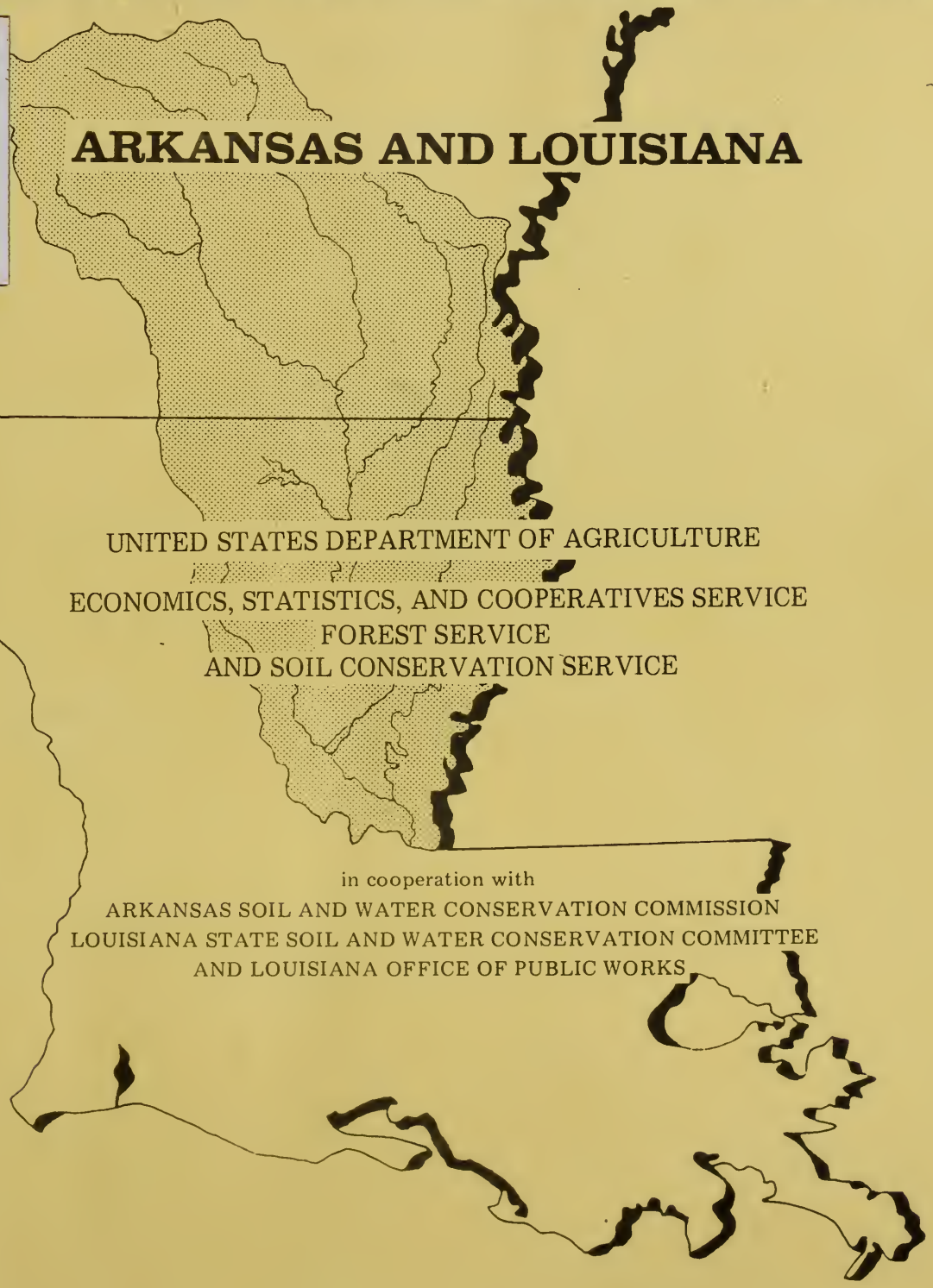
MAIN REPORT

OUACHITA RIVER BASIN STUDY

ARKANSAS AND LOUISIANA



UNITED STATES DEPARTMENT OF AGRICULTURE

ECONOMICS, STATISTICS, AND COOPERATIVES SERVICE
FOREST SERVICE
AND SOIL CONSERVATION SERVICE

in cooperation with
ARKANSAS SOIL AND WATER CONSERVATION COMMISSION
LOUISIANA STATE SOIL AND WATER CONSERVATION COMMITTEE
AND LOUISIANA OFFICE OF PUBLIC WORKS

MAIN REPORT

OUACHITA RIVER BASIN

Prepared by:

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Conservation Service

Economics, Statistics, and Cooperatives Service

Forest Service

Sponsored by:

Arkansas Soil and Water Conservation Commission

Louisiana State Soil and Water Conservation Committee

Louisiana Office of Public Works

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OUACHITA RIVER BASIN STUDY

Arkansas and Louisiana

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PURPOSE OF THE STUDY

The ever-increasing demands of society and an expanding population results in heavy competition for the use of land and water resources. Previous general river basin studies indicated this was creating a need for the conservation, orderly development and utilization of land and water resources in the Ouachita River Basin. Consequently the states of Arkansas and Louisiana jointly determined further, more detailed study was needed.

It was determined the study would consist of an appraisal of the adequacy of existing resources meeting current needs, the identification of problems and concerns, future trends, recommendations for solutions to land and water resource problems, and guidelines for future development of these resources.

AUTHORITY FOR THE STUDY AND SPONSORS

Authority for this study is contained in Section 6 of Public Law 566 as amended. Sponsors of the study are the Arkansas Soil and Water Conservation Commission; the Louisiana State Soil and Water Conservation Committee; and the Louisiana Department of Transportation and Development, Office of Public Works.

AGENCIES PARTICIPATING

Agencies conducting the study include the Soil Conservation Service, the Forest Service, and the Economics, Statistics, and Cooperatives Service all of which are part of the U. S. Department of Agriculture with the SCS being the lead agency. The sponsoring agencies provided coordination to accomplish the study in their respective states. Federal cooperating agencies included the U. S. Army Corps of Engineers; the U. S. Geological Survey; the Bureau of Mines; the Bureau of Outdoor Recreation; the Environmental Protection Agency; the U. S. Fish and Wildlife Service; the National Weather Service; the U. S. Public Health Service; and the Federal Power Commission.

PUBLIC PARTICIPATION

Public meetings were held in Louisiana and Arkansas to inform the public of the study and obtain their views on problems, concerns, and desires regarding land and water resources. In addition to those attending meetings, local officials and interested citizens were sent questionnaires to identify specific problems and concerns. Federal, state, and local agencies provided input into the study through work groups and other means. Near the end of the study the sponsors held a public meeting for the purpose of presenting alternatives developed during the study and obtain their views and desires on what should constitute a Basin plan from the alternatives presented.

EXPECTED USE OF THE STUDY

This study is intended to provide direction in future land and water resources development planning in the Ouachita River Basin by providing information on existing resources, resource limitations, future need and demands, and recommendations for alleviating problems, meeting needs, and the extent to which assistance can be provided under USDA programs. It would also indicate remaining needs and concerns that would require solutions under state and local programs.

DESCRIPTION OF STUDY AREA

The study area includes the entire Ouachita River Basin within the Lower Mississippi Water Resource Region and a portion of the Red River Basin in Rapides and Avoyelles Parishes. This covers about 25,900 square miles in the southern half of Arkansas and the northeast quadrant of Louisiana. The Ouachita River originates in the Ouachita Mountains of west central Arkansas and outlets into the Black River in central Louisiana, which in turn empties into the Red River in Avoyelles Parish in east central Louisiana. The drainage area consists of approximately 3,500 square miles of the Ouachita Mountains in Arkansas; 15,000 square miles of hilly uplands in Arkansas and Louisiana; and 7,400 square miles of flat, alluvial areas in Arkansas and Louisiana. See table E.1 for the Basin area by subbasins and the acreage of each.

PROBLEMS AND CONCERNS

Problems and concerns related to land and water resources within the Ouachita River Basin were identified by the study.

Approximately 25 percent of the Basin, or 4,158,000 acres, are subject to flooding and impaired drainage. This causes significant economic losses and damages to agriculture on 1,574,000 acres and to urban areas covering about 1000 acres. The remaining 2,583,000 acres are in forest land where it is not a tangible problem.

Of the 1,575,000 acres of problem area, 315,000 acres of cropland and pasture and 1000 acres of urban land are in the upland areas where only flooding is a problem. The remaining 1,259,000 acres are cropland and pasture in the flatland areas where flooding and impaired drainage are an inseparable problem.

Under existing conditions, losses and damages average $34,122,000 per year. This includes $29,186,000 of agricultural losses; $227,000[1/] of urban damages; $1,607,000 to roads, bridges, railroads and miscellaneous items; and $3,102,000 of indirect damages. It is estimated that total annual losses will increase to $58,127,000 by 1990 and to $82,714,000 by 2020.

[1/] This does not include damages to Monroe and West Monroe which is under study by the U.S. Army Corps of Engineers.

Table E.1 - Subbasins of the Study Area
Ouachita River Basin

Subbasin	State	Acreage
Little Missouri	Arkansas	1,332,200
Saline River	Arkansas	1,853,100
Ouachita River (Upper reaches)	Arkansas and Louisiana	4,486,200
Bayou Bartholomew	Arkansas and Louisiana	991,300
Boeuf River	Arkansas and Louisiana	1,568,500
Cornie Bayou	Arkansas and Louisiana	573,200
Bayou Macon	Arkansas and Louisiana	363,700
Boeuf River and Bayou Bartholomew	Louisiana	157,500
Boeuf River, Tensas River and Bayou Macon	Louisiana	196,000
Bayou Macon and Boeuf River	Louisiana	248,900
Bayou Macon and Tensas River	Louisiana	328,000
Tensas River	Louisiana	645,300
Bayou D'Arbonne	Louisiana	738,500
Dugdemona River	Louisiana	591,700
Castor Creek	Louisiana	599,100
Little River	Louisiana	677,000
Red River Tributaries	Louisiana	625,600
Bayou Cocodrie	Louisiana	379,200
Batture Land		221,000
TOTAL ACRES (Square Miles = 25,900)		16,576,000

Other problems and concerns include indicated increased needs of 114 mgd by 1990 and 273 mgd by 2020 for agricultural water supply. The existing need for an additional development of 345,000 acres of water surface for fishing, boating, and skiing is expected to increase about 20 percent by 1990.

Water quality problems exist in some areas of the Basin. Agricultural pollution is the most widespread. Pollution from this source consists of plant nutrients, pesticides, and suspended solids. Other pollutants affecting water quality include domestic, industrial, and oil or gas production.

The greatest existing recreation need is trails, followed by water-based recreation, hunting, camping, and picnicking.

The clearing of bottomland hardwoods continues but at a declining rate. Wetlands are still being converted to other uses. Increasing economic development continues to cause a decline in the quality and quantity of wildlife habitat. Many farm ponds in the Basin lack proper management for good fish production.

Increasing economic pressures for land use with higher economic returns are contributing to more species of flora and fauna becoming threatened species; causing losses of unique ecological communities worthy of preservation; and reducing open and green space around major cities.

There are a number of archaeological, geological, and historical sites worthy of recognition and preservation. These are not always sufficiently considered in private development circumstances.

Erosion and sedimentation are two major continuing problems. This causes a reduction in water quality and reduces the flow efficiency of drainage channels. It is estimated that 3,364,000 acres of agricultural land are subject to economically significant erosion under existing conditions. Sediment being deposited annually in drainage channels is estimated to amount to 11,804,000 tons per year.

RECOMMENDED PLAN

The recommended plan represents tradeoffs of measures from three alternative plans consisting of an emphasis on economic development, an emphasis on environmental quality and no action. It applies only to the Louisiana portion of the Basin. No measures were proposed for the Arkansas portion.

The planned measures consist of the following:

1. Three floodwater retarding structures in the upland areas.

2. Channel work on 1,320 miles of outlet channels in the flatland areas.

3. Land treatment measures in association with the channel work.

4. Land treatment measures to reduce erosion and sediment.

5. Increased utilization of 18,758,000 cubic feet of material after forest harvesting.

6. Restocking 1,518,000 acres of poorly stocked forested areas.

7. Recreation facilities including 69 boat ramps; 1,650 picnic tables; 7 swimming beaches with facilities; 3,540 camping sites for tenting, and recreational vehicles, and 200 group cabins.

8. Various trails totaling 187 miles.

9. Wildlife habitat management on 33,000 acres for improved hunting.

10. Retain 93,000 acres of upland type wildlife habitat through proper management.

11. Establish a management program to retain 26,000 acres of wetlands.

12. Mitigate the loss of 700 acres of wetlands and 800 acres of bottomland hardwoods as a result of channel work by creation of Greentree reservoirs and other comparable measures such as planting hardwood seedlings on spoil material.

13. Establish proper management on 170 farm ponds for improved fish habitat.

14. Recognize any areas of natural beauty or archaeological, geological, or historical sites that might be disturbed by the installation of project measures and follow existing procedures and regulations for the circumstance involved.

The estimated average annual cost of implementing this plan is $22,753,000 plus $467,000 for land treatment. Annual economic benefits would be approximately $33,672,000 from all planned elements to be installed except land treatment (see table E.1). Benefits from land treatment were not evaluated.

This plan includes an early-action USDA program consisting of seven proposed PL-566 projects and one Resource Conservation and Development Project in Louisiana. See figure II.1, Chapter II, and table III.2, Chapter III.

Table E.2 - Benefits and Costs of Recommended Plan
Ouachita River Basin

	(Dollars)
Average Annual Benefits	
Flood Prevention only	190,000
Inseparable flood prevention and improved drainage	17,810,000
Increased recreation	4,678,000
Sediment reduction	728,000
Improved forest production	10,021,000
Labor Resource Utilization	245,000
TOTAL	33,672,000
Average Annual Costs	
Project installation (Includes floodwater storage, channel work, recreation facilities, associated measures, land rights, project administration)	11,540,000
Operation, Maintenance, Replacement	6,953,000
Forest resource development	4,155,000
Fish and wildlife habitat development	105,000
TOTAL	22,753,000[a/]
Net Benefits	10,919,000

[a/] There are additional estimated average annual land treatment costs of $467,000 for improving land and water quality and on-farm ponds for agricultural water supply.

PLAN EFFECTS

The major effects of the recommended plan are the reduction of flooding and improvement of drainage on agricultural land. Present agricultural losses would be reduced about 75 percent in the eight watersheds proposed for early action under USDA programs in Louisiana.

For the Basin as a whole this reduction amounts to an estimated 30 percent. See table E.3.

Other effects include a 25 percent increase in the utilization of material remaining after wood harvesting, and restocking to pine about two-thirds of the areas needing to be restocked. Approximately 3 percent of the recreation needs would be met. Sediment deposition in channels would be reduced about 8 percent and the acreage of agricultural land having erosion rates greater than 5 tons per acre would be reduced about 8 percent. See table E.3 for amounts of effects.

OPPORTUNITIES FOR IMPLEMENTATION

It is anticipated that the measures included in the recommended plan will be installed by 1990. This will be dependent on available state and federal funds.

Opportunities for implementation of the plan include USDA programs for installing the eight early-action watershed projects. Seven of these would be under Public Law 566 (Small Watershed Program) and Public Law 46 (Conservation Operations), and one would be under Public Law 703 (Resource Conservation and Development). The forestry practices would be established under the cooperative Federal-State Private Forest Program of the U. S. Forest Service. The remaining measures in the recommended plan would be installed under programs of agencies of the state of Louisiana.

With USDA programs being limited in scope as are programs of other Federal agencies many of the needs remaining after the recommended plan would have to be met by local and state programs. This would require increased funding by state legislatures. An especially intensive amount of coordination would be required between state and local agencies, planning commissions, development districts, and federal agencies in accordance with public desires and wants.

OTHER ALTERNATIVES

The recommended plan is a mix of plan elements from the alternative emphasizing economic development and the alternative emphasizing environmental quality. These two alternatives form the outer framework of proposals resulting from any study of water and related land resources as required by Principles and Standards. A third alternative of no plan was also studied. See Chapter IV, ALTERNATIVES, for details and table IV.1 for a summary of plan elements for the economic development and environmental quality alternatives as well as the recommended plan.

Table E.3 - Effects of Recommended Plan
Ouachita River Basin

Concern	Unit	1970	1990				2020
				Remaining Needs:			
		Existing Needs	Future Without Plan	With Recommended Plan		Plan Effects [c]	Future Needs Without Plan [d]
Flooding and Impaired Drainage							
Urban Damage	Dollars[a]	250,000	412,000	238,000	-	174,000	522,000
Agricultural Damages and Losses	Dollars[a]	32,072,000	54,750,000	37,850,000	-	16,900,000	77,511,000
Other	Dollars[b]	1,800,000	2,965,000	2,039,000	-	926,000	4,681,000
Total	Dollars	34,122,000	58,127,000	40,127,000	-	18,000,000	82,714,000
Agricultural Problem Areas	Acres	1,574,000	1,827,000	1,259,000	-	568,000	1,939,000
Agricultural Water Supply	Mgd	0	114	80	+	34	273
Forest Resources							
Utilization	Mil.Cu.Ft.	62	75	56	+	19	101
Restocking	Acres	1,500,000	2,300,000	782,000	+	1,518,000	4,700,000
Increased Recreation	Visitor Days	43,000,000	55,000,000	53,441,000	+	1,559,000	56,000,000
Wildlife Habitat Management							
Upland Types (includes bottomland hardwoods)	Acres	10,077,000	9,087,000	8,993,000	+	94,000	8,237,000
Wetlands	Acres	1,473,000	1,385,000	1,358,000	+	27,000	1,272,000
Land and Water Quality							
Sediment Deposition							
Channels	Cu. Yds.	11,804,000	11,777,000	10,867,000	-	910,000	10,705,000
Overland	Acres	342,000	342,000	342,000		0	342,000
Erosion							
Agricultural Land	Acres	3,364,000	2,643,000	2,187,000	-	456,000	1,932,000
Forest Land	Acres	0	439,000	373,000	-	66,000	742,000

[a] Includes indirect damages.

[b] Includes roads, bridges, farm lanes etc. plus indirect damages.

[c] Minus indicates a decrease; plus indicates an increase.

[d] 2020 was too distant in the future to be specific about any long-range projects and effects.

CONCLUSIONS

It can be concluded from the study that existing ongoing programs for the conservation of soil and water resources will have difficulty keeping abreast of maintaining and conserving the resource base of land and water with the current rate of development. Agricultural losses from flooding and impaired drainage are projected to increase at an increasing rate. A declining acreage of various biological components needing management indicates increasing recognition of the value of wildlife habitat. Indications are that sediment and erosion can be held to only a moderate level with existing ongoing programs. Recreation demands in particular are increasing at a rate far surpassing the amount of recreation facilities being supplied or which can be supplied.

It can further be concluded that existing problems and concerns in general will remain at status quo or worsen in the future unless accelerated efforts are made to overcome them. The plan developed from this study would be a step in this direction.

PREFACE

The Ouachita River Basin Study is authorized under Section 6 of Public Law 566, as amended. Planning guidelines for the study were based on the principles and standards developed by the Water Resources Council and published in the Federal Register on September 10, 1973. Agencies within the USDA which participated in the study include the Soil Conservation Service (SCS), Forest Service (FS), and the Economics, Statistics, and Cooperatives Service (ESCS). These agencies conducted the study under the supervision of a Field Advisory Committee (FAC) as provided in an Interagency Memorandum of Understanding dated May 6, 1968.

Continuing economic activity is placing pressure on the development of water and land resources in the Ouachita River Basin. Currently, many projects are being constructed by Federal, State, and private sources. Two low-intensity studies -- the Arkansas-White-Red and the Lower Mississippi Region Comprehensive Study -- conducted earlier, pointed out on a broad basis the need for conservation, development, and utilization of land and water resources in the area.

The next step in gathering data and developing a detailed plan to guide water and related land resource development was the development of the Ouachita River Basin Study. Specifically, the intention of this study is to identify, describe, and appraise potential problems and their possible solutions through programs under the USDA and agencies of the states of Louisiana and Arkansas.

The Soil Conservation Service had overall responsibility for the Study. Basically, this responsibility includes the gathering, analysis, review, and preparation of data concerning water related problems and the coordination of other agency input into a final report.

The U. S. Forest Service had the responsibility of providing data, inventories, recommendations, analyses, and projections pertaining to forest resources especially as they relate to current and future demands for their products and uses.

The Economics, Statistics, and Cooperatives Service, formerly the Economic Research Service, had the responsibility for analyzing the economic base of the study area and appraising the broad economic impacts of plans and and alternatives.

Sponsoring and cooperating agencies involved in the study were responsible for representation of local, State, and Federal concerns and ideas. The Arkansas Soil and Water Conservation Commission, the Louisiana Department of Transportation and Development - Office of Public Works, and the Louisiana State Soil and Water Conservation Committee were sponsors in this study. These agencies provided the coordination to accomplish the study in their respective states.

Federal cooperating agencies included the U. S. Army Corps of Engineers; the U. S. Geological Survey; the Bureau of Mines; the

Bureau of Outdoor Recreation; the Environmental Protection Agency; the U. S. Fish and Wildlife Service; the National Weather Service; the Public Health Service; and the Federal Power Commission.

State agencies cooperating in the study include the Louisiana Department of Wildlife and Fisheries, the Louisiana Department of Culture, Recreation, and Tourism, and the Louisiana State Planning Office.

Locally, the soil and water conservation districts; police jurors (in Louisiana); county judges of the quorum court (in Arkansas); members of regional, municipal, or local planning commissions; rural development committees; local environmental interest groups; and leaders in community and rural affairs provided valuable input in meeting study objectives through individual contact and active participation in public meetings.

This report contains a summary of existing and projected land and water resource problems and needs; alternatives for solving them; the extent to which they can be solved; planned project measures; and the extent to which these measures can be implemented.

Detailed information consisting of inventory data developed from the Study is contained in seven special reports that have been prepared. These reports are: (1) Land Use, Treatment, and Management; (2) Flood Prevention and Drainage; (3) Water Resources; (4) Recreation; (5) Fish and Wildlife; (6) Economic Conditions; and (7) Environmental Quality. They are available from the Soil Conservation Service.

CHAPTER I

PROBLEMS AND CONCERNS

INTRODUCTION

The USDA river basin planning staffs in Arkansas and Louisiana began an inventory of land and water resources when public meetings were held in Monroe, Louisiana; Camden, Arkansas; and Arkadelphia, Arkansas, to inform the public of the general conduct of the study and to solicit input regarding problems, desires, and concerns. The sponsors mailed questionnaires to many interested groups and individuals. Also, these questionnaires were presented to all who attended the public meetings. Completed questionnaires were returned to the sponsors and subsequently evaluated by the planning staffs. Ten study concerns were identified: (1) land use treatment and management; (2) flood water damages; (3) drainage; (4) irrigation; (5) water supply, use, and management; (6) environmental quality; (7) economic condition; (8) recreation; (9) fish and wildlife; and (10) erosion and sediment.

Problems and needs were determined for 1970 and projected to 1990 and 2020. The existing needs shown in this report were considered to be total existing needs less those to be met by PL-566 projects approved for installation or under construction and ongoing land treatment programs.

SUMMARY OF STUDY CONCERNS

The ten study concerns were evaluated, refined, and consolidated into eight concerns. Net needs for these eight concerns were developed for the time frames 1970, 1990, and 2020. See Table I.1. Net needs for 1990 and 2020 were based on the best information available for estimating future conditions.

Table I.1 - Summary of Net Needs By Concerns for 1970, 1990, and 2020. Ouachita River Basin Study, Louisiana

Concern	Units	Quantity 1970	1990	2020
1. Flooding & Impaired Drainage				
a. Flooding only				
Agriculture (crop & pasture)	(1000 ac.)	315	315	315
	($1000 dollars)[a/]	4,854	6,768	9,129
Urban (damages)	($1000 dollars)[a/]	227	375	475
(homes & business)	(no.)	206	218	218

Continued -

Table I.1 - Continued -

Concern	Units	Quantity 1970	1990	2020
b. Inseparable flooding & impaired drainage				
Agriculture (crop & pasture)	(1000 ac.)	1,259	1,512	1,624
	($1000 dollars)[a/]	24,332	43,005	61,334
Other damage	($1000 dollars)[a/]	1,607	2,695	4,256
c. Indirect damage	($1000 dollars)[a/]	3,102	5,284	7,520
Total	($1000 dollars)[a/]	34,122	58,127	82,714
2. Water Supply & Storage				
a. Agricultural				
Rice irrigation	MGD	0	67	160
Supplemental irrigation	MGD	0	1	2
Subtotal irrigation	MGD	0	68	162
Fish farming	MGD	0	31	75
Rural domestic	MGD	0	10	26
Livestock & poultry	MGD	0	5	10
Total	MGD	0	114	273
b. Public water supply	MGD	0	24	86
c. Recreation	(1000 surface acres)	345	418	418
3. Forest Resources				
a. Increased volume of forest products	(million cu.ft.)	62	75	101
b. Regeneration	(1000 ac.)	1,500	2,300	4,700
4. Recreation				
a. Demand	(1000 visitor-days)	43,000	55,000	56,000

Continued -

[a/] Increases in dollar values do not include allowances for economic inflation.

Table I.1 - Continued -

Concern	Units	Quantity 1970	1990	2020
b. Facilities				
Fishing, boating, skiing	(1000 sur. ac.)	345	418	418
Swimming (beach)	(1000 sq. ft.)	3,670	4,110	4,110
Camping	(1000 sites)	16	19	19
Picnicking	(1000 tables)	10	10	12
Trails	(1000 mi.)	13	13	13
Hunting	(1000 ac.)	157	2,140	2,766
5. Biological Resources & Ecosystems				
a. Hardwoods				
Upland stream bottoms (La. only)				
Establishment	acres	0	700	1,040
Management	(1000 ac.)	369	331	256
Bottomlands				
Establishment	(1000 ac.)	0	411	581
Management	(1000 ac.)	2,188	1,454	805
b. Wetlands				
Establishment	(1000 ac.)	0	491	663
Management	(1000 ac.)	1,473	894	609
c. Wildlife upland habitat mgt.	(1000 ac.)	7,520	6,191	5,555
d. Fish habitat (farm pond mgt.)	no.	8,270	6,310	6,000
e. Threatened & endangered species	no.	10	b/	b/
f. Unique ecological communities	no.	12	12	12

Continued -

b/ Projections of species that may become endangered or threatened were not made due to the unpredictability of future conditions under which this may occur.

Table I.1 - Continued -

Concern	Units	Quantity 1970	1990	2020
6. Areas of Natural Beauty				
a. Wilderness areas	(1000 ac.)	0	20	20
b. Open and green space	(1000 ac.)	2	4	6
c. Scenic streams	no.	15	15	15
d. Botanical systems	no.	6	6	6
7. Cultural Resources				
a. Archaeological sites	no.	1,045	1,045	1,045
b. Historical sites	no.	535	c/	c/
c. Geological sites	no.	10	10	10
8. Land and Water Quality				
a. Erosion				
Agricultural land (cropland and pastureland)	(1000 ac.)	3,364	2,643	1,932
Forest land	(1000 ac.)	0	439	700
Stripmines	acres	7,700	8,000	8,500
Roadsides and streambanks	miles	6,800	6,800	6,800
Gullies	miles	120	120	120
b. Sediment Deposition Channels	(1000 cu. yds.)	11,804	11,777	10,705
	(Annual cost of removal $1000 dollars)	9,443	9,422	8,564
Overland	acres	342,000	342,000	342,000
c. Pollution (fish & wildlife) Streams (agri.) d/				
Severe	miles	3,155	3,225	3,280
	acres	15,100	15,500	15,800
Moderate	miles	1,765	1,800	1,840
	acres	11,100	11,600	12,100

c/ Future sites to be included in historical registers were not predicted.

d/ Values for streams are for Louisiana only.

Table I.1 - Continued -

Concern	Units	Quantity 1970	1990	2020
Lakes	no.	462	e/	e/
	acres	121,000	e/	e/
Ponds	no.	2,485	e/	e/
	acres	1,570	e/	e/

e/ Projections not made because the number of lakes and ponds adversely affected by pollution and benefited by ongoing programs could not be reliably predicted.

FLOODING AND IMPAIRED DRAINAGE

An estimated 4,158,000 acres, or about 25 percent, of the Basin are subject to flooding and impaired drainage which causes damages on about 1,574,000 acres of cropland and pasture or 38 percent of this acreage and an estimated additional 1000 acres of urban land. The remaining 2,583,000 acres include 2,454,000 acres of forest land and 129,000 acres of other land where no tangible damages occur. The land use and area of significantly damaged land is as follows:

Land Use of Significantly Damaged Areas

Cropland	1,174,000 acres
Pastureland a/	400,000 acres
Urban land a/	1,000 acres
Total	1,575,000 acres

a/ Does not include Monroe and West Monroe. This area is included in a separate study by the U.S. Army Corps of Engineers.

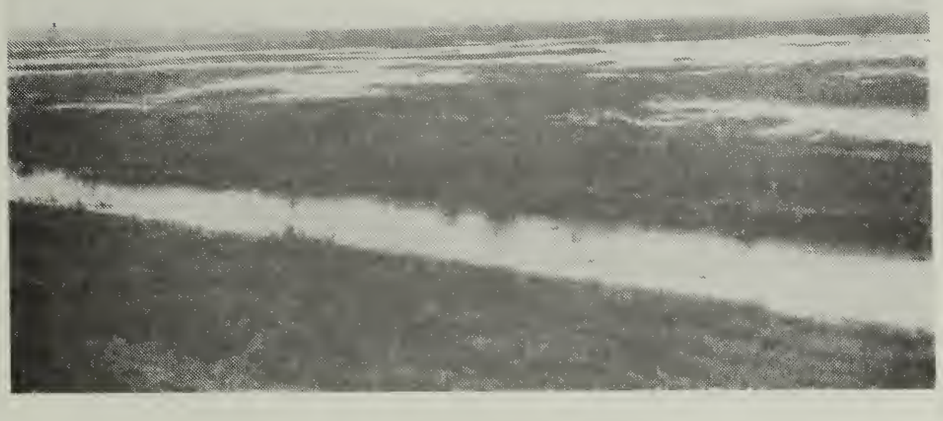
About 20 percent or 315,000 acres of the 1,574,000 acres of cropland and pasture damaged, and the 1000 acres of urban land are located in the upland areas of the Basin where flooding is the only problem. The remaining 1,259,000 acres are cropland and pasture in the flatland areas of the Basin where flooding and impaired drainage are an inseparable problem.

Existing losses and damages average $34,122,000 per year in 1978 dollars. This includes $29,186,000 of damages and losses to agriculture; $227,000 of urban damages; $1,607,000 to roads, bridges, railroads, and other items; and $3,102,000 of indirect damages.

Projections indicate that damages and losses will increase in terms of 1978 dollar values from $34,122,000 in 1970 to $58,127,000 by 1990, and to $82,714,000 by 2020. This is based on 1,575,000 acres of problem areas in 1970; 1,828,000 acres in 1990; and 1,940,000 acres in 2020.

Flooding and impaired drainage on flatland areas is an inseparable problem that restricts land use and causes losses in agricultural production.

Urban flooding is costly and can occur with little or no warning.



Uneven surfaces on flatland areas impair drainage and cause losses in production.

Floods often cause considerable damage to roads and bridges.

In 1970, agricultural losses from flooding and impaired drainage averaged $20 per acre per year and are projected to be $30 by 1990 and $40 by 2020 in terms of 1978 dollar values.

WATER SUPPLY AND STORAGE

Agricultural

Agricultural water use projections show a net increase over 1970 water use of 114 mgd by 1990 and 273 mgd by 2020, an increase of 22 percent and 53 percent respectively. Water supplies in 1970 appeared to be adequate for the demand.

The 1990 net needs for agricultural water are as follows: in Arkansas 53 mgd for rice irrigation and 0.8 mgd for supplemental irrigation; 24 mgd for fish farming; 6 mgd for rural domestic; and 3 mgd for livestock and poultry. In Louisiana, 14 mgd for rice irrigation and .2 mgd for supplemental irrigation; 7 mgd for fish farming; 4 mgd for rural domestic; and 2 mgd for livestock and poultry.

Public Water Supply

Public water supply use projections show a net increase over 1970 use of 24 mgd by 1990 and 86 mgd by 2020, an increase of 39 percent and 138 percent respectively. The 1990 net needs are 11 mgd for Arkansas and 13 mgd for Louisiana.

Recreation Needs

The 1970 surface area needs for fishing, boating, and skiing are 345,000 acres. A large part of these needs could be fulfilled by installing boat ramps which would make existing water bodies accessible. By 1990, these needs would increase to about 418,000 acres and remain at that level to 2020.

FOREST RESOURCES

The demand for wood products has caused prices for these products to increase at a faster rate than the prices of most other products. For example, from 1967 to 1977 the index of prices received by farmers increased from 100 to 183 while the average of indexes for 5 main wood products increased from 100 to 243.

This rate of increase, while more than for other commodities, is not the amount it might be. The substitution of competing materials for wood in building, packaging, and energy has held wood product prices to moderate levels. Many of these substitutes however, are produced from minerals which unlike wood are nonrenewable.

Projections indicate that the demand for wood products will exceed the supply before 1990. Two factors contribute to this problem. First, much of the timber which is cut, is left as waste material. If the same percentage of the harvest is left unused in 1990 as at present, the waste will equal 75 million cubic feet. By 2020, this figure will reach 101 million cubic feet.

The second factor is related to the South's tremendous potential for growing timber. Since the forests of the South often give the appearance of reproducing themselves naturally after wood is cut, landowners often neglect their forest land. It has been estimated that on at least half of the harvested pine acreage, mixed stands of poor quality hardwoods displace the pines. At predicted harvesting rates, the number of acres lost to pine production will be 2.3 million by 1990, and 4.7 million by 2020.

In addition, present trends indicate the demand for wood products will increase, while the number of acres in forest land declines. In the Louisiana portion of the Basin, it is predicted that these trends will result in more wood being cut than is grown by 1990. This will deplete the forest growing stock and eventually reduce the future available supply of timber.

Between 1970 and 1990, it is estimated that 335 million more cubic feet will be cut than is grown, which is equivalent to the volume of growing stock om 249,000 acres of normally stocked forest land.

RECREATION

Currently there is a demand for recreation in the Basin that far exceeds the supply. The present existing shortage amounts to an unmet need of approximately 43,000,000 visitations to recreation areas. By 1990 this is projected to reach 55,000,000 and by 2020 it is projected to increase another 1,000,000 to 56,000,000.

The largest shortage is trails which comprise 62 percent of the needs. Fishing, boating and water skiing are next with 12 percent. Hunting ranks third with a 9 percent shortage. Camping and picnicking each represent 6 percent of the shortage and the smallest shortage is swimming with 5 percent of the distribution.

BIOLOGICAL RESOURCES AND ECOSYSTEMS

Hardwoods

Upland Stream Bottoms (Evaluated only in Louisiana)

In the last 20 years clearing for agriculture use has resulted in reduction of the quality and quantity of suitable habitat for both game and nongame animals which in turn has reduced hunting opportunities. Reductions in downstream water quality and fisheries have also resulted from increases in turbidity associated with the clearing of these hardwood areas. Because of the high value of these areas for wildlife and the low value of most surrounding areas for wildlife, there will be an increasing need to plant upland areas to suitable hardwood species. All existing upland stream bottom hardwoods need to be maintained and managed properly to prevent declines in water quality and fish and wildlife populations.

Areas for public hunting are decreasing while demands are increasing.

Much of the material remaining after timber harvest is left as waste material.

Bottomland Hardwoods

The clearing of tracts of bottomland hardwoods and subsequent conversion to cropland has vastly altered the appearance of much of the Basin's alluvial lands. The conversion has resulted in a decline in water quality of bottomland streams and lakes. Populations of wildlife and game fish species have been reduced by the associated decline in habitat quality.

The conversion of bottomland hardwoods to cropland is expected to continue but at a declining rate. Because of the clearing of bottomland hardwoods to date and the predicted future clearing, a need to plant additional acreages of hardwoods in suitable bottomland sites will exist in 1990 and 2020. The acreage of bottomland hardwoods needing management is projected to decrease due to adequate treatment of private and public areas with ongoing programs and the loss of acreage from clearing.

Wetlands

The rapid expansion of soybean farming since 1960 has resulted in the clearing and drainage of a substantial acreage of wetlands. These areas once served as valuable wildlife habitat for many game and nongame species. The loss of wetlands has also played a role in the lowering of water quality in bottomland areas. By 1990, it is estimated an additional 491,000 acres will be converted to residential, commercial, and agricultural uses. Eventually, most wetlands remaining on private lands will be at such low elevations they will not be economically feasible to drain for agricultural purposes.

Wildlife Upland Habitat Management

Increasing numbers of residental, industrial, and agricultural developments have resulted in declines of quality and quantity of wildlife habitat. In order to preserve existing levels of game and nongame wildlife species more intensive habitat management must be practiced. In 1990 over six million acres of land which need to be maintained or improved for wildlife are expected to remain untreated.

Fish Habitat (Farm pond management)

Many farm ponds in the Basin are lacking proper management for fisheries habitat. Excessive turbidity, incorrect pH, excessive aquatic growth, contamination by polluted water, out-of-balance fish populations and improper or lack of fertilization are among the management problems adversely affecting fishery production. Beginning in 1970 there was a need to manage 8,270 ponds. Although this number is expected to decrease by 2020 due to land treatment programs, a considerable number of ponds will still require management.

Threatened and Endangered Species

In 1970 ten animal species which have been known to occur in or pass through the Basin were classified as endangered by the U.S. Department of the Interior. The outlook for survival of several of these species is uncertain.

According to past trends, increasing development and the subsequent reduction in suitable habitat coupled with an overall decline in habitat quality will be responsible for an increasing number of species to be placed on the endangered list. Recent research indicates a number of plant species may be placed on the endangered list in the near future.

Unless the special habitat requirements of certain species are recognized, many more species will become threatened or endangered as a result of man's alterations to their environment.

Unique Ecological Communities [a/]

The Basin contains a number of unique ecological communities worthy of preservation. The failure to identify and protect such areas, to date, has resulted in the destruction or irreversible commitment to other uses of a number of these areas.

By 1990 there will be a need to protect 12 of these areas and this need is expected to remain constant through 2020. The general public is involved in determining the fate of these areas through their usage and support for protection.

AREAS OF NATURAL BEAUTY

Wilderness Areas

The vast amount of land clearing and conversion of mixed forest to pure pine stands in recent years has greatly reduced the undisturbed forest acreage in the Basin. This has had a severe effect on the quantity and quality of natural areas. Increased posting of private lands to protect it from public abuse will also reduce undisturbed areas open to the public. Until the early and mid-1970's there was little public demand and consequently little action to protect any suitable wilderness areas. Because of this the need for protection of wilderness areas is projected to rise from zero acres in 1970 to five areas of 20,000 acres in 1990 and 2020.

Open and Green Space

The lack of suitable planning and funding for the preservation of open and green space in the past has led to a deficit in land needed for this purpose. This problem has led to a reduction in opportunities for the enjoyment of open space and park-like areas within urban centers of population. In 1970 there was a need for 2,000 additional acres of open and green space within urban areas of the Basin. In 1990 and 2020 there will be an additional need for 4,000 and 6,000 acres respectively.

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a/ An ecological community is a natural area such as a watershed, swamp, etc., that functions as a unit. An example is Catahoula Lake in LaSalle Parish in Louisiana which is also considered to be unique.

Scenic Streams

In the Louisiana portion of the Basin eleven streams have been protected to date under the Louisiana Natural and Scenic Streams System. None have been deemed as eligible for protection as yet under the National Wild and Scenic Rivers Act. In Arkansas, there is presently no state scenic stream program. According to the study, approximately 15 additional streams in the Basin need protection. In the past the most desirable waterways have been overused. Other waterways that were scenic were not used extensively due to pollution.

Unique Botanical Systems [b/]

The conversion of forestland to cropland, mixed forests to pure pine and unimproved, mixed grass pastures to single species of improved pastures has reduced the number of areas of unaltered flora in the Basin. The drainage and conversion to other uses of wetland areas has also been responsible for the depletion of unaltered flora. If these trends continue the elimination of more plant species is a possibility.

A need to preserve six areas of unique flora with a total of 2,400 acres existed in 1970. This need is expected to continue through 1990 and 2020.

CULTURAL RESOURCES

Archaeological

Although numerous archaeological sites are listed, and are cataloged in the "Archaeological Assessment of the Ouachita River Basin," other sites exist which have not been discovered. Many of the sites listed have not been adequately investigated or have been lost or partially lost due to cultural activity or natural erosion and sedimentation.

The present problems are the result of a lack of systematic investigation in the past, a lack of means of preserving sites, and a lack of personnel to evaluate the sites or information collected. Lush vegetation makes discovery of all but the most obvious sites difficult.

Historical

Historical sites in both the Louisiana and Arkansas portions of the Basin have been identified but only a small percentage have been nominated for inclusion in the National Register of Historic Places. Most of these are in Arkansas. Many more sites could be recognized particularly in Louisiana. This is because the program for recognizing and preserving historical sites has not been adequately funded.

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b/ A botanical system is a component of an ecological system. An example of a unique botanical system is Seven Devils' Swamp in Drew County, Arkansas.

Geological

Some of the geological sites are unique. One of these sites, a diamond producing volcanic pipe, has been preserved as an Arkansas State Park. Other types of geological sites that are of special interest to the geological community are on private property and are subject to cultural development or destruction at the owner's whim.

LAND AND WATER QUALITY

Erosion

Sheet and rill erosion was extensive and severe enough to be a problem on about 3,364,000 acres of cropland and pastureland in 1970. Ongoing conservation programs are expected to reduce this to about 2,643,000 acres in 1990 and 1,932,000 acres in 2020. In addition, erosion from roadsides, streambanks, strip mines, and forest land is occurring. Most damages from these sources occur locally. About 120 miles of gully erosion has been identified.

Basinwide, present erosion was calculated to be in excess of 37 million tons per year. This is in excess of two tons per acre per year. The maximum allowable soil loss in the Basin is five tons per acre per year.

Cropland and pastureland is considered to be adequately protected with conservation practices when soil loss is within the range of two to five tons per acre. On this basis most pastureland is adequately protected. However, in 1970 there were about 2,166,000 acres of cropland with erosion rates exceeding this annual rate.

Erosion on forest land is not normally a problem. However, improper preparation of harvest sites and poorly constructed and maintained logging roads cause locally severe erosion problems. By 1990 erosion control will be needed on 439,000 acres including 22,300 acres of site preparation improvement and better road construction and maintenance.

Sediment

Sediment deposition in channels and reservoirs lowers water quality for all purposes. Sediment deposition in channels amounted to an estimated 11,804,000 cubic yards in 1970. Projections to 1990 and 2020 indicate that channel deposition will decrease to about 11,777,000 cubic yards and 10,705,000 cubic yards, respectively.

It is estimated that the amount of sediment deposited in 1970 would have cost $9,443,000 to remove. By 1990 this cost would decrease to $9,422,000 and would further decrease to $8,564,000 by 2020. This decline is due to ongoing programs.

Sediment deposition by overbank flooding is related to the frequency and duration of flooding. The longer an area is inundated, the larger the amounts of sediment deposited. In 1970, about 342,000 acres were affected by overland deposition. Projections indicate that the acres affected will remain about the same for 1990 and 2020.

Erosion problems occur on forest land when logging roads are not properly maintained.

Erosion occurring from improper land management produces sediment that clogs outlet channels and drainage ditches.

Pollution

Intensive agriculture without proper regard for protection of the soil resources from erosion along with the sharp increase in the use of pesticides have contributed to the pollution of many water bodies within the Basin. This problem has become most acute in bottomland areas. Excessive levels of turbidity, nutrients, and agricultural chemicals have the most pronounced effects of pollution on water bodies in the Basin. Additional pollution type problems include domestic, oil or gas, acid mine drainage and industrial. These problems are most acute near urban areas and in localized oil and natural gas producing areas.

A need exists to reduce existing water pollution within the Basin in order to adequately protect existing fisheries and wildlife population and allow for expansion of additional high quality habitat.

CHAPTER II

RECOMMENDED PLAN

INTRODUCTION

The sponsors chose a plan containing a mix of plan elements from the alternative emphasizing national economic development and the alternative emphasizing the quality of the natural environment.

This selection was based on inputs obtained at a public meeting as well as consultation with the sponsoring and other interested agencies. The purpose of the meeting was to provide the general public an opportunity to express their preferences for various plan elements contained in both alternatives. From this information, differences in the plan elements between the two alternatives could be traded off or compromised to arrive at a selected element and the amount of that element.

The meeting was held at Monroe, Louisiana on November 16, 1978. Existing Basin problems and needs as revealed by the study were presented. The extent of these problems in 1990 and 2020 were also indicated.

Two alternatives to meet these problems and needs were also presented. One alternative emphasized national economic development and the other emphasized environmental quality. Included in this discussion were the plan elements contained in each alternative.

There were no dissenting views toward either alternative presented. From the results of this meeting, the sponsors made tradeoffs where differences existed between the two alternatives either in the elements planned or in the amounts of an element. This resulted in a mixed objective plan having general acceptance.

PLAN ELEMENTS INCLUDED IN THE RECOMMENDED PLAN

Floodwater Damage Reduction And Improved Drainage

Construct three floodwater storage reservoirs for urban and agricultural flood protection.

Perform channel work on 1,320 miles of channels to provide adequate outlets for on-farm drainage systems.

Install on-farm land treatment measures in association with channel work to provide improved drainage on agricultural land, reduce sedimentation, and improve water quality.

Water Supply And Management

Construct 160 farm ponds to increase the surface water supply for livestock and poultry.

Construct 380 ponds to provide additional water supply for expanding fish farming.

Excess runoff can be stored in reservoirs to prevent the occurrence of flood damages downstream.

Channel work provides adequate outlets for on-farm drainage systems.

Landgrading is a way of improving on-farm drainage.

On-farm ditches are constructed to drain off excess water and convey it to outlet channels.

Forest Resources

Increase by 25 percent the utilization rate of 18,758,000 cubic feet of material that would otherwise be left as waste from forest harvesting in order to help meet the predicted demands for wood products.

Restock 1,518,000 acres of poorly stocked forested stands with selected desirable species to improve the quality and quantity of future timber production on forest land.

Recreation [a/]

Install 69 boat ramps with associated facilities to provide access to 14,000 surface acres of water in various locations in Louisiana for fishing, boating and water skiing. Associated facilities include sanitation and parking.

Install 1,650 picnic tables and associated facilities which include sanitation, cooking grills, parking and roads.

Install a total of 1,610,000 square feet of swimming beach and associated facilities in various locations. Associated facilities include bathhouses, sanitary facilities, sunbathing areas, parking and roads.

Install 3,540 camping sites of which approximately one-third are for tent camping and two-thirds are for recreational vehicle camping. In addition, 200 cabins for group camping would be constructed.

Install a total of 187 miles of trails consisting of 146 miles for hiking, 21 miles for bicycling, and 20 miles for horseback riding.

Improve 33,000 acres of wildlife habitat for the purpose of enhancing hunting for recreation.

Biological Resources And Ecosystems

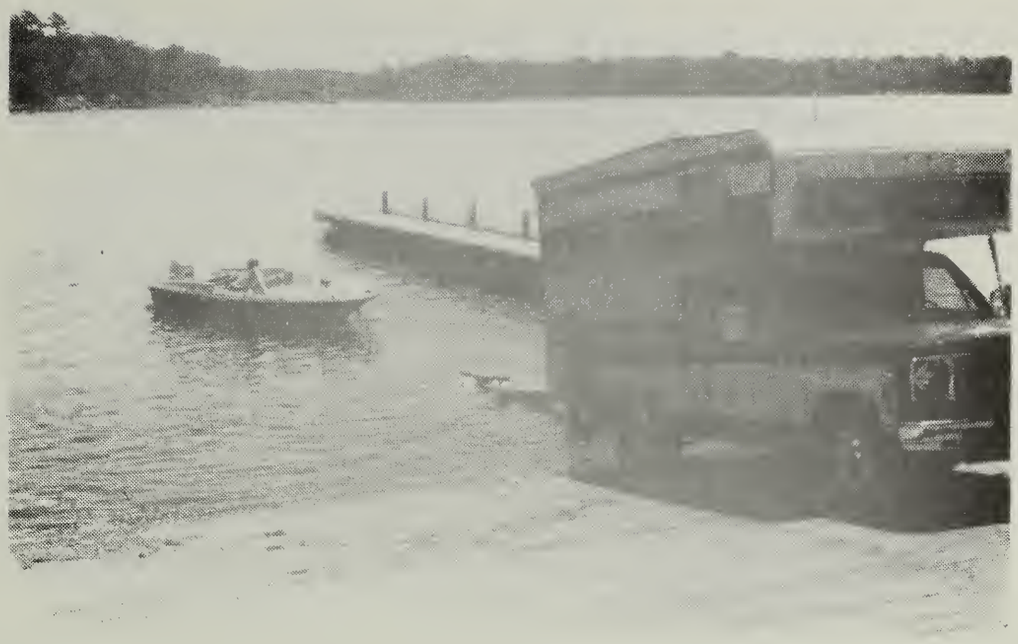
Through proper management, retain 93,000 acres of upland type wildlife habitat. This would include 84,000 acres of bottomland hardwoods.

Establish a management program to retain 26,000 acres of wetlands.

Create 700 acres of wetlands and 800 acres of bottomland hardwoods as mitigation for wetlands and bottomland hardwoods disturbed by channel work.

Establish proper management on 170 farm ponds to improve fish habitat.

[a/] Standards for recreation based on standards established by SCORP.



Boat ramps provide access to lakes and ponds for all types of water activities.

Campsites increase the accessibility of the outdoors to many people.

Swimming areas with beaches and associated facilities are a main attraction for recreational activity.

Improved wildlife habitat enhances hunting for recreation.

Recognize and provide support for the protection of ten threatened or endangered species of flora or fauna that may be affected by project measures.

Give consideration to any one of the 12 identified unique ecological communities in the event one or more of them would be affected by the installation of project measures.

Areas of Natural Beauty

Recognize and support identification of 15 scenic streams, six unique botanical systems, 4,000 acres of open and green space around cities and towns, and 20,000 acres of wilderness areas, and when affected by installation of project measures, follow existing regulations regarding protection.

Cultural Resources

In the event any of the 1,590 archaeological, historical, or geological sites are to be affected by the installation of project measures, the archaeologists at Louisiana State University, the Heritage, Conservation, and Recreation Service (HCRS), the Curator of Anthropology, and the Historical Preservation Officer will be notified and given an opportunity to evaluate and make recommendations for salvage or mitigation before construction continues.

The Advisory Council on Historic Preservation will be afforded an opportunity to comment if such sites are determined to be eligible for inclusion in the National Register of Historic Places in accordance with the "Procedures for the Protection of Historic and Cultural Properties."

Land And Water Quality

Install land treatment measures on 456,000 acres of agricultural land to reduce erosion and improve the quality of land and water. These measures include conservation cropping systems, crop residue management, chiseling and subsoiling, drainage land grading, land smoothing, surface drainage, and structures for water control (pipe drops). On pastureland, measures include pasture and hayland planting, pasture and hayland management, and drainage as needed.

Improve site preparation and spur road construction and maintenance on 66,000 acres of forest land to reduce erosion and sediment yields.

Visual resources will be considered in the installation of all plan elements and techniques will be employed to minimize any impacts on these resources.

PLAN EFFECTS

The recommended plan will reduce damages and losses from flooding and impaired drainage an estimated 53 percent or $18,000,000 in the Louisiana portion of the Basin where the planned measures would be

System of Accounts - Display of Beneficial and Adverse Effects
Recommended Plan

COMPONENTS	MEASURES OF EFFECTS [a] (Dollars)
Economic Development Account	
Beneficial effects:	
A. Flood Prevention and Improved Drainage	
1. Flood prevention only	190,000
2. Inseparable flood prevention and improved drainage	17,810,000
B. Sediment reduction	728,000
C. Improved forest production	10,021,000
D. Increased recreation	4,678,000
E. Labor resource utilization	245,000
Total Beneficial Effects	33,672,000
The value of resources required for the plan	
Adverse effects:	
A. Project installation (includes floodwater storage, channel work, recreation facilities, associated measures, land rights, project administration)	11,540,000
B. Operation, Maintenance, Replacement	6,953,000
C. Forest Resource Development	4,155,000
D. Fish and Wildife Habitat Development	105,000
Total Adverse Effects [b]	22,753,000
Net Beneficial Effects	10,919,000

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[a] Average annual

[b] There are additional estimated average annual land treatment costs of $467,000 for improving land and water quality and onfarm ponds for agricultural water supply.

Systems of Accounts - Continued

Environmental Quality Account

Beneficial and Adverse Effects:

Biological Resources and Ecosystems

1. Maintain or improve 93,000 acres of upland wildlife habitat.

2. Plant 800 acres of bottomland to hardwood.

3. Create 700 acres of man-made wetlands.

4. Maintain or manage 26,000 acres of existing wetlands benefiting various waterfowl and wildlife species.

5. Disrupt 1,320 miles of channel fisheries and riparian habitat due to channel construction.

6. Improve water quality by installation of land treatment on 456,000 acres of agricultural land and 66,000 acres of forest land.

Areas of Natural Beauty

1. Retain 119,000 acres of upland and wetland wildlife habitat.

2. Support identification of scenic streams and unique botanical systems.

3. Disrupt visual quality to 1,320 miles of channel construction.

Cultural Resources

1. Provide protection to any of the 1,590 archaeological, historical, or geological sites if encountered during project installation. Any additional resources discovered during installation will be identified and protected as mandated by law.

Land and Water Quality

1. Reduce erosion on 522,000 acres of agricultural and forest land.

2. Improve water quality by reduced turbidity associated with erosion reduction.

3. Short-term decrease in water quality due to installation of onfarm channels.

System of Accounts - Continued

Social Well-Being Account

COMPONENTS	MEASURES OF BENEFICIAL AND ADVERSE EFFECTS
Beneficial and Adverse Effects:	
A. Real Income Distribution	1. PL-566 projects under USDA programs would create an estimated 200 low- to medium-income jobs for Basin residents in Louisiana.
	2. Information for displaying benefits and costs by income class was not available for this general study.
B. Life, Health, Safety	1. Outputs of livestock, grain, and fiber products will be increased.
	2. A one-percent level of protection will be provided in the Port DeLuce and Caney Creek Watersheds.
	3. The length of time excess water remains on benefited flat land areas will be reduced.
	4. Land treatment will improve land and water quality.
C. Recreational Opportunities	1. An estimated additional 1,559,000 visitor days of recreational activities will be provided by the recommended plan.

implemented. This amounts to a 30 percent reduction for the Basin as a whole. See table II.1. In some cases further reductions would require measures beyond the scope of programs included in this study. In other cases further reductions would be unsound economically.

By providing flood control and drainage, the recommended plan will bring about an efficiency gain in the production of the projected national market clearing quantities. Estimates of production and farm income in this basin for this study were based on a partial analysis of the comparative advantage of this area with the rest of the United States. It is possible that the economic effects of the development proposed in the recommended plan would be greater if the analysis were broader. Many of the resources displaced by development are not marginal cropland when viewed in the perspective of all the cropland in the United States. If the demands for crops grown in the basin should increase more than the national market clearing projections used in this study, the basin could be instrumental in supplying them.

Of the major crops grown in the basin rice, soybeans, cotton, and sweet potatoes are the most profitable. Recent trends indicate that it is likely rice and soybeans will continue to be the most common crop. If markets are available, the recommended plan could stimulate an additional estimated production of 300,000 more acres of soybeans and 70,000 more acres of rice. This increased production would occur as a result of flood prevention and improved drainage but with none occurring due to shifts from forest land to cropland. It would mean an additional $71,000,000 of income for the Basin by 1990.

The plan is not expected to induce any land clearing. If shifts are profitable, they will occur regardless of any USDA programs for development.

Reducing the channel work 365 miles in the recommended plan from the 1685 miles in the ED alternative will avoid the disturbance of high quality wildlife habitat areas and the high cost of compensation for adverse impacts on the environment.

The forestry sector will be enhanced considerably by the planned increase in the utilization of harvested material and regeneration by restocking to desirable species. The measures planned for this component are realistic for they can be practically achieved within the time frame of this study. See table II.1.

Projected demands for recreation in 1990 far surpass the measures that can be provided with the recommended plan. See table II.1. Remaining needs would have to be met by accelerated planning and funding by state and local agencies and private development. Facilities that can be installed under U. S. Department of Agriculture programs are limited according to established policy and legislation.

Under the recommended plan wildlife habitat and land and water quality would be enhanced by the installation of land treatment measures. However, the plan only provides for land treatment on 17 percent of the land needing adequate treatment to reduce erosion. See table II.1.

Table II.1 - Effects of Recommended Plan
Ouachita River Basin

Concern	Unit	1970	1990				2020
				Remaining Needs:			
		Existing Needs	Future Without Plan	With Recommended Plan		Plan Effects [c]	Future Needs Without Plan [d]
Flooding and Impaired Drainage							
Urban Damage	Dollars [a]	250,000	412,000	238,000	-	174,000	522,000
Agricultural Damages and Losses	Dollars [a]	32,072,000	54,750,000	37,850,000	-	16,900,000	77,511,000
Other	Dollars [b]	1,800,000	2,965,000	2,039,000	-	926,000	4,681,000
Total	Dollars	34,122,000	58,127,000	40,127,000	-	18,000,000	82,714,000
Agricultural Problem Areas	Acres	1,574,000	1,827,000	1,259,000	-	568,000	1,939,000
Agricultural Water Supply	Mgd	0	114	80	+	34	273
Forest Resources							
Utilization	Mil.Cu.Ft.	62	75	56	+	19	101
Restocking	Acres	1,500,000	2,300,000	782,000	+	1,518,000	4,700,000
Increased Recreation	Visitor Days	43,000,000	55,000,000	53,441,000	+	1,559,000	56,000,000
Wildlife Habitat Management							
Upland Types (includes bottomland hardwoods)	Acres	10,077,000	9,087,000	8,993,000	+	94,000	8,237,000
Wetlands	Acres	1,473,000	1,385,000	1,358,000	+	27,000	1,272,000
Land and Water Quality							
Sediment Deposition							
Channels	Cu. Yds.	11,804,000	11,777,000	10,867,000	-	910,000	10,705,000
Overland	Acres	342,000	342,000	342,000		0	342,000
Erosion							
Agricultural Land	Acres	3,364,000	2,643,000	2,187,000	-	456,000	1,932,000
Forest Land	Acres	0	439,000	373,000	-	66,000	742,000

[a] Includes indirect damages.

[b] Includes roads, bridges, farm lanes etc. plus indirect damages.

[c] Minus indicates a decrease; plus indicates an increase.

[d] 2020 was too distant in the future to be specific about any long-range projects and effects.

The installation of conservation measures on much of the remaining acreage are limited due to lack of adequate drainage outlets. Under special programs group drainage systems could possibly provide a certain amount of outlets on many of these areas. Expanding going programs could also provide for the treatment of much of this acreage.

Legislation passed just prior to the issuance of this report will be instrumental in assisting land users to install conservation measures. The Clean Water Act of 1977, (Rural Clean Water Program), and the Resources Conservation Act, also passed in 1977 will provide for the voluntary installation of conservation measures on areas of high priority lands and provide USDA with valuable new strategies for designing, carrying out, and evaluating all of its conservation programs. Section 208 of Public Law 92-500 - Federal Water Pollution Control Act of 1972 - pertains to all forms of surface water pollution. This program allows for both the identification of sources of water pollution and identity of solutions to these problems. Once implemented these programs, and others not yet developed, can greatly reduce the acres needing treatment.

Even though land treatment programs are voluntarily applied by landusers, they have been effectively applied in the past to reduce erosion and sediment and improve land and water quality in general. See table II.2 for conservation measures installed under these programs.

RELATIONSHIP OF RECOMMENDED PLAN TO LAND USE, PLANS, POLICIES, AND CONTROLS WITHIN THE BASIN

The recommended plan was developed within the environmental constraints of land use plans, policies, and controls as set forth by the Congress of the United States through various agencies such as the Environmental Protection Agency, the U. S. Department of Agriculture, and the U.S. Department of the Interior, and by state and local agencies.

SHORT-TERM VS LONG-TERM USE OF RESOURCES

Trends in the basin indicate future land use will be agricultural and forest land with increased rural-residential development. The recommended plan is expected to be compatible with short-term uses of land, water, and other natural resources in the Basin without precluding any significant long-term options. Short-term food and fiber needs can be met through continuation of the present allocation of land resources. Changes in land use and the acceleration of conservation treatment application is essential to preserve the quality of the land resource base for use in meeting long-term needs. Continued depletion of the soil resource would have serious detrimental effects on the Basin's capacity to sustain food and fiber production for future generations.

Flood prevention and drainage measures in the recommended plan would have some temporary negative short-term environmental impacts during construction. Long-term effects includes the irreversible and irretrievable loss of agricultural land and woodland for reservoirs and channel rights-of-way. However, long-term effects of the recommended plan include positive environmental consequences such as better wildlife habitat management, reduced erosion and sediment, and improved water quality would be achieved.

Table II.2 - Established Conservation Land Treatment Measures
Ouachita River Basin

Conservation Land Treatment Measures	Units	Arkansas	Louisiana	Total
Conservation Cropping Systems	Acres	835,700	371,500	1,207,200
Contour Farming	Acres	14,400	17,700	32,100
Crop Residue Management	Acres	848,200	452,700	1,300,900
Critical Area Planting	Acres	1,400	1,000	2,400
Drainage Field Ditches	Feet	7,240,600	14,527,200	21,767,800
Drainage Land Grading	Acres	31,500	72,300	103,800
Drainage Main Or Lateral	Feet	10,143,500	21,322,900	31,466,400
Grade Stabilization Structure	Number	100	100	200
Irrigation Field Ditches	Feet	2,033,400	1,000	2,034,400
Irrigation Land Leveling	Acres	39,500	2,000	41,500
Irrigation Pipelines	Feet	76,700	100	76,800
Structure For Water Control	Number	4,700	1,200	5,900
Wells	Number	900	100	1,000
Pasture and Hayland Management	Acres	434,400	165,700	600,100
Pasture and Hayland Planting	Acres	495,200	181,100	676,300
Ponds	Number	12,100	5,700	17,800
Brush Management	Acres	484,500	36,500	521,000
Proper Grazing Use	Acres	175,500	154,100	329,600
Fish Pond Management	Number	5,400	2,400	7,800
Wildlife Wetland Habitat Mgt.	Acres	22,800	62,800	85,600
Wildlife Upland Habitat Mgt.	Acres	495,700	135,800	631,500
Recreation Area Improvement	Acres	2,300	800	3,100
Land Adequately Treated	Acres	4,894,300	1,681,600	6,575,900

Source: Soil Conservation Service

The construction of reservoirs and farm ponds would improve water supplies over long-term use. However, these structures would require the commitment of wildlife habitat to these purposes.

Reforestation will reduce the loss of pine sites to hardwood encroachment with no adverse short-term effects. Improved technology in the utilization of stumps and slashing can reduce the waste from harvesting activity by an estimated 16 percent by 2020 with no negative environmental effects. The recommended plan will extend the favorable cut to growth ratio by at least 10 years. Long-term environmental impacts of forestry programs would, therefore, be positive.

Short- and long-term recreational opportunities would be improved under the recommended plan. Some minor disturbances to the environment would occur during construction. However, over a long-term period, availability and management of recreational areas and wildlife habitat will improve providing significant positive environmental effects. In addition, the preservation of wetland areas and areas of natural beauty would have positive short- and long-term environmental consequences with no negative environmental impacts.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Should the plan elements recommended in this study be implemented throughout the Basin, some irreversible and irretrievable commitment of resources will occur. Projects included in the early action plans will require the commitment of a small acreage of cropland, pastureland, and forest land to channel rights-of-way and reservoirs. The production of crops, livestock, and forest products as well as wildlife habitat would be foregone. In addition, the energy, capital resources, and labor involved in installing and maintaining these projects will be irreversibly committed.

CHANGED RESOURCE USE

Some changes in the use of resources throughout the Basin would occur due to implementation of the recommended plan.

Improved flood prevention and drainage should provide more intensive use of cropland and pastureland. No shifts in land use from forest land to crop and pasture should result from the plan because it does not intentionally induce land clearing and the loss of forest resources.

Areas of marginal or low intensity use would be upgraded to high activity recreational areas. Reservoirs, farm ponds, boat ramps, camping, picnicking, and recreational trails and accompanying facilities would all provide increased use and enjoyment of resources within the Basin. In addition, the improvement of 120,500 acres of wildlife habitat and 33,000 acres of hunting areas will provide increased use of these resources.

Flood prevention and improved drainage result in more intensive use and production of cropland.

Trails for horseback riding and other purposes increase the use and enjoyment of the outdoors.

ENVIRONMENTAL IMPACT SUMMARY

Nearly 350 environmental impacts were considered in an environmental analysis of the recommended plan. Only those impacts considered as being significant over the life of the project were included in this summary.

It is recognized that there are also temporary or short term significant impacts resulting from the installation of measures requiring earth moving construction. Generally these are impacts that have negative effects on water quality, associated fisheries, and riparian wildlife habitat. Earthmoving construction temporarily produces sediment and disrupts wildlife habitat by removing vegetative cover and exposing raw earth for a short period of time.

The construction of three reservoirs and work on 1,320 miles of channel will have a positive effect on floodwater retardation and drainage. The reservoirs will have a positive impact on fisheries, water quality, and visual resources. The channel work will have a negative effect on water quality, fish, and erosion during construction. Measures such as leaving woody vegetation on one side undisturbed and revegetating spoil will be utilized during construction to minimize the impacts on visual resources.

The installation of associated land treatment measures will appreciably reduce floodwater and drainage problems and erosion and sedimentation. Prime farm land will be enhanced by assuring the maximum returns for monies invested. Water quality will be enhanced thus improving fish and wildlife habitat.

The installation of recreation facilities is expected to have little effect on the environment. Trails, areas of campsites, and picnic facilities will have a slight contribution to erosion, but this will be minimized by proper maintenance. Areas to be managed for hunting use will enhance wildlife habitat populations. Land committed to recreational use would not preclude other use in the future. Maintenance of facilities would enhance local employment.

The proper management of 93,000 acres of upland type wildlife habitat will have an overall beneficial effect on the environment. The major effect will be the retention of wildlife habitat. The management of 26,000 acres of wetlands will have a positive effect. Fish and wildlife habitat and water quality will be the major beneficiary.

Project measures will provide consideration for threatened and endangered species and recognize unique ecological communities and areas of natural beauty. This will minimize any impacts on the environment.

The impact of project measures on cultural resources can only be generally addressed here, but they will be examined and discussed in detail as each project EIS is planned and prepared. Any project measure to be installed will be considered and planned to meet the requirements of legislation pertaining to the protection of cultural resources.

Other land treatment measures in addition to those directly associated with project measures will reduce erosion and sedimentation and improve the water quality.

SCS policy, as recorded in the Federal Register, Vol. 43, No. 210 requires SCS personnel to check the Register of Historic Places prior to aiding in the installation of land treatment measures that could be detrimental to an historic site. If during installation of land treatment measures an item of historical or archaeological significance is encountered, the Soil Conservation Service or the landowner will report this to one of the following: archaeologists at Louisiana State University, the HCRS, the Curator of Anthropology the Historical Preservation Officer, or the Arkansas Archeological Society.

Land treatment on forest land will have positive impacts by reducing erosion, and sedimentation, and improving water quality.

COMPARISON OF RECOMMENDED PLAN WITH OTHER ALTERNATIVES

Principles and Standards for the planning of water and related land resources, require that at least two alternatives be studied to form the outer framework of any proposals. These are economic development and environmental quality. A third alternative of future water and related land resource development with no recommended overall plan was also studied. This alternative additionally served as a basis against which effects of the two alternatives of economic development and environmental quality and the recommended plans were measured. See Chapter IV for a detailed discussion of these alternatives.

Other possible alternatives were also considered but not studied. To do so would have required a vast amount of factors to be analyzed for a large study area and would also have required extensive time. Secondly, other alternatives would also have had to be studied subsequent to the three required alternatives which served as the outer framework for the study. Thirdly, in consideration of the generality of the study, tradeoffs among the three basic alternatives would provide a plan that could feature development within the Basin.

These three basic alternatives on which the recommended plan is based are:

1. Future Without Conditions - The alternative of future conditions without a recommended plan is an alternative allowing existing conditions to continue. Many of these conditions such as flooding and impaired drainage would become worse due to expected changes in land use. The reduction of erosion would be only slightly effected by existing programs and water quality would likely continue to decline.

   Demands for recreation facilities would continue to increase. This would place an increasing demand on the need for available water surfaces. Available fish and wildlife habitat would

continue to decline as the stress on water and related land resources increased. Existing progams would have little effect on increasingly adverse conditions consisting of the misuse and mismanagement of resources.

An evaluation of costs and benefits for this alternative was not attempted.

2. Economic Development - The alternative of economic development (ED) is designed to optimize economic development in the Basin. Its objective is to increase the value of the Nation's output of goods and services and is production oriented. Under this alternative, environmental values are only considered to a minimum extent according to basic requirements of federal or state regulations or by policies of the implementing agency. This alternative would reduce flooding and drainage losses an estimated 30 percent in 1990. Planned recreation measures would also add to the amount of income received.

   It is estimated the cost of this alternative would average $27,527,000 per year and provide annual benefits of $38,900,000. See tables IV.3 and IV.4.

3. Environmental Quality The objective of the environmental quality (EQ) alternative presented in this study is to emphasize environmental quality in the Basin. To attain this objective would require the diversion of resources from economic production.

   Under this alternative, flood damages and impaired drainage losses would be reduced about 15 percent in 1990. Recreation benefits would be approximately $500,000 less per year, while wildlife habitat of both the upland types and the wetland types would be enhanced to a greater degree and in greater acreages. This alternative would also enhance natural beauty to a greater degree. Land and water quality would in general also be higher thereby providing better quality fish habitat.

   The annual cost of this alternative is about $18,023,000 and average annual benefits are approximately $24,818.000. See Tables IV.7 and IV.8.

The recommended plan consists of measures that are tradeoffs between these three alternatives resulting in a recommended plan containing mixed objectives. See table II.3. The average annual cost of this plan is estimated to be $10,919,000 with an additional annual cost of $467,000 for land treatment, and annual benefits are $33,672,000. It represents the most desirable course of action because it not only includes environmental considerations but is economically favorable. See Economic Development Account, Chapter II and Table II.4.

An independent analysis of the economic effects on agricultural production for each alternative also shows that net returns for the recommended plan would be intermediary between the economic development alternative and the environmental quality alternative. Net returns for the "future without development" conditions would be the lowest for any alternative. For details of this analysis, see subreport, "Analysis of Alternatives," Ouachita River Basin Study, 1979.

EARLY-ACTION USDA PROGRAM

The proposed early-action program of the U. S. Department of Agriculture consists of seven Public Law 566 Watersheds and one Resource Conservation and Deveopment project in Louisiana. See table III.2, Chapter III. No early-action program was proposed for Arkansas.

Three reservoirs contained in two of the P.L.-566 watersheds would provide protection for approximately 300 agricultural acres and two urban areas. Approximately 1200 miles of channel work in the remaining 6 watershed would benefit an estimated 519,000 acres of agricultural land. Planned channel work avoids the draining of wetlands and minimizes inducements to clear bottomland hardwoods. No channel work was planned on any existing channels that were supporting good fisheries.

The recreation facilities included in these eight projects would provide for an additional 637,000 visitor days[1/] of recreation.

Wildlife management practices would be carried out on about 121,000 acres of land which includes approximately 84,000 acres of bottomland hardwoods. It is estimated that 800 acres of bottomland hardwoods and 700 acres of wetlands would be mitigated as a result of channel work. In addition management would be improved on about 170 farm ponds to enhance fish habitat.

Land and water quality would be enchanced by the conservation treatment of 456,000 acres of agricultural land.

Threatened and endangered species, unique ecological systems, and areas of natural beauty as presented by the study would always be recognized in the event they would be affected by any project action or establishment of land treatment. Existing procedures would be adhered to if any of the cultural resources or endangered species would be affected by any project action.

Landscape and wildlife plantings will be made on watershed channels and around reservoirs to reduce the environmental and visual impact of these measures. Channel work will be modified and special plantings made to minimize the effect on the visual quality of the area affected. This would particularly apply to transportation corridor crossings and along channel segments frequently seen by the public.

All eight of the proposed projects are viable and considered to be economically feasible. See location map, Figure II.1

[1/] One visitor day is one trip to a recreation site regardless of the number of activities participated in.

Table II.3 - Effects of Recommended Plan Compared With Effects of FWO, ED, and EQ Alternatives (1990)
Ouachita River Basin

Concern	Unit	Future Without Condition (1990)	Economic Development Alternative	Recommended Plan	Environmental Quality Alternative
		- - - - - - - - - - - - - - - Remaining Need - - - - - - - - - - - - - - - -			
Flooding and Impaired Drainage					
Total Losses and Damages	Dollars	58,127,000	35,177,000	40,127,000	47,642,000
Problem Areas	Acres	1,827,000	1,154,000	1,259,000	1,551,000
Agricultural Water Supply	Mgd	114	80	80	80
Forest Resources					
Utilization	Mil.cu.ft.	75	56	56	56
Restocking	Acres	2,300,000	782,000	782,000	836,000
Increased Recreation	Visitor Days	55,000,000	53,392,000	53,441,000	53,559,000
Wildlife Habitat Mgt.					
Upland Types (includes bottomland hardwoods)	Acres	9,087,000	9,006,000	8,993,000	8,941,000
Wetlands	Acres	1,385,000	1,361,000	1,358,000	1,333,000
Land and Water Quality					
Sediment Deposition					
Channels	Cu. yds.	11,777,000	10,754,000	10,867,000	11,028,000
Overland	Acres	342,000	342,000	342,000	342,000
Erosion					
Agricultural land	Acres	2,643,000	2,050,000	2,187,000	2,359,000
Forest land	Acres	439,000	439,000	372,000	123,000

Table II.4 - Comparison of Average Annual Costs and Benefits of Recommended Plan and Selected Alternatives

Item	Economic Development[a/]	Recommended Plan	Environmental Quality[a/]
	- - - - - - - - -Dollars- - - - - - - - -		
Total Benefits	38,900,000	33,672,000	24,818,000
Total Costs	27,527,000	22,753,000	18,023,000
Net Benefits	11,373,000	10,919,000	6,795,000

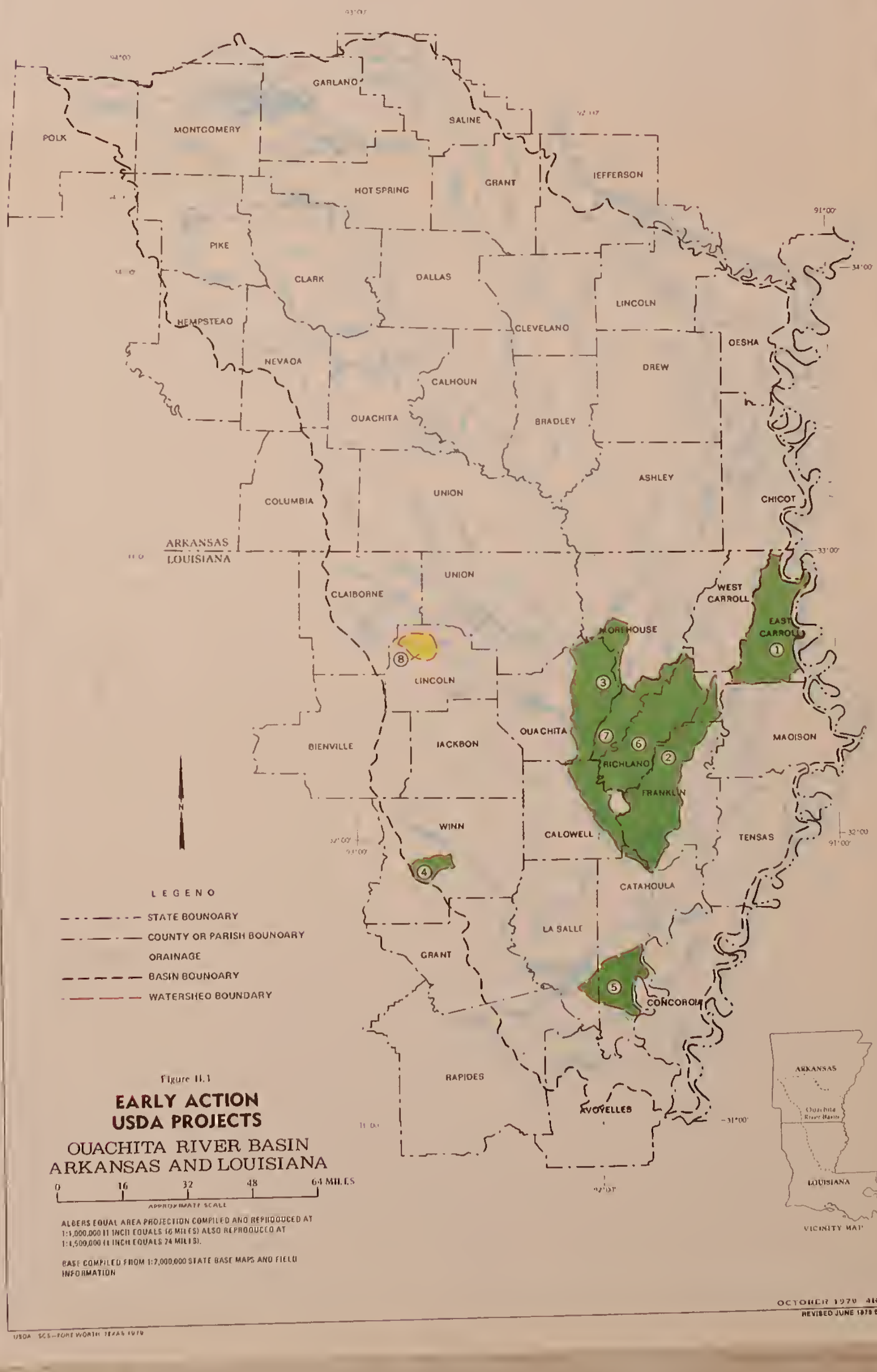
[a/] See Chapter IV, Alternative Plans, for details.

LEGEND

① East Carroll Watershed
② West Franklin Watershed
③ Bayou LaFourche–Monroe Bastrop Watershed
④ Port de Luce Creek Watershed
⑤ Jonesville to Larto Lake Watershed
⑥ East Richland Watershed
⑦ West Richland Watershed
⑧ Caney Creek Watershed

P.L.–566

RC and D



LEGEND

STATE BOUNDARY
COUNTY OR PARISH BOUNDARY
DRAINAGE
BASIN BOUNDARY
WATERSHED BOUNDARY

Figure II.1

EARLY ACTION USDA PROJECTS

OUACHITA RIVER BASIN ARKANSAS AND LOUISIANA

0 16 32 48 64 MILES

APPROXIMATE SCALE

ALBERS EQUAL AREA PROJECTION COMPILED AND REPRODUCED AT 1:1,000,000 (1 INCH EQUALS 16 MILES) ALSO REPRODUCED AT 1:1,500,000 (1 INCH EQUALS 24 MILES).

BASE COMPILED FROM 1:2,000,000 STATE BASE MAPS AND FIELD INFORMATION

OCTOBER 1979 4R-33308A-1

REVISED JUNE 1979 BASE 4-R-32173

USDA SCS—FORT WORTH, TEXAS 1979

CHAPTER III

OPPORTUNITIES FOR IMPLEMENTATION

INTRODUCTION

Implementation of this plan will require a mix of programs of various federal, state, and local agencies. Priorities and schedules of installation will depend on the willingness of local units of government and organizations not only to initiate requests for assistance but also to assume leadership and financial and legal responsibilities as appropriate. Technical and financial assistance for implementing these elements can be obtained through various federal and state agencies. See table III.1 for the estimated cost of implementing the various components and the costs of annual operation, maintenance, and replacement.

OPPORTUNITIES FOR USDA PROGRAMS

Opportunities for implementing part of the recommended plan and meeting anticipated needs with USDA programs are presented in this discussion. The initiative required for using USDA program resources generally rests with the residents and landowners in the Basin. Land treatment measures will be accomplished by individual landowners. (See special ORB report, "Land Use, Treatment, and Management" for details of land treatment program.) Measures for flood control and channel work require community action to be able to receive assistance from USDA programs for installing these measures. Combining land treatment measures with structural measures provides an integrated watershed management program.

1. Public Law 83-566 Watershed Protection and Flood Prevention - This law provides for the implementation of a combination of structural and land treatment measures according to a plan. The recommended plan includes seven such projects. See table III.2.

   A. Structural Measures. Structural measures of the recommended plan that can be included in this program consist of 3 reservoirs, 1200 miles of channel work with appurtenances for flood damage reduction and improved drainage and a limited amount of recreational facilities among the 7 watershed projects.

      Each project would need to be sponsored by local conservation districts and other entities of local government. Technical and financial assistance would be provided by the Soil Conservation Service with the Louisiana Department of Transportation and Development, Office of Public Works assisting.

Table III.1 - Estimated Cost of Implementing the Recommended Plan and Cost For Operation, Maintenance, and Replacement Ouachita River Basin

Component	Installation Cost	Average Annual Cost [a/]	Operation Maintenance Replacement	Total Average Annual Cost
Floodwater Damage Reduction and Improved Drainage	118,892,000	8,461,000	4,754,000	13,215,000
Improved Forest Production	55,590,000	4,155,000	Not determined	4,155,000
Recreation Facilities	43,153,000	3,079,000	1,726,000	4,805,000
Biological Resources and Ecosystems	1,474,000	105,000	473,000	578,000
Total	219,109,000	15,800,000	6,953,000	22,753,000 [b/]

[a/] Installation costs amortized at 6 7/8 percent.

[b/] There are additional estimated average annual land treatment costs of $467,000 for improving land and water quality and onfarm ponds for agricultural water supply. Benefits for these measures were not evaluated.

B. Land Treatment Measures. Resource Management Systems[1/] will be installed to assure adequate treatment of 456,000 acres of agricultural land. This includes the installation of conservation measures directly associated with channel work. These systems would be installed at an accelerated rate through local soil and water conservation districts. Technical assistance would be furnished by the Soil Conservation Service. This is an integral part of the overall process of project installation.

Local landusers will be responsible for installing and maintaining the conservation measures. History indicates this is an effective approach. See table II.2, Chapter II. Financial assistance for installing conservation measures can be obtained from the Agricultural Stabilization and Conservation Service, the Farmers Home Administration, and P.L.-566 project funds.

The planned land treatment program would result in Resource Management Systems (RMS) being installed that would substantially reduce erosion and sediment, which would

protect the resource base and improve the quality of the environment. The program would also reduce pollutants of plant nutrients, pesticides, and suspended solids.

The land treatment measures that are included in the planned RMS's on cropland are conservation cropping systems, crop residue management, chiseling and subsoiling, drainage land grading, land smoothing, surface drainage, and structures for water control (pipe drops). On pastureland, the RMS include pasture and hayland planting, pasture and hayland management, and drainage as needed. The installation of these Resource Management Systems as accelerated land treatment measures would result in adequate protection of an additional 456,000 acres of agricultural land over that which would be installed in the absence of any projects. As a result, the gross erosion would be reduced from 25,084,000 tons per year to 22,753,000 tons per year.

About 93,000 acres of upland type wildlife habitat could receive accelerated development, improvement, or maintenance. This would include both the planting of food plots and management of 84,000 acres of bottomland hardwoods. The management or improvement of about 26,000 acres of wetlands for habitat for wetland wildlife species can also be accelerated.

About 540 ponds for livestock and poultry water supplies and fish farming would be constructed. In addition, 170 farm ponds will be managed to improve fish habitat.

The planting of 800 acres of bottomland hardwoods and creation of 700 acres of wetlands will serve as mitigation for areas that have been disturbed in carrying out the planned channel work for the P.L.-566 projects.

Projects in the recommended plan would be done in harmony with the U. S. Army Corps of Engineers flood control projects on many of the large outlet channels in the Ouachita River Basin. Many are completed while others are in the planning or construction stage.

1/ Resource Management System - A combination of conservation practices identified by the primary use of land or water that will, at a minimum, protect the resource base by making soil losses tolerable, maintaining acceptable water quality, and maintaining acceptable ecological and management levels for the selected resource use.

This weir installed as an appurtenance to the channel work stores water for irrigation use.

Pastureland made productive and protected from erosion by the application of the correct resource management system.

The average annual costs of implementing the planned projects under PL-566 are estimated to be $13,318,000. See table III.2.

2. Public Law 83-703 Resource Conservation and Development

The program under this law is intended to enhance rural development. It provides opportunities for the prudent use, management and protection of natural resources; it enables local citizens to carry out an action oriented resource conservation and development plan for their area and it allows local people to apply all available political, social, and economic forces for improvement and development of the area.

The recommended plan includes only one project that is potentially viable under this program. It is Caney Creek in the Bayou D'Arbonne subbasin at Homer, Louisiana. This project would consist of one flood storage reservoir that could provide flood protection to an urban area. It could be implemented in a manner similar to a P.L.-566 project. The estimated average annual cost of implementing this project is estimated to be $105,000. See table III.2.

3. Public Law 74-46 Land Treatment

Due to a continuing need for conservation treatment of the land, this law makes available to landusers a program for adequately protecting land with resource management systems comprised of conservation measures to reduce erosion and sediment and improve land and water quality.

Under this program, the USDA provides technical and financial assistance to landusers through local soil and water conservation districts. USDA agencies furnishing this assistance include the Soil Conservation Service, the Agricultural Stabilization and Conservation Service, the Forest Service, and the Farmers Home Administration.

Local landusers are responsbile for installing and maintaining the conservation measures. This approach along with USDA assistance has proven to be an effective method of implementation. See table II.2, Chapter II.

In addition to the adequate protection of 456,000 acres of agricultural land in the 7 early-action watersheds, this program will continue to provide conservation treatment throughout the remainder of the Basin under the ongoing program.

4. Cooperative Federal-State-Private Forest Programs

Planned forestry resource measures consisting of a 25 percent increase in present utilization rate to yield an additional 18,758,000 cubic feet of harvest material, restocking 1,518,000 acres of existing poorly stocked areas, and controlling erosion

Farm ponds when properly managed, provide good habitat for fish and serve as a source of recreational activity.

Properly managed wetlands provide high quality habitat for waterfowl.

on 66,000 acres of forest land will be carried out largely on nonfederal forest land. This will be done through cooperative state and private forest programs in cooperation with the state forestry organizations. The remainder will be done on national forest land. The U. S. Forest Service will provide the lead in implementing these measures on the private and nonfederal land and implement them on National Forests.

Existing cooperative forestry programs help meet needs and solve problems on nonfederal public lands and private forest lands. These programs provide a variety of forestry projects and measures for development and protection of forest lands. The programs are applied under the direction of State Foresters. The state agencies, private forest owners, processors, rural community planners, developers, and the Forest Service join in a cooperative effort to implement the programs.

All accelerated forestry programs are to begin in 1980. The utilization program will achieve its objective of 16 percent volume improvement by 2020. The restocking backlog will have been completed by the year 2000. The regeneration and the land treatment task will also be continuing in a direct association with the accelerated harvesting effort.

The U. S. Forest Service through the Arkansas Forestry Commission and the Louisiana Office of Forestry can affect the planned reduction of existing problems and needs through expansion of the following federal and state programs, among others:

--Cooperative Forestry Assistance Act of 1978, which provides for both technical and financial assistance to state foresters, or equivalent state officials.

--The Forestry Inventives Program of 1975 through the Forest Service and the state foresters which provides direct financial incentives to landowners to regenerate their forest lands.

--The P.L. 566, Small Watershed Program, where the Forest Service through the state forester provides technical and direct program aid for critical area stabilization and watershed management practice installation on forest lands.

Technology is available to lower the percentage of wood that is wasted when timber is harvested. Federal, state, and private consulting foresters are working now to disseminate this technology to the public which will be used toward increasing wood production by the planned amount.

Educational and incentives programs are already in effect to increase regeneration of poor stands of timber. These programs which provide technical assistance and cost-sharing, will be expanded and accelerated.

Table III.2 - Costs of Implementing the Early-Action P.L.-566 and Resource Conservation and Development Projects Under USDA Programs
Ouachita River Basin

Type of Project	Watershed	Watershed Area	Flood Prevention Only: Reservoirs	Flood Prevention Only: Agricultural Area Benefited	Inseparable Flood Prevention and Improved Drainage: Channel Work	Inseparable Flood Prevention and Improved Drainage: Agricultural Area Benefited	Land Treatment: Wildlife Habitat Management: Recreation	Land Treatment: Wildlife Habitat Management: Upland Type	Land Treatment: Wildlife Habitat Management: Wetlands	Land Treatment: Agricultural Land	Land Treatment: Fish Habitat Mgt.	Total Installation Cost	Total Average Annual Costs[d]
		acres	no.	acres	miles	acres	visitor days provided for	acres	acres	acres	no. farm ponds managed	- - - - dollars - - - -	
PL-566	East Carroll	223,700			282	136,000	18,000	5,500	5,400	91,400		25,578,000	2,855,000
PL-566	West Franklin	244,700			242	123,600	106,000	15,700	5,300	116,400		22,826,000	2,562,000
PL-566	Bayou LaFourche Monroe Bastrop	317,600[a]			280	59,600	313,000	54,300	9,300	78,700	22	27,590,000	3,154,000
PL-566	Port DeLuce	28,000	2[b]	300				7,200	3,500	1,300		5,775,000	515,000
PL-566	Jonesville to Larto Lake	108,900			98	46,000	1,000	300	300	44,700		9,045,000	1,005,000
PL-566	East Richland	218,300			195	111,800	96,000	5,300	2,200	81,900	48	18,783,000	2,069,000
PL-566	West Richland	115,500			103	42,000	103,000	5,700	1,000	41,600	100	10,487,000	1,158,000
Subtotal	PL-566	1,256,700	2	300	1,200	519,000	637,000	93,000	27,000	456,000	170	120,084,000	13,318,000
RC&D	Upper Bayou D'Arbonne Caney Creek	4,100	1[b]	None								1,109,000	105,000
Total		1,260,800	3	300	1,200	519,000	637,000	94,000[c]	27,000	456,000	170	121,193,000	13,423,000

[a] 317,600 acres were used for evaluation purposes. Under the P.L.-566 Program, watershed cannot exceed 250,000 acres.

[b] Single purpose primarily for urban protection.

[c] Includes approximately 84,000 acres of bottomland hardwoods.

[d] Includes operation, maintenance, and replacement costs. Installation costs amortized at 6 7/8 percent for 50 years.

As harvesting and regeneration practices are accelerated, the efforts to provide assistance through the Cooperative Forestry Assistance Act of 1978 and the P.L.-566 Small Watershed Program will also be accelerated. Improved planning and carefully installed site preparation and road layout and construction methods should result in reduced rather than increased erosion volumes from forest lands.

5. Recreation - U. S. Forest Service

A limited amount of recreational facilities would be directly implemented on national forest land by the Forest Service. These facilities would provide for an estimated 27,000 visitor days of recreation. They consist of an estimated 8,000 square feet of beach area, 60 tent and trailer sites, 50 picnic tables, and 60 miles of trails for hiking.

OPPORTUNITIES FOR NON-USDA PROGRAMS

One hundred and twenty miles of channel work not planned for implementation under USDA programs would be carried out by the Louisiana Department of Transportation and Development, Office of Public Works. The remaining planned recreation facilities and opportunities to provide for approximately 922,000 visitor days of recreation per year would be implemented by the Louisiana Department of Culture, Recreation, and Tourism, Office of State Parks, and the Louisiana Department of Wildlife and Fisheries.

A general time frame for establishment of these planned elements would be 1990 depending on availability of funds.

The Office of State Parks has responsibility for acquiring land and developing state parks for all types of outdoor recreation except hunting. They can purchase land and develop camping and day-use areas, either water oriented or nonwater oriented. Most of the state parks are water oriented however.

The Department of Wildlife and Fisheries has authority to acquire lands for public hunting and fishing, and manage them to increase carrying capacity of wildlife to provide increased hunting and fishing opportunities. The acquisition of these lands depends on their availability and funds.

CHAPTER IV

ALTERNATIVE PLANS

INTRODUCTION

The alternatives presented in this chapter represent the combined efforts of state, federal, and local agencies and individuals involved in resource planning. This includes the U. S. Department of Agriculture, planning and development organizations, various local entities of government and cooperating state and federal agencies.

The work of each was reviewed to determine the extent their current plans might satisfy the component needs and problems of the Basin. Possible projects were based upon local interest, existing facilities, population centers, future growth projections, and suitability of sites. The alternatives contain USDA project proposals as well as projects of other agencies.

Certain flora and fauna species, natural beauty areas, and cultural features require no developmental measures other than to be protected or preserved. These components have been fully recognized in the formulation of the ED and EQ alternative plans.

This chapter allows a comparison to be made of the three alternatives that were studied based on conditions predicted to exist in 1990. See Table IV.1 for summary of plan elements contained in each alternative.

Tables IV.2 and IV.6 are a description of the measures included in the ED and EQ alternatives. (The "future without condition" is no action at all.) Tables IV.3 and IV.7 are a comparison of installation costs and tables IV.4 and IV.8 compare the benefits of the two alternatives. Tables IV.5 and IV.9 compare the elements to be installed and total costs under the USDA program. Table IV.10 compares the alternative of no project action (future without conditions) with the effects of the ED and EQ alternatives and the recommended plan. These tables can be compared with Table III.1, Cost of Implementing the Recommended Plan and Table III.2, Cost of Implementing USDA Program, Chapter III.

FUTURE WITHOUT PLAN ALTERNATIVE

Under this alternative existing programs would continue as is with no acceleration of measures to lessen or halt adverse trends. Consequently no additional measures of any kind are planned for this alternative.

Under future conditions without an overall recommended plan (commonly known as "future without condition") flood damages and losses of agricultural production attributed to impaired drainage would increase about 70 percent from 1970 to 1990. By 2020 these losses and damages would be an estimated two and a half times greater than conditions in 1970. Problem areas of agricultural land could be expected to increase by as much as 365,000 acres between 1970 and 2020.

Table IV.1 - Summary of Plan Elements For Each Alternative
Ouachita River Basin

Plan Element	Unit of Measure	Alternative: Economic Development Objective	Alternative: Recommended Plan	Alternative: Environmental Quality Objective
Floodwater Damage Reduction and Improved Drainage				
Construct floodwater storage reservoirs to reduce flooding	No.	3	3	3
Perform channel work with appurtenances to reduce flooding and improve drainage	Miles	1,685	1,320	762
Install levees for flood protection	Miles	10	10	10
Install onfarm associated land treatment measures to improve drainage and water quality, and reduce erosion and sedimentation	Commensurate with channel work			
Water Supply and Management				
Construct farm ponds for livestock and poultry water supply to increase the available supply of surface water	No.	160	160	160
Construct ponds to provide the water supply for increased fish farming	No.	380	380	380
Forest Resources				
Improve the utilization of harvested forest material	Cu. ft.	18,758,000	18,758,000	18,758,000
Restock poorly stocked areas to increase the quality and quantity of timber production on forest lands	Acres	1,518,000	1,518,000	1,464,000
Recreation				
Install boat ramps with associated facilities to make available the surface acres of existing water for fishing, boating, and water skiing	No. Ramps Acres	79 15,000	69 14,000	46 11,000
Construct picnic tables and associated facilities	No.	1,650	1,650	1,650
Construct beaches and associated facilities for swimming	Sq. ft.	1,610,000	1,610,000	1,610,000
Construct camping sites for tents and recreational vehicles, and cabins for group camping	No. sites No. cabins	3,540 200	3,540 200	3,480 200
Establish trails with associated facilities for horseback riding, bicycling and hiking	Miles	187	187	187
Improve wildlife habitat for hunting	Acres	33,000	33,000	30,500
Biological Resources and Ecosystems				
Develop, improve, and maintain upland type wildlife habitat which includes a management program for bottomland hardwoods	Acres Acres	80,000 (72,000)[a/]	93,000 (84,000)[a/]	142,000 (128,000)[a/]
Create bottomland hardwoods	Acres	None	800	3,200
Create wetlands	Acres	None	700	315
Establish a management program to retain wetlands	Acres	24,000	26,000	52,000
Establish a management program for farm ponds for improved fish habitat	No.	170	170	170
Provide support in protecting threatened and endangered species of flora and fauna	No.	10	10	10
Recognize unique ecological communities	No.	12	12	12
Areas of Natural Beauty				
Recognize scenic streams	No.	15	15	15
Recognize unique botanical systems	No.	6	6	6
Recognize open and green space (urban environments)	Acres	4,000	4,000	4,000
Recognize wilderness areas	Acres	20,000	20,000	20,000
Cultural Resources				
Recognize selected cultural sites of archaeological, historical, and geological importance	No.	1,590	1,590	1,590
Land and Water Quality				
Install land treatment measures on agricultural land	Acres	591,000	456,000	282,000
Establish land treatment measures on forest land	Acres	[b/]	66,000	316,000

[a/] Included in the upland type wildlife habitat acreage shown.

[b/] No significant amount of general treatment applied under ED objective except in some local cases.

The need for surface areas of water for recreational activities is predicted to be an estimated 21 percent greater by 2020 while the need for recreational facilities of all types would be about 30 percent greater.

Approximately 40 million additional cubic feet per year of harvested material from forest resources would be lost by lack of proper utilization by 2020. It is further estimated the existing need for regeneration of forest land by restocking would increase 3,200,000 acres by 2020.

It is estimated that under going programs, only about 20 percent of the needed upland wildlife habitat management and 15 percent of the needed wetland areas would be met.

The quality of land and the suitability of water quality for fish habitat would continue to decline to some degree. Sediment deposition in channels would decline only about 10 percent by 2020. Erosion on forest land would increase consistent with increased harvesting. Erosion of roadsides and streambanks along with gully erosion is expected to continue at the existing rate. The mileage of streams having severe and moderate pollution are expected to increase about four percent by 2020.

ECONOMIC DEVELOPMENT ALTERNATIVE

Planned Measures

The objective of the ED alternative is to promote national economic development by increasing the value of the nation's output of goods and services and improving national economic efficiency. Elements included in the ED alternative were selected on the basis of their ability to satisfy component needs while emphasizing national economic development. Environmental values under this alternative are considered only to the minimum extent required by federal or state regulations or policies of the implementing agency.

Descriptions of Planned Measures For ED Alternative

Floodwater Damage Reduction and Improved Drainage

Separable floodwater damages can be reduced with 3 floodwater storage reservoirs. This would protect approximately 218 homes and businesses and 300 acres of agricultural land.

Inseparable flood damages and impaired drainage losses would be reduced by the installation of about 1,685 miles of channel work with appurtenant structures, 10 miles of levees and associated land treatment measures. This would benefit an estimated 724,000 acres of agricultural land.

Table IV.2 - Proposed Early-Action Measures of the ED Alternative
Ouachita River Basin

Planned Measures
Floodwater Damage Reduction and Improved Drainage
Construct 3 floodwater storage reservoirs to reduce flooding.
Construct 1,685 miles of channels and appurtenances to reduce flooding and improve drainage.
Construct onfarm associated land treatment to improve drainage and water quality, and reduce erosion and sedimentation.
Water Supply and Management
Construct 160 farm ponds for livestock and poultry water supply to increase the available supply of surface water.
Construct 380 ponds for fish farming to increase the supply of fish ponds.
Forest Resources
Improve the utilization to yield 18,758,000 cubic feet of harvested material. Restock 1,518,000 acres of poorly stocked areas to increase the quality and quantity of forest lands.
Recreation
Construct 79 boat ramps with associated facilities to make available 15,000 surface acres of existing water for fishing, boating, and water skiing.
Construct 1,650 picnic tables and associated facilities.
Construct 7 beaches (1,610,000 sq. ft.) and associated facilities for swimming.
Construct 3,540 camping sites for tents and recreational vehicles, and 200 cabins for group camping.
Construct 187 miles of trails with associated facilities for horseback riding, bicycling, and hiking.

Continued -

Table IV.2 Continued

Planned Measures
Improve hunting on 33,000 acres.
Biological Resources and Ecosystems
Develop, improve, and maintain 80,000 acres of upland type wildlife habitat which includes a management program for 72,000 acres of bottomland hardwoods.
Establish a management program for 24,000 acres of wetlands.
Manage 170 farm ponds for improved fish habitat.
Provide support in protecting 10 threatened and endangered species of flora and fauna.
Recognize 12 unique ecological communities.
Areas of Natural Beauty
Recognize 15 scenic streams.
Recognize 6 unique botanical systems.
Recognize 4,000 acres of open and green space (urban environments).
Recognize 20,000 acres of wilderness areas
Cultural Resources
Recognize 1,590 selected cultural sites of archaeological, historical, and geological importance.
Land and Water Quality
Install land treatment measures on 591,000 acres of agricultural land.

Table IV.3 - Component Costs of the ED Alternative
Ouachita River Basin

Component	Total Installation Costs	Average Annual Costs[a/]
	- - - - - - - dollars	- - - - - - - -
Floodwater Damage Reduction and Improved Drainage	164,636,000	18,017,000
Improved Forest Production	55,590,000	4,155,000
Recreation	43,381,000	5,008,000
Biological Resources and Ecosystems	885,000	347,000
TOTAL	264,492,000	27,527,000[b/]

a/ Total installation costs amortized at 6 7/8 percent. Average annual costs include annual operation, maintenance, and replacement costs.

b/ There are additional estimated average annual land treatment costs of $407,000 for improving land and water quality and onfarm ponds for agricultural water supply. Benefits for the land treatment measures were not evaluated.

Table IV.4 - Monetary Benefits of the ED Alternative
Ouachita River Basin

Purpose	Benefits
	dollars
Flood Prevention and Improved Drainage	22,950,000
Sediment Reduction	824,000
Improved Forest Production	10,021,000
Increased Recreation	4,826,000
Labor Resource Utilization	279,000
TOTAL	38,900,000

Table IV.5 - Elements of Proposed Early-Action USDA PL-566 and Resource Conservation and Development Projects Included in Economic Development Alternative
Ouachita River Basin

Watershed	Watershed Area	Flood Prevention Only: Reservoirs	Flood Prevention Only: Agricultural Area Benefited	Flood Prevention and Improved Drainage: Channel Work	Flood Prevention and Improved Drainage: Agricultural Area Benefited	Recreation	Land Treatment: Wildlife Habitat Management: Upland Type	Land Treatment: Wildlife Habitat Management: Wetlands	Land Treatment: Agricultural Land	Fish Habitat Management	Installation Costs
	acres	no.	acres	miles	acres	visitor days provided for	acres			no. farm ponds mgd.	
PL-566											
East Carroll	223,700			360	173,500	18,100	4,500	1,300	114,000		44,399,000
West Franklin	244,700			294	150,100	106,200	11,400	700	144,800		25,172,000
Bayou LaFourche Monroe-Bastrop	317,600			381	81,100	362,400	43,600	12,000	104,900	22	34,807,000
Port De Luce	28,000	2[a]	300				4,000		1,400		5,967,000
Jonesville to Larto Lake	108,900			130	61,300	1,000	2,000	5,400	59,300		9,895,000
East Richland	218,300			262	150,100	95,800	10,000	3,100	109,500	48	28,512,000
West Richland	115,500			138	56,300	102,800	4,700	1,500	57,500	100	17,046,000
Subtotal PL-566	12,603,900	2	300	1,565	672,400	686,300	80,200	24,000	591,400	170	165,798,00
RC&D											
Upper Bayou D'Arbonne (Caney Creek)	4,100	1[b]	None								1,109,000
TOTAL	12,608,000	3	300	1,565	672,400	686,300	80,200[c]	24,000	591,400	170	166,907,000

[a] Will provide urban protection to Winnfield, La.

[b] Will provide urban protection to Homer, La.

[c] Includes 72,000 acres of bottomland hardwoods.

Water Supply and Management

Agricultural water availability will be increased by the construction of 540 farm ponds that will provide 18 million gallons of water per day for livestock, poultry, and fish farming.

Recreation water will be increased by the construction of a 5,000-acre reservoir that will create an additional 5,000 surface acres of water for fishing, boating, and water skiing.

Forest Resources

Technology is available to lower the percentage of wood which is wasted when timber is harvested. Federal, state, and private consulting foresters are working now to disseminate this technology to the public in order to increase wood production about 18.8 million cubic feet by 1990, without increasing the number of acres harvested.

The loss of pine sites due to encroachment by hardwoods will be reduced by the planting of pine seedlings on about 1.5 million acres.

Recreation

Recreational opportunities will be increased by the following planned facilities:

Fishing, boating, and water skiing opportunities will increase as a result of approximately 15,000 surface acres of water made available for these purposes by the construction of 79 boat ramps.

Available areas for swimming will be increased by installing 7 beaches with associated facilities totalling 1,610,000 sq. ft.

Camping facilities will be increased by the addition of 3,540 tent and recreational vehicle sites and 200 group cabins.

Picnicking activity will be increased by the addition of 1,650 tables and associated facilities.

Approximately 187 miles of trails with associated facilities for horseback riding, bicycling, and hiking will be constructed.

Hunting will be improved on 33,000 acres of land.

Biological Resources and Ecosystems

Eighty thousand acres of upland type wildlife habitat, including 72,000 acres of bottomland hardwoods, will be developed, improved, and maintained.

Twenty four thousand acres of wetlands will be maintained, managed, and protected.

One hundred seventy farm ponds will be managed for fish habitat improvement.

Ten threatened and endangered species of flora and fauna will be protected by concerned agencies and organizations.

Twelve unique ecological communities will be recognized.

Areas of Natural Beauty

Fifteen scenic streams, 20,000 acres of wilderness areas, 6 unique botanical systems, and 4,000 acres of open and green space will be recognized.

Cultural Resources

Selected cultural resources of archaeological, historical, and geological importance will be recognized on 1,590 sites.

Land and Water Quality

The resource management systems to be installed will be aimed at maintaining the long-term productivity of the resource base. The installation of these systems will result in about 591,000 acres of agricultural land being adequately protected. All areas adequately protected will have erosion rates within the allowable limit of five tons per acre per year.

Stream pollution will be alleviated by the planned land treatment program, but effects on lakes and ponds cannot be predicted with any certainty.

ENVIRONMENTAL QUALITY ALTERNATIVE

Planned Measures

The environmental quality objective is to improve environmental quality by the conservation, preservation, and restoration of the quality of certain natural and cultural resources, and ecological systems. This objective reflects society's concern and emphasis for the natural environment and its maintenance and enhancement as a source of present enjoyment and a heritage for future generations.

The EQ alternative recognizes the desirability of diverting a portion of the nation's resources from production of more conventional market-oriented goods and services in order to accomplish environmental objectives. As incomes and living standards increase, society appears less willing to accept environmental deterioration in exchange for additional goods and services. Elements included in the EQ alternative were selected on the basis of their ability to satisfy component needs while emphasizing environmental quality.

Table IV.6 - Proposed Early-Action Measures of the EQ Alternative
Ouachita River Basin

Planned Measures
Floodwater Damage Reduction and Improved Drainage
Construct 3 floodwater storage reservoirs to reduce flooding.
Construct 762 miles of channels and appurtenances to reduce flooding and improve drainage.
Construct onfarm associated land treatment to improve drainage and water quality, and reduce erosion and sedimentation.
Water Supply and Management
Construct 160 farm ponds for livestock and poultry water supply to increase the available supply of surface water.
Construct 380 ponds for fish farming to increase the supply of fish ponds.
Forest Resources
Improve the utilization to produce 18,758,000 cubic feet of harvested material.
Restock 1,464,000 acres of poorly stocked areas to increase the quality and quantity of forest land.
Recreation
Construct 46 boat ramps with associated facilities to make available 11,000 surface acres of existing water for fishing, boating, and water skiing.
Construct 1,650 picnic tables and associated facilities.
Construct 7 beaches (1,610,000 sq. ft.) and associated facilities for swimming.
Construct 3,480 camping sites for tents and recreational vehicles, and 200 cabins for group camping.
Construct 187 miles of trails with associated facilities for horseback riding, bicycling and hiking.
Improve hunting on 30,500 acres.

Continued -

Table IV.6 - Continued

Planned Measures
Biological Resources and Ecosystems
Develop, improve, and maintain 142,000 acres of upland type wildlife habitat that includes 128,000 acres of bottomland hardwoods.
Create 3,200 acres of bottomland hardwoods.
Create 315 acres of wetlands.
Establish a program to properly manage 52,000 acres of wetlands.
Manage 170 farm ponds for improved fish habitat.
Provide support in protecting 10 threatened and endangered species of flora and fauna.
Recognize 12 unique ecological communities.
Areas of Natural Beauty
Recognize 15 scenic streams, wilderness areas, and botanical systems.
Recognize 6 unique botanical systems.
Recognize 4,000 acres of open and green space (urban environments).
Recognize 20,000 acres of wilderness areas.
Cultural Resources
Recognize 1,590 selected cultural sites of archaeological, historical, and geological importance.
Land and Water Quality
Install land treatment measures on 282,200 acres of agricultural land.
Establish land treatment measures on 316,000 acres of forest land.

Table IV.7 - Component Costs of the EQ Alternative
Ouachita River Basin

Component	Total Installation Costs	Average Annual Costs [a/]
	dollars	
Floodwater Damage Reduction and Improved Drainage	85,831,000	8,611,000
Improved Forest Production	53,692,000	4,014,000
Recreation	42,015,000	4,703,000
Biological Resources and Ecosystems	2,008,000	695,000
TOTAL	183,546,000	18,023,000 [b/]

a/ Total installation costs amortized at 6 7/8 percent. Average annual costs include annual operating, maintenance, and replacement costs.

b/ There are additional estimated average annual land treatment costs of $10,609,000 for improving land and water quality and onfarm ponds for agricultural water supply. This includes an estimated average annual income of $10,296,000 foregone by restricting harvesting on 249,400 acres of forest land. Benefits for land treatment measures were not evaluated.

Table IV.8 - Monetary Benefits of the EQ Alternative
Ouachita River Basin

Purpose	Average Annual Benefits
	dollars
Flood Prevention and Improved Drainage	10,485,000
Sediment Reduction	525,000
Improved Forest Production	9,682,000
Increased Recreation	3,910,000
Labor Resource Utilization	216,000
TOTAL	24,818,000

Table IV.9 - Elements of Proposed Early-Action USDA PL-566 and Resource Conservation and Development Projects Included in Environmental Quality Alternative
Ouachita River Basin

Watershed	Watershed Area	Flood Prevention Only		Flood Prevention and Improved Drainage		Recreation	Land Treatment			Fish Habitat Management	Installation Costs
							Wildlife Habitat Management		Agricultural Land		
		Reservoirs	Agricultural Area Benefited	Channel Work	Agricultural Area Benefited		Upland Type	Wetlands			
	acres	no.	acres	miles	acres	visitor days provided for	acres			no. farm ponds mgd.	
PL-566											
East Carroll				160	68,800	18,100	17,400	2,700	54,400		18,800,000
West Franklin				118	50,700	82,400	21,000	1,400	69,100		14,662,000
Bayou LaFourche Monroe-Bastrop				152	65,400	172,500	62,900	26,000	50,000	22	18,313,000
Port De Luce		2	300				7,700		700		6,338,000
Jonesville to Larto Lake				52	22,400	1,000	5,000	11,800	28,300		6,487,000
East Richland				105	45,000	52,700	19,100	6,800	52,200	48	13,014,000
West Richland				55	23,700	54,900	9,300	3,100	27,500	100	7,481,000
Subtotal PL-566		2	300	642	276,000	381,600	142,000	52,000	282,200	170	85,095,000
RC&D											
Upper Bayou D'Arbonne (Caney Creek)		1									1,109,000
TOTAL		3	300	642	276,000	381,600	142,400[a/]	52,000	282,200	170	86,204,000

[a/] Includes 128,000 acres of bottomland hardwoods.

Description of Planned Measures For EQ Alternative

Floodwater Damage Reduction and Improved Drainage

Separable floodwater damages can be reduced with 3 floodwater storage reservoirs. This would protect approximately 218 homes and businesses and 300 acres of agricultural land.

Inseparable flood damages and impaired drainage losses would be reduced by the installation of about 762 miles of channel work with appurtenant structures, 10 miles of levees, and associated land treatment measures. This would benefit an estimated 328,000 acres of agricultural land.

Water Supply and Management

Agricultural water availability will be increased by the construction of 540 farm ponds that will yield 18 mgd of water for livestock and poultry.

Recreation water will be increased by the construction of a 5,000-acre reservoir that will create an additional 5,000 surface acres of water for fishing, boating, and waterskiing.

Forest Resources

Approximately 18,758,000 cu.ft. of harvested material will be utilized more efficiently.

Approximately 1,464,000 acres of land will be restocked to increase forest material for harvesting.

Recreation

Recreational opportunities will be increased by the following planned facilities.

Fishing, boating, and water skiing opportunities will increase as a result of approximately 11,000 surface acres of water made available for these purposes by the construction of 46 boat ramps.

Available areas for swimming will be increased by installing 7 beaches totalling 1,610,000 sq.ft.

Camping facilities will be increased by the addition of 3,480 tent and recreation vehicle sites and 200 group cabins.

Picnicking activity will be increased by the addition of 1,650 tables and associated facilities.

Approximately 187 miles of trails with associated facilities for horseback riding, bicycling, and hiking will be constructed.

Hunting will be improved on approximately 30,500 acres of land.

Biological Resources and Ecosystems

About 142,000 acres of upland wildlife habitat, including 128,000 acres of bottomland hardwoods will be developed, improved, and maintained.

Bottomland hardwood stands will be created on 3,200 acres for upland type wildlife habitat.

Fifty two thousand acres of wetlands will be maintained, managed and protected.

Wetlands will be created on 315 acres.

One hundred seventy farm ponds will be constructed for fish habitat.

Ten threatened and endangered species of flora and fauna will be protected by concerned agencies and organizations.

Twelve unique ecological communtiies will be recognized.

Areas of Natural Beauty

Fifteen scenic streams, 20,000 acres of wilderness areas, and 6 unique botanical systems, and 4,000 acres of open and green space will be recognized.

Cultural Resources

Selected cultural resources of archaeological, historical, and geological importance will be recognized on 1,590 sites.

Land and Water Quality

Resource management systems that would be installed are essentially the same as the system for the NED alternative except that emphasis will be placed on those measures that reduce erosion and benefit wildlife. However, conservation measures such as crop residue management and minimum tillage (measures that improve water quality) cannot be installed in quantity because conservation measures such as farm drainage ditches, land smoothing, and drainage land grading (measures that increase crop production) must be installed as a prerequisite.

The installation of resource management systems will adequately protect about 282,000 acres of agricultural land. Areas treated adequately will have erosion rates within the allowable limit of five tons per acre per year.

Land treatment measures will be installed on 316,000 acres of forest land to reduce erosion and sediment. This includes improved site preparation methods on about 22,000 acres of harvested forest land, proper road construction and maintenance on about 44,000 acres, and

restricted timber harvest on about 250,000 acres. Restricting the timber harvest on this acreage also will help maintain the forest base by helping to keep the annual harvest rate at or below the annual growth rate.

Stream pollution will be alleviated by the planned land treatment program, but the effects on lakes and ponds cannot be predicted with any certainty.

EFFECTIVENESS OF ALTERNATIVE PLANS

Table IV.10 displays the comparative effectiveness of the two alternatives and the recommended plan to alleviate the stated needs of the Ouachita River Basin.

Table IV.10 - Effectiveness of ED and EQ Alternatives and Recommended Plan, 1990
Ouachita River Basin

COMPONENT NEEDS		Amount of Need 1990	ED		Recommended Plan		EQ	
Description	Unit		Plan Effects	Remaining Need	Plan Effects	Remaining Need	Plan Effects	Remaining Need
1. Flood Prevention and Improved Drainage[a/]								
a. Flood prevention only								
Agriculture (crop and pasture)	Acres	315,500	300	315,200	300	315,200	300	315,200
	Dollars	6,768,000	5,000	6,763,000	5,000	6,763,000	5,000	6,763,000
Urban (amount damages)	Dollars	375,000	158,000	217,000	158,000	217,000	158,000	217,000
b. Inseparable flood prevention and improved drainage								
Agriculture (crops and pasture)	Acres	1,512,000	672,400	839,600	568,000	944,000	276,000	1,236,000
	Dollars	43,005,000	19,749,000	23,256,000	15,204,000	27,801,000	9,059,000	33,946,000
c. Other damage[b/]	Dollars	2,695,000	1,098,000	1,597,000	833,000	1,862,000	457,000	2,238,000
d. Indirect damages	Dollars	5,284,000	1,940,000	3,344,000	1,800,000	3,484,000	806,000	4,478,000
Total	Dollars	58,127,000	22,950,000	35,177,000	18,000,000	40,127,000	10,485,000	47,642,000
2. Water Supply and Storage								
a. Public supply	MGD	24	0	24	0	24	0	24
b. Agriculture	MGD	114	34	80	34	80	34	80
c. Recreation	Surface Acres	418,000	10,000	408,000	5,000	413,000	1,000	417,000
3. Forest Resources								
a. Improved utilization of harvested material	Mil. Cu. Ft.	75	19	56	19	56	19	56
b. Restocking	Acres	2,300,000	1,518,000	782,000	1,518,000	782,000	1,464,000	836,000
4. Recreation (Tabulated in 1,000's)								
Facilities								
a. Fishing, boating, waterskiing	Available Sur. Ac. (1,000)	418	15	403	14	404	11	407
b. Swimming (beach)	Sq. Ft. (1,000)	4,110	1,610	2,500	1,610	2,500	1,610	2,500
c. Camping								
1. Tenting and recreation vehicles	No. Sites (1,000)	19	3.5	15.5	3.5	15.5	3.5	15.5
2. Group cabins	No. Cabins (1,000)	.7	.2	.5	.2	.5	.2	.5
d. Picnicking	No. Tables (1,000)	10	1.6	8.4	1.6	8.4	1.6	8.4
e. Trails	Miles (1,000)	13	.2	12.8	.2	12.8	.2	12.8
f. Hunting	Acres (1,000)	2,140	33	2,107	33	2,107	31	2,109
Use	Visitor Days (1,000)	55,000	3,000	52,000	1,559	53,441	2,900	52,100

Continued -

Table IV.10 - Continued

COMPONENT NEEDS Description	Unit	Amount of Need 1990	ED Plan Effects	ED Remaining Need	Recommended Plan Plan Effects	Recommended Plan Remaining Need	EQ Plan Effects	EQ Remaining Need
5. Biological Resources and Ecosystems								
a. Hardwoods								
Upland stream bottoms								
Establishment	Acres	700	0	700	0	700	0	700
Management	Acres (1,000)	331	0	331	0	331	0	331
Bottomlands								
Establishment	Acres (1,000)	411	1.0	410	.8	410.2	.3	410.7
Management	Acres (1,000)	1,454	72	1,382	84	1,370	128	1,324
b. Wetlands								
Establishment	Acres (1,000)	491	.2	491	.7	490.3	.3	490.7
Management	Acres (1,000)	894	24	870	26	868	52	842
c. Wildlife upland type habitat management	Acres (1,000)	6,191	80	6,111	93	6,098	142	6,049
d. Fish habitat								
Farm pond management	No.	6,310	170	6,140	170	6,140	170	6,140
e. Threatened and endangered species	No.	10	0	10	0	10	0	10
f. Unique ecological communities	No.	12	0	12	0	12	0	12
6. Acres of Natural Beauty								
a. Recognize wilderness areas	Acres	20,000	20,000	0	20,000	0	20,000	0
b. Recognize open and green space	Acres	4,000	4,000	0	4,000	0	6,000	0
c. Recognize scenic streams	No.	15	15	0	15	0	15	0
d. Recognize botanical systems	No.	6	6	0	6	0	6	0
7. Cultural Resources								
a. Recognize archaeological sites	No.	1,045	1,045 c/	c/	1,045	c/	1,045	c/
b. Recognize historical sites	No.	535	535	c/	535	c/	535	c/
c. Recognize geological sites	No.	10	10	c/	10	c/	10	c/

Continued -

Table IV.10 - Continued

COMPONENT NEEDS		Amount of Need	ED		Recommended Plan		EQ	
Description	Unit	1990	Plan Effects	Remaining Need	Plan Effects	Remaining Need	Plan Effects	Remaining Need
8. Land and Water Quality								
a. Erosion reduction								
Agricultural land	Acres (1,000)	2,643	591	2,052	456	2,187	282	2,361
Forest land	Acres (1,000)	439	0	439	67	372	316	123
Roadsides and streambanks	Miles	6,800	0	6,800	0	6,800	0	6,800
Strip mines	Acres	8,000	0	8,000	0	8,000	0	8,000
Gullies	Miles	120	0	120	0	120	0	120
b. Sediment reduction								
Channel deposition Amt required to be removed	1,000 Cu. Yds.	11,777	1,030	10,747	910	10,867	756	11,021
Cost of removal	Dollars	9,422,000	824,000	8,598,000	728,000	8,694,000	605,000	8,817,000
Overland deposition	Acres	342,000	0	342,000	0	342,000	0	342,000
c. Agricultural pollution reduction								
Streams[d/]								
Severe and moderate	Miles	5,000[e/]	1,300	3,700	1,060	3,940	950	4,150
	Acres	27,100[f/]	11,000	16,100	8,900	18,200	8,000	19,100
Lakes	No.	[g/]						
Ponds	No.	[g/]						

[a/] Average annual values.

[b/] Includes roads and bridges, farm lanes and fencing, and miscellaneous.

[c/] Possible sites for historic register in addition to existing sites not predictable for 1990 and 2020.

[d/] Louisiana only.

[e/] Includes 3,200 miles of severe pollution and 1,800 miles of moderate pollution.

[f/] The 3,200 miles of severely polluted streams consists of 15,500 surface acres, and the 1,800 miles of moderately polluted streams consists of 11,600 surface acres.

[g/] Projections not made because the lakes and ponds adversely affected by pollution and benefited by ongoing programs could not be predicted. Likewise, project effects could not be estimated.

APPENDIX

OUACHITA RIVER BASIN STUDY
ARKANSAS AND LOUISIANA

APPENDIX - RESOURCE BASE

GENERAL DESCRIPTIONS

TABLES

FIGURES

GENERAL DESCRIPTIONS

LOCATION AND SIZE

The Ouachita River and its tributaries drain an area of about 25,900 square miles in Arkansas and Louisiana of which approximately 14,400 square miles are in southeastern Arkansas and 11,500 square miles are in Northeastern Louisiana. The study area and watersheds are depicted in Figure A.1. The drainage area constitutes all or part of 28 counties in Arkansas and 22 parishes in Louisiana.

From its source near Mena in Polk County, Arkansas, near the Oklahoma state line, the Ouachita River flows about 50 miles eastward through steep terrain into Lake Ouachita, a 40,100-acre reservoir built by the Corps of Engineers for power generation, flood control, recreation, fish and wildlife, and flows for navigation. From Lake Ouachita, the river flows southeastward through the Ouachita Mountain Major Land Resource Area (MLRA) then to Lake Hamilton, then to Lake Catherine. These lakes, both private developments on the Ouachita River near Hot Springs, operate in tandem to produce hydroelectric power. About six miles below Lake Catherine, the river emerges from the Ouachita Mountains MLRA into the Southern Coastal Plain MLRA, bends abruptly and flows southwesterly about 25 miles to Arkadelphia. From Arkadelphia, the river bends gently southward, then southeastward through forested bottomlands until it leaves the Southern Coastal Plain MLRA a few miles north of Monroe, Louisiana. After the Ouachita leaves the Southern Coastal Plain MLRA, it enters the Southern Mississippi Valley Alluvium MLRA and continues a generally southeasterly course to its outlet into the Red River near Acme, Louisiana. The Ouachita River is navigable from its mouth to Camden, Arkansas a distance of about 350 river miles. The principal urban areas in the Basin are Hot Springs, Arkadelphia, Camden, Malvern, Pine Bluff, and El Dorado in Arkansas; and Monroe, West Monroe, Tallulah, Bastrop, Ruston, and Pineville.

CLIMATE

Variable exposure to contrasting air masses determines the climate of the Basin. Tropical air masses are replaced by polar air masses in three- to five-day cycles during late fall, winter, and early spring causing successive warming and cooling. Warm fronts often produce general rains of low to moderate intensity. Cold fronts usually cause rapid temperature drops and high intensity rains of short duration. Turbulent air movement occasionally produces violent wind storm's which may include tornadoes. Average precipitation over the Basin is approximately 51 inches annually.

Winter temperatures ordinarily fall within a range of 20°F (-7°C) and 70°F (21°C). The lowest recorded temperature in the Basin was -21°F (-29°C) at Mt.Ida, Arkansas, in the Ouachita Mountain MLRA, in February 1951. The lowest recorded temperature at the southern end of the Basin was 3°F (-16°C) in Alexandria, Louisiana in February, 1899. Snowfall is

CONSERVATION NEEDS INVENTORY

WATERSHEDS IN LOUISIANA

[illegible]

Figure A.1

WATERSHEDS

OUACHITA RIVER BASIN ARKANSAS AND LOUISIANA

0 16 32 48 64 MILES

APPROXIMATE SCALE

ALBERS EQUAL AREA PROJECTION COMPILED AND REPRODUCED AT 1:1,000,000 (1 INCH EQUALS 16 MILES) ALSO REPRODUCED AT 1:1,500,000 (1 INCH EQUALS 24 MILES)

BASE COMPILED FROM 1:2,000,000 STATE BASE MAPS AND FIELD INFORMATION

SOURCE: Soil Conservation Service, Conservation Needs Inventory.

REVISED JUNE 1975 4-R-33308A

REVISED JUNE 1975 BASE 4-R-32173

USDA-SCS-FORT WORTH TEXAS 1979

infrequent and usually light. Average annual snowfall ranges from less than one inch in the south to approximately five inches in the Ouachita Mountains at the northern tip of the Basin.

Summer weather is characterized by sluggish movement of air masses. Cold fronts rarely move through. The prevailing flow of tropical air from the Gulf of Mexico favors development of localized convective thunderstorms, especially in the afternoon. The maritime air mass is displaced at times by continental air masses, which usually produce hotter, drier weather. Occasionally, tropical cyclones or easterly waves bring general rains of varying amounts. Summer temperatures normally range between 70°F (21°C) and 95°F (35°C). When continental air masses prevail, temperatures may exceed 100°F (38°C). The highest recorded temperature in the Basin was 116°F (47°C) at Mt.Ida, Arkansas in August 1936. Figure A.2 depicts average rainfall and temperature information at various locations in the Basin.

The average number of frost-free days ranges from approximately 210 days in the Ouachita Mountains MLRA to 240 days in the northern lowlands and 255 days in the south.

LAND

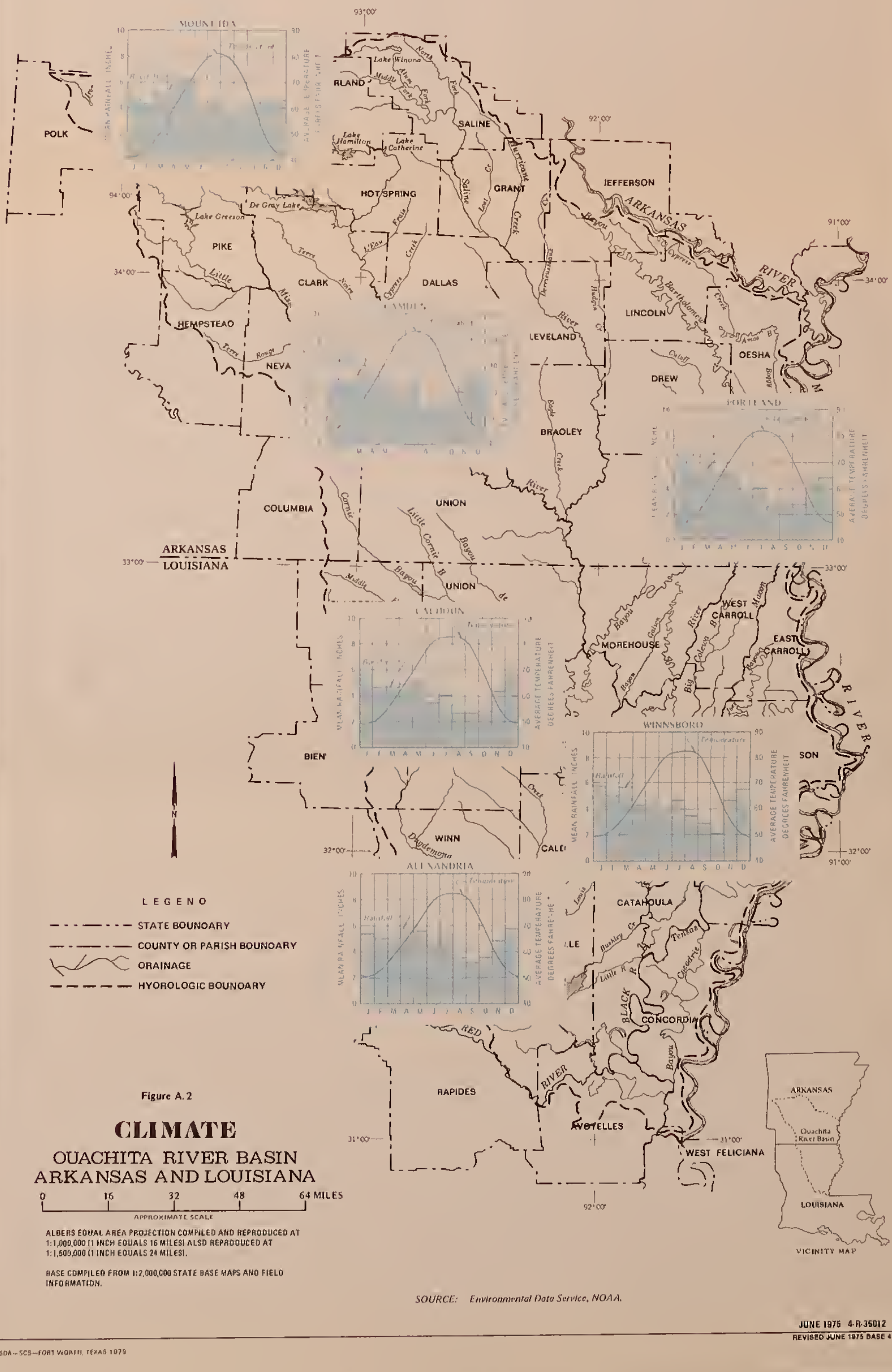
Basin Area

The total area of the Ouachita River Basin encompasses about 16.6 million acres.

The following tabulation, rounded to the nearest 100 acres, represents existing conditions for 1970:

	Land	Large Water	Small Water	Total Land and Water
		Acres		
Arkansas	9,084,400	121,200	24,400	9,230,000
Louisiana	7,177,100	103,800	65,100	7,346,000
Total	16,261,500	225,000	89,500	16,576,000

Land areas, therefore, account for 98 percent of the total Basin area.



LEGEND

- STATE BOUNDARY
- COUNTY OR PARISH BOUNDARY
- DRAINAGE
- HYDROLOGIC BOUNDARY

Figure A.2

CLIMATE

OUACHITA RIVER BASIN
ARKANSAS AND LOUISIANA

0 16 32 48 64 MILES

APPROXIMATE SCALE

ALBERS EQUAL AREA PROJECTION COMPILED AND REPRODUCED AT 1:1,000,000 (1 INCH EQUALS 16 MILES) ALSO REPRODUCED AT 1:1,500,000 (1 INCH EQUALS 24 MILES).

BASE COMPILED FROM 1:2,000,000 STATE BASE MAPS AND FIELD INFORMATION.

SOURCE: Environmental Data Service, NOAA.

JUNE 1975 4-R-35012

REVISED JUNE 1975 BASE 4-R-32173

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General Soils and Major Land Resource Areas

The U.S. Department of Agriculture uses a land classification system that divides the United States into Land Resource Regions. These Regions are further divided into Major Land Resource Areas (MLRA's). Each MLRA is a geographical area of land consisting of soils that are similar in slope, erosion, climate, origin and land use. Contrasts between MLRA's are usually distinct and in many cases, very abrupt. 1/

The Basin is partially in three Land Resource Regions. They are the East and Central General Farming and Forest Region, the Mississippi Delta Cotton and Feed Grain Region, and the South Atlantic and Gulf Slope Cash Crop, Forest, and Livestock Region.

The Basin lies partially in five MLRA's. These are the Southern Mississippi Valley Alluvium (MLRA 131), Southern Coastal Plains (MLRA 133), Southern Mississippi Valley Silty Uplands (MLRA 134), Texas Blackland Prairie (MLRA 86) and Ouachita Mountains (MLRA 119). See Figure 3.

Southern Mississippi Valley Alluvium (MLRA 131) - This includes areas of level to gently undulating bottom land soils formed from sediments of the Arkansas, Ouachita, Red, and Mississippi Rivers. It makes up about 45 percent of the Basin in Louisiana and 11 percent in Arkansas. The soils are high in natural fertility and crops respond well to recommended fertilizers, however, many need flood protection and improved drainage.

Southern Coastal Plains (MLRA 133) - This is an area of gently sloping to strongly sloping mostly well drained soils. Some areas along local streams and broad flats are somewhat poorly to poorly drained. The soils in this MLRA are formed in a group of geologic formations that are mostly marine in origin. This MLRA makes up about 46 percent of the Basin in Louisiana and 59 percent in Arkansas.

The soils are low in natural fertility, however crops respond moderately well to fertilizers. Much of this area was cleared at one time and used for crop production. Because of low soil fertility,

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1/ U.S. Department of Agriculture, Soil Conservation Service, Land Resource Regions and Major Land Resources Areas of the United States, Agriculture Handbook No. 296 (Washington: U.S. Government Printing Office, 1965.

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

MAJOR LAND RESOURCE AREAS AND GENERAL SOIL ASSOCIATIONS

SOUTHERN MISSISSIPPI VALLEY ALLUVIUM[1/]

1. SHARKEY association[2/]: Level to gently undulating clayey [3/] and loamy soils
2. SHARKEY-BUXIN-ALLIGATOR association, flooded: Level to gently undulating clayey soils that are subject to flooding.
3. ROXANA-NORWOOD association: Level to gently sloping loamy soils.
4. PERRY-PORTLAND association: Level to gently undulating clayey soils.
5. BILLA-HEBERT association: Level to gently undulating loamy soils.
6. DESHA association: Level to gently undulating loamy and clayey soils.

SOUTHERN COASTAL PLAIN

7. SAWYER-SUSQUEHANNA association: Nearly level to steeply sloping, moderately well drained and somewhat poorly drained soils.
8. SMITHDALE-SACUL-KIRVIN association: Gently to strongly sloping, well drained and moderately well drained soils.
9. RUSTON association: Very gently to steeply sloping well drained soils.
10. FRIZZELL-PROVIDENCE-GUYTON association: Level to gently sloping, moderately well drained to poorly drained soils.
11. BOSWELL-KIRVIN association: Gently and steeply sloping, moderately well and well drained soils.
12. CADEVILLE-LIBUSE association: Gently and steeply sloping moderately well drained soils.
13. GORE-MUSKOGEE-ACADIA association: Nearly level to strongly sloping, somewhat poorly and moderately well drained soils.
14. ANACOCO-VAIDEN association: Moderately sloping, moderately well drained and somewhat poorly drained soils
15. ALAGA-SMITHDALE association: Nearly level to moderately steep, somewhat excessively drained, and well drained soils.
16. ANY association, flooded: Level, poorly drained soils that are subject to flooding.
17. ANY-PHEBA-SAVANNAH association: Nearly level to gently sloping, poorly drained, somewhat poorly drained, and moderately well drained soils.
18. ANGIE-SACUL association: Nearly level to steep, moderately well drained soils.
19. OLEVIN-SACUL association: Gently and moderately sloping, well drained and moderately well drained soils.
20. OUACHITA-AMY association, flooded: Level, well drained and poorly drained soils that are subject to flooding.
21. PHEBA-SAVANNAH-AMY association: Level to gently sloping, somewhat poorly drained, moderately well drained, and poorly drained soils.
22. SACHELL-SACUL association: Gently to moderately sloping well drained and moderately well drained soils.
23. SAVANNAH-SMITHDALE association: Nearly level to moderately sloping well drained and moderately well drained soils.
24. SMITHDALE-SACUL association: Gently sloping to moderately steep well drained and moderately well drained soils.
25. SMITHTON-SAVANNAH association: Level and nearly level, poorly drained and moderately well drained soils.
26. TIPPAH-SACUL association: Nearly level to moderately sloping, moderately well drained soils.

SOUTHERN MISSISSIPPI VALLEY SILTY UPLANDS

27. GRENADA-CALLOWAY-CALHOUN association: Level to gently sloping moderately well to poorly drained soils.
28. CALLOWAY-HENRY-GRENADA association: Level to nearly level somewhat poorly drained, poorly drained, and moderately well drained soils

BLACKLAND PRAIRIES

29. OKTIBBEHA-SUMTER association: Gently sloping and moderately sloping, moderately well drained and well drained loamy and clayey soils.

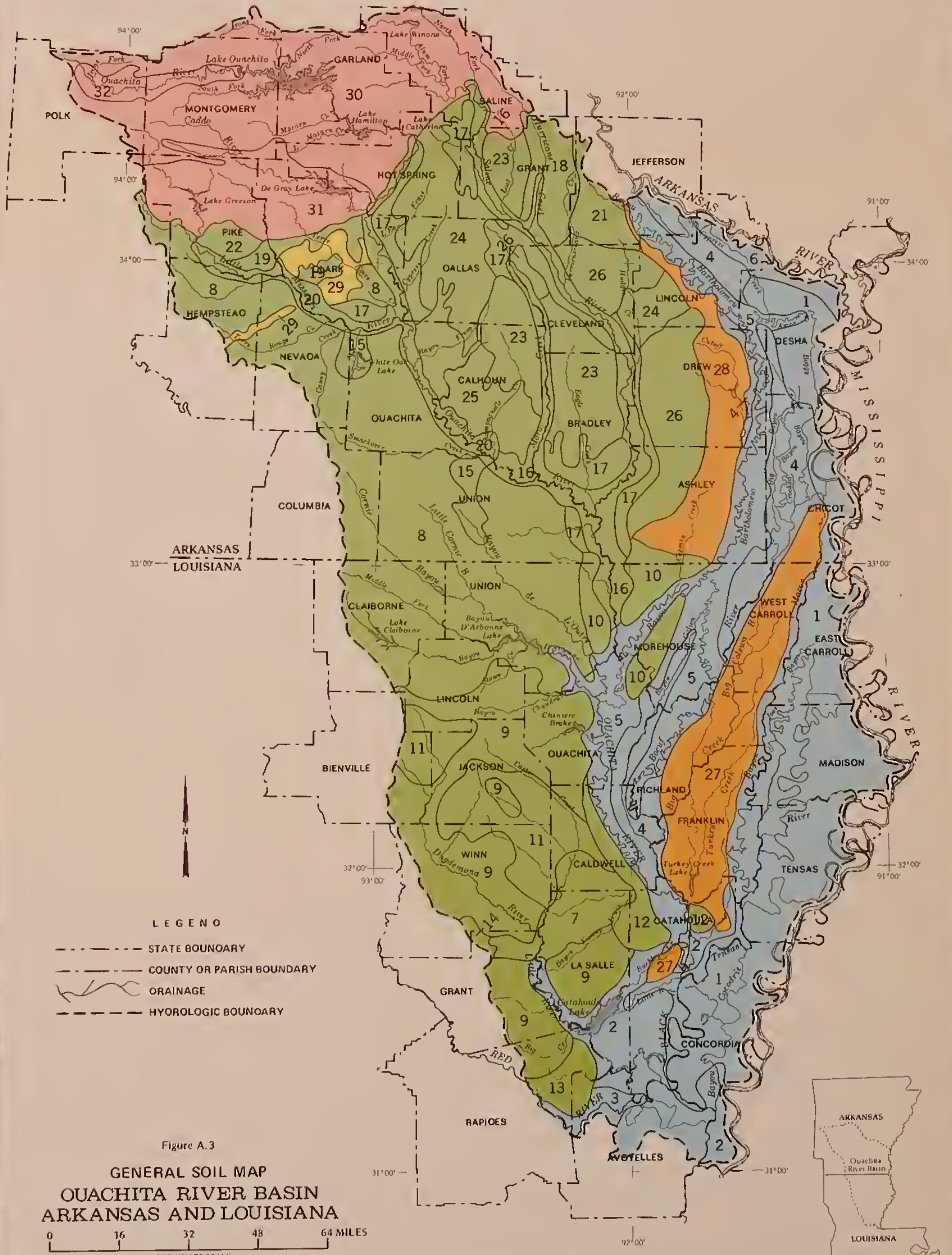
OUACHITA MOUNTAINS

30. CARNASAW-TOWNLEY association: Deep and moderately deep well drained, clayey soils with loamy surfaces on steep low mountains.
31. SHELLWOOD-TOWNLEY association: Moderately deep, well drained loamy and clayey soils on gently rolling and rolling low mountains.
32. WICKHAM-ALTAVISTA-CONGAREE association: Deep, well drained and moderately well drained loamy soils on nearly level to gently sloping stream terraces and on flood plains.

1/ Major land resource area

2/ General soil association

3/ Unless otherwise indicated, the texture refers to the subsoil



LEGEND

- STATE BOUNDARY
- COUNTY OR PARISH BOUNDARY
- DRAINAGE
- HYDROLOGIC BOUNDARY

Figure A.3

GENERAL SOIL MAP

OUACHITA RIVER BASIN
ARKANSAS AND LOUISIANA

0 16 32 48 64 MILES

APPROXIMATE SCALE

ALBERS EQUAL AREA PROJECTION COMPILED AND REPRODUCED AT 1:1,000,000 (1 INCH EQUALS 16 MILES) ALSO REPRODUCED AT 1:1,500,000 (1 INCH EQUALS 24 MILES).

BASE COMPILED FROM 1:2,000,000 STATE BASE MAPS AND FIELD INFORMATION.

Note: This General Soil map is suitable for broad planning purposes only. For more detailed planning on individual tracts of land, a detailed soil survey is needed.

Source: Original draft by State Soil Survey Staff.

VICINITY MAP

DECEMBER 1975 4-R-35292

REVISED JUNE 1975 BASE 4-R-32173

USDA—SCS—FORT WORTH, TEXAS 1970

excessive soil losses from erosion and field sizes that are not suited to modern tillage equipment, most of the farms have been abandoned. As a result, afforestation either by natural reseeding or planting has taken place.

Southern Mississippi Valley Silty Uplands (MLRA-134) - This is a nearly level to gently sloping area formed from material deposited by the wind.. This MLRA is locally known as the "Mason Ridge", and makes up about 9 percent of the Basin in Louisiana and about 5 percent in Arkansas.

The soils are low in natural fertility, but crops generally respond well to fertilizers.

Texas Blackland Prairies (MLRA 86) - This area includes deep gently sloping to moderately sloping clayey and loamy soils formed from calcareous marls and chalks. It makes up about 1 percent of the Basin in Arkansas. The soils are medium in natural fertility and crops give good response to fertilizers.

Ouachita Mountains (MLRA 119) - This area includes deep and loamy soils on gently rolling to steep low mountains and level to nearly level, loamy soils along stream terraces and flood plains. It makes up about 24 percent of the Basin in Arkansas. The soils are low in natural fertility and give moderate response to fertilizers.

Each Major Land Resource Area is further divided into soil associations. Soil associations generally consist of one or more major soils for which it is named and several minor soils. There are 32 in the Basin. Table A.1 gives the distribution by states.

Geology

The exposed geology of the Basin ranges in age from Palezoic to Quaternary. The outcropping of the various geologic groups are illustrated in Figure A.4.

Quaternary: Alluvium and Terrace deposits occur in the flood plain of the Mississippi River, the Ouachita River, the Arkansas River, the Red River, and along major tributaries of these rivers. Terrace deposits have a normal depositional sequence of gravel to sand to silt to clay. In many locations the Pleistocene gravels are in contact with the Recent alluviums. This accounts for the tremendous aquifer generally referred to as the "alluvium aquifer" which is found in the vicinity of the Mississippi River.

While the surficial material is normally clays and silts, the clays are generally quite expansive and this fact, along with the presence of tree roots and burrowing animals, allows a high recharge rate to the aquifer.

Table A.1 - Soil Associations by States
Ouachita River Basin, Arkansas and Louisiana[a/]

Soil Association	Arkansas	Louisiana	Total
	acres		
Sharkey Association	241,700	1,481,500	1,723,200
Sharkey-Buxin-Alligator Association, Flooded	-	606,800	606,800
Roxana-Norwood Association	-	71,100	71,100
Perry-Portland Association	398,700	397,300	796,000
Rilla-Hebert Association	301,400	574,800	876,200
Desha Association	72,200	-	72,200
Sawyer-Susquehanna Association	-	227,000	227,000
Smithdale-Sacul-Kirvin Association	1,560,100	973,700	2,533,800
Ruston Association	-	1,240,900	1,240,900
Frizzell-Providence-Guyton Association	53,400	203,800	257,200
Boswell-Kirvin Association	-	497,800	497,800
Cadeville-Libuse Association	-	142,000	142,000
Gore-Muskogee-Acadia Association	-	113,900	113,900
Anacoco-Vaiden Association	-	29,600	29,600
Alaga-Smithdale Association	106,800	-	106,800
Amy Association, Flooded	499,700	48,700	548,400
Amy-Pheba-Savannah Association	305,200	-	305,200
Angie-Sacul Association	171,700	-	171,700
Blevin-Sacul Association	141,100	-	141,100
Ouachita-Amy Association, Flooded	316,600	-	316,600
Pheba-Savannah-Amy Association	125,900	-	125,900
Saffell-Sacul Association	53,400	-	53,400
Savannah-Smithdale Association	633,200	-	633,200
Smithdale-Sacul Association	595,000	-	595,000
Smithton-Savannah Association	309,000	-	309,000
Tippah-Sacul Association	568,300	-	568,300
Grenada-Calloway-Calhoun Association	50,800	737,100	787,900
Calloway-Henry-Grenada Association	410,200	-	410,200
Oktibbeha-Sumter Association	92,200	-	92,200
Carnasaw-Townley Association	1,632,200	-	1,632,200
Sherwood-Townley Association	476,200	-	476,200
Wickham-Altavista-Congaree Association	115,000	-	115,000
Total	9,230,000	7,346,000	16,576,000

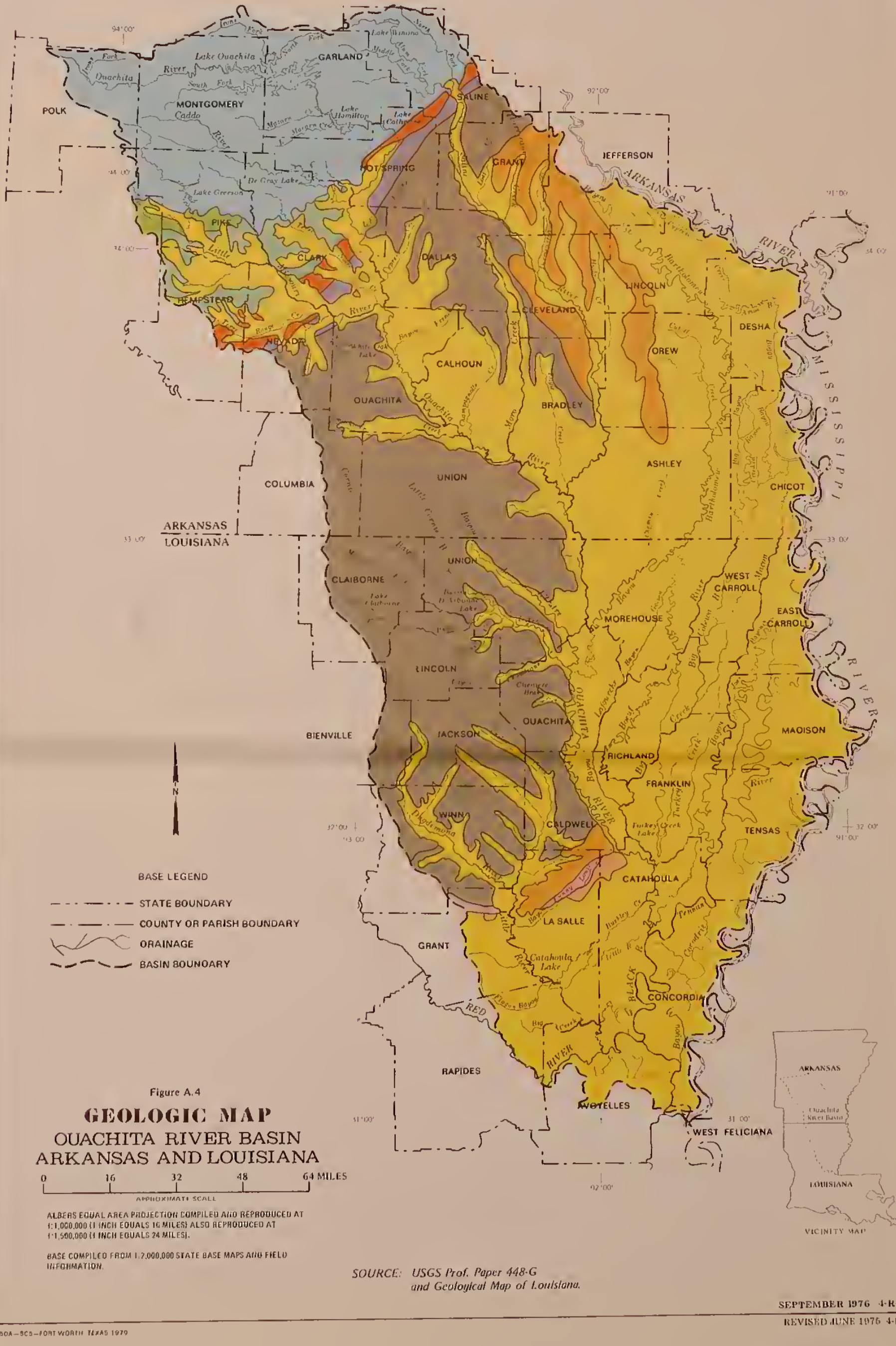
[a/] Includes large and small water.

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

LEGEND

SYSTEM	GROUP
QUATERNARY	Alluvium and Terrace
TERTIARY	Grand Gulf
	Vicksburg
	Jackson
	Claiborne
	Wilcox
	Midway
CRETACEOUS	Upper Cretaceous
	Lower Cretaceous
PALEZOIC	Paleozoic Rocks (undifferentated)



BASE LEGEND

- STATE BOUNDARY
- COUNTY OR PARISH BOUNDARY
- ORAINAGE
- BASIN BOUNOARY

Figure A.4

GEOLOGIC MAP

OUACHITA RIVER BASIN ARKANSAS AND LOUISIANA

0 16 32 48 64 MILES

APPROXIMATE SCALL

ALBERS EQUAL AREA PROJECTION COMPILED AND REPRODUCED AT 1:1,000,000 (1 INCH EQUALS 16 MILES) ALSO REPRODUCED AT 1:1,500,000 (1 INCH EQUALS 24 MILES).

BASE COMPILED FROM 1:2,000,000 STATE BASE MAPS AND FIELD INFORMATION.

SOURCE: USGS Prof. Paper 448-G and Geological Map of Louisiana.

SEPTEMBER 1976 4-R-35729

REVISED JUNE 1976 4-R-32173

USDA—SCS—FORT WORTH, TEXAS 1979

Tertiary: The Tertiary System has four series; the Miocene, Oligocene, Eocene, and Paleocene.

The Miocene series is divided into two formations; the Fleming and the Catahoula. The Fleming consists of freshwater fluviatile sands and brackish water silts and clays. The Catahoula formation consists of sands, sandy clays and tuffaceous siltstones. Neither of these formations provide a major aquifer.

The Oligocene series consists of the Vicksburg Group. This Group is characterized by near shore materials with lignite being present in some of the formations. The Vicksburg does not offer any major aquifers. Neither the Miocene nor the Oligocene is mapped in Arkansas. This is probably due to nondeposition.

The Eocene series consists of the Jackson, Claiborne, and Wilcox Groups. The Jackson Group outcrops along the uplands of the Saline River in Arkansas and in Caldwell and LaSalle Parishes, Louisiana. The Group is relatively thin and is not considered an aquifer. The Claiborne Group outcrops over a large area of the Basin. The Group is primarily sands, sandy clays, and gravel of the Cockfield, Cook Mountain, Sparta, and Cane River formations. This Group provides one of the two highly productive aquifers of the Basin. The Wilcox Group outcrops in a narrow northeast-southwest band in the Arkansas portion of the Basin and in a small portion of Winn Parish in Louisiana. The formation contains large quantities of water.

The Paleocene series is represented by the Midway group. It generally consists of dark clays and outcrops in the Arkansas portion of the Basin. Small quantities of water are produced from this Group near the outcrop area.

Cretaceous: Formations of Cretaceous Age outcrop in the drainage of the Antonine and Little Missouri Rivers in Arkansas. The thin to a feather edge to the northwest against the Palezoic rocks. The Cretaceous is a source of moderate amounts of water.

Paleozoic: Formation of Paleozoic Age form the headwaters of the Ouachita River. The rocks are relatively brittle and in the thicker sandstone layers there are numerous fractures. Springs are common along the lower slopes.

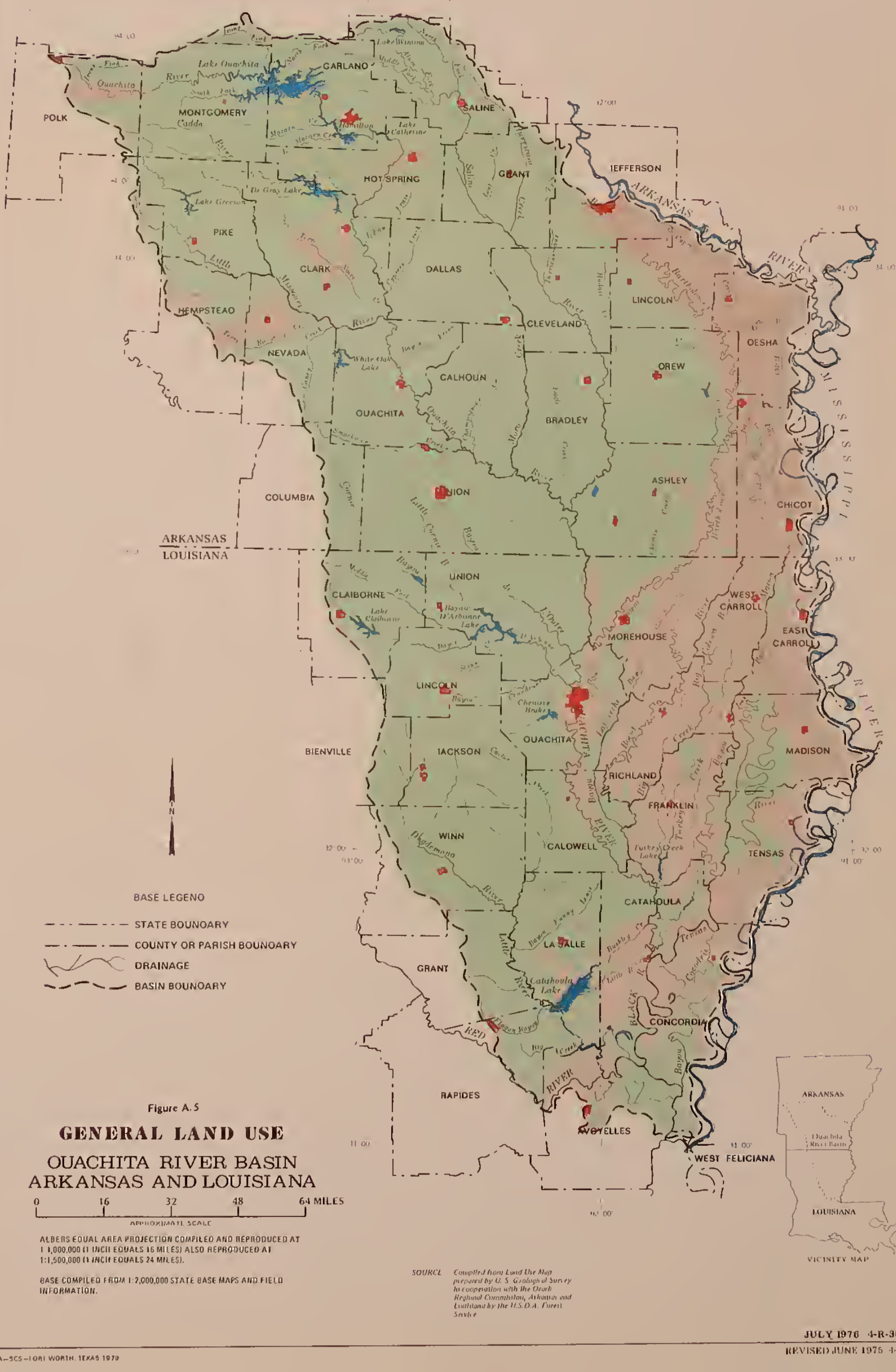
Land Use

Cropland, pastureland, forest land, and other agricultural land total about 14.8 million acres. Public land (including land owned by local, state, and federal governments), urban and built-up, and small water make up about 1.6 million acres. The remaining 200,000 acres are in large water.

Approximately 2.9 million acres are devoted to cropland. Major crops grown are soybeans and cotton. Other crops grown are rice, sorghum, corn, wheat, and truck crops (mostly tomatoes and sweet potatoes).

LAND USE LEGEND

- AGRICULTURAL LAND (Cropland and Pastureland)
- FOREST LAND
- URBAN and BUILD-UP
- WATER



BASE LEGEND

- STATE BOUNDARY
- COUNTY OR PARISH BOUNDARY
- DRAINAGE
- BASIN BOUNDARY

Figure A.5

GENERAL LAND USE

OUACHITA RIVER BASIN ARKANSAS AND LOUISIANA

0 16 32 48 64 MILES

APPROXIMATE SCALE

ALBERS EQUAL AREA PROJECTION COMPILED AND REPRODUCED AT 1:1,000,000 (1 INCH EQUALS 16 MILES) ALSO REPRODUCED AT 1:1,500,000 (1 INCH EQUALS 24 MILES).

BASE COMPILED FROM 1:2,000,000 STATE BASE MAPS AND FIELD INFORMATION.

SOURCE *Compiled from Land Use Map prepared by U. S. Geological Survey in cooperation with the Ozark Regional Commission, Arkansas and Louisiana by the U.S.D.A. Forest Service*

JULY 1976 4-R-36603

REVISED JUNE 1975 4-R-32173

USDA—SCS—FORT WORTH, TEXAS 1976

Table A.7 - Land use by subbasins and states for 1970
Ouachita River Basin

Sub-Basins	Large Water	National Forest	Other Public Land	Urban and Built-up	Small Water	Cropland	Pasture	Forest	Other	Total
	acres									
Arkansas										
Ouachita	79,800	482,900	14,400	144,000	6,700	63,100	425,000	2,536,500	22,200	3,774,600
Little Missouri	13,700	49,400	15,800	37,800	1,700	51,000	242,600	907,800	12,000	1,331,800
Saline	5,600	52,800	1,200	68,900	5,500	32,700	188,000	1,470,300	28,800	1,853,800
Cornie Bayou 1/	200	4,100	100	12,300	500	7,400	52,000	279,600	1,400	357,600
Bayou Bartholomew	6,300	0	11,800	30,800	5,600	199,600	96,000	539,300	5,900	895,300
Boeuf River	2,600	0	15,100	17,800	2,200	343,900	86,900	64,400	4,300	537,200
Tensas (Bayou Macon)	11,100	0	700	5,700	1,300	208,000	53,300	55,100	3,000	338,200
Total	119,300	589,200	59,100	317,300	23,500	905,700	1,143,800	5,853,000	77,600	9,088,500
Louisiana										
Ouachita	13,100	0	500	37,000	10,700	98,500	54,600	696,300	5,900	916,600
Bayou Bartholomew	0	0	500	8,000	1,400	49,000	9,300	115,700	1,500	185,400
Boeuf River	11,300	0	16,500	42,900	17,700	466,800	136,100	327,700	12,200	1,031,200
Cornie Bayou 2/	5,300	2,000	400	3,900	700	4,500	6,900	107,300	800	131,800
Boeuf R., Tensas R. and B. Macon	600	0	100	5,700	2,600	135,200	27,800	19,700	4,300	196,000
Bayou Macon	0	0	0	500	200	13,800	900	8,600	700	24,700
Bayou Macon and Boeuf River	100	0	400	7,900	1,700	180,300	25,300	28,700	4,500	248,900
Bayou Macon and Tensas River	2,100	0	200	5,200	1,600	205,900	16,600	85,200	11,200	328,000
Tensas River	6,000	0	1,200	11,200	7,200	279,800	80,900	249,600	9,200	645,100
Bayou D'Arbonne	18,200	10,500	1,400	35,400	3,500	24,600	68,200	569,900	6,700	738,400
Dugdemona River	700	47,900	400	13,000	1,100	14,200	32,800	478,100	3,700	591,900
Castor Creek	700	0	0	11,700	700	8,300	17,500	556,300	3,900	599,100
Little River	9,200	111,700	18,600	13,300	3,300	50,500	10,000	454,800	5,600	677,000
Red River Tributaries	32,000	0	88,000	14,100	5,100	189,000	28,400	261,400	7,800	625,800
Bayou Cocodrie	5,800	0	13,600	9,000	6,200	122,800	46,200	168,400	7,300	379,300
Boeuf River and Bayou Bartholomew	700	0	0	500	2,200	108,800	16,000	16,400	12,900	157,500
Total	105,800	172,100	141,800	219,300	65,900	1,952,000	577,500	4,144,100	98,200	7,476,700
BASIN TOTAL	225,100	761,300	200,900	536,600	89,400	2,857,700	1,721,300	9,997,100	175,800	16,565,200

1/ Does not include watersheds that will be evaluated by Louisiana

2/ Includes watersheds in Arkansas that will be evaluated by Louisiana

About 1.7 million acres are managed for permanent pastureland. Plants such as common bermudagrass, dallisgrass, and clovers furnish most of the summer roughage for the livestock industry. In addition to hay harvested during the normal growing season, cover crops planted on cropland offers grazing during the late fall and winter months.

There are about 10.0 million acres of private forest land in the Basin. Most of this is in the upland land resource areas (see figure 5) in the western and northwestern part of the study area. The present condition of the forest resources generally ranges from poor in the delta to good in the uplands. The forest produces a variety of forest products, with lumber and woodpulp being the most important.

Other land makes up about 200,000 acres. Included in this land use category is farmsteads, farm roads, feed lots, nonfarm residences, urban and built-up areas less than 10 acres, and gravel and borrow pits.

Table A.2 gives the land distribution by states and subbasins. The land use map shows the general location of the various land uses.

Vegetative Types

Major vegetative types will be described as forested and nonforested. In the forested category, six timber types exist. The forested area totals 10,758,500 acres, or 65 percent of the total Basin area. In the nonforested category, there are two types: cropland and pastureland vegetative types. Total area for the two types is 4,579,000 acres or 28 percent of the Basin area.

The forest timber types include loblolly-shortleaf pine, longleaf-slash pine, oak-pine, oak-hickory, oak-gum-cypress, and elm-ash-cottonwood. General forest types are illustrated in appendix figure A.6.

Pine types are predominantly in the uplands of the Southern Coastal Plain Land Resource Area MLRA and to a lesser extent in the Ouachita Mountains MLRA. The longleaf-slash pine type is small in area and found only in LaSalle, Grant, Rapides, and Winn Parishes in Louisiana.

Oak-pine and oak-hickory types are found scattered throughout the Southern Coastal Plain MLRA and the Ouachita Mountains MLRA. The majority of the oak-pine type is present in the Arkansas portion of the Basin. Much of the oak-hickory type is found in the Southern Mississippi Valley Silty Uplands MLRA in Arkansas.

Oak-gum-cypress type is distributed throughout the flood plains of the larger streams in the Southern Mississippi Valley Alluvium MLRA, Southern Coastal Plain MLRA, and the Southern Mississippi Valley Silty

LEGEND

- LONGLEAF - SLASH PINE
- LOBLOLLY - SHORTLEAF PINE
- OAK - PINE
- OAK - HICKORY
- OAK - GUM - CYPRESS
- NON - FOREST

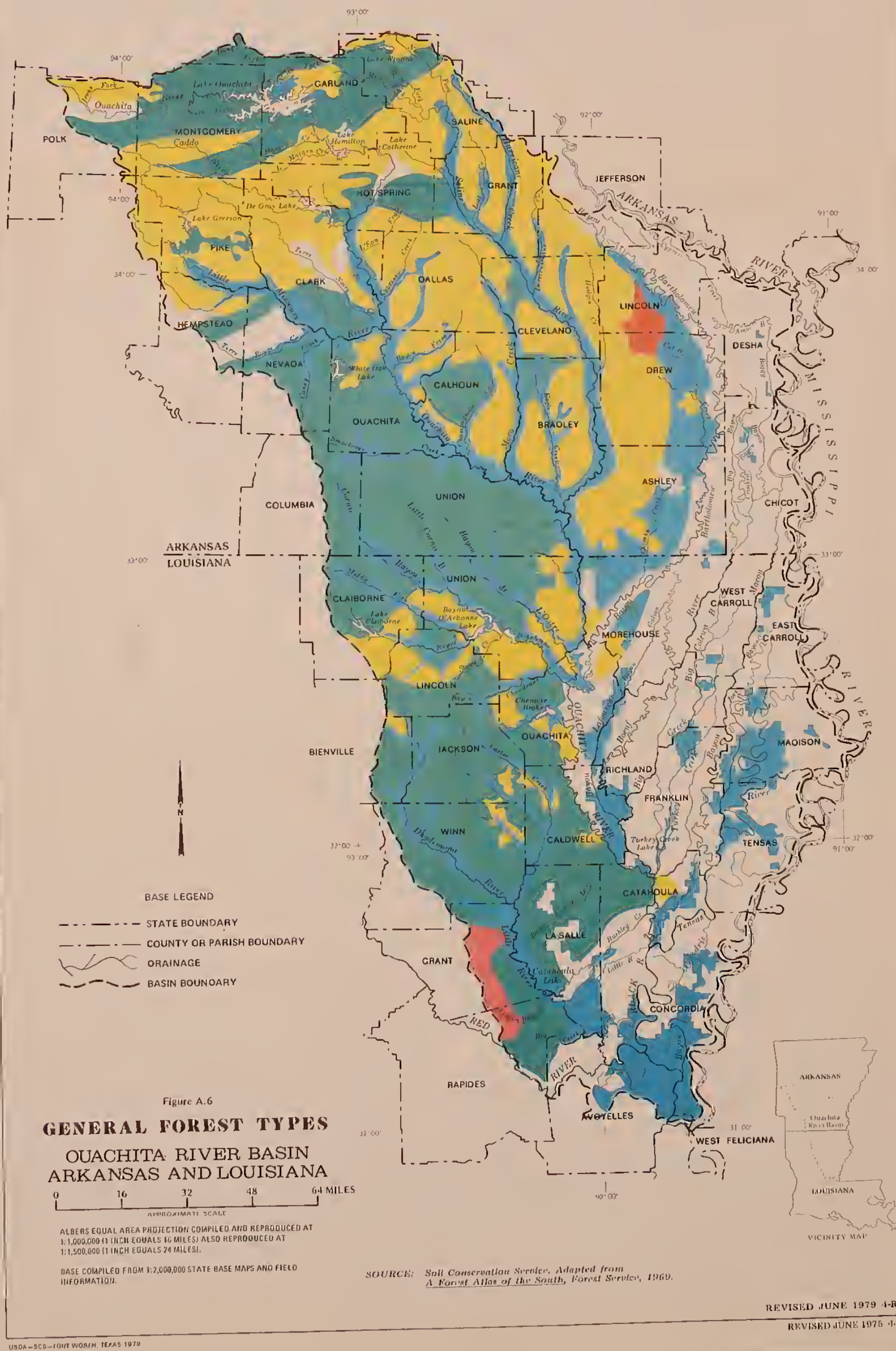


Figure A.6

GENERAL FOREST TYPES

OUACHITA RIVER BASIN ARKANSAS AND LOUISIANA

0 16 32 48 64 MILES

APPROXIMATE SCALE

ALBERS EQUAL AREA PROJECTION COMPILED AND REPRODUCED AT 1:1,000,000 (1 INCH EQUALS 16 MILES) ALSO REPRODUCED AT 1:1,500,000 (1 INCH EQUALS 24 MILES).

BASE COMPILED FROM 1:2,000,000 STATE BASE MAPS AND FIELD INFORMATION.

SOURCE: Soil Conservation Service, Adapted from A Forest Atlas of the South, Forest Service, 1969.

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REVISED JUNE 1975 4-R-32173

USDA—SCS—FORT WORTH, TEXAS 1979

Uplands MLRA. Elm-ash-cottonwood type is found primarily in the Southern Mississippi Valley Alluvium MLRA with minor acreage in the Southern Mississippi Valley Silty Uplands MLRA. Land clearing for agricultural purposes in the Southern Mississippi Valley Alluvium MLRA has severely reduced the bottomland hardwood type. Remaining areas are small, isolated blocks with the exception of the state-owned wildlife management areas.

The nonforested vegetative types include cropland and pastureland. Cropland vegetation is composed of crops including cotton, soybeans, rice, corn, wheat, truck crops, and grasses and forbs associated with this culture. Pasture vegetation present includes bermudagrass, bahiagrass, dallisgrass, fescue, clovers, ryegrass, and other grasses and forbs.

Land Capability Units

Capability Classes, the broadest groups, are designated by Roman numerals I through VIII. Class I soils have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. Class VIII soils and landforms are rough, shallow, or otherwise limited so that they do not produce worthwhile yield of crops, forage, or wood products. Classes I, II, and III are suitable for cropland, Class IV is marginal for cropland, and Classes V-VIII are unsuitable for cropland.[3/]

Capability Subclasses show soils in the same class that have similar problems; they are designated by adding a small letter, "e" or "w". The letter "e" shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; "w" shows that water in or on the soil surface interferes with plant growth or cultivation[4/].

Soil Productivity Groups

A soil productivity group (SPG) consists of two or more land capability units that have similar yield characteristics, responses to fertilizers, and management requirements. The soils included in a soil productivity group may occur in one or more major land resource area (MLRA) and are sufficiently homogeneous to permit a reasonable degree of accuracy in estimating and projecting crop yields. These groups were developed to be used in the analysis of Basin-wide conditions and impacts.

[3/] U.S. Department of Agriculture, Soil Conservation Service Land Capability Classification, Agriculture Handbook No. 210. (Washington: U.S. Government Printing Office, 1961), pp. 6-10.

[4/] Ibid., pp. 10-11.

The soil productivity groups were developed separately, but with a consistent procedure for each state. Although some soils occur in both states, differences in the soil identification systems employed by each state necessitated unique productivity groups for soils in each state.

WATER RESOURCES

Surface Water

Availability

The average annual surface yield of all streams in the Basin is approximately 20,800,000 acre-feet or 15 watershed inches, and ranges from 10 to 24 inches in various localities. The least amounts of runoff occur near the middle of the Basin and the greatest amounts occur in the Ouachita Mountains and at the extreme southern end of the Basin. See figure A.7.

The major influence on total surface yield is the amount of rainfall. Seasonal variations in runoff are influenced by seasonal rainfall and evapotranspiration rates, and by springflow rates. Variations between regions are principally due to variations in rainfall. Detailed information concerning surface yield including generalized seasonal and annual yield probabilities for streams and monthly flow rate probabilities have been published in the Water Resource Special Report. These data generally show that seasonal variations in rainfall of different locations are prime factors in surface water availability.

In addition, volume of flow and other factors determine availability of surface water. These include (1) availability of reservoir storage, (2) costs of constructing reservoirs and distribution facilities, (3) costs of treating water, and (4) requirements for downstream releases. Physically viable sites for small and large scale reservoirs are plentiful in the area west of Bayou Bartholomew and the Ouachita River. In the remainder of the Basin, storage availability is limited to channels, depressions, areas within closed levees, and small scale valleys in stream terraces.

Some of the better reservoir sites have already been appropriated. The more prominent reservoirs and the amount each contains for various purposes are listed in Table A.3. Almost all the reservoirs were created by construction of dams. Catahoula Lake is in a large natural depression, and is subject to limited regulation by control structures.

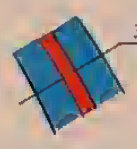
Quality

The natural quality of surface waters in the Basin is excellent for most purposes because the climate is humid. Almost all streams have more than 10 inches average annual runoff, and the soils have a low level of mineral solubility in comparison with soils in drier regions. Dissolved solids concentrations in waters that are not significantly affected by human activities seldom exceed 200 milligrams per liter.

SCALE WIDTH OF BAND

0 5 10 15 20 25

MILLION ACRE FEET



Flow at Gage in Acre Feet:
Upper figure is the average annual flow; Lower figure is the average minimum 6-month flow.

Note: Figures in parentheses are estimates where gaged information is not available.

Width of total band represents the average annual flow;
Width of inner band represents the average minimum 6-month flow.

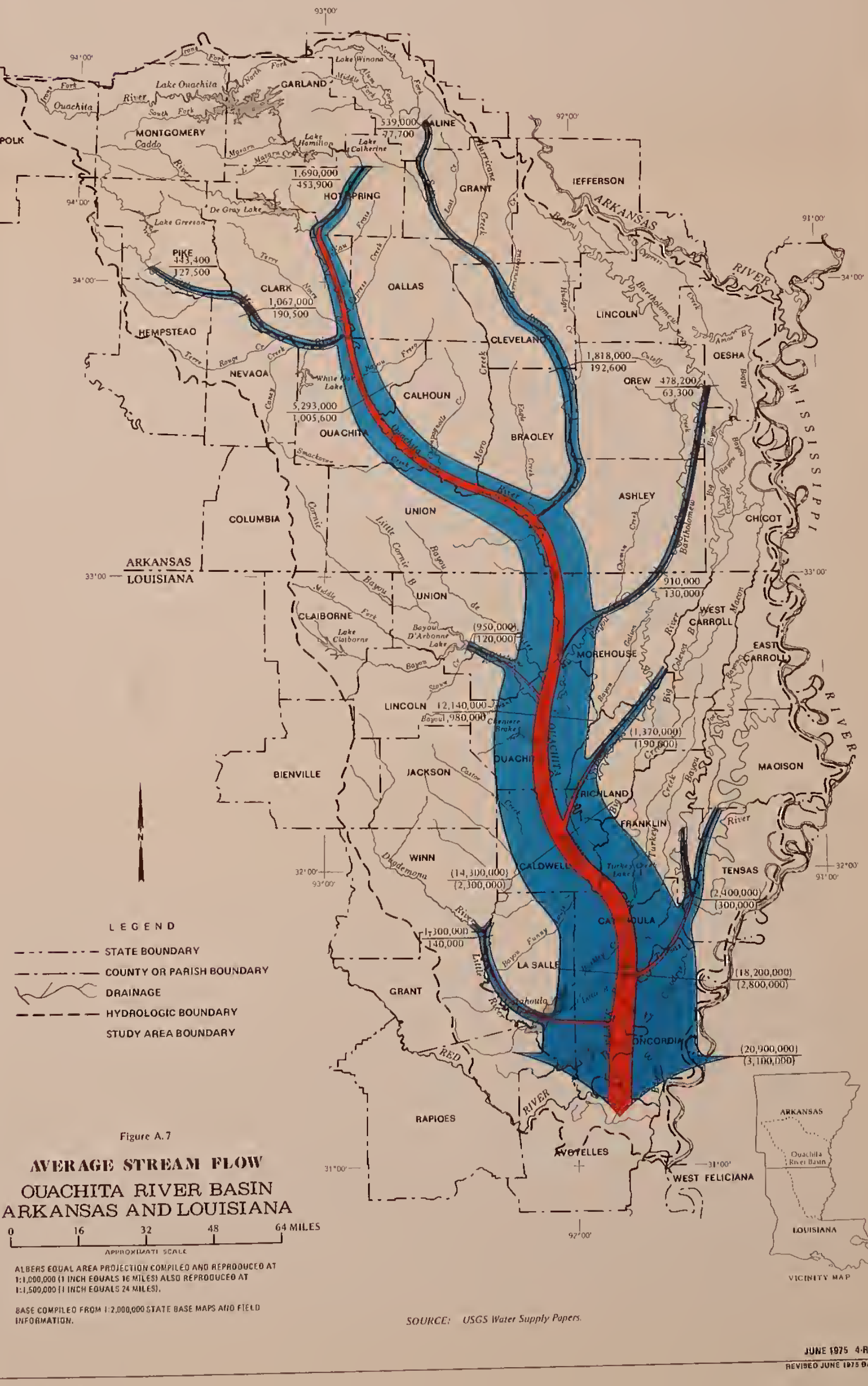


Figure A.7

AVERAGE STREAM FLOW

OUACHITA RIVER BASIN ARKANSAS AND LOUISIANA

0 16 32 48 64 MILES

APPROXIMATE SCALE

ALBERS EQUAL AREA PROJECTION COMPILED AND REPRODUCED AT 1:1,000,000 (1 INCH EQUALS 16 MILES) ALSO REPRODUCED AT 1:1,500,000 (1 INCH EQUALS 24 MILES).

BASE COMPILED FROM 1:2,000,000 STATE BASE MAPS AND FIELD INFORMATION.

SOURCE: USGS Water Supply Papers.

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REVISED JUNE 1975 BASE 4-R-32173

USDA—SCS—FORT WORTH, TEXAS 1970

Table A.3 - Prominent Reservoirs in the Ouachita River Basin

Name	Stream	Total Storage	Active Storage	Surface Area	Use[a/]
		- - - -acre-feet- - - -		acres	
Lake Ouachita	Ouachita River	2,768,100	1,903,200	48,300	P,F,R
Lake Hamilton	Ouachita River	190,000	119,600	7,200	P
Lake Catherine	Ouachita River	35,400	20,000	1,800	P
DeGray Lake	Caddo River	881,900	620,400	17,000	P,F,M,I,W
Lake Greeson	Little Missouri River	407,900	330,300	9,800	P,F,R
D'Arbonne Lake	Bayou D'Arbonne	130,000	---	15,250	R
Corney Lake	Corney Bayou	8,000	---	2,100	M
Lake Claiborne	Bayou D'Arbonne	100,000	---	6,400	M
Catahoula Lake	Little River	133,000	---	27,000	R
Cheniere Brake Lake	Bayou De L'Outre	70,000	---	4,970	R
Bayou De L'outre	Cheniere Creek	15,000	---	2,600	R
Lake Winona	Alum Fork	43,000	---	---	M
Turkey Creek	Turkey Creek	20,500	---	3,100	R

Source: Lower Mississippi Comprehensive Study, Appendix C, Vol. II

a/ P-Power, M-Municipal Water Supply, R-Recreation, F-Flood Control, I-Irrigation, W-Industrial.

Water quality parameters of many streams and lakes have changed significantly in modern times as a result of human activities. The trend of increasing adverse effects has reversed in recent years in some localities because of increased pollution abatement efforts. An example of such a reversal is indicated in the graph of annual chloride concentrations in the Ouachita River at Monroe. On the other hand, levels of some parameters such as suspended solids, plant nutrients, pesticide residues,. and turbidity in water draining from highly developed agricultural areas are increasing or have stabilized at adversely high levels.

Water quality parameters important to only limited water uses were given in Special Reports to which they apply. For instance, turbidity, suspended solids, dissolved oxygen, and pesticide residue levels are parameters important mainly to fish and wildlife, and recreation, and were presented in detail in these two Special Reports.

Pesticide concentration measurements in streams and lakes in Louisiana have not been made to any extent until recent years. Most observations have been made in highly developed agricultural areas. Measurements for various pesticides were made at 14 locations in Louisiana and details were published in the Water Resources Special Report along with water use and fishery classification for the major streams and bayous of the Ouachita River Basin.

Ground Water

Water-bearing aquifers underlie practically all the Ouachita River Basin. While water is present, in certain areas because of either quantity or quality, the source has some limitations. The different aquifers have different capabilities.

The Geologic Column published in the Water Resources Special Report contained the lithology and water-bearing characteristics of the various formations found in the Ouachita Basin.

The Major Land Resource Areas (MLRA's) within the Basin are the Southern Mississippi Valley Alluvium, the Southern Coastal Plain, the Southern Mississippi Valley Silty Uplands, the Blackland Prairies, and the Ouachita Mountains. Major aquifers within each of these MLRA's will be discussed.

In the Ouachita Mountain MLRA the Big Fork Chert supplies moderate amounts (10-75 gpm) of water. Of course, this formation is not present over the entire area, and the other water-bearing formations in the area have an even smaller yield. The ground water is of a mixed calcium and sodium bicarbonate type and is chemically suitable for most domestic and farm uses. However, some ground water is higher in calcium magnesium hardness and contains iron, manganese, chloride, nitrate, or dissolved solids in excess of concentrations recommended for water supplies by the

U.S. Public Health Service. The well yields are not adequate for extensive irrigation nor major industrial usage.

Ground water resources in the Blackland Prairie MLRA are restricted basically to water from the Upper Cretaceous, Midway, and alluvial deposits. The better wells are from the Nacatoch Sand and have a maximum capacity of 100 gpm. In areas down-dip from the outcrop the water quality becomes poor.

Ground water resources of the Southern Mississippi Valley Silty Uplands are from the Quaternary and the Tertiary. In Arkansas the Sparta Sand is productive in the northern part of the silty uplands and nonproductive in a portion of the southern part due to salt water. The Cockfield is productive in a portion of the Arkansas silty uplands. In Louisiana the Cockfield is productive and the terrace deposits are productive.

In the Southern Coastal Plains MLRA the Sparta and Cockfield are productive. Some small wells are productive from the valley alluvium. Since both the Sparta and Cockfield have sodium bicarbonate water, care must be used when using this water for irrigation. It should be noted that several large cones of depression have developed in the piezometric surface of the Sparta. These cones are located in the Monroe-Bastrop area and the El Dorado area. Salt water intrusion is also developing in the immediate vicinity of these areas. The large use of the Sparta water for industrial purposes is thought to be the cause of this condition.

While both the Sparta and Cockfield have high yields, the water is restricted to municipal and industrial usage. The waters are of the sodium bicarbonate type and could be detrimental to the land if used for irrigation.

The Southern Mississippi Valley Alluvium MLRA is the location of one of the largest aquifers, the Mississippi Valley Alluvium, in the Ouachita Basin. This is the main source of ground water and yields up to 6,000 gallons per minute can be achieved. The water is suitable for most uses although the high iron content is not desirable for domestic water. This iron content coupled with its hardness can cause difficulties with its usage in boilers, but it is excellent water for irrigation.

Selected ground water constituents, ground water withdrawals, and the quality of ground water found in the Basin were listed in detail in the Water Resources Special Report.

Use and Management

Agricultural

About 388 mgd were used for irrigation in the Basin in 1970 which constitutes about 76 percent of the total agricultural water use. About 91 mgd were used for fish farming and this constitutes about 18 percent of the agricultural water. Rural domestic and livestock used about 34

Table A.4 - Agriculture Water Use in 1970

Ouachita River Basin

State / County Or Parish	Irrigation: Rice: Ground	Irrigation: Rice: Surface	Irrigation: Other: Ground	Irrigation: Other: Surface	Irrigation: Total	Fish Farming [a/]: Catfish, Crawfish, & Minnows: Ground	Fish Farming [a/]: Catfish, Crawfish, & Minnows: Surface	Rural: Domestic	Rural: Livestock: Ground	Rural: Livestock: Surface	Total Agricultural
	million gallons per day										
Arkansas											
Ashley	15.18	1.30	2.76	0.37	19.61	6.55	0.5	0.54	0.10	0.15	27.45
Bradley	0	0	0	0	0	0.21	0.64	0.37	0.09	0.10	1.41
Calhoun	0	0	0	0	0	0	0.02	0.24	0.06	0.08	0.40
Chicot	17.28	24.86	2.70	2.86	47.70	3.48	2.32	0.49	0.21	0.31	54.51
Clark	0	1.0	0	0	1.00	0.01	0.29	0.48	0.21	0.31	2.30
Cleveland	0	0	0	0	0	0	0.15	0.36	0.12	0.13	0.76
Columbia	0	0	0	0	0	0.29	0.38	0.74	0.18	0.21	1.80
Dallas	0	0.13	0	0	0.13	0.19	0.37	0.27	0.06	0.07	1.09
Desha	43.29	11.79	25.80	3.66	84.54	11.82	1.83	0.50	0.08	0.10	98.87
Drew	13.34	2.64	0.67	8.06	24.71	8.53	0.66	0.60	0.12	0.17	34.79
Garland	0	0	0	0.10	0.10	0.33	0.04	0.74	0.10	0.13	1.44
Grant	0	0.06	0.10	0.01	0.17	0.26	0.12	0.43	0.07	0.09	1.14
Hempstead	0	0	0	0.13	0.13	0.25	0.56	0.66	0.53	0.46	2.59
Hot Spring	0	0.86	0	0.08	0.94	1.84	0.23	0.93	0.15	0.22	4.31
Jefferson	32.08	1.27	13.46	7.09	53.90	5.33	2.04	1.19	0.14	0.30	62.80
Lincoln	41.79	4.56	10.05	3.66	60.06	17.31	2.57	0.60	0.12	0.14	80.80
Montgomery	0	0	0	0.03	0.03	0.09	0	0.33	0.15	0.15	0.75
Nevada	0	0	0	0	0	0	0	0.40	0.26	0.22	0.88
Ouachita	0	0	0	0	0	0.28	0	0.77	0.13	0.14	1.32
Pike	0	0	0	0	0	0.08	0	0.45	0.25	0.17	0.95
Polk	0	0	0.02	0.16	0.18	0.22	0.24	0.60	0.28	0.21	1.73
Saline	0	0	0	0.27	0.27	0.29	0.17	1.14	0.10	0.14	2.11
Union	0	0	0	0.06	0.06	0.03	0.02	0.76	0.11	0.11	1.09
Total	162.96	48.47	55.56	26.54	293.53	57.39	13.15	13.59	3.62	4.01	385.29
Louisiana											
Avoyelles	5.58	0	0	0	5.58	1.28	0	0.48	0.56	0.24	8.14
Caldwell	1.07	0	0.11	0.42	1.60	0	0	0.16	0.03	0.15	1.94
Catahoula	0.80	0	0.36	0.	1.16	0.30	0	0.37	0.14	0.14	2.11
Claiborne	0	0	0	0	0	0	0	0.28	0.15	0.15	0.58
Concordia	0	0	0	0	0	0.48	0	0.14	0.22	0.06	0.90
East Carroll	12.50	2.19	1.18	0	15.87	0.68	0	0.30	0.07	0.01	16.93
Franklin	1.61	0	4.01	0.13	5.75	3.63	0	0.82	0.32	0.18	10.70
Grant	0	0	0	0	0	0	0	0.44	0.10	0.10	0.64
Jackson	0	0	0	0	0	0.28	0	0.14	0.05	0.03	0.50
LaSalle	0	0	0	0	0	0.05	0	0.30	0.01	0.13	0.39
Lincoln	0	0	0.04	0.07	0.11	0.07	0	0.25	0.04	0.10	0.57
Madison	5.31	0	0.73	1.20	7.24	1.88	0	0.20	0.13	0.02	9.47
Morehouse	23.43	9.38	6.40	0.50	39.71	2.56	0	0.29	0.15	0.02	42.73
Ouachita	0	2.95	0	1.52	4.47	0.77	0	0.41	0.08	0.08	5.81
Rapides	0	0	0.01	0.14	0.15	2.22	0	0.77	0.41	0.14	3.69
Richland	2.93	1.25	1.81	0.78	3.77	3.87	0	0.80	0.20	0.13	11.77
Tensas	0	0.44	0.09	0.06	0.59	0.61	0	0.27	0.26	0	1.73
Union	0	0	0	0	0	0.18	0	0.48	0.13	0.18	0.97
West Carroll	4.22	1.41	0.32	0	5.95	1.17	0	0.54	0.16	0.04	7.86
Winn	0	0	0	0	0	0.16	0	0.20	0.09	0.06	0.51
Total	57.45	17.62	15.06	4.82	94.95	20.19	0	7.54	3.30	1.96	127.94
BASIN TOTAL	220.41	66.09	70.62	31.36	388.48	77.58	13.15	21.13	6.92	5.97	513.23

Sources: Use of Water in Arkansas, 1970, Water Resource Summary No. 7, U.S. Geological Survey in Cooperation with the Arkansas Geological Commission

Pumpage of Water in Louisiana, 1970, Water Resources Pamphlet No. 26, U.S. Geological Survey in Cooperation with the Louisiana Department of Conservation, Geological Survey, and the Louisiana Department of Public Works.

[a/] Fish Farming Data for Louisiana is from Soil Conservation Service inventory data.

mgd and this constitutes the remaining 6 percent. Agricultural water use in the Basin in 1970 is presented in table A.4.

Irrigation: Rice requires more water than all other irrigated crops combined. In 1970, about 286 mgd were used for irrigating rice, and about 102 mgd were used for irrigating all other crops.

Fish-Farming: Fish-farming is done primarily in the flatland areas. Water is supplied mainly from ground water sources. Catfish, and crawfish are raised for food, and fingerlings and minnows are raised for stocking and bait.

Rural Domestic and Livestock: Normally rural residents and farmers who have their own supply systems are classed as rural domestic water users. The supply for rural domestic use is ground water.

Cattle, hogs, and poultry constitute the bulk of livestock use. Quantities used by other animals are extremely small.

Nonagricultural

Thermoelectric is the largest category of nonagricultural water use with about 856 mgd being used in 1970. Mostly, this is river water that is used for cooling and then returned to the stream. Thermoelectric water constitutes about 71 percent of the total nonagricultural water use. Industrial water use in the Basin was about 270 mgd. The largest industrial water users are oil and gas operations and paper mills. Industrial water constitutes about 22 percent of the total nonagricultural water. Public supplies amounted to about 76 mgd. This was supplied from ground water (72 percent) and from surface water (28 percent). Nonagricultural water use in the Basin in 1970 is presented in table A.5.

Thermoelectric: There are nine thermoelectric plants in the Basin -- two in Arkansas and seven in Louisiana. The plants in Arkansas -- one at Camden and one on Lake Catherine -- have a combined generating capacity of 892.5 megawatts. The total annual water withdrawal is about 905,000 acre-feet, or about 810 mgd. The plants in Louisiana -- one in Monroe, Homer, Jonesboro, Rayville, Ruston, and Sterlington -- have a total annual water withdrawal of 1,200,000 acre-feet or about 1,071.3 mgd. The consumptive use of these plants is about two percent of the withdrawal.

Additionally, there are five hydroelectric plants in the Basin, all in Arkansas. These are Blakely Mountain, Carpenter, DeGray, Narrows, and Remmel.

Municipal: In Arkansas, there are 104 cities and towns that have public water supplies. Three towns have a population over 20,000; three towns have a population from 10,000 to 20,000; five towns from 5,000 to 10,000 population; 25 towns from 1,000 to 5,000 population; and 68 towns with less than 1,000 population. These cities and towns were listed in

Table A.5 - Non-Agriculture Water Use in 1970; Ouachita River Basin

State Parish Or County	Public Supplies		Industrial		Total Municipal and Industrial	Thermoelectric		
	Ground	Surface	Ground	Surface		Ground	Surface	Total
	million gallons per day							
Arkansas								
Ashley	1.43	0	9.21	39.97	50.61	0	0	50.61
Bradley	0.64	0	0.53	0	1.17	0	0	1.17
Calhoun	0.13	0	0	0.55	0.68	0	0	0.68
Chicot	0.73	0	0.01	0	0.74	0	0	0.74
Clark	0.02	1.29	0.24	1.40	2.95	0	0	2.95
Cleveland	0.14	0	0.01	0	0.15	0	0	0.15
Columbia	1.82	0	3.17	0.43	5.42	0	0	5.42
Dallas	0.63	0	0	0	0.63	0	0	0.63
Desha	0.85	0	0.01	0	0.86	0	0	0.86
Drew	2.06	0	0.20	0	2.26	0	0	2.26
Garland	0.01	5.17	0.35	2.31	7.84	0	0	7.84
Grant	0.80	0	0.11	0.01	0.92	0	0	0.92
Hempstead	1.04	0	0.04	0	1.08	0	0	1.08
Hot Spring	0	0.85	0.62	5.04	6.51	0	584.85	591.36
Jefferson	7.83	0	51.23	0.01	59.07	0	0	59.07
Lincoln	0.42	0	0.19	0	0.61	0	0	0.61
Montgomery	0	0.09	0.06	0	0.15	0	0	0.15
Nevada	0.43	0	0.39	0	0.82	0	0	0.82
Ouachita	0.52	1.44	5.94	12.36	20.26	0	0	20.26
Pike	0.54	0.17	0.12	0.04	0.87	0	0	0.87
Polk	0.03	0.44	0.10	0	0.57	0	0	0.57
Saline	0.23	1.73	0.01	4.44	6.41	0	0	6.41
Union	4.35	0	14.38	0	18.73	0	0	18.73
Total	24.65	11.18	86.92	66.56	189.31	0	584.85	774.16
Louisiana								
Avoyelles	1.59	0	0.53	0.14	2.26	0	0	2.26
Caldwell	0.35	0	0.08	0	0.43	0	0	0.43
Catahoula	0.35	0	0.05	1.50	1.90	0	0	1.90
Claiborne	1.08	0	1.80	0	2.88	0	0	2.88
Concordia	1.53	0	0.10	0.43	2.06	0	0	2.06
East Carroll	0.40	0	0.66	0	1.06	0	0	1.06
Franklin	0.76	0	1.64	0	2.40	0	0	2.40
Grant	0.24	0.02	0.15	0	0.41	0	0	0.41
Jackson	0.95	0	13.03	0	13.98	0	0	13.98
LaSalle	0.71	0	0.14	0.10	0.95	0	0	0.95
Lincoln	2.66	0	1.71	0	4.37	0	0	4.37
Madison	0.74	0	4.00	0	4.74	0	0	4.74
Morehouse	1.94	0	20.12	27.19	49.25	0	0	49.25
Ouachita	3.10	7.73	15.21	10.52	36.56	0.14	272.00	308.70
Rapides	10.52	2.06	14.48	0	27.06	0	0	27.06
Richland	0.64	0.26	2.52	0	3.42	0	0	3.42
Tensas	0.61	0.01	0	0	0.62	0	0	0.62
Union	0.70	0	0.02	0	0.72	0	0	0.72
West Carroll	0.26	0	0.58	0	0.84	0	0	0.84
Winn	1.29	0	0.58	0.04	1.86	0	0	1.86
Total	30.42	10.08	77.35	39.92	157.77	0.14	272.00	429.91
BASIN TOTAL	55.07	21.26	164.27	106.48	347.08	0.14	856.85	1,204.07

Sources: Use of Water in Arkansas, 1970, Water Resource Summary No. 7, U.S. Geological Survey in Cooperation with the Arkansas Geological Commission.

Pumpage of Water in Louisiana, 1970, Water Resource Pamphlet No. 26, U.S. Geological Survey in Cooperation with the Louisiana Department of Conservation, Geological Survey, and the Louisiana Department of Public Works.

the Water Resources Special Report. Additionally, there are about 65 small towns and 151 named, unincorporated communities not having a public supply.

An inventory of public water supplies in Louisiana in 1975 indicated that for the 20-parish area, there were 182 public water supply systems. Of these, 164 systems are considered adequate, 10 are considered inadequate, and eight systems are not classified because a reliable estimate of the maximum dependable draft is not available. An inventory of public water supplies for Arkansas was completed in 1978.

An inventory was made of waste disposal sites in the Louisiana portion of the Basin. A summary by parishes of municipal sewage plants or lagoons, animal waste lagoons, and solid waste disposal sites was presented in the Water Resources Special Report.

Arkansas has 51 cities and towns in the Ouachita Basin with sewer systems. These were summarized in the Special Report.

Industrial: In Arkansas, four counties used most of the industrial water -- Jefferson County about 51 mgd, Ashley County about 49 mgd, Ouachita County about 18 mgd, and Union County about 14 mgd. About 60 industries are located in the Pine Bluff area of Jefferson County. In Ashley and Ouachita counties, lumber and wood products, and paper and allied products constitute the major water using industries. In Union County, petroleum products, chemicals, and allied products are the principal water using industries.

In Louisiana, four parishes used most of the industrial water -- Morehouse Parish about 47 mgd, Ouachita Parish about 26 mgd, Rapides Parish about 15 mgd, and Jackson Parish about 13 mgd. The major water using industries in these parishes are lumber and wood products, and paper and allied products.

Navigation: A canal for navigation is maintained along the main stem of the Ouachita River to Camden, Arkansas. The annual large traffic from 1967 to 1973 was about 620,315 tons. New locks and dams are under construction for improved navigation along this waterway.

ECONOMY

General Description

Twenty-three counties in Arkansas and 20 parishes (counties) in Louisiana comprise an Economic Study Area which represents the drainage area of the Ouachita River. While not corresponding exactly to the hydrologic area included in the study, these counties and parishes are representative of the economic characteristics of the Basin study area. Arkansas uses a system of counties as political subdivision and Louisiana uses a system of parishes. In this report both are referred to as counties.

Population

Population of this Economic Study Area was 1,085,800 in 1970, table A.6. From 1960 to 1970 this population had increased 2.6 percent in the Arkansas portion and 3.0 percent in the Louisiana portion.

Table A.6 Population by County, Ouachita Economic Study Area, 1970 [a/]

Arkansas County	Total	Louisiana County	Total
	Number		Number
Ashley	24,976	Avoyelles	37,751
Bradley	12,778	Caldwell	9,354
Calhoun	5,573	Catahoula	11,769
Chicot	18,164	Claiborne	17,024
Clark	21,537	Concordia	22,578
Cleveland	6,605	East Carroll	12,884
Columbia	25,952	Franklin	23,946
Dallas	10,022	Grant	13,671
Desha	18,761	Jackson	15,963
Drew	15,157	La Salle	13,295
Garland	54,131	Lincoln	33,800
Grant	9,711	Madison	15,065
Hempstead	19,308	Morehouse	32,463
Hot Spring	21,963	Ouachita	115,387
Jefferson	85,329	Rapides	118,078
Lincoln	12,913	Richland	21,774
Montgomery	5,821	Tensas	9,732
Nevada	10,111	Union	18,447
Ouachita	30,896	West Carroll	13,028
Pike	8,711	Winn	16,369
Polk	13,297		
Saline	36,107		
Union	45,428		
Subtotal	513,251		572,378

[a/] U. S. Census of Housing

The Ouachita River Basin population was 47 percent urban and 53 percent rural in 1970. Rural nonfarm population for the Arkansas and Louisiana portions were 86 and 84 percent, respectively, of the rural population.

The 47 percent of the population considered to be urban or 513,376 people is distributed as follows:

Arkansas Portion		Louisiana Portion	
Urban Center	Population	Urban Center	Population
Arkadelphia	9,841	Bastrop	14,713
Benton	16,662	Farmerville	3,416
Camden	15,147	Ferriday	5,085
Dermott	4,434	Grambling	4,407
Dumas	4,731	Haynesville	4,407
El Dorado	25,283	Homer	4,481
Eudora	3,687	Jonesboro	5,235
Hamburg	3,102	Jonesville	2,761
Hope	8,845	Marksville	4,519
Hot Springs	35,631	Monroe	56,347
Lake Village	3,310	Pinevillie	8,937
Magnolia	11,303	Ruston	17,365
Malvern	8,765	Tallulah	9,697
McGehee	4,737	Vidalia	5,538
Mena	4,530	West Monroe	14,686
Monticello	5,085	Winnfield	7,142
Pine Bluff	57,344		
Prescott	3,874		
Warren	6,433		

The rural population was 572,424 in 1979. This was 53 percent of the Study Area's population. For the year, rural population was 84.6 percent, nonfarm, and 15.4 percent farm.

The high percentage of rural residents in the Ouachita Economic Study Area is indicative that the population density is relatively low. The Arkansas study portion had population density of 24.5 and the Louisiana portion had 27.6. The average is 26 persons per square mile. This compares to the State average of 37 for Arkansas and 81 for Louisiana.

In 1970 distribution by race in the Arkansas portion was 73 percent, white, and 27 percent, nonwhite, predominantly black. The Louisiana portion was 67 percent, white, and 33 percent, nonwhite. This compares to 19 percent, nonwhite, for the State of Arkansas and 30 percent for Louisiana.

The rural farm population was 21 percent, nonwhite, in Arkansas and 25 percent in Louisiana. The rural nonfarm population was 26 percent, nonwhite, in Arkansas and 29 percent in Louisiana. In 1970, rural nonfarm female population constituted 50.9 percent of the rural nonfarm population (table A.6).

Age groups in the Basin for rural nonfarm people were consistent with State averages.

Employment

Employment for the Ouachita Economic Study Area was concentrated in agriculture, mining, manufacturing, public administration, and "other industrial grouping". Agriculture contributed 7.0 percent; mining 2.1 percent; manufacturing 23.0 percent; public administration 3.8 percent; and other industrial grouping 64.1 percent of major 1970 employment. The first four major industries contributed 41.1 percent of industrial employment in the Arkansas portion and 30.7 percent of industrial employment in the Louisiana portion of the Study Area.

About half of the employment in these four major groupings in the Arkansas portion was in Jefferson, Garland, Union, Saline, and Ouachita counties, and in Louisiana it comprised about three-fifths in Ouachita, Rapides, Lincoln, Avoyelles, and Morehouse Parishes.

Employment growth in the Study Area has paralleled employment in the two states. Employment for all industries rose by almost one-sixth from 1960-1970 for each of the states except agriculture, forestry, and fisheries which had a reduction in both Arkansas and Louisiana of 48.5 and 43.4 percent, respectively.

Labor force unemployment in 1970 in the Study Area was 5.6 percent. Male unemployment reached 5.0 percent of the labor force while female unemployment reached 6.8 percent. Arkansas portion's unemployment was 5.3 percent of its labor force compared to 6.0 percent for Louisiana's portion.

Income

Three measures that are frequently used to assess the economic status of an area are: family mean income, family median income, and per capita income. For the Ouachita Economic Study Area all of these measures were blow the level for the States of Arkansas and Louisiana.

The Study Area's family mean income was 82.9 percent of the two State's mean income; its median income was 91.1 percent of the family median income for the two States; and its per capita income was 83.1 percent of the two States per capita income.

The family median income between 1960-1970 for the Study Area had a 0.4 percent rise. The Arkansas portion had a 1.5 percent rise in its family median income compared to a 0.5 percent loss for the Louisiana portion.

Family mean, family median, and per capita incomes in the Arkansas portion were larger than in the Louisiana portion during 1970.

The median family income for whites was $6,691 and nonwhite families $3,264 in the Study Area during 1969.

The average income in the Study Area was $1,954 for 1970. The average incomes of the Arkansas and Louisiana study portions were $1,977 and $1,951, respectively. The average income deficiencies of the two study portions were $1,394 and $1,664, respectively.

Families with incomes of $15,000 and above, comprised 6.4 percent of all Economic Study Area families in 1969. Families with incomes at poverty level to $14,999 comprised 64.1 percent of Area families. Families with income less than poverty level comprised 29.5 percent. The Arkansas study portion of the Study Area had 68.0 percent of its families with incomes at poverty level to $14,999 compared to 59.7 percent for the Louisiana study area.

The Arkansas and Louisiana portions of the Study Area had 6.0 and 12.8 percent, respectively, of their families in the $15,000 and above income group. The States of Arkansas and Louisiana had 8.1 percent and 12.8 percent, respectively.

Families with incomes less than poverty level were 26.0 percent in the Arkansas portion and 33.4 percent in the Louisiana portion of the study.

For the State of Arkansas 22.8 percent were below the poverty level. The State of Louisiana had 21.5 percent.

Agriculture

The Ouachita Economic Study Area contained 25,573 farms in 1969. Of the nine economic classes, those that fall into classes 1-5, i.e., have agricultural sales of $2,500 or more, are considered commercial farms. In the Arkansas portion 48 percent and in the Louisiana portion 51 percent were classed as commercial farms. This compares to 56 percent for the State of Arkansas and 47 percent for the State of Louisiana. Other than Pike, Hempstead, Nevada, and Clark counties in Arkansas all of the counties with large proportions of commercial farms were in the alluvial area. Those four counties produced large volumes of poultry products.

The average market value for all agricultural products sold for all farms for the Arkansas portion was $15,544 compared to a State average of $16,097. For the Louisiana portion the average $7,714 compared to a State average of $11,743. The averages for commercial farms were $31,315 for the Arkansas portion and $20,769 for the Louisiana portion. These compare to the State averages of $28,081 for Arkansas and $23,682 for Louisiana. These data indicate large size commercial operations in Arkansas and in Louisiana.

In addition to volume of sales, size of farms is indicative of the nature of agriculture of an area. In both the Arkansas and Louisiana portion of the Study Area the distribution by size groups was approximately that of the respective state.

Commercial farms also exhibited about the same distribution of farm by size group for the Study Area portion of States as that for the States. These were fewer small farms -- 1 to 99 acres -- and more large farms -- particularly 260 acres or more.

The Study Area encompasses approximately 19,620,032 acres with 6,128,962 (31.2 percent) of the total in farms in 1969. The Arkansas portion had 27.0 percent of its land in farms compared to 36.4 percent in the Louisiana portion.

Between 1964 and 1969 the Study Area's farm acreage declined from 6,525,854 to 6,128,962 acres, a 6.1 percent decline. For the same period farm numbers declined from 37,565 to 25,573 farms (31.9 percent). There was a 62.¢ percent reduction in farm numbers in the Arkansas portion and 41.7 percent in the Louisiana portion.

The average size of the Study Area farm in the same time increased from 173.7 to 246.3 acres (41.8 percent). The average size of farm increased from 182.6 to 262.0 acres (43.5 percent) in the Arkansas portion, and from 165.6 to 233.8 acres (41.2 percent) in the Louisiana portion of the Study. By State, the increase in farm size for Arkansas from 1964 to 1969 were 20.1 percent for Arkansas and 28.0 percent for Louisiana.

The value of agricultural production was $476,220,000 during 1970 in the Study Area. Crop values constituted 48.0 percent of the total; livestock products 32.2 percent; poultry and poultry products made up the other 19.8 percent.

Of the major crop values in 1970 soybeans were the most important in both States. Cotton ranked second and rice third. In the State portion, cotton was more important in Louisiana and rice was more important in Arkansas. Also significantly less corn was grown in Arkansas.

Soybeans, the most valuable crop grown in the study area constituted 50.5 percent of study area major crop values in 1970. Its production was valued at $40,898,880 in the Arkansas study portion and $74,736,809 in the Louisiana study portion for the year. The Arkansas portion produced 14.6 percent of its state crop and the Louisiana portion produced 57.4 percent of the state crop.

Cotton constituted 31.0 percent of Arkansas study portion major crop values and 35.9 percent of major crop values in the Louisiana study portion. The Arkansas study portion had 23.4 percent of Arkansas' 1970 cotton production. The Louisiana study portion contributed 79.3 percent of Louisiana's 1970 cotton production. Cotton production in the Study Area was 6.5 percent of national cotton production.

Rice was third most valuable crop within the Study Area for 1970. The value was $15,488,830 in the Arkansas study portion and $4,384,640 in the Louisiana study portion. Rice in the Arkansas study portion contributed 77.9 percent of the crop's Study Area value; Louisiana study portion contributed the remaining 22.1 percent.

Forestry

Commercial forest land is that land producing, or capable of producing, crops of industrial wood. Commercial forests in the Basin occupy 10,758,500 acres, or about 65 percent of the study area. In the Basin are found six major commercial forest types (table A.7). Of these, the loblolly-shortleaf pine type not only covers the largest acreage, but is the most important from an economic standpoint.

Table A.7--Commercial Forest Types, Ouachita Economic Study Area, 1970

Forest Type	Acres	Percent
Longleaf-slash pine	87,500	0.8
Loblolly-shortleaf pine	3,438,000	32.0
Oak-pine	2,364,000	22.0
Oak-hickory	2,175,000	20.2
Oak-gum-cypress	2,508,000	23.3
Elm-ash-cottonwood	186,000	1.7
Total	10,758,500	100.0

Source: Forest Survey

Table A.8--Commercial Forest Ownership by Ownership Class, Ouachita Economic Study Area, 1970

Ownerships	Arkansas	Louisiana	Total	Percent
	- - - - - - - - - acres - - - - - - - - -			
National forest	589,200	172,200	761,400	7
Other public	72,600	153,200	225,800	2
Forest industry	2,850,600	1,544,700	4,395,300	41
Farm forest	1,036,800	581,300	1,618,100	15
Misc. private	1,998,600	1,759,300	3,757,900	35
Total	6,547,800	4,210,700	10,758,500	100

Source: Forest Survey

Table A.9 - Summary of Outdoor Recreation Facilities
Ouachita River Basin

Resource and/or Facility	Unit	Arkansas[a]	Louisiana[b]	Basin Total
Lakes, Ponds and Reservoirs	Acres	153,729	56,472[c]	210,201
Fishing Streams	Miles	1,465	1,822[d]	3,287
Canoe and Float Trails	Miles	13	1,822[e]	1,835
Swimming Beach	Sq. Ft.	4,399,560	984,300	5,383,860
Boat Launch Area	Parking Spaces	4,433	2,249	6,682
Big and Small Game Hunting	Acres	7,945,295	3,405,058[f]	11,350,353
Waterfowl Hunting	Acres	169,283	359,835[g]	529,018
Tent Campground	Sites	1,493	197	1,690
Group and Organized Campgrounds	Beds	12,157	564	12,721
Trailer and Recreational Vehicle Campgrounds	Sites	2,450	1,421	3,871
Horseback Riding Trails	Miles	1,540	25	1,565
Hiking and Walking for Pleasure Trails	Miles	836	33	869
Bicycle Trails	Miles	248	26	274
Off-Road Recreation Vehicle Driving or Riding Trails	Miles	8,502	5	8,507
Picnic Grounds	Tables	2,834	1,417	4,251

[a] Inventory data by Arkansas Department of Local Services, 1973.

[b] Inventory data by Louisiana State Parks and Recreation Commission, 1974.

[c] Acres accessible for fishing, boating, sailing, and water skiing for existing boat ramps.

[d] The accessible area of fishing streams in the Louisiana portion of the Ouachita River Basin is included in the Lakes, Ponds and Reservoirs total. However, there are 1,822 miles of streams which provide limited fishing opportunities but use is severely limited by lack of access and, in some cases, turbidity. These streams have potential for providing increased fishing activities with improved water quality and access.

[e] Represents total miles of floatable streams in the Louisiana portion of the Ouachita River Basin. However, only 25 miles are easily accessible and designated for canoe and float trips. Canoeing use of the remaining 1,797 miles of streams is severely limited by lack of access and, in some cases, low stream flow and poor water quality.

[f] Privately owned land which is open for public hunting will decrease. It is estimated that only 10 percent of the privately owned land presently open for public hunting will still be open by 1990; by 2020 none will be open. Therefore, the supply of land open to hunting in 1990 and 2020 is estimated as follows: Small game: 1990 - 633,900 acres; 2020 - 318,080 acres; Big game: 1990 - 562,148 acres; 2020 - 318,080 acres.

[g] Wetlands suitable for waterfowl hunting are projected to decrease. Large reductions are projected in Wetland Types I and II, with a smaller reduction in Type VI. Wetland Types III, IV, and V are projected to remain static. Therefore, wetland acreage suitable for waterfowl hunting are projected as follows: 1990 - 111,437 acres, 2020 - 88,043 acres.

and float streams are listed for Arkansas and all streams suitable for canoeing and floating are tabulated in Louisiana.

Big and small game hunting acreage in Arkansas and Louisiana represents both private and public lands open to public hunting (not posted). In Louisiana, the hunting acreage includes only the "huntable" area around the perimeter of large bottomland fields. Both big and small game hunting is assured to occur on the same woodland area, but not in the same time period.

In Louisiana, Wetland Types I, II, III, IV, V, VI and VII were inventoried as waterfowl hunting acreage. The area in each wetland type was weighted to reflect the importance for waterfowl hunting. Wetland Types I, III, IV, VI and VII are considered the most important, Type II and V the least.

In Arkansas, all suitable logging roads and trails open for public use were inventoried as off-road vehicle driving or riding trails. In Louisiana, only designated trails were inventoried.

Figure A.8 depicts Major Public Recreation Areas, National and State Parks, lakes and reservoirs, unique natural and scenic streams, and National and State Forests in the Ouachita River Basin.

BIOLOGICAL RESOURCES AND ECOSYSTEMS

Streams and Stream Fisheries

All named streams, both intermittent and perennial in the Louisiana portion of the Basin were inventoried and evaluated by the Louisiana Wildlife and Fisheries Commission. Portions of the data developed by the Commission are summarized and presented in the Special Report on Wildlife Resources. Close examination and study of this report will provide a relatively thorough summation of the existing streams and rivers and their present condition. One important factor that is not readily evident is the lack of access to most of the streams. High pesticide residues are present in many streams, especially in the bottomland areas.

Lakes and Lake Fisheries

The Arkansas portion of the Basin contains 84,594 acres of natural and manmade lakes. The largest lake in the Arkansas portion is Lake Ouachita with 20,900 surface acres. The second largest lake is Lake DeGray with 13,400 acres. In addition to the lakes, there are 14,025 farm ponds in the Arkansas portion which cover 3,510 acres.

The Louisiana portion of the Basin contains 506 natural and manmade lakes totaling 101,440 surface acres. The majority of this acreage (78,472) is contained in only 31 lakes, 500 acres or more in size. The

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

KEY TO RECREATION RESOURCES

MAJOR PUBLIC RECREATION AREAS

Map Location No.	Name
1	Lana Landing
2	Iron Fork
3	Rockville
4	Big Elk
5	Little Elk
6	Wichita
7	Highway 27
8	River Bluff
9	Pergason
10	Fulton Branch
11	Rocky Shoals
12	Simo Landing
13	Big Brushy
14	Shirley Creek
15	Rich Mountain
16	Baird Springs
17	Shady Lake
18	Albert Pike
19	Little Missouri Falls
20	Hi Hat
21	Twin Creek
22	Denby Point
23	Tompkin's Bend
24	Cap Creek
25	Joplin
26	Hickory Nut Mountain
27	Charlton
28	Crystal Springs
29	Brady Mountain
30	Spillway
31	Stephen's Park
32	Malvern
33	Bear Creek
34	Holly Landing
35	Sell Creek
36	Aquilonia Point
37	Highway 50 Landing
38	Star of the West
39	Rock Creek
40	Blackhorn
41	Pinnacle
42	Pilot Creek
43	Riverside
44	Dam Area
45	Cowhead Cove
46	Laurel Creek
47	Amity
48	Cox Creek
49	Point Cedar
50	Shouse Ford
51	Lenora Mittal
52	Arlie Moore
53	Caddo Drive
54	Edgewood
55	DeRoache Ridge
56	Highway 7
57	Lakeview
58	Spillway Dam
59	Lower Lake
60	Iron Mountain
61	Ouachi Creek
62	Glen Point
63	Alpine Ridge
64	Caney Lake & Recreation Area
65	D'Arbonne Lake Commission Public Park
66	Lum Lake Park
67	Lazare Park
68	Lum Springs Recreation Area
69	Stuart Lake & Recreation Area
70	Cattle Lake & Recreation Area
71	Valentine Lake & Recreation Area
72	Kincaid Lake & Recreation Area
73	Indian Creek Lake & Recreation Area

NATIONAL AND STATE PARKS

Map Location No.	Name
1	Queen Wilhelmina State Park
2	Lake Ouachita State Park
3	Hot Springs National Park
4	Lake Catherine State Park
5	Daisy State Park
6	DeGray State Park
7	Historical Memorial State Park
8	White Oak Lake State Park
9	Moro Bay State Park
10	Lake Chicot State Park
11	Lake Claiborne State Park
12	Lake D'Arbonne State Park
13	Lake Bruin State Park

LAKES AND RESERVOIRS

Map Location No.	Name
1	Lake Winona
2	Lake Ouachita
3	Lake Hamilton
4	Lake Catherine
5	DeGray Lake
6	Lake Greeson
7	Lake Pine Bluff
8	White Oak Lake
9	Lake Erling
10	Lake Georgia Pacific
11	Lake Chicot
12	Grand Lake
13	Lake Providence
14	Lake Providence
15	Beaver Dam Lake
16	Quitman Lake
17	Loch Lake
18	Bayou DeView (North)
19	Black Bayou Lake
20	Bayou DeView (South)
21	Cheniere Brake Lake
22	Bayou D'Arbonne Lake
23	Quitman Lake
24	Lake Claiborne
25	Bird Pond
26	Saline Lake
27	Manchac Lake
28	Iatt Lake
29	Little Lake
30	Nicholi Lake
31	Indian Creek Lake
32	Crowder Lake
33	Big Lake
34	Walters Lake
35	Saline Lake
36	Ward Lake
37	Little Lake
38	Spring Bayou (complex)
39	Bayou Cocodrie
40	Lower Sunk Lake
41	Glenrock Lake
42	Cocodrie Lake
43	Lake Concordia
44	Lake St. John
45	Lake Louis
46	Turkey Creek Lake
47	Rodney Lake
48	Lake Bruin
49	Lake St. Joseph
50	Yucatan Lake
51	Calhoun Lake

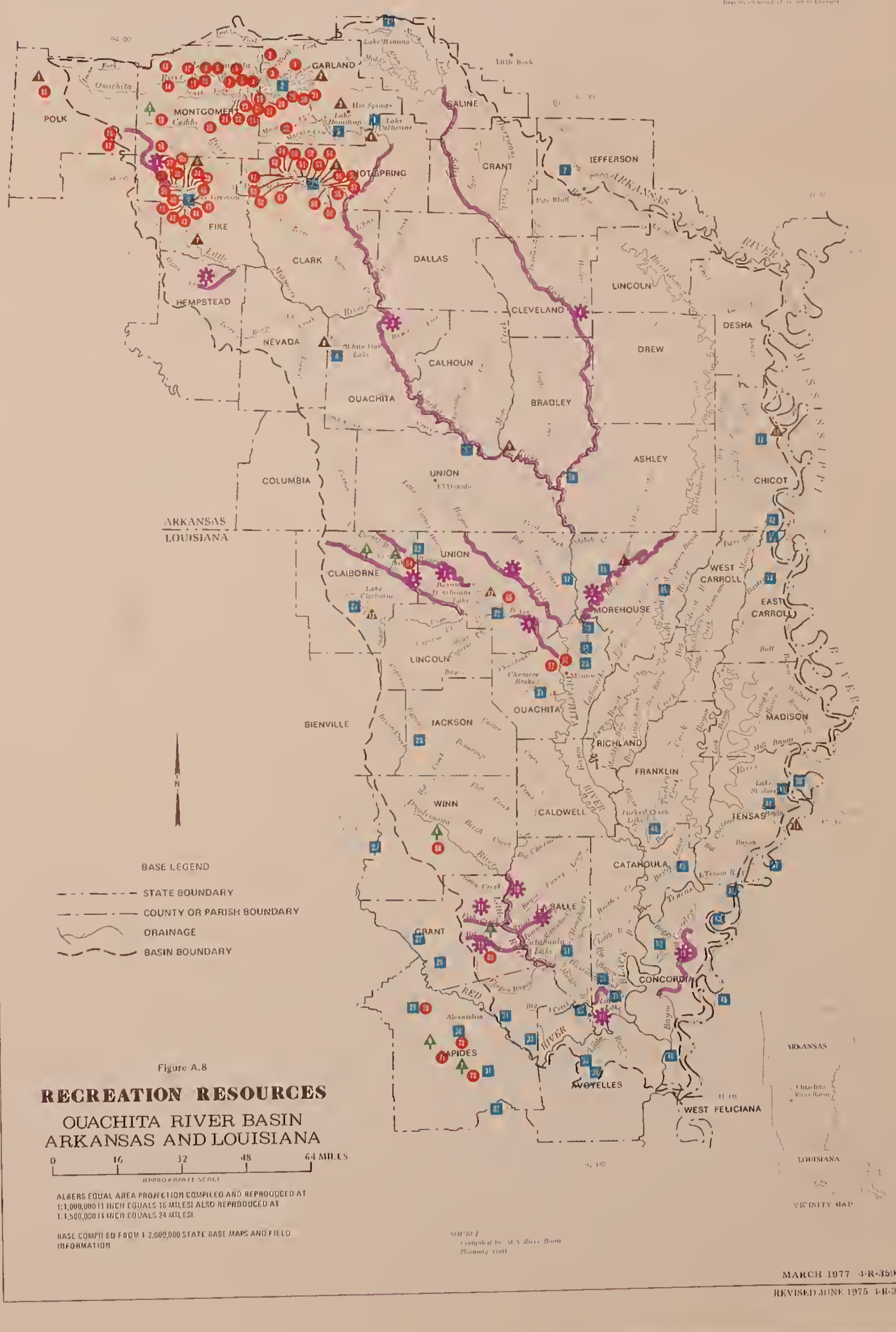
UNIQUE, NATURAL AND SCENIC STREAMS

Map Location No.	Name
1	Little Missouri River
2	Otter Creek
3	Ouachita River
4	Saline River
5	Bayou Bartholomew
6	Bayou D'Louie
7	Caney Bayou
8	Middle Fork of Bayou D'Arbonne
9	Bayou D'Arbonne
10	Little Kiehl
11	Tide Creek
12	Trout Creek
13	Big Creek
14	Saline Bayou
15	Bayou Cocodrie

Portion of Stream Designated as Unique, Natural and Scenic

NATIONAL AND STATE FORESTS

Map Location No.	Name
1	Ouachita National Forest
2	Kisatchie National Forest, Caney District, Caney Unit
3	Kisatchie National Forest, Caney District, Middle Fork Unit
4	Kisatchie National Forest, Winn District
5	Kisatchie National Forest, Catahoula District
6	Kisatchie National Forest, Livingston District
7	Alexander State Forest



BASE LEGEND

STATE BOUNDARY

COUNTY OR PARISH BOUNDARY

DRAINAGE

BASIN BOUNDARY

Figure A.8

RECREATION RESOURCES

OUACHITA RIVER BASIN ARKANSAS AND LOUISIANA

0 16 32 48 64 MILES

APPROXIMATE SCALE

ALBERS EQUAL AREA PROJECTION COMPILED AND REPRODUCED AT 1:1,000,000 (1 INCH EQUALS 16 MILES) ALSO REPRODUCED AT 1:1,500,000 (1 INCH EQUALS 24 MILES).

BASE COMPILED FROM 1:2,000,000 STATE BASE MAPS AND FIELD INFORMATION

SOURCE

Compiled by SCS Basin Team

Planning Staff

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remaining 475 lakes have an area of only 22,766 surface acres. The three leading parishes in surface acreages are: LaSalle - 16 water bodies with 17,383 surface acres; Union - 12 water bodies with 16,093 surface acres; and Avoyelles - 50 water bodies with 10,270 surface acres. Catahoula, Concordia, and Tensas Parishes have the largest number of water bodies with 80, 74, and 71 surface acres respectively. At the other extreme, the three parishes with the least acreage of surface water are: West Carroll - none; Bienville - 1 water body with 10 surface acres; and Winn - 1 water body with 25 surface acres. However, Bienville and Winn are only partially in the basin. The three largest lakes in this area are: Catahoula, 5,000 to 25,000 acres (LaSalle Parish); D'Arbonne, 15,000 acres (Union Parish); and Claiborne, 6,400 acres (Claiborne Parish). D'Arbonne and Claiborne are manmade impoundments and Catahoula is a natural shallow sump area. Brief descriptions of these major lakes can be found found in the Fish and Wildlife Special Report.

Overall, water quality for large lakes in the Basin is good to excellent as illustrated by the water quality data given in the Special Report. The present trend is a rapid decline in water quality in the bottom-land parishes. Water quality in the upland parishes is stable or declining very slowly. Water quality in many small lakes in the bottom-land area has already declined to the point where it is very poor. Parameters indicating a decline in water quality are increases in turbidities, suspended solids, plant nutrients (ammonia, nitrate, phosphate, etc.), and pesticide residues; and decreases in dissolved oxygen.

Fish populations and standing crop values are directly to water quality. Lakes with excellent to good water quality have moderate standing crop values and a high percentage of game fish. Lakes with poor to fair water quality usually have high standing crop values, of which a very high percentage is commercial and forage species and only a remnant population is game fish. Lakes with very poor to poor water quality usually have low standing crop values composed almost entirely of forage and trash fish, a few commercial species, and no game fish.

All lakes which have reasonable access and a good population of game fish and to a lesser extent commercial fish, receive moderate to heavy utilization by fishermen. The degree of utilization seems to depend upon the following factors: (1) proximity to large population centers; (2) adequate access; (3) good population of desirable fish species (4) good water quality; (5) scenic beauty; (6) degree of shoreline development with facilities related to use of lake (rental cabins, camping areas, swimming areas, picnic areas, boat rental, etc.). Most large lakes have some access but few have adequate access.

In addition to the 101,238 acres of manmade and natural lakes, the Louisiana portion of the Ouachita River Basin contains about 8,820 private farm ponds with a water area totaling 12,165 surface acres. These ponds range in size from .17 to 65 acres with an average size of 1.5 acres. A summary of the farm ponds by parish is presented in the Special Report. Most farm ponds are located in the upland parishes. Over 50 percent of the acreage of farm ponds is in three parishes: Lincoln - 2,400 acres; Ouachita - 1,986 acres; and Union - 1,800 acres. Fish populations in these farm ponds range from excellent in the unpolluted, well managed ponds to poor in polluted or unmanaged ponds. Standing crop values vary from over 250 lbs./acre to less than 75 lbs./acre.

Wildlife Habitat Types and Populations

Wildlife habitat types (vegetative types) include pure pine, mixed pine-hardwood, upland hardwood, bottomland hardwood, pastureland, and cropland. A summary of the population and harvest data for selected game species by parish and habitat types is contained in the Wildlife Special Report. The habitat acres, animals per acre, total animals, number harvested, man-days of recreation, and economic (monetary) value are included.

The harvest data was calculated from a 3-year average of small game surveys conducted in 1967-68, 1972-73, and 1974-75. Since this survey is broken down by parish and based on the number of hunting licenses sold by the parish, the resulting harvest data does not reflect an accurate measure of the harvest within each respective parish. It reflects the estimated harvest by people who bought licenses in that parish. In metropolitan situations, such as Ouachita and Rapides parishes, the estimated harvest surpasses the reasonable population estimate for that parish. Therefore, harvest data for all the parishes involved in the Ouachita Basin was pooled and then broken down by habitat types; thus, it will not agree with the 3-year average harvest data for the individual parishes. Average hunter success ratio of 1.89 per effort and average daily small game hunter expense of $7.62 were used. Average daily big game hunter expense of $17.47 was used.

Wetland Types

Wetland types, their general locations, and acreages within the Ouachita (La.) River Basin were determined. This data is important to the wildlife biologists engaged in wetland preservation and enhancement and to the agricultural interest making land-use recommendations for private lands. Also, it is important for the public to fully understand the many values of wetland areas. Some of the basic major functions and values of wetlands are: (1) provide fish and wildlife habitat, (2) increase recharge of ground water, (3) retention of surface water, (4) stabilize surface runoff, (5) reduce or prevent erosion, (6) produce timber, (7) create firebreaks, (8) provide outdoor laboratories for students, scientists, and photographers, and (9) produce cash crops such

as marshhay, wild rice, spanish moss, and bait. Of these values and functions, providing needed habitat for fish and wildlife is considered the most important by most people. Wetlands are used extensively by all waterfowl species inhabiting Louisiana. In addition, 20 to 22 of Louisiana's 23 species of fur and game animals utilize the wooded wetland types (1,6,7) as all or part of their essential habitat. When planners and the public are determining the fate of a wetland, all its values and functions should be considered.

Wetlands in the Ouachita River Basin were inventoried in 1975 using the criteria set forth in U.S. Circular 39. The inventory showed a total of 1,104,048 acres of Wetland Types 1, 5, 6, and 7 in the Arkansas portion, and a total of 531,920 acres of Wetland Types 1 through 7 in the Louisiana portion of the Basin. The results of these inventories are summarized and presented in tabular form in the special report. A brief description of the seven wetland types which occur in the Louisiana portion of the Basin and the four types inventoried in the Arkansas portion are as follows:

Type 1 - Seasonally Flooded Basins or Flats. - These areas are covered with water or are waterlogged during variable seasonal periods but dry during most of the growing season. They occur most commonly in upland depressions and bottomland overflow areas. Vegetation in these areas varies according to season, frequency, and duration of flooding, but it is in the broad group called bottomland hardwoods and its associated understory and herbaceous growths.

Type 2 - Inland Fresh Meadows - These areas are usually without standing water during most of the growing season but are waterlogged at least within a few inches of the surface. Typical vegetation found in these areas are grasses, sedges, rushes, and various broad-leaved weeds.

Type 3 - Inland Shallow Fresh Marshes - These areas are usually waterlogged or have standing water up to six (6) inches deep during the growing season. Vegetation of these areas includes, grasses, bulrushes, spikerushes, and various other marsh plants such as cattails, arrowheads, pickerelweed, and smartweeds.

Type 4 - Inland Deep Fresh Marshes - These areas are covered with six (6) inches to three (3) feet of water during the growing season. Typical vegetation includes spikerushes and spatterdock in the shallow portions with water milfoil and water lilies, in deeper areas. Also, waterhyacinths, alligatorweeds, and waterprimroses may form floating mats in these areas.

Type 5 - Inland Open Fresh Water - These are shallow ponds and lakes up to ten (10) feet deep which are fringed by a border of emergent vegetation. Vegetation is usually absent in the deep areas (over 6 feet). The shallower areas have vegetation similar to that of a Type 4 wetland.

Type 6 - Shrub Swamps - These areas are usually waterlogged or covered with as much as six (6) inches of water during the growing season. Typical vegetation includes willows, buttonbush, swamp dogwood, and swamppprivet.

Type 7 - Wooded Swamps - These areas are waterlogged or covered with a foot or more of water during the growing season. Typical vegetation includes cypress, tupelogum, swamp blackgum and to a lesser extent water oak and overcup oak on the margins of these swamps.

Types 1 and 7 make up the majority of wetland acreage comprising 58 and 16 percent respectively. Types 2 and 5 are the next most abundant, each comprising about 8 percent of the total. Types 3, 4, and 6 make up the remainder with 3, 3, and 5 percent of the total wetlands. Avoyelles, Concordia, and LaSalle Parishes contain the most wetland acres with 17, 13, and 17 percent, respectively, of the total acreage. Jackson, West Carroll, and Winn Parishes contain the least amount of wetlands with .09, .10, and .08 percent, respectively, of the total. Parishes ranking first in acreages of each Wetland Type 1 through 7 are Avoyelles (18 percent), Ouachita (56 percent), Tensas (34) percent), Ouachita (49 percent), Catahoula (19 percent), LaSalle (46 percent), and Avoyelles (25 percent), respectively. The most valuable single wetland complex in the Louisiana portion of the Basin is Catahoula Lake and surrounding area which total about 25,000 acres of Wetland Types 1 through 7.

Threatened and Endangered Species

The Endangered Species Act of 1973 (Public Law 93-205) establishes two categories of endangerment: (1) Endangered Species - those species in danger of extinction throughout all or a significant portion of their range; (2) Threatened Species - those species which are likely to become endangered within the foreseeable future throughout all, or a significant portion of their range.

A list of threatened and endangered native animals has been compiled for the Basin. See table A.10. Species are listed for both Arkansas and Louisiana.

AREAS OF NATURAL BEAUTY

Natural, and Scenic Areas

The natural, scenic and historic areas were inventoried in the Louisiana portion of the Basin by the parish[4/] Rural Development Committees as part of a study entitled "Appraisal of Potential for Outdoor Recreation Developments." In Arkansas, the inventory was made by the U.S. Soil Conservation Service.

[4/] In Louisiana, the local legal governmental subdivisions are referred to as parishes while in Arkansas they are termed counties.

The areas were identified by state and county and listed in the Special Report on Recreation. A complete listing of these areas is contained in the Special Report.

Table A.10 - Threatened or Endangered Native Animals
Ouachita River Basin[a/]

Common and Scientific Names and Categories	
Birds	
American peregrine falcon Falco peregrinus anatum	Ivory-billed woodpecker Campephilus principalis
Arctic peregrine falcon Falco peregrinus tundrius	Red-cockaded woodpecker Dendrocopos borealis
Bachman's warbler Vermivora bachmanii	Southern bald eagle Haliaeetus leucocephalus
Eskimo curlew Numenius borealis	
Mammals	
Cougar Felis concolor	Red wolf Canis rufus
Reptiles	
American alligator Alligator mississippiensis	

Source: U.S. Fish and Wildlife Service

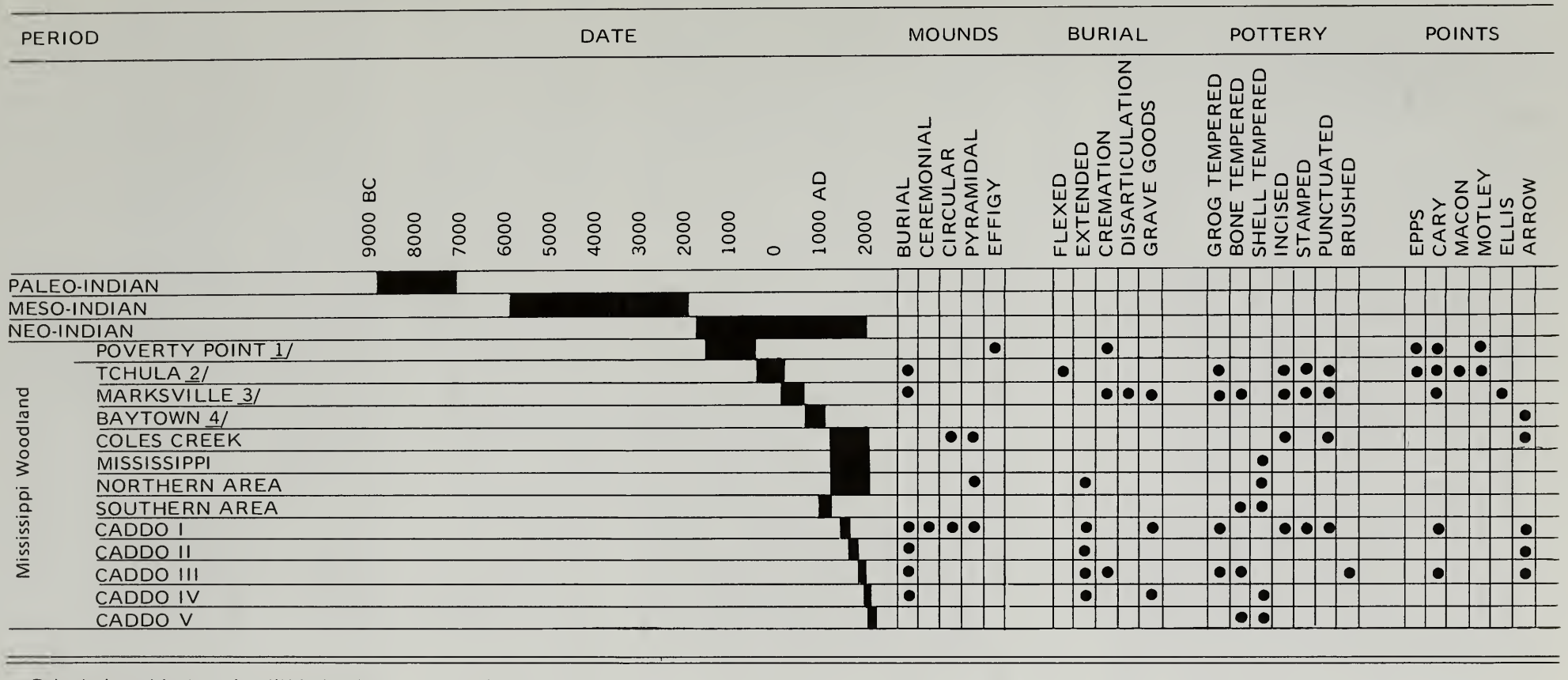
[a/] As of 1975.

CULTURAL RESOURCES

Archaeology

The history of human habitation in the Ouachita Basin is chronologically long, but the record is sparse. Paleo-Indian man left few artifacts in the basin that have been recovered. These are primarily restricted to projectile points (arrow and spear heads). Considering the

FIGURE A.9 **ARCHAEOLOGICAL SEQUENCE**
OUACHITA RIVER BASIN STUDY



1/ Baked clay objects, microlithic implements, Steatite Vessels, Plummets

2/ Baked clay objects, contorted paste and fine cracked surface pottery

3/ Some authors equate this period with Hopewell

4/ Cultivation of Maize began

nomadic life of these people, whose existance depended on hunting big game in an era where both the climate and land forms were vastly different from the present, it is doubtful whether there are any remaining records of these people. Their occupancy of the basin has been dated between 9,000 B.C. and 6,500 B.C. As big game became extinct the inhabitants became dependent on local game and plants. With the formation of more or less permanent settlement associated with this form of subsistence, the Meso-Indian or Archaic period commenced. This period has been roughly defined between 6,000 B.C. and 2,000 B.C. The closing of this period has been arbitrarily defined as the shift from the throwing stick to the bow and arrow. The final period of aboriginal occupancy of the basin is the Neo-Indian. This period with its many phases and cultures extends to the advent of the Europeans on historical time. An archaeological sequence chart is included as figure A.9. This chart graphically displays the characteristics of the pre-European occupancy of the area.

Historical Settlement

The periods and patterns of land acquisition, is indicative of the historical and cultural heritage of the Ouachita Basin. Figure A.10 illustrates this statement. The divisions of time used in this map were not arbitrarily chosen, but represent clear breaks in the sequence of acquisition. The period prior to 1830 represents an early period during which the area was governed by the Spanish, French, and finally by the United States Governments. The period between 1830 and 1849 represents the time during which the land was surveyed and divided into townships, ranges, and sections. Titles to the land became more valid during this period. The period between 1850 and 1869 represents the time of unrest before and during the War Between the States. The period between 1870 and 1889 represents the period of "Reconstruction" after the war. The period between 1890 and 1910 represents the emergence from the "Reconstruction" period. The post-1910 period is the modern period.

Land acquisition in the Ouachita River Basin through the years reveals a number of characteristics in patterns related to the various areas. The earliest land holdings bear a distinct and almost universal relationship to the streams of the area. The lack of good roads providing access to the Basin likely prompted this situation. In addition, lands along the rivers were less subject to flooding, due to the higher elevations of the natural levees.

While the township and range survey system dominates the Basin, samples of Spanish and Spanish-influenced land grants also exist, particularly in Louisiana. These consist of both rectangular lots and the square (or nearly square) Spanish sitios.

The Louisiana portion of the study area was settled earlier, with more land being secured during the earliest periods, although the Arkansas area experienced some settlement during the earliest periods as well. Again, the greater navigability of streams in Louisiana (as well as a longer annual season of navigability) can be held responsible.

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

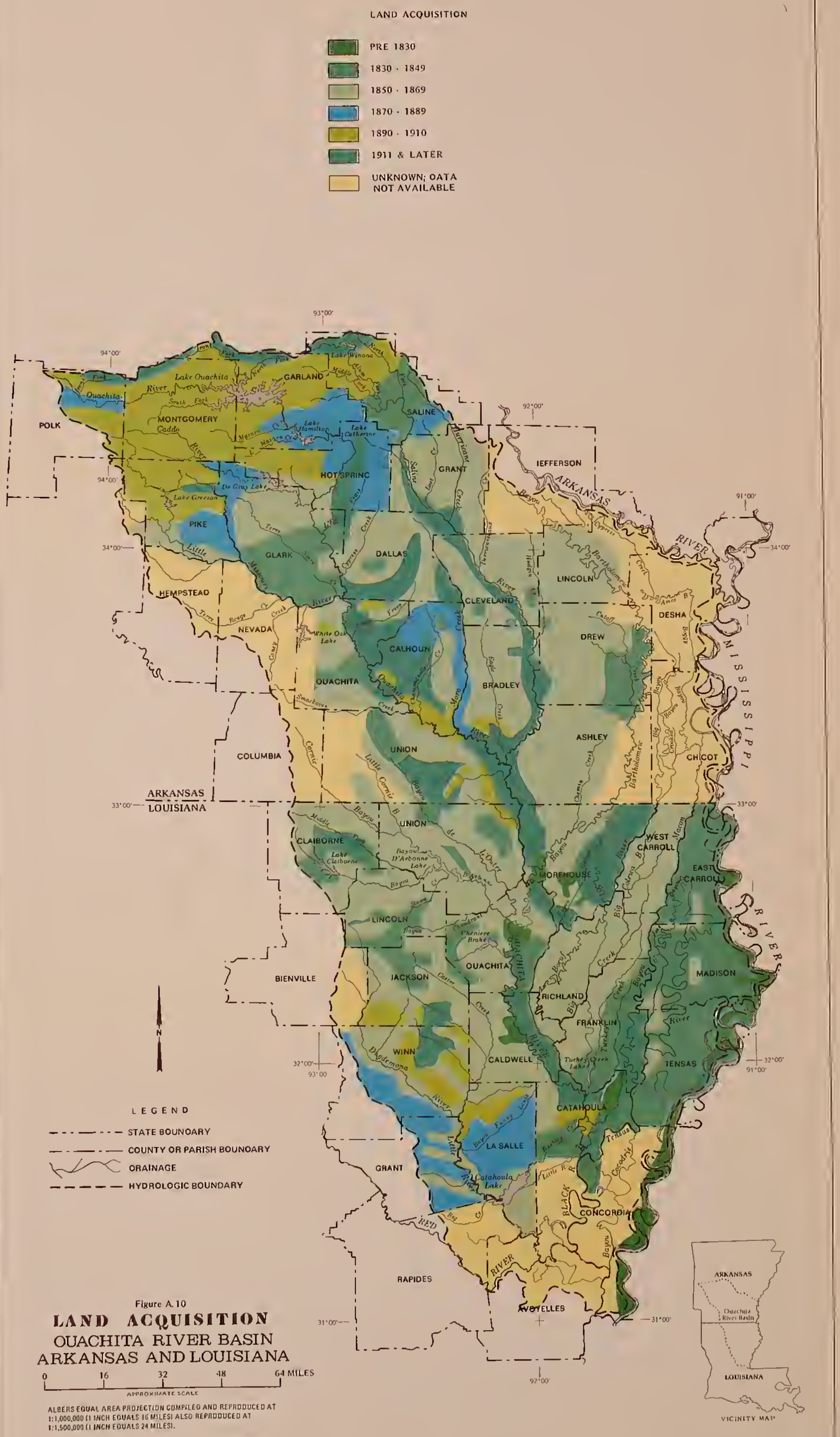


Figure A.10

LAND ACQUISITION
OUACHITA RIVER BASIN
ARKANSAS AND LOUISIANA

0 16 32 48 64 MILES
APPROXIMATE SCALE

ALBERS EQUAL AREA PROJECTION COMPILED AND REPRODUCED AT 1:1,000,000 (1 INCH EQUALS 16 MILES) ALSO REPRODUCED AT 1:1,500,000 (1 INCH EQUALS 24 MILES).

BASE COMPILED FROM 1:2,000,000 STATE BASE MAPS AND FIELD INFORMATION.

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Conversely, the northwestern portion of the Basin, in Arkansas, shows dominance of settlement during the last two eras. While Louisiana sections also experienced new land acquisitions during these years, none of them equaled such impressive dominance in those periods.

While the Basin contains both low, swampy floodplain topography and hills or hill-like surfaces, the observer finds near dominance of the Upland South cultural traits. This dominance manifests itself in agricultural methods and preferences, building types, place names, and language habits. The floodplain sections especially attracted Upland South immigrants in later eras.

Suspected speculation by individuals and railroads and other companies likely delayed settlement and land acquisition in parts of the Basin. Railroad companies, in particular, secured large areas. Small farmers found themselves unable to meet the prices asked by these possible speculators, in some cases until this century.

Finally, the Ouachita River Basin conforms to the trend elsewhere in the nation of abandonment of the uplands by the small farmer in recent years. Lands desired by the early settlers and once dotted with small farms are increasingly covered by forests, commercial and otherwise. The occupants of these lands have moved to the lowlands or, in greater numbers, to the cities. The uplands, which saw such a rapid influx of settlers during the nineteenth century, now experience a new and rather quiet effect of man's use of the land.