary, are the significant publicly-owned lakes in this segment. There is one cooperative wildlife management area in this segment which is operated by the Arkansas Game and Fish Commission (AG&FC). The total drainage area of the segment is approximately 1094 square miles.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish and wildlife, primary and secondary contact recreation, and public, industrial and agriculture water supplies. Monitored data were used as the basis of assessing 111.9 miles of stream within this segment. An additional 67.3 miles were evaluated. Mercury contamination was the cause for 50.6 miles of Dorcheat Bayou being listed as partially supporting its fish consumption use. Another 11.9 miles of Dorcheat Bayou was not supporting the swimmable use as the result of bacteria contamination. The source is unknown. During one sampling event on Big creek, very low pH and high levels of metals were found. All other stream segments in this basin fully support all uses. Figures SW-1A-1 and SW-1A-2 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 1B - Red River, Sulphur River, McKinney Bayou

Basin segment 1B is located in the southwest corner of the State and includes all of Miller County and parts of Little River, Hempstead, and Lafayette Counties. Major streams within this segment are the Red River from its point of entrance into Arkansas to the Louisiana state line, the Sulphur River and McKinney Bayou. There are no significant publicly-owned lakes in this segment. The total drainage area of this segment is approximately 1302 square miles.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish and wildlife, primary and secondary contact recreation, and public, industrial and agriculture water supplies. Monitored data were used as the basis of assessing 87.6 miles of stream within this segment. An additional 257.3 miles of stream were evaluated bringing the total miles assessed streams within this segment to 344.9. Monitored data clearly indicate that the criteria protective of the public water supply use are not being maintained for the full extent of the Red River in the state. High chloride concentrations originating in the states of Oklahoma and Texas are the cause of the violations. Figure SW-1B-1 displays selected water quality data from a selected water quality monitoring station within this planning segment.

Segment 1C - Little River and its Tributaries

Segment 1C is located in southwest Arkansas north of Texarkana and includes all of Sevier County and parts of Polk, Howard, Hempstead and Little River Counties. This includes the entire reach of the Little River in Arkansas from its point of entrance into the State to its confluence with the Red River. The major tributaries include Rolling Fork, Cossatot River, Saline River and Mine Creek. The major reservoirs located in this segment include DeQueen, Gillham and Dierks Reservoirs, all of which drain into Millwood Reservoir.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation, public, industrial and agricultural water supplies and contains ecologically sensitive water bodies. Overall water quality is fair in the basin with the exception of several long-term problem areas. Several stream segments in the basin display degradation that is the result of agricultural nonpoint pollution. The Cossatot River below Gillham Reservoir, Rolling Fork River and the Saline River below Dierks Reservoir have elevated nutrient and sediment concentrations which are degrading water quality. Figures SW-1C-1, SW-1C-2 and SW-1C-3 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 1D - Mountain Fork and Tributaries

This segment is located on the western edge of Arkansas and covers a portion of Polk County. Basin Segment 1D encompasses a 20-mile reach of the Mountain Fork of Little River from its headwaters to the Arkansas-Oklahoma State line.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation and public, industrial and agricultural water supplies. Also the Mountain Fork River is designated as an extraordinary resource and has an ecologically sensitive use due to the leopard darter known to occur there. Monitored data were used as the basis of assessing 11 miles of stream within this segment. An 11.0 mile reach of the Mountain Fork is listed as only partially supporting its aquatic use as the result of high turbidity concentrations. The source is runoff from agriculture land uses. Figure SW-1D-1 displays selected water quality data from a selected water quality monitoring station within this planning segment.

Figure SW-1A-1

RED15A

DORCHEAT BAYOU EAST OF TAYLOR, AR

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	6.55	32	10.40	3.20	1.39
pH	7.02	32	7.80	6.69	0.29
TSS mg/l	8.04	34	22.00	2.00	5.41
NO2+NO3-N mg/l	0.32	31	1.37	0.02	0.30
Tot. Phos. mg/l	0.12	31	0.29	0.04	0.06
Tot. Org. C mg/l	13.43	31	28.90	8.30	3.98
T.Hardness mg/l	23.55	33	46.00	10.00	7.67
Chloride mg/l	25.95	34	45.00	9.00	8.44
TDS mg/l	128.21	34	313.00	76.00	45.38
Turbidity NTU	9.47	35	21.00	2.60	4.68
Fecal Coliform col/100 ml		14	840	20	4(2)

Figure SW-1A-2

BDT02

BAYOU DORCHEAT AT HWY 82 6 MI W. OF WALDO

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	5.99	8	11.30	3.20	2.75
pH	6.23	8	6.63	5.77	0.34
TSS mg/l	6.81	8	20.00	1.00	5.91
NO2+NO3-N mg/l	0.07	6	0.15	0.03	0.05
Tot. Phos. mg/l	0.08	9	0.12	0.05	0.02
Tot. Org. C mg/l	14.51	9	26.70	9.60	5.14
T.Hardness mg/l	26.59	9	61.00	9.00	17.50
Chloride mg/l	38.41	8	116.00	11.00	40.92
TDS mg/l	120.75	8	240.00	67.00	68.15
Turbidity NTU	8.77	9	19.00	2.70	5.04
Fecal Coliform col/100ml		9	>600	11	3(1)

Figure SW-1B-1

RED09

RED RIVER NEAR SPRING BANK, AR

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	7.14	33	10.50	3.70	1.54
pH	7.51	33	9.92	6.64	0.61
TSS mg/l	126.96	35	490.00	22.00	115.79
NO2+NO3-N mg/l	0.22	31	0.70	0.02	0.15
Tot. Phos. mg/l	0.18	32	0.39	0.08	0.09
Tot. Org. C mg/l	8.43	32	20.60	4.80	3.51
T.Hardness mg/l	181.73	34	351.00	62.00	82.15
Chloride mg/l	95.20	35	265.00	17.00	64.35
TDS mg/l	424.52	35	924.00	160.00	208.03
Turbidity NTU	74.22	36	210.00	16.00	59.33
Fecal coliform col/100 ml		14	1218	9	1(0)

Figure SW-1C-1

RED22

COSSATOT RIVER WEST OF LOCKESBURG

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	7.44	30	14.10	4.40	2.44
pH	6.92	34	7.72	5.10	0.49
TSS mg/l	8.38	36	117.00	1.00	19.06
NO2+NO3-N mg/l	0.19	31	0.62	0.03	0.13
Tot. Phos. mg/l	0.07	25	0.36	0.03	0.06
Tot. Org. C mg/l	4.86	33	11.00	1.90	2.08
T.Hardness mg/l	15.42	32	42.00	6.00	8.15
Chloride mg/l	2.72	36	5.00	2.00	0.71
TDS mg/l	41.22	36	72.00	26.00	11.46
Turbidity NTU	11.77	36	70.00	1.40	13.05
Fecal coliform col/100 ml		15	3100	34	5(2)

Figure SW-1C-2

RED21

SALINE RIVER NEAR LOCKESBURG

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	7.09	30	12.80	3.10	2.31
pH	6.69	34	7.50	5.78	0.50
TSS mg/l	9.47	36	41.00	2.00	9.60
NO2+NO3-N mg/l	0.23	32	0.46	0.06	0.11
Tot. Phos. mg/l	0.09	31	0.19	0.03	0.04
Tot. Org. C mg/l	6.21	33	10.90	2.20	2.10
T.Hardness mg/l	19.42	33	75.00	5.00	12.45
Chloride mg/l	3.50	36	7.00	2.00	1.01
TDS mg/l	54.39	36	152.00	34.00	19.00
Turbidity NTU	14.41	36	70.00	3.00	13.66

Figure SW-1C-3

RED23A

ROLLING FORK RIVER AT COUNTY ROAD BRIDGE

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	7.05	30	11.50	3.50	1.81
pH	7.12	32	7.58	5.92	0.33
TSS mg/l	10.98	34	106.00	1.00	20.62
NO2+NO3-N mg/l	0.23	33	1.57	0.02	0.28
Tot. Phos. mg/l	0.07	27	0.20	0.04	0.04
Tot. Org. C mg/l	5.84	32	13.70	2.70	2.20
T.Hardness mg/l	17.39	33	57.00	5.00	9.90
Chloride mg/l	5.78	35	20.00	2.00	4.03
TDS mg/l	54.51	35	140.00	36.00	24.81
Turbidity NTU	13.33	35	74.00	2.20	15.43

Figure SW-1D-1

RED01

MT. FORK NEAR HATFIELD ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	7.84	30	11.00	5.20	1.78
pH	7.35	34	8.18	5.98	0.40
TSS mg/l	6.06	34	83.00	1.00	13.89
NO2+NO3-N mg/l	0.20	26	1.48	0.03	0.27
Tot. Phos. mg/l	0.07	19	0.22	0.03	0.04
Tot. Org. C mg/l	4.43	32	12.40	2.00	2.05
T.Hardness mg/l	12.08	31	60.00	7.00	9.78
Chloride mg/l	3.35	36	35.00	2.00	5.39
TDS mg/l	43.03	36	213.00	26.00	30.75
Turbidity NTU	12.65	35	78.00	2.50	14.56

Table SW-2

Summary of NPS Impaired Waterbodies in the Red River Basin

STREAM NAME	H.U.C.	REACH	MILES	STATION	ASSESSED	FISH CONSUM	AQUATIC LIFE	SWIMNG	SEC. CONTACT	DRINKING WATER	AGRI & INDSTRY	MAJOR SOURCE	MINOR SOURCE	MAJOR CAUSE	MINOR CAUSE
Seg 1A															
None															
Seg 1B															
Red River	11140201	-011	15.2		E	S	S	S	S	N	S	AG		MN	
Red River	11140201	-007	40.1		E	S	S	S	S	N	S	AG		MN	
Red River	11140201	-005	12.0		E	S	S	S	S	N	S	AG		MN	
Red River	11140201	-004	4.0		E	S	S	S	S	N	S	AG		MN	
Red River	11140201	-003	15.5	RED09	M	S	S	S	S	N	S	AG		MN	PA
Red River	11140106	-001	34.8		E	S	S	S	S	N	S	AG		MN	
Red River	11140106	-003	9.8		E	S	S	S	S	N	S	AG		MN	
Red River	11140106	-005	25.3	RED25	M	S	S	S	S	N	S	AG		MN	
Red River	11140106	-025	8.0		E	S	S	S	S	N	S	AG		MN	
NPS Impacted			164.7												
Seg 1C															
Saline River	11140109	-014	25.3	RED32	M	S	S	N	S	S	S	AG		PA	
Cossatot R.	11140109	-018B	37.2	RED22	M	S	S	N	S	S	S	AG		PA	
Cossatot R.	11140109	-019	14.2		E	S	S	N	S	S	S	AG		PA	
Rolling Fork	11140109	-024	1.7		E	S	P	S	S	S	S	AG		NU	
Rolling Fork	11140109	-027	18.0		E	S	P	S	S	S	S	AG		NU	
Rolling Fork	11140109	-028	20.7	RED30	M	S	P	S	S	S	S	AG		NU	
NPS Impacted			117.1												
Seg 1D															
Mountain Fork	11140108	-014	11.0	RED01	M	S	P	S	S	S	S	AG		SI	
Basin Stream Miles			1028.1												
Miles Evaluated			474.3												
Miles Monitored			378.4												
NPS Impacted			563.6												

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OUACHITA RIVER BASIN (2)

The Ouachita River originates in west-central Arkansas near the Oklahoma state line along the north slope of the central Ouachita Mountains. The river flows easterly out of the Ouachita Mountains near Malvern, Arkansas where it turns southwestward and flows along the "fall line". Just north of Arkadelphia, Arkansas the river turns southeastward and flows through the Gulf Coastal Plains and into Louisiana south of Crossett, Arkansas. The river discharges into the Black River near Jonesville, Louisiana and has a total length of approximately 605 miles, approximately 363 miles are in Arkansas. Principal tributaries originating in Arkansas are the Caddo River, Little Missouri River, Smackover Creek, Champagnolle Creek, Moro Creek, Saline River, Bayou Bartholomew, Crooked Bayou, and Bayou Macon. The last three tributaries originate in Arkansas and discharge into the Ouachita River in Louisiana. The Ouachita River drops from an elevation of 1615 feet above msl at its headwaters to an elevation of 51 feet above msl at the state line. Almost 89% of this 1564 feet drop in elevation occurs in the first 157 river miles, mostly located above Malvern, Arkansas in the Ouachita Mountains ecoregion. The remainder of the decrease in elevation occurs in the Gulf Coastal Plains ecoregion.

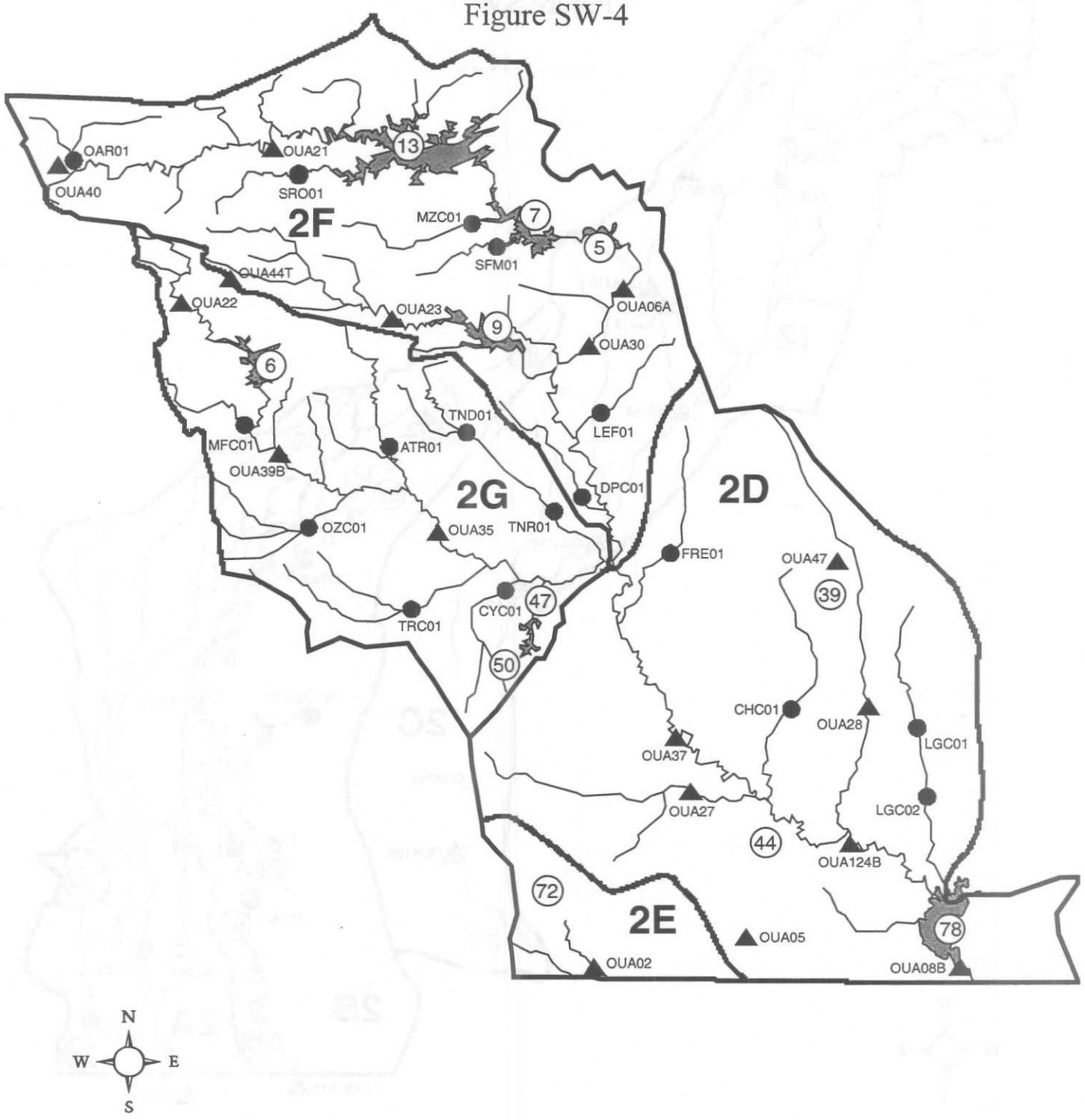
Land use in the drainage basin is dominated by silviculture. Public lands of the Ouachita National Forest control the majority of the land use in the Ouachita Mountains while private timber companies own most of the lands in the Gulf Coastal Plains. Pasture land occurs throughout the drainage basin, mainly for cattle grazing and for litter application from the many confined animal operations scattered throughout the basin. Resource extraction occurs in the Ouachita Mountains mainly as gravel and mineral mining, and in the Gulf Coastal Plains as sand and gravel, and oil and gas extraction. There is also a great deal of recreational activities that occur throughout the basin and a minimal amount of urban land use activities.

There are 24 publicly-owned lakes within the Ouachita River drainage basin in Arkansas. A list of these lakes and their water quality status can be found in the Clean Lakes section of the report.

Figure SW-4 is a map of the Ouachita River basin in Arkansas depicting the Ambient Water Quality Monitoring Stations, the Quarterly monitoring stations used in this survey, and the significant publicly-owned lakes.

Table SW-5 lists the Ouachita River segments, the status of their current designated uses attainments, and a lists of probable causes and possible sources of those water body segments not fully meeting their assigned designated uses.

Figure SW-4

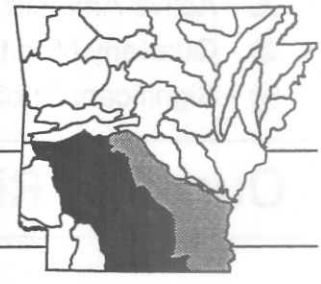


▲ - Active Ambient Monitoring Stations

● - Quarterly Monitoring Stations

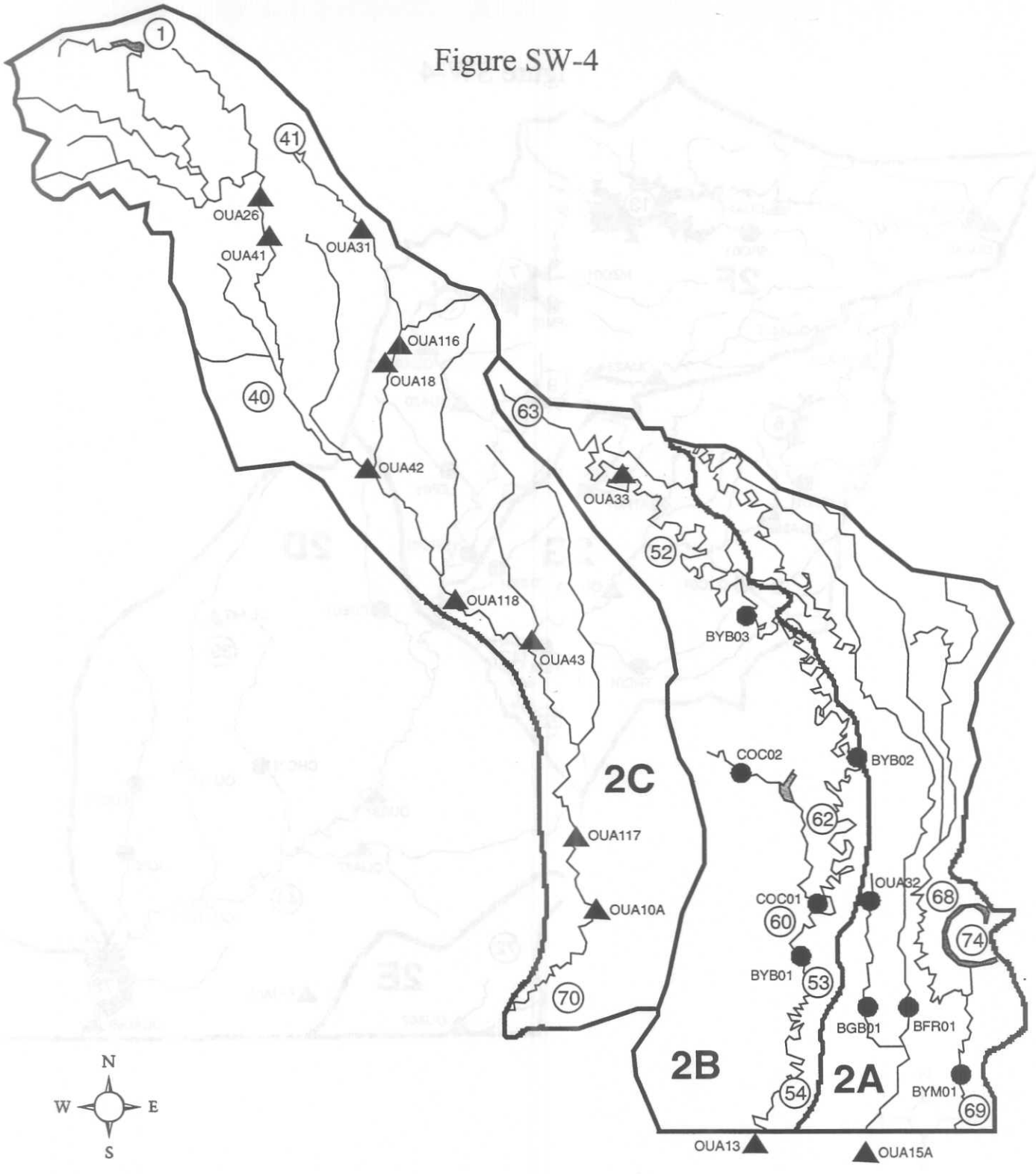
⑩ - Significant Publicly-Owned Lakes

(2D, E & F)



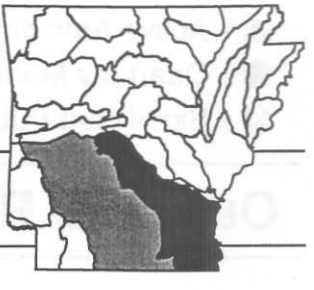
Ouachita River Planning Segments

Figure SW-4



▲ - Active Ambient Monitoring Stations
● - Quarterly Monitoring Stations
⑩ - Significant Publicly-Owned Lakes

(2A, B & C)



Ouachita River Planning Segments

Segment 2A - Boeuf River and Tributaries

This segment is located in the extreme southeastern corner of Arkansas. It includes most of Chicot and Desha Counties, the northeastern part of Lincoln County, and small areas of Drew, Ashley and Jefferson Counties. Major streams within this segment include the Boeuf River and its tributaries - Macon Bayou, Cypress Creek, Big Bayou, Oakwood Bayou and others. The flows are generally southward into Louisiana.

This segment lies almost entirely within the Mississippi Alluvial Plain. Agriculture land use activities, almost extensively row crop, dominant the land use of the flat terrain segment. A highly developed man-made drainage system of canals and ditches criss-cross this segment to carry excess away water from the land. Most of the sources of pollutants in this segment affecting water quality are from nonpoint source origins. Figures SW-2A-1 and SW-2A-2 display selected water quality data from selected water quality monitoring stations within this planning segment.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation, and public, industrial and agricultural water supplies. Monitored data were used as the basis of assessing 215.1 miles of stream within this segment. Data assessed from those monitored reaches provided some indication that the aquatic life use is being impaired due to frequent and very high turbidity and suspended solids values. It is clear that these conditions are caused by the runoff from intensive row crop agriculture. Both aquatic life and drinking water uses throughout the entire basin are severely impacted by the silt and nutrients generated by row crop agricultural activities.

All stations monitored within this segment exhibited multiple occurrences of pesticides(several pesticides and/or more than one occurrence of the same pesticide)which were above the analytical detection level. This was the highest rate of occurrence of pesticides within any planning segment.

Segment 2B - Bayou Bartholomew and Tributaries

Segment 2B, located in the southeastern part of Arkansas, covers parts of Jefferson, Lincoln, Drew and Ashley Counties. The major streams in this segment are Bayou Bartholomew, Ables Creek, Cutoff Creek and their tributaries. This segment lies on the border of two physiographical regions; the Mississippi Alluvial Plain on the east side and the Gulf Coastal Plain on its western side. The land uses include extensive agriculture in the Alluvial Plain changing over to silviculture west of the Gulf Coastal escarpment. Approximately 75% of the watershed land use is silviculture, 20% row crop agriculture, most of which lies adjacent to the bayou. Bayou Bartholomew separates these two regions. However, most of its drainage comes from the Gulf Coastal Plains.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation, and public, industrial and agricultural water supplies. This segment contains a total of 359.4 stream miles, of which 330.5 are being assessed using monitoring data. As in other basins contained within the Delta region of the State water quality is degraded by nonpoint pollution generated by row crop agriculture. Silt loads and turbidity are consistently very high, thus causing degradation to the aquatic life contained in these streams. Bayou Bartholomew also recorded the highest level of the pesticide metolachlor of any station sampled during the reporting period.

Mercury contamination of fish tissue in 42.9 miles of Bayou Bartholomew and 16.8 miles of Cutoff Creek is limiting fish consumption in this basin. The source of the mercury contamination is unknown. Figures SW-2B-1 and SW-2B-2 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 2C - Saline River and Tributaries

Segment 2C is located in south central Arkansas and covers parts of Saline, Garland, Hot Spring, Grant, Jefferson, Cleveland, Lincoln, Drew, Bradley and Ashley Counties. This segment contains the Saline River drainage system from its headwaters in the Ouachita Mountains to its confluence with the Ouachita River. The principal tributaries are Hurricane Creek, Hudgins Creek and Derrieusseaux Creek. Dominant land use activities includes silviculture with some confined animal operations. Resource extraction also occurs throughout the basin.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation, and public, industrial and agricultural water supplies. Slightly over one-half of the total stream miles within this segment are designated as extraordinary resource waters. This includes the Saline River and its primary headwater tributaries. Monitored data were used to assess 271.5 miles of stream and another 224.7 miles were evaluated. Total stream miles within the segment are 532.1 of which 506.2 were assessed within this process. Monitoring data indicate that 83.8 miles of stream are not meeting the public water supply use due to excessive mineral content. Mineral content (chlorides, sulfates, other dissolved minerals) originates in this basin from open pit bauxite mines mostly owned by Alcoa, Inc. and Reynolds Metals, Inc.

A fish consumption advisory has been placed on 89.9 miles of the Saline River because of mercury contamination. The source is unknown. Figures SW-2C-1 and SW-2C-2 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 2D - Lower Ouachita River and Tributaries

Segment 2D occupies the south central part of Arkansas, covering all of Calhoun County, large portions of Bradley, Dallas, Ouachita and Union Counties and smaller areas of Ashley, Cleveland, Columbia and Nevada Counties. Segment 2D encompasses the lower Ouachita River and its tributaries from the confluence of the Little Missouri and Ouachita Rivers to the Louisiana state line. The major tributaries are Moro Creek, L'Aigle Creek, Lapile Creek, Champagnolle Creek and Smackover Creek. Land use activities in this segment are dominated by silviculture, but some confined animal operations and resource extraction also occurs.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation, and public, industrial and agricultural water supplies. Topping the list of water quality problems in this basin is the fish consumption advisory on the Ouachita River. Both Dioxin and mercury contamination are the causes for the advisories below Felsenthal Dam. However, the majority of the Ouachita River, Champagnolle Creek and Moro Creek in this segment has fish consumption advisories due to mercury contamination. Jug Creek below Fordyce is severely degraded by discharges from a municipal wastewater treatment facility and perhaps other sources such as storm water runoff.

Smackover Creek still displays the same problems now that it did several decades ago. However, there has been significant improvement over the last five to ten years in the level of chlorides and total dissolved solids in this stream (Figure A-2D-1). A similar improvement can also be seen in Bayou De L'Outre (Figure A-2D-2). The oil, brine and bromine extraction industry has contributed point and nonpoint source contamination to waters in this segment for many years. Recent water quality improvements are likely a result of clean up of the extraction sites; improved storage, such as phasing out open pits; and better maintenance of transmission lines, e.g., repair and replacement of broken and leaking pipelines.

A fish consumption advisory has been placed on 66.3 miles of the Ouachita River, 20.0 miles of Champagnolle Creek and 12 miles of Moro Creek because of mercury contamination. The source is unknown. Figures SW-2D-1 and SW-2D-2 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 2E - Upper Cornie Bayou and Tributaries

Segment 2E is located in south central Arkansas and covers parts of Columbia and Union Counties. This segment includes the upper portions of Cornie Bayou and Little Cornie Bayou, which eventually flow into the Ouachita River in northern Louisiana. The two major tributaries are Beech Creek and Three Creeks. The dominant land use in this segment is silviculture, however there is a ever increasing confined animal operation usage, mainly poultry production. Oil and gas extraction activities also occur in the basin.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation and public, industrial and agricultural water supplies. From a total of 33.0 stream miles within this segment, 15.0 miles were assessed using monitored data. The water quality within this basin has been improving. There were no chloride violations the last two years for the first time since this Department began monitoring this basin. The oil industry has ceased discharging salt water almost entirely in this basin.

Segment 2F - Ouachita River and Tributaries: Headwaters to its Confluence with the Little Missouri River

Segment 2F, located in west central Arkansas, covers most of Hot Spring, Garland and Montgomery Counties, portions of Clark, Dallas, Pike, Polk and Yell Counties, and very small areas of Scott and Perry Counties. This segment consists of a 220-mile reach of the Ouachita River and a 70-mile reach of the Caddo River. Principal tributaries include the South Fork of the Ouachita River, Mazarn Creek, L'Eau Frais Creek and Irons Fork Creek. Segment 2F contains three major impoundments of the Ouachita River: Lake Ouachita, Lake Hamilton and Lake Catherine, and DeGray Reservoir, an impoundment of the Caddo River.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation and public, industrial and agricultural water supplies. Approximately 36 percent of the waters within this segment are designated as extraordinary resource waters. Water quality in basin 2F is generally good and trends seem to indicate it is still improving. Major rivers in the basin, such as the Caddo, South Fork of the Caddo, and the Ouachita above the lake are all improving or holding steady, which is encouraging. Occasional peaks in bacteria levels and turbidity occur during increased runoff. Figure SW-2F-1 displays selected water quality data from a selected water quality monitoring station within this planning segment.

Segment 2G - Little Missouri River and Antoine River

Segment 2G, located in the southwestern part of the State, covers most of Nevada and Pike Counties, large areas of Clark and Hempstead Counties, and small portions of Ouachita, Howard, Polk and Montgomery Counties. This segment encompasses the entire drainage area of the Little Missouri River with its major tributaries, the Antoine River, Muddy Fork, Caney Creek, Terre Noire Creek and Terre Rouge Creek. Dominant land use activities include silviculture and confined animal operations, mostly poultry and swine. Pasture lands for waste application and cattle grazing is also prevalent. Resource extraction for gravel both in-stream and open pit also occurs. There are two large impoundments in the segment, Lake Greeson and White Oak Lake.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation and public, industrial and agricultural water supplies. Approximately 17 percent of the waters within this segment are designated as extraordinary resource waters. This segment contains a total of 427.5 stream miles, of which 321.6 are being assessed. Monitoring data were used to assess 193.6 miles of stream and the remaining 128.0 miles were evaluated. All assessed stream reaches in the basin are meeting all uses and water quality criteria, except for periodic high values of turbidity in the lower Little Missouri River. Figure SW-2G-1 displays selected water quality data from a selected water quality monitoring station within this planning segment.

Figure SW-2A-1

BFR01

BOEUF RIVER A HWY 278 4 MI. W. OF CHICOT

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	8.06	7	10.20	6.40	1.13
pH	7.72	7	8.22	7.35	0.27
TSS mg/l	75.72	9	197.00	23.00	60.17
NO2+NO3-N mg/l	0.61	7	1.12	0.13	0.32
Tot. Phos. mg/l	0.33	8	0.58	0.16	0.17
Tot. Org. C mg/l	9.52	6	11.30	6.80	1.61
T.Hardness mg/l	137.78	9	386.00	48.00	108.54
Chloride mg/l	56.56	9	199.00	17.00	56.98
TDS mg/l	316.89	9	757.00	200.00	171.69
Turbidity NTU	120.33	9	340.00	18.00	111.61
Fecal Coliform col/100ml		9	>1678	60	1(1)

Figure SW-2A-2

BYM01

BAYOU MACON AT HWY 65 NR. EUDORA

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	7.46	7	9.70	5.50	1.47
pH	7.56	7	8.14	7.05	0.32
TSS mg/l	139.80	10	814.00	9.00	238.87
NO2+NO3-N mg/l	0.43	10	2.38	0.04	0.70
Tot. Phos. mg/l	0.36	9	1.19	0.17	0.32
Tot. Org. C mg/l	9.03	7	12.80	6.80	2.13
T.Hardness mg/l	104.30	10	145.00	55.00	32.26
Chloride mg/l	16.86	10	34.00	8.00	6.93
TDS mg/l	194.10	10	236.00	151.00	25.14
Turbidity NTU	110.80	10	660.00	19.00	197.20
Fecal Coliform col/100ml		8	>1200	64	4(1)

Figure SW-2B-1

BYB01

BAYOU BARTHOLOMEW AT HWY 82 NR THEBES

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	5.50	7	7.00	3.60	1.27
pH	7.02	7	7.42	6.59	0.32
TSS mg/l	12.78	9	23.00	4.00	6.12
NO2+NO3-N mg/l	0.19	9	0.46	0.05	0.13
Tot. Phos. mg/l	0.18	8	0.27	0.09	0.06
Tot. Org. C mg/l	9.45	6	14.10	7.00	2.61
T.Hardness mg/l	50.57	9	113.00	20.00	37.76
Chloride mg/l	13.06	9	28.00	3.00	9.23
TDS mg/l	122.11	9	179.00	79.00	33.04
Turbidity NTU	31.22	9	58.00	12.00	15.12
Fecal Coliform col/100ml		9	155	14	0(0)

Figure SW-2B-2

OUA13

BAYOU BARTHOLOMEW NEAR JONES LA

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/	I6.33	31	9.50	4.20	1.42
pH	7.17	32	7.88	5.96	0.45
TSS mg/l	36.94	33	205.00	4.00	38.38
NO2+NO3-N mg/l	0.26	34	1.11	0.03	0.21
Tot. Phos. mg/l	0.27	32	1.53	0.05	0.25
Tot. Org. C mg/l	9.52	32	26.10	4.70	3.67
T.Hardness mg/l	52.01	35	127.00	14.00	32.93
Chloride mg/l	2.09	3	32.00	3.00	7.55
TDS mg/l	136.71	34	207.00	91.00	32.98
Turbidity NTU	60.93	36	265.00	7.60	53.40
Fecal coliform col/100 ml		16	460	28	1(0)

Figure SW-2C-1

OUA116

HURRICANE CREEK-HWY 270 BRIDGE NEAR SHERIDAN

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	7.42	33	12.40	3.20	2.42
pH	6.47	33	6.88	5.72	0.25
TSS mg/l	7.87	31	28.00	1.00	7.54
NO2+NO3-N mg/l	0.18	29	0.50	0.03	0.11
Tot. Phos. mg/l	0.06	17	0.10	0.03	0.03
Tot. Org. C mg/l	6.89	32	12.50	3.10	2.56
T.Hardness mg/l	91.42	34	259.00	27.00	64.52
Chloride mg/l	7.14	34	13.00	3.00	2.47
TDS mg/l	337.46	34	882.00	106.00	226.29
Turbidity NTU	14.73	35	190.00	1.30	31.51

Figure SW-2C-2

OUA31

HURRICANE CREEK NEAR SARDIS ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	8.45	33	13.10	5.10	1.75
pH	6.64	33	8.33	5.81	0.55
TSS mg/l	20.97	30	200.00	1.00	42.07
NO2+NO3-N mg/l	0.32	33	1.18	0.07	0.25
Tot. Phos. mg/l	0.09	19	0.27	0.04	0.07
Tot. Org. C mg/l	5.52	33	11.70	1.30	2.38
T.Hardness mg/l	139.31	34	652.00	48.00	117.32
Chloride mg/l	9.14	32	52.00	3.00	8.25
TDS mg/l	470.65	34	1214.00	114.00	296.73
Turbidity NTU	27.08	33	230.00	0.30	51.36

Figure SW-2D-1

OUA05

BAYOU DELOUTRE NEAR EL DARADO ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	5.87	31	10.10	2.60	1.54
pH	7.17	32	7.91	6.33	0.42
TSS mg/l	6.94	33	18.00	2.00	4.30
NO2+NO3-N mg/l	1.16	35	3.99	0.0	1.10
Tot. Phos. mg/l	0.15	31	0.92	0.04	0.16
Tot. Org. C mg/l	13.25	32	29.00	6.10	5.30
T.Hardness mg/l	62.44	35	125.00	23.00	25.27
Chloride mg/l	146.00	33	344.00	40.00	63.05
TDS mg/l	485.41	34	818.00	140.00	185.03
Turbidity NTU	8.15	36	20.00	2.50	3.81

Figure SW-2D-2

OUA27

SMACKOVER CREEK N OF SMACKOVER ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	5.93	31	10.70	3.00	1.64
pH	6.87	32	7.89	5.90	0.51
TSS mg/l	10.36	35	32.00	2.00	6.32
NO2+NO3-N mg/l	0.15	30	0.42	0.02	0.11
Tot. Phos. mg/l	0.07	29	0.13	0.03	0.03
Tot. Org. C mg/l	11.57	33	27.60	5.10	4.79
T.Hardness mg/l	43.91	34	85.00	14.00	17.92
Chloride mg/l	88.70	35	200.00	21.00	39.03
TDS mg/l	224.16	35	410.00	102.00	69.13
Turbidity NTU	13.52	36	26.00	4.50	5.61

Figure SW-2F-1

OUA21

OUACHITA RIVER NEAR MT. IDA ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	9.88	31	10.90	8.70	0.65
pH	7.18	32	7.67	6.38	0.25
TSS mg/l	3.75	30	12.00	1.00	2.86
NO2+NO3-N mg/l	0.14	27	0.52	0.02	0.11
Tot. Phos. mg/l	0.04	15	0.07	0.03	0.01
Tot. Org. C mg/l	3.83	33	6.80	1.80	1.17
T.Hardness mg/l	20.56	33	46.00	10.00	6.01
Chloride mg/l	2.32	35	5.00	1.00	0.73
TDS mg/l	42.15	34	64.00	30.00	8.41
Turbidity NTU	6.55	34	46.00	1.90	8.35
Fecal coliform col/100 ml		15	2300	4	4(1)

Figure SW-2G-1

OUA35

LITTLE MISSOURI RIVER NEAR BOUGHTON ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	8.15	31	9.80	4.40	1.33
pH	6.91	33	8.68	5.81	0.50
TSS mg/l	19.66	34	200.00	3.00	37.10
NO2+NO3-N mg/l	0.14	31	0.36	0.03	0.09
Tot. Phos. mg/l	0.08	29	0.20	0.03	0.04
Tot. Org. C mg/l	5.18	33	11.60	2.60	2.39
T.Hardness mg/l	22.56	33	45.00	8.00	8.31
Chloride mg/l	3.58	34	9.00	2.00	1.10
TDS mg/l	57.00	34	95.00	35.00	16.55
Turbidity NTU	18.79	35	100.00	3.00	21.46

Table SW-3

Summary of NPS Impaired Water bodies in the Ouachita River Basin

STREAM NAME	H.U.C.	REACH	MILES	STATION	ASSESSED	FISH CONSUM	AQUATIC LIFE	SWIMNG	SEC. CONTACT	DRINKING WATER	AGRI & INDSTRY	MAJOR SOURCE	MINOR SOURCE	MAJOR CAUSE	MINOR CAUSE
Seg 2A															
Boeuf River	8050001	-018	49.4	OUA15A	M	S	N	N	S	N	S	AG		SI	NU
Boeuf River	8050001	-019	58.1	BFR01	M	S	N	S	S	N	S	AG		SI	NU
Big Bayou	8050001	-022	27.1	BGB01,+	M	S	N	N	S	N	S	AG		SI	PA
Cypress Creek	8050001	-020	47.5		E	S	N	S	S	N	S	AG		SI	NU
Choctaw Bayou	8050001	-021	58.9		E	S	N	S	S	N	S	AG		SI	NU
Macon Bayou	8050002	-003	80.5	BYM01	M	S	N	S	S	N	S	AG		SI	NU
Ditch Bayou	8050002	-004	4.0		E	S	N	S	S	N	S	AG		SI	NU
Macon Bayou	8050002	-006	38.6		E	S	N	S	S	N	S	AG		SI	NU
Clay Ditch	8050002	-007	24.3		E	S	N	S	S	N	S	AG		SI	NU
Boggy Creek	8050002	-009	12.0		E	S	N	S	S	N	S	AG		SI	NU
Oak Log Creek	8050002	-010	48.4		E	S	N	S	S	N	S	AG		SI	NU
Red Fork Creek	8050002	-008	17.0		E	S	N	S	S	N	S	AG		SI	NU
NPS Impacted			465.8												
Seg 2B															
B. Bartholomew	8040205	-001	60.1	OUA13	M	S	S	P	S	S	S	AG		SI	
B. Bartholomew	8040205	-002	17.9	BYB01	M	P	P	S	S	S	S	AG	UN	SI	HG
B. Bartholomew	8040205	-006	82.3	OUA33	M	S	S	N	S	S	S	AG		PA	SI
Deep Bayou	8040205	-005	28.9		E	S	P	S	S	S	S	AG		SI	
B. Bartholomew	8040205	-012	82.7	BYB02	M	S	P	N	S	S	S	AG		SI	PA
B. Bartholomew	8040205	-012	25.0		M	P	P	S	S	S	S	AG	UN	SI	HG
B. Bartholomew	8040205	-013	33.9	BYB03	M	S	P	N	S	S	S	AG		SI	PA
NPS Impacted			330.8												
Seg 2C															
Hurricane Cr.	8040203	-004	19.5	OUA116	M	S	P	S	S	N	S	RE		MN	
Hurricane Cr.	8040203	-006	30.8	OUA31	M	S	N	S	S	N	S	RE		MN	
Lost Creek	8040203	-008	33.5		E	S	P	S	S	N	S	RE		MN	
NPS Impacted			83.8												

continued

Table SW-3 (continued)

Summary of NPS Impaired Waterbodies in the Ouachita River Basin

STREAM NAME	H.U.C.	REACH	MILES	STATION	ASSESSED	FISH CONSUM	AQUATIC LIFE	SWIMNG	SEC. CONTACT	DRINKING WATER	AGRI & INDSTRY	MAJOR SOURCE	MINOR SOURCE	MAJOR CAUSE	MINOR CAUSE
continued															
Seg 2D															
B. De L'Outre	8040202	-006	32.4	OUA05	M	S	P	S	S	N	S	RE	MP	MN	NU
Smackover Cr.	8040201	-006	14.8	OUA27	M	S	P	S	S	S	S	RE		MN	
Smackover Cr.	8040201	-007	29.1		E	S	P	S	S	S	S	RE		MN	
NPS Impacted			76.3												
Seg 2E															
None															
Seg 2F															
Ouachita River	8040101	-033	11.9	OUA21	M	S	S	P	S	S	S	AG		PA	
Prairie Creek	8040101	-048	10.0	OUA40	M	S	N	S	S	S	S	MP	RC	NU	
NPS Impacted			21.9												
Seg 2G															
L. Missouri R.	8040103	-008	19.6	OUA35	M	S	P	S	S	S	S	AG		SI	
Basin Stream Miles			2786.6												
Miles Evaluated			1040.1												
Miles Monitored			1535.5												
NPS Impacted			1976.8												

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ARKANSAS RIVER BASIN (3)

The Arkansas River originates in the Rocky Mountains in Colorado and flows eastward through Colorado, Kansas, Oklahoma and Arkansas. The river traverses some 1450 miles before discharging to the Mississippi River on the southeastern border of Arkansas south of Helena. The Arkansas River drainage basin is approximately 160,533 square miles, 11,180 of which are in Arkansas.

The main stem of the Arkansas traverses some 310 river miles across Arkansas from Van Buren to Helena. Most of the rivers' major tributaries enter the river upstream of the Arkansas-Oklahoma border. Tributaries in Arkansas to the river are the Illinois River, Poteau River, Lee Creek, Frog Bayou, Mulberry River, Illinois Bayou, Piney Creek, Cadron Creek, Bayou Meto, Petit Jean River, Fourche La Fave River, and the Maumelle River. The river flows through the Arkansas River Valley ecoregion in Arkansas and drains portions of the Ouachita Mountian ecoregion, Boston Mountains ecoregion and the Delta ecoregion.

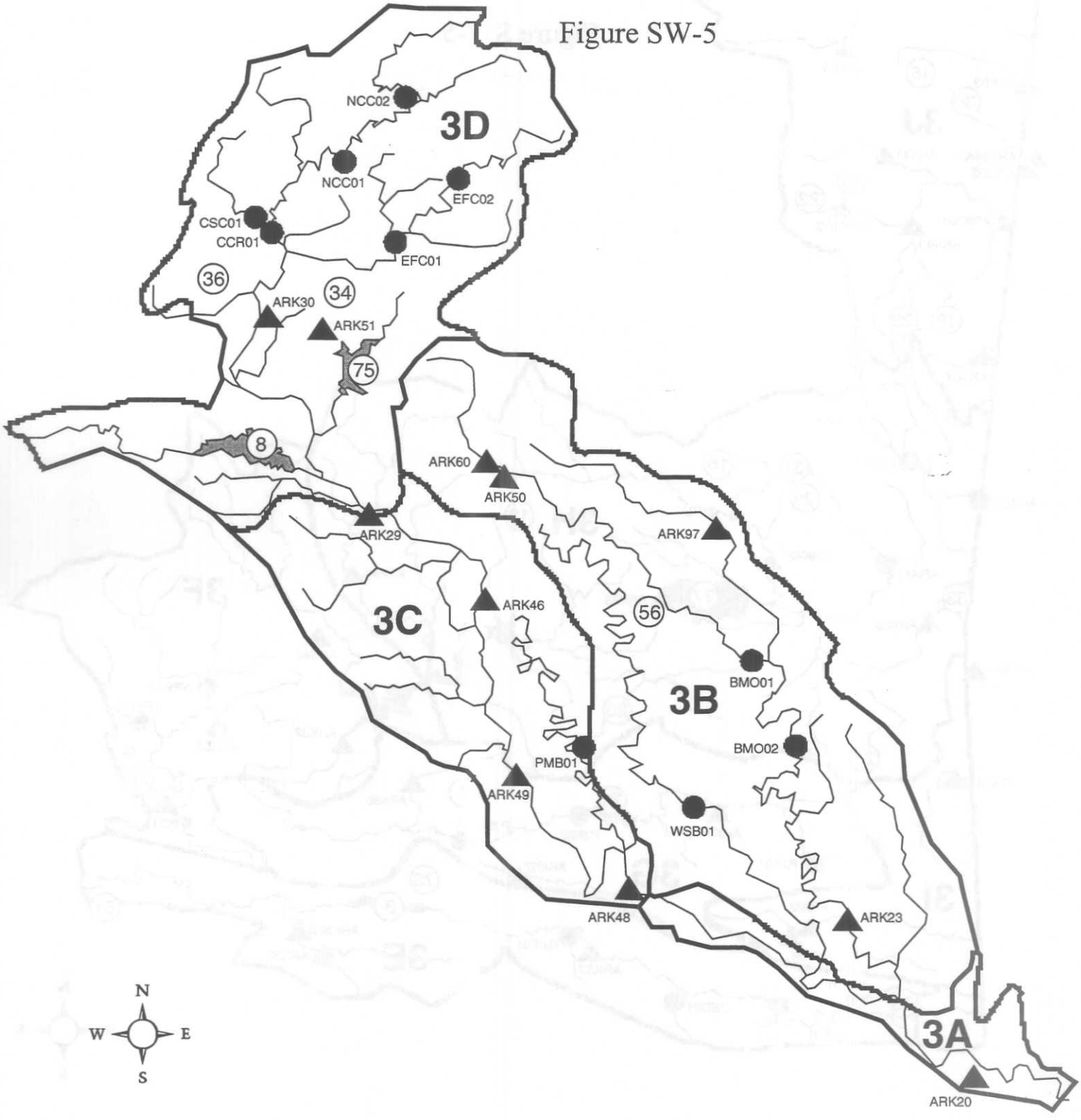
Land use in the Arkansas portion of the drainage basin is dominated by agriculture, mainly row crop. There is a large forestry land use located mainly in the headwaters of the tributaries and owned mostly by the National Forest. Confined animal operations and pasture lands are also located throughout the drainage basin. Resource extraction occurs in the forms of sand and gravel removal and mineral mining. Recreational activities occur mainly in the tributaries as primary contact and in the larger waterbodies as secondary contact. The largest urban contributions come from the metropolitan areas of Van Buren/Fort Smith, Little Rock/North Little Rock and Pine Bluff, however these compose only a small percentage of the overall land use.

There are 22 publicly-owned lakes within the Arkansas River drainage basin in Arkansas. A list of these lakes and their water quality status can be found in the Clean Lakes section of the report.

Figure SW-5 is a map of the Arkansas River basin in Arkansas Depicting the Ambient Water Quality Monitoring Stations, the Quarterly monitoring stations used in this survey, and the significant publicly-owned lakes.

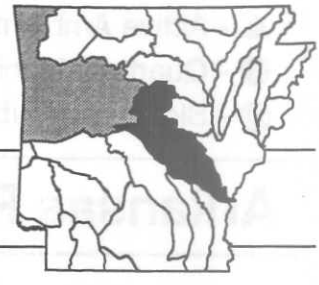
Table SW-4 lists the Arkansas River segments, the status of their current designated uses attainments, and a lists of probable causes and possible sources of those waterbody segments not fully meeting their assigned designated use

Figure SW-5



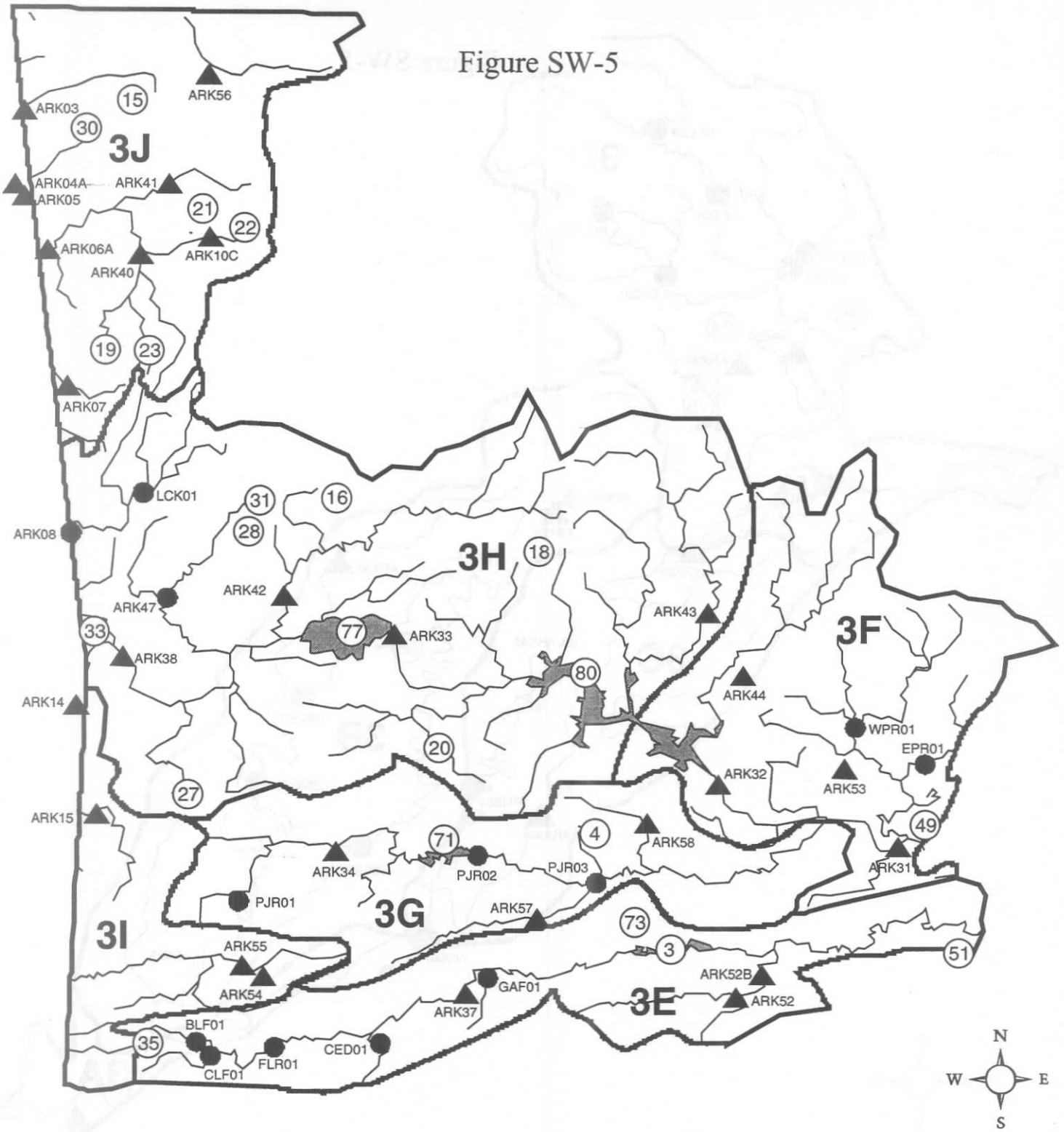
▲ - Active Ambient Monitoring Stations
● - Quarterly Monitoring Stations
⑩ - Significant Publicly-Owned Lakes

(3A, B, C & D)



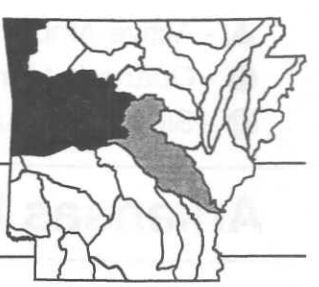
Arkansas River Basin Planning Segments

Figure SW-5



▲ - Active Ambient Monitoring Stations
● - Quarterly Monitoring Stations
⑩ - Significant Publicly-Owned Lakes

(3E, F, G, H, I & J)



Arkansas River Basin Planning Segments

Segment 3A - Lower Arkansas River

Segment 3A, located in the southeastern part of the State, includes small portions of Desha, Lincoln, Jefferson and Arkansas Counties. The water quality in this last 52-mile segment of the main stem of the Arkansas River is a result of contributions from upstream segments rather than discharges within the segment.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation and public, industrial and agricultural water supplies. Monitoring data was used to assess 52.2 stream miles within this segment and the remaining 32.7 stream miles were evaluated. The data indicate that all designated uses are being maintained.

Segment 3B - Bayou Meto and Tributaries

Segment 3B is located in the east central portion of Arkansas and includes a major portion of Lonoke County, as well as parts of Arkansas, Jefferson, Faulkner, Pulaski and Prairie Counties. Bayou Meto and its tributaries comprise the major surface water resource in the segment. Major tributaries include Bayou Two Prairie, Mill Bayou, Salt Bayou and Wabbaseka Bayou.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation and public, industrial and agricultural water supplies. This segment contains a total of 344 stream miles, of which the majority are being assessed. This report uses monitoring data from four monthly and two quarterly stations to assess 293.4 miles of stream. The monitoring data from these stations was also used to evaluate an additional 4.3 miles of streams. The remaining 46.3 miles of stream were unassessed.

The upper reach of Bayou Meto is under a fish consumption advisory due to the presence of dioxin in fish tissue. Frequent turbidity violations have resulted in declaring the majority of Bayou Meto as only partially supporting the aquatic life use. Some segments also have elevated bacteria numbers. Bayou Two Prairie was also assessed as partially meeting the aquatic life use. This stream reflects both point and non-point source inputs. Some of the waters within this planning segment have been listed as partially supporting the primary contact use due to the presence of fecal coliform bacteria. Figures SW-3B-1 and SW-3B-2 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 3C - Arkansas River and Tributaries: Lock and Dam No. 4 to Lock and Dam No. 7

Segment 3C is located in central Arkansas and covers large portions of Pulaski and Jefferson Counties as well as small areas of Grant, Saline and Lonoke Counties. The Arkansas River, with its tributaries, is the major surface water resource in this segment. The principal tributary within this segment is Plum Bayou, and Lake Pine Bluff is the largest impoundment.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation and public, industrial and agricultural water supplies. This planning segment contains a total of 223.4 stream miles, and 136 miles are being assessed. Four monitoring stations are located on the main stem of the Arkansas River which provides monitored data for 52.2 miles of the river. An additional 15.4 miles of the Arkansas River were evaluated. The remaining 87.4 miles within this planning segment were unassessed.

Although occasional high turbidity values continue to occur in the Arkansas River within this planning segment, the value and frequency of occurrence were much lower than during the previous assessment period. This may be due to lower magnitudes and frequency of storm events during the past two years. As a result, the Arkansas River was assessed as supporting all designated uses; however, only limited bacteria data was available.

Segment 3D - Arkansas River and Tributaries: Lock and Dam No. 7 to Morrilton

Segment 3D, located in upper central Arkansas, covers most of Faulkner County as well as portions of Conway, Cleburne, White, Perry, Pulaski, Saline and Van Buren Counties. This segment includes a 35-mile reach of the Arkansas River from Lock & Dam No. 7 upstream to Morrilton. The principal tributaries include the Maumelle River, Cadron Creek and Palarm Creek. The major impoundments within Segment 3D include Lake Maumelle and Lake Conway.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation and public, industrial and agricultural water supply. This planning segment contains a total of 346.5 stream miles, of which 143.5 stream miles were monitored. One of the monitoring stations is located on Stone Dam Creek which is tributary to Lake Conway. Current monitoring data on Stone Dam Creek indicates acute toxicity to aquatic life due to the discharge of high ammonia concentrations from the City of Conway POTW. In addition, very high levels of nutrients are being discharged from this

facility. Cypress Creek, below the City of Conway water supply reservoir, had frequent low D.O. values. The stream was often "pooled" with little or no flow. This is likely the result of the modified hydrology of the stream by the upstream reservoir.

Segments of the East Fork Cadron Creek and Cadron Creek had frequently elevated bacteria levels which impaired the primary contact designated use. The source of this contaminant may have been from agriculture activities within the watershed. This includes numerous dairy farms. Figures SW-3D-1 and SW-3D-2 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 3E - Fourche LaFave River

Segment 3E, located in west central Arkansas, includes portions of Perry, Yell, Polk, Scott and Saline Counties. This segment contains a 148-mile reach of the Fourche LaFave River and its tributary streams, which include Big Cedar Creek, Mill Creek, Gafford Creek and South Fourche LaFave River. Major impoundments in this segment are Nimrod Lake (formed by a dam on Fourche LaFave River), and Harris Brake Lake.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation and public, industrial and agricultural water supplies. All 211.5 stream miles in this segment were assessed. Both monthly and quarterly sampled stations were used to monitor 116.4 miles of stream. The remaining 95.1 miles were evaluated. Throughout much of this planning segment the aquatic life use is shown as partially supporting due to chronic turbidity readings which exceed the standard. Although no site specific studies have been performed, the major causes are being divided between agriculture and silviculture which are two of the main land uses within the watershed. However, the construction and maintenance of an abundance of dirt and gravel roads for timber access and general transportation is likely causing much of the water quality problems.

A statewide sampling effort has determined that fish from Lake Nimrod and the Fourche LaFave River below Nimrod Dam have elevated concentrations of mercury. Both of these water bodies are currently listed in a state health advisory for fish consumption. Figures SW-3E-1 and SW-3E-2 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 3F - Arkansas River, Miles 160-209

Segment 3F is located in the central portion of Arkansas and covers parts of Conway, Perry, Pope, Yell, Van Buren, Logan, and Searcy Counties. This segment contains the Arkansas River and its tributaries from mile 160 to mile 209. The principal tributaries are the East and West Forks of Point Remove Creek, Illinois Bayou, Overcup Creek and Gum Log Creek. The lower reach of Lake Dardanelle is the only large impoundment in the segment.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation and public, industrial and agricultural water supplies. This segment contains a total of 346.3 streams miles. Five monitoring stations within this segment allow assessment of 93 streams miles with an additional 99.2 miles of stream being evaluated. The remaining stream segments were unassessed.

Although the station on Illinois Bayou shows occasional very high turbidity values, the frequency of occurrence is not as great as in past years. This may be a reflection of the climatological conditions over the last two years which was much below normal in rainfall and heavy storm runoff. For the current assessment period this waterbody was assessed as meeting all designated uses.

Whig Creek and White Oak Creek continue to be impaired by point source discharges. Both municipal and industrial discharges exist in Whig Creek. A municipal and industrial discharge also existed in White Oak Creek, however both were supposedly eliminated. Water quality data indicates continuing discharges into White Oak Creek.

Segment 3G - Petit Jean River and Tributaries

Segment 3G, located in west central Arkansas, includes portions of Yell, Conway, Perry, Logan, Sebastian, Franklin and Scott Counties. This segment includes the entire length of the Petit Jean River and its tributary streams. Major tributaries include Dutch Creek, Spring Creek, Chickalah Creek and Rose Creek. Blue Mountain Lake, formed by damming the Petit Jean River, is the largest impoundment in the segment.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation and public, industrial and agricultural water supply. This planning segment contains 198.5 stream miles. Monitoring data were utilized to assess 108.2 stream miles. An additional 8.7 stream miles were evaluated. The remaining stream miles within this segment did not have adequate information for assessment and are therefore listed as unassessed. Within this planning segment, 68.8 stream miles have been listed as only partially supporting the aquatic life use. The cause is excessive turbidity values. Much of the watershed of these impaired streams is used for agriculture activities (primarily pasture land) and timber harvest. These activities are the likely source of the contaminants. Figures SW-3G-1 and SW-3G-2 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 3H - Arkansas River and Tributaries: State Line to River Mile 210

Segment 3H, located in the lower portion of the northwest quarter of Arkansas, includes most of Crawford, Franklin and Johnson Counties, as well as parts of Sebastian, Logan, Pope, Newton, Madison and Washington Counties. This segment contains a 99-mile reach of the Arkansas River from the Oklahoma state line to the upper end of Lake Dardanelle. Major tributaries in this reach include Big Piney Creek, Lee Creek, Mulberry River, Six Mile Creek and Vache Grasse Creek.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation and public, industrial and agricultural water supply. Eight monitoring stations are located within this segment and were utilized to assess 110.3 miles of stream segments. An additional 181.8 stream miles were evaluated, and the remainder were unassessed. A 14.9 mile segment of Short Mountain Creek was assessed as not supporting primary contact and secondary contact uses due to a municipal discharge. The lower segments of the Mulberry River and several segments of Piney Creek were assessed as partially supporting the aquatic life use due to chronic turbidity values which exceed the standard. Land clearing for pastures has been extensive in the lower sections of these watersheds. Figures SW-3H-1, SW-3H-2, SW-3H-3, and SW-3H-4 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 3I - Poteau River

Segment 3I is located on the western edge of Arkansas, just south of the Arkansas River. This segment includes large portions of Scott and Sebastian Counties and a small part of northwestern Polk County. The waters of this segment include the Poteau River from its headwaters to the Oklahoma state line, as well as the tributary streams. Major tributaries include Jones Creek and James Fork.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation and public, industrial and agricultural water supplies. This planning segment contains 105.3 stream miles. Four monitoring stations are located within this segment and were utilized to assess 39.8 stream miles. An additional 16 streams miles were evaluated and the remainder were listed as unassessed. All the waters which were assessed within this segment were listed as not supporting or partially supporting the aquatic life use, except for the Poteau River above Waldron. This was due to excessive turbidity

readings during high flow events. The Poteau River below Waldron is listed as not supporting or partially supporting the primary and secondary contact use due to excessive bacteria levels. This segment is also not fully supporting the aquatic life use due to siltation, excessive nutrients and high metals concentrations. The sources of these contaminants are agriculture activities, a municipal and an industrial discharge. Figures SW-3I-1 and SW-3I-2 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 3J - Grand Neosho Basin

Segment 3J occupies the northwestern corner of Arkansas, and covers most of Benton County and a large part of Washington County. This segment includes the Illinois River and its tributaries within Arkansas. The main tributaries are Osage Creek, Spavinaw Creek, Little Sugar Creek, Flint Creek and Spring Creek.

Summary of NPS Water Quality Conditions

The waters within this segment have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation and public, industrial and agricultural water supplies. This segment contains 197.7 stream miles. Ten monitoring stations are located within this planning segment and were utilized to assess 96.7 stream miles. An additional 101 stream miles were evaluated. The majority of waters within this segment are shown to only partially support the aquatic life use due to elevated nutrients and chronic turbidity accedences. This impairment is primarily caused from pasture land that is also used for application of poultry waste products. In addition, in-stream gravel removal is de-stabilizing the stream banks and causing excessive bank erosion. Road construction and maintenance is also contributing to significant siltation problems. Figures SW-3J-1 and SW-3J-2 display selected water quality data from selected water quality monitoring stations within this planning segment.

A municipal point source discharge is impairing the aquatic life use and the drinking water use in Town Branch from excessive nutrient discharges.

Figure SW-3B-1

WSB01

WABBASEKA BAYOU AT HWY 79 AT WABBASEKA

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	4.98	6	8.60	2.00	2.43
pH	7.12	5	7.70	6.03	0.65
TSS mg/l	16.57	7	33.00	6.00	8.26
NO2+NO3-N mg/l	0.54	8	1.12	0.10	0.37
Tot. Phos. mg/l	0.35	9	0.64	0.17	0.14
Tot. Org. C mg/l	8.60	6	10.40	6.40	1.32
T.Hardness mg/l	100.56	9	260.00	52.00	66.44
Chloride mg/l	22.50	9	66.00	10.00	17.92
TDS mg/l	193.78	9	391.00	123.00	81.18
Turbidity NTU	65.68	9	204.00	4.10	69.98
Fecal Coliform col/100 ml		9	>600	46	3(2)

Figure SW-3B-2

ARK97

BAYOU TWO PRAIRIE @ HWY 13 S. OF CARLISLE ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	6.60	34	12.00	3.50	2.15
pH	6.90	34	7.54	6.36	0.35
TSS mg/l	25.28	34	117.00	3.00	21.56
NO2+NO3-N mg/l	0.50	32	4.94	0.04	0.85
Tot. Phos. mg/l	0.67	33	5.24	0.13	0.96
Tot. Org. C mg/l	11.48	32	20.50	7.00	3.34
T.Hardness mg/l	70.06	34	168.00	12.00	35.16
Chloride mg/l	24.07	33	60.00	4.00	15.21
TDS mg/l	163.24	34	291.00	74.00	58.32
Turbidity NTU	30.68	34	120.00	9.00	21.58

Figure SW-3D-1

EFC01

EAST FORK CADRON CR @ HWY 287 3 MI SE GREENBRIER

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	6.28	8	11.20	2.00	3.61
pH	6.91	8	8.34	5.90	0.77
TSS mg/l	12.44	9	24.00	5.00	8.04
NO2+NO3-N mg/l	0.26	8	0.52	0.05	0.17
Tot. Phos. mg/l	0.07	8	0.10	0.04	0.02
Tot. Org. C mg/l	5.32	9	8.80	1.90	2.50
T.Hardness mg/l	15.79	9	33.00	11.00	7.60
Chloride mg/l	4.04	9	5.00	3.00	0.70
TDS mg/l	47.78	9	67.00	31.00	11.41
Turbidity NTU	17.09	8	38.00	8.70	9.78
Fecal Coliform col/100 ml		8	>600	31	2(2)

Figure SW-3D-2

CCR01

CADRON CREEK AT CO. RD. 5 MI. W. OF WOOSTER

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	7.47	8	12.90	3.30	2.93
pH	6.87	8	8.10	6.35	0.58
TSS mg/l	19.56	9	63.00	2.00	17.75
NO2+NO3-N mg/l	0.40	7	0.81	0.03	0.26
Tot. Phos. mg/l	0.11	8	0.23	0.07	0.05
Tot. Org. C mg/l	5.84	9	12.00	2.30	3.34
T.Hardness mg/l	18.30	9	46.00	10.00	11.24
Chloride mg/l	5.93	9	14.00	3.00	3.44
TDS mg/l	54.44	9	88.00	33.00	21.18
Turbidity NTU	25.48	8	90.00	7.80	26.70
Fecal Coliform col/100 ml		8	966	10	1(1)

Figure SW-3E-1

BLF01

BLACK FORK AT TAR 3.5 MI AB CLEAR FORK 10 MI W. OF BOLES

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	8.51	8	10.70	7.30	1.13
pH	7.04	6	7.17	6.81	0.14
TSS mg/l	2.75	8	5.00	1.00	1.10
NO2+NO3-N mg/l	0.08	6	0.18	0.02	0.07
Tot. Phos. mg/l	0.05	3	0.05	0.04	0.01
Tot. Org. C mg/l	3.81	9	5.70	1.60	1.60
T.Hardness mg/l	11.26	9	16.00	8.00	2.80
Chloride mg/l	3.25	8	4.00	3.00	0.35
TDS mg/l	41.06	9	60.00	33.00	8.41
Turbidity NTU	18.24	8	35.00	6.20	9.68
Fecal Coliform col/100 ml		8	>240	3	0(0)

Figure SW-3E-2

GAF01

GAFFORD CREEK AT HWY 28 NR BLUFFTON

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	9.26	8	11.40	7.70	1.43
pH	6.84	8	7.63	6.45	0.44
TSS mg/l	3.42	6	10.00	1.00	3.83
NO2+NO3-N mg/l	0.09	7	0.20	0.03	0.07
Tot. Phos. mg/l	0.03	2	0.03	0.03	0.00
Tot. Org. C mg/l	2.73	8	3.70	1.80	0.68
T.Hardness mg/l	11.16	9	17.00	8.00	3.44
Chloride mg/l	2.32	8	4.00	2.00	0.60
TDS mg/l	39.11	9	50.00	31.00	6.21
Turbidity NTU	13.79	8	26.00	4.10	7.68
Fecal Coliform col/100 ml		9	144	0	0(0)

Figure SW-3G-1

PRJ02

PETIT JEAN RIVER AT HWY 309 NR. WAVELAND

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	8.98	8	13.10	5.90	2.42
pH	7.30	8	8.31	6.82	0.50
TSS mg/l	9.00	8	16.00	2.00	5.68
NO2+NO3-N mg/l	0.16	9	0.26	0.02	0.09
Tot. Phos. mg/l	0.07	7	0.08	0.04	0.01
Tot. Org. C mg/l	5.00	9	6.80	3.20	1.31
T.Hardness mg/l	15.47	9	20.00	12.00	2.55
Chloride mg/l	3.69	8	6.00	3.00	1.09
TDS mg/l	53.11	9	69.00	47.00	6.62
Turbidity NTU	23.81	8	45.00	7.30	12.88
Fecal Coliform col/100 ml		8	144	0	0(0)

Figure SW-3G-2

ARK58

CHICKALAH CREEK AT CHICKALAH ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	7.70	33	16.50	2.30	3.34
pH	6.75	31	7.74	5.88	0.41
TSS mg/l	11.44	34	110.00	1.001	8.98
NO2+NO3-N mg/l	0.35	34	0.90	0.02	0.22
Tot. Phos. mg/l	0.08	25	0.48	0.03	0.09
Tot. Org. C mg/l	3.94	31	12.10	1.40	2.50
T.Hardness mg/l	21.65	34	47.00	9.00	11.16
Chloride mg/l	4.19	35	10.00	2.00	1.68
TDS mg/l	53.68	34	99.00	39.00	13.7
Turbidity NTU	21.16	35	43.00	8.50	8.82

Figure SW-3H-1

ARK43

BIG PINEY CREEK AT HWY 164

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	9.22	33	16.50	3.10	2.69
pH	7.17	31	7.97	6.11	0.38
TSS mg/l	2.65	13	9.00	1.00	2.34
NO2+NO3-N mg/l	0.07	27	0.30	0.02	0.06
Tot. Phos. mg/l	0.04	5	0.07	0.03	0.01
Tot. Org. C mg/l	2.10	30	4.30	1.00	0.93
T.Hardness mg/l	19.92	34	29.00	13.00	4.23
Chloride mg/l	2.08	36	4.00	1.00	0.46
TDS mg/l	44.29	35	321.00	28.00	48.35
Turbidity NTU	6.91	36	33.00	1.20	6.72

Figure SW-3H-2

ARK42

MULBERRY RIVER AT INTERSTATE 40

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	6.84	30	9.80	4.70	1.51
pH	6.95	30	7.53	6.34	0.37
TSS mg/l	5.40	21	34.00	1.00	8.48
NO2+NO3-N mg/l	0.09	29	0.19	0.03	0.04
Tot. Phos. mg/l	0.05	13	0.10	0.03	0.02
Tot. Org. C mg/l	2.42	28	7.80	0.90	1.72
T.Hardness mg/l	17.87	30	144.00	8.00	24.28
Chloride mg/l	5.78	30	112.00	1.00	20.09
TDS mg/l	51.32	33	387.00	22.00	74.41
Turbidity NTU	10.15	32	54.00	1.80	10.41

Figure SW-3H-3

ARK47

FROG BAYOU AT RUDY ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	9.04	8	12.30	6.50	2.09
pH	7.34	7	8.41	6.68	0.58
TSS mg/l	7.38	8	12.00	2.00	3.29
NO2+NO3-N mg/l	0.30	9	0.57	0.04	0.20
Tot. Phos. mg/l	0.05	5	0.06	0.04	0.01
Tot. Org. C mg/l	2.69	8	4.20	1.10	1.04
T.Hardness mg/l	15.68	9	21.00	9.00	3.74
Chloride mg/l	2.89	8	5.00	2.00	0.87
TDS mg/l	45.67	9	68.00	31.00	11.01
Turbidity NTU	19.55	8	45.00	7.10	15.72
Fecal Coliform col/100 ml		9	1180	6	1(1)

Figure SW-3H-4

LCK01

LEE CREEK AT HWY 220 10 MI N. OF CENDARVILLE

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	9.20	8	12.80	6.50	2.08
pH	7.54	8	9.10	6.79	0.73
TSS mg/l	2.75	6	8.00	1.00	2.73
NO2+NO3-N mg/l	0.19	4	0.47	0.02	0.21
Tot. Phos. mg/l	0.05	3	0.06	0.04	0.01
Tot. Org. C mg/l	2.22	8	3.00	1.10	0.75
T.Hardness mg/l	25.73	9	34.00	20.00	5.74
Chloride mg/l	7.23	8	16.00	2.00	4.24
TDS mg/l	71.78	9	190.00	43.00	45.82
Turbidity NTU	9.73	8	22.00	3.20	6.95
Fecal Coliform col/100 ml		8	205	3	0(0)

Figure SW-3I-1

ARK 14

POTEAU RIVER NEAR FORT SMITH ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	6.50	32	9.70	4.30	1.38
pH	6.84	33	7.81	6.25	0.36
TSS mg/l	34.16	34	111.00	3.00	25.84
NO2+NO3-N mg/l	0.27	35	0.87	0.04	0.19
Tot. Phos. mg/l	0.13	34	0.25	0.06	0.04
Tot. Org. C mg/l	6.78	32	14.50	3.80	2.25
T.Hardness mg/l	50.09	31	115.00	16.00	26.43
Chloride mg/l	9.20	33	70.00	2.00	13.18
TDS mg/l	112.86	36	258.00	28.00	47.21
Turbidity NTU	51.56	35	150.00	4.60	28.09

Figure SW-3I-2

ARK15

JAMES FORK NEAR HACKET ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	6.46	30	9.50	4.40	1.31
pH	6.91	31	8.23	6.32	0.43
TSS mg/l	16.79	31	149.00	2.00	27.16
NO2+NO3-N mg/l	0.16	27	0.43	0.02	0.09
Tot. Phos. mg/l	0.10	31	0.60	0.03	0.10
Tot. Org. C mg/l	5.61	30	15.60	2.00	3.11
T.Hardness mg/l	61.17	29	170.00	6.00	48.92
Chloride mg/l	4.79	32	8.00	3.00	1.24
TDS mg/l	123.46	34	246.00	33.00	66.01
Turbidity NTU	26.57	33	110.00	3.90	27.92

Figure SW-3J-1

ARK06A

ILLINOIS RIVER NEAR SILOAM SPRINGS ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	9.82	32	17.60	5.00	2.65
pH	7.66	32	8.57	6.65	0.43
TSS mg/l	12.41	34	97.00	1.00	18.50
NO2+NO3-N mg/l	2.35	33	3.46	1.18	0.49
Tot. Phos. mg/l	0.21	32	0.37	0.10	0.09
Tot. Org. C mg/l	3.25	33	9.50	1.70	1.50
T.Hardness mg/l	118.87	34	158.00	56.00	20.48
Chloride mg/l	12.16	36	25.00	4.00	5.10
TDS mg/l	178.09	35	477.00	113.00	56.93
Turbidity NTU	9.89	36	80.00	0.80	14.37

Figure SW-3J-2

ARK40

ILLINOIS RIVER NEAR SAVOY ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	9.70	32	15.20	5.20	2.59
pH	7.49	32	8.49	6.65	0.43
TSS mg/l	13.96	34	144.00	1.00	24.95
NO2+NO3-N mg/l	1.69	33	2.95	0.09	0.61
Tot. Phos. mg/l	0.10	29	0.45	0.03	0.08
Tot. Org. C mg/l	4.24	32	8.80	1.30	1.85
T.Hardness mg/l	117.49	34	173.00	9.00	34.92
Chloride mg/l	7.20	36	10.00	1.00	2.26
TDS mg/l	151.47	35	191.00	28.00	30.87
Turbidity NTU	13.02	36	93.00	2.10	17.40
Fecal coliform col/100 ml		10	2400	4	1(0)

Table SW-4

Summary of NPS Impaired Waterbodies in the Arkansas River Basin

STREAM NAME	H.U.C.	REACH	MILES	STATION	ASSESSED	FISH CONSUM	AQUATIC LIFE	SWIMNG	SEC. CONTACT	DRINKING WATER	AGRI & INDSTRY	MAJOR SOURCE	MINOR SOURCE	MAJOR CAUSE	MINOR CAUSE
Seg 3A															
None															
Seg 3B															
Wabbaseka B.	8020401	-003	101.7	WSB01	M	S	S	P	S	S	S	AG		SI	PA
Bayou Meto	8020402	-001	4.3		E	S	P		S	S	S	AG		SI	
Bayou Meto	8020402	-003	39.8	ARK23	M	S	P		S	S	S	AG		SI	
B.Two Prairie	8020402	-006	44.7	ARK97	M	S	P		S	S	S	AG	MP	SI	NU
NPS Impacted			190.5												
Seg 3C															
None															
Seg 3D															
E. Fork Cadron	11110205	-002	15.6	EFC01	M	S	S	N	S	S	S	AG		PA	
E. Fork Cadron	11110205	-003	2.0		E	S	S	N	S	S	S	AG		PA	
Cadron Creek	11110205	-009	0.7		E	S	S	N	S	S	S	AG		PA	
Cadron Creek	11110205	-011	2.2	CCR01	M	S	S	N	S	S	S	AG		PA	
NPS Impacted			20.5												
Seg 3E															
Fourche LaFave	11110206	-001	44.4		E	S	P	S	S	S	S	AG		SI	
Fourche LaFave	11110206	-002	8.7		M	P	P	S	S	S	S	UN	AG	HG	SI
Fourche LaFave	11110206	-006	21.5		E	S	P	S	S	S	S	AG	SV	SI	
Black Fork	11110206	-009	14.3	BLF01	M	S	P	S	S	S	S	RC	SV	SI	
Gafford Creek	11110206	-012	8.5	GAF01	M	S	P	S	S	S	S	RC	SV	SI	
S.FourcheLaFave	11110206	-013	10.3		E	S	P	S	S	S	S	RC	SV	SI	
S.FourcheLaFave	11110206	-014	26.1	ARK52,+	M	S	P	S	S	S	S	RC	SV	SI	
NPS Impacted			133.8												

continued

Table SW-4 (continued)

Summary of NPS Impaired Waterbodies in the Arkansas River Basin

STREAM NAME	H.U.C.	REACH	MILES	STATION	ASSESSED	FISH CONSUM	AQUATIC LIFE	SWIMNG	SEC. CONTACT	DRINKING WATER	AGRI & INDSTRY	MAJOR SOURCE	MINOR SOURCE	MAJOR CAUSE	MINOR CAUSE
continued															
Seg 3F															
None															
Seg 3G															
Petit Jean R.	11110204	-003	8.7		E	S	P	S	S	S	S	AG		SI	
Petit Jean R.	11110204	-005	1.3	PJR03	M	S	P	S	S	S	S	AG		SI	
Petit Jean R.	11110204	-006	17.9	PJR02	M	S	P	S	S	S	S	AG	SV	SI	
Petit Jean R.	11110204	-011	21.6	ARK34	M	S	P	S	S	S	S	AG	SV	SI	
Chickalah Cr.	11110204	-002	19.3	ARK58	M	S	P	S	S	S	S	AG	SV	SI	
NPS Impacted			68.8												
Seg 3H															
Piney Creek	11110202	-018	0.5		E	S	P	S	S	S	S	AG	SV	SI	
Piney Creek	11110202	-019	26.3	ARK43	M	S	P	S	S	S	S	AG	SV	SI	
Piney Creek	11110202	-021	11.9		E	S	P	S	S	S	S	AG	SV	SI	
Piney Creek	11110202	-023	19.0		E	S	P	S	S	S	S	AG	SV	SI	
Mulberry River	11110201	-006	10.4	ARK42	M	S	P	S	S	S	S	AG	RC	SI	
Frog Bayou	11110201	-018	20.4	ARK47	M	S	P	N	S	S	S	RC	MP	SI	PA
NPS Impacted			88.5												
Seg 3I															
Poteau River	11110105	-001	2.0	ARK14	M	S	P	S	S	S	S	AG		SI	
Poteau River	11110105	-027	16.0		E	S	N	N	S	S	S	AG	IP	SI	PA
James Fork	11110105	-033	18.4	ARK15	M	S	P	S	S	S	S	AG	RE	SI	
NPS Impacted			36.4												

continued

Table SW-4 (continued)

Summary of NPS Impaired Water bodies in the Arkansas River Basin

STREAM NAME	H.U.C.	REACH	MILES	STATION	ASSESSED	FISH CONSUM	AQUATIC LIFE	SWIMNG	SEC. CONTACT	DRINKING WATER	AGRI & INDSTRY	MAJOR SOURCE	MINOR SOURCE	MAJOR CAUSE	MINOR CAUSE
continued															
Seg 3J															
Evansville Cr.	11110103	-012	9.0		E	S	P	N	S	S	S	AG		PA	SI
Baron Fork	11110103	-013	10.0	ARK07	M	S	P	S	S	S	S	AG	MP		SI
Illinois River	11110103	-020	1.6		E	S	P		S	S	S	AG	RE		SI
Cincinnati Cr.	11110103	-021	9.0		E	S	P		S	S	S	AG		SI	
Illinois River	11110103	-022	10.8	ARK06A	M	S	P	S	S	S	S	AG	RE	SI	NU
Illinois River	11110103	-023	8.1		E	S	P	S	S	S	S	AG		SI	
Illinois River	11110103	-024	2.5	ARK40	M	S	P	S	S	S	S	AG	RE	SI	
Muddy Fork.	11110103	-025	3.2		E	S	P		S	S	S	AG		SI	
Moores Creek	11110103	-026	9.8		E	S	P		S	S	S	AG		SI	
Muddy Fork	11110103	-027	11.0		E	S	P		S	S	S	AG		SI	
Illinois River	11110103	-028	19.9		E	S	P		S	S	S	AG	RE	SI	
Clear Creek	11110103	-029	13.5	ARK10C	M	S	P		S	S	S	RC	UR	SI	
Little Sugar Cr.	11070209	-003	24.2		E	S	P		S	S	S	AG		SI	
Beaty Creek	11070209	-003t	3.0		M	S	P	S	S	N	S	MP	RC	NU	SI
Town Branch	11070209	-0049	5.2		E	S	P		S	S	S	AG		SI	
NPS Impacted			140.8												
Basin Stream Miles			2713.2												
Miles Evaluated			469.8												
Miles Monitored			1245.6												
NPS Impacted			1171.9												

WHITE RIVER BASIN (4)

The White River basin comprises about 27,765 square miles, approximately 17,143 square miles are in Arkansas, the remainder is in southern Missouri. The river arises in the Boston Mountains in the western part of the state and flows in a northerly direction into Missouri across the Springfield Plateau. The river then turns in a easterly direction flowing across southern Missouri until turning southeastward and flowing into northern Arkansas once again. The river continues southeastward until the Black River joins it near Newport, Arkansas where it turns southward flowing out of the Boston Mountains and onto the Mississippi Alluvial Plain and eventually discharging into the Mississippi River south of Helena.

Major tributaries to the White River in Arkansas are the upper White River Forks, War Eagle Creek, Kings River, Crooked Creek, Buffalo National River, Norfork River, and the Black River and its tributaries - the Current River, Eleven Point River, Spring River, and the Strawberry River. In Missouri the tributaries are the Roaring River, James River, Little North Fork River, and the North Fork River.

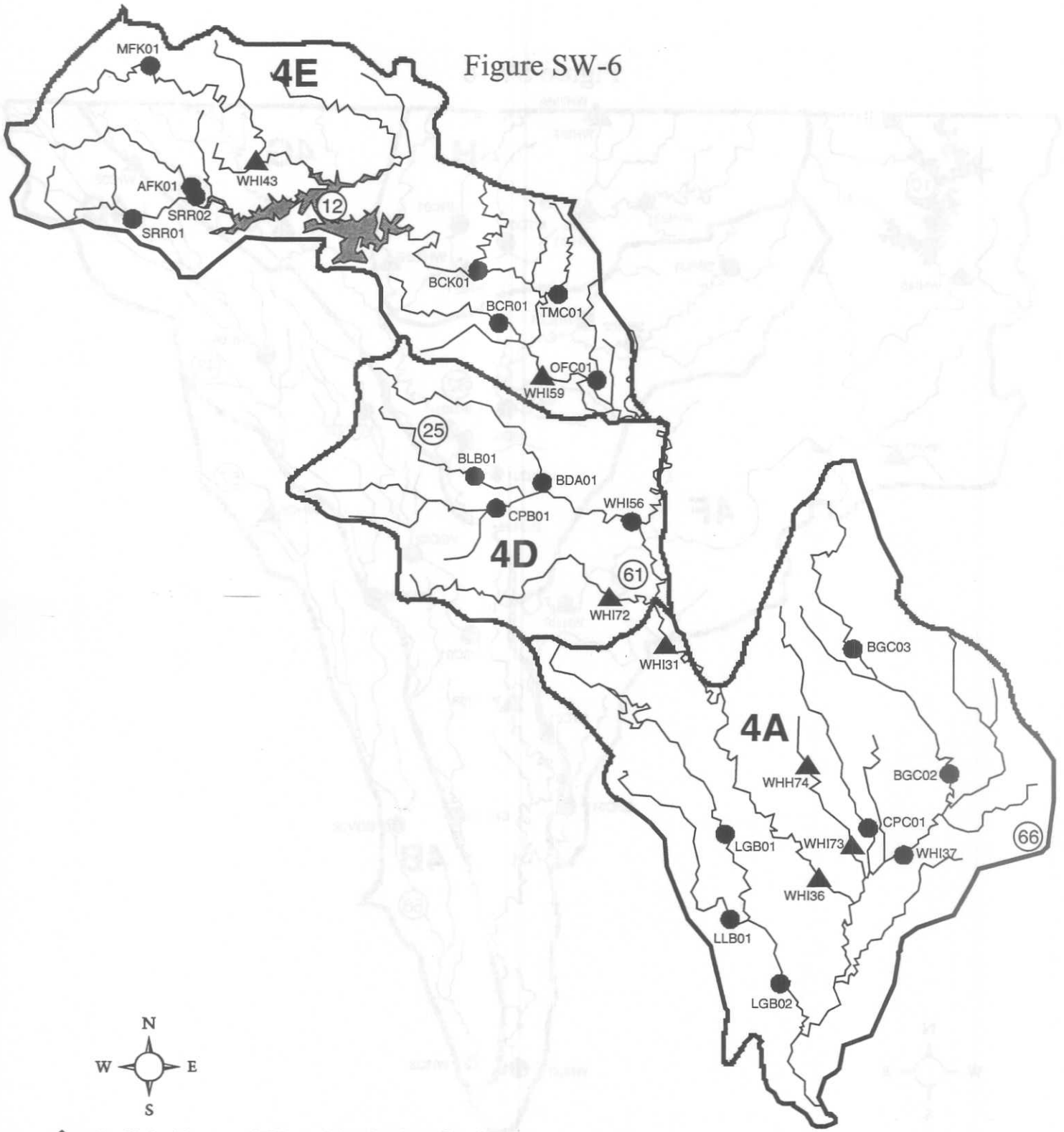
Land use in the White River is dominated by silviculture practices. However, there is also a very heavy pasture land use for cattle grazing and litter application from the numerous confined animal operations, both poultry and swine facilities, throughout the watershed. Resource extraction activities, mainly in-stream gravel mining but also some gravel-pit mining and ore extraction, also occurs. Construction activities, highway and urban, in the growing rural communities has been on the increase over the past decade.

There are 19 publicly-owned lakes within the Arkansas River drainage basin in Arkansas. A list of these lakes and their water quality status can be found in the Clean Lakes section of the report.

Figure SW-6 is a map of the Whits River basin in Arkansas Depicting the Ambient Water Quality Monitoring Stations, the Quarterly monitoring stations used in this survey, and the significant publicly-owned lakes.

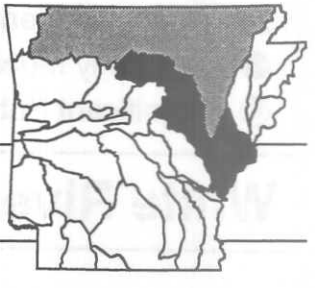
Table SW-5 lists the White River segments, the status of their current designated uses attainments, and a lists of probable causes and possible sources of those waterbody segments not fully meeting their assigned designated uses.

Figure SW-6



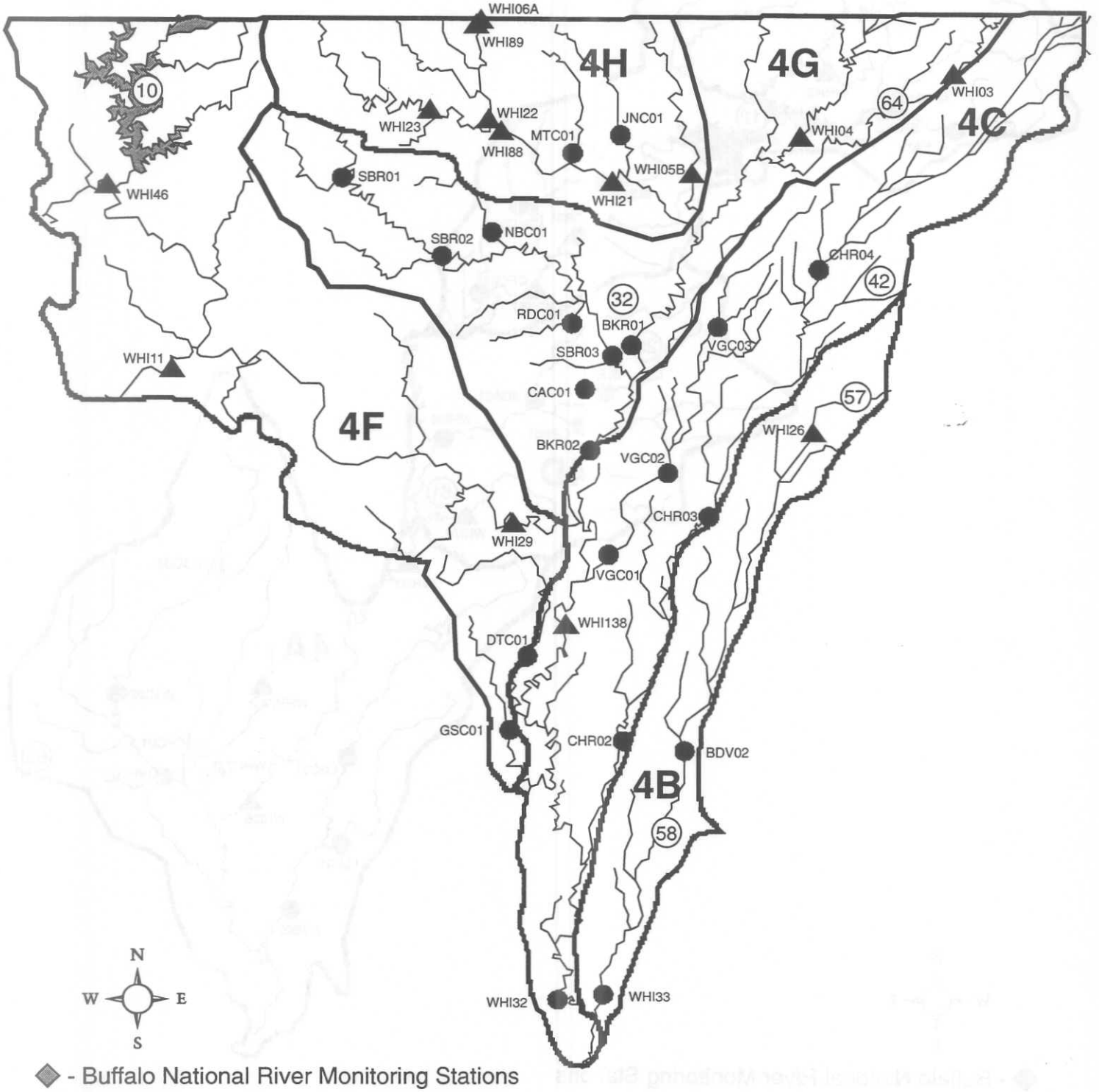
◆ - Buffalo National River Monitoring Stations
▲ - Active Ambient Monitoring Stations
● - Quarterly Monitoring Stations
⑩ - Significant Publicly-Owned Lakes

(4A, D & E)



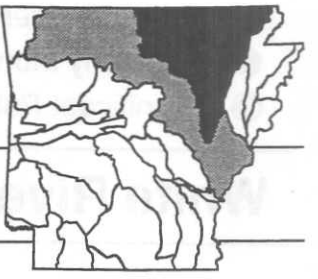
White River Basin Planning Segments

Figure SW-6



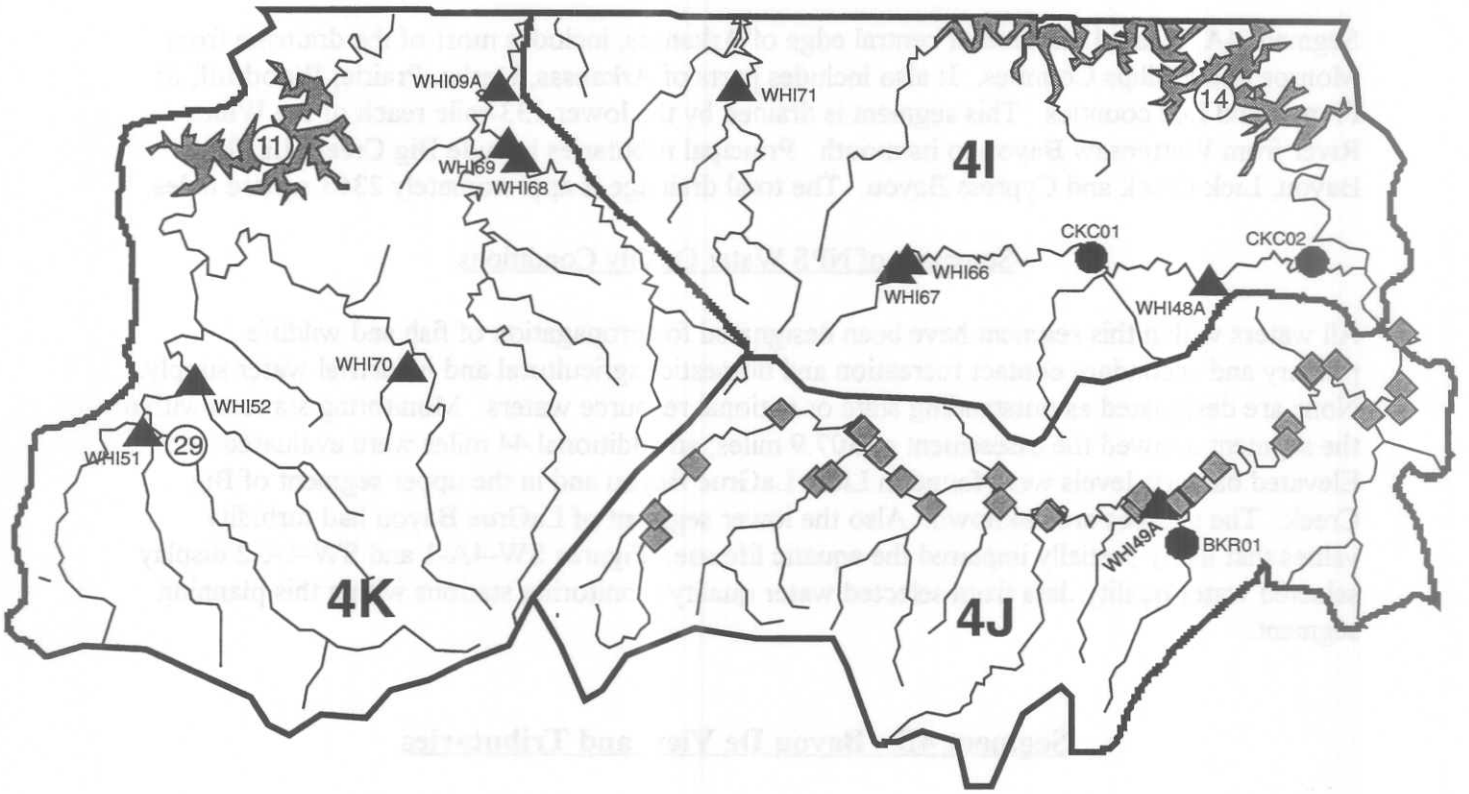
◆ - Buffalo National River Monitoring Stations
▲ - Active Ambient Monitoring Stations
● - Quarterly Monitoring Stations
⑩ - Significant Publicly-Owned Lakes

(4B, C, F, G & H)



White River Basin Planning Segments

Figure SW-6



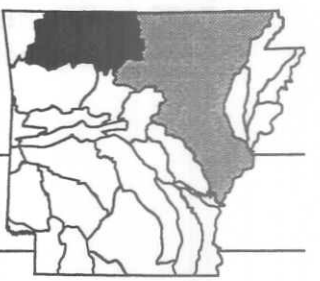
◆ - Buffalo National River Monitoring Stations

▲ - Active Ambient Monitoring Stations

● - Quarterly Monitoring Stations

⑩ - Significant Publicly-Owned Lakes

(4I, J & K)



White River Basin Planning Segments

Segment 4A - Lower White River and Tributaries

Segment 4A, located on the east central edge of Arkansas, includes most of the drainage from Monroe and Phillips Counties. It also includes parts of Arkansas, Desha, Prairie, Woodruff, St. Francis and Lee counties. This segment is drained by the lower 133-mile reach of the White River from Wattensaw Bayou to its mouth. Principal tributaries include Big Creek, La Grue Bayou, Lick Creek and Cypress Bayou. The total drainage is approximately 2363 square miles.

Summary of NPS Water Quality Conditions

All waters within this segment have been designated for propagation of fish and wildlife, primary and secondary contact recreation and domestic, agricultural and industrial water supply. None are designated as outstanding state or national resource waters. Monitoring stations within the segment allowed the assessment of 307.9 miles; an additional 44 miles were evaluated. Elevated bacteria levels were found in Little LaGrue Bayou and in the upper segment of Big Creek. The sources are unknown. Also the lower segment of LaGrue Bayou had turbidity values that likely partially impaired the aquatic life use. Figures SW-4A-1 and SW-4A-2 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 4B - Bayou De View and Tributaries

Segment 4B, located in the northeastern part of Arkansas, is a long, narrow segment that includes parts of Greene, Craighead, Poinsett, Jackson, Woodruff and Monroe counties. The segment includes 99 miles of Bayou DeView and its major tributaries including Cow Ditch, Buffalo Creek and Flag Slough. The total drainage area is approximately 694 square miles.

Summary of NPS Water Quality Conditions

The 187.2 miles of streams in this segment are designated for propagation of fish and wildlife, primary and secondary contact recreation, domestic, agricultural and industrial water supplies. None of these are designated as outstanding state or national resource waters. Water sampling stations allowed monitoring of 55.2 miles of Bayou DeView in this segment. An additional 44.1 miles of this stream were evaluated. The upper section of this stream is not meeting the aquatic life use due to high turbidity and nutrient values. It is felt that both point and nonpoint sources are responsible for this situation. Downstream reaches were assessed as having partially impaired aquatic life uses from the same causes; however, the lowest approximately 20 miles of this stream appear to be meeting all designated uses. Occasionally elevated bacteria levels are partially impairing the primary contact use in the majority of the upper reaches of Bayou DeView. Figures SW-4B-1 and SW-4B-2 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 4C - Cache River and Tributaries

Segment 4C includes portions of Clay, Greene, Lawrence, Craighead, Jackson, Woodruff and Prairie counties. This segment encompasses the entire 182-mile length of the Cache River and its major tributaries - Village Creek, Big Creek, Willow Ditch, Locust Creek, Cache Bayou and Overcup Creek. The total drainage basin is approximately 1774 square miles.

Summary of NPS Water Quality Conditions

Propagation of fish and wildlife, primary and secondary contact recreation, domestic, agricultural and industrial water supply are the designated uses for all waters within this segment. Additionally, 25 miles of these waters are designated as extraordinary resource waters. Assessment of designated use support was made on 236.9 miles of the total of 621.4 miles of stream within this segment. White River segments were assessed as meeting all designated uses.

The lowest reaches of the Cache River were assessed as not meeting the aquatic life uses, and this use was only partially supported in the mid and upper reaches of this waterbody. Siltation and excessive turbidity values from agriculture runoff was the cause. In Village Creek, the upper reach was not meeting the aquatic life use while the aquatic life use in the mid and lower reaches was only partially met. Causes were the same as in Cache River. Occasional to frequent high bacteria levels impaired the primary contact use in both streams. Figures SW-4C-1, SW-4C-2, and SW-4C-3 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 4D - White River, Wattensaw Bayou and Bayou Des Arc

Segment 4D includes portions of White, Prairie and Lonoke Counties in central Arkansas. The segment encompasses a 67-mile stretch of the White River and Wattensaw and Des Arc Bayous, which are tributary to it. The total drainage basin is approximately 1100 square miles.

Summary of NPS Water Quality Conditions

The designated uses for all waters within this segment include the propagation of fish and wildlife, primary and secondary contact recreation, and domestic, agricultural and industrial water supply. No outstanding state or national resource waters are located in this segment. Monitoring stations provided data to assess 107.4 stream miles, an additional 52.5 miles were evaluated. Almost 43 miles of the White River were evaluated as meeting all designated uses. Wattensaw Bayou had silt and turbidity levels that partially impaired the aquatic life use. Both the aquatic life and primary contact use were partially impaired on Cypress Bayou; excessive turbidity, bacteria and high levels of metals were identified. The sources of these contaminants were from agriculture activities and a municipal point source. Figures SW-4D-1 and SW-4D-2 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 4E - Little Red River: Headwaters to Mouth

Segment 4E includes portions of Searcy, Van Buren, Stone, Cleburne and White counties. The segment contains the entire 81-mile length of the Little Red River and its major tributaries the Middle, South, and North Forks, Big Creek, Devil's Fork and Archey Creek. The total drainage basin is approximately 1803 miles.

Summary of NPS Water Quality Conditions

The designated uses of waters within this segment include propagation of fish and wildlife, primary and secondary contact recreation, domestic, agricultural and industrial water supply. Additionally, 158.1 miles, approximately one-third of the stream miles, are designated as outstanding state or national resource waters. Monitoring stations allowed for use support assessment of 213.1 miles. An additional 2 miles were monitored for fish consumption uses and found to be partially impaired. Scattered throughout this segment, several stream reaches were found to occasionally or frequently have elevated bacteria levels. The sources were not determined. Elevated turbidity values, particularly during storm events, in the Middle Fork of the Little Red River is likely to be impairing the aquatic life uses. It is speculated that the source is from gravel and dirt road construction and maintenance and from timber harvest activities. Figures SW-4E-1 and SW-4E-2 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 4F - White River from Mouth of Black River to Mouth of Buffalo River

Segment 4F includes Baxter, Fulton, Izard, Stone, Independence and Sharp counties. The segment encompasses a 125-mile reach of the White River and its major tributaries - Polk Bayou, Sylamore Creek, Salado Creek, Hicks Creek, Norfork River and Bennett's River. The total drainage area is approximately 2182 square miles.

Summary of NPS Water Quality Conditions

Waters within this segment have been designated for fish and wildlife propagation, primary and secondary contact recreation, domestic, agricultural and industrial water supply uses. Outstanding state or national resource waters make up 19.1 miles within the segment. Use support assessments were made on 249.3 miles of streams. The 9.1 miles of Hicks Creek did not meet the drinking water use due to high nitrates; the primary contact use was impaired by excessive bacteria levels and the aquatic life use was assessed as partially impaired as a result of excessive nutrients. The source of these contaminants is a municipal point source discharge. Glaise Creek, in the southern most tip of this segment, was found to contain high levels of minerals. The source is unknown. Also, the highest levels of the pesticide Ordram (molinate) of any segment sampled was found in Glaise Creek. All other waters assessed in this segment were found to be supporting all designated uses. Figures SW-4F-1 and SW-4F-2 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 4G - Black River, Strawberry River and Tributaries

Segment 4G includes portions of Izard, Sharp, Independence, Lawrence, Randolph and Clay counties in the northeast corner of the state. This segment encompasses a 121-mile reach of the Black River to the Missouri state line, and its major tributaries - the Strawberry River, Current River and Big Running Creek. The total drainage area is approximately 1741 square miles.

Summary of NPS Water Quality Conditions

Fish and wildlife propagation, primary and secondary contact recreation, domestic, agricultural and industrial water supplies are the designated uses for all waters within this segment. Also, 112.2 miles of these streams are designated as outstanding state or national resource waters. The water quality monitoring stations allowed for the monitored assessment of 249 miles of streams in the segment and the evaluation of 41.8 miles. Over 73 miles of extraordinary resource waters in this segment were assessed with partial aquatic life impairment due to excessive turbidity levels. Trend data from the monitoring station on the Strawberry River demonstrates these excessive turbidity levels occurring routinely over the last five to seven years. Concurrently, the total suspended solids and the total phosphorus levels show peaking values much above normal. This is most likely from agriculture activities probably associated with pasturing and animal grazing to the edge of the stream bank. Several smaller tributary streams in this segment show frequently elevated bacteria levels. This may also be due to runoff from pasture land. Figures SW-4G-1, SW-4G-2, SW-4G-3, and SW-4G-4 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 4H - Spring River, South Fork Spring River, and Eleven Point River

Segment 4H, in north central Arkansas, includes portions of Fulton, Sharp and Randolph counties. The segment encompasses the entire 46-mile length of the Spring River and its major tributaries, the South Fork Spring River, the Eleven Point River, Myatt Creek and Martin's Creek. The total drainage area is approximately 920 square miles.

Summary of NPS Water Quality Conditions

Designated uses for all waters within this segment include propagation of fish and wildlife, primary and secondary contact recreation, domestic, agricultural and industrial water supplies. Additionally, about 74 percent of these waters are designated as outstanding state or national resource waters. Approximately 134.2 miles of the waters were assessed from seven monitoring stations, and 16 miles were evaluated. The lower reaches of the Spring River, classified as extraordinary resource, indicate aquatic life impacts from occasionally very high turbidity levels. These levels seem to be associated with major storm events and are likely caused by land

clearing to the edge of the stream for pastures. The long-term trend data for the lower Spring River station do not show significant upward trends in turbidity and TSS; however, it does show the peak values that are substantially above normal values. The South Fork of the Spring River, which in the past has contributed high bacteria and excessive turbidity to the Spring River, did not demonstrate these excessive values over the past two years. Janes Creek water quality appears to be near pristine levels. Figures SW-4H-1 and SW-4H-2 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 4I - White River from Crooked Creek to Long Creek

Segment 4I, located in north central Arkansas, includes portions of Carroll, Boone and Marion counties. This segment encompasses a 31-mile reach of the White River and its major tributaries - Crooked Creek and Long Creek. The total drainage area is approximately 1417 square miles.

Summary of NPS Water Quality Conditions

All waters within this segment are designated for fish and wildlife propagation, primary and secondary contact recreation, domestic, agricultural and industrial water supplies. None of these waters, except Bull Shoals Reservoir, are designated as outstanding state or national resource. Four monitoring stations were used to assess 76.3 miles of stream uses, and 82.1 miles were evaluated.

Primary contact (swimming) was not supported in 59.5 miles of waters on Yocum Creek, Long Creek and Dry Creek. In addition, 22.9 miles on Long Creek and the lower section of Crooked Creek were assessed as only partially supporting the aquatic life use. This was caused by high turbidity levels and the associated silt loads from agriculture activities and from the abundance of gravel removal operations in Crooked Creek. Figures SW-4I-1 and SW-4I-2 display selected water quality data from selected water quality monitoring stations within this planning segment.

Segment 4J - Buffalo River and Tributaries

Segment 4J includes portions of Newton, Searcy and Marion counties in north central Arkansas. This segment contains the entire 113-mile length of the Buffalo River and its major tributaries - Big Creek, Little Buffalo, Richland Creek, Water Creek and Bear Creek. The total drainage area is approximately 1334 square miles.

Summary of NPS Water Quality Conditions

Designated uses of waters in this segment include propagation of fish and wildlife, primary and secondary contact recreation, domestic, agricultural and industrial water supplies. Almost 48 percent are also designated as outstanding state or national resource waters. Only one routine monitoring station is located in this segment; however, over the past several years, a cooperative project with the Buffalo National River has added nine sites on the Buffalo River, 20 tributary sites and three spring sites. This has allowed for a much more detailed assessment of the river and its tributaries. All waters assessed in this segment met all designated uses. However, due to the designation of these waters as an extraordinary resource, the very sensitive environmental conditions, the significant recreational potential and a substantial change in land use activities in some areas of the watershed, the Buffalo River has been listed as a threatened waterbody in the nonpoint source assessment. Although nutrient values are low in the Buffalo River, nitrite/nitrate-nitrogen values have shown a distinct increase in a downstream direction during the 1989-1993 period. This was very evident in the maximum values recorded in the main channel sites. A similar, but less, pronounced pattern was also demonstrated by average concentrations, although a noticeable decline was noted near the mouth of the river. The most significant increases were noted below Boxley Valley and below Mill Creek (between Pruitt and Hastey). Of the 20 tributary sites, highest nitrite/nitrate-nitrogen concentrations were found in Mill Creek, in Brush Creek and in Tomahawk Creek. The significantly higher minimum values in Mill Creek indicates a more continuous input of nitrates from a point source. Concentrations of this parameter in the three springs sampled were about three times greater than main channel values.

The mean nitrate values on the main stem of the Buffalo River during 1989-1993 is compared to the mean nitrate values for the period of this report in Figure A-4J-1. Mean values for the last two years were consistently higher at all stations in the lower three-fourths of the river. A similar comparison was made among the tributary streams as shown in Figure A-4J-2. Tomahawk, Calf, Bear, Water, Rush, Clabber and Big Creeks all show substantially higher mean nitrate values during the last two years. This condition may have resulted from the significantly lower rainfall and surface runoff over the last two years which would have caused these tributary streams to be more dominated by ground water discharges than surface runoff. Highest nitrates have generally been found in ground water in this area. Mill and Brush Creek consistently exhibit the highest average nitrate values, although Calf Creek values for 1993-95 were similar to their values.

Segment 4K - Upper White River and Kings River

Segment 4K includes portions of Washington, Benton, Madison and Carroll counties in northwest Arkansas. This segment encompasses a 66-mile reach of the White River and its tributaries and an 85-mile reach of the Kings River and its tributaries. The total drainage area is approximately 1846 square miles.

Summary of NPS Water Quality Conditions

All waters within this segment are designated for propagation of fish and wildlife, primary and secondary contact recreation, domestic, agricultural and industrial water supplies. Also, about 20 percent (20%) of these waters are designated as outstanding state or national resource waters. A total of 227.9 miles of streams were monitored for use support utilizing data from 10 routine monitoring stations. An additional 116.3 miles were evaluated. Partially impaired aquatic life use was assessed for 154.2 miles in this segment. The major cause was high turbidity levels and excessive silt loads. This is from three primary sources: (1) agriculture land clearing; (2) road construction and maintenance; and (3) gravel removal from stream beds. Riparian zone defamation leading to excessive stream band erosion may also be adding to the escessive in-stream silt problems. In addition, a point source discharge to Holman Creek has partially impaired the aquatic life use and has impaired the primary contact and drinking water uses of this stream. In addition, only limited bacteria data was available from waters in this segment for the last two years, and only Brush Creek and the mid to upper sections of War Eagle Creek was assessed as not supporting the primary contact use. Additional information from previous studies has indicated high bacteria counts below communities with on-site waste treatment facilities in the upper White River watershed. Figures SW-4K-1, SW-4K-2, and SW-4K-3 display selected water quality data from selected water quality monitoring stations within this planning segment.

Figure SW-4A-1

LLB01

LITTLE LAGRUE BAYOU AT HWY 1 NR DEWITT

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	5.62	6	9.20	4.20	1.84
pH	7.40	5	7.94	6.97	0.35
TSS mg/l	13.29	7	28.00	6.00	9.12
NO2+NO3-N mg/l	0.19	8	0.56	0.02	0.18
Tot. Phos. mg/l	0.17	7	0.24	0.11	0.05
Tot. Org. C mg/l	8.31	7	10.40	5.80	1.51
T.Hardness mg/l	101.69	7	297.00	41.00	89.05
Chloride mg/l	22.70	8	77.00	6.00	22.41
TDS mg/l	183.38	8	372.00	105.00	84.20
Turbidity NTU	32.78	8	78.00	5.20	25.00
Fecal Coliform col/100 ml		9	1010	49	3(2)

Figure SW-4A-2

BGC03

BIG CREEK AT HWY 79 3 MI. W. OF MORO

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	5.37	7	6.70	4.20	0.85
pH	7.38	6	7.85	7.04	0.26
TSS mg/l	41.31	8	75.00	12.00	21.15
NO2+NO3-N mg/l	0.21	6	0.41	0.04	0.16
Tot. Phos. mg/l	0.20	8	0.24	0.16	0.03
Tot. Org. C mg/l	9.27	8	12.40	6.50	1.93
T.Hardness mg/l	142.22	9	324.00	57.00	92.59
Chloride mg/l	25.76	9	64.00	10.00	18.40
TDS mg/l	230.67	9	448.00	136.00	100.07
Turbidity NTU	49.56	9	83.00	22.00	23.19
Fecal Coliform col/100 ml		9	>830	34	3(1)

Figure SW-4B-1

BDV02

BAYOU DEVIEW AT HWY 64 4 MI. E. OF MCCROY

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	6.76	7	10.50	3.30	2.84
pH	7.41	6	8.01	6.30	0.60
TSS mg/l	63.88	8	160.00	33.00	41.00
NO2+NO3-N mg/l	0.33	8	0.65	0.10	0.19
Tot. Phos. mg/l	0.27	9	0.45	0.17	0.11
Tot. Org. C mg/l	10.34	7	16.00	7.50	3.07
T.Hardness mg/l	94.49	9	171.00	41.00	48.88
Chloride mg/l	13.96	9	24.00	7.00	6.82
TDS mg/l	195.78	9	243.00	147.00	35.16
Turbidity NTU	81.11	9	180.00	33.00	51.07
Fecal Coliform col/100 ml		9	>800	63	(4)1

Figure SW-4B-2

WHI26

BAYOU DEVIEW NEAR GIBSON ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	8.42	32	12.10	4.20	2.13
pH	7.78	31	8.80	6.40	0.59
TSS mg/l	91.69	34	936.00	3.00	175.92
NO2+NO3-N mg/l	0.94	33	2.79	0.05	0.66
Tot. Phos. mg/l	1.11	30	4.14	0.23	0.86
Tot. Org. C mg/l	10.55	33	21.20	6.00	4.09
T.Hardness mg/l	73.95	35	311.00	20.00	65.35
Chloride mg/l	17.63	35	49.00	3.00	12.24
TDS mg/l	191.24	35	336.00	107.00	62.03
Turbidity NTU	108.34	35	760.00	8.00	135.25
Fecal coliform col/100 ml		13	710	11	1(0)

Figure SW-4C-1

WHI 32

CACHE RIVER @ BRASFIELD, ARK.

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	7.97	7	12.80	6.00	2.27
pH	7.38	6	7.56	7.12	0.16
TSS mg/l	27.81	8	50.00	12.00	10.87
NO2+NO3-N mg/l	0.21	9	0.53	0.05	0.17
Tot. Phos. mg/l	0.26	8	0.60	0.14	0.15
Tot. Org. C mg/l	9.21	8	11.10	6.90	1.29
T.Hardness mg/l	75.49	9	169.00	36.00	39.20
Chloride mg/l	10.95	9	17.00	6.00	3.71
TDS mg/l	189.22	9	310.00	142.00	55.03
Turbidity NTU	78.67	9	198.00	35.00	50.24
Fecal Coliform col/100 ml		9	>600.00	92	3(2)

Figure SW-4C-2

CHR02

CACHE RIVER AT HWY 64 AT PATTERSON

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	6.87	7	10.50	4.70	2.05
pH	7.53	6	8.02	7.00	0.38
TSS mg/l	48.69	8	89.00	13.00	27.49
NO2+NO3-N mg/l	0.44	9	0.95	0.03	0.35
Tot. Phos. mg/l	0.28	9	0.62	0.16	0.14
Tot. Org. C mg/l	9.50	7	13.70	7.50	2.00
T.Hardness mg/l	68.06	9	139.00	27.00	35.57
Chloride mg/l	10.33	9	16.00	6.00	3.99
TDS mg/l	218.89	9	433.00	147.00	86.03
Turbidity NTU	129.67	9	410.00	45.00	111.52
Fecal Coliform col/100 ml		9	2300	63	4(1)

Figure SW-4C-3

VGC01

VILLAGE CREEK AT HWY 37 3 MI. E. OF TUCKERMAN

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	6.73	7	9.60	4.40	1.83
pH	7.48	6	8.00	6.88	0.46
TSS mg/l	36.13	8	65.00	12.00	21.84
NO2+NO3-N mg/l	0.30	9	0.84	0.06	0.31
Tot. Phos. mg/l	0.28	9	0.46	0.15	0.10
Tot. Org. C mg/l	8.78	7	11.30	6.60	1.57
T.Hardness mg/l	85.43	8	183.00	37.00	48.03
Chloride mg/l	8.70	9	18.00	5.00	4.70
TDS mg/l	171.45	9	242.00	118.00	42.42
Turbidity NTU	60.44	9	110.00	19.00	34.04
Fecal Coliform col/100 ml		9	>2200	31	2(0)

Figure SW-4D-1

CPB01

CYPRESS BAYOU AT HWY 13 3 MI S.E. OF BEEBE

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	5.47	7	10.10	2.60	2.98
pH	6.82	7	7.28	6.30	0.34
TSS mg/l	16.38	8	27.00	6.00	7.85
NO2+NO3-N mg/l	0.19	6	0.32	0.10	0.08
Tot. Phos. mg/l	0.16	9	0.22	0.10	0.04
Tot. Org. C mg/l	8.12	7	10.00	5.60	1.53
T.Hardness mg/l	33.29	9	64.00	20.00	15.72
Chloride mg/l	29.71	9	65.00	9.00	25.06
TDS mg/l	121.22	9	231.00	75.00	57.78
Turbidity NTU	24.44	9	45.00	10.00	10.48
Fecal Coliform col/100 ml		9	1245	18	1(1)

Figure SW-4D-2

WHI72

WHATTENSAW BAYOU NORTH OF HAZEN ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	5.79	33	11.50	2.10	2.62
pH	6.85	33	7.65	6.24	0.38
TSS mg/l	13.18	33	82.00	2.00	14.53
NO2+NO3-N mg/l	0.12	31	0.43	0.02	0.09
Tot. Phos. mg/l	0.15	32	0.42	0.05	0.07
Tot. Org. C mg/l	10.72	31	22.00	6.10	3.68
T.Hardness mg/l	77.12	33	159.00	15.00	33.42
Chloride mg/l	21.40	33	71.00	3.00	14.94
TDS mg/l	154.02	33	280.00	85.00	52.81
Turbidity NTU	18.33	33	67.00	3.00	14.38

Figure SW-4E-1

OFC01

OVERFLOW CREEK AT CO. RD. 1.5 MI. SE OF JUDSONIA

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	8.28	6	10.50	6.10	1.76
pH	7.03	6	7.53	6.57	0.41
TSS mg/l	64.94	8	186.00	5.00	65.66
NO2+NO3-N mg/l	0.16	7	0.31	0.05	0.09
Tot. Phos. mg/l	0.13	7	0.25	0.04	0.07
Tot. Org. C mg/l	5.05	6	8.50	2.00	2.10
T.Hardness mg/l	20.33	8	40.00	10.00	11.80
Chloride mg/l	9.01	8	24.00	3.00	7.45
TDS mg/l	64.25	8	127.00	36.00	29.10
Turbidity NTU	39.25	8	70.00	7.00	24.36
Fecal Coliform col/100 ml		9	>7500	23	5(3)

Figure SW-4E-2

WHI43

MIDDLE FORK LITTLE RED RIVER NEAR SHIRLEY ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	9.22	25	12.50	6.70	1.62
pH	6.90	33	9.06	5.90	0.58
TSS mg/l	10.53	31	87.00	1.00	18.76
NO2+NO3-N mg/l	0.11	20	0.30	0.03	0.07
Tot. Phos. mg/l	0.07	31	0.20	0.04	0.04
Tot. Org. C mg/l	4.15	34	17.20	1.20	3.12
T.Hardness mg/l	34.74	34	45.00	25.00	5.45
Chloride mg/l	2.56	36	5.00	2.00	0.49
TDS mg/l	54.63	35	73.00	44.00	8.02
Turbidity NTU	12.62	35	70.00	2.90	16.16

Figure SW-4F-1

GSC01

GLAISE CREEK HWY 64 4.5 MI E. OF BALD KNOB

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	5.60	6	9.30	1.10	2.97
pH	7.03	6	7.48	6.67	0.34
TSS mg/l	21.25	8	79.00	4.00	26.32
NO2+NO3-N mg/l	0.17	5	0.31	0.04	0.13
Tot. Phos. mg/l	0.10	8	0.16	0.04	0.05
Tot. Org. C mg/l	5.91	6	8.40	2.00	2.32
T.Hardness mg/l	104.50	8	346.00	12.00	122.61
Chloride mg/l	148.30	8	683.00	3.00	234.82
TDS mg/l	343.81	8	1288.00	51.00	431.46
Turbidity NTU	26.94	8	79.00	6.00	29.93
Fecal Coliform col/100 ml		9	>2800	16	3(2)

Figure SW-4G-1

SBR01

STRAWBERRY R. AT CO. RD. OFF HWY 354 NR. WISEMAN

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	8.39	7	11.00	6.60	1.62
pH	7.91	7	8.65	7.38	0.39
TSS mg/l	26.22	9	122.00	1.00	39.33
NO2+NO3-N mg/l	0.17	8	0.30	0.07	0.08
Tot. Phos. mg/l	0.12	4	0.21	0.03	0.08
Tot. Org. C mg/l	4.21	7	8.60	2.40	2.39
T.Hardness mg/l	128.56	9	168.00	68.00	36.48
Chloride mg/l	3.17	9	4.00	2.00	0.42
TDS mg/l	139.45	9	163.00	114.00	16.71
Turbidity NTU	24.09	9	74.00	2.60	27.58
Fecal Coliform col/100 ml		9	>3500	31	6(4)

Figure SW-4G-2

SBR03

STRAWBERRY RIVER AT HWY 361 NR SAFFELL

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	8.68	6	11.40	7.00	2.02
pH	8.35	6	9.02	7.94	0.37
TSS mg/l	21.63	8	43.00	11.00	11.53
NO2+NO3-N mg/l	0.32	8	1.57	0.05	0.51
Tot. Phos. mg/l	0.07	5	0.14	0.04	0.04
Tot. Org. C mg/l	3.15	6	5.20	2.40	1.09
T.Hardness mg/l	196.00	8	228.00	165.00	20.02
Chloride mg/l	3.35	8	4.00	3.00	0.37
TDS mg/l	196.75	8	208.00	177.00	11.66
Turbidity NTU	12.26	8	25.00	5.00	6.33
Fecal Coliform col/100 ml		9	>600	108	3(1)

Figure SW-4G-3

NBC01

NORTH BIG CREEK @ CO RD. OFF HY 354 SE OF CENTER

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	10.73	7	13.00	9.00	1.53
pH	8.49	7	9.15	8.14	0.36
TSS mg/l	6.00	6	15.00	3.00	4.67
NO2+NO3-N mg/l	0.15	7	0.29	0.03	0.10
Tot. Phos. mg/l	0.05	3	0.05	0.04	0.01
Tot. Org. C mg/l	3.10	7	5.20	1.60	1.46
T.Hardness mg/l	224.33	9	249.00	177.00	25.44
Chloride mg/l	3.28	9	4.00	3.00	0.39
TDS mg/l	221.61	9	246.00	177.00	22.58
Turbidity NTU	4.81	9	18.00	0.60	6.69
Fecal Coliform col/100 ml		9	>6000	6	3(2)

Figure SW-4G-4

RDC01

REEDS CREEK AT HWY 117 AT STRAWBERRY

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	9.70	6	11.60	8.50	1.26
pH	8.35	6	8.92	7.78	0.37
TSS mg/l	8.94	8	28.00	1.00	9.53
NO2+NO3-N mg/l	0.34	8	0.55	0.22	0.10
Tot. Phos. mg/l	0.08	3	0.15	0.03	0.06
Tot. Org. C mg/l	2.91	6	7.20	1.70	2.15
T.Hardness mg/l	174.38	8	206.00	120.00	25.41
Chloride mg/l	3.16	8	4.00	3.00	0.36
TDS mg/l	179.94	8	199.00	147.00	15.73
Turbidity NTU	7.95	8	34.00	1.80	11.14
Fecal Coliform col/100 ml		9	>6000	34	2(2)

Figure SW-4H-1

WHI21

SPRING RIVER AT RAVENDEN ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	9.45	31	16.60	5.90	2.27
pH	8.14	31	10.23	6.35	0.66
TSS mg/l	14.05	32	85.00	3.00	18.44
NO2+NO3-N mg/l	0.41	35	0.80	0.08	0.18
Tot. Phos. mg/l	0.10	16	0.36	0.03	0.10
Tot. Org. C mg/l	3.09	33	6.90	1.20	1.71
T.Hardness mg/l	218.44	35	262.00	124.00	33.69
Chloride mg/l	2.93	36	4.00	2.00	0.38
TDS mg/l	221.44	35	258.00	141.00	24.58
Turbidity NTU	11.86	35	78.00	1.10	17.01
Fecal coliform col/100 ml		13	191	3	0(0)

Figure SW-4H-2

WHI05B

ELEVEN POINT RIVER NEAR POCAHONTAS ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	9.33	31	15.10	6.40	2.18
pH	8.05	31	9.75	6.91	0.54
TSS mg/l	25.67	33	415.00	1.00	72.67
NO2+NO3-N mg/l	0.49	35	0.94	0.24	0.14
Tot. Phos. mg/l	0.10	18	0.42	0.03	0.11
Tot. Org. C mg/l	2.92	33	7.80	1.00	1.89
T.Hardness mg/l	181.74	35	225.00	115.00	28.93
Chloride mg/l	2.52	36	3.00	1.00	0.35
TDS mg/l	186.32	36	222.00	146.00	20.70
Turbidity NTU	16.03	35	220.00	1.30	38.09

Figure SW-4I-1

WHI48A

CROOKED CREEK AT YELLVILLE ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	10.26	31	14.00	7.10	1.91
pH	7.97	32	8.75	6.92	0.38
TSS mg/l	5.55	22	30.00	1.00	6.73
NO2+NO3-N mg/l	0.62	30	1.35	0.03	0.36
Tot. Phos. mg/l	0.08	14	0.19	0.03	0.05
Tot. Org. C mg/l	2.74	32	6.00	1.00	1.34
T.Hardness mg/l	167.85	32	204.00	129.00	19.70
Chloride mg/l	6.36	33	11.00	3.00	2.11
TDS mg/l	184.75	32	214.00	153.00	15.99
Turbidity NTU	3.90	32	50.00	0.40	8.99

Figure SW-4I-2

WHI71

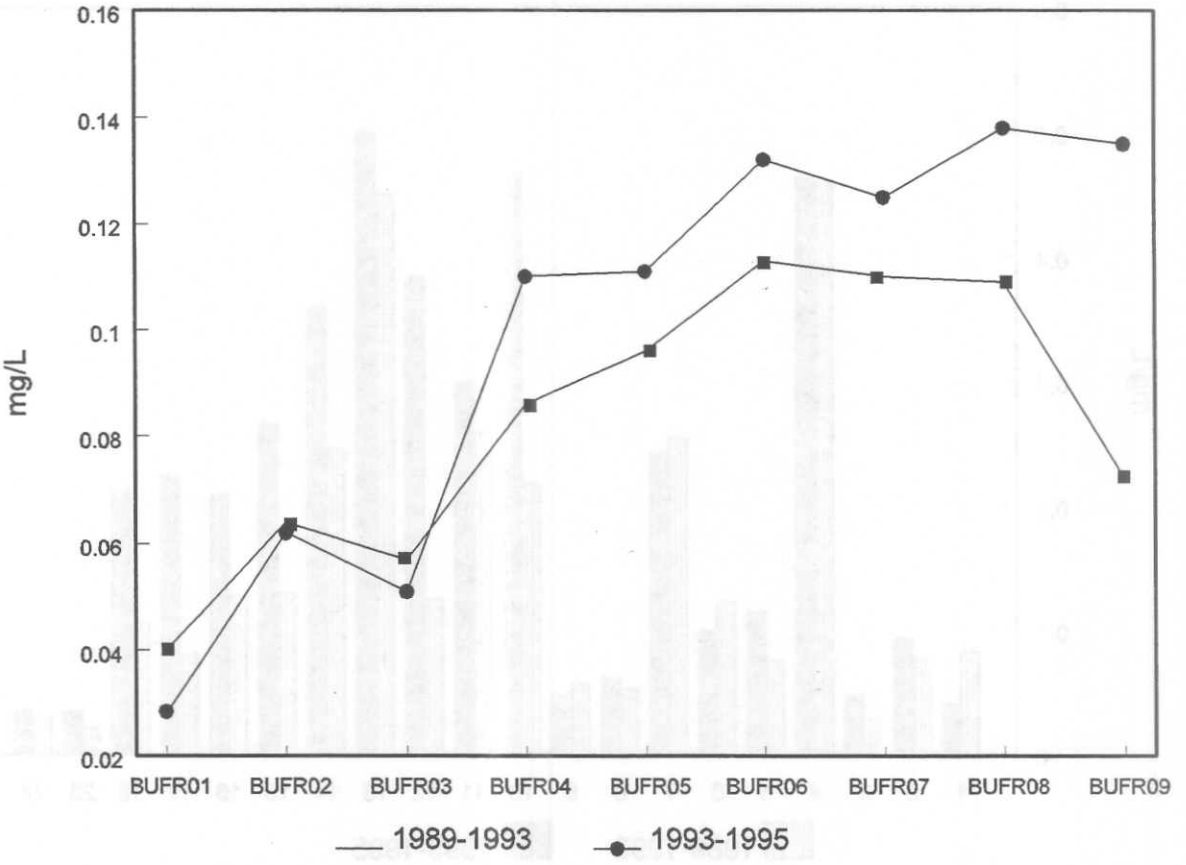
LONG CREEK BELOW DENVER ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	41.88	35	1109.00	7.70	185.69
pH	7.75	35	8.30	7.15	0.25
TSS mg/l	5.06	27	33.00	1.00	6.76
NO2+NO3-N mg/l	1.80	31	2.82	1.00	0.46
Tot. Phos. mg/l	0.09	30	0.47	0.03	0.08
Tot. Org. C mg/l	2.49	35	7.60	1.40	1.17
T.Hardness mg/l	153.65	35	189.00	101.00	24.12
Chloride mg/l	8.61	34	17.00	3.00	3.74
TDS mg/l	186.07	35	233.00	129.00	26.76
Turbidity NTU	6.08	36	42.00	0.50	7.66
Fecal coliform col/100 ml		9	680	4	1(1)

FIGURE SW-4J-1

BUFFALO NATIONAL RIVER - MAIN CHANNEL

MEAN VALUES FOR NITRATES



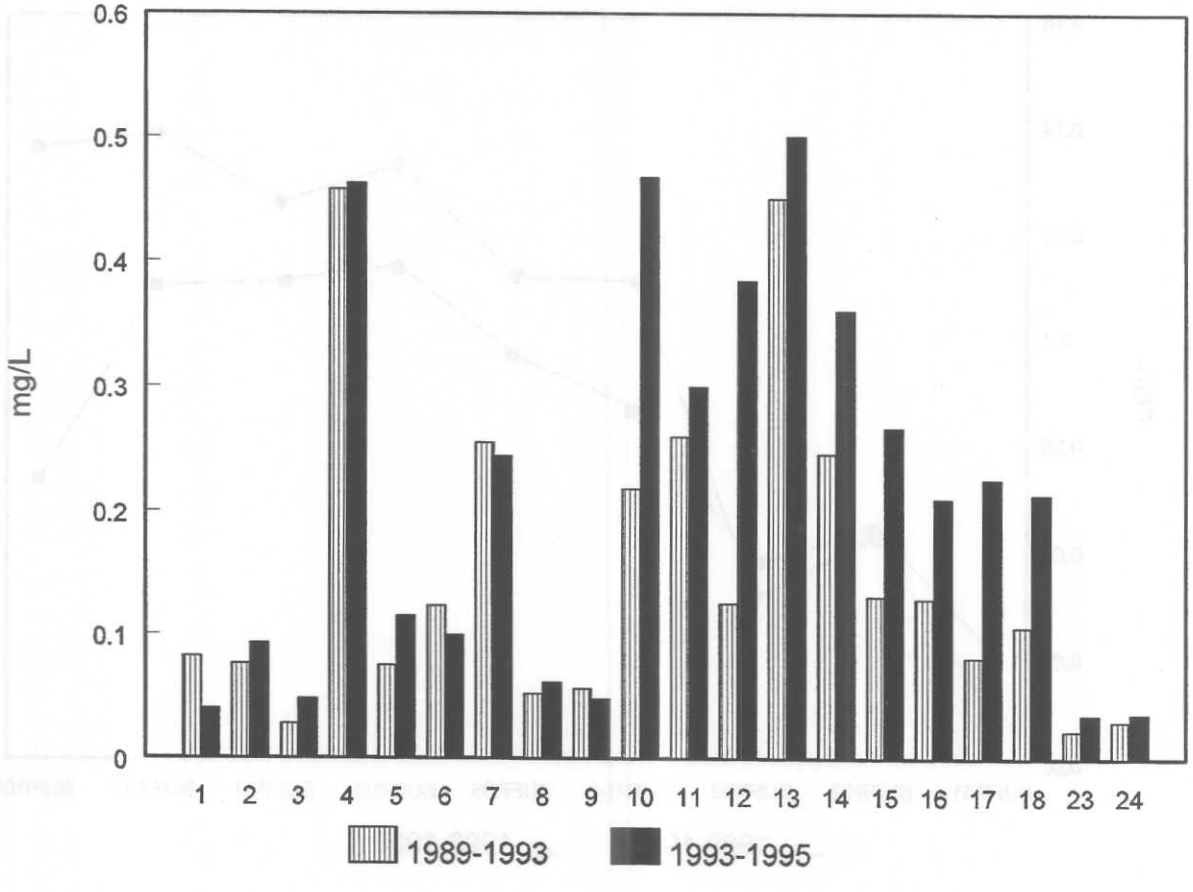
LEGEND

BUFR1 -- Above Boxley	BUFR2 -- Ponca
BUFR3 -- Pruitt	BUFR4 -- Hastey
BUFR5 -- Woolum	BUFR6 -- Gilbert
BUFR7 -- Ark. Hwy. 14	BUFR8 -- Rush
BUFR9 -- Mouth of River	

FIGURE SW-4J-2

BUFFALO NATIONAL RIVER - TRIBUTARIES

MEAN VALUES FOR NITRATES



LEGEND

1 -- Beech Creek	2 -- Ponca Cree	3 -- Cecil Creek
4 -- Mill Creek (Pruitt)	5 -- Little Buffalo	6 -- Big Creek (S. Hasty)
7 -- Davis Creek	8 -- Cave Creek	9 -- Richland Creek
10 -- Calf Creek	11 -- Mill Creek (St. Joe)	
12 -- Bear Creek	13 -- Brush Creek	14 -- Tomahawk Creek
15 -- Water Creek	16 -- Rush Creek	17 -- Clabber Creek
18 -- Big Creek (lower)	23 -- Middle Creek	24 -- Leatherwood Creek

Figure SW-4K-1

WHI52

WHITE RIVER NEAR GOSHEN ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	8.99	35	12.40	5.00	1.97
pH	7.35	35	8.47	6.73	0.32
TSS mg/l	15.79	36	113.00	1.00	19.05
NO2+NO3-N mg/l	1.02	31	3.06	0.05	0.74
Tot. Phos. mg/l	0.10	29	0.39	0.03	0.08
Tot. Org. C mg/l	3.91	35	6.90	1.40	1.65
T.Hardness mg/l	64.60	36	122.00	25.00	27.16
Chloride mg/l	9.95	35	43.00	2.00	10.74
TDS mg/l	115.07	36	285.00	60.00	64.15
Turbidity NTU	20.58	36	88.00	3.40	17.41

Figure SW-4K-2

WHI68

OSAGE CREEK ABOVE BERRYVILLE ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	9.36	35	13.40	5.20	2.31
pH	7.71	35	8.19	7.24	0.25
TSS mg/l	8.39	28	66.00	1.00	14.22
NO2+NO3-N mg/l	0.49	31	1.60	0.03	0.35
Tot. Phos. mg/l	0.07	21	0.16	0.03	0.04
Tot. Org. C mg/l	3.09	34	6.40	1.20	1.18
T.Hardness mg/l	130.97	36	172.00	73.00	27.93
Chloride mg/l	4.00	34	5.00	2.00	0.79
TDS mg/l	142.66	35	183.00	96.00	24.85
Turbidity NTU	6.96	36	48.00	0.70	9.80

Figure SW-4K-3

WHI116

WAR EAGLE CREEK AT HWY 45 NEAR HINDSVILLE ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	9.11	37	12.00	6.10	1.73
pH	7.47	37	8.04	6.87	0.24
TSS mg/l	6.89	37	48.00	1.00	10.09
NO2+NO3-N mg/l	1.24	33	2.13	0.75	0.40
Tot. Phos. mg/l	0.06	25	0.12	0.03	0.02
Tot. Org. C mg/l	2.56	35	4.70	1.20	0.82
T.Hardness mg/l	91.07	38	139.00	43.00	30.49
Chloride mg/l	7.63	36	24.00	2.00	4.75
TDS mg/l	117.03	37	191.00	73.00	33.37
Turbidity NTU	8.28	38	42.00	1.40	8.33

Table SW-5

Summary of NPS Impaired Waterbodies in the White River Basin

STREAM NAME	H.U.C.	REACH	MILES	STATION	ASSESSED	FISH CONSUM	AQUATIC LIFE	SWIMNG	SEC. CONTACT	DRINKING WATER	AGRI & INDSTRY	MAJOR SOURCE	MINOR SOURCE	MAJOR CAUSE	MINOR CAUSE
Seg 4A															
La Grue Bayou	8020303	-006	20.1	LGB02	M	S	P	S	S	S	S	AG		SI	
Seg 4B															
Bayou DeView	8020302	-004	21.2	BDV02	M	S	P	P	S	S	S	AG		SI	PA
Bayou DeView	8020302	-005	8.6		E	S	P	P	S	S	S	AG	MP	SI	NU
Bayou DeView	8020302	-006	10.2		E	S	P	P	S	S	S	AG	MP	SI	NU
Bayou DeView	8020302	-007	18.2		E	S	P	P	S	S	S	AG	MP	SI	NU
Bayou DeView	8020302	-009	20.3	WHI26	M	S	N	P	S	S	S	AG	MP	SI	NU
NPS Impacted			78.5												
Seg 4C															
Cache River	8020302	-016	21.8	WHI32	M	S	N	N	S	S	S	AG		SI	PA
Cache River	8020302	-017	15.8		E	S	N	P	S	S	S	AG		SI	PA
Cache River	8020302	-018	25.0	CHR02	M	S	N	P	S	S	S	AG		SI	PA
Cache River	8020302	-019	13.7		E	S	P	S	S	S	S	AG		SI	
Cache River	8020302	-020	22.6	CHR03	M	S	P	S	S	S	S	AG		SI	
Cache River	8020302	-027	3.9		E	S	P	P	S	S	S	AG		SI	PA
Cache River	8020302	-028	5.9	CHR04	M	S	P	P	S	S	S	AG		SI	PA
Cache River	8020302	-029	3.9		E	S	P	P	S	S	S	AG		SI	PA
Cache River	8020302	-031	3.4		E	S	P	P	S	S	S	AG		SI	PA
Cache River	8020302	-032	11.4		E	S	P	P	S	S	S	AG		SI	PA
Village Cr	11010013	-006	25.2	VGC01&3	M	S	P	P	S	S	S	AG		SI	PA
Village Cr	11010013	-007	1.2		E	S	P	S	S	S	S	AG		SI	
Village Cr	11010013	-008	13.0		E	S	P	S	S	S	S	AG		SI	
Village Cr	11010013	-012	7.4	VGC02	M	S	N	N	S	S	S	AG		SI	PA
NPS Impacted			174.2												

continued

Table SW-5 (continued)

Summary of NPS Impaired Water bodies in the White River Basin

STREAM NAME	H.U.C.	REACH	MILES	STATION	ASSESSED	FISH CONSUM	AQUATIC LIFE	SWIMNG	SEC. CONTACT	DRINKING WATER	AGRI & INDSTRY	MAJOR SOURCE	MINOR SOURCE	MAJOR CAUSE	MINOR CAUSE
continued															
Seg 4D															
Cypress Bayou	8020301	-010	5.0	CPB01	M	S	P	P	S	S	S	MP	AG	PA	ME
Cypress Bayou	8020301	-011	9.5		E	S	P	P	S	S	S	MP	AG	PA	ME
Wattensaw B.	8020301	-015	48.2	WHI72	M	S	P	S	S	S	S	AG		SI	
NPS Impacted			48.2												
Seg 4E															
Overflow Creek	11010014	-004	0.6		E	S	P	N	S	S	S	AG		PA	SI
Overflow Cr.	11010014	-006	21.7	OFC01	M	S	P	N	S	S	S	AG		PA	SI
Middle Fork	11010014	-027	8.8	WHI43	M	S	P	S	S	S	S	RC	SV	SI	
Middle Fork	11010014	-028	12.0		E	S	P	S	S	S	S	RC	SV	SI	
NPS Impacted			43.1												
Seg 4F															
None															
Seg 4G															
Strawberry R.	11010012	-001	4.4		E	S	P		S	S	S	AG		SI	
Strawberry R.	11010012	-002	9.4	SBR03	M	S	S	P	S	S	S	AG		PA	
Strawberry R.	11010012	-004	0.3		M	S	P		S	S	S	AG		SI	
Strawberry R.	11010012	-005	0.7		M	S	P		S	S	S	AG		SI	
Strawberry R.	11010012	-006	19.0	WHI24	M	S	P		S	S	S	AG		SI	
Strawberry R.	11010012	-009	28.4	SBR02	M	S	P	S	S	S	S	AG			PA
Strawberry R.	11010012	-011	20.4	SBR01	M	S	P	N	S	S	S	AG		SI	PA
Curia Creek	11010009	-001t	18.0	CAC01	M	S	S	N	S	S	S	AG		PA	
NPS Impacted			100.6												
continued															

Table SW-5 (continued)

Summary of NPS Impaired Waterbodies in the White River Basin

STREAM NAME	H.U.C.	REACH	MILES	STATION	ASSESSED	FISH CONSUM	AQUATIC LIFE	SWIMNG	SEC. CONTACT	DRINKING WATER	AGRI & INDSTRY	MAJOR SOURCE	MINOR SOURCE	MAJOR CAUSE	MINOR CAUSE
continued															
Seg 4H															
Spring River	11010010	-003	9.4	WHI21	M	S	P	S	S	S	S	AG		SI	
Spring River	11010010	-018	12.0		E	S	P	S	S	S	S	AG		SI	
Eleven Point	11010011	-001	33.1	WHI05B	M	S	P	S	S	S	S	AG		SI	
NPS Impacted			54.5												
Seg 4I															
Crooked Creek	11010003	-048	31.7	WHI48A,+	M	S	P	S	S	S	S	RE	MP	SI	
Yocum Creek	11010001	-052	16.2		E	S	S	N	S	S	S	AG		PA	
Long Creek	11010001	-054	8.4	WHI71	M	S	S	N	S	S	S	AG	MP	PA	
Dry Creek	11010001	-055	12.0		E	S	S	N	S	S	S	MP	AG	PA	
Long Creek	11010001	-056	14.3		E	S	P	N	S	S	S	AG		PA	SI
Long Creek	11010001	-057	8.6		E	S	P	N	S	S	S	AG		PA	SI
NPS Impacted			91.2												
Seg 4J															
Buffalo National River *															

continued

Table SW-5 (continued)

Summary of NPS Impaired Water bodies in the White River Basin

STREAM NAME	H.U.C.	REACH	MILES	STATION	ASSESSED	FISH CONSUM	AQUATIC LIFE	SWIMNG	SEC. CONTACT	DRINKING WATER	AGRI & INDSTRY	MAJOR SOURCE	MINOR SOURCE	MAJOR CAUSE	MINOR CAUSE
continued															
Seg 4K															
White River	11010001	-023	6.2	WHI52	M	S	P	S	S	S	S	RC	AG	SI	
West Fork	11010001	-024	27.2	WHI51	M	S	N	S	S	S	S	RC	AG	SI	
Middle Fork	11010001	-026	21.9	WHI103	M	S	P	S	S	S	S	AG	RC	SI	
Richland Cr.	11010001	-030	12.1		E	S	P	S	S	S	S	AG		SI	
Brush Creek	11010001	-033	13.5		E	S	P	N	S	S	S	AG		PA	SI
War Eagle Cr.	11010001	-034	22.2	WHI116	M	S	S		S	S	S	AG	RE	SI	
War Eagle Cr.	11010001	-035	8.6		E	S	S		S	S	S	AG	RE	SI	
Kings River	11010001	-037	19.1	WHI09A	M	S	P	S	S	S	S	RE		SI	
Osage Creek	11010001	-045	30.6	WHI69&69	M	S	P	S	S	S	S	AG	MP	SI	NU
Osage Creek	11010001	-047	13.4		E	S	P		S	S	S	AG	RC	SI	
Holman Creek	11010001	-059	9.1	Whi70	M	S	P	N	S	N	S	MP	AG	NU	SI
War Eagle Creek	11010001	-060	28.3		M	S	P	N	S	S	S	AG	RE	PA	SI
NPS Impacted			212.2												
Basin Stream Miles			3735.4												
Miles Evaluated			726.4												
Miles Monitored			1894.0												
NPS Impacted			1441.9												

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ST. FRANCIS RIVER BASIN (5)

The St. Francis River, which has a total length of approximately 475 miles, arises in the hill section of the Ozark Mountains in southeast Missouri and flows generally southward into the flatlands of eastern Arkansas onto the Delta ecoregion to enter the Mississippi River eight miles upstream from Helena. Its main tributaries within Arkansas are the Big Slough Ditch, Little River, Tyronza River, St. Francis Bay and L' Anguille River. The St. Francis river drains approximately 1700 square miles at the Missouri state line and approximately 8416 squares miles within the total drainage basin.

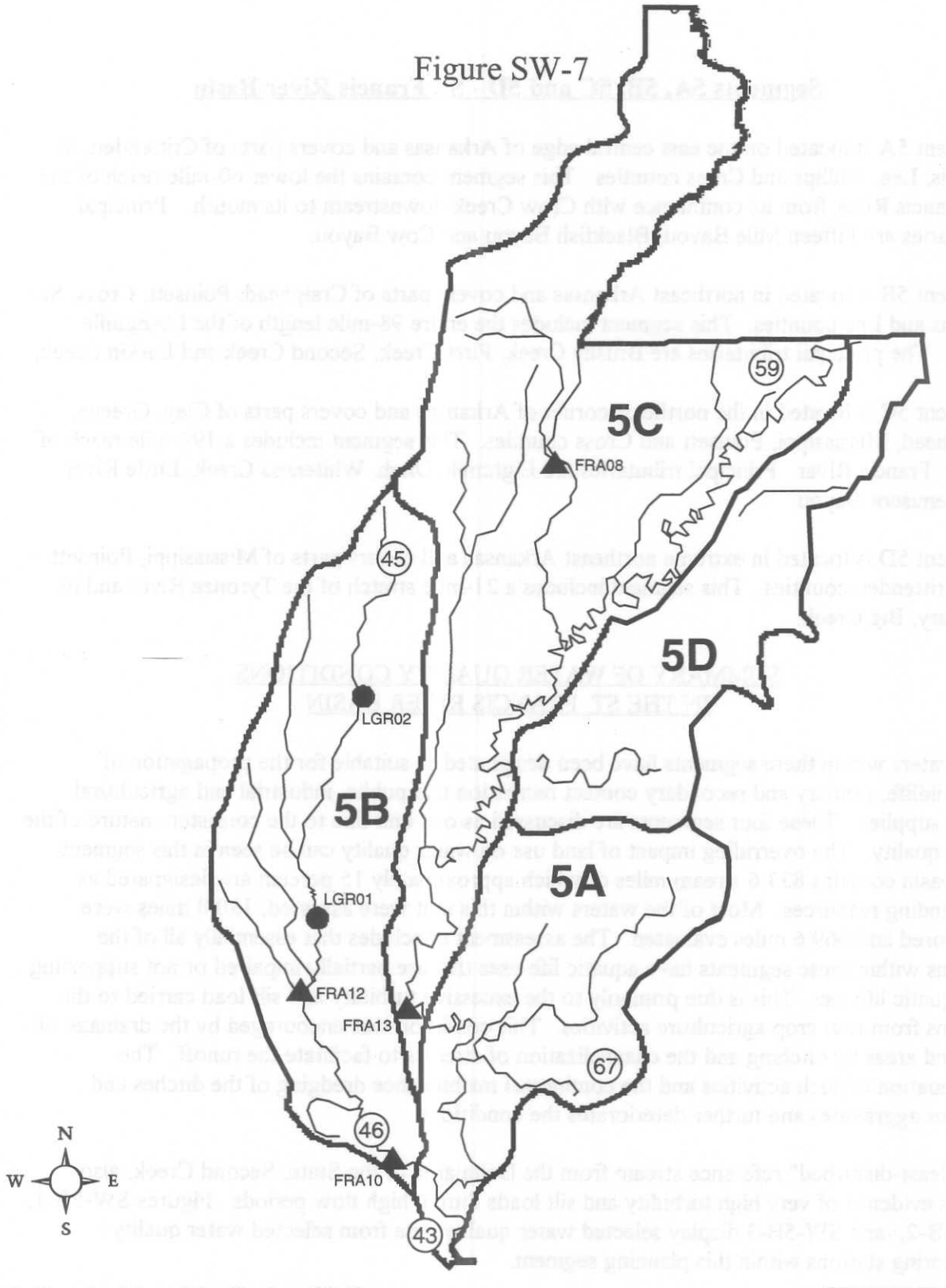
Row crop agriculture dominates the land use in the river basin. There is very little silviculture, except those area of Crowley's Ridge, recreation and/or urban land use in this area. There is, however, a growing confined animal operation land use in this area. There is also some resource extraction activities for sand and gravel utilization in this region.

There are five publicly-owned lakes within the St. Francis River drainage basin in Arkansas. A list of these lakes and their water quality status can be found in the Clean Lakes section of the report.

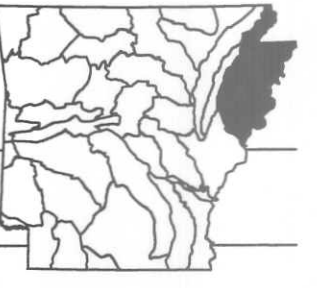
Figure SW-7 is a map of the St. Francis River basin in Arkansas Depicting the Ambient Water Quality Monitoring Stations, the Quarterly monitoring stations used in this survey, and the significant publicly-owned lakes.

Table SW-6 lists the St. Francis River segments, the status of their current designated uses attainments, and a lists of probable causes and possible sources of those waterbody segments not fully meeting their assigned designated uses.

Figure SW-7



▲ - Active Ambient Monitoring Stations
● - Quarterly Monitoring Stations
⑩ - Significant Publicly-Owned Lakes



St. Francis Basin Planning Segments

Segments 5A, 5B, 5C and 5D - St. Francis River Basin

Segment 5A is located on the east central edge of Arkansas and covers parts of Crittenden, St. Francis, Lee, Phillips and Cross counties. This segment contains the lower 60-mile reach of the St. Francis River from its confluence with Crow Creek downstream to its mouth. Principal tributaries are Fifteen Mile Bayou, Blackfish Bayou and Cow Bayou.

Segment 5B is located in northeast Arkansas and covers parts of Craighead, Poinsett, Cross, St. Francis and Lee counties. This segment includes the entire 98-mile length of the L'Anguille River. The principal tributaries are Brushy Creek, First Creek, Second Creek and Larkin Creek.

Segment 5C is located in the northeast corner of Arkansas and covers parts of Clay, Greene, Craighead, Mississippi, Poinsett and Cross counties. This segment includes a 199-mile reach of the St. Francis River. Principal tributaries are Eightmile Ditch, Whiteness Creek, Little River and Pemiscot Bayou.

Segment 5D is located in extreme northeast Arkansas and covers parts of Mississippi, Poinsett and Crittenden counties. This segment includes a 21-mile stretch of the Tyronza River and its tributary, Big Creek.

SUMMARY OF WATER QUALITY CONDITIONS IN THE ST. FRANCIS RIVER BASIN

The waters within these segments have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation and public, industrial and agricultural water supplies. These four segments are discussed as one unit due to the consistent nature of the water quality. The overriding impact of land use on water quality can be seen in this segment. This basin contains 833.6 stream miles of which approximately 15 percent are designated as outstanding resources. Most of the waters within this unit were assessed; 130.8 miles were monitored and 669.6 miles evaluated. The assessment concludes that essentially all of the streams within these segments have aquatic life uses that are partially impaired or not supporting the aquatic life use. This is due primarily to the excessive turbidity and silt load carried to the streams from row crop agriculture activities. This condition was encouraged by the drainage of lowland areas by ditching and the channelization of streams to facilitate the runoff. The continuation of such activities and the continuous maintenance dredging of the ditches and streams aggravates and further deteriorates the conditions.

The "least-disturbed" reference stream from the Delta area of the State, Second Creek, also shows evidence of very high turbidity and silt loads during high flow periods. Figures SW-5B-1, SW-5B-2, and SW-5B-3 display selected water quality data from selected water quality monitoring stations within this planning segment.

Figure SW-5B-1

LGR02

L'ANGUILLE RIVER AT HWY 214 3 MI. W OF WHITEHALL

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	4.83	7	9.80	1.00	3.10
pH	7.45	6	8.20	6.70	0.53
TSS mg/l	88.94	8	259.00	8.00	87.59
NO2+NO3-N mg/l	0.16	7	0.34	0.03	0.12
Tot. Phos. mg/l	0.26	9	0.37	0.13	0.10
Tot. Org. C mg/l	11.51	7	15.50	7.00	2.96
T.Hardness mg/l	112.51	9	214.00	51.00	52.72
Chloride mg/l	16.09	9	30.00	7.00	7.49
TDS mg/l	216.11	9	308.00	145.00	48.17
Turbidity NTU	85.75	8	200.00	8.00	68.82
Fecal Coliform col/100 ml		9	>2000	36	2(0)

Figure SW-5B-2

FRA10

L'ANGUILLE RIVER NEAR MARIANNA ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	7.25	31	18.10	1.90	3.31
pH	7.31	31	8.25	6.86	0.33
TSS mg/l	32.29	34	197.00	6.00	37.11
NO2+NO3-N mg/l	0.22	29	0.60	0.03	0.15
Tot. Phos. mg/l	0.22	31	0.45	0.03	0.11
Tot. Org. C mg/l	9.07	33	63.20	2.90	10.05
T.Hardness mg/l	98.19	34	206.00	29.00	45.95
Chloride mg/l	11.30	32	42.00	4.00	8.48
TDS mg/l	172.38	34	321.00	115.00	46.28
Turbidity NTU	48.31	34	190.00	5.60	40.52
Fecal coliform col/100 ml		13	640	37	2(1)

Figure SW-5B-3

FRA13

ST. FRANCIS AT MADISON ARK

PARAMETER	MEAN	NO. OF SAMPLES	MAX	MIN	STD. DEV.
Dissolved Oxygen mg/l	6.87	31	14.20	2.00	2.54
pH	7.35	31	8.70	6.93	0.36
TSS mg/l	40.15	34	189.00	6.00	40.35
NO2+NO3-N mg/l	0.22	29	0.51	0.02	0.15
Tot. Phos. mg/l	0.21	32	0.42	0.05	0.09
Tot. Org. C mg/l	6.64	33	16.30	2.90	2.61
T.Hardness mg/l	99.46	34	203.00	28.00	44.89
Chloride mg/l	9.87	31	43.00	4.00	8.11
TDS mg/l	166.62	34	252.00	114.00	37.97
Turbidity NTU	47.59	34	160.00	4.80	34.24
Fecal coliform col/100 ml		12	480	23	1(0)

Table SW-6

Summary of NPS Impaired Waterbodies in the St. Francis River Basin

STREAM NAME	H.U.C.	REACH	MILES	STATION	ASSESSED	FISH CONSUM	AQUATIC LIFE	SWIMNG	SEC. CONTACT	DRINKING WATER	AGRI & INDSTRY	MAJOR SOURCE	MINOR SOURCE	MAJOR CAUSE	MINOR CAUSE
Seg 5A															
St. Francis R.	8020203	-002	25.5		E	S	P		S	S	S	AG		SI	
Blackfish Bayou	8020203	-003	2.4		E	S	P		S	S	S	AG		SI	
Frenchmans B.	8020203	-004	14.5		E	S	P		S	S	S	AG		SI	
Blackfish Bayou	8020203	-005 *	2.6		E	S	P		S	S	S	AG		SI	
Fifteen Mile B.	8020203	-006	38.4		E	S	P		S	S	S	AG		SI	
Blackfish Bayou	8020203	-007	16.1		E	S	P		S	S	S	AG		SI	
St. Francis(portion)	8020203	-008	22.9		M	S	P	S	S	S	S	AG		SI	
NPS Impacted			122.4												
Seg 5B															
L'Anguille R.	8020205	-001	19.7	FRA10	M	S	P	P	S	S	S	AG		SI	PA
L'Anguille R.	8020205	-002	16.8		E	S	P	P	S	S	S	AG		SI	PA
L'Anguille R.	8020205	-003	1.8		E	S	P	P	S	S	S	AG		SI	PA
L'Anguille R.	8020205	-004	16.0	LGR01	M	S	P	P	S	S	S	AG		SI	PA
L'Anguille R.	8020205	-005	44.1	LGR02	M	S	N	P	S	S	S	AG		SI	PA
Brushy Creek	8020205	-006	30.7		E	S	P		S	S	S	AG		SI	
First Creek	8020205	-007	27.9		E	S	P		S	S	S	AG		SI	
Second Creek	8020205	-008	16.4	FRA12	M	S	P	S	S	S	S	AG		SI	
NPS Impacted			173.4												
Seg 5C															
St. Francis R.(Pt)	8020203	-008	33.0	FRA13	M	S	P	S	S	S	S	AG		SI	
St. Francis R.	8020203	-009	17.1		E	S	N	N	S	S	S	AG		SI	PA
St. Francis R.	8020203	-013	47.5		E	S	P		S	S	S	AG		SI	
St. Francis R.	8020203	-014	22.8	FRA08	M	S	N		S	S	S	AG		SI	
St. Francis R.	8020203	-015	90.8		E	S	N		S	S	S	AG		SI	
Eightmile Ditch	8020203	-018	17.8		E	S	P		S	S	S	AG		SI	
Eightmile Ditch	8020203	-019	12.8		E	S	P		S	S	S	AG		SI	

continued

Table SW-6 (continued)

Summary of NPS Impaired Waterbodies in the St. Francis River Basin

STREAM NAME	H.U.C.	REACH	MILES	STATION	ASSESSED	FISH CONSUM	AQUATIC LIFE	SWIMNG	SEC. CONTACT	DRINKING WATER	AGRI & INDSTRY	MAJOR SOURCE	MINOR SOURCE	MAJOR CAUSE	MINOR CAUSE
continued															
Whiteners Cr.	8020203	-021	33.6		E	S	P		S	S	S	AG		SI	
Big Boy Creek	8020203	-022	24.2		E	S	P		S	S	S	AG		SI	
Whiteness Cr.	8020203	-023	15.0		E	S	P		S	S	S	AG		SI	
Little River	8020204	-001	20.3		E	S	P		S	S	S	AG		SI	
Little River	8020204	-002	61.7		E	S	P		S	S	S	AG		SI	
Pemiscot Bayou	8020204	-003	28.0		E	S	P		S	S	S	AG		SI	
Little River	8020204	-004	6.0		E	S	P		S	S	S	AG		SI	
Little River	8020204	-005	37.0		E	S	P		S	S	S	AG		SI	
NPS Impacted			467.6												
Seg 5D															
Tyronza River	8020203	-010	8.4		E	S	P		S	S	S	AG		SI	
Big Creek	8020203	-011	15.8		E	S	P		S	S	S	AG		SI	
Tyronza River	8020203	-012	12.8		E	S	P		S	S	S	AG		SI	
Mississippi R.	8010100	-004	4.8	USGS	M	S	P	S	S	S	S	AG		SI	
NPS Impacted			25.0												
Basin Stream Miles			833.6												
Miles Evaluated			669.6												
Miles Monitored			130.8												
NPS Impacted			800.4												

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MISSISSIPPI RIVER BASIN (6)

Table SW-7 lists the Mississippi River segments, the status of their current designated uses attainments, and a lists of probable causes and possible sources of those waterbody segments not fully meeting their assigned designated uses.

Segments 6A, 6B and 6C

These three segments comprise the Mississippi River Basin, which consists of a 437 mile reach of the Mississippi River. It is levied throughout its total length within the state. Segment 6A contains a 129.9-mile reach of the Mississippi from its confluence with the Arkansas River to the Arkansas-Louisiana state line. No surface drainage enters this reach below the Arkansas River except from the Lake Chicot pumping plant on Macon Bayou. Segment 6B consists of a 137.2-mile reach of the Mississippi from its confluence with the St. Francis River to the confluence with the Arkansas River. All drainage from the White River Basin reaches the Mississippi River at the lower end of this reach. Segment 6C is a 174.4-mile reach of the Mississippi from the Arkansas-Missouri state line to its confluence with the St. Francis River. All surface drainage from the St. Francis River Basin within Arkansas enters the Mississippi River via the St. Francis River at the end of this reach.

SUMMARY OF WATER QUALITY CONDITIONS IN THE MISSISSIPPI RIVER BASIN

The waters within these segments have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact recreation and public, industrial and agricultural water supplies. These three segments include 437 miles of the Mississippi River. One monitoring station maintained by USGS is the only source of data from this river. This data was used to assess a 4.8 mile reach of the river. As a result of very high turbidity and silt loads, this segment was assessed with partial impairment of the aquatic life use. Although no other assessments were made for the Mississippi River, it is likely that all segments adjacent to the State are similarly impacted.

Table SW-7

Summary of NPS Impaired Waterbodies in the Mississippi River Basin

STREAM NAME	H.U.C.	REACH	MILES	STATION	ASSESSED	FISH CONSUM	AQUATIC LIFE	SWIMNG	SEC. CONTACT	DRINKING WATER	AGRI & INDSTRY	MAJOR SOURCE	MINOR SOURCE	MAJOR CAUSE	MINOR CAUSE
Seg 6															
Mississippi R.	8010100	-004	4.8	USGS	M	S	P	S	S	S	S	AG		SI	

Surface Water Pesticide Analyses

Analyses for approximately 50 pesticides were completed from the 133 monthly monitored stations from one sampling event. All 100 quarterly sample stations were sampled for these pesticides during the July 1995 sample event. After the initial screening of the 100 quarterly sample sites, only selected sites were then chosen for pesticide analysis. These were the 33 sites located in the State's Delta ecoregion. Samples were collected and analyzed from these sites on two additional occasions, October 1995 and October 1996. This provided a total of 285 analyses for the 50 pesticides during this survey. Only 26 of these compounds were found in detectable levels. The three pesticides which had the highest incidence of occurrence above the detection level were atrazine, metolachlor and molinate (Ordram). The detection level of all three compounds was generally less than 0.009 ug/L. Atrazine was detected in approximately 68% of all of the samples and at 102 of the samples sites; metolachlor was detected in approximately 73% of the samples and at 82 of the sample sites; and molinate was detected in approximately 62% of the samples and at 62 of the samples sites. The highest values found were 1.085 ug/L for atrazine in DePartee Creek near Bradford, 6.87 ug/L for metolachlor in Bayou Bartholomew near McGehee, and 332.65 ug/L for molinate in Glaise Creek near Worden. Metribuzin, cyanazine and alachlor were also found quite frequently and at a number of the different sampling sites..

Table SW-8 is an outline of the sample sites that had the most numerous pesticide detections. Figure SW-8 depicts the locations of the sample sites listed in Table SW-8, and Figure SW-9 illustrates the total number of samples sites that the most commonly detected pesticides were found. Atrazine, molinate, and metalochlor were responsible for over 66% of the total pesticide detections listed in Table SW-8. They were also detected at many sights during all three sampling events that occurred from the Delta ecoregion sites and from the one time sample event from all of the other sites. This indicates that these three pesticides are very easily found in not only the row crop agriculture regions of the state, but also in many other areas were pesticide usage is minimal. This may indicate that these three pesticides are somewhat persistent in the environment, easily detectable, somewhat slow to breakdown, and used for a broad spectrum of applications in the state. Additionally, metribuzin, cyanazine and alachlor were also detected quite frequently from a number of different sampling sites. These three compounds are commonly used for weed control throughout the Delta ecoregion on a variety of crops. They seem to be somewhat persistent in the environment also, but not as much as atrazine, metalochlor and molinate.

The two sites located on Bayou Macon, BYM01 and BYM02, the lower Bayou Bartholomew site, BYB03, and the upper Boeuf River site (BFR01) had the highest number of overall detections. All four of these sites are located in the southeastern most section of the state where there is an extensive amount of rice and soybean production. All of the sample sites located in planning segments 2A and 2B had numerous detections of pesticides, usually more than 11 per sample station. Atrazine, molinate, and metalochlor were responsible for approximately 53% of the detections.

Table SW-8

Sample Sites With Numerous Pesticide Occurrences

Station	Segment	Location	No. of Detections[#]
BYM01	2A	Bayou Macon near Eudora	17(9)
BYM02	2A	Bayou Macon at Hwy. 65	16(7)
BGB01	2A	Big Bayou near Portland	13(7)
OUA 32	2A	Big Bayou at Hwy. 144	11(9)
BFR01	2A	Boeuf River at Hwy. 278	15(9)
OUA 15A*	2A	Boeuf River near the state line	9(3)
BYB01	2B	Bayou Bartholomew at Hwy. 82	11(7)
BYB02	2B	Bayou Bartholomew at Hwy. 4	16(7)
BYB03	2B	Bayou Bartholomew at Hwy. 54	13(7)
COC01	2B	Cut-Off Creek at Co. Rd. NE of Bydell	7(4)
COC02	2B	Cut-Off Creek at Hwy. 4	7(3)
WSB01	3B	Wabbaseka Bayou at Hwy. 79	16(8)
ARK 23*	3B	Bayou Meto near Bayou Meto	10(3)
BMO02	3B	Bayou Meto at Hwy. 79	6(5)
PMB01	3C	Plum Bayou near Tucker	10(8)
WHI37**	4A	Big Creek at Hwy. 318	10(4)
BGC02	4A	Big Creek at Hwy 49	6(4)
CPC01	4A	Big Cypress Creek at Hwy. 1	7(4)
LGB01	4A	LaGrue Bayou at Hwy 33	9(8)
LLB01	4A	Little LaGrue Bayou at Hwy. 1	8(7)
BDV02	4B	Bayou DeView at Hwy. 64	9(8)
WHI33	4B	Bayou DeView at Hwy. 70	7(5)
WHI32	4C	Cache River at Bradsbury, Ar	11(9)
CHR02	4C	Cache River at Hwy. 64	11(9)
CHR03	4C	Cache River at Hwy. 18	10(9)
CHR04	4C	Cache River at Hwy. 412	11(9)
VGC01	4C	Village Creek at Hwy. 37	11(9)
VGC02	4C	Village Creek at Hwy. 228	10(9)
VGC03	4C	Village Creek at Hwy. 224	11(9)
WHI56**	4D	Bayou Des Arc at Hwy. 11	7(5)
BDA01	4D	Bayou Des Arc, County Road	6(5)
DTC01	4F	DePartee Creek near Bradford	9(8)
GSC01	4F	Glaise Creek at Hwy. 64	8(8)
LGR02	5B	L'Anguille River at Hwy. 214	7(7)
LGR01	5B	L'Anguille River at Hwy. 306	7(7)
FRA 10*	5B	L'Anguille River near Marianna	10(3)
FRA 13*	5C	St. Francis River at Hwy. 50	9(3)

* Sampled one time only.

** Sampled on two sampling events only.

[#] (#) Number of detections of Molinate, Metalachlor and Atrazine.

Figure SW-8

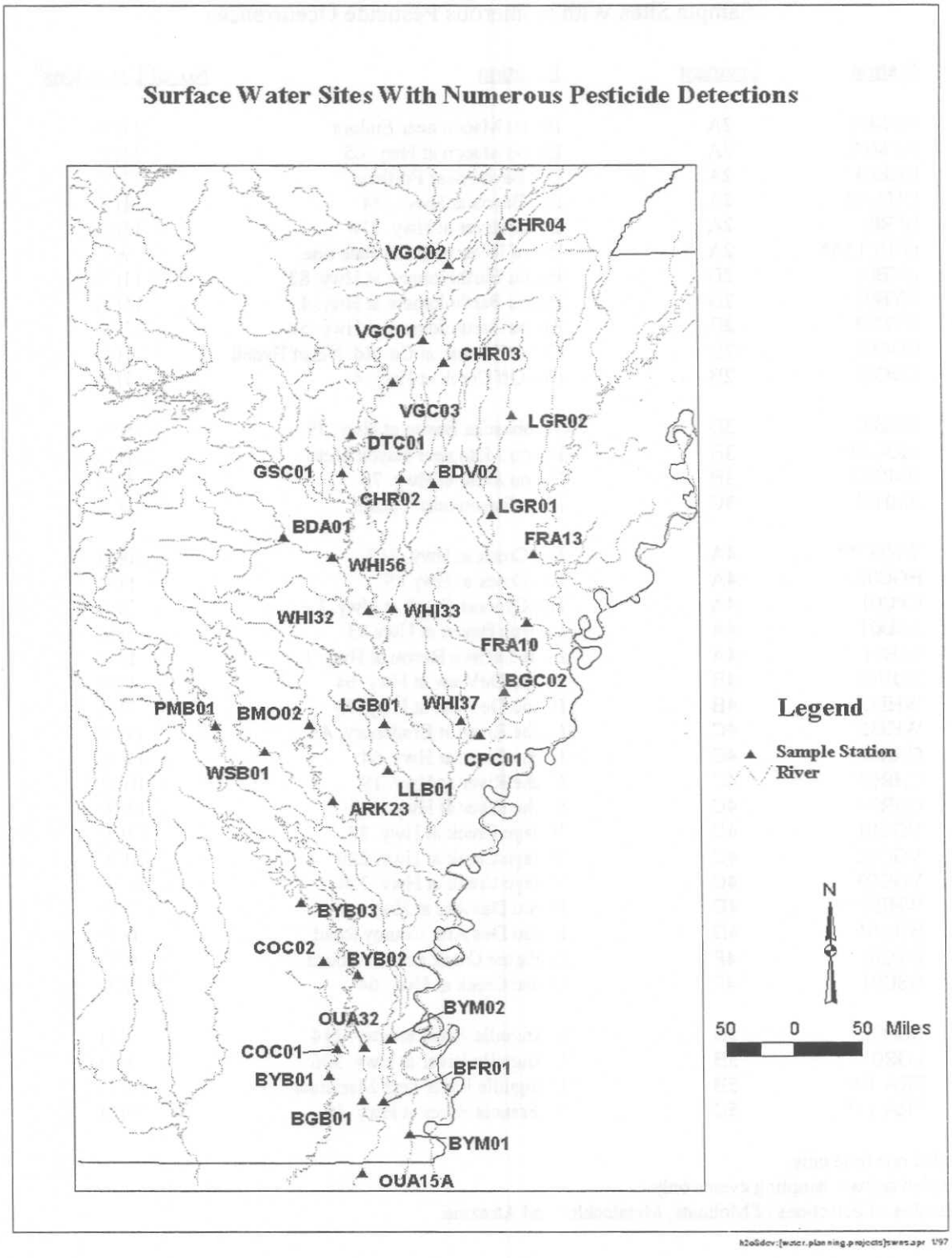
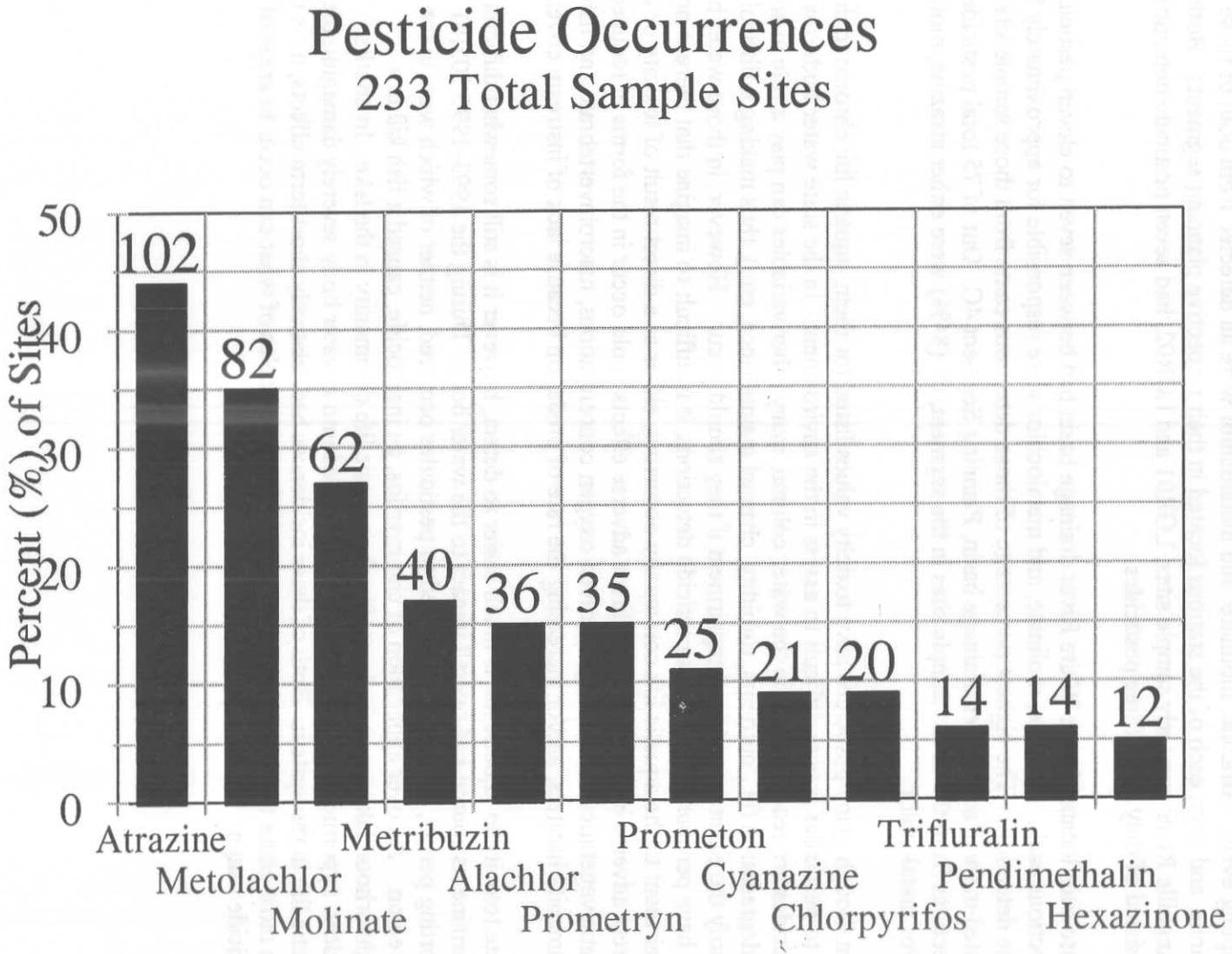

Surface Water Sites With Numerous Pesticide Detections
CHR04
VGC02
VGC01
CHR03
VGC03
LGR02
DTC01
GSC01
BDV02
CHR02
LGR01
BDA01
FRA13
WHI56
WHI32
WHI33
FRA10
BGC02
PMB01
BMO02
LGB01
WHI37
CPC01
WSB01
LLB01
ARK23
BYB03
COC02
BYB02
BYM02
OUA32
COC01
BFR01
BYB01
BGB01
BYM01
OUA15A
Legend
Sample Station
River
N
50 0 50 Miles

Figure SW-9


Pesticide Occurrences
233 Total Sample Sites
Percent (%) of Sites
50
40
30
20
10
0
102
82
62
40
36
35
25
21
20
14
14
12
Atrazine
Metolachlor
Molinate
Metribuzin
Alachlor
Prometryn
Prometon
Cyanazine
Chlorpyrifos
Trifluralin
Pendimethalin
Hexazinone

The Bayou Meto site near Bayou Meto, ARK23, and the L'Anguille River site near Marianna, FRA10, had the highest number of different overall pesticides detections (10) per single sampling event. Atrazine, molinate, and metalochlor were all detected from both of these stations, and from each of the stations located in their respective planning segments. Both of the L'Anguille River quarterly sample sites, LGR01 and LGR02, had seven pesticide detections that consisted of only these three pesticides.

Those sites located in the White River drainage basin had between seven to eleven pesticides detections each. Atrazine, molinate, and metalochlor were responsible for approximately 80% of those detections. The highest percentage of those detections came from those sample sites located in the Cache River drainage basin, Planning Segment 4C. Out of 75 total pesticide detections from the seven sample sites in the segment, 63 (84%) were either atrazine, molinate, and/or metalochlor.

Even though many pesticides have toxicity values listed for them, aquatic life chronic toxicity due to pesticides is very difficult to assess in the environment. In the state water bodies where pesticides are readily found in the water column, many other variables can play a role in aquatic life degradation (ie., nutrients, turbidity, channel maintenance, etc.), thus making it difficult to identify the exact cause(s) of impairment if they should occur. However, in those water bodies that have persistent, numerous pesticide detections, it is difficult to imagine that there is not an impairment to the aquatic life community occurring, either as a direct result of toxicity or as an indirect adverse impact. These indirect adverse effects could occur in the forms of reduced aquatic vegetation decreasing dissolved oxygen concentrations, macroinvertebrate and fish community habitats, and/or increasing the rate of predation because lack of instream cover.

Acute toxicity to aquatic life is much easier to detect, however it is still somewhat difficult to determine its source and overall impact to the water body. During the 1993-1995 305(b) reporting period, two fish kills related to pesticides occurred, neither of which were in the Delta ecoregion. An over application of chlorpyrifos, an insecticide, caused a fish kill in a neighborhood lake severely damaging the aquatic life community in the lake. In another incident, cypermethrin, an insecticide, was spilled into a water body severely damaging the aquatic life in the system. Both of these incidences had relatively short term effects, as is normal with most acute toxicity events; however, they are examples of what can occur in areas of pesticide usage.

Literature Cited for Surface Water Section

EPA Guidelines for 319(h) assessment reports pursuant to the 1987 Clean Water Act.

Arkansas Department of Pollution Control & Ecology, State of Arkansas Water Quality Inventory Report, (305(b)), 1996.

Farm Chemical Handbook, '96, Vol. 82. Meister Publishing Company. Willoughby, OH 44094

Seyler, Linda A. et. at., EXTOXNET, Extension Toxicology Network. Pesticide Information Notebook. 1994

WATERSHED PRIORITIZATION

Table SW-9 is a prioritized listing if the nonpoint source impaired waterbody segments as per the prioritization method described earlier in this document. Below is a listing of the abbreviations used in Table SW-9.

STREAM IDENTIFICATION

H.U.C.	Hydrologic Unit Code
RCH	Reach number
Miles	Number of miles in the reach
Assmnt Type	Assessment Type - Monitored or Evaluated

USE SUPPORT

Aquatic Life	Aquatic Life Use
Swimming	Primary Contact Recreation
Drinking Water	Drinking Water

DESIGNATIONS

Extra Resource	Extraordinary Resource Waterbody
Water supply	Water Supply
Eco Sens	Ecologically Sensitive Waterbody

Table SW-9

WATERSHED PRIORITIZATION																	
Stream Identification						Use Support			Designations			Sources/Causes					
Stream Name	H.U.C.	RCH	Miles	Station	Assmnt Type	Aquatic Life	Swimming	Drinking Water	Extra Rsrce	Water Supply	Eco Sens	Major Source	Minor Source	Major Cause	Minor Cause	DRASTIC	Total Score
Strawberr y R.	11010012	-011	20.4	SBR01	4	2	4	0	2	4	2	4		SI	PA	6	28
Strawberry R.	11010012	-002	9.4	SBR03	4	4	2	0	2	4		4		PA		6	26
War Eagle Cr.	11010001	-060	28.3		4	2	4	0		4		4	2	PA	SI	6	26
Big Bayou	8050001	-022	27.1	BGB01,+	4	4	4	4				4		SI	PA	4	24
Boeuf River	8050001	-018	49.4	OUA15A	4	4	4	4				4		SI	NU	4	24
Brush Creek	11010001	-033	13.5		2	2	4	0		4	2	4		PA	SI	6	24
Cossatot R.	11140109	-018B	37.2	RED22	4	0	4	0	2	4	2	4		PA		4	24
Eleven Point	11010011	-001	33.1	WHI05B	4	2	0	0	2	4	2	4		SI		6	24
Illinois River	11110103	-022	10.8	ARK06A	4	2	0	0		4	2	4	2	SI	NU	6	24
Spring River	11010010	-003	9.4	WHI21	4	2	0	0	2	4	2	4		SI		6	24
Strawberry R.	11010012	-009	28.4	SBR02	4	2	0	0	2	4	2	4			PA	6	24
West Fork	11010001	-024	27.2	WHI51	4	4	0	0		4		4	2	SI		6	24
White River	11010001	-023	6.2	WHI52	4	2	0	0		4	2	4	2	SI		6	24
Cache River	8020302	-016	21.8	WHI32	4	4	4	0	2			4		SI	PA	4	22
Cossatot R.	11140109	-019	14.2		2	0	4	0	2	4	2	4		PA		4	22
Crooked Creek	11010003	-048	31.7	WHI48A,+	4	2	0	0	2	4		4	0	SI		6	22
Holman Creek	11010001	-059	9.1	WHI70	4	2	4	4				0	2	NU	SI	6	22
Illinois River	11110103	-020	1.6		2	2		0		4	2	4	2		SI	6	22
Kings River	11010001	-037	19.1	WHI09A	4	2	0	0	2	4		4		SI		6	22
Spring River	11010010	-018	12.0		2	2	0	0	2	4	2	4		SI		6	22
Strawberry R.	11010012	-006	19.0	WHI24	4	2		0	2	4		4		SI		6	22
Strawberry R.	11010012	-005	0.7		4	2		0	2	4		4		SI		6	22
Strawberry R.	11010012	-004	0.3		4	2		0	2	4		4		SI		6	22
Beaty Creek	11070209	-049	5.2		2	2		0		4	2	4		SI		6	20
Boeuf River	8050001	-019	58.1	BFR01	4	4	0	4				4		SI	NU	4	20
Evansville Cr.	11110103	-012	9.0		2	2	4	0		4		4		PA	SI	4	20
Hurricane Cr.	8040203	-006	30.8	OUA31	4	4	0	4				4		MN		4	20
Macon Bayou	8050002	-003	80.5	BYM01	4	4	0	4				4		SI	NU	4	20
Mulberry River	11110201	-006	10.4	ARK42	4	2	0	0	2	4		4	2	SI		2	20
Piney Creek	11110202	-023	19.0		2	2	0	0	2	4		4	2	SI		4	20

WATERSHED PRIORITIZATION

Stream Identification						Use Support			Designations			Sources/Causes					
Stream Name	H.U.C.	RCH	Miles	Station	Assmnt Type	Aquatic Life	Swimming	Drinking Water	Extra Rsrce	Water Supply	Eco Sens	Major Source	Minor Source	Major Cause	Minor Cause	DRASTIC	Total Score
Strawberry R.	11010012	-001	4.4		2	2		0	2	4		4		SI		6	20
Town Branch	11070208	-003t	3.0	ARK56	4	2	0	4			2	0	2	NU		6	20
War Eagle Cr.	11010001	-034	22.2	WHI116	4	0		0		4		4	2	SI		6	20
Yocum Creek	11010001	-052	16.2		2	0	4	0		4		4		PA		6	20
B. Bartholomew	8040205	-013	33.9	BYB03	4	2	4	0				4		SI	PA	4	18
B. Bartholomew	8040205	-012	82.7	BYB02	4	2	4	0				4		SI	PA	4	18
B. De L'Outre	8040202	-006	32.4	OUA05	4	2	0	4				4	0	MN	NU	4	18
Baron Fork	11110103	-013	10.0	ARK07	4	2	0	0		4		4	0		SI	4	18
Bayou DeView	8020302	-009	20.3	WHI26	4	4	2	0				4	0	SI	NU	4	18
Boggy Creek	8050002	-009	12.0		2	4	0	4				4		SI	NU	4	18
Cache River	8020302	-018	25.0	CHR02	4	4	2	0				4		SI	PA	4	18
Choctaw Bayou	8050001	-021	58.9		2	4	0	4				4		SI	NU	4	18
Clay Ditch	8050002	-007	24.3		2	4	0	4				4		SI	NU	4	18
Clear Creek	11110103	-029	13.5	ARK10C	4	2		0			2	4		SI		6	18
Cypress Creek	8050001	-020	47.5		2	4	0	4				4		SI	NU	4	18
Ditch Bayou	8050002	-004	4.0		2	4	0	4				4		SI	NU	4	18
Dry Creek	11010001	-055	12.0		2	0	4	0		4		0	2	PA		6	18
Hurricane Cr.	8040203	-004	19.5	OUA116	4	2	0	4				4		MN		4	18
Illinois River	11110103	-024	2.5	ARK40	4	2	0	0			2	4	2	SI		4	18
Long Creek	11010001	-057	8.6		2	2	4	0				4		PA	SI	6	18
Long Creek	11010001	-056	14.3		2	2	4	0				4		PA	SI	6	18
Long Creek	11010001	-054	8.4	WHI71	4	0	4	0				4	0	PA		6	18
Macon Bayou	8050002	-006	38.6		2	4	0	4				4		SI	NU	4	18
Middle Fork	11010001	-026	21.9	WHI103	4	2	0	0				4	2	SI		6	18
Moores Creek	11110103	-026	9.8		2	2		0		4	2	4		SI		4	18
Muddy Fork	11110103	-027	11.0		2	2		0		4	2	4		SI		4	18
Muddy Fork.	11110103	-025	3.2		2	2		0		4	2	4		SI		4	18
Oak Log Creek	8050002	-010	48.4		2	4	0	4				4		SI	NU	4	18
Petit Jean R.	11110204	-011	21.6	ARK34	4	2	0	0		4		4	2	SI		2	18
Petit Jean R.	11110204	-006	17.9	PJR02	4	2	0	0		4		4	2	SI		2	18
Piney Creek	11110202	-019	26.3	ARK43	4	2	0	0	2			4	2	SI		4	18
Red Fork Creek	8050002	-008	17.0		2	4	0	4				4		SI	NU	4	18

WATERSHED PRIORITIZATION

Stream Identification						Use Support			Designations			Sources/Causes					
Stream Name	H.U.C.	RCH	Miles	Station	Assmnt Type	Aquatic Life	Swimming	Drinking Water	Extra Rsrce	Water Supply	Eco Sens	Major Source	Minor Source	Major Cause	Minor Cause	DRASTIC	Total Score
Red River	11140106	-005	25.3	RED25	4	0	0	4				4		MN		6	18
St. Francis R.	8020203	-009	17.1		2	4	4	0				4		SI	PA	4	18
Village Cr	11010013	-012	7.4	VGC02	4	4	4	0				4		SI	PA	2	18
War Eagle Cr.	11010001	-035	8.6		2	S		0		4		4	2	SI		6	18
B. Bartholomew	8040205	-002	17.9	BYB01	4	2	0	0				4	UN	SI	HG	6	16
B. Bartholomew	8040205	-006	82.3	OUA33	4	0	4	0				4		PA	SI	4	16
Cache River	8020302	-017	15.8		2	4	2	0				4		SI	PA	4	16
Cache River	8020302	-028	5.9	CHR04	4	2	2	0				4		SI	PA	4	16
Cadron Creek	11110205	-011	2.2	CCR01	4	0	4	0	2			4		PA		2	16
E. Fork Cadron	11110205	-002	15.6	EFC01	4	0	4	0	2			4		PA		2	16
Frog Bayou	11110201	-018	20.4	ARK47	4	2	4	0				4	0	SI	PA	2	16
Illinois River	11110103	-023	8.1		2	2	0	0			2	4		SI		6	16
Illinois River	11110103	-028	19.9		2	2		0			2	4	2	SI		4	16
L'Anguille R.	8020205	-001	19.7	FRA10	4	2	2	0				4		SI	PA	4	16
L. Missouri R.	8040103	-008	19.6	OUA35	4	2	0	0			2	4		SI		4	16
Lost Creek	8040203	-008	33.5		2	2	0	4				4		MN		4	16
Osage Creek	11010001	-045	30.6	WHI68&69	4	2	0	0				4	0	SI	NU	6	16
Osage Creek	11010001	-047	13.4		2	2		0				4	2	SI		6	16
Ouachita River	8040101	-033	11.9	OUA21	4	0	2	0			2	4		PA		4	16
Overflow Cr.	11010014	-006	21.7	OFC01	4	2	4	0				4		PA	SI	2	16
Petit Jean R.	11110204	-005	1.3	PJR03	4	2	0	0		4		4		SI		2	16
Piney Creek	11110202	-021	11.9		2	2	0	0	2			4	2	SI		4	16
Piney Creek	11110202	-018	0.5		2	2	0	0	2			4	2	SI		4	16
Poteau River	11110105	-027	16.0		2	4	4	0				4	0	SI	PA	2	16
Red River	11140106	-003	9.8		2	0	0	4				4		MN		6	16
Red River	11140201	-003	15.5	RED09	4	0	0	4				4		MN	PA	4	16
Red River	11140106	-001	34.8		2	0	0	4				4		MN		6	16
Red River	11140106	-025	8.0		2	0	0	4				4		MN		6	16
Saline River	11140109	-014	25.3	RED32	4	0	4	0				4		PA		4	16
St. Francis R.	8020203	-014	22.8	FRA08	4	4		0				4		SI		4	16
Wabbaseka B.	8020401	-003	101.7	WSB01	4	2	2	0				4		SI	PA	4	16
B. Bartholomew	8040205	-012	25.0		4	2	0	0				4	UN	SI	HG	4	14

WATERSHED PRIORITIZATION																	
Stream Identification						Use Support			Designations			Sources/Causes					
Stream Name	H.U.C.	RCH	Miles	Station	Assmnt Type	Aquatic Life	Swimming	Drinking Water	Extra Rsrce	Water Supply	Eco Sens	Major Source	Minor Source	Major Cause	Minor Cause	DRASTIC	Total Score
B. Bartholomew	8040205	-001	60.1	OUA13	4	0	2	0				4		SI		4	14
Bayou DeView	8020302	-004	21.2	BDV02	4	2	2	0				4		SI	PA	2	14
Bayou Meto	8020402	-003	39.8	ARK23	4	2		0				4		SI		4	14
Black Fork	11110206	-009	14.3	BLF01	4	2	0	0				4	2	SI		2	14
Brushy Creek	8020205	-006	30.7		2	2		0				4		SI		6	14
Cache River	8020302	-031	3.4		2	2	2	0				4		SI	PA	4	14
Cache River	8020302	-032	11.4		2	2	2	0				4		SI	PA	4	14
Cache River	8020302	-029	3.9		2	2	2	0				4		SI	PA	4	14
Cache River	8020302	-020	22.6	CHR03	4	2	0	0				4		SI		4	14
Cache River	8020302	-027	3.9		2	2	2	0				4		SI	PA	4	14
Cadron Creek	11110205	-009	0.7		2	0	4	0	2			4		PA		2	14
Chickalah Cr.	11110204	-002	19.3	ARK58	4	2	0	0				4	2	SI		2	14
Cincinnati Cr.	11110103	-021	9.0		2	2		0				4		SI		6	14
Curia Creek	11010009	-001t	18.0	CAC01	4	0	4	0				4		PA		2	14
E. Fork Cadron	11110205	-003	2.0		2	0	4	0	2			4		PA		2	14
Fourche LaFave	11110206	-006	21.5		2	2	0	0				4	2	SI		4	14
Gafford Creek	11110206	-012	8.5	GLF01	4	2	0	0				4	2	SI		2	14
James Fork	11110105	-033	18.4	ARK15	4	2	0	0				4	2	SI		2	14
L'Anguille R.	8020205	-004	16.0	LGR01	4	2	2	0				4		SI	PA	2	14
L'Anguille R.	8020205	-005	44.1	LGR02	2	4	2	0				4		SI	PA	2	14
Middle Fork	11010014	-027	8.8	WHI43	4	2	0	0				4	2	SI		2	14
Mississippi R.	8010100	-004	4.8	USGS	4	2	0	0				4		SI		4	14
Mountain Fork	11140108	-014	11.0	RED01	4	2	0	0				4		SI		4	14
Overflow Creek	11010014	-004	0.6		2	2	4	0				4		PA	SI	2	14
Petit Jean R.	11110204	-003	8.7		2	2	0	0		4		4		SI		2	14
Prairie Creek	8040101	-048	10.0	OUA40	4	4	0	0				0	2	NU	SI	4	14
Red River	11140201	-005	12.0		2	0	0	4				4		MN		4	14
Red River	11140201	-011	15.2		2	0	0	4	0			4		MN		4	14
Red River	11140201	-007	40.1		2	0	0	4	0			4		MN		4	14
Red River	11140201	-004	4.0		2	0	0	4				4		MN		4	14
Richland Cr.	11010001	-030	12.1		2	2	0	0				4		SI		6	14
Rolling Fork	11140109	-028	20.7	RED30	4	2	0	0				4		NU		4	14

WATERSHED PRIORITIZATION

Stream Identification						Use Support			Designations			Sources/Causes					
Stream Name	H.U.C.	RCH	Miles	Station	Assmnt Type	Aquatic Life	Swimming	Drinking Water	Extra Rsrce	Water Supply	Eco Sens	Major Source	Minor Source	Major Cause	Minor Cause	DRASTIC	Total Score
S.Fourche LaFave	11110206	-014	26.1	ARK52,+	4	2	0	0				4	2	SI		2	14
Second Creek	8020205	-008	16.4	FRA12	4	2	0	0	2			4		SI		2	14
Smackover Cr.	8040201	-006	14.8	OUA27	4	2	0	0				4		MN		4	14
St. Francis R.	8020203	-015	90.8		2	4		0				4		SI		4	14
St. Francis R.(Pt)	8020203	-008	33.0	FRA13	4	2	0	0				4		SI		4	14
StFrancis(portion)	8020203	-008	22.9		4	2	0	0				4		SI		4	14
Village Cr	11010013	-006	25.2	VGC01&3	4	2	2	0				4		SI	PA	2	14
B.Two Prairie	8020402	-006	44.7	ARK97	4	2		0				4	0	SI	NU	2	12
Bayou DeView	8020302	-007	18.2		2	2	2	0				4	0	SI	NU	2	12
Bayou DeView	8020302	-006	10.2		2	2	2	0				4	0	SI	NU	2	12
Bayou DeView	8020302	-005	8.6		2	2	2	0				4	0	SI	NU	2	12
Bayou Meto	8020402	-001	4.3		2	2		0				4		SI		4	12
Big Creek	8020203	-011	15.8		2	2		0				4		SI		4	12
Blackfish Bayou	8020203	-007	16.1		2	2		0				4		SI		4	12
Blackfish Bayou	8020203	-005	2.6		2	2		0				4		SI		4	12
Blackfish Bayou	8020203	-003	2.4		2	2		0				4		SI		4	12
Cache River	8020302	-019	13.7		2	2	0	0				4		SI		4	12
Cypress Bayou	8020301	-010	5.0	CPB01	4	2	2	0				0	2	PA	ME	2	12
Deep Bayou	8040205	-005	28.9		2	2	0	0				4		SI		4	12
Fifteen Mile B.	8020203	-006	38.4		2	2		0				4		SI		4	12
Fourche LaFave	11110206	-002	8.7		4	2	0	0				0	2	HG	SI	4	12
Fourche LaFave	11110206	-001	44.4		2	2	0	0				4		SI		4	12
Frenchmans B.	8020203	-004	14.5		2	2		0				4		SI		4	12
L'Anguille R.	8020205	-002	16.8		2	2	2	0				4		SI	PA	2	12
L'Anguille R.	8020205	-003	1.8		2	2	2	0				4		SI	PA	2	12
La Grue Bayou	8020303	-006	20.1	LGB02	4	2	0	0				4		SI		2	12
Little River	8020204	-004	6.0		2	2		0				4		SI		4	12
Little River	8020204	-005	37.0		2	2		0				4		SI		4	12
Little River	8020204	-002	61.7		2	2		0				4		SI		4	12
Little River	8020204	-001	20.3		2	2		0				4		SI		4	12
Little Sugar	11070208	-003	24.2		2	2		0				4	0	SI	NU	4	12
Middle Fork	11010014	-028	12.0		2	2	0	0				4	2	SI		2	12

WATERSHED PRIORITIZATION

Stream Identification						Use Support			Designations			Sources/Causes					
Stream Name	H.U.C.	RCH	Miles	Station	Assmnt Type	Aquatic Life	Swimming	Drinking Water	Extra Rsrce	Water Supply	Eco Sens	Major Source	Minor Source	Major Cause	Minor Cause	DRASTIC	Total Score
Pemiscot Bayou	8020204	-003	28.0		2	2		0				4		SI		4	12
Poteau River	11110105	-001	2.0	ARK14	4	2	0	0				4		SI		2	12
Rolling Fork	11140109	-024	1.7		2	2	0	0				4		NU		4	12
Rolling Fork	11140109	-027	18.0		2	2	0	0				4		NU		4	12
S.Fourche LaFave	11110206	-013	10.3		2	2	0	0				4	2	SI		2	12
Smackover Cr.	8040201	-007	29.1		2	2	0	0				4		MN		4	12
St. Francis R.	8020203	-013	47.5		2	2		0				4		SI		4	12
St. Francis R.	8020203	-002	25.5		2	2		0				4		SI		4	12
Tyronza River	8020203	-010	8.4		2	2		0				4		SI		4	12
Tyronza River	8020203	-012	12.8		2	2		0				4		SI		4	12
Wattensaw Bayou	8020301	-015	48.2	WHI72	4	2	0	0				4		SI		2	12
Big Boy Creek	8020203	-022	24.2		2	2		0				4		SI		2	10
Cypress Bayou	8020301	-011	9.5		2	2	2	0				0	2	PA	ME	2	10
Eightmile Ditch	8020203	-019	12.8		2	2		0				4		SI		2	10
Eightmile Ditch	8020203	-018	17.8		2	2		0				4		SI		2	10
First Creek	8020205	-007	27.9		2	2		0				4		SI		2	10
Village Cr	11010013	-007	1.2		2	2	0	0				4		SI		2	10
Village Cr	11010013	-008	13.0		2	2	0	0				4		SI		2	10
Whiteners Cr.	8020203	-021	33.6		2	2		0				4		SI		2	10
Whiteners Cr.	8020203	-023	15.0		2	2		0				4		SI		2	10

There are a total of 178 stream segments listed in Table SW-9. The top 20 percent of those total 36 segments and approximately 805 stream miles. Seven drainage basin HUC codes, comprise the majority of those 805 stream miles. The major cause of impairment to all of these stream miles is either excessive silt loads or pathogens. The source of most of these impairment causes is generally some kind of agriculture activity, however resource extraction and road construction and maintenance is the source of some of the silt loadings.

Top NPS Priority Watersheds

The Strawberry River accounted for over 10 percent of the stream miles of the top waterbody segments listed in Table SW-9. This included seven different stream segments of the river encompassing almost the entire main stem of the river. The upper White River tributaries accounted for approximately 18 percent of the stream miles of the top waterbody segments in Table SW-9. This included stream segments from the upper White River forks, War Eagle Creek, Kings River and Yocum Creek. These two watersheds had more stream segments listed in the top 20 percent than any other. Other watersheds contributing to this list included stream segments from the Eleven Point, Spring, Illinois, and Mulberry Rivers, and Crooked and Piney Creeks in the northern portion of the state; the Cosatot River in the southwest portion of the state; and Bayou Bartholomew, Macon Bayou, Boeuf River, and the Cache River from the States' Delta region. The water bodies from the Delta region of the state accounted for the majority of the stream miles listed in the top 20 percent of Table SW-9.

LAKES WATER QUALITY ASSESSMENT

Background

Various estimates have been made concerning the size of Arkansas' surface water resource. Most of these estimate three-fourths of one million acres of flowing and impounded waters. Streams and rivers compose approximately one-third of this total. The remaining one-half million acres are about equally divided between the large Corps of Engineers multi-purpose reservoirs and the small, usually specific-purpose lakes (including private ponds). In this document, primarily for convenience, the terms "lakes" and "reservoirs" are used synonymously without regard to size or whether they were naturally or artificially created.

The large Corps of Engineers constructed reservoirs are multi-use, but most were constructed primarily for hydropower and flood control; some primarily for navigation. A few are used for municipal water supply. All receive substantial recreational uses such as fishing, swimming, boating, camping, and related uses. The smaller lakes in the state were constructed for a single purpose. Many of these lakes are used exclusively for municipal water supply, others were built for general recreation use and some were designed and managed primarily for public fishing. In the latter group, other recreational uses are permitted, unless they conflict with fishing, e.g., water skiing. Multiple uses are allowed on very few of the municipal water supply lakes; however, numerous uses are allowed on the industrial water supply impoundments.

Water quality data from the majority of Arkansas' lakes is sparse, although selected lakes have intensive, long-term data collection. Some have only specific-purpose data, e.g., fecal coliform sampling from swimming areas. A few lakes have been investigated as a short-term project when a specific or potential problem was identified. Such studies were associated with the Clean Lakes Section of the Water Quality Act or municipal water supply reservoirs with treatment problems. In contrast, the Corps' lakes of the Little Rock District have a relatively large amount of multi-parameter and multi-site water quality data. Additionally, DeGray Reservoir probably has the most extensive water quality data base of any reservoir in this region of the country. The data extend from pre-impoundment to the current date.

Selection of the lakes to be assessed was determined by the definition developed for a "significant publicly-owned lake". Such lakes are defined as an impoundment of substantial size (approximately 100 acres or greater) which contains access designed to enhance public uses in and on the waters. Eighty (80) lakes ranging in size from 60 to over 45,000 acres and totaling 356,254 acres were identified. The lakes were categorized by (1) the ecoregions in which they are located, (2) the primary purpose for which they were constructed, and (3) by lake type which includes certain morphometric features such as size and average depth.

Data were collected from most of these lakes between mid-July and the end of August in 1989 and again in 1994. The larger Corps of Engineers lakes and some of the large municipal water supply lakes are sampled annually. Table L-1 lists Arkansas' Significant Publicly-Owned lakes and selected characteristics of each. Figure L-1 is a map of the lakes locations.

Table L-1: Arkansas' Significant Publicly-Owned Lakes

No.	Lake	County	Acres	Avg Depth	Water-shed[1]	W/A[2]	Eco-region[3]	Purpose[4]	Type
1	WINONA	SALINE	1240	30.0	44.4	22.9	OM	W	A
2	DIERKS	HOWARD	1360	22.0	114.0	53.6	OM	F	A
3	GILLHAM	HOWARD	1370	21.0	271.0	126.6	OM	F	A
4	DEQUEEN	SEVIER	1680	21.0	169.0	64.4	OM	F	A
5	CATHERINE	HOT SPRING	1940	18.0	1516.0	500.1	OM	H	A
6	GREESON	PIKE	7200	38.7	237.0	21.1	OM	H	A
7	HAMILTON	GARLAND	7300	26.0	1441.0	126.3	OM	H	A
8	MAUMELLE	PULASKI	8900	23.0	137.0	9.9	OM	W	A
9	DEGRAY	CLARK	13200	48.8	453.0	22.0	OM	H	A
10	NORFORK	BAXTER	22000	57.0	1806.0	52.5	OH	H	A
11	BEAVER	BENTON	28200	58.0	1186.0	26.9	OH	H	A
12	GREERS FERRY	CLEBURNE	31500	60.0	1153.0	23.4	BM	H	A
13	OUACHITA	GARLAND	40100	51.0	1105.0	17.6	OM	H	A
14	BULL SHOALS	MARION	45440	67.0	6036.0	85.0	OH	H	A
15	CRYSTAL	BENTON	60	12.0	4.5	48.0	OH	A	B
16	SHORES	FRANKLIN	82	10.0	26.0	202.9	BM	R	B
17	SPRING	YELL	82	23.0	10.5	82.0	AV	R	B
18	HORSEHEAD	JOHNSON	100	16.0	17.3	110.7	BM	R	B
19	WEDDINGTON	WASHINGTON	102	16.0	3.0	18.8	OH	R	B
20	COVE	LOGAN	160	10.0	8.5	34.0	AV	R	B
21	ELMDALE	WASHINGTON	180	8.0	6.0	21.3	OH	A	B
22	FAYETTEVILLE	WASHINGTON	196	15.0	6.0	19.6	OH	R	B
23	BOBB KIDD	WASHINGTON	200	13.3	4.0	12.8	OH	A	B
24	WILHELMENA	POLK	200	10.0	13.5	43.2	OM	A	B
25	BARNETT	WHITE	245	27.0	37.5	98.0	AV	A	B
26	SUGARLOAF	SEBASTIAN	250	12.0	5.0	12.8	AV	A	B
27	WRIGHT	SEBASTIAN	350	9.0	3.1	5.7	AV	A	B
28	FT. SMITH	CRAWFORD	416	28.0	73.0	112.3	BM	W	B
29	SEQUOYAH	WASHINGTON	500	8.0	275.0	352.0	OH	R	B
30	SWEPCO	BENTON	531	17.0	14.0	16.9	OH	W	B
31	SHEPHERD SPGS.	CRAWFORD	552	31.0	68.0	78.8	BM	W	B
32	CHARLES	LAWRENCE	562	8.0	18.0	20.5	OH	A	B
33	LEE CREEK	CRAWFORD	634	11.0	465.0	469.4	BM	W	B
34	BEAVERFORK	FAULKNER	900	10.0	11.5	8.2	AV	R	B
35	HINKLE	SCOTT	965	15.0	27.5	18.2	AV	A	B
36	BREWER	CONWAY	1165	20.0	36.4	20.0	AV	W	B
37	JUNE	LAFAYETTE	60	5.0	4.0	42.7	GC	A	C
38	BAILEY	CONWAY	124	8.0	7.5	38.7	AV	R	C
39	TRICOUNTY	CALHOUN	280	7.0	11.5	26.3	GC	A	C
40	COX CREEK	GRANT	300	6.0	17.0	36.3	GC	A	C
41	HURRICANE	SALINE	300	8.0	24.9	53.1	OM	W	C
42	FRIERSON	GREENE	335	7.5	7.3	13.9	DL	A	C
43	STORM CREEK	PHILLIPS	420	7.0	8.0	12.2	DL	R	C
44	CALION	UNION	510	6.0	6.7	8.4	GC	A	C
45	POINSETT	POINSETT	550	7.0	4.5	5.2	DL	A	C
46	BEAR CREEK	LEE	625	10.0	6.0	6.1	DL	R	C
47	UP WHITE OAK	OUACHITA	630	8.0	20.7	21.0	GC	A	C

Table L-1: Arkansas' Significant Publicly-Owned Lakes

No.	Lake	County	Acres	Avg Depth	Water-shed[1]	W/A[2]	Eco-region[3]	Purpose[4]	Type
(continued)									
48	ATKINS	POPE	750	5.5	10.2	8.7	AV	A	C
49	OVERCUP	CONWAY	1025	4.0	17.2	10.7	AV	A	C
50	LO WHITE OAK	OUACHITA	1080	8.0	42.5	25.2	GC	A	C
51	HARRIS BRAKE	PERRY	1300	6.0	11.2	5.5	AV	A	C
52	CANE CREEK	LINCOLN	1620	6.0	24.0	9.5	GC	A	C
53	WILSON	ASHLEY	150	5.0	1.0	4.3	DL	A	D
54	ENTERPRISE	ASHLEY	200	5.0	2.0	6.4	DL	A	D
55	1ST OLD RIVER	MILLER	200	4.0	2.0	6.4	GC	A	D
56	PICKTHORNE	LONOKE	207	5.0	13.2	40.8	DL	A	D
57	HOGUE	POINSETT	280	4.4	2.0	4.6	DL	A	D
58	GREENLEE	MONROE	300	6.0	0.5	1.1	DL	A	D
59	MALLARD	MISSISSIPPI	300	6.0	0.5	1.1	DL	A	D
60	GRAMPUS	ASHLEY	334	6.0	2.0	3.8	DL	A	D
61	DESARC	PRAIRIE	350	6.0	1.0	1.8	DL	A	D
62	WALLACE	DREW	362	5.2	1.0	1.8	DL	A	D
63	PINE BLUFF	JEFFERSON	500	6.0	4.0	5.1	DL	A	D
64	ASHBAUGH	GREENE	500	5.0	1.0	1.3	DL	A	D
65	BOIS D'ARC	HEMPSTEAD	750	4.0	4.0	3.4	GC	A	D
66	OLD TOWN	PHILLIPS	900	3.5	23.0	16.4	DL	R	D
67	HORSESHOE	CRITTENDEN	1200	10.0	13.5	7.2	DL	R	E
68	UPPER CHICOT	CHICOT	1270	15.0	14.0	7.1	DL	R	E
69	GRAND	CHICOT	1400	7.0	5.5	2.5	DL	A	E
70	GA. PACIFIC	ASHLEY	1700	4.0	4.0	1.5	GC	W	E
71	BLUE MT.	LOGAN	2900	8.6	488.0	107.7	AV	F	E
72	COLUMBIA	COLUMBIA	2950	11.0	48.0	10.4	GC	W	E
73	NIMROD	YELL	3600	8.2	680.0	120.9	AV	F	E
74	LOWER CHICOT	CHICOT	4030	15.4	350.0	55.6	DL	R	E
75	CONWAY	FAULKNER	6700	5.0	136.0	13.0	AV	A	E
76	ERLING	LAFAYETTE	7000	7.0	400.0	36.6	GC	W	E
77	OZARK	FRANKLIN	10600	14.0	151801.0	9165.3	AV	N	E
78	FELSENTHAL	BRADLEY	14000	7.0	10852.0	496.1	GC	R	E
79	MILLWOOD	LITTLE RIVER	29500	5.2	4144.0	89.9	GC	F	E
80	DARDANELLE	POPE	34300	14.2	153666.0	2867.2	AV	N	E
	TOTAL		356254						

1 — Watershed: square miles

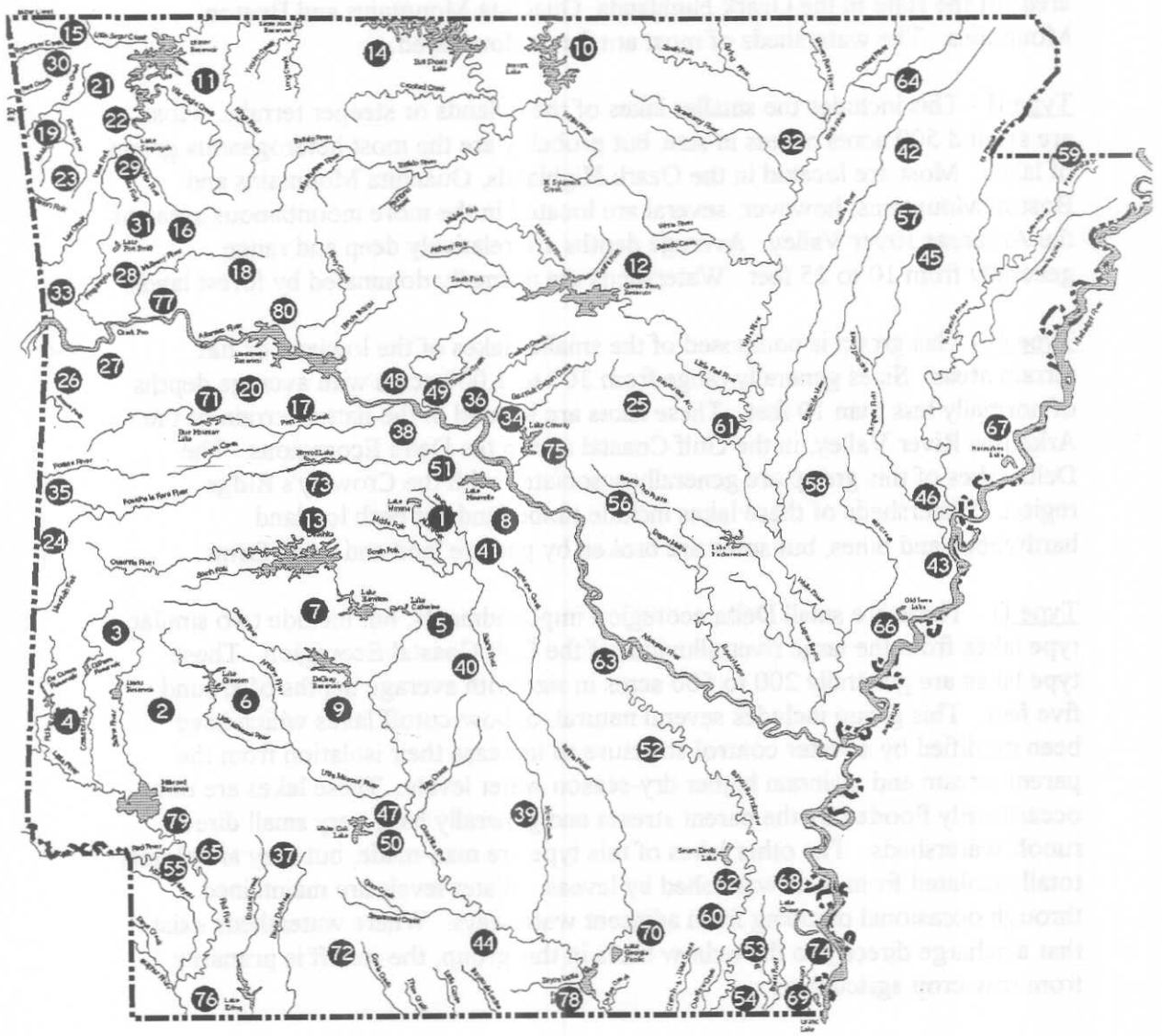
2 — W/A: Watershed (acres)/Area of Lake

3 — Ecoregions: OM-Ouachita Mtns.; BM-Boston Mtns.; OH-Ozark Highlands; AV-Arkansas River Valley; GC-Gulf Coastal; DL-Delta

4 — Purpose: W-Water supply; F-Flood Control; H-Hydropower; A-Angling (public fishing); N-Navigation; R-Recreation

FIGURE L-1

Location of Arkansas' Significant Publicly-Owned Lakes



Using size, average depth and ecoregion, all lakes are placed into one of the following lake types:

Type A - These are the larger lakes, usually of several thousand acres in size. They have average depths normally 30 to 60 feet and are located in the montane areas of the state in the Ozark Highlands, Ouachita Mountains and Boston Mountains. The watersheds of most are forest dominated.

Type B - This includes the smaller lakes of the uplands or steeper terrain. Most are around 500 acres or less in size, but probably are the most heterogenous group of lakes. Most are located in the Ozark Highlands, Ouachita Mountains and Boston Mountains; however, several are located in the more mountainous areas of the Arkansas River Valley. Average depths are relatively deep and range generally from 10 to 25 feet. Watersheds are normally dominated by forest lands.

Type C - This group is composed of the smaller lakes of the lowland or flat terrain areas. Sizes generally range from 300 to 1,000 acres with average depths of normally less than 10 feet. These lakes are located in the flatter terrain of the Arkansas River Valley, in the Gulf Coastal and in the Delta Ecoregions. The Delta lakes of this group are generally associated with the Crowley's Ridge region. Watersheds of these lakes include timberlands of both lowland hardwoods and pines, but some are broken by pasture land and small farms.

Type D - These are small Delta ecoregion impoundments, but include two similar type lakes from the large river alluvium of the Gulf Coastal Ecoregion. These type lakes are generally 200 to 500 acres in size with average depths of around five feet. This group includes several natural, oxbow-cutoff lakes which have been modified by a water control structure to increase their isolation from the parent stream and maintain higher dry-season water levels. These lakes are only occasionally flooded by the parent stream and generally have very small direct runoff watersheds. The other lakes of this type are man-made, but they are almost totally isolated from their watershed by levees. Water levels are maintained through occasional pumping from adjacent waterways. Where watersheds exist that discharge directly to the oxbow lakes in this group, the runoff is primarily from row crop agriculture.

Type E - These are the large lowland lakes of the Delta, Gulf Coastal Plains, and alluvial areas of the Arkansas River Valley Ecoregion. They range from several thousand to over 30,000 acres in size, but average depth is usually less than 10 feet. This group includes four large oxbow-cutoff lakes which have been modified by the construction of drainage ditches, levees and other water control structures. Watershed types include mixtures of intensive row crop agriculture, small farms and pastures (confined animal operations) and timberlands.

Impaired and Threatened Uses of Lakes

A two-time, single-point-in-time data base for most of Arkansas' lakes does not allow a definitive determination of the degraded, threatened or impaired status of a lakes designated use. However, none of the statutory designated uses, i.e., public, agriculture or industrial water supply; propagation of fish and wildlife, recreational uses and navigation, have been eliminated or in any of the lakes. Similarly, the fishable/swimmable goals of the Clean Water Act have been attained in all lakes. Although there were water quality values in some lakes which exceeded the specific standards, most of these parameters were a result of short-term, natural occurrences, or were of a magnitude which did not threaten an existing use. However, fish consumption was only partially supported in some lakes due to fish consumption advisories which have been issued for waters where fish tissue contamination exceeded the Federal Drug Administration's action levels. Table L-2 outlines the total attained use support of Arkansas' significant publicly-owned lakes and the assessment means.

Table L-2 Lakes Use Support

Degree of Use Support	Assessment Category		Total Assessed (acres)
	Evaluated	Monitored	
Size Fully Supporting		328,912	328,912
Size Partially Supporting		27,342	27,342
Size Not Supporting			
TOTAL ASSESSED (acres)		356,254	356,254

The fish consumption use is only partially supported in five lakes, totaling 27,342 acres, designated as significant publicly-owned lakes. Six additional smaller public lakes totaling 306 acres are also not fully meeting the fish consumption use because of fish tissue contamination of mercury. The source is yet unknown. Current health advisories warn against the consumption of certain fishes from these lakes.

Nonpoint source impacts are generally more subtle and require more intensive and long-term data. Additionally, water quality effects from this source are often only identifiable seasonally or may be cyclic chronologically. It is, therefore, beyond the scope of the current database of most lakes to make definitive determinations concerning nonpoint source impacts. However, the Beaver Lake Clean Lakes Study, 1992, demonstrated; 1) a similar trophic status as that identified by the National Eutrophication Survey (NES) in 1974; 2) a lower total phosphorus and

chlorophyll a concentration than in 1974; 3) a substantial decrease in point source loadings since 1974; and 4) an increase in nonpoint source nutrient loadings since 1974. Likewise, the Millwood Lake Clean Lakes Study of 1994 demonstrated; 1) a similar trophic status since the National Eutrophication Survey in 1974; 2) nutrient loadings have increased since 1974; 3) the water clarity has decreased since 1974, keeping the trophic status stable; 4) nonpoint source nutrient loads account for over 75% of the total nutrient load to the lake; and 5) the Millwood Lake fishery is healthy and stable.

Chlorophyll [a] values, which are also seasonally and spatially variable, may be a possible indicator of nonpoint source contributions to accelerated eutrophication. Although this parameter will not distinguish between natural and cultural eutrophication, very high values should prompt an investigation of the activities within the watershed of a specific lake which could provide conclusive evidence of the sources. Old Town Lake is obviously significantly impacted by enriched, agricultural runoff. To a lesser degree, Grand Lake, Horseshoe Lake and upper Lake Chicot also suffer from similar impacts. In addition, Lake Greenlee and Lake Frierson suffer excessive turbidity concentrations decreasing secchi disk transparencies and increasing trophic state indices. Table L-3 outlines a number of lakes with impairments most likely due to nonpoint sources of pollution. This assessment is mainly attributed to lake watershed use, which in most cases is dominated by nonpoint sources activities, ie agriculture, silviculture.

Table L-3

Nonpoint Source Impacts to Lakes

Lake	County	Lake Acres	Impairment	
			Cause	Source*
Fayetteville	Washington	196	Total Phosphorus	Agriculture Septic Tanks
Wilhelmina	Polk	200	Bacteria	Agriculture
Sugarloaf	Sebastian	250	Bacteria	Septic Tanks
Charles	Lawrence	562	Bacteria	Septic Tanks
June	Lafayette	60	Minerals Bacteria	Resource Extraction Septic Tanks
Frierson	Greene	335	Nutrients/Turbidity Bacteria	Agriculture Septic Tanks
Storm Creek	Phillips	420	Bacteria	Septic Tanks
Calion	Union	510	Minerals	Resource Extraction
Poinsette	Poinsette	550	Turbidity	Agriculture
Bear Creek	Lee	625	Nutrients/Turbidity	Agriculture
Cane Creek	Lincoln	1620	Bacteria	Septic Tanks
First Old River	Miller	200	Nutrients/Turbidity	Agriculture
Greenlee	Monroe	300	Nutrients/Turbidity	Agriculture
Continued				

Table L-3 (continued)

Nonpoint Source Impacts to Lakes

Lake	County	Lake Acres	Impairment	
			Cause	Source*
Continued				
Mallard	Mississippi	300	Nutrients/Turbidity Bacteria	Agriculture Agriculture
Pine Bluff	Jefferson	500	Bacteria	Septic Tanks
Old Town Lake	Phillips	900	Nutrients/Turbidity	Agriculture
Horseshoe	Crittenden	1200	Nutrients/Turbidity	Agriculture
Upper Chicot	Chicot	1270	Nutrients/Turbidity	Agriculture
Grand	Chicot	1400	Nutrients/Turbidity Bacteria	Agriculture Agriculture
Lower Chicot	Chicot	4030	Nutrients/Turbidity	Agriculture
Lake Erling	Lafayette	7000	Minerals Bacteria	Resource Extraction Unknown
Felsenthal	Union	14000	Bacteria	Unknown

* The source of some of these impairments is a best professional judgement assessment based on the type of impairment and the most likely source due to watershed usage.

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WETLANDS

At the time of the first settlers arrival into the State of Arkansas, the wetland resources comprised approximately 8.5 million acres over the State's six ecoregions; the majority of these wetlands were located in the Mississippi Alluvial Plain, the Delta. Today, approximately 10 percent, or 800,000 acres, remain (Arkansas Department of Parks and Tourism (ADPT) 1985).

The Delta is bordered by the Mississippi River on the east and extends to the base of the Ouachita Mountains near Little Rock. From here the Delta extends northward along the "Fall Line" and Ozark Mountains' foothills into Missouri and southward from Little Rock along the edge of the Gulf Coastal Plains to Louisiana. This area contains approximately 15,625 square miles and all or part of 27 of the State's 75 counties.

The Delta's major streams above the mouth of the Arkansas River flow through channels originally carved out by the Mississippi River. At one time, the Mississippi River flowed west of Crowley's Ridge and carved portions of the channels that now form the Black River, the White River, the Cache River, and Bayou DeView. After the Mississippi River moved east of Crowley's Ridge it carved a channel that is now the St. Francis River. Over the millenniums, the flow of the Mississippi River across the Delta deposited silt and organic materials which developed one of the nation's most fertile land areas. The Delta's flat slope and the frequent flooding events produced extensive water-tolerant hardwood trees and lead to the formation of numerous "swamps".

The first settlers found vast resources of bottomland hardwoods in the swamps upon their arrival in Arkansas. These timber resources included baldcypress, water oak, and tupelo gum. For 200 years, generation after generation cleared the timber and farmed the rich, fertile soil. The process was slow and labor intensive; however, these settlers had help from the federal government from time to time. In 1849-50, Congress passed the Swamp Land Acts, which resulted in the transfer of 7,686,575 acres of public domain land to the State of Arkansas. Funds collected from the sale of these lands were used to construct levees and drainage ditches in the Delta. Major floods occurred in 1858, 1862, 1865, 1871, 1874, 1882, 1883, and 1884. In 1879, the Mississippi River Commission, a cooperative effort of the federal government and local interests, was formed to address the problems associated with these reoccurring floods. Levee boards and drainage districts were formed resulting in swamp clearing, ditch and levee construction for flood control. The passage of the Flood Control Act of 1928 removed the requirement for the local interests to pay half of the cost of levee construction on the Mississippi River. The passage of these various flood control acts resulted in the conversion of thousands of acres of wetlands into productive agricultural lands. After WWII, mechanization allowed the clearing of wetland acreage faster than ever before. A dozer with a cutting blade could clear more land in one day than some families, a generation earlier, were able to clear in a year. Ninety percent (90%) of wetland acreage cleared in the last 35 to 40 years has been due to the expansion of soybean production (Holder 1969). Estimates of bottomland hardwood forest lost in eastern Arkansas since 1957 and projections of losses through 1995 are given below (U.S. Fish and Wildlife Service 1979).

Table W-1

Losses of Bottomland Hardwood Forests in Eastern Arkansas		
YEAR	ACRES	% CHANGE
1957	2,083,009	-----
1967	1,326,835	-36.3
1977	1,015,166	-23.5
1958	875,820	-13.7
1990*	796,940	-9.0
1995*	731,420	-8.2

* Projection

Act 561 of the State of Arkansas Statutes in 1995 defines a wetland as "an area that has water at or near the surface of the ground at some time during the growing season (wetland hydrology). It contains plants that are adapted to wet habitats (hydrophytic vegetation) and is made up of soils that have developed under wet conditions (hydric soils) or any other definition promulgated by the Arkansas Soil and Water Conservation Commission."

The term "marsh" appears in the State law under the Arkansas Water and Air Pollution Control Act, Act 472 of 1949, as amended. Subdivision 9(a): "waters of the State, means all streams, lakes, marshes, ponds, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private, which are contained within, flow through, or border upon this state or any portion thereof."

Although the state does not have delegated 404 permitting authority, the state has used its Antidegradation Policy to protect wetland resources affected by projects requiring Section 404 dredge and fill permits. The State will deny water quality certification for such projects when, in the opinion of the state, the use will no longer be maintained and protected.

At the present time the state does not have a formal policy for Section 401 water quality certifications. The state makes Section 401 decisions based on its Regulation No. 2, Regulation Establishing Water Quality Standard for Surface Water of the State of Arkansas.

In 1985, the ADPT prepared a Statewide Comprehensive Outdoor Recreation Plan (SCORP). This plan investigated wetland losses and proposed a policy to abate these losses. The 1992 SCORP makes this Wetlands Issue Statement: "Arkansas must define and adopt a statewide no-net-loss wetland policy and take a proactive role to preserve, protect and restore our wetlands."

Several state agencies are working independently to preserve wetlands within the State. The AGFC, the State's chief wildlife agency, has a long-standing commitment to protecting wetlands within the Delta because of its outstanding wildlife importance, particularly to migratory game birds. The AGFC has acquired 12 areas within the Delta comprising over 125,000 acres. The ANHC, an agency of the Department of Arkansas Heritage, focuses on the protection of rare plant and animal species and natural communities, and has made a comparable commitment of acquiring legal interest (fee title on conservation easement) in 57 areas of the state. Of these areas, 37 protect approximately 6,125 acres of wetlands and 24 miles of riparian corridor. The agency is also working cooperatively with landowners to manage wetlands along 16 miles of Bayou Dorcheat and its tributaries in Columbia and Lafayette Counties involving approximately 11,000 acres of bottomland forest and wetlands.

The AGFC and the ANHC have committed to additional investment in the Delta and have begun developing comprehensive plans for these activities: the AGFC has developed the Cache/Lower White River Joint Venture Project under the North American Waterfowl Management Plan; and the ANHC has developed the White River/Lower Arkansas Megasite Plan to guide its future activities. A formal dedication ceremony on July 25, 1990 was attended by officials from the U.S. Fish and Wildlife Service, the AGFC, Ducks Unlimited and Governor Bill Clinton in proclaiming the five state-and-federally-owned areas as "Wetlands of International Importance". This designation stems from the "Ramsar Convention". This convention resulted in an international agreement which provided the framework for international cooperation for the conservation of wetland habitats. This designation of the Cache/Lower White River is only the eighth wetland area in the United States to be recognized as a wetland of international importance under the Ramsar agreement.

During 1992, the State of Arkansas made its first attempts at developing a comprehensive strategy for protecting wetlands within the state. Four state agencies - AGFC, ASWCC, ANHC, and the Department joined together to discuss wetland protection efforts within the state. The group has since expanded to include the University of Arkansas Cooperative Extension Service, the Arkansas Forestry Commission (AFC), the Arkansas Highway and Transportation Department (AHTD) and the ADPT.

In 1993, Governor Tucker created the Water Resource and Wetlands Task Force "to provide recommendations to the Governor regarding protection of Arkansas' water resources and wetlands". Protection and preservation of Arkansas' water resources, and the development of a wetlands policy that meets or exceeds the national wetlands policy were specifically cited in the proclamation, along with cooperative development of plans for wetlands restoration and agricultural management practices between Arkansas and seven other delta states. Task force membership includes representatives from federal and state agencies, environmental organizations, tourism and agricultural interests, academic institutions, and the Arkansas General Assembly.

The Task Force developed the following mission statement:

> "The Wetlands and Water Resource Task Force is to develop recommendations to the Governor that will result in the preservation and protection of Arkansas water and wetland resources, including conserving, enhancing, and restoring the acreage, quality, biological diversity and ecosystem sustainability of Arkansas Wetlands, and recommendations regarding the long term health of the aquifers including surface water projects, restoration and clean water initiatives as they relate to agriculture and wetlands."

The group became organized as the Multi-Agency Wetlands Planning Team (MAWPT) in 1995. The MAWPT continues to utilize 104(b) grants to develop the Arkansas Wetlands Conservation Plan and to support the Governor's Water Resources and Wetlands Task Force.

The ANHC leads the 1992 grant, examining GIS applications and wetland protection mechanisms in the Cache River basin. The ASWCC leads the 1993 grant for the Bayou Bartholomew watershed and continues wetland GIS development and will also produce a wetland mitigation plan. The Department leads the 1994 grant to continue the wetland inventory effort in the Boeuf-Tensas basin and examine the protocol, hardware and software, and coordination required for wetland GIS development. The AGFC leads the 1995 grant to develop the Wetland Conservation Strategy, a document containing policy, program, and legislation recommendations for the implementation of the Arkansas Wetland Conservation Plan. The AFC leads the 1996 grant which continues the wetland inventory and GIS development in the Black River basin and produces educational materials for private landowners managing bottomland hardwoods.

The Arkansas Wetlands Conservation Plan will consist of two elements:

1. Statewide strategies for wetland protection and restoration.
2. Watershed wetland conservation strategies based on GIS inventories and analysis requiring local partnership and decision sharing.

In 1995, Governor Jim Guy Tucker signed Acts 561 and 562, which provide tax incentives and monetary aid to property owners who engage in the conservation, development or restoration of wetlands and riparian areas. Act 562 makes provisions for the ASWCC to develop a "mitigation bank", "a publicly owned and managed wetland site, created or restored in accordance with Act 562 to compensate for unavoidable adverse impacts due to activities which otherwise comply with the requirements of the Federal Water Pollution Control Act." The ASWCC has recently promulgated regulations implementing these Acts.

The group of state agencies which organized as the Multi-Agency Wetlands Planning Team (MAWPT) in 1992 continues to utilize 104(b) grants to develop the Arkansas Wetlands Conservation Plan and to support the Governor's Water Resources and Wetlands Task Force.

The ANHC led the 1992 grant examining GIS applications and wetland protection mechanisms in the Cache River basin. The ASWCC led the 1993 grant for the Bayou Bartholomew watershed, continuing GIS development and is producing a state wetland mitigation plan. The Department leads the 1994 grant to continue wetland inventory efforts in the Boeuf-Tensas basin and examine the protocol, hardware and software, and coordination required for wetland GIS development. The AGFC leads the 1995 grant to develop the Arkansas Wetland Strategy; a document containing policy, program, and legislation recommendations for implementation of the Arkansas Wetlands Conservation Plan. Strategy development is now somewhat complete. To inform strategy development, the MAWPT conducted a statewide conservation, interagency cooperation, and government/private sector partnerships for wetlands stewardship. The AFC leads the 1996 grant which continues wetland inventory and GIS development in the Black River basin and will produces educational materials for private landowners managing bottomland hardwoods. For 1997, MAWPT is requesting wetland grant funds to: 1) begin inventory and GIS development in the St. Francis River basin; 2) produce a video explaining the Arkansas Wetlands Conservation Plan; 3) complete the watershed strategy reports in the river basins previously inventoried; 4) begin hydrogeomorphic (functional) characteristics of Arkansas' wetlands; and 5) continue plan development and coordination activities.

Literature Cited for Wetlands Section

Arkansas Department of Parks and Tourism. 1995. S.C.O.R.P. 95 Statewide Comprehensive Outdoor Recreation Plan. Arkansas Department of Parks and Tourism, Little Rock, Arkansas.

Holder, T. 1969. Disappearing Wetlands in Eastern Arkansas. Arkansas Planning Commission, Little Rock, Arkansas.

U.S. Fish and Wildlife Service. 1979. Documentation, Chronology, and Future Projections of Bottomland Hardwood Loss in the Lower Mississippi Alluvial Plain. Volume 1 and Volume 11. U.S. Fish and Wildlife Service, Vicksburg, Mississippi.

Wetlands Bulletin. The Ramsar Convention-International Effects, Potential in the U.S. 1988. Michael Smart.

Interim Report of the Arkansas Water Resource and Wetlands Task Force. November 1994

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GROUND WATER QUALITY

OVERVIEW

Ground water continues to be one of Arkansas' most important natural resources. Between 1975 and 1980 ground water use increased from 2,596 to 4,056 million gallons per day, a 56 percent increase (Holland and Ludwig, 1981). The rate of increase slowed somewhat between 1980 and 1990 when ground water use rose from 4,056 million gallons per day to 4,708 million gallons per day, a 16 percent increase (Holland, 1993). Part of the reason for the lower rate of increase of ground water usage can be attributed to reliance on surface water by a greater segment of the populace for public supply and for commercial purposes. Nevertheless, ground water accounts for 1,580 million gallons more per day in total withdrawals than surface water (Holland, 1993). Ground water accounts for a little over 60 percent of the total withdrawals and 47.21 percent of the total used for drinking water. This considerable reliance on ground water stresses the need for increased water quality monitoring and associated research.

Ground water quality is monitored by several state agencies and the United States Geological Survey both on an ambient basis and for specific investigations. Monitoring programs established to provide early detection of a pollutant entering a fresh water aquifer can be an effective way to preserve the quality of the ground water by initiating steps to eliminate or prevent further water quality degradation. However, there are too few monitoring sites located statewide to effectively monitor the quality of ground water before it becomes too late to protect public and private systems.

The Arkansas Department of Pollution Control and Ecology has established an ambient ground water quality monitoring program at various statewide locations which provides background ground water quality data from various aquifers. At the same time, it evaluates water quality in areas of specific interest, such as in and around communities located in agricultural and industrial areas or in the extremely complex karst region of northern Arkansas, which is especially vulnerable to contamination. This monitoring program has recently been expanded to increase the areal extent and the number of sampling sites for each area. New areas are also under consideration for incorporation into the program. The Department has also participated in or funded ground water quality investigations with other state and federal agencies. The ambient ground water quality monitoring was designed to help in water-quality planning and development of ground water standards as part of the Arkansas Ground Water Protection Program. This program is funded entirely with Clean Water Act, Section 106 funds and resides within the Water Quality Planning Branch of the Water Division of the Department. In addition, a survey in the summer of 1996 of 77 wells in a ten county area of the Delta Ecoregion of the State was funded with 319(h) funds through the ASWCC.

The Arkansas Ground Water Protection Program has produced documents such as "Groundwater - Volume 1 Elements of an Arkansas State Groundwater Protection Strategy" (1985) and " A Profile of the Arkansas State Groundwater Quality Protection Program" (1991) as precursors to the "Comprehensive State Ground Water Protection Program" (CSGWPP), which is being

developed by a statewide committee chaired by the ASWCC. The main goals for FY96 are to continue to implement program changes developed during FY94 and FY95, especially in the area of statewide ambient monitoring. Program personnel will continue to work with other departments and other state agencies in a more comprehensive approach to ground water protection.

Ground water protection programs are in varying stages of development by the State. The Wellhead Protection Program (WHPP), under the authority of the Arkansas Department of Health (ADH), is making steady progress in its implementation statewide. Accomplishments since program start-up in 1991 include development of WHP programs for approximately 100 public water systems, delineations of wellhead protection areas for more than 300 wells, outreach and technical aid programs, and WHP road signs designed by the Arkansas State Highway and Transportation Department (Cordova, 1996). The ASWCC has utilized funds from Section 106 of the Clean Water Act to identify areas of the State which may be vulnerable to contamination from nonpoint source pollution, especially through the use of pesticides. Other activities by the ASWCC include development of a State Ground Water Protection Priority Map and Ground Water Quality Data Base (Smith, et al, 1995).

Although the overall quality of ground water in Arkansas appears to be good, widespread problems do occur and their presence has been addressed by a number of recent studies conducted by state agencies, educational institutions, the United States Geological Survey, and by independent scientific investigations. Specific investigations have targeted pesticides and nitrates as indicators of contamination in fresh-water aquifers. Other studies have taken a look at saline intrusion or brine contamination, an increasing problem in southern and eastern Arkansas. Contamination of ground water by microbial organisms normally found only in surface water is currently being investigated by the Arkansas Department of Health. Microbial contamination may be caused by poor well construction or by hydrogeological conditions permitting easy movement of the contaminant into the aquifer. A number of public water systems have had problems with elevated levels of radio nuclides, in northern Arkansas. Widespread problems have also been reported to be related to waste products generated by cattle, poultry and swine operations, particularly in northwest Arkansas. Additional problems, which are common in other states, include leaks from underground storage tanks, landfills, hazardous waste sites, sewage treatment lagoons, septic tanks, and surface impoundments related to the oil and gas industry. There are over 7,640 impoundments related to agricultural, oil and gas, municipal and mining activities. Over 6,000 of these impoundments are associated with oil and gas operations in west central and southern Arkansas (Chesney, 1979).

GROUND WATER OCCURRENCE

Physiographically, the state of Arkansas can be divided into two provinces by a diagonal line running from the northeast to the southwest, each segment representing approximately one-half of the state. The segment northwest of this diagonal line is called the Interior Highlands Province, or the Paleozoic outcrop area of the state. This province can further be divided into the Ozark, Boston Mountains, Arkansas Valley, and Ouachita Mountains Regions. Mesozoic

and Cenozoic sediments outcrop south and east of this line, lap upon the Paleozoic rocks and unconformably overlie them. These rocks lie within the Gulf Coastal Plain Province. The rocks representing the Cenozoic (Tertiary and Quaternary) are more extensive at the surface than the Mesozoic rocks which crop out in the southwest portion of the state (Landes, 1970). The rock types and their weathered products associated with each of these regions are a major factor in controlling the occurrence of ground water.

The majority of the ground water supplies in the Gulf Coastal Plain are obtained from six aquifers. These are in the Quaternary deposits (alluvium), Cockfield Formation, Sparta Sand, Wilcox Group, Nacatoch Sand, and the Tokio Formation (Bryant et al, 1985). These aquifers are part of a thick sequence of semiconsolidated sediments consisting of sands, shales and clays, with sand representing the larger fraction. The yields for these aquifers range from 300 to 2,000 gallons per minute for the formations excluding the Quaternary alluvial aquifer, which ranges from 1,000 to 2,000 gallons per minute (Bryant et al, 1985).

The Interior Highlands are underlain by consolidated rocks consisting of sands, shales and carbonates of Paleozoic age. Most of the ground water in this province occurs in fractures and joints in the consolidated rocks, and in solution cavities in the carbonate rocks (limestones and dolomites). Two of the most important aquifers in northern Arkansas are the Roubidoux Formation and the Gunter Sandstone (Van Buren Formation). Yields for the combined intervals range up to 500 gallons per minute (Bryant et al, 1985). Other formations that contribute ground water range in age from the Pennsylvanian through the Cambrian and are chiefly carbonate. Paleozoic strata in the Arkansas Valley and Ouachita Region of the Interior Highland Province produce water from fractures in sandstone and shale. Yield is commonly in the range of 10 to 25 gallons per minute (Bryant et al, 1985).

USE OF GROUND WATER

Table GW-1 is a compilation of withdrawals of ground water from the major aquifers within the state. This table shows the rather dramatic contrast in withdrawals from the Quaternary alluvial aquifer of the Gulf Coastal Plain as compared to the combined withdrawals of all the other State aquifers.

The Quatenary Aquifer is the principal source of water for irrigation, but is also important as a source of water for public and domestic use. Due to large scale pumping of this aquifer, several areas within the state have become vulnerable to saltwater contamination. The second most important aquifer, in terms of withdrawal, is the Sparta/Memphis aquifer, which is located in the same province as the alluvial aquifer. This aquifer, particularly in southern Arkansas, also has had saltwater contamination related to large scale pumping. The primary source of ground water in the Paleozoic strata of northern Arkansas comes from the Roubidoux Formation and the Gunter Sandstone (Van Buren Formation). These aquifers, combined with the other Paleozoic aquifers of northern Arkansas, the Arkansas Valley and the Ouachita Region, rank third in terms of withdrawal. Table GW-2 reflects the significance of ground water, in terms of usage, compared to surface water.

Table GW-1. WITHDRAWALS OF GROUND WATER FROM AQUIFERS IN ARKANSAS, 1990 (in million gallons per day)
(modified from Holland, T.W. (1993). Use of Water in Arkansas, 1990)

AQUIFER	WITHDRAWAL(MGD)
Quaternary Alluvium	4375.77
Cockfield Formation	8.09
Sparta/Memphis Sand	222.50
Cane River Formation	2.20
Wilcox Group	30.85
Clayton Formation	0.02
Nacatoch Sand	3.14
Tokio Formation	2.29
Trinity Group	0.23
Paleozoic (Undifferentiated)	63.06

Table GW-2. TOTAL WITHDRAWALS IN TERMS OF USAGE (MGAL/D)
(modified from Holland, T.W. (1993). Use of Water in Arkansas, 1990)

	Ground Water	Surface Water	% Ground Water
Public Supply	118.95	189.57	38.60
Domestic	50.61	0.00	100.00
Commercial	14.31	207.30	6.50
Industrial	98.92	78.43	55.80
Mining	1.82	0.66	73.30
Livestock	124.96	64.44	66.00
Irrigation	4,296.15	949.28	82.00
Thermo-electric	2.43	1,638.22	<1.00

GROUND WATER QUALITY MONITORING

Table GW-3 lists the approximate number of ground water quality data available for the state. The Department of Health, Department of Pollution Control and Ecology, and the United States Geological Survey monitor ground water sources on a regular basis. Other investigations by state agencies or institutions are usually conducted on a one-time basis only.

The Department of Pollution Control and Ecology monitors the water quality of 154 wells and 11 springs once every three years. This monitoring is part of the on-going, ambient-monitoring program initiated in 1986 to gather background ground water quality data from various aquifers in the state. The nine monitoring areas have specific lists of sampling constituents, which are based on the types of contaminants likely to be found in their respective areas. The monitoring wells located at industrial or landfill sites regulated by RCRA or CERCLA are monitored at least yearly, but only for indicator parameters required by the regulations.

The Department of Health, as primacy agency for the SDWA, monitors public water supply wells every three years (± 920 wells). The Total Coliform Rule requires sampling on a monthly basis with the number of samples dependent on the size of the user population. Nitrate monitoring is conducted on a yearly basis unless a sample greater than or equal to 50 percent of the MCL triggers the need for increased sampling. Raw-water sampling has been implemented in order to detect microbial contaminants for selected ground water wells found to be at risk from contaminated surface water (Surface Water Treatment Rule). This sampling (microscopic particulate analysis) is performed in conjunction with weekly, raw-water bacteriological testing, turbidity, temperature and pH determinations.

The United States Geological Survey (USGS) has 25 master wells scattered throughout the state which are sampled regularly every five years. The other wells utilized by the USGS are sampled for specific projects and not at a regular frequency.

Most of the other wells or springs listed in Table GW-3 are sampled for particular projects such as the on-going nitrate study conducted by the Cooperative Extension Service and various research projects by the Arkansas Water Resources Center (AWRC), which focuses much of its research on the effects of agricultural pesticides and nutrients on ground and surface water.

TABLE GW-3
GROUND WATER QUALITY DATA AVAILABILITY

Agency	Number of wells/springs	Computer
Pollution Control	±670 (RCRA) 154/11 (Water) 19 (Mining) ±260 (CERCLA) ±200 (Solid Waste) (RST)	(Storet) (Storet) IBM Paper Only Mac Paper Only
Health Department	±920 (Community) ±500 (Non-Community)	Wang
USGS	4,100 (Research 25 Wells) (Master Wells)	(Watstore)
UA - Extension	>2,900 (Wells) <100 (Springs)	IBM
US DOE (NURE)	1,369 (Wells)	IBM
UA & AR Tech	±455 (Wells) ±85 (Springs)	IBM

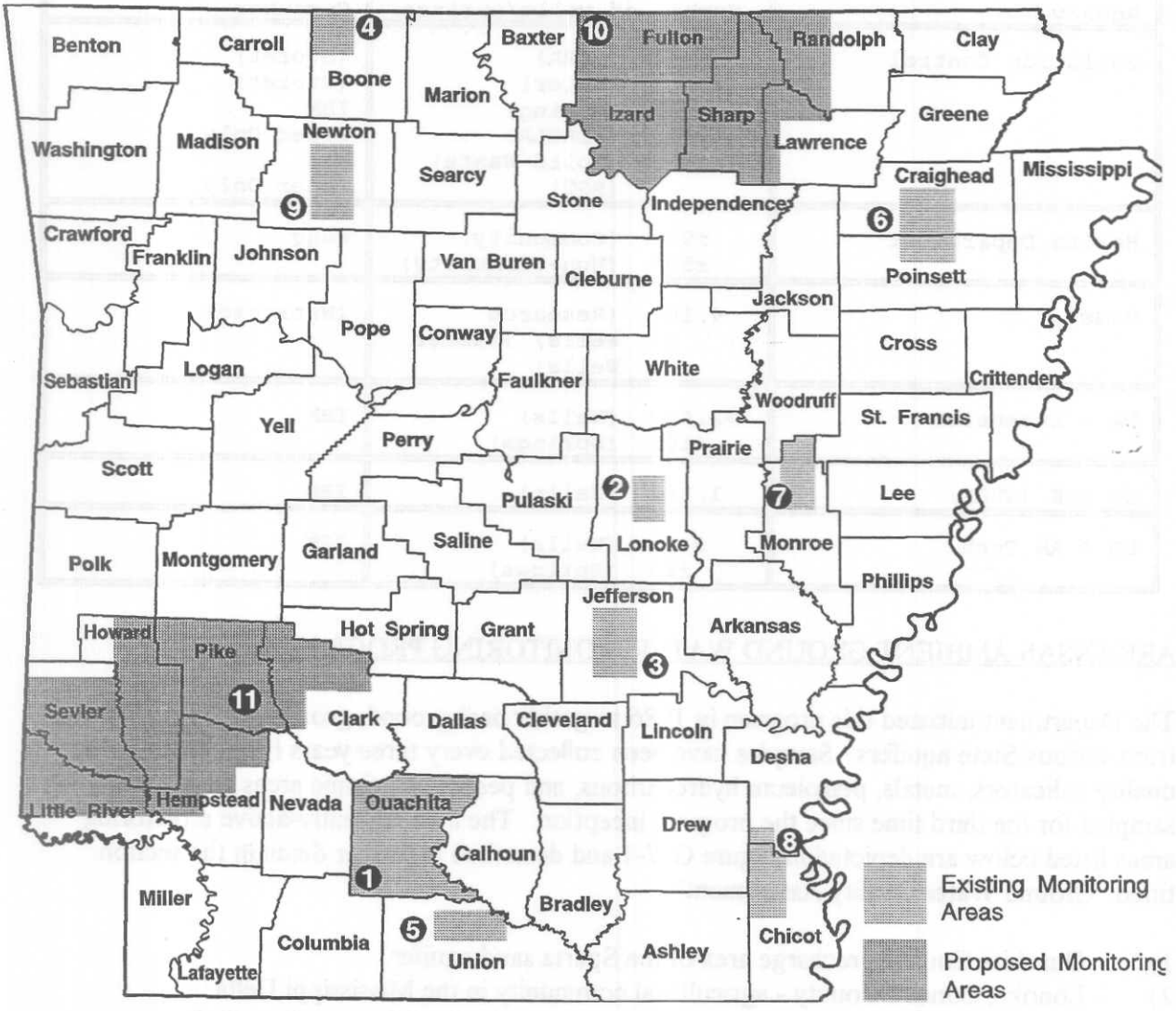
ARKANSAS AMBIENT GROUND WATER MONITORING PROGRAM

The Department initiated this program in 1986 to gather background, ground water quality data from various State aquifers. Samples have been collected every three years for general water quality indicators, metals, petroleum hydrocarbons, and pesticides. Some areas have been sampled for the third time since the program inception. The nine currently-active monitoring areas listed below are depicted in Figure GW-1 and described in further detail in the section titled "Ground Water Quality Assessment".

1) Ouachita County - recharge area of the Sparta sand aquifer.
2) Lonoke, Lonoke County - agricultural community in the Mississippi Delta.
3) Pine Bluff, Jefferson County - community system in the Arkansas River Valley.
4) Omaha, Boone County - karst area in northern Arkansas.
5) El Dorado, Union County - industrialized urban center in an oil production area.
6) Jonesboro, Craighead County - second largest city on ground water in the state and located in the middle of an agricultural region in the Arkansas Delta.
7) Brinkley, Monroe County - an agricultural community affected by saltwater intrusion of uncertain origin.
8) Chicot County - an area of extensive saltwater contamination in southeastern Arkansas.
9) Buffalo River Watershed, Newton County - an area potentially impacted by confined animal operations.

Figure GW-1

Arkansas Ambient Ground Water Monitoring Program



Existing monitoring areas include Ouachita (1), Lonoke (2), Pine Bluff (3), Omaha (4), El Dorado (5), Jonesboro (6), Brinkley (7), Chicot (8), and Buffalo River Watershed (9). Expansion areas will include Hardy (10) and Athens Plateau/Coastal Plain (11).

All available wells (i.e. domestic, commercial, public, irrigation, etc.) were inventoried and considered for possible use as part of a monitoring network in each area. Some wells have had to be replaced due to abandonment or inaccessibility. Lists of sampling constituents were based on the types of contaminants likely to be found in each of the respective areas. Selected water-quality parameters are included in the tables following a brief summary of each of the monitoring areas. Reports describing each of these areas with complete chemical analyses are available from the Department.

Delta Monitoring Project

Seventy-seven irrigation wells in seven counties, Lonoke, Jefferson, Arkansas, Phillips, Lincoln, Desha and Drew, in east-central Arkansas were sampled during July, August and September, 1996. Land use in this area of the Mississippi Aluvial Plain is dominated almost entirely by row crop agriculture; cotton, soybean and rice. The heavy pesticide and fertilizer usage associated with row crop agriculture increases the potential for ground water contamination. Many of the wells were located in a area where there is a shallow, thin confining layer, increasing the potential for ground water contamination. The aquifer located in the Mississippi Aluvial Plain is of great importance because of its use for crop irrigation. This is displayed in Tables GW-1 and GW-2. Sampling categories of chemical constituents included the following: major and trace inorganic constituents, nutrients, total organic carbon, total alkalinity, and selected pesticides. Figure GW-2 depicts the location of the wells in the sample area.

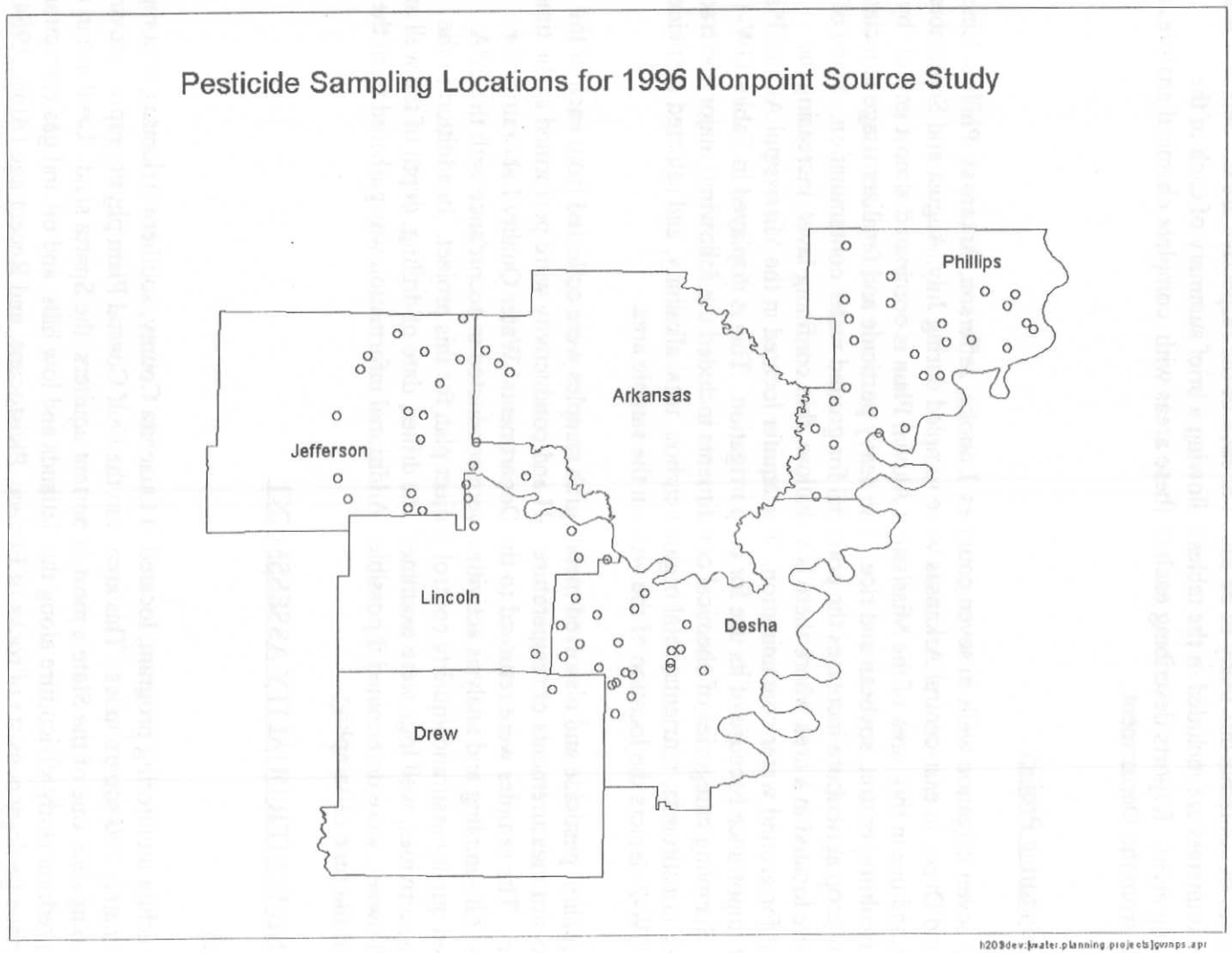
Water quality, pesticide and dissolved metals grab samples were collected from each of the wells; in-situ measurements of temperature, pH and conductivity were performed at the time of sampling. The samples were returned to the Departments' Water Quality Laboratory for analysis. All sampling and analysis activities were conducted in accordance with the EPA approved quality assurance/quality control project plan for this project. In addition to the sampling activities, well logs were examined, the driller, date of drilling, depth of the well and the well owner were determined if possible. Additional information was gathered from the owner at the time of sampling.

GROUND WATER QUALITY ASSESSMENT

Ouachita

The Ouachita monitoring program, located in Ouachita County, southern Arkansas, encompasses approximately 350 square miles. This area is in the Gulf Coastal Plain physiographic province, and encompasses one of the State's most important aquifers, the Sparta sand. Land use in the area is predominantly silviculture along the flatlands and low hills, and oil and gas extraction. The surface geology consists of rocks of Eocene, Pleistocene, and Recent age (Albin, 1964).

Figure GW-2


Pesticide Sampling Locations for 1996 Nonpoint Source Study
Phillips
Arkansas
Jefferson
Lincoln
Desha
Drew
h20$dev:[water.planning.projects]gwnps.apr

There was no serious contamination detected in the twenty-six Sparta wells. Elevated nitrate levels were observed in one of the wells (3.33 mg/L). This well had levels of 1.60 mg/L and 1.64 mg/L from the previous two sampling events, respectively. The highest chloride value observed was 72 mg/L from a well which produced water from 285 to 300 feet. The chloride concentrations throughout the area showed no correlation with well depth.

Lonoke

The Lonoke monitoring program area encompasses approximately 90 square miles surrounding the town of Lonoke in central Lonoke County. Physiographically, the area is located in the Gulf Coastal Plain province. According to Counts (1957), "this region consists of broad and nearly level interstream divide areas and flood plain cuts from a few feet to about 25 feet below them. The bottom lands of the flood plains are characterized by numerous swamps, bayous, lakes, and abandoned stream channels." Quaternary alluvial deposits cover much of the area and may attain a thickness in excess of 150 feet.

Land use activities in this area are dominated by row crop agriculture. This area of the Mississippi River delta has an increased ground water contamination risk from pesticides and fertilizers because of the land use activities. The objective of this monitoring program is to determine if the land use activities within the monitoring area have resulted in contamination of the alluvial aquifer. Some additional sources of ground water contamination include a RCRA site, a landfill, and an unknown number of septic tanks.

Nine wells, eight from the alluvial aquifer and one from the Sparta Sand, were sampled. There was no evidence of ground water contamination in any of the wells by pesticides or from any other source. High iron and manganese concentrations, common in shallow alluvial aquifers, were detected in most wells. All the wells exceeded the secondary maximum contaminant level (SMCL) established by EPA for iron (300 µg/L). Seven of the alluvial wells exceeded the SMCL for manganese (50 µg/L). A more thorough review of the program area and a complete chemical analyses is included in the, "Report On The Third Sampling Of The El Dorado, Pine Bluff, and Lonoke Prototypes" (Van Schaik and Kresse, 1994).

Pine Bluff

The Pine Bluff monitoring program is located within the city of Pine Bluff in south-central Jefferson County. The city uses ground water to meet all of its water needs. Because of this, there is a large cone of depression in the Sparta Aquifer in and around Pine Bluff.

The area lies within the Gulf Coastal Plain physiographic province and is dominated by the flood plain of the Arkansas River which lies immediately to the northeast of the city. Land use is predominately row-crop agriculture, but there is a large amount of urban land use in the study area. The surface geology consists of clay, silt, sand, and gravel of Quaternary Age. The confining clays and silts of the Jackson Group crop out to the west of the city.

The twelve sampling sites included three alluvial wells, one Cockfield well, and eight Sparta wells. There was little indication of contamination in the wells with the exception of one of the alluvial wells which had a relatively high arsenic concentration (37 µg/L). This well had an arsenic level of 44 µg/L reported during the first sampling, but was below the detection limit during the second sampling. These elevated levels are still below the maximum contaminant level (MCL) established by the EPA (50 µg/L). The chloride concentration for this well was also somewhat elevated (196 mg/L).

Two wells were sampled for the first time because of their proximity to the center of the cone of depression within the Sparta aquifer (Status Report - Arkansas Prototype Monitoring Program, April, 1994). There were no elevated Na or Cl concentrations in these wells such as evidenced in El Dorado near the center of the cone of depression within the Sparta aquifer. A more thorough review of this program area accompanied by complete chemical analyses is included in the document entitled "Report On The Third Sampling Of The El Dorado, Pine Bluff, and Lonoke Prototypes" (Van Schaik and Kresse, 1994).

Omaha

The Omaha monitoring program occupies an area of about 160 square miles around the town of Omaha in the northwestern part of Boone County. This area lies within the Interior Highlands physiographic province. The landscape exhibits moderate relief with elevations ranging from 700 feet above sea level in the northeastern portion of the area to 1,600 feet near the center of the area (Leidy and Morris, 1990). The surface geology consists of the cherty limestones of the Boone Formation occupying the central portion of the area, and the Cotter Dolomite exposed to the northwest and northeast in the major stream tributaries. Land use activities are dominated by silviculture and agriculture in the form of confined animal operations. Other potential sources of ground water contamination include a Superfund site and numerous septic tanks in the rural area.

Ten springs from the Boone Formation and fourteen wells, one from the Boone Formation, twelve from the Cotter Dolomite, and one from the Roubidoux-Gunter interval, were sampled for this monitoring project.

Nitrate concentrations of the ten springs issuing from the Boone Formation ranged from 0.034 to 8.5 mg/L with a median of 1.85 mg/L. This compares to a range of 0.02K to 1.14 mg/L for the 12 wells that penetrated the Cotter Dolomite. The median concentration for those wells was 0.265 mg/L. The presence of pentachlorophenol (1447 µg/L) in Cricket Spring indicates that there is still an impact from wood preservatives. The spring is located within a quarter mile of a Superfund site which was formerly a wood treatment plant. The concentration reported at the time of a USGS water quality study in 1987 was 1200 µg/L (Leidy and Morris, 1990). The concentration reported during the first sampling period by the Department (1989) was 3023 µg/L. Concentrations of iron, manganese, and lead were generally low with one well and one spring exceeding the SMCL for iron, and two springs exceeding the SMCL for manganese. Because both spring samples were slightly turbid, and the samples were unfiltered, the elevated

concentrations may reflect dissolution of suspended material by the addition of nitric acid. Lead concentrations for the twelve Cotter Dolomite wells had a range of 2.0K to 7.9 µg/L with a median concentration of 1.0 µg/L. A report on this monitoring program with complete chemical analyses will be completed in the near future.

El Dorado

The El Dorado monitoring program is located in and immediately surrounding the city of El Dorado. This city is approximately seventeen miles north of the Louisiana border in Union County and lies within the Gulf Coastal Plain physiographic province. The landscape is mostly sandy, gently rolling terrain with a vegetative cover of pine forests and pastures (Leidy and Taylor, 1992). The surface geology consists of clays and lignitic sands of the Cockfield Formation (Claiborne Group). Primary land use activities within this sampling area is silviculture. However, there is a great amount of oil and gas extraction in the area. Urban use is also a key feature in the monitoring area.

Eighteen wells were sampled during the third sampling period; nine Cockfield wells, three Greensand (upper Sparta) wells, and six El Dorado (lower Sparta) wells. There was no evidence of saltwater contamination in the shallow Cockfield aquifer or in the Greensand aquifer. In addition to the common water quality constituents and metals listed in the tables, VOCS and pesticides were run on all wells screened in the Cockfield aquifer. The primary and secondary maximum contaminant levels for drinking water were not exceeded in any of the wells.

There does appear to be a gradual increase in Na, Cl, and total dissolved solids (TDS) in the El Dorado aquifer in a southward direction. This does not support or refute the theory presented by Broom and others (1984), but does suggest that there is a regional increase in Na, Cl, and TDS downdip. There were no deep wells located in the graben or at the mouth of the graben to validate the theory. A report by Payne (1968) states that there is a regional change in the ground water chemistry of the Sparta Sand from a bicarbonate water province toward a chloride water province to the southeast of El Dorado (near Strong, Arkansas). This would add credibility to the idea that the chloride concentration as well as the TDS should naturally increase to the southeast. Future sampling will include additional wells to the south of the current sites used in this study. A more thorough review of the program area accompanied by complete chemical analyses is included in the document entitled "Report On The Third Sampling Of The El Dorado, Pine Bluff, and Lonoke Prototypes" (Van Schaik and Kresse, 1994).

Jonesboro

The Jonesboro monitoring program is located in close proximity to the city of Jonesboro in south-central Craighead County and extends into north-central Poinsett County. The project area lies within the Gulf Coastal Plain physiographic province. The city of Jonesboro lies on Crowley's Ridge, an erosional remnant of unconsolidated Eocene clay, silt, sand, and lignite capped by Pliocene sand and gravel and middle to late Pleistocene loess (Guccione et. al., 1986). Local relief can be as much as 200 feet within the metropolitan area.

This section of the alluvial aquifer is heavily relied on as a water supply both for domestic and agricultural uses; hence there is a large cone of depression that has formed in and around the Jonesboro area. Also, the underlying Memphis aquifer is susceptible to contamination because of the thin confining layer between the two aquifers. Eighteen wells were sampled during the third monitoring period including fourteen alluvial aquifer wells and four Memphis aquifer wells.

Elevated nitrate concentrations were observed in two alluvial aquifer wells (11.3 and 1.9 mg/L) and in one Memphis aquifer well (1.69 mg/L). The SMCL established by the EPA for iron (300 ug/L) was exceeded in eight alluvial wells. The SMCL for manganese (50 µg/L) was exceeded in nine of the alluvial wells. One alluvial well, with a TDS concentration of 703 mg/L, exceeded the SMCL (500 mg/L).

A pesticide scan for the more common pesticides used in rice and soybean production was run for all wells screened in the alluvial aquifer. Two of the fourteen alluvial wells (14.3 %) had traces of p-p'-DDE (a metabolite of DDT). The two wells had concentrations of 0.01730 and 0.00745 µg/L, respectively. All alluvial wells were analyzed for VOCS with no detections. A more thorough review of the program area accompanied by complete chemical analyses is included in the document entitled "Report On The Third Sampling Of The Jonesboro Prototype" (Van Schaik and Kresse, 1995).

Brinkley

The Brinkley monitoring program area encompasses approximately 56 square miles surrounding the town of Brinkley in northern Monroe County. This monitoring area includes a town in eastern Arkansas where 100% of the population uses ground water to meet community needs. This area lies within the Gulf Coastal Plain physiographic province. The country is mostly farmland used for rice, cotton, and soybean production. The surface geology consists of the clay, silt, sand and gravel of Quaternary alluvial and terrace deposits which range in thickness from 100 to 160 feet (Morris and Bush, 1986).

This monitoring project included twenty-seven wells screened in the alluvial aquifer. The ground water quality in the monitoring area is quite variable due to the presence of definable saltwater contamination in much of the study area. Twenty-five wells exceeded the SMCL for iron (300 µg/L) and manganese (50 µg/L). Twenty wells exceeded the SMCL for TDS (500 mg/L). Six wells exceeded the SMCL for chloride (250 mg/L). Chloride concentrations ranged from 4.8 to 581 mg/L with a median concentration of 81.2 mg/L. A pesticide scan for the more common pesticides used in rice and soybean production was run for all wells screened in the alluvial aquifer. Trace amounts of pesticides were detected in three of the twenty-seven wells (11.1 %). The three pesticides detected were molinate (0.04898 µg/L), methyl-parathion (0.01395 µg/L), and metribuzin (0.00744 µg/L).

A comparison of chloride concentrations from selected wells over a period of twenty years indicated some increases as well as decreases. This investigation suggests that the areas that were considered the most contaminated by high salinity are still the most contaminated. Irrigation waters from the twenty-seven wells were classified in terms of salinity hazard and sodium hazard utilizing the sodium-adsorption-ratio (SAR) and specific conductivity. The sodium hazard for the wells used in the present study ranged from low to high with most of the wells falling within the low sodium hazard category (21 of 27 wells). The salinity hazard ranged from low to very high with high hazard being the most prevalent (17 of 27 wells).

Results of the most recent sampling indicate that the area of contamination is basically of the same configuration as cited in the USGS report. The number of wells utilized for this monitoring program may be slightly increased in the future. It may be useful to monitor wells considerably farther from the area of contamination, such as those located in the vicinity of the city water supply wells. A more thorough review of the program area accompanied by complete chemical analyses is included in the document entitled "Report On The Third Sampling Of The Brinkley Prototype" (Van Schaik and Kresse, 1996).

Chicot

The Chicot monitoring area is located in southwestern Chicot County just northwest of the town of Eudora in extreme southeastern Arkansas. The area, which lies within the Gulf Coastal Plain physiographic province, is characterized by relatively flat terrain and is typified by sluggish, meandering streams, and includes such features as oxbow lakes, natural levees, and irrigation ditches (Fitzpatrick, 1985). The surface geology consists of clay, silt, sand, and gravel of Quaternary Age. Row crop agriculture is the primary land use in the area.

Nine wells were sampled during the second sampling event. Chloride concentrations ranged from 168 to 1100 mg/L with a median of 840 mg/L. The SMCL for iron was exceeded in the five alluvial wells that were analyzed for that element. One of those five wells also had a manganese concentration in excess of the SMCL. None of the wells had nitrate concentrations above the detection limit. The chief sources of saltwater contamination are thought to be 1) the accumulation of dissolved solids from past intrusion from the Arkansas River; 2) irrigation practices which allow the accumulation of salts through evaporation; 3) saltwater intrusion from below caused by pumping the upper aquifers, especially where the Jackson confining unit is thin or absent; and 4) movement through abandoned oil and gas test holes (Fitzpatrick, 1985).

Buffalo River Watershed

The Buffalo River Watershed program area lies within the Ozark Region of the Interior Highlands physiographic province. The surface geology of the main tributaries of the Buffalo River, including the Buffalo River Valley, is composed mainly of the cherty limestones of the Boone Formation of Mississippian age, although the Everton Formation and St. Peter sandstone of Ordovician age are exposed in the eastern portion of the area. The rocks of the Boone Formation (including the lower St. Joe limestone member) form the Springfield Plateau aquifer.

The outcropping Everton and St. Peter sandstone and older formations including the Powell, Cotter, Roubidoux, and Gunter member of the Gasconade Formation which do not outcrop in the immediate area, comprise the rocks that make up the Ozark aquifer. Younger strata exposed in the Boston Mountains are composed chiefly of interbedded sandstones, limestones, and shales of the Hale, Bloyd, and Atoka Formations of Pennsylvanian age. These rocks comprise a portion of the Western Interior Plains Confining System, but locally are water-bearing and are a source of domestic and public water supply (i.e. Deer and Lurton-Pelsor Water Associations). The program area presently includes the Little Buffalo, Big Creek, and Cave Creek sub-basins of the Buffalo River watershed.

This area of the state has one of the highest concentrations of confined animal populations in the state. It is also listed as one of the highest potential ground water contamination area of the state due to its karst geology. Because of the importance the Buffalo National River has on both a State and National level, the Department initiated a ground water quality monitoring program in the watershed in 1996. Results of this monitoring program should be available in 1998.

Cooperative Extension Service Program

The University of Arkansas Cooperative Extension Service is presently conducting a water sampling and testing program focusing on nitrates. A Status Report was issued in November, 1993 summarizing the results of the program (Teague et.al., 1993). Since this has been an on-going program, and no new report has been issued, a summary of the 1993 report is presented, and is followed by a current update at the end of this discussion.

Through October 1992, 3196 water samples had been analyzed for NO_3+NO_2. The results from this sampling program represented 2441 wells or springs from twenty-two counties. Included in this total are 1754 wells for which depths were reported.

The analyses were separated into high (NO_3 > 44 mg/L), medium (14 mg/L < NO_3 < 44 mg/L), or low (NO_3 < 14 mg/L) nitrate sources. Approximately 44 mg/L NO_3 is equivalent to 10 mg/L NO_3-N, exceeds EPA's drinking water MCL. After the results were analyzed, 1997 (81.8%) were in the low range, 341 (13.6%) in the medium range, and 113 (4.6%) in the high range. The following eight counties reported higher than 4.6% in the high range: Benton, Cleburne, Columbia, Howard, Independence, Sevier, Union, and Washington (Table GW-4).

The 1754 wells which had depths reported through October, 1992 were mostly less than 100 feet in depth. Of the 84 high-nitrate wells, 8 (11%) are greater than 200 feet deep; 19 (23%) are between 100 and 200 feet deep; and 57 (66%) are less than 100 feet deep.

Table GW-4. Number of Different Water Sources In the Low-, Medium-, and High-Concentration Ranges for Twenty-two Arkansas Counties Sampled, 1989-1992

(Teague and others, 1993)

County	Nitrate Levels *						County Total	
	Low		Medium		High			
	No.	%	No.	%	No.	%	No.	% of All Sources
Benton	149	60.3	82	33.2	16	6.5	247	10.1
Calhoun	13	68.4	6	31.6	0	0.0	19	0.8
Cleburne	94	75.2	16	12.8	15	12.0	125	5.1
Cleveland	19	100.0	0	0.0	0	0.0	19	0.8
Columbia	155	75.2	27	13.1	24	11.7	206	8.4
Conway	159	94.0	7	4.1	3	1.8	169	6.9
Cross	38	86.4	6	13.6	0	0.0	44	1.8
Dallas	47	82.5	10	17.5	0	0.0	57	2.3
Faulkner	133	96.4	4	2.9	1	0.7	138	5.7
Howard	87	78.4	17	15.3	7	6.3	111	4.5
Independence	181	85.0	22	10.3	10	4.7	213	8.7
Little River	19	90.5	2	9.5	0	0.0	21	0.9
Lonoke	35	100.0	0	0.0	0	0.0	35	1.4
Mississippi	85	90.4	8	8.5	1	1.0	94	3.9
Phillips	98	100.0	0	0.0	0	0.0	98	4.0
Polk	84	95.5	4	4.5	0	0.0	88	3.6
Scott	85	93.4	3	3.3	3	3.3	91	3.7
Sevier	98	73.7	25	18.8	10	7.5	133	5.4
Union	128	85.9	12	8.1	9	6.0	149	6.1
Washington	133	62.1	71	33.2	10	4.7	214	8.8
Woodruff	11	100.0	0	0.0	0	0.0	11	0.5
Yell	146	91.8	9	5.7	4	2.5	159	6.5
	1997	81.8	331	13.6	113	4.6	2441	100.0

*** Low - 0-15 mg/l NO3; Medium - 15-44 mg/l NO3; High - > 44 mg/l**

Fifty-one high range sources were selected for more extensive evaluations. Site evaluations documented the source type, well or spring, and characterized them as either a shallow dug, bored, or shallow drilled well, and whether the source was downslope of human waste or animal confinement facilities. At 19 sites, septic tanks and/or filter fields were found within 200 feet of the wellhead usually on level slopes or upslope. At 16 sites, either an operational or abandoned poultry house or pad was found less than 100 feet from the wellhead. Vulnerability to NO_3 contamination is generally influenced by soil type, depth to ground water, bedrock geology, and/or proximity to the source (i.e. human waste or animal confinement facilities).

Between 1989 and 1996, approximately 3850 individual water sources (wells and springs) were tested for NO_3-N. Some of these sources were tested more than once, bringing the total number of tested samples to about 4800; approximately 2900 are wells. Based on the highest observed sample concentration for each tested source, the median concentration of NO_3-N for wells was approximately 0.2 mg/L and the corresponding median for all tested sources is the same. Overall, less than 4% of the water sources have tested higher than 10.0 mg/L, and almost 18% have tested higher than 3.0 mg/L. The corresponding percentages for wells are roughly the same as for all water sources (Teague, 1996).

GROUND WATER QUALITY PESTICIDE MONITORING

The investigation of pesticides in both surface and ground waters of Arkansas has gained increased attention in the last four years. Reasons for the increased attention on pesticides, especially in regard to the occurrence of pesticides in ground water, is primarily in response to various EPA programs targeting pesticides in ground water (EPA, 1986a; 1986b; 1987; 1990; 1992a) and the mandates for states to develop State Management Plans for pesticide use (EPA, 1992b; 1992c).

Most of the emphasis in regard to the investigation of pesticides in Arkansas focuses on ambient monitoring, which provides data on the occurrence, location and magnitude of pesticide detections in State waters. However, the persistence of pesticides is also studied by resampling sites which have elevated concentrations for one pesticide and/or occurrences of more than one pesticide at a single location. One site-specific investigation focused on determining the source of one pesticide in the alluvial aquifer in Augusta, Arkansas, in which case the pesticide exceeded the EPA maximum contamination level for drinking water (Kresse and Van Schaik, 1996).

Ambient monitoring of pesticides is performed primarily by the Arkansas Water Resources Center (AWRC) and the Department, and is funded dominantly by the EPA 319 nonpoint source program and the Arkansas State Plant Board. Since 1982, the AWRC has sampled a total of 257 wells, and the Department sampled a total of 77 wells during the summer of 1996 for the purpose of the present assessment. The Department has also routinely analyzed for pesticides in ground water in the Gulf Costal Plain as part of its Ambient Ground Water Prototype Monitoring Program (see previous sections).

Pesticide Use in Arkansas

Although pesticides are used statewide in both urban and rural settings, the predominant use of pesticides is associated with row-crop agriculture. Pesticides are used throughout the growing season, and their use ranges from seed treatment and preemergence herbicides to defoliants toward the end of the season. The pesticides used by the agricultural community include fungicides, insecticides and herbicides; although herbicides account for the largest percentage of pesticide use. Table GW-5 lists the pesticides used most frequently by the agricultural community. The table is arranged by the total number of acres for which a pesticide is applied. The data was projected from 1995 agricultural statistics for Arkansas (U of A, 1996) and in various pesticide use handbooks (Spradley, 1992; Spradley, 1993; Meyers, 1997).

Because pesticides are used throughout the growing season and differ in their chemical and physical properties, designing an adequate program for detecting all pesticides which occur in runoff throughout the growing season is both time-consuming and expensive. The lack of detection for some of the pesticides in any one data set does not necessarily mean that these pesticides do not occur in runoff, but instead reflects the timing of the sampling event with the type of pesticides used during an equivalent time frame.

In general, the monitoring of pesticides in ground water does not reflect the same transient nature and problematic situation as presented in surface water monitoring. Because of the relatively slow movement of ground water, contaminants tend to persist at a given site so that the timing of a sampling event is not as critical in detecting the various pesticides used throughout the growing season. At one site, bentazon was detected in a domestic well 8-10 years beyond the cessation of its use by the owner (Kresse and Van Schaik, 1996).

Because pesticides vary in their physical and chemical properties, they also vary in their potential to contaminate either surface or ground water. The EPA cites various criteria to identify potential "leachers" -pesticides with a potential for contaminating ground water based on properties such as volatility, solubility, dissipation, half-life and sorption coefficients (EPA 1987). However, the same properties which cause a pesticide to be a potential threat to ground water, may result in a lower potential for contaminating surface water. Table GW-7 lists the physical and chemical characteristics and the contamination potential for the most frequently used pesticides among Arkansas farmers.

In many cases where the potential for ground water contamination (leaching) is high, the potential for surface water contamination (runoff) is low. This situation is also true in many cases where the potential for surface water contamination is high and the leaching potential is low. A pesticide which has a high leaching potential based on a high solubility would also appear to have a large runoff potential. However, directly following a rain event, the soluble pesticide is often leached into the subsurface during the period the soil moisture capacity is being met, and by the time runoff occurs, most of the pesticide has leached into the subsurface (Wauchope, 1996).

Table GW-5: Commonly Used Pesticides in Arkansas					
Pesticide	Rice (acres)	Soybean (acres)	Cotton (acres)	Corn (acres)	Total (acres)
Fluometuron			1930500		1930500
Trifluralin		1241000	666900		1907900
Tribufos			1298700		1298700
Imazaquin		1224000			1224000
Propanil	1165800				1165800
Pendimethalin	147400	574600	285900		1037900
MSMA			1006200		1006200
Cyanazine			982800		982800
Carboxin		958800			958800
Acifluorfen	53600	894200			947800
Metolachlor		574600	58500	75000	708100
Chlorimuron		703800			703800
Captan		697000			697000
Bentazon		693600			693600
Ethephon			666900		666900
Metribuzin		612000			612000
DSMA			456300		456300
Prometyrn			409500		409500
Clomisone			374400		374400
Molinate	361800				361800
Fomesafen		340000			340000
Glyphosate		336600			336600
Benomyl	335000				335000
2,4,D	294800				294800
Fluazifop		272000			272000
Atrazine				270000	270000
Alachlor		176800		75000	251800
Thiram		224400			224400
Norflurazon			222300		222300
Propixonazole	201000				201000
Thidiazuron			198900		198900
Thiobencarb	187600				187600
Quinclorac	160800				160800
Sethoxydim		159800			159800
Bromoxynil	93800				93800
Paraquat Dichloride			93600		93600
Dimethipin			93600		93600
Quizalofop		91800			91800
2,4,DB		88400			88400
Diuron			81900		81900
Trilopyr	80400				80400
Iprodione	80400				80400
Acidichlor				75000	75000
Dimethenamid				75000	75000
Methyl Parathion	67000				67000
Lactofen			58500		58500
Malathion	53600				53600
Phenoxyprop	40200				40200
Methazole			35100		35100

Table GW-6: Physical and Chemical Characteristics of Commonly Used Pesticides					
Pesticide	Solubility (mg/L)	Koc (ml/g)	1/2 Life (days)	Runoff Potential	Leaching Potential
2-4-D	300000	109	10	Medium	Medium
2-4-DB	200000	20	10	Small	Medium
Aciflurofen	900000	139	30	Medium	Medium
Alachlor	240	190	14	Medium	Medium
Ametryn	185	388	30	Medium	Medium
Atrazine	33	160	60	Medium	Large
Benomyl	2	2100	100	Large	Small
Bentazon	2300000	35	10	Small	Medium
Bromoxynil	50	1000	14	Medium	Small
Carboxin	170	264	20	Medium	Medium
Chlorimuron	500	20	50	Small	Large
Chloropyrifos	2	6070	30	Large	Small
Cyanazine	171	168	20	Medium	Medium
Diazinon	40	85	30	Medium	Large
Dimethapin	3000	10	10	Small	Large
Diuron	42	400	60	Large	Medium
Ethephon	1000000	10000	5	Medium	Small
Fluazifop	2	3000	20	Large	Small
Fluometuron	90	100	14	Medium	Medium
Fomesafen	600000	50	180	Medium	Large
Fonifos	13	680	45	Large	Medium
Glyphosate	1000000	10000	30	Large	Small
Imazaquin	160000	20	60	Small	Large
Iprodione	13	500	20	Medium	Small
MCPA	270000	20	14	Small	Large
MSMA	1000000	10000	100	Large	Small
Malathion	145	1780	1	Small	Small
Methazole	2	10000	14	Large	Small
Methyl Parathion	60	5100	5	Medium	Small
Metolachlor	530	200	20	Medium	Medium
Metribuzin	1220	41	30	Medium	Large
Molinate	880	110	21	Medium	Medium
Norflurazon	28	248	45	Medium	Medium
Oxyfluorfen	<1	100000	30	Large	Small
Paraquat	1000000	100000	3600	Large	Small
Pendimethalin	<1	24300	60	Large	Small
Prometon	750	300	120	Large	Large
Prometryn	48	614	30	Medium	Small
Propachlor	580	420	7	Medium	Small
Propiconazole	110	100	20	Medium	Medium
Propanil	500	188	1	Small	Small
Propazine	8	154	90	Medium	Large

Table GW-6: Physical and Chemical Characteristics of Commonly Used Pesticides					
Pesticide	Solubility (mg/L)	Koc (ml/g)	1/2 Life (days)	Runoff Potential	Leaching Potential
Quizalofop	<1	100000	140	Large	Small
Sethoxydim	1000	50	5	Small	Small
Simazine	3	138	75	Medium	Large
Thidiazuron	20	100	10	Medium	Medium
Thiodicarb	35	300	7	Medium	Small
Thiram	30	383	20	Medium	Medium
Tribufos	1	5000	10	Large	Small
Trichlorfon	154000	2	27	Small	Large
Triclopyr	23	780	46	Large	Medium
Trifluralin	<1	1400	60	Large	Small

However, a pesticide with a high sorption coefficient and a low solubility has a low leaching potential, but can be transported in runoff by facilitated transport; i.e., where the pesticide is attached to organic and/or soil particles and is moved off-site with the suspended particles.

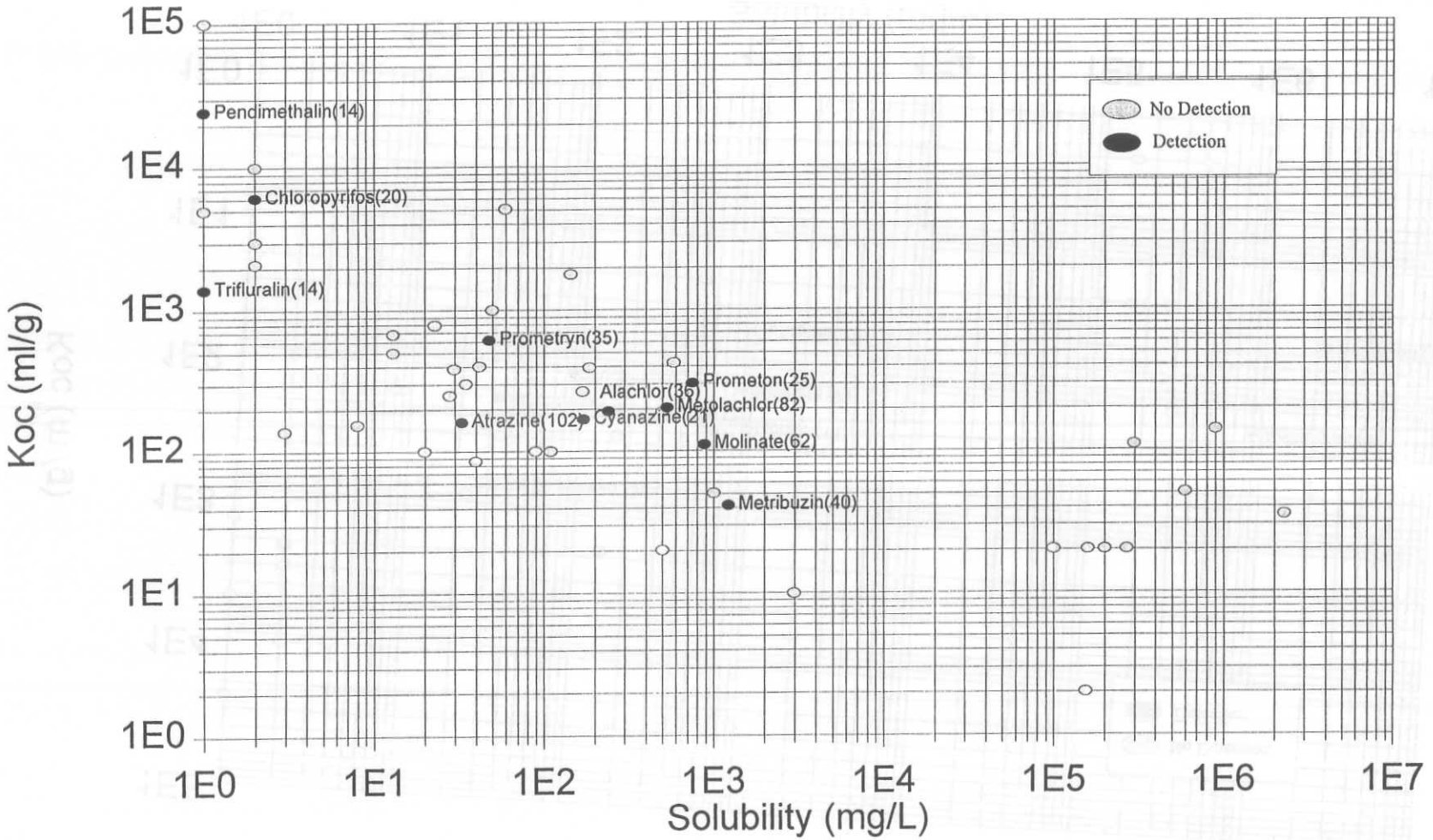
This situation is clearly demonstrated in Figures GW-3 and GW-4, which shows the pesticides detected in both ground water and surface water, respectively, as compared to sorption (Koc) versus solubility for the pesticides. Chlorpyrifos, Pendimethalin and Trifluralin all have solubilities less than 2 mg/L and Koc values which range from 1,400 to 24,300 ml/g. The potential for leaching under normal circumstances is negligible; however, they are listed in Table GW-6 as having a large runoff potential. All three pesticides were detected in surface water, but not detected in any of the ground water samples. This situation demonstrates the important role that proper pesticide management techniques plays in attenuating pesticide transport. In other words, a pesticide which is safe to use purely from the standpoint of ground water protection based on its chemical and physical properties, does not insure that these same properties are protective of surface water.

Previous Pesticide Studies

The Arkansas Water Resources Center (AWRC) sampled twenty wells in Pulaski and Lonoke Counties in what was thought to be vulnerable ground water areas during June, 1995. This sampling, which is part of a contamination prevention program funded by the State Plant Board (SPB), assists the ASWCC in the development of their ground water vulnerability study. Pesticides were detected in one well in Pulaski County out of 20 sampled in the two-county area. The four pesticides detected in the well were aciflouren (27 µg/L), bentazon (135 µg/L), fluometuron (24 µg/L), and metribuzin (4 µg/L). To date, 13 out of a total of 138 wells analyzed for pesticides in what is thought to be vulnerable areas, have had detections (9.4%) (Steele, 1996). Table GW-7 lists the wells from the ambient monitoring programs that had pesticide detections during the period 1992-1995.

PESTICIDE SOLUBILITY VERSUS SORPTION

Pesticide Detections in Surface Water



PESTICIDE SOLUBILITY VERSUS SORPTION

Pesticide Detections in Ground Water

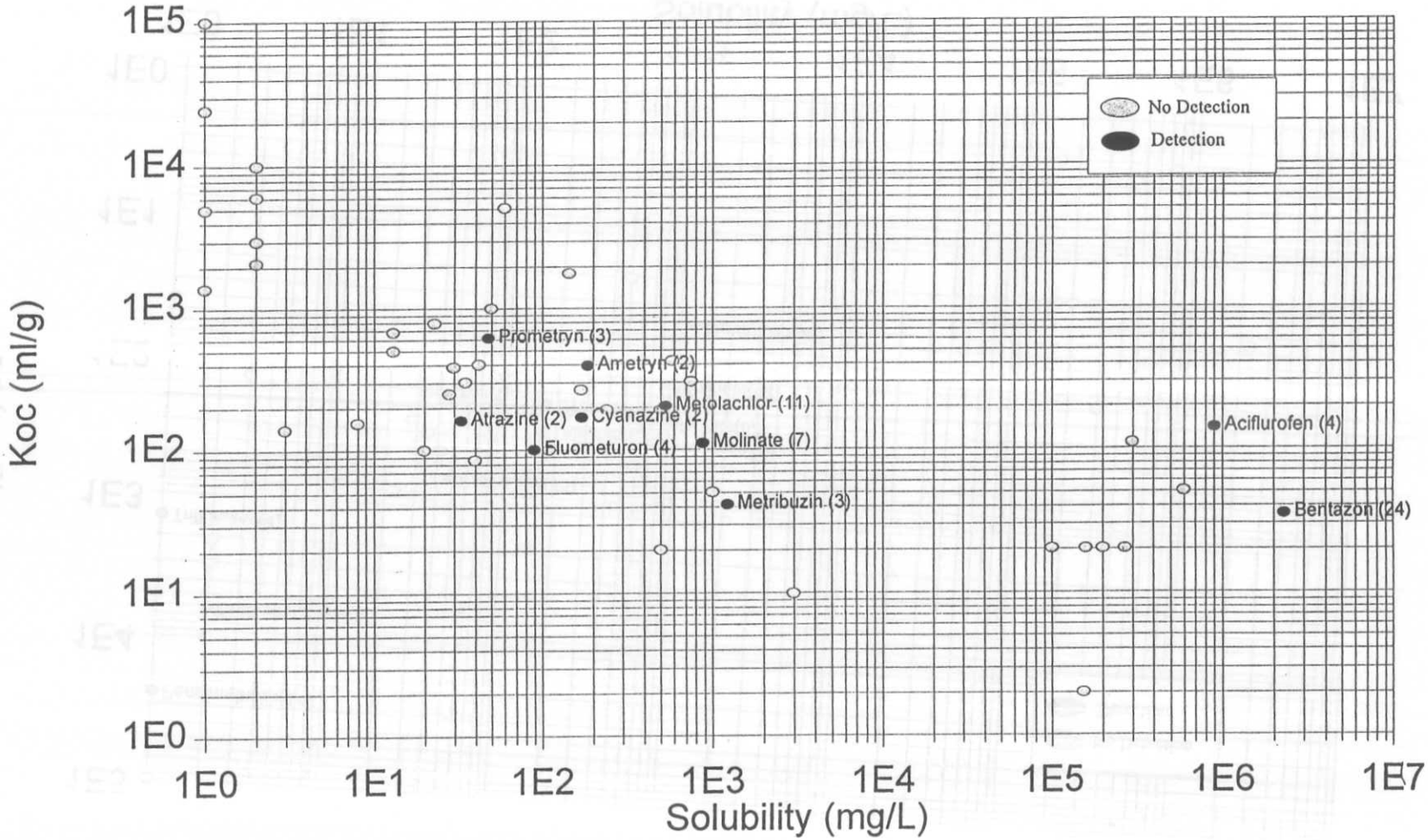


Table GW-7: AWRC WELLS WITH PESTICIDE DETECTIONS FOR THE PERIOD 1992-1995 (Steele, 1996)

Well	County Location	Well Use	Collection Date	Pesticides Detected	Concentration (µg/l)
DREW -1	Drew	Drinking	4/22/93	Metolachlor †	0.7
POIN #1	Poinsett	Irrigation	12/6/93, 3/29/94	Bentazon o	0.2, <K
MISS #4	Mississippi	Garden	11/2/93	Bentazon †	2.5
MISS #5	Mississippi	Green House	11/2/93, 3/28/94	Bentazon o	0.3, <K
CH #4	Craighead	Mixing	11/22/93, 3/29/94	Fluometuron o	0.5, <K
WOOD #7	Woodruff	Domestic	5/23/94, 6/29/94 7/27/94, 5/15/95	Bentazon *	55, 66, 78, 21
WOOD #9	Woodruff	Mixing	5/24/94, 6/29/94 5/15/95	Acifluorfen * Bentazon * Fluometuron *	1.7, 8.6, 6.8 25, 88, 37 0.9, 0.8, 0.4
WOOD #11	Woodruff	Garden	7/26/94, 2/20/95	Metolachlor *	13, 11.5
WOOD #25	Woodruff	Domestic	9/15/94, 2/20/95	Bentazon *	4.4, 1.9
WOOD #26	Woodruff	Domestic	9/15/94, 2/20/95	Bentazon *	1.5, 0.9
WOOD #29	Woodruff	Domestic	9/29/94, 2/20/95	Metribuzin *	0.35, 0.4
WOOD 34(PB)	Woodruff	Farm Stead	2/20/95, 5/15/95	Alachlor † Bentazon † Acifluorfen †	1.5, ⊗ 1.5, ⊗ 0.5, ⊗
PUL #14	Pulaski	Drinking	6/19/95	Acifluorfen ¶ Bentazon ¶ Fluometuron ¶ Metribuzin ¶	27 135 24 4.0

* Verified by at least one other sample collected at a later time (at least one month); † Not verified; ¶ Waiting for verification;
o No pesticide detected in a later sampling (several months later); <K Below detection limits; ⊗ Analytical results not received.

1996 Survey - Results of Ground Water Pesticide Monitoring

The Department sampled 77 irrigation wells during the summer of 1996 for 54 pesticides and pesticide breakdown products. The average depth of all wells was 100 feet, and the wells generally ranged from 80 to 110 feet. A total of 24 wells yielded water samples containing one or more pesticides. Figure GW-5 depicts the locations of all wells sampled for the 1996 assessment. The well locations were divided into three general areas: the eastern portion of Jefferson County, the northwestern half of Desha County, and Phillips County and termed Area I, Area II, and Area III, respectively. The wells with positive detections for one or more pesticide were evenly distributed between each area with 7 detections in Area I, 7 detections in Area II and 10 detections in Area III.

Of the 77 wells sampled for the assessment, there were a total of 38 pesticide detections; some wells had more than one pesticide detected in the well water sample. Figure GW-6 displays the percentage of each pesticide detection out of a total of 38 detections. Bentazon was detected most often (14 detections) in the samples, followed by molinate (7 detections). Figures GW-7 and GW-8 show the locations for bentazon and molinate, respectively. Bentazon is used almost solely for soybeans in Arkansas, whereas molinate is used for rice. The greatest number of detections for bentazon was in Phillips County, which harvested a total of 172,000 acres of soybeans compared to 108,000 and 96,000 acres for Desha and Jefferson, respectively. However, all detections of molinate were in Desha and Jefferson counties, which harvested 44,000 acres and 42,000 acres of rice, respectively, compared to 22,000 acres of rice for Phillips County.

Table GW-8 lists the average confining layer thickness for each area and the average confining thickness for all sites with positive pesticide detections in each area. Although the average confining layer thickness for Area I wells with positive detections was half of the average value for the rest of the county, this relation was not apparent in Areas II and III. Area III had the greatest average thickness value for any of the areas; however, it also had the greatest number of wells with positive pesticide detections. This anomaly is explained in part by the fact that 7 of the wells had detections for bentazon, which has an infinite solubility compared to the other pesticides. Bentazon, with a water solubility of 2.3 kg/L, has the highest solubility of any of the pesticides sampled for the study and was the pesticide most often detected by both the Department and the AWRC. It is apparent that confining layer thickness is not effective in restricting the leaching potential or transport ability of bentazon within the subsurface.

Table GW-8: Average confining layer thickness for sampling areas and wells with detections.

	AREA I	**AREA II**	**AREA III**
Average Confining Layer Thickness	9.5 feet	7.2 feet	11.3 feet
Average Confining Layer for Well w/ Detections	4.5 feet	9.5 feet	12.6 feet

Figure GW-5

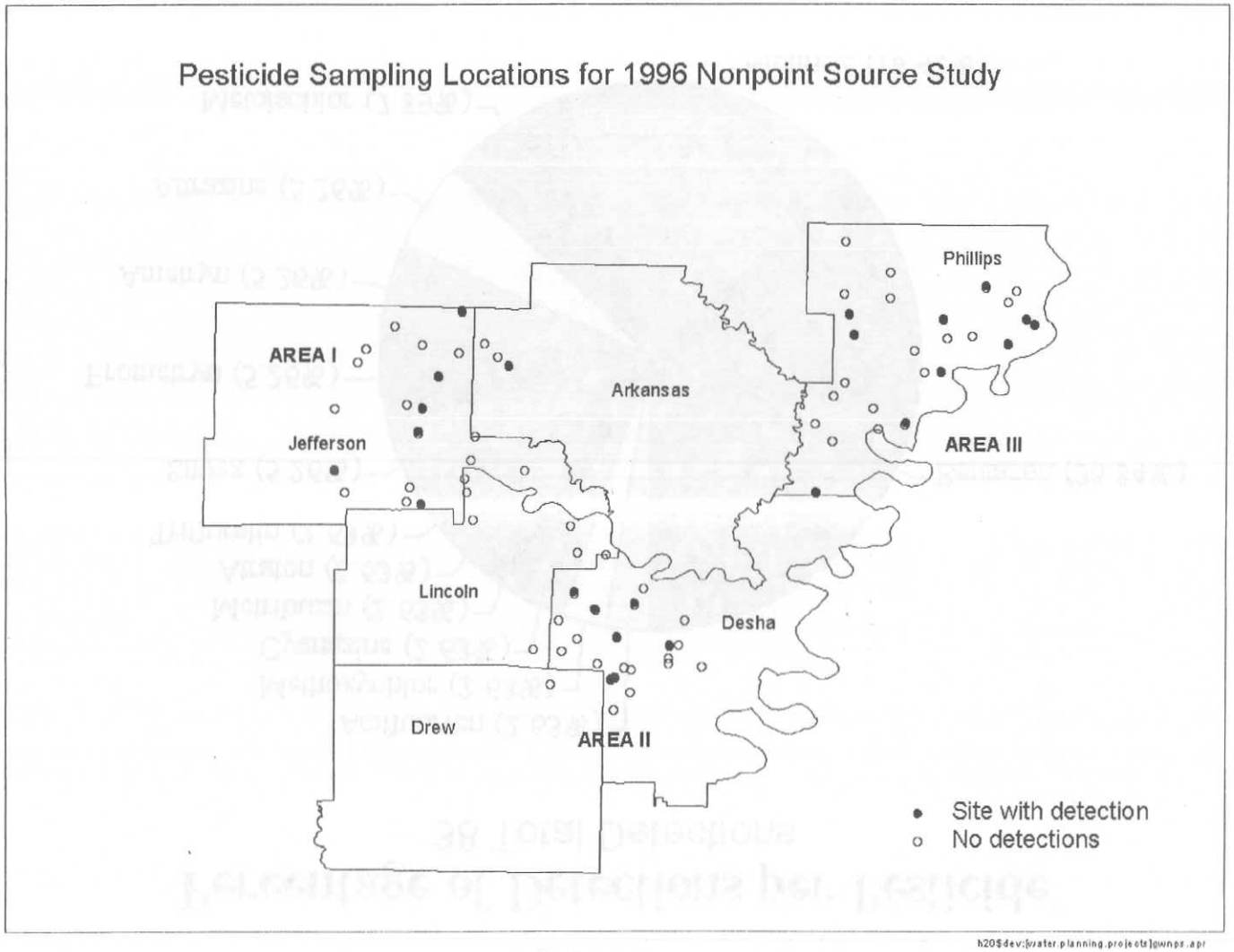

Pesticide Sampling Locations for 1996 Nonpoint Source Study
Phillips
AREA I
Arkansas
Jefferson
AREA III
Lincoln
Desha
Drew
AREA II
Site with detection
No detections
h20$dev:[water.planning.projects]gwnps.apr

Figure GW-6

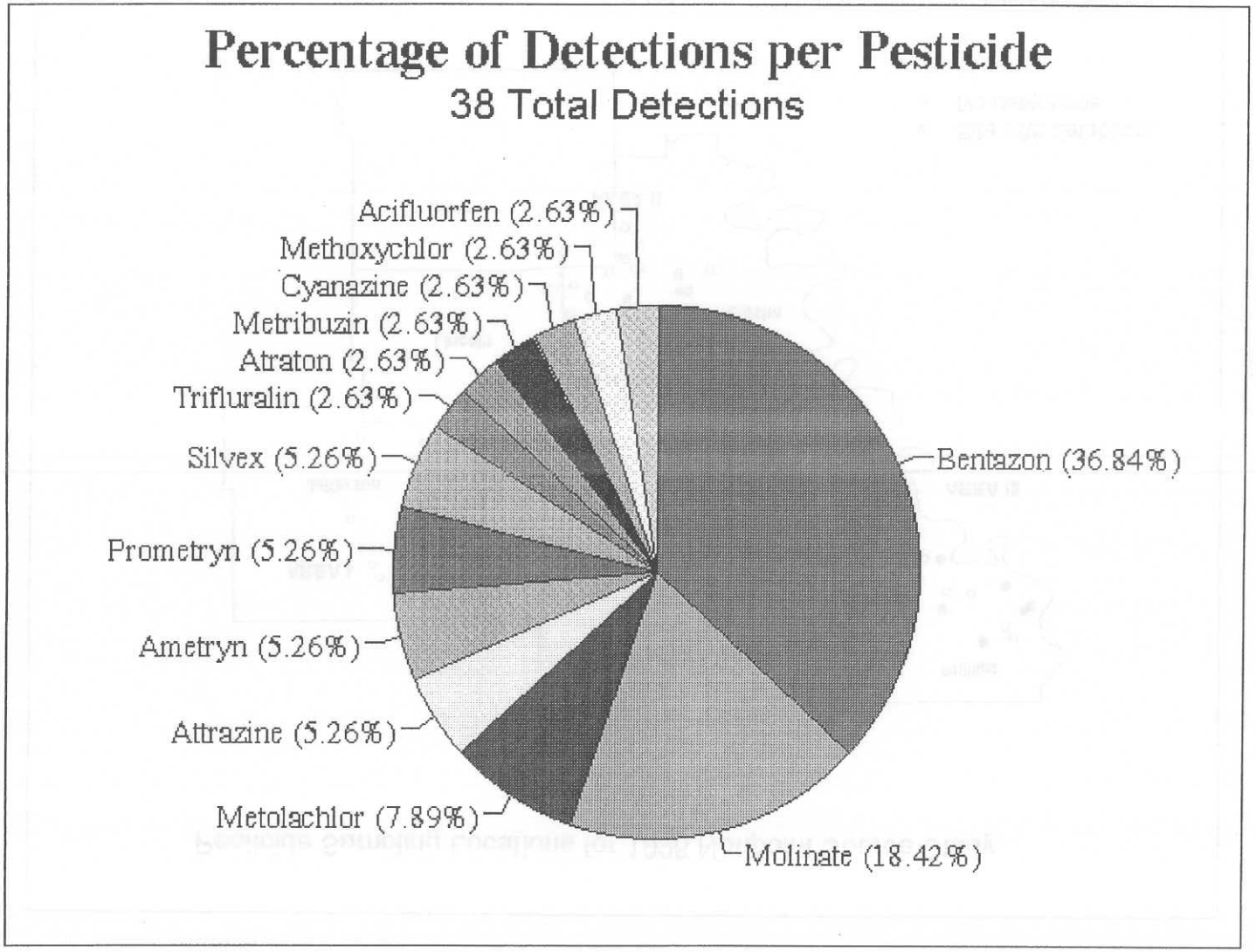

Percentage of Detections per Pesticide
38 Total Detections
Acifluorfen (2.63%)
Methoxychlor (2.63%)
Cyanazine (2.63%)
Metribuzin (2.63%)
Atraton (2.63%)
Trifluralin (2.63%)
Silvex (5.26%)
Prometryn (5.26%)
Ametryn (5.26%)
Attrazine (5.26%)
Metolachlor (7.89%)
Molinate (18.42%)
Bentazon (36.84%)

Figure GW-7

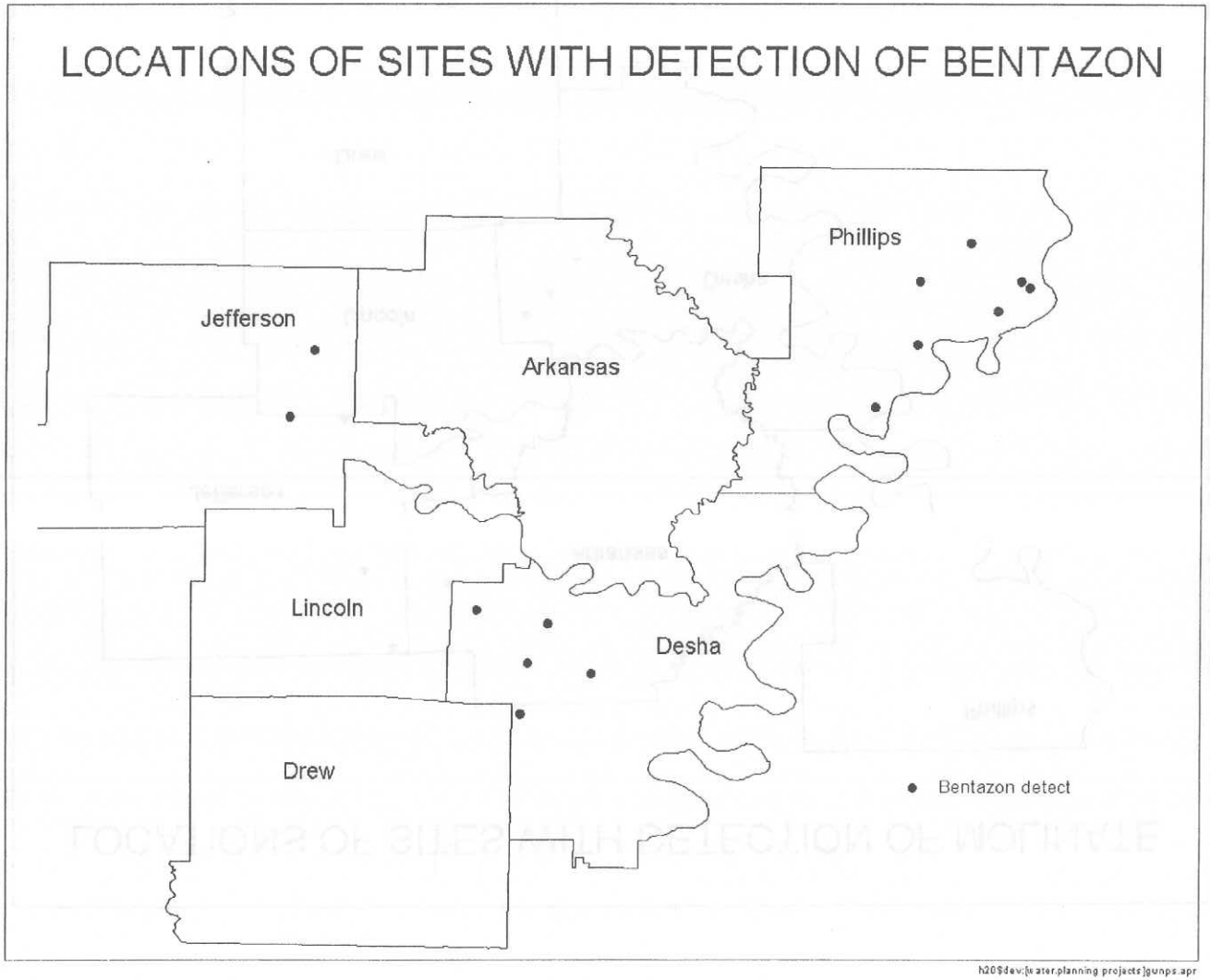

LOCATIONS OF SITES WITH DETECTION OF BENTAZON
Phillips
Jefferson
Arkansas
Lincoln
Desha
Drew
Bentazon detect
h20$dev:[water.planning projects]gunps.apr

Figure GW-8

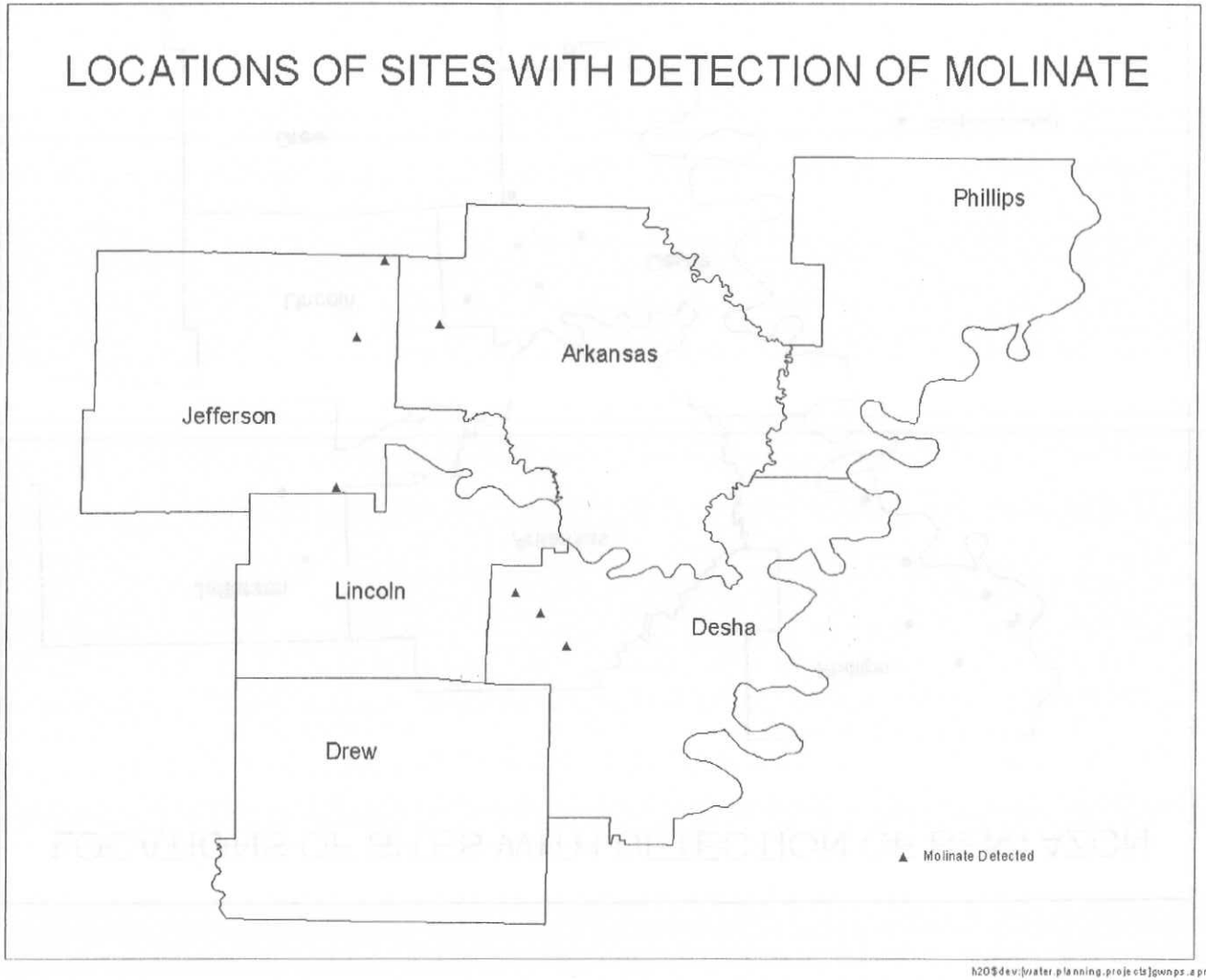
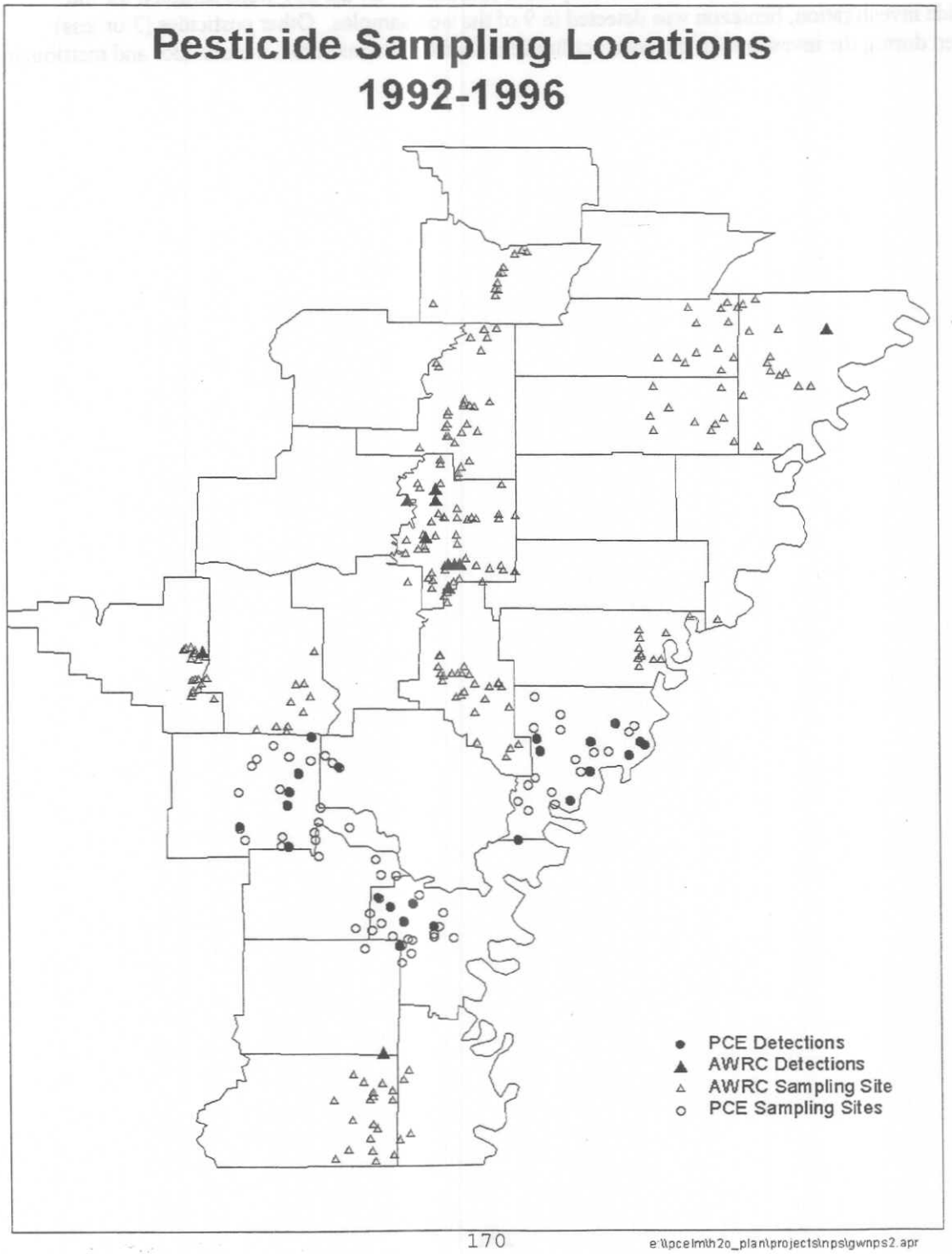

LOCATIONS OF SITES WITH DETECTION OF MOLINATE
Phillips
Arkansas
Jefferson
Lincoln
Desha
Drew
Molinate Detected
h2O$dev:[water.planning.projects]gwnps.apr

Figure GW-9


Pesticide Sampling Locations
1992-1996
PCE Detections
AWRC Detections
AWRC Sampling Site
PCE Sampling Sites
e:\\pce\mh2o_plan\projects\nps\gwnps2.apr

The 77 wells sampled during the 1996 assessment period, in combination with the 257 wells sampled for pesticides by the AWRC, yields a total of 334 wells which have been sampled specifically for pesticides in Arkansas. Figure GW-9 displays the location of all wells sampled to date, including wells from which the water samples tested positive for one or more pesticide. The investigation by the AWRC produced similar results to the 1996 assessment work by the Department. Of the 257 wells sampled for the pesticide investigation, bentazon was detected in 9 of the well samples. Other pesticides (3 or less) detected during the investigation included acifluorfen, alachlor, fluometuron, metolachlor and metribuzin.

Literature Cited for Ground Water Section

Albin, D.R., 1964. Geology and Ground water Resources of Bradley, Calhoun and Ouachita Counties, Arkansas. U.S. Geological Survey Water-Supply Paper 1779-G, 32 p.

Arkansas Department of Pollution Control and Ecology, 1994. Status Report, Arkansas Prototype Monitoring Program, 59 p.

Bryant, C.T., Ludwig, A.H., and Morris, E.E., 1985. Ground Water Problems in Arkansas. U.S. Geological Survey Water-Resources Investigations Report 85-4010, 24 p.

Chesney, C., 1979. Surface Impoundment Assessment State of Arkansas. Arkansas Soil and Water Conservation Commission, 48 p.

Cordova, R.C., 1996. Written communication. Arkansas Department of Health, Little Rock, Arkansas.

Counts, H.B., 1957. Ground water Resources of Parts of Lonoke, Prairie, and White Counties, Arkansas. Arkansas Geological and Conservation Commission Water Resources Circular No. 5, 58 p., 6 pl.

Fitzpatrick, D.J., 1985. Occurrence of Saltwater in the Alluvial Aquifer in the Boeuf-Tensas Basin, Arkansas. U.S. Geological Survey Water-Resources Investigations Report 85-4029, 1 sheet.

Guccione, M.J., Prior, W.L., and Rutledge, E.M., 1986. The Tertiary and Quaternary Geology of Crowley's Ridge: A Guidebook. Arkansas Geological Commission Guidebook 86-4, 39 p.

Holland, T.W., 1993. Use of Water in Arkansas, 1990. U.S. Geological Survey Open-File Report 93-48, 1 sheet.

Holland, T.W., and Ludwig, A.H., 1981. Use of Water in Arkansas, 1980. Arkansas Geological Commission Water-Resources Summary 14, 30 p.

Landes, K.K., 1970. Petroleum Geology of the United States. Wiley and Sons, Inc., 571 p.

Leidy, V.A., and Morris, E.E., 1990. Hydrogeology and Quality of Ground Water in the Boone Formation and Cotter Dolomite in Karst Terrain of Northwestern Boone County, Arkansas. U.S. Geological Survey Water-Resources Investigations Report 90-4066, 57 p.

Kresse, T.M., and Van Schaik, E.J., 1996. Preliminary Results of Pesticide Investigation, Augusta, Arkansas, 15 p.

Leidy, V.A., and Morris, E.E., 1990. Ground water Quality and Preliminary Assessment of the Potential for Contamination beneath Agricultural Lands in Central Lonoke County, Arkansas. U.S. Geological Survey Water-Resources Investigations Report 90-4099, 31 p.

Leidy, V.A., and Taylor, R.E., 1992. Overview of Susceptibility of Aquifers to Contamination, Union County, Arkansas. U.S. Geological Survey Water-Resources Investigations Report 92-4094, 35 p.

Meyers, Hal. 1997. Written communication. Cooperative Extension Service, Lonoke Extension and Research Center, Lonoke, Arkansas.

Morris, E.E., and Bush, W.V., 1986. Extent and Source of Saltwater Intrusion into the Alluvial Aquifer Near Brinkley, Arkansas, 1984. U.S. Geological Survey Water-Resources Investigations Report 85-4322, 123 p.

Smith, E.T., Fugitt, D.T., Hanson, L.A., Rotenberry, M., Cable, S., Smith, P., and Griffith, D., 1995. Arkansas Water Plan Supplement: Ground Water Protection and Management Report, 67 p.

Spradley, P., 1992. 1991 Arkansas Soybean Pesticide Use Survey. ETB206 Cooperative Extension Service. University of Arkansas. 37p.

Spradley, P., 1993. 1992 Arkansas Rice Pesticide Use Survey. ETB251 Cooperative Extension Service. University of Arkansas. 44p.

Steele, K.F., 1996. Written communication. Arkansas Water Resources Center, Fayetteville, Arkansas.

Teague, W., 1996. Written communication. University of Arkansas Cooperative Extension Service, Little Rock, Arkansas.

Teague, W., Tacker, P., and Chapman, S., 1993. Nitrate Testing and Sources Evaluation for Private Rural Water Supplies in Arkansas. University of Arkansas Cooperative Extension Service Status Report, November, 1993, 39 p.

University of Arkansas at Fayetteville. 1996. Soil Analyses of Woodruff County From 1990-1992. Data Sheets Submitted by Department of Agronomy, Agri. Experiment Station.

U.S. Environmental Protection Agency, 1986a. State Program Briefs - Pesticides in Ground Water. Office of Ground water, WH-550G. 93p.

---------- 1986b. Pesticides in Ground Water: Background Document. Office of Ground Water, WH-550G.

---------- 1987. Protecting Ground Water: Pesticides and Agriculture Practices. Office of Ground Water

---------- 1990. National Pesticide Survey - Dinoseb. Office of Water and Office of Pesticides and Toxic Substances. 4p.

---------- 1992a. Another Look: National Survey of Pesticides in Drinking Water Wells, Phase II Report. Office of Pesticides and Toxic Substances (H-7501C).

U.S. Environmental Protection Agency, 1992b. Appendix A. Review, Approval and Evaluation of State Management Plans.

---------- 19892c. Appendix B. Assessment, Prevention Monitoring and Response Components of State Management Plans.

Van Schaik, E.J., and Kresse, T.M., 1994. Report on the Third Sampling of the El Dorado, Pine Bluff, and Lonoke Prototypes, 44 p.

Van Schaik, E.J., and Kresse, T.M., 1995. Report on the Third Sampling of the Jonesboro Prototype, 27 p.

Van Schaik, E.J., and Kresse, T.M., 1996. Report on the Third Sampling of the Brinkley Prototype, 40 p.

Wauchope, D. 1996. Written communication. Cooperative Extension Service - Agriculture Research Center. Tifton, Georgia.

APPENDICES

APPENDIX A

Definition of Navigable Waters and Waters of the United States*

Navigable Waters

> ...The term :navigable waters means the waters of the United States, including the territorial seas.
>
> Source: Federal Water Pollution Control Act as Amended by the Water Quality Act of 1987.

Waters of the United States

a) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
b) All interstate waters, including interstate "wetlands;"
c) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, "wetlands," sloughs, prairie, potholes, wet meadows, playa lakes, or natural ponds in use, degradation, or destruction of which would affect or could effect interstate or foreign commerce including any such waters:
    1) which are or could be used by interstate or foreign travelers for recreational or other purposes;
    2) from which fish and shellfish are or could be taken and sold in interstate or foreign commerce; or
    3) which are used or could be used for industrial purposes by industries in interstate commerce;
d) All impoundments of waters otherwise defined as waters of the United States under this definition;
e) Tributaries of waters identified in paragraphs (a) through (d) of this definition;
f) The territorial sea; and
g) "Wetlands" adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) through (f) of this definition...

Wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas...

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*Source: 40 CFR 122.2

APPENDIX B

Major Nonpoint Source Pollution Categories and Subcategories*

10 Agriculture
- 11: Non-irrigated crop production
- 12: Irrigated crop production
- 13: Specialty crop production (Truck farming, orchards)
- 14: Pasture land
- 15: Range land
- 16: Feedlots - all types
- 17: Aquaculture
- 18: Animal holding/management areas

20 Silviculture
- 21: Harvesting, reforestation, residue management
- 22: Forest management
- 23: Road construction/maintenance

30 Construction
- 31: Highway/road/bridge
- 32: Land development

40 Urban Runoff
- 41: Storm sewers (source control)
- 42: Combined sewers (source control)
- 43: Surface runoff

50 Resource Extraction/Exploration/Development
- 51: Surface mining
- 52: Subsurface mining
- 53: Placer mining
- 54: Dredge mining
- 55: Petroleum mining
- 56: Mill tailings
- 57: Mine tailings

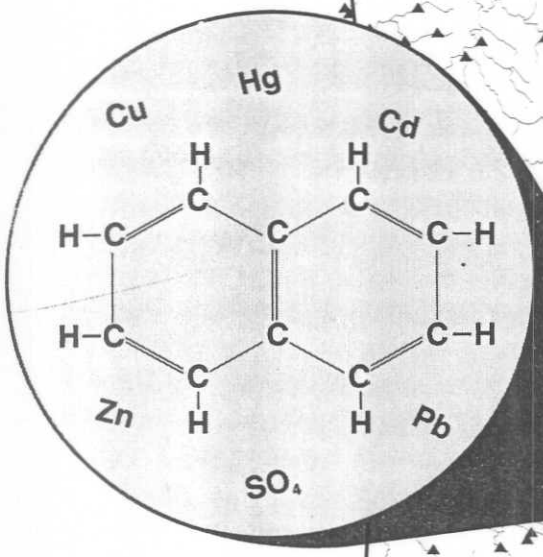
60 Land Disposal (Runoff/Leachate From Permitted Areas)
- 61: Sludge
- 62: Wastewater
- 63: Landfills
- 64: Industrial land treatment
- 65: On-site waste systems (septic tanks, etc.)
- 66: Hazardous waste

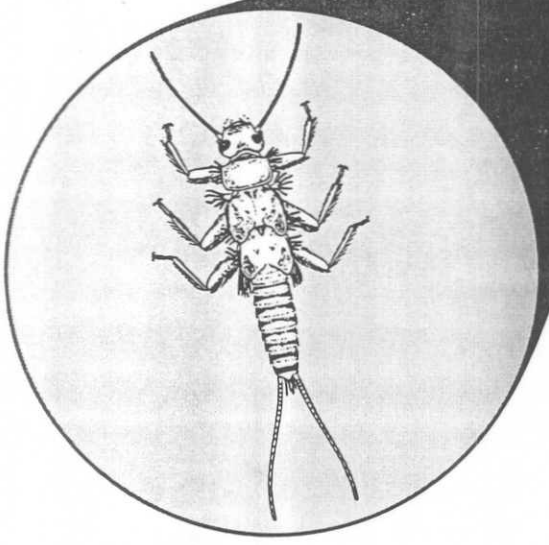
70 Hydrologic/Habitat Modification
- 71: Channelization
- 72: Dredging
- 73: Dam Construction
- 74: Flow regulation/modification
- 75: Bridge construction
- 76: Removal of riparian vegetation
- 77: Stream bank modification/ destablization

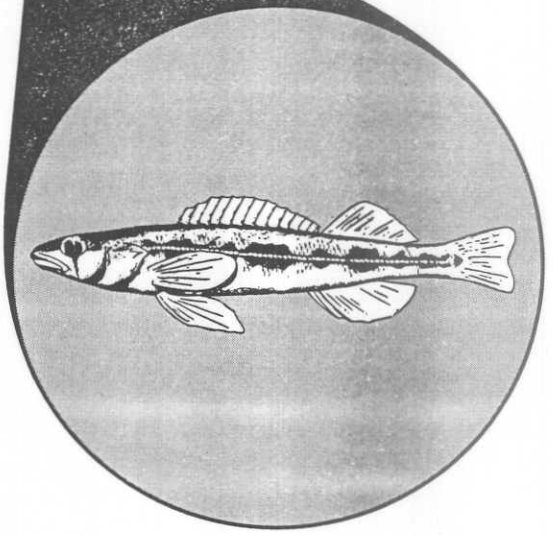
80 Other
- 81: Atmospheric deposition
- 82: Waste storage/storage tank leaks
- 83: Highway maintenance and runoff
- 84: Spills
- 85: In-place contaminants
- 86: Natural

90 Source Unknown

Source: U.S. EPA Guidelines for the Preparation of the 1988 State Waste Quality Assessment (305(b) Report), April 1, 1987, p. 19.







1996 Arkansas Water Quality Inventory Report

State of Arkansas Department of Pollution Control and Ecology

Prepared pursuant to Section 305(b) of the Federal Water Pollution Control Act

APPENDIX B

Nonpoint Source Impacted Waters

All waterbody reaches determined to be impacted by nonpoint sources, either as a major or minor source, are listed in Table B-1. Agricultural activities were determined to be the source of major impacts to 3197.1 miles of streams and the source of minor impacts on an additional 77.7 miles. Silviculture was the minor impact source on 218 streams miles. Major and minor impacts from resource extraction was assigned to 210.9 miles and 112.3 miles, respectively. An unknown source was causing major impacts to 557.4 miles of streams and an additional minor impact on 46.9 stream miles. The cause of most of these impacts was fish tissue contamination by mercury, but the source is yet unidentified. Road construction/maintenance was causing major impacts on 147.3 miles and minor impacts on 58.7 stream miles. The total stream miles impacted by nonpoint sources in the state were 4112.7 of major impacts and 513.6 stream miles of minor impacts.

The data also indicates that the major causes of impacts from nonpoint sources is excessive turbidity and its associated silt load. Nutrients are also causing substantial nonpoint source impacts, although in most situations they are the minor cause to other nonpoint causes. Pathogen indicators indicate potential fecal coliform contamination from nonpoint sources is either a major or minor cause on a total of 909.5 miles. Minerals from nonpoint sources, usually from soil erosion or runoff of mining or gas and oil extraction activities, has been identified as the major or minor cause of impacts on 324.8 miles of stream reaches.

Table B-1: Nonpoint Source Impacted Waters

STREAM NAME	H.U.C.	REACH	MILES	STATION	ASSESSED	FISH CONSUM	AQUATIC LIFE	SWIMNG	SEC. CNTCT	DRINKING WATER	AGRI & IND	MAJOR SOURCE	MINOR SOURCE	MAJOR CAUSE	MINOR CAUSE
Red River	11140201	-011	15.2		E	S	S	S	S	N	S	AG		MN	
Red River	11140201	-007	40.1		E	S	S	S	S	N	S	AG		MN	
Red River	11140201	-005	12.0		E	S	S	S	S	N	S	AG		MN	
Red River	11140201	-004	4.0		E	S	S	S	S	N	S	AG		MN	
Red River	11140201	-003	15.5	RED09	M	S	S	S	S	N	S	AG		MN	PA
Red River	11140106	-001	34.8		E	S	S	S	S	N	S	AG		MN	
Red River	11140106	-003	9.8		E	S	S	S	S	N	S	AG		MN	
Red River	11140106	-005	25.3	RED25	M	S	S	S	S	N	S	AG		MN	
Red River	11140106	-025	8.0		E	S	S	S	S	N	S	AG		MN	
Saline River	11140109	-014	25.3	RED32	M	S	S	N	S	S	S	AG		PA	
Cossatot R.	11140109	-018B	37.2	RED22	M	S	S	N	S	S	S	AG		PA	
Cossatot R.	11140109	-019	14.2		E	S	S	N	S	S	S	AG		PA	
Rolling Fork	11140109	-024	1.7		E	S	P	S	S	S	S	AG		NU	
Rolling Fork	11140109	-027	18.0		E	S	P	S	S	S	S	AG		NU	
Rolling Fork	11140109	-028	20.7	RED30	M	S	P	S	S	S	S	AG		NU	
Mountain Fork	11140108	-014	11.0	RED01	M	S	P	S	S	S	S	AG		SI	
Boeuf River	8050001	-018	49.4	OUA15A	M	S	N	N	S	N	S	AG		SI	NU
Boeuf River	8050001	-019	58.1	BFR01	M	S	N	S	S	N	S	AG		SI	NU
Big Bayou	8050001	-022	27.1	BGB01,+	M	S	N	N	S	N	S	AG		SI	PA
Cypress Creek	8050001	-020	47.5		E	S	N	S	S	N	S	AG		SI	NU
Choctaw Bayou	8050001	-021	58.9		E	S	N	S	S	N	S	AG		SI	NU
Macon Bayou	8050002	-003	80.5	BYM01	M	S	N	S	S	N	S	AG		SI	NU
Ditch Bayou	8050002	-004	4.0		E	S	N	S	S	N	S	AG		SI	NU
Macon Bayou	8050002	-006	38.6		E	S	N	S	S	N	S	AG		SI	NU
Clay Ditch	8050002	-007	24.3		E	S	N	S	S	N	S	AG		SI	NU
Boggy Creek	8050002	-009	12.0		E	S	N	S	S	N	S	AG		SI	NU
Oak Log Creek	8050002	-010	48.4		E	S	N	S	S	N	S	AG		SI	NU
Red Fork Creek	8050002	-008	17.0		E	S	N	S	S	N	S	AG		SI	NU
B. Bartholomew	8040205	-001	60.1	OUA13	M	S	S	P	S	S	S	AG		SI	
B. Bartholomew	8040205	-002	17.9	BYB01	M	P	P	S	S	S	S	AG	UN	SI	HG
B. Bartholomew	8040205	-006	82.3	OUA33	M	S	S	N	S	S	S	AG		PA	SI
Deep Bayou	8040205	-005	28.9		E	S	P	S	S	S	S	AG		SI	
B. Bartholomew	8040205	-012	82.7	BYB02	M	S	P	N	S	S	S	AG		SI	PA
B. Bartholomew	8040205	-012	25.0		M	P	P	S	S	S	S	AG	UN	SI	HG
B. Bartholomew	8040205	-013	33.9	BYB03	M	S	P	N	S	S	S	AG		SI	PA
Hurricane Cr.	8040203	-004	19.5	OUA116	M	S	P	S	S	N	S	RE		MN	
Hurricane Cr.	8040203	-006	30.8	OUA31	M	S	N	S	S	N	S	RE		MN	
Lost Creek	8040203	-008	33.5		E	S	P	S	S	N	S	RE		MN	
B. De L'Outre	8040202	-006	32.4	OUA05	M	S	P	S	S	N	S	RE	MP	MN	NU
Smackover Cr.	8040201	-006	14.8	OUA27	M	S	P	S	S	S	S	RE		MN	
Smackover Cr.	8040201	-007	29.1		E	S	P	S	S	S	S	RE		MN	
Ouachita River	8040101	-033	11.9	OUA21	M	S	S	P	S	S	S	AG		PA	
Prairie Creek	8040101	-048	10.0	OUA40	M	S	N	S	S	S	S	MP	RC	NU	SI
L. Missouri R.	8040103	-008	19.6	OUA35	M	S	P	S	S	S	S	AG		SI	
Wabbaseka B.	8020401	-003	101.7	WSB01	M	S	S	P	S	S	S	AG		SI	PA

(continued)

Table B-1: Nonpoint Source Impacted Waters

STREAM NAME	H.U.C.	REACH	MILES	STATION	ASSESSED	FISH CONSUM	AQUATIC LIFE	SWIMNG	SEC. CNTCT	DRINKING WATER	AGRI & IND	MAJOR SOURCE	MINOR SOURCE	MAJOR CAUSE	MINOR CAUSE
(continued)															
Bayou Meto	8020402	-001	4.3		E	S	P		S	S	S	AG		SI	
Bayou Meto	8020402	-003	39.8	ARK23	M	S	P		S	S	S	AG		SI	
B.Two Prairie	8020402	-006	44.7	ARK97	M	S	P		S	S	S	AG	MP	SI	NU
E. Fork Cadron	11110205	-002	15.6	EFC01	M	S	S	N	S	S	S	AG		PA	
E. Fork Cadron	11110205	-003	2.0		E	S	S	N	S	S	S	AG		PA	
Cadron Creek	11110205	-009	0.7		E	S	S	N	S	S	S	AG		PA	
Cadron Creek	11110205	-011	2.2	CCR01	M	S	S	N	S	S	S	AG		PA	
Fourche LaFave	11110206	-001	44.4		E	S	P	S	S	S	S	AG		SI	
Fourche LaFave	11110206	-002	8.7		M	P	P	S	S	S	S	UN	AG	HG	SI
Fourche LaFave	11110206	-006	21.5		E	S	P	S	S	S	S	AG	SV	SI	
Black Fork	11110206	-009	14.3	BLF01	M	S	P	S	S	S	S	RC	SV	SI	
Gafford Creek	11110206	-012	8.5	GLF01	M	S	P	S	S	S	S	RC	SV	SI	
S.Fourche LaFave	11110206	-013	10.3		E	S	P	S	S	S	S	RC	SV	SI	
S.Fourche LaFave	11110206	-014	26.1	ARK52,+	M	S	P	S	S	S	S	RC	SV	SI	
Petit Jean R.	11110204	-003	8.7		E	S	P	S	S	S	S	AG		SI	
Petit Jean R.	11110204	-005	1.3	PJR03	M	S	P	S	S	S	S	AG		SI	
Petit Jean R.	11110204	-006	17.9	PJR02	M	S	P	S	S	S	S	AG	SV	SI	
Petit Jean R.	11110204	-011	21.6	ARK34	M	S	P	S	S	S	S	AG	SV	SI	
Chickalah Cr.	11110204	-002	19.3	ARK58	M	S	P	S	S	S	S	AG	SV	SI	
Piney Creek	11110202	-018	0.5		E	S	P	S	S	S	S	AG	SV	SI	
Piney Creek	11110202	-019	26.3	ARK43	M	S	P	S	S	S	S	AG	SV	SI	
Piney Creek	11110202	-021	11.9		E	S	P	S	S	S	S	AG	SV	SI	
Piney Creek	11110202	-023	19.0		E	S	P	S	S	S	S	AG	SV	SI	
Mulberry River	11110201	-006	10.4	ARK42	M	S	P	S	S	S	S	AG	RC	SI	
Frog Bayou	11110201	-018	20.4	ARK47	M	S	P	N	S	S	S	RC	MP	SI	PA
Poteau River	11110105	-001	2.0	ARK14	M	S	P	S	S	S	S	AG		SI	
Poteau River	11110105	-027	16.0		E	S	N	N	S	S	S	AG	IP	SI	PA
James Fork	11110105	-033	18.4	ARK15	M	S	P	S	S	S	S	AG	RE	SI	
Evansville Cr.	11110103	-012	9.0		E	S	P	N	S	S	S	AG		PA	SI
Baron Fork	11110103	-013	10.0	ARK07	M	S	P	S	S	S	S	AG	MP		SI
Illinois River	11110103	-020	1.6		E	S	P		S	S	S	AG	RE		SI
Cincinnati Cr.	11110103	-021	9.0		E	S	P		S	S	S	AG		SI	
Illinois River	11110103	-022	10.8	ARK06A	M	S	P	S	S	S	S	AG	RE	SI	NU
Illinois River	11110103	-023	8.1		E	S	P	S	S	S	S	AG		SI	
Illinois River	11110103	-024	2.5	ARK40	M	S	P	S	S	S	S	AG	RE	SI	
Muddy Fork.	11110103	-025	3.2		E	S	P		S	S	S	AG		SI	
Moores Creek	11110103	-026	9.8		E	S	P		S	S	S	AG		SI	
Muddy Fork	11110103	-027	11.0		E	S	P		S	S	S	AG		SI	
Illinois River	11110103	-028	19.9		E	S	P		S	S	S	AG	RE	SI	
Clear Creek	11110103	-029	13.5	ARK10C	M	S	P		S	S	S	RC		SI	
Beaty Creek	11070209	-049	5.2		E	S	P		S	S	S	AG		SI	
Little Sugar	11070208	-003	24.2		E	S	P		S	S	S	AG	MP	SI	NU
Town Branch	11070208	-003t	3.0	ARK56	M	S	P	S	S	N	S	MP	RC	NU	
La Grue Bayou	8020303	-006	20.1	LGB02	M	S	P	S	S	S	S	AG		SI	

(continued)

Table B-1: Nonpoint Source Impacted Waters

STREAM NAME	H.U.C.	REACH	MILES	STATION	ASSESSED	FISH CONSUM	AQUATIC LIFE	SWIMNG	SEC. CNTCT	DRINKING WATER	AGRI & IND	MAJOR SOURCE	MINOR SOURCE	MAJOR CAUSE	MINOR CAUSE
(continued)															
Bayou DeView	8020302	-004	21.2	BDV02	M	S	P	P	S	S	S	AG		SI	PA
Bayou DeView	8020302	-005	8.6		E	S	P	P	S	S	S	AG	MP	SI	NU
Bayou DeView	8020302	-006	10.2		E	S	P	P	S	S	S	AG	MP	SI	NU
Bayou DeView	8020302	-007	18.2		E	S	P	P	S	S	S	AG	MP	SI	NU
Bayou DeView	8020302	-009	20.3	WHI26	M	S	N	P	S	S	S	AG	MP	SI	NU
Cache River	8020302	-016	21.8	WHI32	M	S	N	N	S	S	S	AG		SI	PA
Cache River	8020302	-017	15.8		E	S	N	P	S	S	S	AG		SI	PA
Cache River	8020302	-018	25.0	CHR02	M	S	N	P	S	S	S	AG		SI	PA
Cache River	8020302	-019	13.7		E	S	P	S	S	S	S	AG		SI	
Cache River	8020302	-020	22.6	CHR03	M	S	P	S	S	S	S	AG		SI	
Cache River	8020302	-027	3.9		E	S	P	P	S	S	S	AG		SI	PA
Cache River	8020302	-028	5.9	CHR04	M	S	P	P	S	S	S	AG		SI	PA
Cache River	8020302	-029	3.9		E	S	P	P	S	S	S	AG		SI	PA
Cache River	8020302	-031	3.4		E	S	P	P	S	S	S	AG		SI	PA
Cache River	8020302	-032	11.4		E	S	P	P	S	S	S	AG		SI	PA
Village Cr	11010013	-006	25.2	VGC01&3	M	S	P	P	S	S	S	AG		SI	PA
Village Cr	11010013	-007	1.2		E	S	P	S	S	S	S	AG		SI	
Village Cr	11010013	-008	13.0		E	S	P	S	S	S	S	AG		SI	
Village Cr	11010013	-012	7.4	VGC02	M	S	N	N	S	S	S	AG		SI	PA
Cypress Bayou	8020301	-010	5.0	CPB01	M	S	P	P	S	S	S	MP	AG	PA	ME
Cypress Bayou	8020301	-011	9.5		E	S	P	P	S	S	S	MP	AG	PA	ME
Wattensaw Bayou	8020301	-015	48.2	WHI72	M	S	P	S	S	S	S	AG		SI	
Overflow Creek	11010014	-004	0.6		E	S	P	N	S	S	S	AG		PA	SI
Overflow Cr.	11010014	-006	21.7	OFC01	M	S	P	N	S	S	S	AG		PA	SI
Middle Fork	11010014	-027	8.8	WHI43	M	S	P	S	S	S	S	RC	SV	SI	
Middle Fork	11010014	-028	12.0		E	S	P	S	S	S	S	RC	SV	SI	
Strawberry R.	11010012	-001	4.4		E	S	P		S	S	S	AG		SI	
Strawberry R.	11010012	-002	9.4	SBR03	M	S	S	P	S	S	S	AG		PA	
Strawberry R.	11010012	-004	0.3		M	S	P		S	S	S	AG		SI	
Strawberry R.	11010012	-005	0.7		M	S	P		S	S	S	AG		SI	
Strawberry R.	11010012	-006	19.0	WHI24	M	S	P		S	S	S	AG		SI	
Strawberry R.	11010012	-009	28.4	SBR02	M	S	P	S	S	S	S	AG		SI	PA
Strawberry R.	11010012	-011	20.4	SBR01	M	S	P	N	S	S	S	AG		SI	PA
Curia Creek	11010009	-001t	18.0	CAC01	M	S	S	N	S	S	S	AG		PA	
Spring River	11010010	-003	9.4	WHI21	M	S	P	S	S	S	S	AG		SI	
Spring River	11010010	-018	12.0		E	S	P	S	S	S	S	AG		SI	
Eleven Point	11010011	-001	33.1	WHI05B	M	S	P	S	S	S	S	AG		SI	
Crooked Creek	11010003	-048	31.7	WHI48A,+	M	S	P	S	S	S	S	RE	MP	SI	
Yocum Creek	11010001	-052	16.2		E	S	S	N	S	S	S	AG		PA	
Long Creek	11010001	-054	8.4	WHI71	M	S	S	N	S	S	S	AG	MP	PA	
Dry Creek	11010001	-055	12.0		E	S	S	N	S	S	S	MP	AG	PA	
Long Creek	11010001	-056	14.3		E	S	P	N	S	S	S	AG		PA	SI
Long Creek	11010001	-057	8.6		E	S	P	N	S	S	S	AG		PA	SI
White River	11010001	-023	6.2	WHI52	M	S	P	S	S	S	S	RC	AG	SI	

(continued)

Table B-1: Nonpoint Source Impacted Waters

STREAM NAME (continued)	H.U.C.	REACH	MILES	STATION	ASSESSED	FISH CONSUM	AQUATIC LIFE	SWIMNG	SEC. CNTCT	DRINKING WATER	AGRI & IND	MAJOR SOURCE	MINOR SOURCE	MAJOR CAUSE	MINOR CAUSE
West Fork	11010001	-024	27.2	WHI51	M	S	N	S	S	S	S	RC	AG	SI	
Middle Fork	11010001	-026	21.9	WHI103	M	S	P	S	S	S	S	AG	RC	SI	
Richland Cr.	11010001	-030	12.1		E	S	P	S	S	S	S	AG		SI	
Brush Creek	11010001	-033	13.5		E	S	P	N	S	S	S	AG		PA	SI
War Eagle Cr.	11010001	-034	22.2	WHI116	M	S	S		S	S	S	AG	RE	SI	
War Eagle Cr.	11010001	-035	8.6		E	S	S		S	S	S	AG	RE	SI	
Kings River	11010001	-037	19.1	WHI09A	M	S	P	S	S	S	S	RE		SI	
Osage Creek	11010001	-045	30.6	WHI68&69	M	S	P	S	S	S	S	AG	MP	SI	NU
Osage Creek	11010001	-047	13.4		E	S	P		S	S	S	AG	RC	SI	
Holman Creek	11010001	-059	9.1	WHI70	M	S	P	N	S	N	S	MP	AG	NU	SI
War Eagle Cr.	11010001	-060	28.3		M	S	P	N	S	S	S	AG	RE	PA	SI
St. Francis R.	8020203	-002	25.5		E	S	P		S	S	S	AG		SI	
Blackfish Bayou	8020203	-003	2.4		E	S	P		S	S	S	AG		SI	
Frenchmans B.	8020203	-004	14.5		E	S	P		S	S	S	AG		SI	
Blackfish Bayou	8020203	-005	2.6		E	S	P		S	S	S	AG		SI	
Fifteen Mile B.	8020203	-006	38.4		E	S	P		S	S	S	AG		SI	
Blackfish Bayou	8020203	-007	16.1		E	S	P		S	S	S	AG		SI	
StFrancis(portion)	8020203	-008	22.9		M	S	P	S	S	S	S	AG		SI	
L'Anguille R.	8020205	-001	19.7	FRA10	M	S	P	P	S	S	S	AG		SI	PA
L'Anguille R.	8020205	-002	16.8		E	S	P	P	S	S	S	AG		SI	PA
L'Anguille R.	8020205	-003	1.8		E	S	P	P	S	S	S	AG		SI	PA
L'Anguille R.	8020205	-004	16.0	LGR01	M	S	P	P	S	S	S	AG		SI	PA
L'Anguille R.	8020205	-005	44.1	LGR02	E	S	N	P	S	S	S	AG		SI	PA
Brushy Creek	8020205	-006	30.7		E	S	P		S	S	S	AG		SI	
First Creek	8020205	-007	27.9		E	S	P		S	S	S	AG		SI	
Second Creek	8020205	-008	16.4	FRA12	M	S	P	S	S	S	S	AG		SI	
St. Francis R.(Pt)	8020203	-008	33.0	FRA13	M	S	P	S	S	S	S	AG		SI	
St. Francis R.	8020203	-009	17.1		E	S	N	N	S	S	S	AG		SI	PA
St. Francis R.	8020203	-013	47.5		E	S	P		S	S	S	AG		SI	
St. Francis R.	8020203	-014	22.8	FRA08	M	S	N		S	S	S	AG		SI	
St. Francis R.	8020203	-015	90.8		E	S	N		S	S	S	AG		SI	
Eightmile Ditch	8020203	-018	17.8		E	S	P		S	S	S	AG		SI	
Eightmile Ditch	8020203	-019	12.8		E	S	P		S	S	S	AG		SI	
Whiteners Cr.	8020203	-021	33.6		E	S	P		S	S	S	AG		SI	
Big Boy Creek	8020203	-022	24.2		E	S	P		S	S	S	AG		SI	
Whiteness Cr.	8020203	-023	15.0		E	S	P		S	S	S	AG		SI	
Little River	8020204	-001	20.3		E	S	P		S	S	S	AG		SI	
Little River	8020204	-002	61.7		E	S	P		S	S	S	AG		SI	
Pemiscot Bayou	8020204	-003	28.0		E	S	P		S	S	S	AG		SI	
Little River	8020204	-004	6.0		E	S	P		S	S	S	AG		SI	
Little River	8020204	-005	37.0		E	S	P		S	S	S	AG		SI	
Tyronza River	8020203	-010	8.4		E	S	P		S	S	S	AG		SI	
Big Creek	8020203	-011	15.8		E	S	P		S	S	S	AG		SI	
Tyronza River	8020203	-012	12.8		E	S	P		S	S	S	AG		SI	
Mississippi R.	8010100	-004	4.8	USGS	M	S	P	S	S	S	S	AG		SI	

See Appendix A for a list of abbreviations.

1998 305(b) - 10/95 - 9/1997
1996-305(b) - 10/93 - 9/1995
1997 NPS - 10/93 - 9/1996??

Data Evaluated
2000-305(b) - 1/1995-12/1998 = 4 yrs
2002-305(b) - 10/1998 - 12/2001 = 3¼ yrs
Total 7 yrs

Attachment A. **List of rivers and streams requiring a waterbody specific rationale if not listed on the next Arkansas 303(d) list.**

Stream Name	Hydrologic Unit Code	Reach	Pollutants
Baron Fork	11110103	013	Siltation
Black Fork	11110206	009	Siltation
Bayou Bartholomew	08040205	012	Siltation Mercury
Bayou DeView	08020302	004	Siltation Pathogens
Bayou Deview	8020302	005	Siltation Nutrients
Bayou Deview	8020302	006	Siltation Nutrients
Bayou Deview	8020302	007	Siltation Nutrients
Bayou Meto	8020402	001	Siltation
Bayou Meto	08020402	003	Siltation
Bayou Two Prarie	08020402	006	Siltation Nutrients
Beaty Creek	11070209	049	Siltation
Big Boy Creek	8020203	022	Siltation
Big Creek	8020203	011	Siltation
Blackfish Bayou	8020203	003	Siltation
Blackfish Bayou	8020203	005	Siltation
Blackfish Bayou	8020203	007	Siltation
Boeuf River	08050001	019	Siltation Nutrients

Stream Name	Hydrologic Unit Code	Reach	Pollutants
Boggy Creek	08050002	009	Siltation Nutrients
Brush Creek	11010001	033	Pathogens Siltation
Brushy Creek	8020205	006	Siltation
Cache River	08020302	016	Siltation Pathogens
Cache R	08020302	017	Siltation Pathogens
Cache River	08020302	018	Siltation Pathogens
Cache River	8020302	019	Siltation
Cache River	08020302	020	Siltation
Cache River	8020302	027	Siltation Pathogens
Cache River	08020302	028	Siltation Pathogens
Cache River	8020302	029	Siltation Pathogens
Cache River	8020302	031	Siltation Pathogens
Cache River	8020302	032	Siltation Pathogens
Cadron Creek	11110205	009	Pathogens
Cadron Creek	11110205	011	Pathogens
Chickalah Creek	11110204	002	Siltation
Choctaw Bayou	08050001	021	Siltation Nutrients

Stream Name	Hydrologic Unit Code	Reach	Pollutants
Cincinnati Creek	11110103	021	Siltation
Clay Ditch	08050002	007	Siltation Nutrients
Clear Creek	11110103	029	Siltation
Cossatot River	11140109	~~018B~~ 918	Pathogens
Cossatot River	11140109	019	Pathogens
Crooked Creek	11010003	048	Siltation
Curia Creek	11010009	001t	Pathogens
Cypress Bayou	8020201	011	Pathogens Metals
Cypress Bayou	8020301	010	Pathogens Metals
Cypress Creek	08050001	020	Siltation Nutrients
Deep Bayou	8040205	005	Siltation
Ditch Bayou	08050002	004	Siltation Nutrients
Dry Creek	11010001	055	Pathogens
E. Fork Cadron	11110205	002	Pathogens
E. Fork Cadron	11110205	003	Pathogens
Eightmile Ditch	8020203	018	Siltation
Eightmile Ditch	8020203	019	Siltation
Eleven Point	11010001	001	Siltation
Evansville Creek	11110103	012	Pathogens Siltation

Stream Name	Hydrologic Unit Code	Reach	Pollutants
Fifteen Mile Ditch	8020203	006	Siltation
First Creek	8020205	007	Siltation
Fourche LaFave	11110206	001	Siltation
Fourche LaFave	11110206	006	Siltation
Frenchmans Bayou	8020203	004	Siltation
Frog Bayou	11110201	018	Siltation Pathogens
Gafford Creek	11110206	012	Siltation
Illinois River	11110103	020	Siltation
Illinois River	11110103	022	Siltation Nutrients
Illinois River	11110103	023	Siltation
Illinois River	11110103	024	Siltation
Illinois River	11110103	028	Siltation
James Fork	11110105	033	Siltation
LaGrue Bayou	08020303	006	Siltation
L. Missouri River	08040103	008	Siltation
Little River	8020204	001	Siltation
Little River	8020204	002	Siltation
Little River	8020204	004	Siltation
Little River	8020204	005	Siltation
Little Sugar	11070208	003	Siltation Nutrients
Long Creek	11010001	054	Pathogens

Stream Name	Hydrologic Unit Code	Reach	Pollutants
Long Creek	11010001	056	Pathogens Siltation
Long Creek	11010001	057	Pathogens Siltation
Macon Bayou	08050002	006	Siltation Nutrients
Middle Fork	11010001	026	Siltation
Middle Fork	11010014	027	Siltation
Mississippi R	08010100	004	Siltation
Moores Creek	11110103	026	Siltation
Mountain Fork	11140108	014	Siltation
Muddy Fork	11110103	025	Siltation
Muddy Fork	11110103	027	Siltation
Mulberry River	11110201	006	Siltation
Oak Log Creek	08050002	010	Siltation Nutrients
Osage Creek	11010001	045	Siltation Nutrients
Osage Creek	11010001	047	Siltation
Ouachita River	08040101	033	Pathogens
Overflow Creek	11010014	004	Pathogens Siltation
Overflow Creek	11010014	006	Pathogens Siltation
Pemiscot Bayou	08020204	003	Siltation

Stream Name	Hydrologic Unit Code	Reach	Pollutants
Petit Jean River	08020204	003	Siltation
Petit Jean River	08020204	005	Siltation
Petit Jean River	08020204	006	Siltation
Petit Jean River	11110204	011	Siltation
Piney Creek	11110202	018	Siltation
Piney Creek	11110202	019	Siltation
Piney Creek	11110202	021	Siltation
Piney Creek	11110202	023	Siltation
Poteau River	11110105	027	Siltation Pathogens
Red Fork Creek	08050002	008	Siltation Nutrients
Richland Creek	11010001	030	Siltation
Rolling Fork	11140109	024	Nutrients
Rolling Fork	11140109	027	Nutrients
Rolling Fork	11140109	028	Nutrients
Saline River	11140109	014	Pathogens
Second Creek	08020205	008	Siltation
S. Fourche LaFave	11110206	013	Siltation
S. Fourche LaFave	11110206	014	Siltation
Smackover Creek	08040201	006	Siltation
Smackover Creek	8040201	007	Minerals
Spring River	11010010	003	Siltation

Stream Name	Hydrologic Unit Code	Reach	Pollutants
Spring River	11010010	018	Siltation
St. Francis River (part)	08020203	002	Siltation
St. Francis River	08020203	008	Siltation
St. Francis River	8020203	009	Siltation Pathogens
St. Francis River	8020203	013	Siltation
St Francis River	08020203	014	Siltation
St Francis River	08020203	015	Siltation
Strawberry River	11010012	001	Siltation
Strawberry River	11010012	002	Pathogens
Strawberry River	11010012	004	Siltation
Strawberry River	11010012	005	Siltation
Strawberry River	11010012	009	Pathogens
Tyronza River	08020203	010	Siltation
Tyronza River	08020203	012	Siltation
Village Creek	11010013	006	Siltation Pathogens
Village Creek	11010013	007	Siltation
Village Creek	11010013	008	Siltation
Village Creek	11010013	012	Siltation Pathogens
Wabbaseka Bayou	08020401	003	Siltation Pathogens
War Eagle Creek	11010001	034	Siltation

Stream Name	Hydrologic Unit Code	Reach	Pollutants
War Eagle Creek	11010001	035	Siltation
War Eagle Creek	11010001	060	Pathogens Siltation
Wattensaw Bayou	08020301	015	Siltation
Whitners Creek	8020203	021	Siltation
Whitners Creek	8020203	023	Siltation
Yocum Creek	11010001	052	Pathogens