# THE PEARL RIVER BASIN - ITS PLAN AND POTENTIAL FOR DEVELOPMENT

by

M. E. Cribbs, USDA Soil Conservation Service
Jackson, Mississippi

## INTRODUCTION

The Pearl River Comprehensive Basin Study is part of the national comprehensive river basin planning program that has developed from recommendations in the 1961 report of the Senate Select Committee on National Water Resources and subsequent action of the Executive Branch and the Congress. The basic objective of this program is to plan for the best use, or combination of uses, of water and related land resources to meet all foreseeable short- and long-term needs.

The study has been directed toward developing an understanding of the existing and future needs of the Pearl River Basin; providing a sound basis for, and recommendation of, an early-action program of measures that should be undertaken within the next 10 to 15 years; and establishing a framework for future planning for the basin. It has been conducted as a coordinated State-Federal interagency study.

Studies, investigations, and preparation of the comprehensive report were performed through joint efforts of participating agencies. A Basin Coordinating Committee was formed to provide guidance for conducting the study and to coordinate the efforts of the Federal, State, and local agencies concerned. This Committee consisted of representatives from the States of Mississippi and Louisiana, the Departments of Agriculture, Army, Interior, Health, Education and Welfare, Commerce, and Transportation, and the Federal Power Commission.

Under the chairmanship of the District Engineer, Mobile District, Corps of Engineers, this Committee, collectively and individually, served as a means of achieving coordination in conducting specific studies applicable to each agency and in exploring and formulating plans of development.

## DESCRIPTION OF BASIN

The basin comprises most of the south-central portion of Mississippi and a small portion of southeastern Louisiana. The river drains an area of 5,606,400 acres or 8,760 square miles consisting of all or parts of 23 counties in Mississippi and parts of 3 Louisiana parishes. The basin has a maximum length of about 240 miles and a maximum width of about 50 miles. Elevations within the basin range from 650 feet above mean sea level in the upper portion to sea level along the southern extremity.

Storms which occur in the basin include local thunderstorms and general disturbances of the hurricane and frontal types. Flood-producing summer storms are generally of the thunderstorm type with high intensities over small areas. These storms can be critical for small watersheds in the basin. Flood-producing storms in the winter and spring are usually of the frontal type, covering large areas and lasting from two to four days.

General floods may occur in the basin in any season but are more prevalent in the winter and spring when runoff conditions are more favorable. Under normal runoff conditions, an intense and general rainfall of 5 to 6 inches over the basin will result in widespread flooding while 3 to 4 inches are sufficient to produce local flooding on most of the small tributaries.

## ECONOMIC DEVELOPMENT

Prior to initiation of detailed project studies, economic base studies were made to develop pertinent economic indicators for the basin. Major components of these studies were population, employment, personal income, land use, and the agricultural economy.

One of the primary measures of an area's economy is the number of persons living in the area. People reflect the opportunities and problems of the area in which they live and constitute the market for consumer goods and services. They provide the labor force that responds to employment demand, and represent social requirements such as schools, hospitals, transportation facilities, recreational facilities, and other social services. They constitute one of the principal factors that determine the need for water resource development.

The population of the basin increased from 420,000 in 1930 to over 600,000 in 1970, and is expected to increase to 1,380,000 by 2015.

Even though the logical starting point of any economic analysis is population, it is income to which people gear their efforts and for which they expend their energy.

Total personal income in the basin increased more than four times in the past 30 years, well above the national increase of 2.9 times for this period. This increase reflects both population growth and rising per capita income. Per capita personal income for the basin, however, is well below the national average.

The present land use for the basin is cropland 14 percent, pasture land 12 percent, forest land 67 percent, and urban and other uses 7 percent.

Gross receipts from farm marketing in the basin totaled about $120,000,000 in 1964. Income from this source is expected to triple by 2015 to about $360,000,000. Livestock and livestock products currently account for 80 percent of marketing receipts and crops 20 percent.

## WATER AND RELATED LAND RESOURCE DEVELOPMENT PROBLEMS AND NEEDS

The need for water and related land resource development in the basin continues to increase as the population increases. Many areas need protection from repeated floods. New and added demands are being made by the developing industrial complexes. Day by day, water-oriented recreation plays a more important part in the leisure-time activities of the growing population of the area. These demands require water of sufficient quality as well as quantity.

The control of high flows is vitally important to the security of the people residing in those areas of the basin which are threatened by floods. Tremendous amounts of property damage and business losses have resulted from past floods. Potential damage from floods which could occur is even greater. There are approximately 1,042,000 acres of land subject to flooding in the basin.

Approximately 256,000 acres, or 25 percent of the rural flood plain, are cleared for agricultural uses. The estimated gross annual value of production from this agricultural land is $8,887,000.

Urban areas which have flood problems are Jackson, Columbia, and Picayune, Mississippi, and Bogalusa, Louisiana. In addition, several small urban areas which do not now have a flood problem face situations where future expansion into the flood plains could result in serious problems.

The 689,000 acres of land subject to overflow in the upstream watersheds sustain total average annual damages of $3,700,000. The average annual flood damages to areas along the main stem and lower reaches of the major tributaries are estimated to be $4,800,000. The total average annual flood damage in the basin is estimated to be $8,500,000.

Erosion remains a problem in the basin. There are 3,210,000 acres of land that have an erosion problem or are susceptible to erosion. Approximately 1,143,000 acres of open land are slightly to very severely eroded. Erosion on approximately 32,000 acres of forest land and 184,000 acres of open land is deemed moderately to severely critical, and erosion on 5,000 miles of roadbank has caused moderate to severe deposition of sediment.

Soil deposition contributes to the flooding problem by filling road ditches, culverts, and stream channels and causing added damage to crops, pastures, fixed improvements, and in some cases, fishery resources. Sediment in the streams also causes water quality problems.

The 1965 municipal and industrial water supply requirements totaled about 82 million gallons per day (mgd). These requirements are expected to increase to 280 million gallons per day by the year 2015.

Pollution of streams in the basin is not extensive or widespread at the present time. Some pollution problems do exist, however, in several locations.

General recreation needs exist at present in the upper and lower portions of the basin. Needs in the middle portion of the basin are being met largely by the Barnett Reservoir. Studies indicate that there will be a critical shortage of facilities for water-dependent recreation activities in the basin by the year 2015 in the upper and lower portions with needs in the middle portion barely being met by the Barnett Reservoir.

The fish and wildlife resources of the basin constitute a major recreation potential for residents of the area. Many of the streams in the basin provide excellent opportunity for sport fishing.

Past indifference to natural beauty, aesthetic values, and quality of the environment becomes evident in the problems we now face in trying to improve our surroundings.

Maintaining a quality rural environment will involve continued efforts to obtain proper land use, soil stabilization measures to reduce erosion and stream turbidity, vegetative rehabilitation of areas needing treatment, and an end to indiscriminate waste disposal in rural areas. Cleaning up trash dumps along otherwise scenic rural drives should receive priority by local or multi-county planning boards.

Urban and industrial developers within the basin need to take advantage of the technical assistance available to them in planning land treatment measures where construction takes place. Planning of industrial and urban areas in the future should include preservation of high quality scenic views, preservation of open areas for parks and playgrounds, and establishment of green belts to shield natural beauty detractors.

A number of environmental quality needs should be satisfied in the basin. Creation of reservoirs for multiple uses, including general recreation and fish and wildlife enhancement, would provide scenic and other aesthetic values associated with the impoundments and adjoining project lands, particularly desirable in a basin with few lakes of significant size. Consideration should be given to the preservation of streams or selected reaches of streams in their natural state as scenic or free-flowing streams.

## THE COMPREHENSIVE PLAN

The formulation of the comprehensive plan for developing the water and related land resources of the basin involved a process of testing and evaluating structural and nonstructural measures.

The most important and complex problem encountered in the development of the comprehensive plan was weaving into one overall scheme the best means of satisfying the water and related land needs of the basin. Selecting and fitting plan segments together and considering alternatives in the search for the proper programs, the proper number of projects, and the best size for each element of the plan required extensive analysis and coordinated effort by all study participants.

The comprehensive plan developed for the basin includes the additional improvements required to meet present and long-range water and related land resource needs to the maximum practicable extent. The additional improvements are separated into:

1. The "EARLY-ACTION PROGRAM", which includes projects found necessary to meet immediate and future needs and to be economically feasible for construction within the next 10 to 15 years, and

2. The "FRAMEWORK FOR FUTURE PLANNING", which includes projects that are not economically feasible for construction in the next 10 to 15 years but which could help meet future needs of the basin and are potentially feasible for development or are strongly supported by local interests.

## EARLY-ACTION PROGRAM
(See Fig. 1)

Structural measures included in the early-action portion of the comprehensive plan consist of:

1. Three large multiple-purpose reservoirs.

2. Land treatment measures, 179 floodwater retarding structures, 29 multiple-purpose structures, and 1,202 miles of channel development in 30 upstream watersheds, and critical land area stabilization for the remainder of the basin.

3. Development of a recreational boatway along the Pearl River.

The three reservoir projects, Ofahoma, Carthage, and Edinburg, would variously serve the purposes of flood control, water quality control, general recreation, and fish and wildlife enhancement.

The Ofahoma damsite is located on the Yockanookany River in northwestern Leake County. A dam at this location would control the runoff from 469 square miles. The reservoir would cover about 3,700 acres and contain 30,000 acre feet of storage in the normal pool. Recreation facilities would be provided.

The Carthage damsite is located in the central part of Leake County on Lobutcha Creek. A dam at this location would control the runoff from a 266-square mile drainage area. The reservoir would cover about 3,000 acres and contain 20,000 acre feet of storage in the normal pool. Recreation facilities would also be provided.

The Edinburg damsite is located in the western part of Neshoba County on the Pearl River. A dam at this location would control the runoff from 827 square miles. The reservoir would cover approximately 12,600 acres and contain 130,000 acre feet of storage, of which 89,400 acre feet would be storage for water quality control and recreation. Recreation facilities would also be provided.

There are 30 upstream watersheds, all in Mississippi, in which land treatment and structural measures are needed and which are economically feasible for construction within the next 10 to 15 years. In addition, critical land area stabilization measures are needed in the remainder of the basin. See Fig. 2.

Land treatment and critical land area stabilization measures would be required on more than 1,000,000 acres of land and 5,000 miles of roadbanks. In the 30 watersheds, there are 179 floodwater retarding structures, 29 multiple-purpose structures for flood control and recreation, and 1,202 miles of channel development planned. Recreation facilities would be provided for fishing, boating, swimming, picnicking, and camping.

The early-action program includes a recreational boatway by snagging 302 miles of the Pearl River up to the vicinity of Edinburg. The boatway would include 82 recreation areas with boat-launching ramps and other facilities for recreation activities.

Full development of the water and related land resources cannot be attained through structural measures alone. The plan accordingly contains recommendations relative to implementation of nonstructural measures. Implementation of these measures will require the cooperation of Federal, State, and local interests. Their application should be of a continuing nature. The nonstructural measures include:

1. Flood Plain Management.

2. Agricultural Land and Forest Management - Expansion is needed of current land management, conservation programs, and cooperative forestry programs.

3. Health Programs - Surveillance of water quality is needed. There is also a need to establish vector control programs.

4. Water Quality Control - State-wide Water Quality Standards should be enforced within the basin.

5. Outdoor Recreation - Action is needed to insure that State outdoor recreation plans are used as the focal point for all recreation planning and development activities.

6. Fish and Wildlife Enhancement - Valuable stream fishery and wildlife habitat areas need protection. An additional 325,000 acres of wildlife habitat areas should be acquired for management by appropriate State game and fish agencies. Proposed projects will be coordinated in detail with appropriate local, State, and Federal interests.

7. Preservation - All areas of unique natural beauty, or of historical, archeological, scientific, and ecological importance should be preserved. Portions of 14 streams totaling about 200 miles should be preserved in their present free-flowing state.

8. Review of Water Resource Programs and Policies - There is a need for continuing review of water resource development laws, policies, and programs as they affect the basin.

## Effects of the Early-Action Program

The early-action program will have significant effects throughout the basin. Floodwater damages would be reduced basin-wide by about 49 percent. Sediment damages would be reduced by about 60 percent.

Approximately 1,040,000 acres would receive proper land treatment and reduced soil erosion. Agricultural lands would be used more efficiently.

The plan would also permit the multiple use of waters. Water quality in the main stem of the Pearl would be improved by storage of water for low flow augmentation in the Edinburg Reservoir.

The early action projects would support approximately 5.7 million man days of recreational activity, meeting about 63 percent of the recreational needs.

Approximately 86 percent of the demand for fresh-water fishing would be satisfied by projects in the early-action program. Wildlife habitat areas would be established and improved management programs would be instituted.

Protection and preservation of the basin's streams and other environmental features are included in the plan.

## Costs, Benefits, and Benefit-to-Cost Ratios for Structural Measures

The total first cost of the structural measures in the early-action program would be $186,700,000, of which $93,000,000 would be for multiple-purpose reservoirs, $87,300,000 for upstream watersheds (including $30,600,000 for land treatment and critical land area stabilization), and $6,400,000 for the Pearl River Boatway. Excluding land treatment and critical land area stabilization, the estimated total average annual costs are $10,200,000 and the total average annual primary benefits $18,400,000, giving an overall benefit-to-cost ratio of 1.8. The addition of secondary benefits of $600,000 for the upstream watershed projects and area redevelopment benefits of $1,400,000, not included in the above figures, would increase the overall benefit-to-cost ratio to 2.0.

## FRAMEWORK FOR FUTURE PLANNING

Projects and programs in the framework for future planning were studied in sufficient detail to determine if they would meet foreseeable needs and be compatible with other projects and programs in the basin. Nonstructural measures previously discussed are of a continuing nature and are equally as pertinent to the framework for future planning as to the early-action program.

Structural measures included in the framework for future planning consist of reservoirs, upstream watershed projects, and improvements for barge navigation. Although these measures are not economically justified for inclusion in the early-action program, they are needed to help satisfy the remaining projected needs of the basin or are strongly supported by local interests.

There are 9 large reservoirs included in the framework for future planning. These reservoirs have potential storage for flood control, water quality control, water supply, power, recreation, and fish and wildlife enhancement to help satisfy the projected needs of the basin not being met by the early-action projects. As these needs occur, each potential project will have to be studied in more detail to determine its economic justification and to evaluate possible alternative solutions.

The 16 upstream watersheds included in the framework for future planning would have land treatment measures, single-purpose floodwater retarding structures, multiple-purpose structures for flood control and recreation, and channel development. In addition to these watersheds, 10 additional multiple-purpose projects for flood control and recreation would be needed throughout the basin.

The framework for future planning would provide barge transportation from the mouth of the Pearl River to Jackson. This project was determined to be uneconomical for inclusion in the early-action program. However, it has been included in the framework for future planning and has the strong support of local interests.

## RECOMMENDATIONS OF THE COORDINATING COMMITTEE

You will remember that earlier in my discussion I pointed out that this study was performed through joint efforts of participating agencies through a Basin Coordinating Committee. This committee made four recommendations regarding the comprehensive plan:

First, that this plan be adopted as the basic plan for the coordinated development, conservation, and beneficial use of the water and related land resources of the Pearl River Basin.

Second, that each phase of the early-action program be implemented; the three large multiple-purpose reservoirs, the 30 upstream watersheds, and the recreational boatway.

Third, that the States adopt such legislation as may be required and take appropriate action, utilizing available Federal assistance and programs, to permit implementation of the various nonstructural measures of the plan; and

Fourth, that the comprehensive plan be reviewed and updated periodically.

I have enjoyed presenting to you today the proposed comprehensive plan for the Pearl River Basin. Those of us who have been associated with the development of this plan look forward to the orderly implementation of its features. Thank you very much.

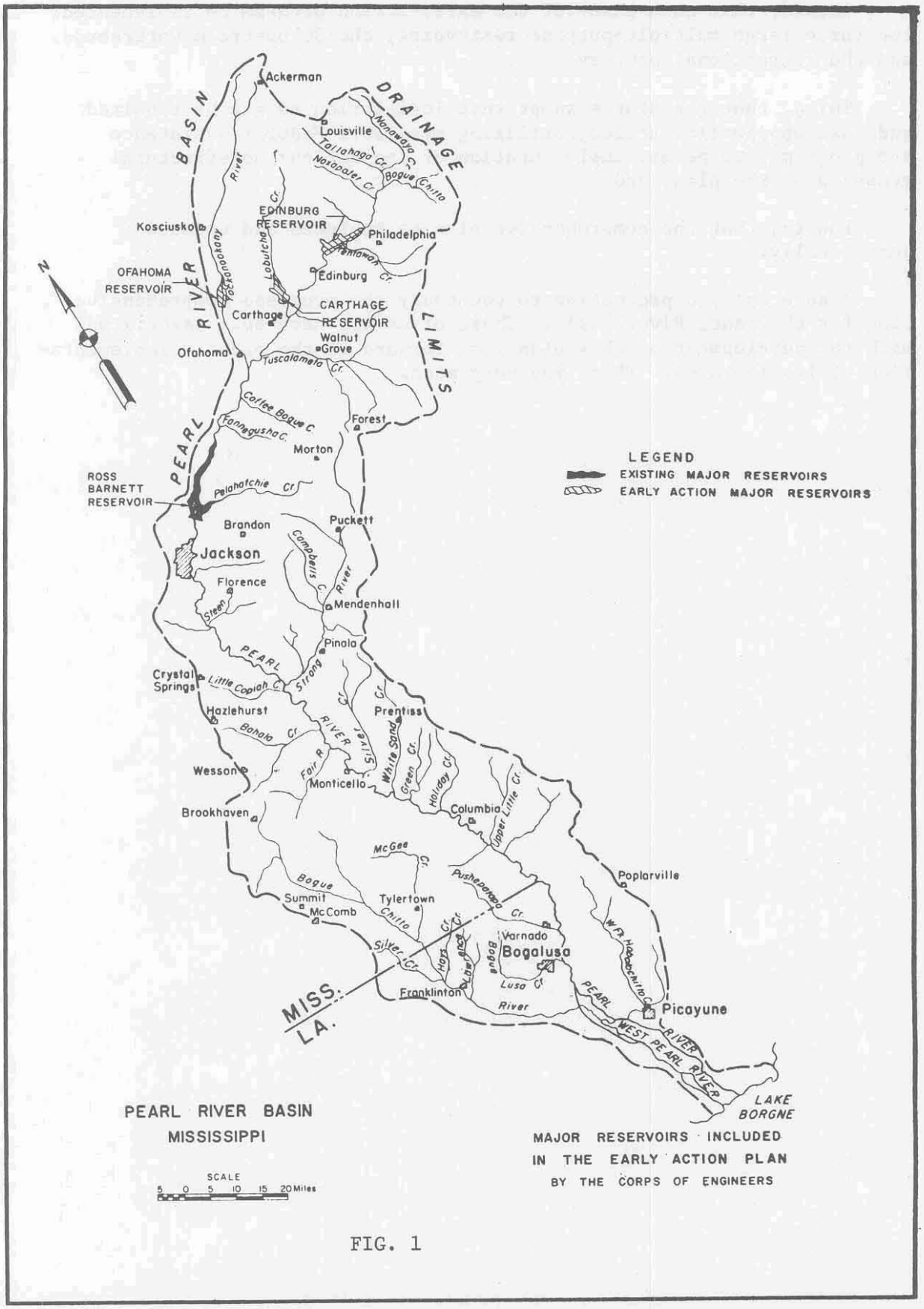
PEARL RIVER BASIN
DRAINAGE
LIMITS
Ackerman
Louisville
Nanawaya Cr.
Tallahaga Cr.
Noxapater Cr.
Bogue Chitto
Kosciusko
EDINBURG RESERVOIR
Philadelphia
Tuscolameta Cr.
Edinburg Cr.
OFAHOMA RESERVOIR
CARTHAGE RESERVOIR
Carthage
Walnut Grove
Ofahoma
Tuscalameta Cr.
Coffee Bogue C.
Tannegusha C.
Forest
Morton
ROSS BARNETT RESERVOIR
Pelahatchie Cr.
Brandon
Puckett
Jackson
Florence
Steen
Campbells C.
Mendenhall
Pinola
Crystal Springs
Little Copiah C.
Strong
Hazlehurst
Bahala Cr.
Prentiss
Wesson
Fair R.
Monticello
White Sand Cr.
Green Cr.
Holiday Cr.
Columbia
Upper Little Cr.
Brookhaven
McGee Cr.
Bogue Chitto
Summit
McComb
Tylertown
Pushepatapa Cr.
Poplarville
Silver Cr.
Hays Cr.
Varnado
Bogalusa
Franklinton
Lusa Cr.
W. Fk. Hobolochitto Cr.
Picayune
MISS.
LA.
PEARL River
WEST PEARL RIVER
LAKE BORGNE
LEGEND
EXISTING MAJOR RESERVOIRS
EARLY ACTION MAJOR RESERVOIRS
PEARL RIVER BASIN
MISSISSIPPI
SCALE
5 0 5 10 15 20 Miles
MAJOR RESERVOIRS INCLUDED
IN THE EARLY ACTION PLAN
BY THE CORPS OF ENGINEERS

FIG. 1

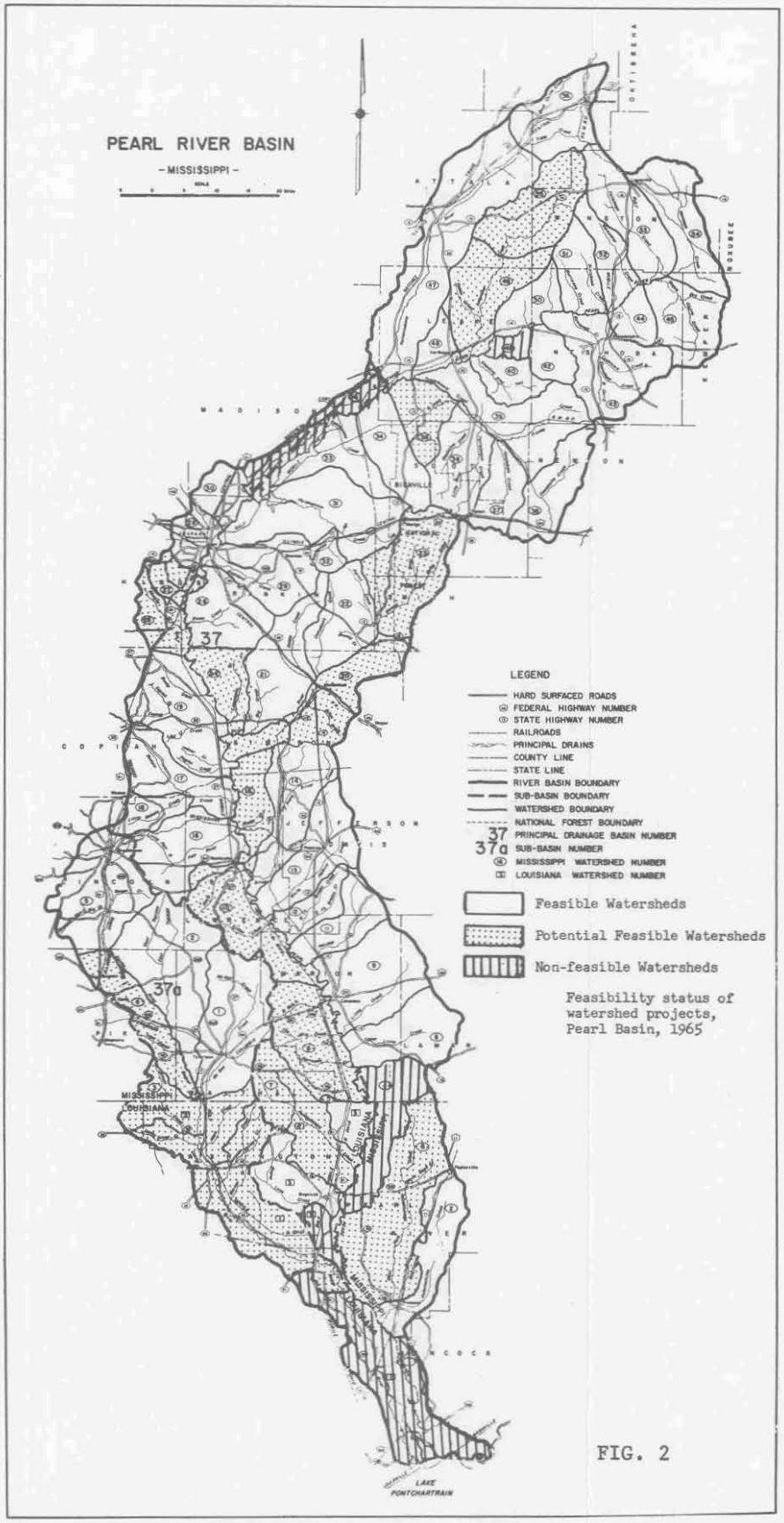
PEARL RIVER BASIN
- MISSISSIPPI -
LEGEND
HARD SURFACED ROADS
FEDERAL HIGHWAY NUMBER
STATE HIGHWAY NUMBER
RAILROADS
PRINCIPAL DRAINS
COUNTY LINE
STATE LINE
RIVER BASIN BOUNDARY
SUB-BASIN BOUNDARY
WATERSHED BOUNDARY
NATIONAL FOREST BOUNDARY
37 PRINCIPAL DRAINAGE BASIN NUMBER
37a SUB-BASIN NUMBER
MISSISSIPPI WATERSHED NUMBER
LOUISIANA WATERSHED NUMBER
Feasible Watersheds
Potential Feasible Watersheds
Non-feasible Watersheds
Feasibility status of watershed projects, Pearl Basin, 1965
37
37a
MISSISSIPPI
LOUISIANA
LAKE PONTCHARTRAIN

FIG. 2