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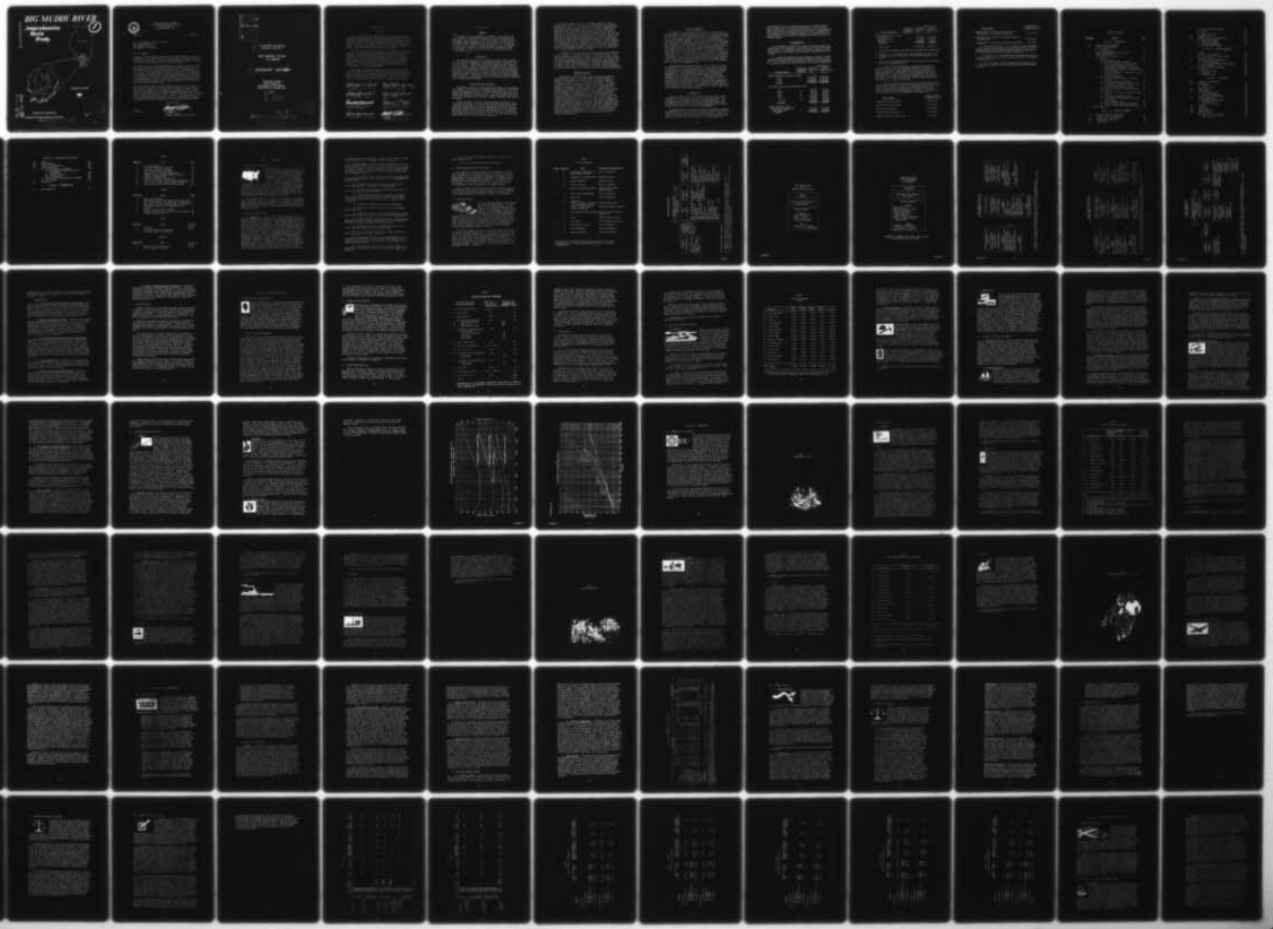

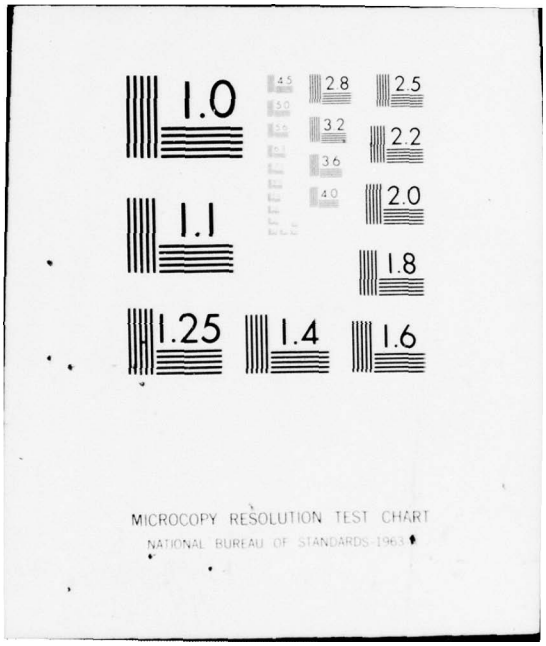
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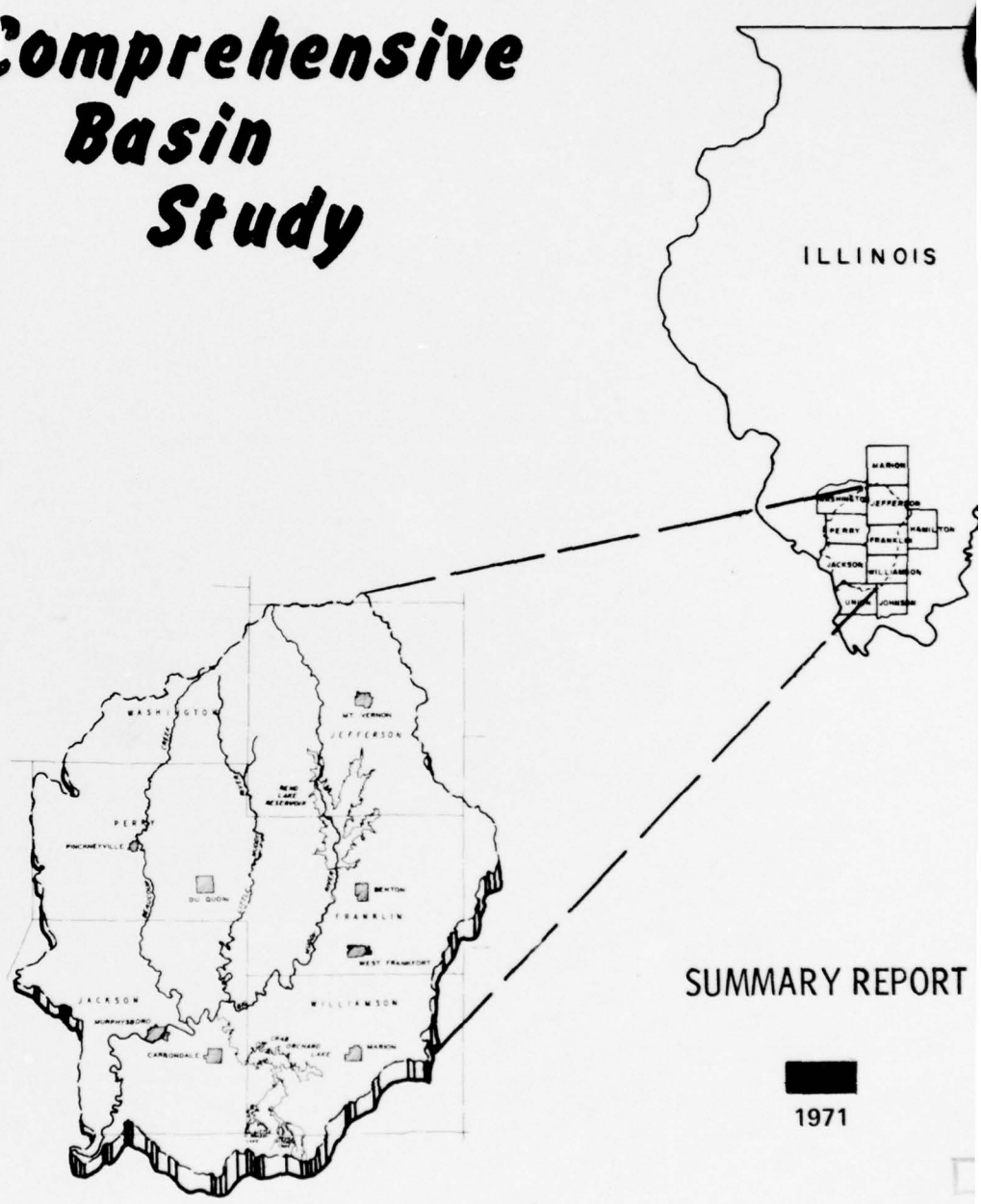

SUMMARY REPORT

1971

Prepared under supervision of

Big Muddy River Basin Coordinating Committee

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210 NORTH 12TH STREET
ST. LOUIS, MISSOURI 63101

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LMSED-BG

3 May 1971

Mr. W. Don Maughan, Executive Director
Water Resources Council
1025 Vermont Avenue, N. W.
Washington, D. C. 20005

Dear Mr. Maughan:

On behalf of the Coordinating Committee for the Big Muddy River, Illinois, Comprehensive Basin Study (Type II), I am formally submitting, under separate cover, four copies of the report which comprise a summary volume and 14 technical appendixes bound in six additional volumes.

This report has been reviewed and unanimously accepted by all field level representatives of the participating Federal and State agencies and the three advisory groups representing local interests. With submission of this report, the responsibility and functions of the Coordinating Committee, as well as all participants, are being terminated. At the same time, an informational brochure also is being released and widely disseminated in order that the public may be fully informed as to the report's findings and recommendations. This will facilitate the public making known their views to the Water Resources Council during preparation of its report to the President of the United States.

Each participating agency is being furnished a full set of the report volumes to serve as supporting documents for preparation of the necessary authorization reports or for incorporation in ongoing programs. The Committee has recommended that the initial funding requests for preparation of the authorizing reports and special studies be included in the individual agency's budget submission for fiscal year 1973. Those agencies not initiating such authorizing reports will, at their own discretion, transmit the Summary Report through channels for internal processing and review.

Sincerely yours,

CARROLL N. LeTELLIER
Colonel CE
District Engineer
Chairman, Coordinating Committee

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BIG MUDDY RIVER ILLINOIS.

9 SUMMARY REPORT.

PREPARED UNDER
SUPERVISION OF
BIG MUDDY RIVER BASIN
COORDINATING COMMITTEE

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F O R E W O R D

May 1971

This study has been reviewed and accepted by the Big Muddy River Basin Coordinating Committee, composed of representatives of the U. S. Departments of Agriculture; Army; Commerce; Health, Education, and Welfare; and Interior; the Federal Power Commission; and the State of Illinois. The St. Louis District, Corps of Engineers, acted as chair agency. With the establishment of the U. S. Environmental Protection Agency, associate membership was accorded that agency.

This report was prepared at field level and presents a proposed plan for the development and management of the water and related land resources of the Big Muddy River, Illinois, Basin. This report is subject to review by the interested Federal agencies at the departmental level, by the Governor of the State of Illinois, and by the Water Resources Council prior to its transmittal to the President of the United States for his review and ultimate transmittal to the Congress for its consideration in authorizing Federal participation in implementing the plan of improvement.

The Coordinating Committee agrees that the report provides the essential framework required as a prerequisite for the basin attaining its projected role in the Upper Mississippi River region and eventual socio-economic parity with the nation. The formal comments indicating an unanimity of acceptance by all participants at the Federal, State, and local levels have been bound at the back of this report.

HOWARD W. BUSCH
U. S. Department of Agriculture

LENARD B. YOUNG
Federal Power Commission

VERNE ALEXANDER
U. S. Department of Commerce

RAY D. DICKERSON
State of Illinois

DONALD W. MARSHALL
U. S. Department of Health, Education, and Welfare

FRANCIS T. MAYO
U. S. Environmental Protection Agency

BURTON H. ATWOOD
U. S. Department of the Interior

CARROLL N. LeTELLIER
CHAIRMAN
U. S. Department of the Army

SYLLABUS

PURPOSE

The purpose of this study was to establish a comprehensive yet flexible plan of improvement that would encourage the conservation, development, and optimum uses of the basin's water and land resources; said improvements designed to assist in attaining a projected level of economic growth commensurate with the desired need to provide for the area's social well-being and the improvement of its environment; and within this framework, set forth the action programs and additional studies necessary to meet the area's needs within the next 10 to 15 years.

BASIN NEEDS

The economic projections and established land-use plans indicate that the area will continue to be predominately rural in character over the next 50 years. Furthermore, the future industrial input into the area is expected to remain essentially light commercial and, together with mining and agriculture, dominate the industrial makeup of the basin. The result of the comparative evaluation between the projected demands and existing or planned supplies indicated that there were four overall categories of needs that required various aspects of resource management and/or development. These four categories involved agricultural enhancement; low-flow stream management; recreation, together with area redevelopment; and environmental control.

ACTION PROGRAMS CONSIDERED

Developments proposed for agricultural enhancement were designed to be responsive to the needs for floodwater damage reduction in the bottomlands, land treatment measures, and channel improvements in order to encourage installation of on-farm drainage. All three of these need categories were considered an integral part of the total effort required to improve the efficiency and the relative economic standing of the individual farmer.

Action programs for low-flow stream management involved two specific areas of concern. One was the need to improve the basin's stream quality and flow quantity in order to sustain the type of use and its equivalent standard specified by the State below major waste discharge. The second was the need to maintain a minimum base flow in those populated areas that, because of natural flow limitations, could experience objectionable sanitary conditions over time. This latter need was warranted from both a social and esthetic standpoint.

The area's natural esthetics and moderate climate of extended duration combine to provide a significant potential for recreational development. Furthermore, an extensive road network, including three national interstate highways, will reduce the time-distance-travel relationship and afford both transients and residents in outlying areas an opportunity to enjoy any recreational development provided in this basin. The program for establishing outdoor general recreational opportunities was designed with two specific objectives in mind. The first was to satisfy the recreational deficiency faced by the State, not only on a local basis, but also those counties in upstate Illinois. The second was to plan the recreational improvements with the dual concept of enlarging the area's economic base by locational control with respect to growth centers, thereby providing an investment environment conducive to attracting additional capital and people and achieving a more equitable distribution of real income.

The program for environmental control was established to maintain a proper balance between man's economic and social well-being. The action programs were designed to provide for the preservation of known archaeological and historical artifacts, conservation of existing wildlife habitat augmented by types of improvements that would lead to better land and water management practices, improvement and protection of the public health, and rehabilitation of abandoned strip-mine areas. In addition, there was a need to enhance the inter-related recreational and environmental potential of selected stream reaches and adjacent lands.

FORMULATION PROCESS

Subsequent to establishing the necessary planning guidelines, various structural and nonstructural methods were identified for meeting the individual needs; and the ability of these methods to provide the required service or output was determined. The types of alternative means that were considered ranged from a do-nothing program to various improvements, some of which involved multiple-resource developments in order to satisfy but a single need. The procedure for formulating a meaningful plan of improvement consisted of an evaluation that compared various combinations of water and land developments. Involved was a process of analyzing various types of development and management proposals to determine the most efficient way of meeting the known short- and long-range needs. The formulation process was divided into two steps: first, quantifying a scale of development based on economic evaluations considering only project costs and the tangible benefits or the value of services provided; and second, modifying this plan to meet those intangible needs that warranted consideration, but which could not be measured in economic terms. This procedure provided a basis for making reasoned choices between potential uses of the area's resources and insured that the social-environmental needs were included in the total decision-making process.

PLAN OF IMPROVEMENT

The resultant plan of improvement consists of 73 reservoirs involving single- and multiple-purpose projects, 283 miles of main stem and 735 miles of lateral and sublateral channel improvements, 178 miles of river recreational-environmental corridors, and installation of proper land treatment measures. Two of the reservoirs are part of a work plan previously completed and approved by the Governor of Illinois for implementation under Public Law 566 and are one of four alternatives available to meet the needs of the Cardondale community and the Cedar Creek Watershed. All of the foregoing improvements will be incremental to and part of a total (basin) system that encompasses other projects already built, authorized, or under construction. The total cost of the incremental time-phased developments is estimated at $228,870,000, based on July 1970 price levels, of which $158,475,000 is required for reservoir construction, $15,300,000 for establishment of the linear stream corridors, and $23,125,000 for channel improvements. An additional $31,970,000 is required to design and install the necessary land treatment measures.

Also included are certain studies needed to insure the successful attainment of the planning objectives. In most cases there was a minimum of basic data available and the time and monies allocated for this report were insufficient to permit the necessary in-depth investigations. These studies are primarily concerned with the reclamation, preservation, and management aspects of the area's natural resources as well as establishing a more logical framework for future economic growth and governmental interaction. Most of these studies can be undertaken concurrently with the preconstruction planning effort normally required for implementing the structural and nonstructural improvements. These studies will require continuing the coordination presently in effect between the Federal, State, and local governmental and planning entities.

CONCLUSIONS

The comprehensive plan of improvement and future roles of the participants, as set forth in this report, have been based on the projected need-time patterns and local financial capability. The recommended action programs will serve as a guideline for Federal and State participation in a coordinated effort with local residents to meet the area's short- and long-term requirements.

The distribution of the various resource developments recommended for implementation has been balanced so that all parts of the basin will share in the resulting social and economic growth. However, the success in attaining the projected growth will depend largely on the ability of the local people and the State to change some of the

institutional and legal constraints that now govern their participation. Federal, State, and local action programs in the past have stabilized the basin's economy and reversed the trend in out-migration. Thus, the area has now progressed to the point where implementation of the recommended action program will provide the impetus necessary to attain a level of socio-economic development more consistent with the national average.

RECOMMENDATIONS

It is recommended that action be taken at the local, State, and Federal levels, as appropriate. With respect to the near-future needs of the basin, it is recommended that the following programs be undertaken as soon as practicable, and in any event, within the next 10 to 15 years.

1. Initial implementation by the construction agencies of those structural and nonstructural improvements summarized below for which there is an immediate need and support as evidenced by local interests. The planning concepts for these projects are set forth in APPENDIX M.

Program Element	Suggested Development Priority 1/	Estimated Total Cost ($)	Estimated Cost, Federal Participation 2/ ($)
Corps of Engineers Reservoirs (Corps)			
C-7	7	20,600,000	18,865,000
C-16A	3	12,000,000	11,138,000
C-35	2	28,500,000	25,833,000
Subtotal		61,100,000	55,836,000
Soil Conservation Service Reservoirs (SCS)			
12-1	5	851,000	572,000
12-7A	6	285,000	190,000
14-2	10	645,000	428,000
14-6	9	281,000	221,000
14-7	8	1,070,000	638,000
2-1 3/	4	898,000	267,000
2-2 3/	4	3,154,000	441,000
Subtotal		7,184,000	2,757,000
Stream Corridors (Corps)			
Main Stem Big Muddy River	1	9,200,000	4,600,000
Little Muddy River	2	3,500,000	1,750,000
Subtotal		12,700,000	6,350,000

Program Element	Suggested Development Priority 1/	Estimated Total Cost ($)	Estimated Cost, Federal Participation 2/ ($)
Land Treatment Measures (SCS)			
Watershed No. 8	2	5,796,000	3,478,000
Watershed No. 12	5	1,968,000	1,181,000
Watershed No. 14	8	1,464,000	878,000
Subtotal		9,228,000	5,537,000
Grand Total		90,212,000	70,480,000

1/ Similar priority number indicates project element interrelationship.

2/ Division of costs determined on a functional basis as defined in existing statues and the policies and procedures adopted for this report.

3/ One of four alternatives available to meet the needs of Carbondale and the Cedar Creek Watershed.

2. That the Corps of Engineers be immediately authorized to undertake a basin wide study presently estimated to cost between $1,500-$1,800,000 that would define the strip-mine problems in the basin and establish a program which it in cooperation with others would implement to restore the ecosystem and esthetics, and income potential of these areas; and that upon completion and authorization, the development proposals be integrated into the State Recreational Plan and the Five-County Land-Use Plan.

3. That the following studies which are an integral part of the early action program be completed concurrently with the preconstruction planning effort normally required for implementing the previously itemized structural and nonstructural improvements. Objectives of these studies and suggested participants should be in accordance with that set forth in this report (Paragraph 51 and TABLE 10).

Type of Study	Estimated Range of Study Costs ($)
Archaeological Field Survey	200-300,000
Sediment and Erosion Control	300-400,000
Flood Plain Information	500-600,000
Stream Monitoring Program	300-400,000
Update of Regional Land Use Plan	150-250,000

Type of Study	Estimated Range of Study Costs ($)
Impact of Water Supply Distribution System on Tax Structure and Demographic Patterns	50- 80,000
Feasibility Study of Inter-City Sewage Collection and Treatment	150-250,000
Evaluation of Local Inter-governmental Organizations	50- 80,000

4. That those Departments of the Federal and State Governments and those local planning entities which will be involved in the subsequent planning and development programs establish a committee to coordinate the individual field agencies work efforts.

5. That each of the affected Federal, State and local agencies keep current the segments of the basin plan for which it is assigned responsibility; and

6. That this Summary Report and technical appendixes be used as supporting documents for both projects and studies authorization requests.

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SECTION I - INTRODUCTION

1. AUTHORIZATION AND PURPOSE

The Big Muddy River Basin, Illinois, is one of 16 river basins selected for a Type II study by the Interdepartmental Staff Committee of the Ad Hoc Water Resources Council. Subsequently, with the establishment of the Water Resources Council by the Water Resources Planning Act of 1965 (Public Law 89-80), the administration and review of this study was placed under the Council's jurisdiction. Due to the comprehensive nature of the study, a separate investigation already underway by the St. Louis District, Corps of Engineers, was incorporated into the basin analysis. This latter investigation was in response to Senate Public Works Committee resolution, dated 21 September 1955, requesting a feasibility study of improving Big Muddy River and Beaucoup Creek for waterborne navigation.

The purpose of the Type II study is to establish a comprehensive plan of improvement that will encourage the conservation, development, and optimum use of the basin's water and land resources. The recommended action program then will serve as a guideline for Federal and State participation in helping local residents meet the area's short- and long-term needs.

2. SCOPE OF INVESTIGATIONS

a. Procedures. As a first step, a general appraisal of the basin's resources and a forecast of the population trends and overall economic composition were prepared. These studies then served as the basis for determining the water- and land-related products and services required both to attain the projected economy and to provide for the area's social and environmental well-being. Planning objectives were identified, formulation controls and procedures established, and various alternative solutions considered in arriving at an optimum plan of improvement. Within this framework the required coordination and time-phasing for implementing the recommended action programs were then set forth to serve as guidelines for future planning and development commitments. Senate Document No. 97, 87th Congress, 2d session, "Policies, Standards, and Procedures In the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources," was used as the basic guideline throughout the study effort. Other documents and policy statements which were published during the course of the investigation were also used. These included the National Environmental Policy Act of 1969 (Public

Law 91-190) and the Water Resources Council's policy statement "Water and Related Land Resources Planning," dated 22 July 1970.

b. Specific studies. Before any action programs could be formulated, the needs of the basin were defined in terms of its role and contribution for achieving stated national, regional, and local goals. This required specific studies to identify the problems and potential for developing the area's water and land resources. Specific areas of investigation included:

(1) An economic survey depicting past trends and projections of population and economic growth indicators, such as employment and personal income;

(2) The need for and capability to alleviate the area's chronic and persistent unemployment or underemployment;

(3) The agricultural economy, both present and future, as measured by productivity and efficiency;

(4) Flood problems and methods of reducing losses experienced in the tributary watersheds and that reach of the Big Muddy River above Rend Lake Dam and Reservoir, which is presently under construction;

(5) Agricultural wetland problems and drainage needs;

(6) Erosion and sediment problems and the land treatment measures required;

(7) Current and future municipal and industrial water supply requirements and programs currently underway to meet these demands;

(8) Present stream(s) flow characteristics, and the programs required to maintain acceptable standards in the major tributaries from either a quality or minimum flow consideration;

(9) The general recreational demand that the basin can service, and the potential for meeting these needs;

(10) Fish and wildlife needs and the effects of future resource development on the area's ecosystem.

(11) Environmental quality, including preservation of unique historical and archaeological artifacts with special emphasis on esthetics and land uses; as further defined in the National Environmental Policy Act of 1969;

(12) The engineering feasibility and economic potential of improving Big Muddy River and Beaucoup Creek for modern barge transportation;

(13) The need for providing hydroelectric or fossil-fuel power generation; and,

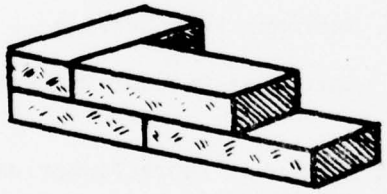
(14) Local and regional plans for development.

3. REPORT ARRANGEMENT AND INVESTIGATIONS

The results of the various studies are presented in a series of technical appendixes covering specific areas of interest. The pertinent information and conclusions contained in the appendixes have been condensed and are presented in non-technical language in this Summary Report. Preparation of the appendixes was assigned those participating agencies having the expertise in the particular subject matter. In all cases each agency was invited to contribute to the contents of the appendixes and this Summary Report.

Listed in TABLE 1 are each of the appendixes and the volumes in which they are bound and the agency responsible for its preparation. A list of the more significant phases of work performed by the individual Federal agencies is presented in EXHIBIT 1 to this report.

4. STUDY ORGANIZATION



The study and planning effort was directed by a coordinating committee. Chaired by the U. S. Army Corps of Engineers, the committee was composed of representatives from the U. S. Departments of Agriculture; Commerce; Health, Education and Welfare; and Interior; the Federal Power Commission; and the State of Illinois. The functions of the Coordinating Committee were to exercise overall managerial control of the study; provide a means for full and continuing exchange of views during the study; advise and assist all participating agencies regarding objectives, work assignments, and schedules; assist in the resolution of study problems; and make periodic review of the study's progress. The basic organization is shown on FIGURE 1.

To insure an effective evaluation small work groups were formed to conduct specific investigations. Each of these work groups was chaired by the Federal agency having expertise in the particular subject. The composition of these groups enabled the Coordinating Committee to insure inter-agency communication of ideas and plans. In most cases, each agency participated in more than one study group and this helped maintain an awareness of the study's status and overall planning effort. The work groups and individual membership are depicted on FIGURES 2 through 5.

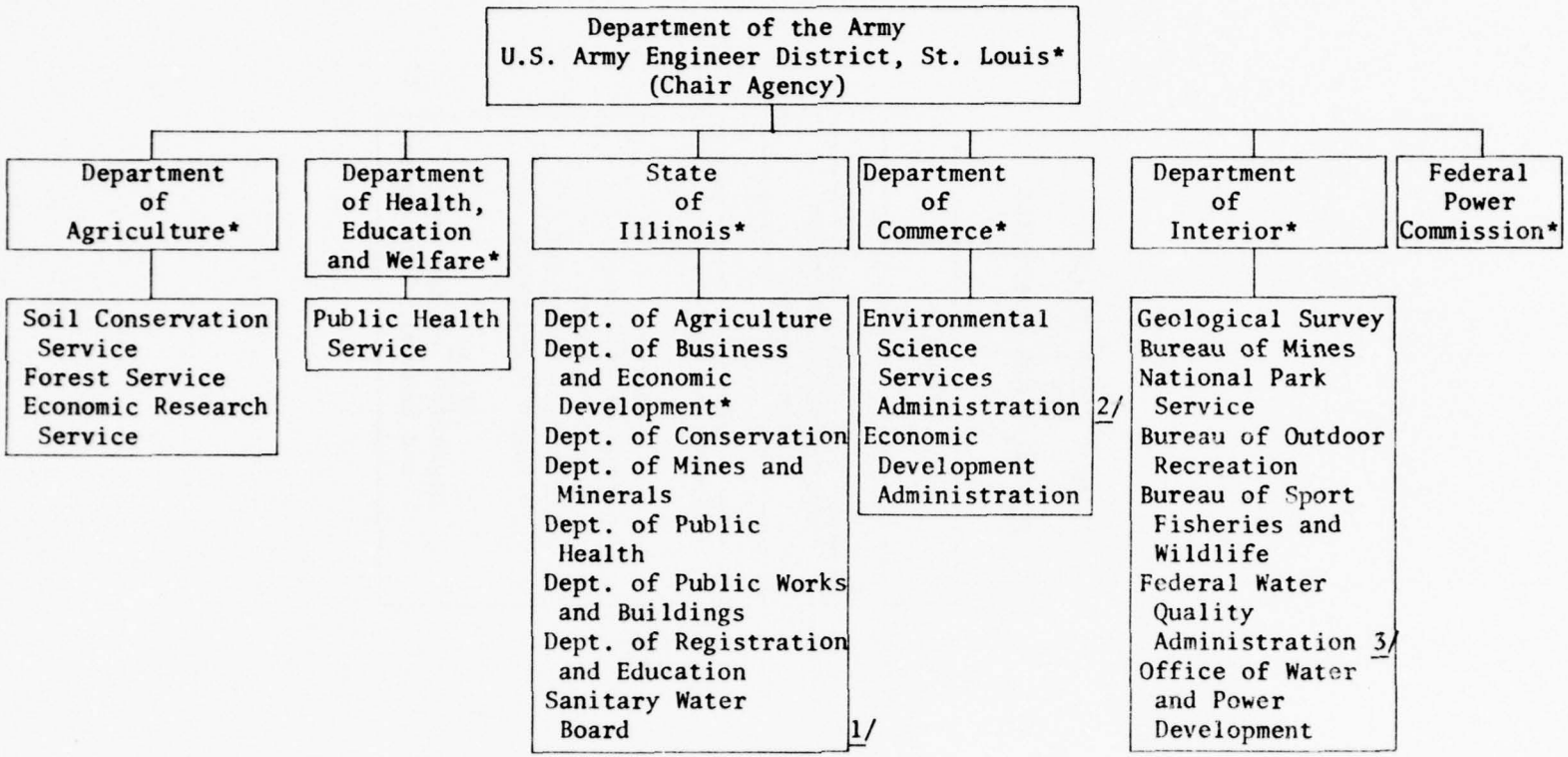
TABLE 1

LIST OF APPENDICES

Volume	Appendix	Title	Responsible Federal Agency
2	A	Climatology, Meteorology, & Surface Water Hydrology	Corps of Engineers
3	B	Availability of Ground Water	Geological Survey
	C	Mineral Resources	Bureau of Mines
	D	Fluvial Sediment	Corps of Engineers
	E	Water Use and Stream Quality	Federal Water Quality Administration*
4	F	Flood Control and Drainage	Corps of Engineers
	G	Navigation	Corps of Engineers
	H	Recreation Part 1 - Natural, Historical, & Archaeological Resources Part 2 - Water-Oriented Outdoor Recreation	 National Park Service Bureau of Outdoor Recreation
	I	Fish and Wildlife Conservation	Bureau of Sport Fisheries and Wildlife
	J	Power	Federal Power Commission
5	K	Agriculture	Soil Conservation Serivce
6	L	Economic Base Survey	Corps of Engineers
7	M	Plan Formulation	Corps of Engineers
	N	Benefit Evaluation	Corps of Engineers

*Incorporated by Presidential Reorganization Plan as part of Water Quality Office, U. S. Environmental Protection Agency, effective 2 December 1970.

PARTICIPATING AGENCIES



*Coordinating Committee Members

1/ Function of this agency now incorporated in the Illinois Pollution Control Board.
2/ Effective 3 October 1970, National Oceanic and Atmospheric Administration.
3/ Effective 2 December 1970, Water Quality Office, U. S. Environmental Protection Agency; and associate member of the Coordinating Committee.

FIGURE 1

WORK GROUP CHAIRED
BY THE
FEDERAL POWER COMMISSION

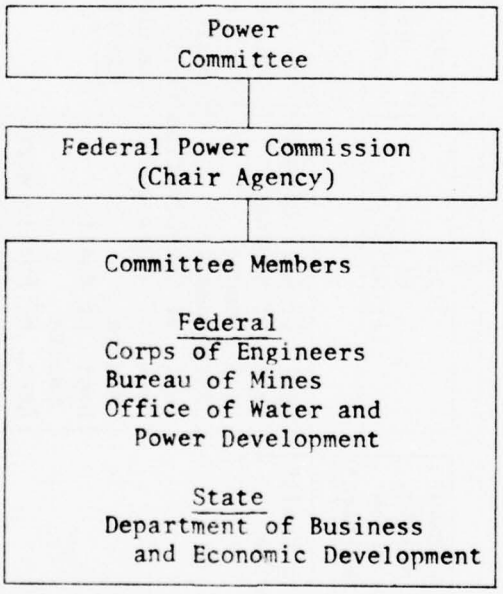
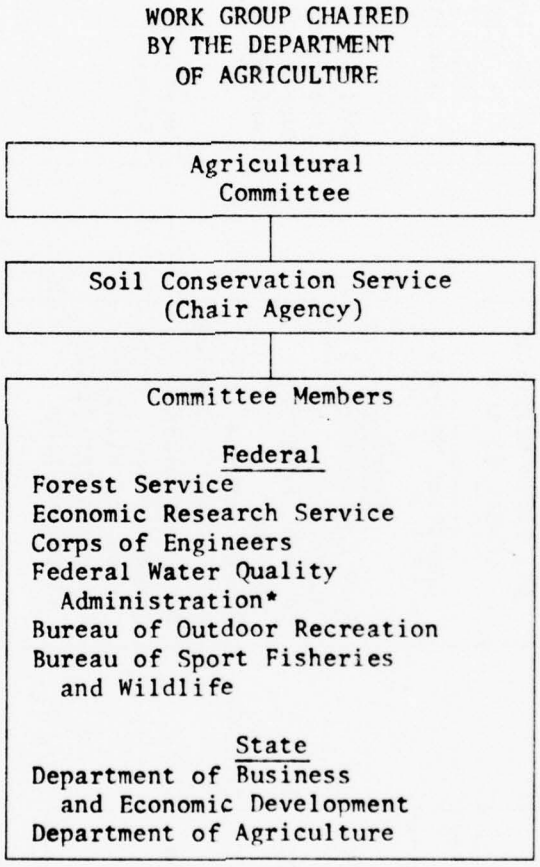


FIGURE 2

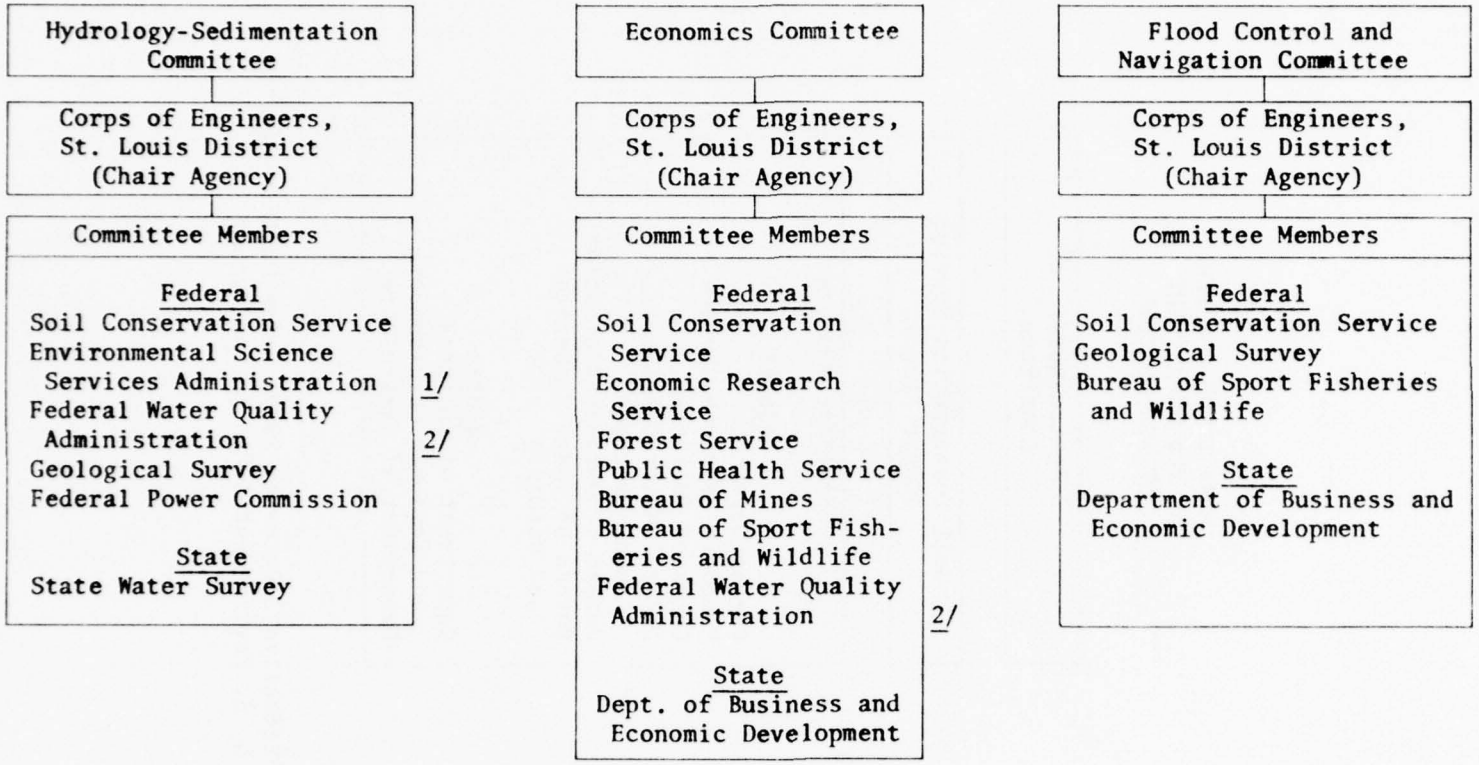


*Effective 2 December 1970, Water Quality Office,
U. S. Environmental Protection Agency

FIGURE 3

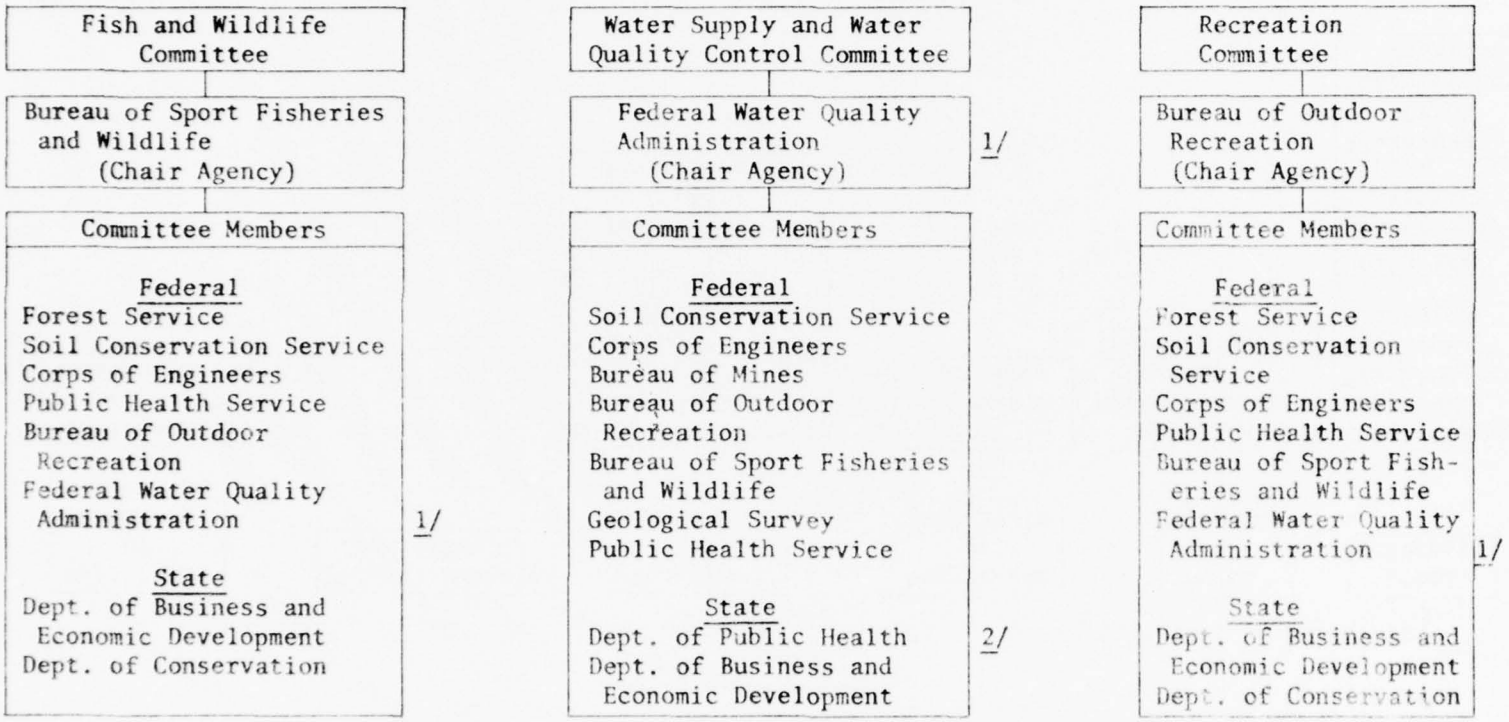
FIGURE 4

WORK GROUPS CHAIRED BY
THE DEPARTMENT OF THE ARMY



1/ Effective 3 October 1970, National Oceanic and Atmospheric Administration.
2/ Effective 2 December 1970, Water Quality Office, U. S. Environmental Protection Agency

WORK GROUPS CHAIRED BY
THE DEPARTMENT OF THE INTERIOR

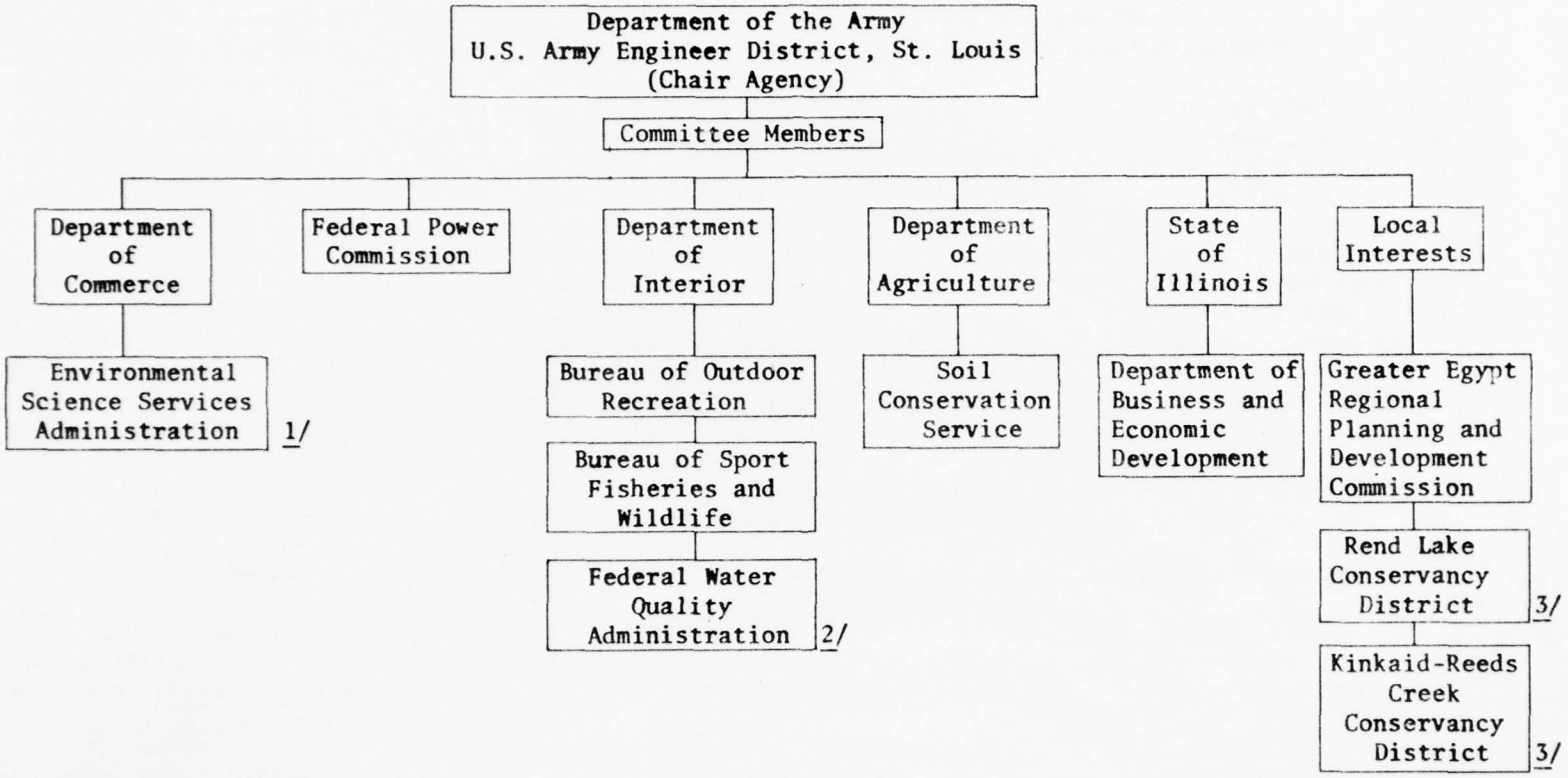


1/ Effective 2 December 1970, Water Quality Office, U. S. Environmental Protection Agency
2/ Agency's function now part of the Illinois Environmental Protection Agency.

FIGURE 5

FIGURE 6

PROJECT FORMULATION
WORK COMMITTEE



1/ Effective 3 October 1970, Natural Oceanic and Atmospheric Administration.
2/ Effective 2 December 1970, Water Qualtiy Office, U. S. Environmental Protection Agency.
3/ Associate member.

In addition, a specially designated Project Formulation Work Committee was established to insure development of a fully correlated and comprehensive basin plan. As shown in FIGURE 6 membership included representatives from most Federal departments, the State, and selected agencies, including local interests. This committee reviewed the conclusions of the various studies, the formulation procedures used in establishing the optimum base plan, and the modifications required to maintain a balanced relationship between man and his natural and/or created environment.

5. PRIOR STUDIES AND REPORTS

a. Coverage. Numerous studies and reports have been prepared on the Big Muddy River Basin by both Federal and non-Federal interests dating back to 1925. No attempt has been made to list all of the reports; rather coverage is limited to those which have a direct bearing on the present investigations and which were utilized to a significant degree. Additional references to other pertinent documents are contained in the supporting appendixes.

b. Federal reports.

(1) Rend Lake Reservoir, Illinois. Prepared by the U. S. Army Corps of Engineers, St. Louis District. The report recommended construction of a multiple-purpose reservoir for flood control, water supply, low-flow augmentation in the interest of water quality control, recreation, fish and wildlife conservation, and area redevelopment.

(2) Soils of the Rend Lake Area - Franklin and Jefferson Counties, Illinois. Prepared by the Soil Conservation Service, U. S. Department of Agriculture in conjunction with the Rend Lake Conservancy District and the Illinois Department of Business and Economic Development. The report is an inventory and interpretation of soil types found in the land immediately surrounding the Rend Lake Dam and Reservoir.

(3) An Appraisal of Potentials for Outdoor Recreational Development, Big Muddy River Basin, Illinois. Prepared by the Soil Conservation Service, U. S. Department of Agriculture, in cooperation with local Soil and Water Conservation Districts and selected State and local agencies. The report contains an inventory of known scenic and historic areas and public and private recreation facilities. Also presented is an appraisal of the potential for developing outdoor recreational enterprises in the basin area.

(4) Watershed Work Plan - Cedar Creek, Jackson County, Illinois. Prepared by the Soil Conservation Service, U. S. Department of Agriculture. The report presents a plan of development consisting of two multiple-purpose reservoirs, one on the main stem of Cedar Creek and the other on a tributary, Poplar Camp Creek. The reservoirs, located within the boundaries of the Shawnee National Forest, would be constructed to provide flood control, recreation, and municipal and industrial water supply for the community of Carbondale. Installation of forestry and other land treatment measures on both private and Federal forest lands were also planned.

c. State of Illinois reports.

(1) Potential Water Resources of Southern Illinois. Prepared by the Department of Registration and Education, Water Survey Division. Two reports, both evaluating the existing sources and potential for development of both surface and ground waters: one covers the 17 southernmost counties; the second, 29 counties in southcentral Illinois.

(2) Outdoor Recreation in Illinois. Prepared by the Department of Business and Economic Development. Financed in part through an urban planning grant from the Housing and Home Finance Agency, the report presents a recommended framework for recreation decision-making. Included is a program to accommodate recreation needs for the years 1965-1970 thereby qualifying the State for grants and aid programs made possible by the Land and Water Conservation Funds.

(3) The Economic Potentials of Tourism and Recreation in Southern Illinois. Prepared by the consulting firm of Checchi and Company, Washington, D. C. under contract with the Economic Development Administration, U. S. Department of Commerce and the State of Illinois. The report detailed how and to what degree tourism and recreation could be expanded into southern Illinois; what benefits would result; and, the applicable costs required. Also included was an organizational and financial plan for the creation and expansion of tourism and recreation as an industry in southern Illinois.

(4) Kinkaid Creek Reservoir, Illinois. A report prepared by the Department of Public Works and Buildings, Division of Waterways. The report recommended construction of a multiple-purpose reservoir for municipal and industrial water supply, recreation and conservation. Subsequent planning has resulted in an expanded program of development involving the local Kinkaid-Reeds Creek Conservancy District and the U. S. Forest Service (Shawnee National Forest).

(5) Water for Illinois - A Plan for Action. Prepared by the Illinois Technical Advisory Committee on Water Resources. The report calls for: an Illinois Resource Development Fund Action Program with a suggested $1 billion expenditure; creation of an independent State Water Resources Board as the sponsor for non-Federal

participation in all Federal projects; and a comprehensive long-range program for developing and managing the water and land resources in the State of Illinois.

d. Local studies.

(1) Feasibility of Rend Lake Inter-City Water System. Prepared by engineer consulting firm of Clark-Dietz-Painter and Associates of Urbana, Illinois, for the Area Redevelopment Administration and the Board of Trustees, Rend Lake Conservancy District. The report contains a basic engineering and feasibility study for construction of a water distribution system supplying those communities in and around the Rend Lake Dam and Reservoir. A more detailed evaluation was later prepared which included water treatment facilities.

(2) Rend Lake Development Program. Prepared by the General Planning and Resource Consultants, Inc. of St. Louis, Missouri, under contract with the Rend Lake Conservancy District, Illinois. This plan presents a land use and zoning proposal for those lands in Franklin and Jefferson Counties, Illinois, surrounding the Rend Lake Reservoir. A supplemental report outlining a comprehensive recreational development program also has been prepared for those lands controlled or owned by the Conservancy District in close proximity to the Rend Lake Reservoir.

(3) The Comprehensive Plan for The Greater Egypt Region. Prepared by the Greater Egypt Regional Planning and Development Commission. The report proposed a land-use plan, a community facilities plan and improvement to the region's highway system as part of a regional planning effort for the then four counties involved: Franklin, Jackson, Perry, and Williamson Counties. This report was partially financed through a Federal grant from the Housing and Home Finance Agency under the Urban Planning Assistance Program. Capital improvements plans for each of these four counties have subsequently been prepared by the Greater Egypt Regional Planning and Development Commission.

(4) Shawnee Project Plan. Prepared by the Executive Committee of the Shawnee Resource Conservation and Development Project. The report outlines a plan to increase employment and income of the area, part of which includes the Big Muddy River Basin counties of Jackson, Williamson, Union, and Johnson.

(5) Overall Economic Development Program. Prepared by the Greater Egypt Regional Planning and Development Commission. In June 1967 the counties of Franklin, Jackson, Jefferson, Perry, and Williamson were officially designated as the Greater Egypt Economic Development District by the U. S. Department of Commerce. This report contains a regional economic analysis and a recommended economic development program for the District.

(6) Report on Cedar Creek Dam and Reservoir. Prepared by Stanley Consultants of Muscatine, Iowa, for the City of Carbondale. This report supplements the study undertaken by the Soil Conservation Service and recommends instead construction of a multiple-purpose dam by mid 1970 on the main stem of Cedar Creek, approximately 4 miles southwest of Carbondale. The project would provide a long-range water supply for the City of Carbondale and be designed for water-based recreational development.

6. PUBLIC HEARINGS

Prior to initiation of this study, two public hearings were held in the basin. The first was held on 21 February 1956 at Murphysboro, Illinois, to determine the views and desires of local interests for navigation improvements. A second was held on 7 December 1961 at Benton, Illinois, with a view to determine public acceptance of the plan of development for Rend Lake Dam and Reservoir.

Once this basin study was started, the process of meetings and conferences was enlarged to include all participating state and Federal agencies as well as local interests. In this way the local residents were afforded the opportunity to make known their problems and needs and to actively participate in the plan-formulation study phase.

The comprehensive basin plan of improvement was presented at a public hearing held on 26 November 1968 at Carbondale, Illinois. The plan as recommended by this report received wide public support from both individual residents and local organizations. Some concern was expressed regarding the projections for future water supplies, particularly since local interests hope to attract heavy industry of the type not contemplated in the economic forecast. In addition, some disappointment was expressed as to the conclusion regarding the navigation improvements which local interests had hoped would assist local mining (coal), agricultural, and other type of commercial industries. Particular indorsement was given the recognition afforded local plans for land use and the proposed developments around Rend Lake Reservoir.

Sample letters received from local planning and action agencies are included in EXHIBIT 2 to this report. The letters selected are only intended to show the range of viewpoints expressed. Verbatim transcripts of the public hearings are on file in the office of the District Engineer, U. S. Army Engineer District, St. Louis, and are available for review by all interested parties.

SECTION II - PLANNING ENVIRONMENT

7. BASIN LOCATION AND DESCRIPTION

The Big Muddy River is located in the southwestern portion of the State of Illinois and drains into the Mississippi River, the confluence being 75.7 river miles above the Ohio River. Its political area includes 11 county units which cover some 5,400 square miles. Of this amount, 2,375 square miles are located within the watershed of the Big Muddy River. The drainage boundaries include the major portions of five counties: Franklin, Jackson, Jefferson, Perry, and Williamson; as well as smaller portions of Hamilton, Johnson, Marion, Randolph, Union, and Washington Counties. The study area is essentially rectangular in shape with a median length of 72 miles and an average width of 33 miles. Excluded were most of those lands located in the Mississippi River flood plain where specific projects already have been developed in accordance with their projected use. A map of the basin is shown on PLATE 1.

8. GEOLOGY, SOILS AND TOPOGRAPHY

Prior to the last glacial period some 60,000 years ago, the Big Muddy River cut a broad valley through the bedrock shales and sandstones found in the basin. Then, following the withdrawal of the glacial ice sheet, the melted water caused the Mississippi River to carry such large quantities of material that its transporting capacity was exceeded. This, in turn, resulted in the Mississippi Valley being filled with sediment deposits that closed some of the mouths of its tributary streams. The Big Muddy River was one of these tributaries which became impounded, thereby forming a lake. This action was probably intermittent in character, but well-defined terrace levels are evidence of at least two different periods of prolonged lake existence. When the Mississippi River was once more capable of transporting the sediment delivered to it, the natural process of cutting a deeper channel occurred and the ponded Big Muddy River, now nearly full of sediment, began to drain. Typical of a lakebed, the soils of the Big Muddy Valley consist of relatively impervious clays and silts, interlaced with layers of very fine sands. Below this lake fill are coarser silts, sands, and thin beds of fine gravels, which probably are remnants of earlier glacial deposits formed when the stream carried melt-water from the retreating ice edge. This lower portion is saturated with ground water but well yields are limited by the low permeability of the material. Bedrock, primarily consisting of sandstone underlain by shale, is 60 feet or more below the flood plain, with the deeper portion occurring on the west side of the valley in the Sesser area.

The topography of the basin is characterized by gently undulating hills in the north and west; low relief, wide valleys and well developed upland drainage systems in the east; and more rugged, well-defined hills and valleys in the south. Local topographic relief seldom exceeds 100 feet in any one general area, even though the land elevations range from 320 to 860 feet above mean sea level.

9. CLIMATE AND PRECIPITATION

The basin has a continental type climate typical of the mid-Mississippi River region. The winters are relatively mild, while summers are commonly warm-to-hot and usually humid, with occasional temperatures of 100° Fahrenheit or higher. The average temperature is 59° Fahrenheit, with extremes of 114° to a -20° having been recorded. July is the warmest month and January is the coldest month, with mean monthly temperatures equivalent to 78° and 36°, respectively. The average daily temperature range is about 18° during the colder half of the year and about 22° during the warmer months. The area has a frost-free growing season of some 190-200 days with the first fall frost occurring usually late in October and the last killing frost normally in early April. Prevailing wind patterns are from the southwest to the northeast during the spring and summer, and from the northwest to the southeast during the winter.

Southern Illinois is subject to intense local rainstorms of short duration, usually in the summer, with widespread storms of lesser intensity throughout the rest of the year. The more notable storms of record are the latter type and have been responsible for the major floods within the basin. Average annual rainfall is about 42 inches, with extremes of 65 to 29 inches having been recorded. Local snowfall averages some 13 inches annually. Distribution of precipitation is relatively uniform throughout the year, with the driest month being February and the wettest month being May. Much of the total rainfall, however, is lost because of evaporation, transpiration, rapid upland runoff rate, and the limited capacity of the surface soils to retain infiltration as ground water.

A detailed evaluation of the climatology, meteorology and surface water hydrology is presented in APPENDIX A.

10. SURFACE WATER HYDRAULICS

The major portion of the basin's drainage system consists of the main stem of the Big Muddy River and its five principal tributaries: Beaucoup Creek, Crab Orchard Creek, Little Muddy River, Middle Fork-Big Muddy River, and Casey Fork Creek. However, there are 15 individual watersheds as defined by topography and drainage. These watersheds are listed in TABLE 2 and shown on PLATE 2. The principal

TABLE 2

TRIBUTARY STREAMS AND WATERSHEDS

	Watershed and principal tributary area *	River mile - main stem, Big Muddy River	Drainage area (square mile) Individual	Total
1.	Lower Big Muddy River	0 - 55.3		117
2.	Cedar Creek	17.1		68
3.	Kinkaid Creek	28.4		64
	Beaucoup Creek Watershed	43.5		574
4.	Lower Beaucoup Creek		102	
5.	Galum Creek		163	
6.	Upper Beaucoup Creek		309	
7.	Crab Orchard Creek Watershed	52.3		291
	Grassy Creek		27	
	Little Grassy Creek		24	
	Wolf Creek		18	
	Drury Creek		51	
	Local Area		171	
8.	Little Muddy River	55.3		286
9.	Central Big Muddy River	55.3 - 103.1		160
10.	Hurricane Creek	65.4		24
11.	Lake and Pond Creek Watershed	76.6		101
	Lake Creek		34	
	Pond Creek		67	
12.	Middle Fork - Big Muddy River	87.8		238
	Middle Fork		177	
	Ewing Creek		61	
13.	Gun Creek	109.3		49
14.	Upper Big Muddy River	103.1 - 160.5		240
15.	Casey Fork Creek	110.2		163
	Total			2,375

* The numbering of the individual watersheds is the same as is shown on PLATE 2 and has been retained to insure consistency throughout the report's presentation.

streams generally follow tortuous routes with abrupt directional changes in many areas. Runoff is comparatively rapid in the northern half of the basin and sluggish in the southern half, particularly in the lower 43 miles of the main stem, which is affected by backwater from the Mississippi River. Because of this backwater effect, the Plumfield gage at river mile 85.5 on the main stem of the Big Muddy was selected as the control gage, typical of the planning area. This reference gage has a drainage area of 785 square miles and a flow pattern and yield relationship representative of the area's hydraulic characteristics during a period of record extending from 1916 to 1965.

The Plumfield gage has a mean recorded flow of 713 cubic feet per second (cfs), with a maximum and minimum discharge of 43,500 and 0, respectively. Low-flow characteristics indicate an annual critical 7-day low-flow averaging 2 cfs or less per day in 25 of the 50 years of record. Average annual runoff represents about 11.5 to 13.0 inches average depth over the drainage area. Yield in acre-feet for the Plumfield gage has equaled or exceeded 513,000, 50 percent of the time; 170,000, 90 percent of the time; and 63,000, 95 percent of the time.

11. GROUND WATER

Availability of ground water as a source of supply is very limited. Not only is the yield a limiting factor but the quality is also a controlling consideration. Extensive hardness and high iron content are the two most common characteristics of the ground water. Saline water is encountered at depths varying from 50 feet in the northeastern part of the basin to 600 feet in the southwestern portion.

It is in this extreme southwestern portion of the basin that ground water is considered a dependable source of supply and then only for small municipalities. The usable ground water is found in bedrock formations approximately 200 to 600 feet in depth. While additional supplies can be obtained from deeper formations, the water's quality and depth involved cause the recovery process to be too costly with present technological methods. In this area moderate yields ranging from 20 to 200 gallons per minute (gpm) can be obtained from individual wells with an average yield of approximately 50 gpm.

The remainder or approximately three-fourths of the basin is classified as an area of low ground water yield. Extensive coal mining has drained much of the ground water from the shallower rocks and deep wells often encounter saline water. Furthermore, the supply is not dependable. Except for a few scattered pockets the yield is low with output estimated at less than 5 gpm per individual well. Thus the available ground water has been restricted to individual, domestic, and farm supply.

Although little ground water is used as a source of supply, ground water discharge does occur both naturally and artificially. It is estimated that ground water naturally contributes some 2,500 acre-feet per year to the area's streams. To this, 3,800 acre-feet per year is added from pumpage for municipal, industrial, domestic, and farm uses.

The Mississippi River flood plain is the only area adjacent to the basin where ground water is abundant enough to permit installation of numerous wells that individually could produce from 500 to 1,500 gpm. Natural ground water discharge from the Mississippi River flood plain within and adjacent to the basin is estimated at approximately 25,000 acre-feet per year.

A comprehensive evaluation of the ground water resources is contained in APPENDIX B.

12. LAND USE AND NATURAL RESOURCES

a. Land use.

There are approximately 1,520,000 acres within the basin boundaries of which some 52 percent is in crop lands, 13 percent in pasture, 18 percent in forest land, and 17 percent in other uses. Most of the land, some 1,441,300 acres is privately owned with 72,600 acres in Federal ownership and 6,100 acres belonging to the State. About 317,000 acres or approximately 21 percent of the area is located in the flood plains. There agricultural production accounts for about 52 percent of the flood plain acreage, the remaining 48 percent in forest lands.

Commercial forest lands comprise some 363,400 acres. An additional 13,500 acres are no longer so classified due to statutory or administrative regulation. Tree species vary from oak, gum, and cottonwood on the poorly-drained lowlands to forests of oak and hickory in the well-drained hill lands.

A breakdown of the existing land use in each of the watersheds is shown in TABLE 3. A more detailed inventory of the land, its use and type, is presented in APPENDIX K.

b. Soils. According to existing inventories, approximately 70 percent of the 1,520,000 acres are classified as soils suitable for an acceptable range of crop production provided reasonable conservation practices are applied and maintained. While some of these lands are subject to varying degrees of overflow and moderate crop damage, the physical characteristics are sufficient to warrant financial investment and cultivation. An additional 10 percent of the

TABLE 3

LAND USE BY WATERSHED
(ACRES)

Watershed	Crop-land	Pasture-land	Forest-land	Other Land 1/	Total
No. 1 Lower Big Muddy	22,010	7,600	21,830	23,700	75,140
No. 2 Cedar Creek	15,120	4,820	13,130	10,450	43,520
No. 3 Kinkaid	16,940	5,330	13,960	4,730	40,960
No. 4 Lower Beaucoup	31,430	9,840	21,210	2,800	65,280
No. 5 Galum Creek	62,330	13,590	15,050	13,350	104,320
No. 6 Upper Beaucoup	128,625	21,885	24,830	22,200	197,540
No. 7 Crab Orchard	62,730	20,420	36,200	66,670	186,020
No. 8 Little Muddy	107,680	23,700	30,810	20,190	182,380
No. 9 Central Big Muddy	58,950	11,780	22,290	9,380	102,400
No. 10 Hurricane Creek	7,900	2,290	3,360	1,810	15,360
No. 11 Lake & Pond	34,180	9,150	14,020	7,290	64,640
No. 12 Middle Fork	85,380	24,150	22,170	21,040	152,740
No. 13 Gun Creek	17,310	4,680	4,890	4,480	31,360
No. 14 Upper Big Muddy	84,120	25,580	17,870	26,450	154,020
No. 15 Casey Fork	54,030	18,930	11,760	19,600	104,320
TOTAL: acres	788,735	203,745	273,380	254,140	1,520,000
percent	52	13	18	17	100

1/ Includes urban, industrial areas, State and Federal lands (including 63,030 acres of public-owned forests), farmsteads, roads, and other miscellaneous land.

basin land is the type that can support the more common crops asso-ated with this area but only if special management and conservation practices are applied and maintained. Subject to frequent overflows and susceptible to severe crop damages, the amount of crop production harvested on these lands is generally low in relation to inputs over a long period of time. Cultivation is impractical on the remaining 20 percent of the lands, the physical characteristics being such as to generally limit their use to pasture, woodland, recreation, and wildlife cover.

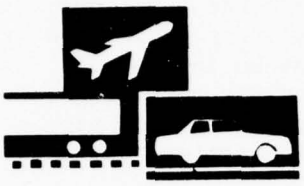
c. Mineral resources. The principal resources found in the basin are coal, petroleum, sand and gravel, clay and shale, and stone. The first two commodities are actively under production and generally shipped to markets outside the basin. Sand, gravel, and stone outputs are not of the magnitude to be considered significantly commercial, being generally limited to the needs of the local area in which they are produced. As far as is known, there has been no commercial mining of clay and shale since 1953.

Minable reserves of coal are extensive, with an estimated 16,713 million tons in the basin. Production methods include both surface (strip) and underground mining. In general, the coals are classified as highly volatile, with high heat values and moderate to high sulfur content. Strip mining began around 1910 and is still used today, accounting for some 54 percent of the basin's 1969 total coal production. Land reclamation in some form has been attempted since the early beginning of strip mining in the basin. According to the U. S. Bureau of Mines, approximately 61 percent of the strip mine lands have been reclaimed to some extent by 1969.

Known oil fields are located in Jefferson and Franklin Counties. These fields have an estimated reserve of some 41,500,000 barrels exclusive of any secondary recovery considerations which would increase these reserve figures by some 50 percent or more. Secondary recovery methods, involving pumping water under pressure through properly located input wells are currently being used, accounting for 64 percent of the basin's total crude oil production in 1969.

A detailed evaluation of the area's mineral resources is presented in APPENDIX C.

13. TRANSPORTATION



The basin is well provided with various modes of transportation that facilitate its role as both a market and service area in the Upper Mississippi River region. Commercial transportation is available with services provided by seven railroads and five airports with facilities for either scheduled and/or private aircraft. In addition to having an excellent road network, three interstate highways, planned and/or under construction as part of a national system, will traverse the basin. When completed, they will open up the area to new population centers, and based on a time-distance-travel concept, cause a secondary input effect on the basin's economy. These three highways are: Interstate Highway 57, connecting Chicago to New Orleans, via Memphis; Interstate Highway 64, connecting St. Louis to the Virginia-Atlantic coastal region, via Louisville and Charleston; and, Interstate Highway 24, interconnecting Interstate Highway 57 in the southeast portion of the basin to the Florda area, via Nashville. In addition, the lower 37.5 miles of the Big Muddy River have been designated by law, though not in fact, as navigable. Actually, this reach is not usable, except during intermittent highwater periods, and then only for short distances.

14. ESTHETIC AND CULTURAL RESOURCES

a. Recreational season. Due to its moderate temperature and seasonal variations, the basin sustains a range of outdoor pursuits during a recreational season that extends from 1 April through 30 November. Concentrated within this 8-month period are peak demands for general recreation, fishing, and selective hunting. While these pursuits are somewhat concurrent, their peak demands are sufficiently time-phased so as to prevent saturation of the same facilities or areas. The peak demand for recreational activities such as boating, camping, picnicking, swimming, and hiking generally occurs from 15 April through 15 September; and for fishing, from 1 April to 15 June and from 15 September through October. Hunting demands vary depending upon the game being sought, but generally, it is the heaviest during the late fall and winter months, namely 15 October through February.

b. Ecological aspects.

Numerous examples of natural developments that have esthetic value are to be found in the basin. Of particular importance is the Shawnee National Forest which was established in 1933 and encompasses part of the acreage lying between the Mississippi and Ohio Rivers in southern Illinois. At present, the boundaries include some 225,000 Federally-owned acres intermingled with 650,000 acres that are in either

private or other ownerships. Of this amount, approximately 29,600 acres are located in the basin and are managed by the U. S. Forest Service under a multiple-use program providing commercial forestation and recreational opportunities. In addition, the natural environment is enhanced by geological formations found in the southern portion of the basin. Particularly noteworthy are the giant rocks and boulders and bluff cleavage found in the Shawnee National Forest area.

Two outstanding examples of significant ground cover are the Pine Hills south of Murphysboro and the scattered swamp lands that provide cover for the area's wildlife. Historically, the northern three-quarters of the basin was once covered by vegetation that was typical of the midwest prairie when grasses attained heights ranging from 6-10 feet. However, these types of grasses have mostly disappeared due to intensive agricultural pursuits and extensive weed control programs. Still, the rolling prairie and bottomlands in the north do combine to give an interesting edge effect when contrasted to the hills and cliffs in the south. Reinforcing this edge effect and bordering the prairie are such shrubs as sumac, rough-leaved dogwood, and prairie crab apple.

The basin has a remarkable array of animal life and includes 46 of the 59 species of animal life listed as native to Illinois. These species range in size from the small shrew to the white tail deer and include, among others, the raccoon, beaver, mink, and muskrat and several species of fox, squirrel, and rabbit. Game birdlife found in the area consists of bob-white quail, mourning dove, and a variety of migratory waterfowl including several species of geese and ducks. Due to sedimentation and pollution, most of the streams in the basin are populated by rough fish such as drum, buffalo, carp, and bullhead. However, where water quality is better, specifically in the man-made impoundments, the predominant species include bass, blue gill, sun fish, and white crappie.

c. Man-made impoundments. Water- and land-related improvements developed by Federal and non-Federal interests are located throughout the basin and have supplemented the natural environment of the area. Generally, these projects consist of variable-sized reservoirs and land management programs. Together, these developments in the five core counties provide more than 36,000 acres of water and 44,000 acres of land that can be used for recreational pursuits. While most of these improvements were designed for restrictive local usage, there are a few worthy of specific mention.

Located in Williamson County is the Crab Orchard National Wildlife Refuge, maintained by the U. S. Fish and Wildlife Service as a multiple-use wildlife management area. Three lakes, Crab Orchard, Devil's Kitchen, and Little Grassy, have been built and together with extensive land acreage are operated for fish and wildlife conservation and general recreation. Under a cooperative program with the nearby

Southern Illinois University the area also serves as an outdoor laboratory for biological studies, education, and research.

Rend Lake, a multiple-purpose reservoir, is presently under construction by the Corps of Engineers in cooperation with the State of Illinois and the local Rend Lake Conservancy District. Located in Franklin and Jefferson Counties, the plan of improvement includes a large state park complex and a waterfowl refuge with two small sub-impoundments in the upper arms of the reservoir. The project is presently scheduled for completion in fiscal year 1974.

The State of Illinois and the Kinkaid-Reeds Creek Conservancy District are developing Kinkaid Lake, a multiple-purpose project just northwest of Murphysboro in Jackson County. Also participating is the U. S. Forest Service which will provide recreational facilities as part of its program for the Shawnee National Forest. The project is presently scheduled for completion in 1973. The lake, together with the Giant City State Park in the Shawnee National Forest, Lake Murphysboro State Park and the privately-owned and operated Du Quoin fair grounds, offer noteworthy contributions to the recreational and esthetic values in the basin.

More detailed coverage of those projects which have a significant impact on the area's recreational development is summated in APPENDIX M and detailed in the various supporting appendixes.

d. Archaeological findings.

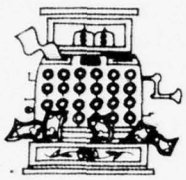
Significant Indian cultural remains have been found in the basin that are historically associated with the tribes that once lived in this part of the country. Three types of sites have been found that are of archaeological interest and which are part of the locality's cultural background: (1) open village or camp sites; (2) rock shelters and cave sites, which were used as habitation areas; and (3) burial sites dating from the period 300 B.C. to 900 A.D. and includes both bluff top or cliff-edge sites and river bottom sites. A fourth type, templetown or Indian mound site, which dates from the period 900-1500 A.D. and included what was essentially an urban population concentration are known to have been built in this part of the country, but as yet none have been discovered.

The basin contains other sites that are of historical interest. Stone forts are found throughout southern Illinois, with one located in the Giant City State Park. The sites consist of large elliptical stone walls constructed on tops of high bluffs. Opinions have varied as to their use, but generally they have been considered a form of wing trap for bison drives, or a defense stronghold. Block houses were built during the War of 1812 at the direction of the first governor of the Illinois Territory. Constructed for the defense of the widespread communities, they were located in Jackson, Franklin, and Williamson Counties but have been lost due to the passage of time.

SECTION III - ECONOMIC FRAMEWORK

15. GENERAL

a. Basis for evaluation.



To properly assess the future trends of the basin's economic development, it was necessary to study an area larger than that encompassed by the drainage boundary. This resulted in an identification of a 13-county economic subregion. Included were those 11 counties which have acreage located within the study area and two other counties, Wayne and Saline, which adjoin the basin on the northeast and east, respectively.

Forecasts were based on individual projections for three major, socio-economic indicators: population, employment, and personal income. These projections were developed for each decade within the study period, 1970-2020. It was assumed that sufficient water and land resources would be available and developed as needed. The population analysis included a study of such factors as migration rates, sex-age relationships, and population distributions by counties and types (urban, rural non-farm, rural farm). The employment projections were developed for those major industrial and manufacturing classifications that would encompass the greatest amount of existing and potential labor force. Also estimated was the relative percent of total employment that would be filled by persons commuting from outside the 5-county core area. Personal income both total and per capita were analyzed with particular emphasis given wages and salaries and the trends in these components of income. This permitted a comparative analysis between the local area and the rest of the nation. There is presented in the following paragraphs a summary of the area's economic development, past, current and projected. A more detailed presentation may be found in APPENDIX L.

b. Relationship with other studies. Within the framework established by the projections, adjustments were made on an individual county basis so as to identify the major centers of future economic and population growth. Because the standard industrial classifications were used, comparisions were easily made with other geographic sectors and the trends in the regional economy. These results were specifically compared with those evaluated for the Upper Mississippi River Comprehensive Basin Study, Type I, and in particular for the plan area of which the Big Muddy River Basin is a part. This insured a compatibility with those projections for the region as a whole and, in turn, its relationship within the national economic framework.

Comparable projections were published in October 1969 by the Office of Business Economics (OBE), Department of Commerce. While the OBE population and employment counts were greater in absolute number, the personal income, also higher than that projected for the study, was consistently depicted as being below the national average. The OBE projections showed a weighted deviation of some +10 percent for the time frame 1970 to 1990, and somewhat greater for the period extending to the year 2020, particularly personal income. Use of the OBE population and industrial projections would result in a greater need framework than that on which the basin plan and early action program was formulated. Furthermore, the OBE projections were prepared without recognition of the socio-economic impact accruing from planned resource developments. This is contrary to recent historical trends for the area and the present commitments by Federal, State, and local governments to stimulate regional development in order to attain national parity.

16. HISTORICAL TRENDS

The basin experienced an exodus of population in the three and one-half decades after 1930. As employment in mining and agriculture (the then two principal industries) was reduced, families found it necessary to move out of the area. By 1940, the out-migration was in full force and continued through the two decades ending in 1960. During this time manufacturing and the wholesale and retail trades became the major employers; not only because of growth, but also due to the reduction in other employment sectors. However, the available labor demand could not create enough jobs and by the 1940's the unemployment rate averaged 20 to 35 percent for the 5-core counties. Subsequently, the continued out-migration of the unemployed reduced the population base so that the unemployment rate began to drop and by the early 1960's averaged approximately 15 to 20 percent for many of the individual counties.

17. CURRENT ECONOMIC CONSIDERATIONS

a. Current conditions. At the start of the 1960's the unemployment rate was sufficiently high to make the area eligible for assistance under the Area Redevelopment Act, and action at both the Federal and State levels was begun to help enlarge the economic structure. In the early and mid-1960's, this nation experienced one of the greatest economic booms of the century and with it came new economic input to the basin. Light industry moved into the area in search of the cheap, unskilled labor necessary for assembly-type operations, inexpensive land and relief from high municipal tax structures. This, in turn, created new job sources so that by 1963 the unemployment rate began to fall; and by 1969 the unemployment rate was estimated to be approximately 6 percent or about one-third of what it had been a decade before. Since then, the five counties

have worked together to improve their economic conditions and in June 1967 the Economic Development Administration of the U. S. Department of Commerce officially designated the five counties as the Greater Egypt Economic Development District. This made them eligible for assistance under the Public Works and Economic Development Act of 1965, (Public Law 89-136). Thus, for the first time since 1940, a real change in the economic decline of the basin was achieved. Except for agriculture, which has held its relative ranking, there has been a complete reversal in the industrial structure with manufacturing and service industries showing a substantial growth. Manufacturing employment, in particular, has experienced an average annual increase of some 3.3 percent during the decade 1950 to 1960 with a majority of this growth occurring in the latter three to four years.

b. The industrial-community relationship. The largest city in the area is Carbondale with an estimated 1970 population of 22,600, followed by Mount Vernon, 16,000, and Marion, 11,600. Other significant communities are Murphysboro, Herrin, West Frankfort, Du Quoin, Benton, and Pinckneyville. Some of the new growth has been the result of industrial parks established by these major communities often with the financial and managerial assistance from State and Federal sources. These parks have placed emphasis on attracting light to medium industry to more fully utilize the available work force.

Two industrial parks are located in the northeast part of the basin in the Mount Vernon area; two in the mideast sector near Benton and West Frankfort; and one in the southeast near Marion, which is now in the preliminary stages of development. An air industrial park has been established in the southwest as an addition to an existing industrial park near the community of Carbondale.

Three industrial districts have also been established which involve general areas of controlled, complementary but mixed land use with selected sites for light commercial industries. One is located near Herrin in the southcentral part of the basin, another between Du Quoin and Pinckneyville in the northwest, and the third at Crab Orchard Reservoir in the southeast near Marion.

c. Action programs. To assist in the reorientation of the local economic structure, certain action programs have been undertaken at the Federal, State and local levels. Water resource developments have been planned and constructed by the Federal and State governments; Rend Lake and Kinkaid Lake are specific examples. In addition, construction of the Federal interstate highway system and State improvements to the local road network have enhanced the accessibility of the basin to other markets. Just as significant has been the establishment of supplementary manpower training programs to upgrade the skills of the local and surrounding labor market. The State's Manpower Training and Development Program has aided in this endeavor through such agencies as the Southern Illinois University Employment Service, Illinois Rehabilitation Service and various

on-the-job training programs. At the present time, Southern Illinois University's vocational training institute graduates approximately 3,000 individuals annually of whom 75 percent are trained in industrial skills.

18. PROJECTED ECONOMIC DEVELOPMENT

a. General.

As light and medium industries continue their projected growth and as the contributions from planned resource developments and educational sources become more effective, the economic characteristics of the basin will approach those of the State and nation. By 2020, it is anticipated that the basin will have changed from an underdeveloped and relatively depressed region to one having an economic status nearly as high as the national average. Indications are that during the years between 1970 and mid-1980, the basin economy will show strong gains in employment, population, and personal income as the area continues its expanded redevelopment. After the mid-1980's, the rapid rate of gains in population and employment will inevitably slow down as the new economic base is established; and, by the year 2000, the long-term pattern will be in effect. Gains in all sources of personal income will be observed; however, wages and salaries will continue to constitute the majority of income for the basin. Population will continue to grow, but at a lesser rate. Unemployment is expected to decline and approach the 4 percent or national level, accompanied by an equitable and more stable industrial mix. Commercial and farm proprietors' income, as a percent of total income, will have stabilized with the relative percent gain or loss becoming insignificant. It is anticipated that by the year 2020, the major portion of employment will still be of semi-skilled type, supplemented by both skilled and unskilled workers, as well as part-time and seasonal labor. As a result, the average annual unemployment rates may be slightly greater than the national average and the per capita income may remain slightly less than the national level.

b. Population trends. The exodus of people from the basin has started to reverse itself and the eventual result should be a long-run increase in net in-migration of population. Although a lag is anticipated in the early years of development (through 1980), the gap between desirable employment opportunities and inflow of people into the area will eventually narrow. As manufacturing and service industries become more dominant, a transition from rural farm to urban and rural non-farm sectors will occur, reflecting a major change in the socio-economic characteristics of the population. Projections indicate a relative modest increase in population between 1970 and the 1990's. Then, as unemployment reaches a minimal level and personal income approximates the national average, substantial

growth in population is anticipated. Finally, growth and social changes will be reflected by where the people reside. The population is expected to gravitate towards the larger communities now in existence, as well as centering around recreational facilities and major highway networks where industries are more likely to be attracted. The rural farm population will continue to decrease during the study period, as farms become larger and more efficient. Projections of population and rate of increase are shown on FIGURE 7.

c. Employment.

A definite shift in the industrial mix of the area will be observed over the 50-year study period. It is anticipated that by the year 2020 manufacturing, service, trade, agriculture, and mining will be the relative order of industrial ranking, based on the number of people employed. This is almost a complete reversal of that found in the basin in 1950. Except for agriculture and mining, selected employment will continue its gradual growth, started in 1960, through mid-1980. Thereafter, an even greater growth is anticipated with a general leveling out expected by the year 2010.

Unemployment will continue to decline as it has since 1960 until a relatively modest 4 to 5 percent rate of unemployment is achieved by 1990. Thereafter, a very gradual decline to a 4 percent level, the expected national average, is forecasted. Involved in these projections are the effects from those workers who are expected to commute to jobs from outside the basin. The net inflow will grow so that during the decades following 1980, approximately 12 percent of the employment in the basin will be met by persons living outside the area.

Trends in agricultural employment will continue to show a decline as farms become larger and fewer. Labor input per acre will continue to decline, as productivity increases through improved technology and greater mechanization. This increased productivity per employee will hasten the decline in agricultural employment up to the year 2000, when a leveling out is expected. Conversely, this production increase will provide greater real returns to the farm proprietor, making it more attractive to devote full time to agricultural pursuits and eventually stabilizing the employment figure. Projections of total employment are shown on FIGURE 7.

d. Personal income.

As unemployment rates continue to decline and more jobs are made available to the residents of the basin, total personal income should continue to grow at a moderate rate. In 1950, wages and salaries consisted of approximately 62 percent of the residents' total personal income and rose to about 65 percent in 1960. This trend will continue and by 1990, 68 percent of total personal income is expected to be derived from

this source. Thereafter, as the economy stabilizes, per capita income will continue to grow and by the year 2030 approach the national average.

Thus, the overall gains in personal income, farm and non-farm, will, in turn, generate a secondary demand which will make it easier for the basin to maintain a favorable net balance of payments relative to its consumer needs. The trend in per capita personal income is shown on FIGURE 8.

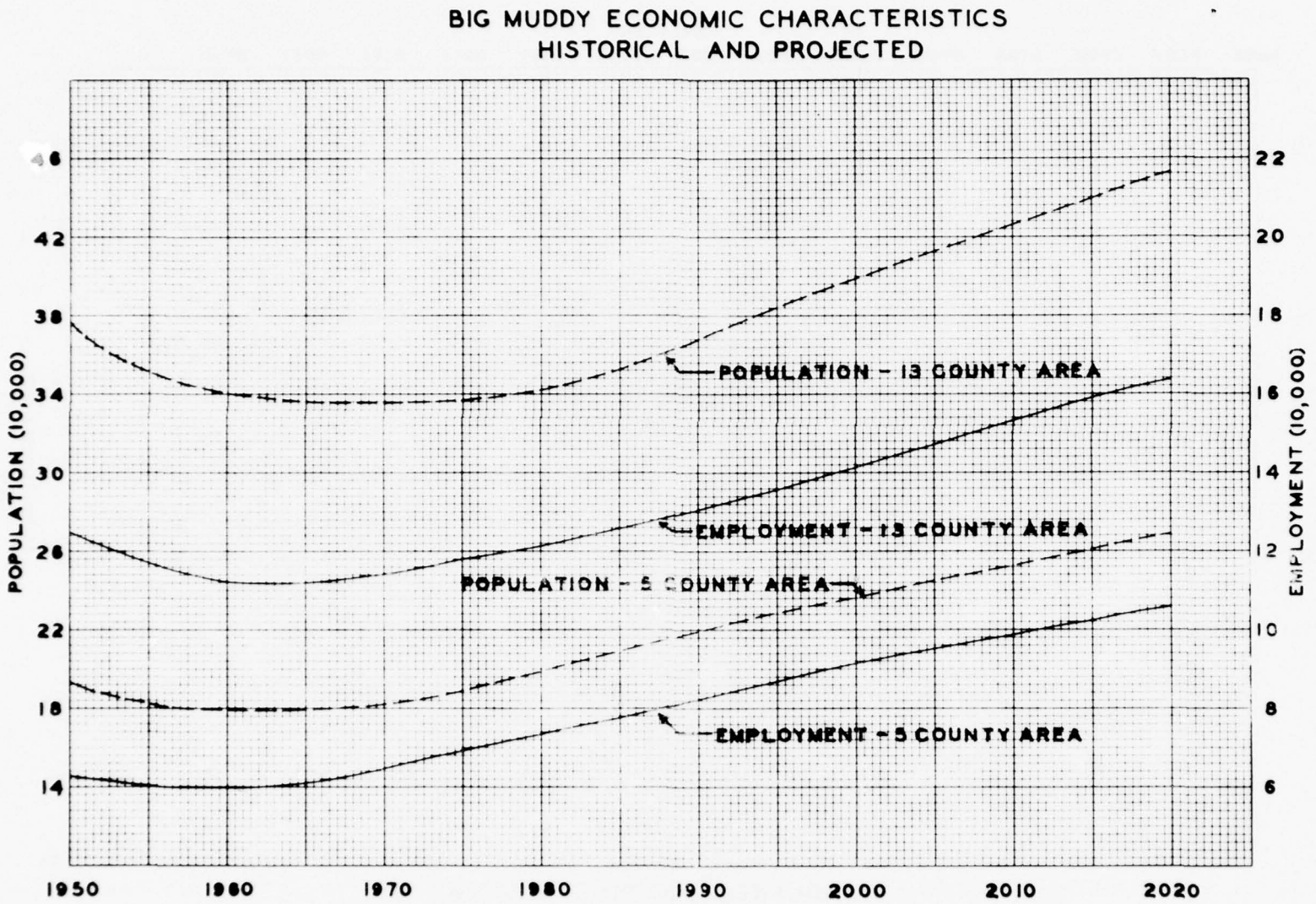
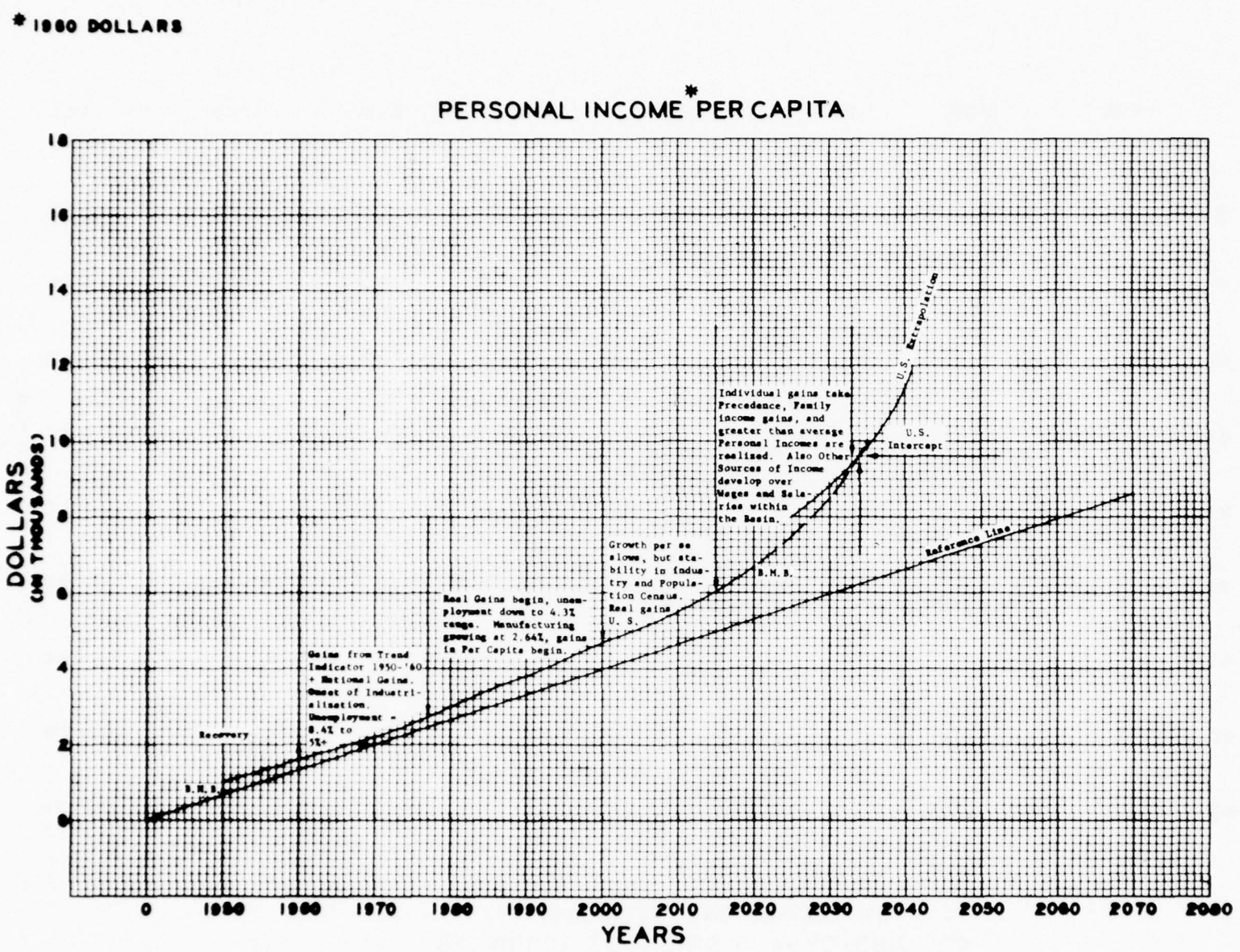

BIG MUDDY ECONOMIC CHARACTERISTICS
HISTORICAL AND PROJECTED
POPULATION (10,000)
EMPLOYMENT (10,000)
46
42
38
34
30
26
22
18
14
22
20
18
16
14
12
10
8
6
1950
1960
1970
1980
1990
2000
2010
2020
POPULATION - 13 COUNTY AREA
EMPLOYMENT - 13 COUNTY AREA
POPULATION - 5 COUNTY AREA
EMPLOYMENT - 5 COUNTY AREA

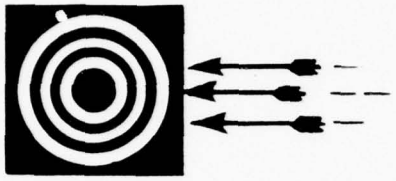
FIGURE 7

FIGURE 8


* 1960 DOLLARS
PERSONAL INCOME * PER CAPITA
DOLLARS (IN THOUSANDS)
YEARS
0
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
2080
Recovery
B.M.B.
Gains from Trend Indicator 1950-'60 + National Gains. Onset of Industrialization. Unemployment - 8.4% to 5%+
Real Gains begin, unemployment down to 4.3% range. Manufacturing growing at 2.64%, gains in Per Capita begin.
Growth per se slows, but stability in industry and Population Census. Real gains U. S.
B.M.B.
Individual gains take Precedence, Family income gains, and greater than average Personal Incomes are realized. Also Other Sources of Income develop over Wages and Salaries within the Basin.
U.S. Extrapolation
U.S. Intercept
Reference Line

SECTION IV - BASIN NEEDS

19. FRAMEWORK FOR EVALUATION



The five core counties have joined together to form a planning entity known as the Greater Egypt Regional Planning and Development Commission (Greater Egypt Commission). Four of these five counties have already established and adopted a land-use plan that will assure a proper framework for development. Preparation of a land-use plan for the fifth county, Jefferson County, was completed in May 1970, but has not yet been approved. These plans, together with the economic projections, indicate that the land use will continue to be predominately rural in character over the next 50 years. Furthermore, the future industrial input into the area is expected to remain essentially light commercial and with mining and agriculture predominately the industrial makeup of the study area.

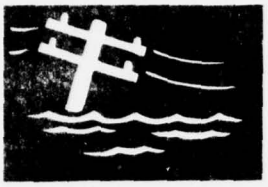
The procedure for identifying those products and services needed to attain the anticipated increased level of development involved a time-phased analysis of projected demands. The short- and long-term demands were based on evaluating the necessary land and water resources required to achieve the projected socio-economic development during the study period 1970 to the year 2020. Recognizing that each demand would have an inherent uniqueness, the individual analysis was divided into three categories: water-related resources, land-related resources, and socio-environmental considerations. This approach permitted subsequent planning objectives to be more realistically defined and helped insure that the formulation of a basin plan would be both comprehensive and responsive to all established needs.

In all evaluations, the projected demands for the various products and services were compared to the effective supply of existing and authorized projects either under construction or in preconstruction planning. These comparative evaluations subsequently established certain specific needs that required some positive form of action program.

PART 1
WATER-RELATED NEEDS

20. FLOOD CONTROL

a. Problem.



The economic projections and related evaluations indicate that, with increased technological applications, the land presently in agricultural use will be capable of meeting the projected food and fiber production assigned to the Upper Mississippi River region and the Big Muddy River Basin through the year 2000. Beyond this period more land will then be required to overcome an anticipated lag of some 15 percent in production versus projected demands.

At the same time an increase in real income per farm unit is expected based on a transition to larger farms and greater investments per farm business. Both of these changes will be required to obtain the increased production necessary to counteract the cost-price squeeze. However, this forecasted increase in real income will not change the competitive economic standing of the individual farm family. The farmer's real income, the retained profit margin, and relative income standing has declined to the point where various types of resource developments are required to help increase his production. Included is the need to minimize the losses due to flood water damage, particularly if the basin's relative production role in the food and fiber markets is to be maintained.

b. Extent of need. There are 317,000 acres in the flood plain that are subject to varying degrees of flood damage. To properly evaluate the need for flood control it first was necessary to determine the degree of peak flow decapitation that would warrant study. Preliminary hydraulic evaluations had indicated that control of major floods would not appreciably change the depth or duration of flooding on the acres involved. Therefore, it was concluded that any action program for reducing flood damages should be confined to that portion of the flood plain inundated by the more frequent floods.

Based on the foregoing, studies were confined to that portion of the bottomlands that would be inundated by a flood with maximum frequency of occurrence of once every 50 years, the damage area amounting to some 156,900 acres. Of this amount, approximately 42,700 acres will be afforded some degree of flood protection from reservoirs either constructed or under construction. Included in this latter category are 37,300 acres on the main stem of the Big Muddy River below the Corps Rend Lake Reservoir; 5,200 acres on the lower Crab Orchard Creek downstream from the Crab Orchard Reservoir operated by the U. S. Fish and Wildlife Service; and 200 acres on Kinkaid Creek below the Kinkaid Reservoir now under construction by the State of Illinois. The remaining 114,200 acres are located mostly in the tributary watersheds where flooding frequently produces moderate to severe damages to those acres in agricultural

production. These losses are caused by excessive periods of inundation and the frequent minor floods that occur during the growing season. Damage to agricultural acreage in these bottomlands consists of crop loss, reduced crop yields, lower crop quality, and increased costs of production. Other losses include damage to roads and farm improvements. While some urban properties are floodprone, most are located at higher elevations and thus are affected by the rarer floods only. A breakdown of the present land use and estimate of damage sustained on that portion of the flood plain studied in each of the 15 watersheds are shown on TABLE 4.

Additional information concerning this problem is presented in APPENDIXES F and K.

21. WATER SUPPLY

The demands for future municipal and industrial water supplies were evaluated based on the projected increases in both population and industrial and commercial developments. Because of the limited ground water, all major communities depend on surface-water impoundments to meet their own domestic needs. In addition, the municipal systems also serve the area's industrial demands except that required by the mineral industry and some railroads which are generally self-supplied. Therefore, it was assumed that this trend would continue and both the domestic and industrial demands were projected on a combined basis. Forecasts for the self-supplied water use of the mineral industry were evaluated separately.

Future municipal and industrial water demands were first estimated for each of the five core counties and then disaggregated to obtain estimates of use for the individual communities which would represent the predominant demand centers. The differential between the sum of the individual community demands and that estimated for the county in which they were located was assumed attributable to other urbanization and industrialization growth that is expected to occur.

An inventory of existing impoundments and firm commitments for providing future water supply also was completed and then compared to the projected demands. Construction of the Rend Lake Dam and Reservoir will provide approximately 40 million gallons per day to meet future municipal and industrial water supply requirements. This storage, together with an intercity distribution system, will assure a dependable source of supply in excess of the 2020 demands for those areas and individual communities located in the middle and northeastern part of the basin.

As a result, the only areas of possible water shortage involved those communities outside the intercity system. Except for the towns

TABLE 4

FLOOD PLAIN LAND USE AND DAMAGES

Damage area	Acreage: Cropland, pasture and idle land	Acreage: Forest & misc.	Acreage: Total	Estimated average ann. damage
No. 1 & 9 Big Muddy (1)	14,100	23,200(2)	37,300	$ 174,100(3)
No. 2 Cedar Creek	400	1,000	1,400	8,500
No. 3 Kinkaid Creek	100	100	200	3,400
No. 4 Lower Beaucoup	9,300	5,100	14,400	26,400
No. 5 Galum Creek	4,400	3,700	8,100	93,500
No. 6 Upper Beaucoup	6,300	6,800	13,100	169,000
No. 7a. Upper Crab Orchard	3,500	3,800(4)	7,300	60,600(5)
No. 7b. Lower Crab Orchard	2,500	2,700	5,200	27,400
No. 8 Little Muddy	11,200	15,400	26,600	190,500
No. 10 Hurricane Creek	400	400	800	4,600
No. 11 Lake and Pond	1,500	1,100	2,600	18,800
No. 12 Middle Fork	10,200	10,500(6)	20,700	228,000(7)
No. 13 Gun Creek	800	100	900	28,600
No. 14 Upper Big Muddy	7,000	3,500	10,500	253,800
No. 15 Casey Fork	6,400	1,400	7,800	178,600
TOTALS	78,100	78,800	156,900	$1,465,800

(1) Big Muddy River flood plain downstream Rend Lake Dam and includes estimated average annual damage.
(2) Includes approximately 70 acres of urban area.
(3) Includes some $27,300 urban damage to Murphysboro, Blairsville, Hurst, Herrin, and Royalton.
(4) Includes approximately 20 acres of urban area.
(5) Includes some $15,400 urban damage to Marion.
(6) Includes approximately 10 acres of urban area.
(7) Includes some $700 urban damage to West Frankfort.

of Marion, Murphysboro, and Carbondale, all remaining communities have sufficient sources of supplies to meet their estimated future demands, excluding any consideration of extended drought periods. The town of Marion is planning to enlarge its present water supply reservoir, thus providing sufficient storage to carry it through the study period. The State of Illinois is including storage in its Kinkaid Reservoir in an amount sufficient to meet the future needs of Murphysboro and the communities and rural water districts in Jackson County.

This left Carbordale as the only community identified as having a potential water supply problem. Part of its present supplies are obtained from the Crab Orchard Reservoir; however, the contractural agreement for these withdrawals is scheduled for eventual termination. Preliminary investigations subsequently identified that there were four alternatives, any one of which would be responsive to satisfying this future need. Presently, the community of Carbondale is studying the feasibility of either constructing its own project for water supply or participating with the Soil Conservation Service in sponsoring construction of two multi-purpose reservoirs in the Cedar Creek Watershed. The work plan for the latter alternative has been completed and approved by the Governor of Illinois for implementation under Public Law 566. In addition, water could be obtained from Rend Lake and the downstream releases stored in off-channel reservoirs. In this case, a suitable contractural agreement involving usage and delivery rates of the projected excess in water supply would be required. Finally, there is sufficient storage in the State's Kinkaid Lake that could be made available by pipeline transfer. The feasibility of this proposal, however, would be dependent primarily upon the effects that the increased drawdown would have on the project's recreational potential. Since any of these alternatives would be capable of meeting Carbondale's requirements, it was apparent that there was no need for additional studies.

Consequently, it was concluded that provision of future water supplies would not be considered in any action program that was formulated for the basin unless the State was specifically interested in purchasing additional storage. The State, by letter, indicated that the basin's water supply storage, both existing and under development, appeared adequate to meet all foreseeable needs and that there was no interest on the part of the State to invest in additional supplies at this time.

A more detailed evaluation of this phase of the basin's study is presented in APPENDIX E.

22. STREAM QUALITY

a. Present conditions. Waste assimilation is one of the most important stream uses in the basin, but it is one for which most

streams are least suited due to the poor quality of surface run-off and the normally low flows. The streams are characterized by high turbidity and sediment load and a relatively low percent saturation (about 60 percent) of dissolved oxygen. Most urban centers within the basin have located on tributaries with small drainage areas rather than on main waterways; and many of these communities discharge their wastes at or near stream headwaters where waste assimilative capacity is the lowest. Hence, many reaches are below acceptable quality standards at times of low stream flow, even when conventional secondary treatment is provided. Previous studies, particularly those undertaken in connection with the Rend Lake Reservoir, had underscored this existing problem; and because of this, Congress authorized low-flow augmentation for that reach of the Big Mudddy River below the dam to its confluence with the Mississippi River.

b. Basis for evaluation. To determine the need for quality improvements, emphasis was placed on the major load points where the greatest flow supplementation for waste assimilation would be required. To augment available data, a sampling program was completed in various reaches of the major streams. Then, estimates of future untreated waste loads were computed based on projections of population and economic activities. Since all significant industrial waste loads are presently discharged into municipal treatment plants, it was assumed that this practice would continue and that a minimum of secondary biological treatment would be afforded all discharged effluent.

Finally, estimates were made of the monthly (target) flows needed to support fish and aquatic life, the State-identified stream use. These estimates were based on projected waste loads and the low-flow characteristics of the individual streams. The State standards essentially require maintinaing a stream quality equivalent of five milligrams per liter of dissolved oxygen (DO). Using the target flows required to maintain this quality level, an analysis then was undertaken to determine whether the required monthly flows could be maintained. Involved was the question as to whether the size and yield capability of the drainage area above the need centers was sufficient to permit augmentation of the natural flows. Where this standard could not be maintained, further routings were then made to establish the nearest stream reach in which adequate DO levels could be sustained.

The results of these studies indicated that sufficient flow augmentation could be provided to maintain acceptable standards of stream quality for five of the six need centers. The exception was in the area of Carbondale where the low-flow characteristics were adversely affected by the Crab Orcahrd Reservoir's operational inability to provide dependable releases. Because this reservoir controls approximately 75 percent of the upstream drainage area, it was determined that the water quality standard in this area

could not be maintained by augmentation. This problem area was the subject of a later study discussed in paragraph 31 of this report.

In addition, the Lake and Pond Creek Watershed was identified as having a special pollution problem due to its acid mine waste. Since past experience has proven that low-flow augmentation is not a practical nor effective solution, remedial measures other than development of specific water-related resources are needed. These will have to be provided on a cooperative basis by the local industries, the State, and local interests, and hence, were not further investigated as part of this study.

c. Location of need centers. Based on the foregoing, it was concluded that except for that portion of the Big Muddy River below Rend Lake Dam, there were five tributary reaches where action programs would be needed to improve stream quality. These five stream reaches where low-flow augmentation could be provided to assimilate the discharged municipal wastes were: Beaucoup Creek below Pinckneyville (Watersheds Nos. 5 and 4); Little Muddy River below the confluence with Reese Creek, a tributary where the community of Du Quoin is located (Watershed No. 8); Casey Fork Creek below Mt. Vernon (Watershed No. 15); Middle Fork-Big Muddy River below West Frankfort (Watershed No. 12); and Upper Crab Orchard Creek below Marion (Watershed No. 7).

Additional data pertaining to this phase of the investigation are contained in APPENDIX E.

23. GENERAL RECREATION

a. Background considerations.

The basin's natural esthetics and moderate climate of extended duration combine to provide a significant potential for recreational development. The extensive highway network, both existing and proposed, will reduce the time-distance-travel relationship and afford residents in outlying areas an opportunity to enjoy any recreational development provided in this basin.

The State in its report, "Water for Illinois - A Plan for Action" indicated the need for long-range planning and construction commitments in both land- and water-related recreational developments. A concern was expressed over what was considered a major deficiency in outdoor opportunities. Underscored was the fact that Illinois has the lowest ratio in the nation of total state park acreage to its population, having 5.6 percent of the nation's population, but only 0.05 percent of the country's recreational land. Existing facilities are overburdened and over half of Illinois's residents vacation out-of-state with a resulting loss to the State's economy of over one-half billion dollars per year. The report recommended an accelerated

program of extensive public land acquisition to meet future open space needs with the qualifications that 75 percent should be associated with the existing or potential public water surface.

Furthermore, as part of its effort to enhance the economic structure of southern Illinois, the State, in cooperation with the Economic Development Administration, U. S. Department of Commerce, funded a study to analyze the economic potential of tourism and recreation in southern Illinois. This report contained specific recommendations for expanding tourism and recreation in southern Illinois. Development of southern Illinois as a state and regional recreational center not only would help rectify the State's recreational deficiency but also provide significant input to the area's economic base. Indicative of the State's current interest and commitments in the basin are its construction of Kinkaid Lake with special emphasis on cooperative recreational planning; and, establishment of both a 2,900 acre state park and a 5,600 acre waterfowl refuge at Rend Lake.

b. Regional plans. Two projects of regional significance are presently under active planning and when developed will have an impact on the area. Both of these projects will traverse the outer fringes of the basin and superimpose additional demands for recreational development in the Big Muddy River area.

The first is the Great River Road. The basic plan of development is outlined in a report published in 1958 by the U. S. Bureau of Public roads and National Park Service. The plan calls for establishment of a Mississippi River linear parkway corridor which would provide opportunities for boating, motoring, and general recreation. It is anticipated that eventually the corridor will create parkways in those portions which pass through urban areas; enhance the river's recreational boating potential by constructing specific mooring facilities and boating harbors; and, develop recreational facilities while also preserving the significant archaeological and historical artifacts found in and adjacent to the Mississippi River flood plain. The plan of improvement offers local counties and individual communities a potential source of aid in meeting some of their recreational needs, particularly through zoning and subsequent development of facilities.

The second project is located within the Shawnee hills and is called the George Rogers Clark Recreational Way. Planned as a linear corridor, it will connect many of the southern Illinois recreational facilities located along the Mississippi and the Ohio Rivers. Conceived as a major attraction of national significance, it is the subject of proposed legislation now pending before the United States Congress. The corridor will include a scenic road system with rest stops, picnic areas, and marked exits to various points of interest and accommodation. These basic facilities would be supplemented by a series of small dams and reservoirs that will provide a range of water-related recreational pursuits. The overall project will involve

public acquisition of land and land-use rights and the establishment of scenic easements and zoning restrictions. Presently, the Forest Service is acquiring acreage along the right-of-way as part of its long-range development of the Shawnee National Forest.

c. Net need evaluation. Evaluation of the water-related recreational demand utilized the populations of the five-county area and selected SMSA's in both the Upper Mississippi and the adjoining Ohio River Basins. The analysis recognized southern Illinois and the Big Muddy Basin in particular as a potential area for accommodating some of an external unmet need, primarily from upstate Illinois. Factors considered in the analysis were: the time-distance-travel relationship of residents within the basin's zone of influence; the impact that three interstate highways will have in establishing the area as a focal point for outside origin-destination travel; length of recreational season for both the demand and service areas; and the present and potential land use in both the Big Muddy Basin and the recreation market areas. In computing the recreational demands, per capita participation rates for selected activities were applied to portions of the population located within the zone of influence. These then were converted to recreation days, using a factor of 2.5 activity occasions per recreation day. To this base, a portion of the vacation travel originating outside the zone of influence was added. This latter segment represented an impact creditable to those people whose travel would be directed toward seeking partial or total satisfaction within the basin. Demand figures then were computed and compared with the estimated (time-phased) usage potential of existing and planned developments. The results indicated a net need (demand less supply) of some 2,000,000 recreational days by 1980; 5,200,000 by the year 2000; and 8,400,000 by the year 2020. In addition, the necessary water and land acreage needed to satisfy the projected recreational deficiency was established. All of these needs are in excess of the potential to be supplied by Rend Lake, Kinkaid Lake, Crab Orchard complex, and other water-resource developments, either completed or under construction.

Additional information is presented in Part 2 of APPENDIX H.

24. FISHERY

An inventory of present water resources indicates that the opportunities for reservoir or lake fishing within the zone of influence more than adequately meets the projected demands for the study period. While any resource development constructed to meet other needs would, due to its availability, attract fishermen, the usage would essentially be a shifting of opportunities from one area to another. This would constitute a new and additional source of supply that would merely add to the existing surplus.

While lake-related fish production is adequate to meet the overall projected demands, there is minimal stream fishing due to low-flow problems, limited fish population, and lack of access. Currently, the poor ecology of the streams is suitable only for rough fish population. If the latent demand for stream fishing is to be met, steps must be taken to provide public access and augment the low flows in order to increase the volume and quality. Furthermore, in those areas where there are active or abandoned mines, at-source corrective measures must be instituted to prevent acid wastes being discharged into the streams.

A more detailed presentation of this phase of the study is presented in APPENDIX I.

25. NAVIGATION

In response to specific Congressional directive, the engineering and economic feasibility of improving both the Big Muddy River and Beaucoup Creek for modern barge transportation was investigated. While some agricultural and other commodities might be moved via the waterway, it was recognized that justification of the channel improvements would have to be based primarily upon water-borne movement of the area's coal reserves. Potential markets were analyzed, taking into consideration competitive coal fields and the use of nuclear and other fuels. It was found that the demand for coal would increase for some years to come and that these needs could be met provided the coal could be supplied at competitive costs.

Most of the basin's remaining coal reserves are located in the upper portions of the Big Muddy River and Beaucoup Creek Watersheds. However, the natural flows on both these two streams are insufficient to maintain adequate navigable depths required for modern barge movements. It was found that the most practical means to overcome this deficiency was a series of locks and dams that would create a slack water system. A navigation channel was studied extending from the Mississippi River to the Jefferson-Franklin County line, approximately 7.5 miles above Rend Lake Dam and to Pinckneyville on Beaucoup Creek. Channel alinement would be improved by straightening, enlarging, and overbank cutoffs; and a new entrance channel, 6.5 miles long, would be constructed from the Mississippi River to bypass the lower 29 miles of the Big Muddy River. Because of the low-flow deficiencies, it would also be necessary to provide a supplemental source of water. The least costly method of obtaining this water was to provide recirculating pumps at each lock site for restoring the water lost by lockages, seepage, and evaporation.

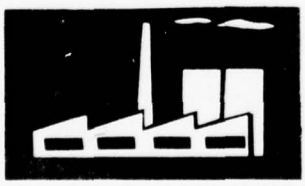
Based on the foregoing, it was determined that while it was technically feasible to improve the Big Muddy River and Beaucoup Creek for modern barge transportation, the cost of these improvements could not be economically justified. Therefore, it was concluded that canalizing the basin's main waterways should be deferred at this time; and that the advisability of improving the waterway should be reconsidered at such time as economic conditions warrant.

A more comprehensive presentation is contained in APPENDIX G.

26. IRRIGATION

Local application of irrigation techniques is practically nonexistant. The basin's soil types and average annual rainfall are such as to make this form of improvement an uneconomical investment at this time. There are three basic variables in optimizing agricultural production: hybrid seed, fertilizer, and controlled moisture content of the soil. It is believed that advances in technology for the first two variables will account for all of the projected production increases required up to the year 2000. Thereafter, when the regional food and fiber demands begin to exceed the commodity output from those lands in production, irrigation will be required to increase the crop yields. Then, the demands will be of sufficient magnitude to warrant installation of a system on an area-wide, organized basis so that the farmer will be able to absorb the required high unit-investment cost on an individual basis. Since irrigation is a long-range need that would be required near the end of the study period, it was concluded that no action program should be formulated at this time.

27. POWER GENERATION



The electrical demand and service area of the Upper Mississippi River region which encompasses the Big Muddy River Basin has been designated as Power Supply Area (PSA) 40 by the Federal Power Commission. Within this market area local needs presently are being served by five utilities, all of which have their plants located outside the basin. As part of the economic resource - demand evaluation, the possibility of electric power being generated within the study area by steam plants located at its fuel (coal) source, and/or from hydropower generation, was considered.

For the purposes of this study, the electric power requirements and supply characteristics within PSA 40 were considered to be indicative of the power situation of the basin. Based on a study of this power area, the basin's electrical requirements are expected to grow at a decreasing rate during the period 1980 to 2020. No hydropower

developments exist within the basin. Natural conditions, such as stream flow and topographical static head, preclude development of either conventional or pumped storage hydroelectric power in amounts sufficient to be economically competitive in the present and foreseeable market. In light of the past trends of supplying the basin's electrical requirements by imports, and the reported plans of the system for increasing its generating capacity, it is anticipated that the future electrical energy requirements will continue to be met by generation located outside the basin. Therefore, it was concluded that there would be no additional demand on the basin's mineral resources (consumption) and water resources (water supply and stream quality) over and above that already identified.

A more detailed presentation of this phase of the investigation is contained in APPENDIX J.

PART 2
LAND-RELATED NEEDS

28. LAND TREATMENT

a. Need for action programs.

As part of the total problem relating to agricultural efficiencies, there is an accompanying need to minimize various land-related losses. The land's productive capability is reduced by erosion, swamping, overbank sediment deposition, and sediment deposits in man-made impoundments. Proper land use and improved land treatment measures are generally recognized as the first increments in achieving an effective flood reduction program. To be successful, the quality and quantity of ground cover is important in controlling and minimizing the surface-water runoff and upland silt production. The failure to undertake proper land treatment measures has been one basic factor that has prevented the local farmers from attaining full economic competitiveness.

b. Type of losses. Erosion and sediment damages are the two major categories of losses occurring on those acreages with reduced potential for agricultural production. Two types of erosion are to be found in the basin; namely, sheet erosion and channel erosion. Both are matters of local concern and occur in varying degrees in all watersheds with the rate and type dependent upon local land use, topographic conditions, and intensity of rainfall. Sheet erosion is the removal of a relatively uniform depth of soil from an area by surface water runoff without the formation of channels as gullies. Channel erosion is the removal of soils and other materials in and along the stream's water course and involves gullying, stream bank cutting, sloughing, and degrading of the channel itself. Sheet erosion is the dominant type of loss affecting some 586,000 acres, while gully erosion has affected only some 16,000 acres. Of the total acreages suffering losses due to erosion, approximately 303,000 require some immediate and corrective action. Stream-bank erosion is comparatively minor since the flow velocities and erodability of the stream-bank soils are comparatively low. Damage due to scouring in the flood plains is not extensive, having affected about 6,000 acres, of which 65 percent have been slightly damaged, 30 percent moderately damaged, and five percent severely damaged.

The movement of the eroded soil and its eventual deposition as sediment is also significant. The damages begin with the removal of valuable topsoil and affect both the streams which transport the material and the area where it is deposited as infertile overwash. The eroded material, once in the stream, is held in suspension, creating a turbidity that is one of the major stream pollutants. Thereafter, when the sediment is deposited by the stream, the soil is frequently lacking in organic material and restoring its productivity is a major cost to the farmer. It is estimated that this overbank accumulation has reduced the productive capacity of some 2,900 acres, with 77 percent having slight damages, 13 percent moderate damages, and 10 percent severe losses.

Sediment deposition also forms levees along stream banks, disrupting the natural drainage and thereby causing the surface runoff to pond. Damage resulting from this type of swamping has affected some 20,400 acres by either reducing the intensity of use or causing complete abandonment. Approximately 30 percent of the land affected by swamping has had slight damage, 25 percent moderate damage, and 45 percent severe damage. Sediment deposition has also affected the surface impoundments constructed to meet the various municipalities' water supply needs. In most cases, these communities have been forced to incur considerable expense in restoring the resultant loss in storage capacity.

Additional information concerning these types of damages is presented in APPENDIX K.

29. DRAINAGE

a. Basis of need. According to the Department of Agriculture, this basin is one of the most underdeveloped areas in the State of Illinois, with respect to drainage improvement. Generally, the Big Muddy River and most of its principal tributaries have neither the capacity nor the slope necessary to provide adequate outlets and permit installation of on-farm drainage systems. Poor drainage has produced high ground water tables, reduced the intensity of land use, restricted the choice of crop distribution and rotation, and increased the production costs because of frequent replanting and delayed harvesting. As a result, the yields and financial returns from present crop lands are substantially below what could be obtained if adequate drainage were provided. Therefore, it was concluded that drainage improvements should be considered as part of any action program to increase the farmers' real income.

b. Needs. There are approximately 661,000 acres of agricultural wet soils in the basin. Of this amount, approximately 294,000 acres were identified as warranting some form of channel improvement or rehabilitation in order to encourage installation of on-farm drainage systems. Selection of these acreages was correlated to those bottomland areas that were being studied for flood control reductions as well as such factors as the type of soil and stream capacity. Of the 294,000 acres, 101,800 acres are in the bottomland and 192,200 in the areas adjacent to the flood plain. Shown in TABLE 5 is a breakdown of the acreages in those watersheds that were selected for study.

More detailed information is presented in APPENDIXES K and F.

TABLE 5
MAXIMUM NEEDS FOR DRAINAGE IMPROVEMENT

Watershed	Flood plain (acres)	Nonflood plain (acres)
No. 1 Lower Big Muddy	----	1,970 1/ 2/
No. 2 Cedar Creek	1,390	2,710
No. 4 Lower Beaucoup	1,930	12,990
No. 5 Galum Creek	8,040	7,010
No. 6 Upper Beaucoup	13,160	15,060
No. 7 Crab Orchard	7,260	24,190
No. 8 Little Muddy	26,590	20,690
No. 9 Central Big Muddy	----	36,480 1/
No. 10 Hurricane Creek	860	4,120
No. 11 Lake and Pond Creeks	2,530	12,280
No. 12 Middle Fork	20,670	23,880
No. 13 Gun Creek	960	6,710
No. 14 Upper Big Muddy	10,550	11,070
No. 15 Casey Fork Creek	7,810	13,080
TOTAL	101,750 3/	192,240 4/

1/ Includes flood plain

2/ Adjusted to correspond with Conservation Needs Inventory.

3/ Includes 46,040 acres of forest which will not require drainage in its present use.

4/ Includes 87,360 acres of forest which will not require drainage in its present use.

30. HUNTING

The wildlife habitat in the basin is good to excellent with numerous scattered tracts of wildlife habitat sufficient to support farm-game species attractive to the hunter. Just as important as the game supply is the accessibility to hunting areas. While most of the basin's acreages are in private ownership, there are enough public-owned lands to insure that the hunting supply will exceed the projected future demands. There are approximately 20,000 acres of land and water in the Crab Orchard National Wildlife Refuge and 29,500 acres in the Shawnee National Forest that are available to the public for hunting. Moreover, there are open uplands and cultivated portions of the flood plains that receive moderate game hunting pressures.

Also found in the 13-county area are some 19,000 acres of permanent water that are used to support migratory waterfowl production, with the main concentration of waterfowl management located in the Crab Orchard National Wildlife Refuge. Of unique significance is a 3,000 acre Greentree Reservoir operated by the Forest Service in the bottomlands of the Mississippi and Big Muddy Rivers. The project, known locally as the Oakwood Bottoms-Greentree Reservoir, is a hardwood timbered area that is flooded during its dormant period and drained during the growing season. Managed primarily to provide a desirable habitat for migratory waterfowl as well as other types of wildlife, it provides the public with additional hunting and other recreational opportunities.

Additional information concerning the wildlife species of the area is presented in APPENDIX I.

PART 3
SOCIO-ENVIRONMENTAL CONSIDERATIONS

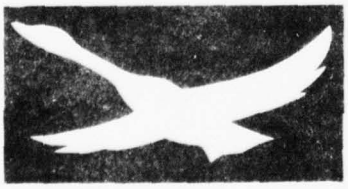
31. STREAM ENVIRONMENT

As part of the low-flow phase of study, special consideration was given the need to maintain a minimum stream flow. Involved was the concern for vector control and protection of public health as well as maintaining an esthetically pleasing environment. As has been noted earlier, urban centers have tended to locate on lateral tributaries of small drainage areas and with growth, water quality and quantity problems have developed. In certain headwater areas, demands for all water uses have approached the ultimate yield capacity of the drainage area and there is a need to maintain an adequate base flow.

Previous hydraulic analyses had indicated that the reach of Crab Orchard Creek, which flows through the environmental area of Carbondale, had this specific type of low-flow problem. Since this community is the largest and most rapidly developing urban area in the basin, there was a concern that the stream would, over time, experience insanitary conditions. This would happen when large volumes of various pollutants are washed into the stream from storm runoff. Therefore, the U. S. Public Health Service indicated the specific need to provide minimum flows for flushing action.

Maintenance of a base flow over and above any return flow (treated wastes) was regarded as necessary in order to minimize the potential hazards to local residents from vector problems and other health and social nuisances. Based on these governing social concerns, and with the obvious opportunity to improve the urban area's esthetics, it was concluded that the natural stream flows should be supplemented sufficiently to maintain a quantifiable base flow. This base flow was selected as equivalent to that required to maintain three milligrams per liter of dissolved oxygen 100 percent of the time, with an assumed minimum of secondary treatment afforded the waste effluent.

32. CONSERVATION OF WILDLIFE HABITAT



With the advent of future economic growth, changes in land use can be expected. These will range from conversion to higher economic usage, such as industrial and residential development to a more intensified land use as will occur in agricultural production. Choice wildlife habitat will be involved in some of these areas, particularly those acreages that will be drained and in the acreages adjacent to the stream courses. All of these changes contribute to the eventual reduction of the wildlife habitat, thereby causing an adverse, long-range effect on the basin's wildlife environment. Consequently, there will be a dual need to conserve the remaining environmental resources and at the same time, enhance its management.

Public ownership is so widely scattered, particularly within the Shawnee National Forest, that providing intensive management practices and meaningful action programs will be a problem. Increased acquisition is needed to consolidate these lands for management purposes with adequate but controlled public access. New water development projects also will offer real improvements for hunting and fishing and may result in greater opportunities or higher quality experience or both, provided the projects are planned effectively. A comprehensive program also will be required encouraging the wide application of land-use practices that safeguards both the soil and land cover and provides a multiple return from both a financial and conservation standpoint.

33. ARCHAEOLOGICAL CONSIDERATIONS

As man expands into his surrounding natural environment, there is an inherent potential of losing the archaeological artifacts that make up his culture and history. To avoid this, it is imperative that an action program be developed to preserve and restore the basin's archaeological and historical remnants. These resources will be valuable additions to those other facilities that would be offered the recreationists and tourists.

The Indian cultural remains should be developed as attractions that would be protected by both land acquisition and scenic easements, the requirements of which would be dependent upon the type of site to be preserved. In many cases, these archaeological sites are river oriented so that any low-flow augmentation that would be provided would enhance the site and should encourage state and local participation in their rehabilitation. Consideration should also be given the preservation of other historical sites that are native to this area. The restoration program would provide additional attractions for the tourists and should be integrated in any recreational development planned for this area.

A detailed presentation summarizing all known data concerning the archaeological aspects of the basin is contained in Part 1 of APPENDIX H.

34. PRESERVATION OF LAND ENVIRONMENT

a. Recreational-environmental corridors. As part of resource management, there is a concern regarding the effects from man's uncontrolled use of his natural environment. The major problem has been the failure to set aside enough land and water acreages to balance the expanding resource use resulting from population and economic growth. Involved is the basic need for preserving the area's natural ecology which is so important to man's well-being.

As part of its long-range recreational program, the State has stressed the advantage of combining the two resources, land and water, to complement each other and thereby greatly increasing the recreational value of both. Within this framework, the State has recommended the establishment of river corridors and planned them as linear parkways that would serve as scenic routes connecting major recreational developments. A similar concept was expressed in the land-use plan prepared by the Greater Egypt Commission which called for establishment of specific recreational-environmental river corridors. These lands and reaches of streams would be maintained for public use and would help balance the social and economic development of the basin. Some of the same acreages are involved in both the State and local plans for recreational development.

b. Strip mine areas.

Coal production in many parts of the basin has involved strip-mining operations. This method has stripped away the over-burden above the coal seams and left extensive amounts of overturned material exposed to the elements of nature. This material contains enough sulfides, iron, and sterile soil to create pollution problems, both in the streams and on the land. The natural runoff flowing over the exposed material contaminates the basin by inducing acid drainage into the streams. At the same time, the runoff contributes a heavy sediment load to the stream from erosion of the overturned soil. These areas also deter growth of plant life and render the mine lands unattractive, creating an environmental as well as economic problem. Unless the strip mine is restored, the land ceases to be productive, and it becomes a liability rather than a contributing source of tax revenue.

As man becomes more concerned with his environment, increased attention is being given to the restoration of these strip mines. The Greater Egypt Commission regards these acreages as a resource requiring extensive rehabilitation in order to improve their value to the basin. In some cases, mining companies have done very little towards reclaiming the stripped-over lands. In other cases, companies have shown initiative and foresight in actively renovating these lands well in excess of the minimum required by State law. However, many areas throughout the basin still remain an economic and esthetic blight and need some form of rehabilitation.

35. SOCIO-ECONOMIC REDEVELOPMENT

All levels of government have shared a concern over the economic situation as it has existed in southern Illinois, and in particular, the Big Muddy River Basin. Concerted efforts have been made to plan and provide specific programs that would contribute to the employment and social well-being of the residents, both directly and indirectly.

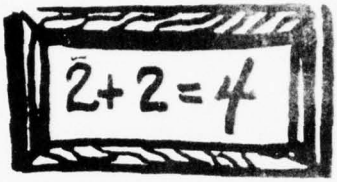
As an example of Federal input to the area's economic reorientation, the United States Congress authorized construction of the Rend Lake Dam and Reservoir by the Corps of Engineers. The project was designed and planned on a coordinated basis with the then Area Redevelopment Administration of the U. S. Department of Commerce, the State of Illinois, and the Rend Lake Conservancy District. The economic evaluation recognized area redevelopment as a specific project purpose. Included in the benefit evaluation was the value of employment creditable to reservoir construction and operation, and the equivalent worth of long-range growth that would accrue once the project was in operation.

Local political entities have also provided additional inputs to the basin's economic redevelopment. The Rend Lake Conservancy District, a co-sponsor of the Rend Lake Dam and Reservoir, has instituted studies for land use and development on the peripheral areas outside the Rend Lake project. Plans have been drawn up to provide a proper framework for attracting the type of capital investment which would change the economic structure. The comprehensive plan involves a protective zoning and in-depth development on land surrounding the reservoir and seeks to promote tourism and recreation as a specific economic input. This proposal is in line with the Checchi Report (see paragraph 5c(3)) funded by both the State and the Economic Development Administration. The comprehensive recreational plan presently envisions extensive development of basic facilities and diversified recreational opportunity on project lands by both the Federal and State government. To complement these basic recreational developments, construction of major luxury-type resorts and convention center facilities would be located on adjacent non-project lands. These developments would provide controlled and zoned development of restaurants, night clubs, motor inns, and a 27-hole championship golf course. In addition, the Rend Lake College recently has been opened as part of an extensive development center adjacent to the project lands. Included in this complex will eventually be high-rise buildings and shopping areas that will serve both the campus residents and the total tourist and recreational influx.

Additional Federal, State, and local action programs also have helped stabilize the basin's economy and reverse the trend in outmigration. While success has been slow, the area has now progressed to a level of public awareness and capability to assure continued progress. However, it still lacks certain resource inputs required to attain the projected level of socio-economic development, that of eventual parity with the nation.

SECTION V - PLAN FORMULATION

36. SUMMARY OF NEEDS



The outcome of the comparative evaluation between projected demands and supplies presented in the preceding section identified specific needs that required some form of action program. These needs, as listed below, have been grouped together in categories that best describe the overall purpose involved in any corresponding resource management and/or development program.

Agricultural enhancement - Developments proposed for this program would be responsive to the needs for floodwater damage reduction in the bottomlands, land treatment measures, and channel improvements in order to encourage installation of on-farm drainage. All three of these need categories are an integral part of the total effort required to improve the production efficiency and the economic competitiveness of the individual farmer.

Low-flow stream management - This action program would involve two specific phases of consideration. One is the need to improve the stream quality in order to sustain the type of use and its equivalent standard specified by the State. The second is to maintain a minimum base flow along with adequate waste treatment in those populated areas that, because of natural flow limitations, could experience insanitary conditions over time. This latter need is warranted from both a social and esthetic standpoint.

Recreation and area redevelopment - The basic objective would be to establish a comprehensive plan for reservoir-related recreation. Provisions for land- and stream-related developments were specifically excluded since these needs were evaluated within the framework of environmental control and management. The recreational program would be planned to meet two functions: (1) to satisfy the known recreational deficiency; and, (2) to enlarge the present economic base by supplementing the impact caused by construction of Rend Lake and Kinkaid Lake.

Environmental control - To maintain a proper balance between man and his environment requires selective use

of the area's natural resources and avoidance of irreversable commitments. Needed are programs specifically designed to preserve known archaeological and historical artifacts, conserve existing wildlife habitat augmented by types of improvements that would lead to better management practices, and rehabilitate abandoned strip-mine areas. In addition, a program is needed to enhance the interrelated recreational and environmental potential of selected stream reaches and the adjacent bottomlands.

It thus became apparent that any alternative for satisfying the individual needs eventually must be evaluated within the framework of each category's overall objective. However, each need has its own particular solution and may require different types of resource commitments. Consequently, while an interrelationship will always exist, the individual needs must serve as the initial bases for formulating a comprehensive plan of improvement.

Of the 15 watersheds, action programs were not studied for Cedar Creek and Kinkaid Creek since comprehensive plans of improvement had already been prepared and were in various stages of development. Furthermore, in three watersheds where there was only the single tangible need of agricultural enhancement, preliminary screenings indicated that structural improvements would not be economically justified. These were in Watersheds Nos. 1, Lower Big Muddy; 4, Lower Beaucoup Creek; and, 9, Central Big Muddy. Therefore, final formulation of any plan of development was restricted to those 10 watersheds where the tangible needs and potential socio-economic returns indicated that additional studies were warranted.

37. VALUE OF NEED SATISFACTION

a. General. In order to facilitate the evaluation of benefits creditable to a specific type of improvement, a differentiation was made between those needs that had either national or regional significance. The needs in the first category would contribute to the nation's economic development by increasing the value of the nation's output of goods and services, thereby improving the national economic efficiency and social well-being. In this case, the accruable benefits reflect the measure of monetary return to the user or the increased value in resource utilization. The second category of benefits represents the incremental enhancement to the region's socio-economic structure that results from investments or services provided to achieve the national objectives. By definition, the value represents an additional return that would accrue to the study area once commitments for the basic resource developments are achieved. In each case, only the net worth was claimed and computed as equivalent to the creditable gross value less any associated cost incurred in the realization of either benefit category.

Summated in the following subparagraphs are the monetary values that would accrue if the needs in each benefit category were fully met. Portions of these benefits would be creditable to the various project elements subsequently considered for development in the 10 watersheds. Benefits expected to accrue at varying rates in the future have been discounted to the base year, 1980, the first year of expected operation, and distributed as an equivalent uniform annual value for a selected 100-year period of analysis. The current Federal interest rate of 5-1/8 percent was used to discount to present worth. All monetary estimates of benefits are based on July 1970 price levels.

b. Flood control and drainage. Benefits creditable to the dual-service system of flood retarding structures and channel improvements were equivalent to the value of flood damages prevented and increased returns. The benefits creditable to each of the watersheds' flood control systems were equivalent to the reduction in flood damages that would occur in the future, with and without the projects, plus the increased returns that the farmer could reasonably expect to obtain once flood characteristics have been modified. Prototype reach analysis, involving both hydraulics and economic considerations, indicated that damage reductions would result primarily from a reduction in acres flooded, rather than a reduction in depth of flooding. The analysis also indicated that maximum benefits would be obtained by a reduction of those flood flows that have a frequency of occurrence ranging from 1 to 3 years. Furthermore, any meaningful reduction in the number of acres being flooded would require a completely controlled water regimen. This would involve retention structures effectively located so as to control local flood runoff. Successive hydraulic screening eventually identified the optimum plan of improvement as one that would control a minimum of 25 percent of a watershed's area and maintain a maximum release rate of 10 to 15 c.f.s. per square mile from the controlled area.

Flood damages prevented are estimated at $1,343,400 annually. The increased returns attainable once the desired level of flood control has been achieved are estimated at $1,893,200. Total average annual benefits creditable to the flood control system in all 10 watersheds are estimated at $3,236,600. Reflective of the objectives to enhance the agricultural industry is the fact that approximately 58 percent of the total benefits represent the potential increase in production output attainable with installation of the optimized flood control system.

Channel improvements were designed to supplement the floodwater control and provide an adequate outlet for drainage systems on an individual farm or groups of farms. Only the acreage that would be free from the more frequent flooding and not already drained was considered. This involved lands both in and outside the flood plains. Gross benefits were based on the incremental value in improved crop

patterns and production efficiencies that would be practical once the flood reductions were achieved and the drainage systems installed. These values first were discounted for delay in attainment and for less than full participation and then further reduced by an amount equivalent to the costs for installing these improvements. Drainage benefits creditable to the dual-service system are estimated to average $1,008,400 annually.

c. Stream supplementation. The value of low-flow augmentation in the interest of stream quality was based on the cost of the most likely alternative, advance waste treatment and pipeline transfer of effluents, that local residents would undertake if the supplemental flows were not provided. The annual worth of meeting these needs was evaluated using time-phased increments of development with the values based on 8-1/4 percent non-Federal interest rate and an amortization period of 25 years. Average annual benefits attributable to those reservoirs that would augment low flows in the interest of water quality control at the five load points are estimated at $1,072,100.

The value of the supplementation for maintaining a minimum base flow in Crab Orchard Creek below Carbondale was based on the cost of a single-purpose reservoir to provide the required services. The annual cost of meeting this need was evaluated using time-phased increments of development with discounted value based on the Federal interest rate and an amortization period of 100 years. Average annual benefits attributable to maintenance of a minimum base flow in the environmental area of Carbondale are estimated at $526,700.

d. General recreation. General recreational benefits were computed as equivalent to the average annual visitation creditable to a project element multiplied by a unit value of the recreational worth. The unit value is a general standard reflective of the project element's environmental quality and the extent and type of activities expected to be provided. For this study, the monetary unit value of benefits per recreational day would range from $0.75 to $1.50, dependent upon whether the opportunities are to be provided by rehabilitated strip mines, reservoir construction, or stream-related developments. If it is assumed that the bulk of the projected recreational needs would be satisfied primarily by a reservoir program as implied by the design amount of water surface acres, a unit value of $1.00 would be applicable. Based on the projected unmet need of some 2,000,000 recreational days by 1980; 5,200,000 by the year 2000; and 8,400,000 by the year 2020, the total discounted recreational benefits are estimated at $4,875,600 annually, of which 41 percent or $2,000,000 are creditable to the 1980 initial needs.

e. Area redevelopment benefits.

(1) Regional benefits. As previously indicated, developments, particularly reservoirs, required to satisfy those needs listed in the national category, will serve as catalysts for additional investment in the basin. These projects will induce investments to be

made that will further stimulate the area's present depressed economy, primarily by broadening its economic base and thereby raising the level of income. To quantify this induced impact, differentiation was made between those benefits that would accrue from expansion of the economic base structure and those that reflect a direct increase in income resulting from improved agricultural efficiencies. The anticipated expansion in the economic base structure was quantified by determining the change in personal income directly attributable to future water-related developments. Any growth resulting from other public and private investments was specifically excluded. The net local economic development benefits are estimated at $13,400,000 annually. The induced returns resulting from improved agricultural efficiencies were based on the expected rise in capital outlays which would be made to attain the projected productivity. The increased expenditures in turn will contribute to the growth in local agricultural-related businesses. The value of this benefit is estimated at approximately 10 percent of the increased economic returns creditable to installation of the flood control and drainage improvements or $424,500 annually.

(2) Relief of unemployment. Utilization of an area's labor resources that are either unemployed or underemployed are valid benefits which can be credited to a project in accordance with Senate Document No. 97. As of November 1970, only two of the basin's five counties have an unemployment problem severe enough to warrant being classified as eligible for assistance under Title I and IV of the Redevelopment Act of 1961 as amended. This reflects a marked improvement in the area's economic situation and is indicative of the success of current governmental and local programs. It is anticipated that by the time work on the early action program is initiated, the unemployment situation should decline sufficiently to preclude these counties from being classified as eligible for special assistance. Based on the present and forecasted change in the area's employment situation, benefits in this particular category equivalent to $581,600 annually were not uitlized in the project formulation and economic evaluation. This decision was predicated on the expectation that, by the time construction of any proposed project is initiated, the value (benefit) of this type of economic input would not be applicable.

f. Total benefits. The identifiable total average annual benefits that may be credited to any plan of improvement proposed for development in the 10 watersheds are estimated at $24,543,900. A breakdown of these benefits, both on a national and regional basis, is shown in TABLE 6. Also identified are those values considered local in nature as opposed to those services that can be provided anywhere within the basin. Not included are those benefits that would accrue from the utilization of labor either unemployed or underemployed. Classified as having national significance these latter benefits would be creditable if the employment situation does not attain its projected level and relationship to the national average.

TABLE 6
Summary of Average Annual Benefits (Dollars)1/

		National Benefits										Regional Benefits		
		Flood Control												
	Watershed	Existing Development	Future Development	Restoration of Productivity	Changed Land Use	More Intensive Land Use	Total Flood Control	Drainage	Low-Flow Augmentation	General Recreation2/	Total National Benefits	Local Economic Development	Agricultural Related Regional	Total National and Regional
5	Galum Creek	72,300	15,200	37,300	56,600	65,700	247,100	64,100			311,200		31,100	342,300
6	Upper Beaucoup	174,200	36,800	84,100	61,200	154,500	510,800	147,300	164,200		822,300		65,900	888,200
7A	Upper Crab Orchard Cr	41,800	8,800	24,300	47,800	62,500	185,200	62,100	231,400		478,700		24,700	503,400
7B	Lower Crab Orchard Cr								526,700		526,700			526,700
8	Little Muddy River	149,500	31,600	64,900	32,800	160,900	439,700	147,300	265,800		852,800		58,800	911,600
10	Hurricane Creek	6,100	1,400	11,800	5,200	14,900	39,400	14,300			53,700		5,300	59,000
11	Lake and Pond Creeks	24,100	5,100	37,400	13,200	54,400	134,200	53,300			187,500		18,700	206,200
12	Middle Fork Creek	190,200	40,400	64,600	52,400	175,700	523,300	164,100	80,900		768,300		68,700	837,000
13	Gun Creek	30,800	6,700	21,400	2,900	37,000	98,800	36,500			135,300		13,600	148,900
14	Upper Big Muddy River	298,600	63,000	104,800	29,700	217,200	713,300	212,100			925,400		92,500	1,017,900
15	Casey Fork Creek	121,300	25,500	73,700	12,000	112,300	344,800	107,300	329,800		781,900		45,200	827,100
	SUBTOTAL WATERSHED	1,108,900	234,500	524,300	313,800	1,055,100	3,236,600	1,008,400	1,598,800		5,843,800		424,500	6,628,300
	SUBTOTAL BASIN									4,875,600 3/	4,875,600	13,400,000		18,275,600
	TOTAL WATERSHED AND BASIN BENEFITS	1,108,900	234,500	524,300	313,800	1,055,100	3,236,600	1,008,400	1,598,800	4,875,600 3/	10,719,400	13,400,000	424,500	24,543,900

1/ Reflects a Federal interest rate of 5 1/8 percent and July 1970 price level.
2/ These types of benefits are not creditable to individual watershed since they are based on the needs of the whole basin.
3/ Estimates of benefits have been based on the unit value per recreation day of $1.00 which is representative of the worth for reservoir related usage. Final worth will be dependent upon allocation of projected needs creditable to usage of the stream corridors which have a unit value of $1.50 per recreation day.

38. PLANNING CONCEPTS

a. Basic guidelines.

To determine the composition of an optimum but flexible development program, specific planning guidelines were established. The purpose of these guidelines was twofold: to obtain the most effective use of all available resources, capital as well as land and water; and to maintain a balanced relationship between man, his needs, and his environment.

As a first step, three basic goals were adopted: to provide the necessary land and water developments needed to sustain the projected economic growth; to encourage the preservation and enhancement of the area's natural environment; and finally, to provide a plan for staged development capable of satisfying the time-phased needs. To help attain these goals, specific objectives were then established for each basic purpose and individual need so that subsequent project(s) formulation would be effective. These objectives were defined in terms of either the resource, its management, and/or productive output.

Specific objectives were established for the control of both the high (flood) flows and the low-flow regimen of the basin's streams with the dual purpose of providing increased economic output and maintenance of a desired environmental standard. In addition, other planning controls were adopted dealing with: the management of the flood plain and adjacent land acreage; regulation of the surface water runoff; water resource developments as economic stimuli; and the preservation of the area's historical and archaeological artifacts and cultural habitat.

A detailed itemization of the individual objectives is presented in APPENDIX M.

b. Framework plan. The land-use plan prepared by the Greater Egypt Commission was used as the basic framework for planning. This plan was formally adopted in 1965 and therefore was considered to be both an expression and a commitment from the local residents. The plan seeks to control future growth into five basic areas: Mt. Vernon-Rend Lake Area, Benton-West Frankfort Area, Marion-Herrin Area, Murphysboro-Carbondale Area, and the Du Quoin-Pinckneyville Area. This principle of concentration offers the greatest opportunity for successful development and at the same time insures that any economic return would be distributed throughout the basin. The area bounded by these five growth centers tends to place the major urban and economic activities in the middle of an environmental or open space area dedicated to both agricultural and recreational pursuits. Envisioned is a phased growth, so controlled that urban expansion would be concentrated in those areas presently urban or semi-urban

with (future) semi-urban areas restricted to acreage where development is now scattered. The control of land resources specifically tends to minimize the acreage that would be developed to meet urban needs and maximizes the amount available for open space including agricultural development. The plan concentrates residential development in areas adjacent to existing communities, thereby facilitating provision of municipal services and recommends proposals for use of waste lands and the establishment of public-use areas.

39. SOLUTIONS CONSIDERED

Subsequent to establishing the necessary planning guidelines, various methods of meeting the individual needs were identified and their ability to provide the required service or output was determined. The types of alternatives that were considered ranged from a do-nothing program to various means, some involving multiple resource developments in order to satisfy a single need. The range of solutions considered for the various need categories involved the following:

Flood plain management - The land-use plan adopted for this study specifies that the flood plain be retained as open space with development of the bottomlands restricted to either agricultural and/or public usage. Consequently, consideration was given the need for both flood control and drainage improvements as well as stream-related recreational developments and the possible use of both structural and non-structural measures. The structural measures included consideration of reservoirs, channel improvements, levees, and combinations thereof. Preliminary studies indicated that where warranted, the agricultural enhancement of the bottomlands and adjacent acreages would be best served by a system of headwater reservoirs located off the main stem of the tributary watersheds, supplemented by channel improvements. The non-structural alternative of flood plain zoning was also considered. While not physically capable of reducing flood depths or durations, it is an effective means of minimizing damages by regulating the type and extent of development in areas subject to overflow. Since both agricultural and recreational developments normally have an advantage in locating in flood-prone areas, this type of control was rejected as an effective method of actually reducing existing flood damages. However, it was retained as part of a total action program for those reaches of stream that would be subject to improvement. Its application in the form of land-use control would tend to limit future encroachment and insure that development of the streams and adjacent lands would be in consonance with the planned usage.

Stream quality - Alternative possibilities of improving stream quality included reservoir construction, improved treatment of waste prior to its discharge into the stream, pipeline transfer of the treated waste effluent to a stream with sufficient assimilative capacity, and restrictions on both the stream and adjacent land use. These alternatives were reviewed and screened relative to cost considerations, effectiveness in providing the required services, minimal usage of resources, and the social desirability of accommodating legitimate stream uses. Based on the foregoing, it was concluded that reservoir construction, pipeline transfer, and at-source advanced waste treatment were the only practical and economically acceptable methods of control.

General recreation - In determining the various alternatives for outdoor recreation, consideration was restricted to water-oriented activities. The alternatives studied were compared in relation to the physical factors needed to provide an adequate potential for water-based pursuits. These factors included water surface acreage, recreational facilities, and the required project associated lands. The evaluation basically consisted of determining the comparative worth of either constructing new reservoirs or modifying the scale of development of those reservoirs in the area either authorized, under construction, or completed. Final analysis indicated that both alternatives were acceptable and should be considered.

Environmental control - The types of improvement considered for this category were restricted to those that either would provide an enhanced environment and/or improve the recreational potential of both the streams and adjacent lands. Major emphasis was given non-structural measures since conservation of land resources and its allied uses was of primary concern. Specific measures found to be the most feasible were establishment of recreational corridors or river parkways, reclamation of strip-mine areas, and construction of reservoirs to maintain minimal stream flows. In addition, these programs could be supplemented by selective use of open space zoning and scenic easements.

Economic reorientation - As was previously indicated, the area has now progressed to the point where specific inputs are needed if parity with the nation is to be achieved. For maintaining the newly-established growth trend, the plan of improvement must provide an additional framework to attract capital investment that would contribute to the area's redevelopment. There are no known alternatives to area redevelopment as such, other than a negative

possibility of a do-nothing program. This approach would cause the basin to again stabliize at a depressed level by denying assistance in the form of resource development. Contributing to this situation would be the continuous outflow of both population and capital. These results would be contrary to both the national objectives of maximum economic efficiency and achievement of human satisfaction and the intent to stimulate regional development.

40. FORMULATION PROCESS

The procedure for formulating a meaningful plan of improvement consisted of an evaluation that compared various combinations of water and land developments. Involved was a process of analyzing various types of development and management proposals to determine the most efficient way of meeting the known short- and long-term needs. The formulation process was divided into a two-step procedure: first, to identify a scale of development based on an economic evaluation - considering only the project costs and the tangible benefits or the value of the services provided; and second, the modification of this baseline plan to meet those intangible needs that warrant consideration but which cannot be measured in economic terms. This procedure provided a basis for making reasoned choices between potential uses of the area's resources and insured that the social-environmental requirements were included in the total decision-making process.

This study has purposely ignored the concept of generating public works as a source of make-work employment. Instead, it has concentrated on providing known and proven resource developments that would also generate a socio-economic return by creating new industries and stabilizing existing industries. Review of the basin needs indicated that the action programs required to enhance the agricultural industry and establish an adequate base for a tourism and recreational industry would achieve the economic objectives. Without additional improvements, the agricultural industry will continue to decline, fall short of its projected standing in the industrial makeup of the basin, and not meet its allocated share of the food and fiber market. Development of a tourism and recreational industry in this part of Southern Illinois would serve both a regional and State effort to overcome a deficiency in general recreational opportunities. Therefore, based on the foregoing, a priority was assigned the accomplishment of these two action programs in an attempt to further the redevelopment of the local economic structure.

Certain other considerations were recognized as affecting the analysis. First was the time when the individual needs actually develop. The developments required to meet the 1980 needs were used to establish the nucleus of the basin plan. Then the long-term needs to the year 2020 were satisfied whenever feasible in order to achieve

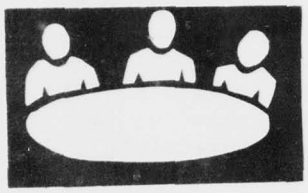
the best use of the resources employed. The geographic distribution or location of the need centers was a second factor considered in the formulation process. This involved the basic recognition that some needs such as agricultural enhancement and stream low-flow control were local in nature and must be solved on an individual-tributary watershed basis. On the other hand, certain needs, such as establishment of a tourism and recreational industry and environmental control, should be developed on a basin-wide approach. Due to the limited number of good sites, it was also decided that reservoirs should be fully developed whenever possible, thereby avoiding a partial waste of the resources involved. Furthermore, design constraints were established defining the relationship between a project and the services required for flood control and drainage, land treatment measures, low-flow augmentation, and reservoir-related recreation.

Details of the design and planning constraints used for this study are presented in APPENDIX M.

SECTION VI - SELECTION OF BASELINE PLAN

41. BASIC CRITERIA

a. General.



Analysis of the needs for water-related developments involved separate studies for flood control, drainage outlets, low-flow augmentation in the interest of both water quality control and maintenance of a minimum base flow, and general recreation. Other improvements involved separate studies for on-farm drainage, land treatment measures, conservation of the wildlife habitat, rehabilitation of strip-mined areas, preservation of the archaeological and historical artifacts, and development of land- and stream-related recreational opportunities. Based on preliminary evaluations, it was concluded that most of the needs in the individual watersheds would be best served by a system of reservoirs and channel improvements impounding and regulating the surface water runoff.

As previously stated, formulation of a baseline plan was restricted to those 10 watersheds where preliminary evaluations had indicated that action programs were warranted. Composition was determined by a procedure analyzing each proposed element as part of a total hydraulic and economic system for the watershed in which it was located. The analysis compared each element's cost to the creditable beneficial returns and the degree of achievement attained in meeting the needs. To identify the optimum plan of improvement for each watershed, a comparative evaluation first was undertaken between those projects that were recommended for consideration in meeting all or portions of the same need. To these were added those single-purpose and other multiple-purpose projects that would be required to meet the remaining needs. These unmet demands included the balance of the local needs and those of the basin which were allocated to the particular growth center located within the watershed boundary. The result was a system whose total scale of development would provide maximum net benefits over cost.

b. Rationale. In recognition of the priority assigned the enhancement of agricultural production and establishment of a tourism and recreational industry, the project studies were coordinated between the Soil Conservation Service and the Corps of Engineers. It was apparent that the interest of the basin would be best served if conflicts with the headwater reservoirs were minimized. This would be required if the concerted effort to enhance the local agricultural productive output and efficiency is to be achieved. Since channel improvements and on-farm drainage systems are essentially last-added

increments to the reservoirs, it was concluded that local participation would be facilitated if most of these proposals, including the required land treatment measures, were implemented under the Soil Conservation Service's Public Law 566 program. Due to the diversity of improvements, it was also decided that multiple Federal agency involvement in the construction program should be minimized since in this area a basically single Federal-local sponsor relationship would be beneficial. Otherwise, planning could become too complex and lead to haphazard phasing and development in each of the watersheds. In addition, this approach would minimize any problems that could result from the differences in cost-sharing arrangements available to the residents under the institutional authorities of the two Federal agencies.

Consequently, the Corps of Engineers restricted its investigative role in this study, considering only those reservoir projects capable of meeting the predominant water resource and then only in those watersheds where low-flow augmentation was a definite need. This procedure automatically assured selection of reservoirs with a good distribution pattern, close to the main growth centers, thereby enhancing the project's recreational potential and its overall contribution to the area's economic redevelopment.

42. ASSIGNMENT OF RESERVOIR FUNCTIONS

The functional requirements of the individual reservoirs selected for study were based on the services assigned the project in meeting the individual watershed and total basin needs. Based on the priority given reduction of flood damages, the storage required for detention of the site's runoff was determined and set aside before attempting to meet other needs. The remaining storage, as determined by topographic and yield limitations, was then allocated as a joint-use pool capable of meeting other needs, both immediate (1980) and long range. Where applicable, sufficient storage of the joint-use pool was set aside, equivalent to the amount required to meet the 1980 low-flow supplemental needs. To this base was added a second pool with enough storage to augment the natural low flows and meet the selected target flow specified for the year 2020. This latter block of storage was included as a dual-purpose pool initially dedicated to recreation but subject to a fixed time-phased conversion to low-flow augmentation. Subsequent analysis indicated that the resultant drawdown would not materially change the pool's basic recreational potential. For those reservoirs whose site potential still was not fully utilized, a third storage block was added for the single-purpose need of recreation. This latter storage would have the added value of enhancing the project's potential as a tourist attraction and increasing its contribution to the basin's economic structure.

43. ALTERNATIVE PROPOSALS CONSIDERED

As part of the total action program for the 10 watersheds, some 86 reservoirs were selected for final study. Proposed for consideration were 80 single- and multiple-purpose projects formulated by the Soil Conservation Service and six by the Corps of Engineers. In addition, the scope of required drainage improvements was established for all 10 watersheds. Involved were some 350 miles of main channel improvements and approximately 875 miles of laterals and sublaterals. These channels were designed to provide an adequate outlet for the acreage in and adjacent to the flood plain.

The primary needs in five of the ten watersheds were confined to the agricultural-related problems of flood control and drainage. These five watersheds were: No. 5, Galum Creek; No. 10, Hurricane Creek; No. 11, Lake and Pond Creeks; No. 13, Gun Creek; and No. 15, Upper Big Muddy River. In each of these watersheds, the Soil Conservation Service had prepared a plan of improvement optimized in terms of economics and systemized flood control hydraulics. While there also was a limited potential to meet a minor increment of the basin's overall recreational needs, it was found that the initial phase could be more econmically and effectively met by projects in other watersheds. Therefore, the recommended plan of improvement for these five watersheds, which included 28 single-purpose flood control reservoirs and 388.4 miles of channel improvements, was adopted.

The alternative proposals which required a comparative evaluation were located in the remaining five watersheds, namely: No. 6, Upper Beaucoup Creek; No. 7, Crab Orchard Creek (upper portion only); No. 8, Little Muddy River; No. 12, Middle Fork Creek; and No. 15, Casey Fork Creek. Of the 52 structures proposed for consideration by the Soil Conservation Service, 35 were single-purpose reservoirs designed as part of a system that would affect the required flood control hydraulic gradient. The other 17 were the multiple-purpose projects which were considered as functional alternatives to five of the six proposed by the Corps of Engineers. Consequently, the final comparative evaluation involved just 22 reservoirs with varying usage, costs, and benefits, and only 207.9 of the remaining 837.1 miles of channel improvements which were designed as last-added increments to the reservoir system.

44. SELECTION OF BASELINE PLAN

The final phase of project(s) screening involved a comparative analysis between those reservoirs designed to meet all or portions of the same needs. Selection was based on a maximization analysis that compared both the effectiveness (excess of benefits over cost) and the efficiency (the level of need satisfaction) of the individual project or combinations of projects. The comparative evaluation resulted in reducing the 22 reservoirs under consideration to seven and in some instances, reformulated and reallocated the storage and functions originally assigned the individual project(s). In addition, the 208 miles of channel improvements were deferred for restudy due to changes in hydraulic control and a potential for use as a recreational-environmental corridor.

The baseline plan, as finally formulated, consisted of 71 reservoirs, land treatment measures, together with 1,018 miles of channel improvements, of which 283 are on the tributaries' main stem. Total storage capacity in the 71 reservoirs will amount to 482,200 acre-feet, of which 221,100 acre-feet are provided for flood flow and sediment retention with the remaining 261,100 for multiple usage, including both low-flow augmentation and recreation. Five of the six reservoirs recommended for construction by the Corps of Engineers provided the maximum net benefits and were included in the baseline plan. The remainder of the modified systems' projects were retained for construction by the Soil Conservation Service under its Public Law 566 program. Listed in TABLE 7 are the recommended improvements and related costs for each of the 10 watersheds. Detailed information concerning the two alternative sets of proposals and the comparative evaluation are presented in APPENDIX M.

A summary of the projects' costs, accruable benefits, and applicable benefit-cost ratios for the baseline plan is shown in TABLE 8. Two benefit-cost ratios were derived: one, based on national benefits only; the other involving consideration of both national and regional benefits. The national benefit potentially creditable for utilization of labor either umemployed or underemployed has not been included in the derivation of either ratio. The projects' average annual costs included interest and amortization on a sinking fund basis of construction costs, annual operation and maintenance charges, and applicable replacement costs. All reservoirs and channel improvements were estimated to have a 100-year life. Interest and amoritization were computed at the current 5-1/8 percent Federal interest rate.

The costs for recreational facilities and the accruable benefits included in TABLES 7 and 8 were time-phased and discounted in relation to the immediate and long-range needs. The time-phasing of these developments was based on the size of the reservoir involved and its proximity to the main growth centers of the basin. The initial costs

for recreational development were based on analyses of existing reservoirs and are representative of an initial level of development reasonable of attainment and acceptable to the State of Illinois for this stage of coordinated planning effort. While no firm commitment as to the extent and timing of future non-Federal investments was received, a tentative phasing of future use and installation costs was established for each of the reservoirs considered for recreational development.

TABLE 7

Summary of baseline plan

	Reservoir				Channel improvements						Cost of land treatment measures ($)	Grand total ($)
					Main stem		Lateral & sublateral		Total			
	Res. No.	SCS (P.L. 566) first cost ($)	Corps first cost ($)	Total watershed cost ($)	miles	cost ($)	miles	cost ($)	miles	cost ($)		
No. 5 Galum Creek	5-1	241,000										
	5-3A	240,000										
	5-4	396,000										
	5-6	423,000										
	5-7	219,000										
	5-10	270,000										
	5-11	132,000										
	5-12	722,000										
Total for Watershed		2,643,000		2,643,000	21.6	905,000	47.8	649,000	69.4	1,554,000	3,980,000	8,177,000
No. 6 Upper Beaucoup	6-8	163,000										
	6-9	198,000										
	6-10	228,000										
	6-11	427,000										
	6-13	619,000										
	6-14	218,000										
	6-15	209,000										
	6-16	149,000										
	6-17	561,000										
	6-18A	250,000										
	C-34	--	20,000,000									
Total for Watershed		3,022,000	20,000,000	23,022,000	66.9	2,759,000	102.7	1,550,000	169.6	4,309,000	7,680,000	35,011,000
No. 7 Crab Orchard	7-6	183,000										
	7-7	2,794,000										
	7-8A	248,000										
	C-16A	--	12,000,000									
Total for Watershed		3,225,000	12,000,000	15,225,000	9.8	490,000	99.0	1,272,000	108.8	1,762,000	2,810,000	19,797,000
No. 8 Little Muddy	8-1B	224,000										
	8-9A	150,000										
	8-10	559,000										
	C-35	--	28,500,000									
Total for Watershed		933,000	28,500,000	29,433,000							7,100,000	36,533,000
No. 10 Hurricane Creek	10-1	205,000										
Total for Watershed		205,000		205,000	6.7	285,000	28.1	270,000	34.8	555,000	320,000	1,080,000
No. 11 Lake and Pond	11-2	110,000										
	11-3	695,000										
Total for Watershed		805,000		805,000	28.5	1,554,000	83.7	1,167,000	112.2	2,721,000	1,360,000	4,886,000
No. 12 Middle Fork Creek	12-1	851,000										
	12-3	245,000										
	12-4	124,000										
	12-5A	179,000										
	12-5B	176,000										
	12-6A	255,000										
	12-7A	285,000										
	12-11	108,000										
	12-12A	258,000										
	12-13	425,000										
	C-7	--	20,600,000									
Total for Watershed		2,906,000	20,600,000	23,506,000	47.8	3,491,000	162.8	2,111,000	210.6	5,602,000	3,110,000	32,218,000

TABLE 7 (cont'd)

Summary of baseline plan

	Reservoir				Channel improvements						Cost of Land treatment measures ($)	Grand total ($)
					Main stem		Lateral & sublateral		Total			
	Res. No.	SCS (P.L. 566) first cost ($)	Corps first cost ($)	Total watershed cost ($)	miles	cost ($)	miles	cost ($)	miles	cost ($)		
No. 13 Gun Creek	13-1	200,000										
	13-2	185,000										
	13-3A	279,000										
	13-4	286,000										
Total for Watershed		950,000		950,000	5.9	211,000	45.8	568,000	51.7	779,000	630,000	2,359,000
No. 14 Upper Big Muddy	14-1	354,000										
	14-2	645,000										
	14-3	178,000										
	14-4	190,000										
	14-5	192,000										
	14-6	281,000										
	14-7	1,070,000										
	14-8	293,000										
	14-9A	203,000										
	14-10A	327,000										
	14-12	567,000										
	14-14	364,000										
	14-15	496,000										
Total for Watershed		5,160,000		5,160,000	44.8	1,766,000	75.5	1,578,000	120.3	3,344,000	2,990,000	11,494,000
No. 15 Casey Fork	15-1A	388,000										
	15-2A	247,000										
	15-3A	347,000										
	15-5	277,000										
	15-6	72,000										
	15-7	71,000										
	15-9	137,000										
	15-10	204,000										
	15-11	287,000										
	15-13A	405,000										
	15-14	222,000										
	15-15	209,000										
	C-5	--	12,000,000									
Total for Watershed		2,866,000	12,000,000	14,866,000	51.0	1,539,000	89.2	960,000	140.2	2,499,000	1,990,000	19,355,000
BASIN TOTALS		22,715,000	93,100,000	115,815,000	283.0	13,000,000	734.6	10,125,000	1,017.6	23,125,000	31,970,000	170,910,000

TABLE 8

Economic evaluation, baseline plan

Watershed	Project Costs ($)		Average Annual Benefits ($)		Benefit-Cost Ratio	
	First Cost	Annual Cost	National Account	National & Regional Account	National Account	National & Regional Account
No. 5 Galum Creek						
a. Corps Reservoirs						
b. SCS Projects						
(1) Reservoirs (8)	2,643,000	141,200				
(2) Channel (69.4 miles)	1,554,000	106,000				
(3) Totals	4,197,000	247,200	311,200	342,300	1.26	1.38
c. Total Watershed	4,197,000	247,200	311,200	342,300	1.26	1.38
No. 6 Upper Beaucoup						
a. Corps Reservoirs (1)	20,000,000	1,269,100	1,036,100	4,053,400	0.82	3.19
b. SCS Projects						
(1) Reservoirs (10)	3,022,000	160,900				
(2) Channel (169.6 miles)	4,309,000	294,000				
(3) Totals	7,331,000	454,900	460,700	506,700	1.01	1.11
c. Total Watershed	27,331,000	1,724,000	1,496,800	4,560,100	0.87	2.65

TABLE 8 (cont'd)

Economic evaluation, baseline plan

Watershed	Project Costs ($) First Cost	Project Costs ($) Annual Cost	Average Annual Benefits ($) National Account	Average Annual Benefits ($) National & Regional Account	Benefit-Cost Ratio National Account	Benefit-Cost Ratio National & Regional Account
No. 7 Crab Orchard						
a. Corps Reservoirs (1)	12,000,000	699,500	706,900	1,374,200	1.01	1.96
b. SCS Projects						
(1) Reservoirs (3)	3,225,000	227,800				
(2) Channel (108.8 miles)	1,762,000	118,100				
(3) Totals	4,987,000	345,900	605,500	1,130,000	1.75	3.27
c. Total Watershed	16,987,000	1,045,400	1,312,400	2,504,200	1.26	2.40
No. 8 Little Muddy						
a. Corps Reservoirs (1)	28,500,000	1,807,300	1,717,100	6,286,400	0.95	3.48
b. SCS Projects						
(1) Reservoirs (3)	933,000	49,700				
(2) Channel	-------	-------				
(3) Totals	933,000	49,700	35,200	38,700	0.71	0.78
c. Total Watershed	29,433,000	1,857,000	1,752,300	6,325,100	0.94	3.41

TABLE 8 (cont'd)

Economic evaluation, baseline plan

Watershed	Project Costs ($) First Cost	Project Costs ($) Annual Cost	Average Annual Benefits ($) National Account	Average Annual Benefits ($) National & Regional Account	Benefit-Cost Ratio National Account	Benefit-Cost Ratio National & Regional Account
No. 10 Hurricane Creek						
a. Corps Reservoirs						
b. SCS Projects						
(1) Reservoirs (1)	205,000	11,000				
(2) Channel (34.8 miles)	555,000	39,200				
(3) Totals	760,000	50,200	53,700	59,000	1.07	1.18
c. Total Watershed	760,000	50,200	53,700	59,000	1.07	1.18
No. 11 Lake & Pond						
a. Corps Reservoirs						
b. SCS Projects						
(1) Reservoirs (2)	805,000	43,000				
(2) Channel (112.2 miles)	2,721,000	200,000				
(3) Totals	3,526,000	243,000	187,500	206,200	0.77	0.85
c. Total Watershed	3,526,000	243,000	187,500	206,200	0.77	0.85

TABLE 8 (cont'd)

Economic evaluation, baseline plan

Watershed	Project Costs ($) First Cost	Project Costs ($) Annual Cost	Average Annual Benefits ($) National Account	Average Annual Benefits ($) National Regional Account	Benefit-Cost Ratio National Account	Benefit-Cost Ratio National & Regional Account
No. 12 Middle Fork						
a. Corps Reserovirs (1)	20,600,000	1,341,600	1,073,600	4,786,200	0.80	3.57
b. SCS Projects						
(1) Reservoirs (10)	2,906,000	155,600				
(2) Channel (210.6 miles)	5,602,000	376,000				
(3) Total	8,508,000	531,600	547,700	602,500	1.03	1.13
c. Total Watershed	29,108,000	1,873,200	1,621,300	5,388,700	0.87	2.88
No. 13 Gun Creek						
a. Corps Reservoir						
b. SCS Projects						
(1) Reservoirs (4)	950,000	50,900				
(2) Channel (51.7 miles)	779,000	53,800				
(3) Totals	1,729,000	104,700	135,300	148,900	1.29	1.42
c. Total Watershed	1,729,000	104,700	135,300	148,900	1.29	1.42

TABLE 8 (cont'd)

Economic evaluation, baseline plan

Watershed	Project Costs ($) First Cost	Project Costs ($) Annual Cost	Average Annual Benefits ($) National Account	Average Annual Benefits ($) National & Regional Account	Benefit-Cost Ratio National Account	Benefit-Cost Ratio National & Regional Account
No. 14 Upper Big Muddy						
a. Corps Reservoir	---	---				
b. SCS Projects						
(1) Reservoirs (13)	5,160,000	276,200				
(2) Channel (120.3 miles)	3,334,000	226,800				
(3) Totals	8,504,000	503,000	925,400	1,017,900	1.84	2.02
c. Total Watershed	8,504,000	503,000	925,400	1,017,900	1.84	2.02
No. 15 Casey Fork						
a. Corps Reservoir (1)	12,000,000	724,400	696,800	1,704,700	0.96	2.35
b. SCS Projects						
(1) Reservoirs (12)	2,866,000	153,700				
(2) Channel (140.2 miles)	2,499,000	185,000				
(3) Totals	5,365,000	338,700	369,300	406,200	1.09	1.20
c. Total Watershed	17,365,000	1,063,100	1,066,100	2,110,900	1.00	1.99
BASIN TOTAL	138,940,000	8,710,800	8,862,000	22,663,300	1.02	2.60

SECTION VII - MODIFICATION OF BASELINE PLAN

45. BASIS FOR MODIFICATION

While the baseline plan would satisfy most of the water- and land-related needs, it represented an economic evaluation involving only measurable national and regional benefits. Although responsive to the area's tangible needs, it did not include consideration of specific social and environmental needs. In particular, planning agencies of the State and the five counties have advocated the need to establish river corridors and rehabilitate abandoned strip-mine areas. These intangibles were felt to be of sufficient import to warrant consideration for modifying or enlarging the base plan.

However, before any additional formulation was initiated, the base plan was analyzed to determine what particular products or services it provides that would also contribute to an effective environmental control program. Low-flow augmentation would automatically enhance the recreational value of the waterway and the land adjacent to the streams. It would also provide the basis for developing different types of water- and land-related recreational pursuits presently not available nor included in the baseline plan. Furthermore, certain acreages in the flood plain now lying idle and not particularly suitable for agricultural usage would have, with proper management and minimum flood control, a potential for satisfying the socio-economic needs of the basin.

46. RIVER RECREATIONAL-ENVIRONMENTAL CORRIDORS

a. Basic criteria.

Development of selected flood plain acreage for public use was recognized as one of the most effective methods for implementing an environmental control. A proposal for creating public-use areas along the main stems of the Big Muddy River, Little Muddy River, and Beaucoup Creek is contained in the four counties' land-use plan. All three reaches are suitable for development as recreational-environmental corridors or linear parkways. The potential of these streams as scenic rivers will be enhanced by the flood protection and low-flow supplementation afforded the major portions of these streams by three Corps reservoirs: Rend Lake Reservoir on the main stem of the Big Muddy; Reservoir No. 35 located on the Little Muddy River, east of Du Quoin; and Reservoir 34 located above Pinckneyville in the Upper Beaucoup Creek Watershed.

Formulation was based on a multiple-use concept: (1) to preserve the natural ecology; (2) to safeguard and restore existing archaeological artifacts; (3) to conserve the area's wildlife habitat in order to offset the losses that will be incurred as the basin grows; and (4) to provide for stream-oriented recreation. To create such a managed environment required the development of multi-use areas selected relative to the quantity and quality of stream flow and the associated flora and fauna of the adjacent lands. Land management would need a controlled intermix of agricultural development, pastures, timber, and specific cover and vegetation useful for the preservation and enhancement of the area's environment.

To assure a significant base for good management practices it was considered necessary to control the land on both sides of the watercourse and for an adequate reach of stream. Most of the land areas would be zoned for the preservation of the natural environment and enhancement of wildlife habitat. Interspaced would be sites developed for specific esthetics and stream-oriented recreational pursuits. In general the corridors would be a mix of public and private ownership with restricted-use easements and rights for linear access obtained on those acreages retained in private ownership. Dedication of a strip of land 1,000 feet in depth from high bank on both sides of the stream is considered sufficient to provide a working acreage for management and action programs. However, this would be varied depending upon the significance of the environment and archaeological features in the different reaches.

b. Proposed developments. To achieve the stated objectives, three specific linear corridors would be developed in consonance with State and local proposals. The first corridor would extend some 103 miles along the main stem of the Big Muddy River from the Rend Lake Dam to the stream's confluence with the Mississippi River. The second corridor, approximately 47 miles in length, would be located between the proposed Corps Reservoir No. 35 on the Little Muddy River and the tributary's confluence with the Big Muddy River. A third corridor 28 miles long would be created in the lower portion of Beaucoup Creek, extending from the confluence of Galum Creek to the Big Muddy River.

Based on projected needs, initial development of recreational sites were restricted to the corridor on the main stem of the Big Muddy; the other two corridors being maintained as green belts with emphasis on development of wildlife habitat. Controlled access or angler-use sites for stream fishing would be provided on all three. Specific landscaping with adequate buffer zones will be required to insure separation of the recreational developments from the remainder of the corridor. The recreational facilities provided should be developed in a primitive park setting and offer selected opportunities for both day and overnight usage. Location of the initial recreational sites should be planned at or near good stream-road crossings. In this connection, local interests proposed and the Coordinating Committee approved initial development of four specific

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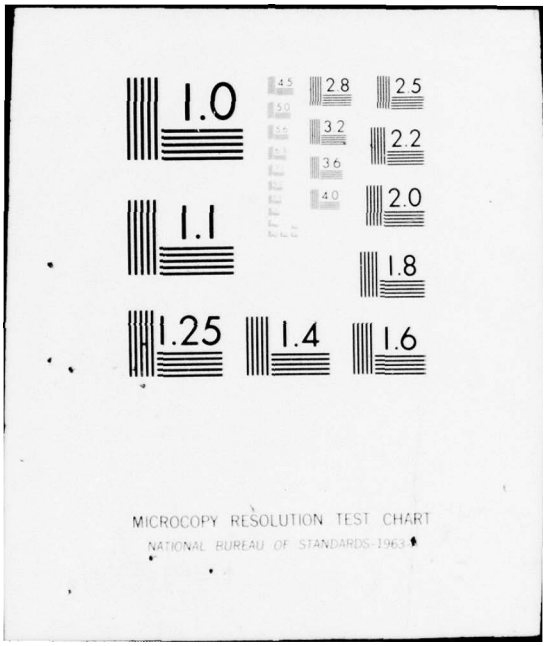
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areas: Site No. 1 at river mile 87 with management of the facilities the responsibility of the West Frankfort Park District; Site No. 2 at river mile 64 near the community of Hurst; Site No. 3 at river mile 35, being planned and managed as part of the existing Murphysboro Park which adjoins the stream; and, Site No. 4, which, as a linear parkway, would extend from river mile 27 to the confluence of the Big Muddy and Mississippi Rivers. This latter development lies within the boundaries of the Shawnee National Forest and acquisition and development of this area would be in consonance with that agency's long-range plans for improvements.

Each of the recreational sites should have a minimum river frontage of at least five miles in length with the acreages purchased totally in fee. Development would extend to both sides of the river with the recreational facilities concentrated in the middle one-mile zone. It is in this area that the stream-related recreational pursuits would be provided. In addition, buffer zones two miles long will be required on either side of this center zone, separating the facilities from the rest of the corridor and at the same time providing various land-related activities. In addition to the four recreational areas, acquisition in fee would be required for those acreages that contain unique ecological and environmental aspects or archaeological findings worthy of preservation.

c. Justification. After defining the scope of development, the cost for establishing the three recreational-environmental corridors was determined. Included as part of the total project costs were such items as lands and damages, recreational and stream access facilities, and contingencies. Total project costs for the three corridors are currently estimated at $15,300,000, of which $9,200,000 is for the corridor on the main stem of the Big Muddy River, $3,500,000 for the corridor on the Little Muddy River, and $2,600,000 for the lower portion of Beaucoup Creek.

Tangible benefits creditable to the three corridors were evaluated by the Bureau of Outdoor Recreation and the Bureau of Sport Fisheries and Wildlife in cooperation with appropriate State and local planning agencies. The Bureau of Outdoor Recreation has estimated that an average annual visitation of some 200,000 user-days could be expected once the projects are in operation. Based on a unit value of $1.50 per user-day, the general recreational benefits initially creditable to the corridors would amount to $300,000 annually. Ultimate usage is expected to reach 700,000 to 1,200,000 recreational-days annually. The Bureau of Sport Fisheries and Wildlife has quantified the creditable benefits for satisfying a latent stream fishery demand. Of the total fishing experienced in the five-county area, only three percent or 12,600 fisherman days are estimated as occurring in the stream segments being proposed for corridor development. This is expected to increase approximately seven-fold or to 88,200 fisherman days annually when the corridors are operation. The average daily value per fisherman day will concurrently increase from

$0.50 to $1.50, due to the greatly improved quality of the fishery. Therefore, the accruable net fishery benefits amounted to $126,000 annually, of which $72,900 would be creditable to the corridor on the main stem of the Big Muddy; $33,300 for the corridor on the Little Muddy River; and $19,800 for that reach of stream in the Lower Beaucoup Creek. Total tangible benefits are thus equal to $426,000 annually.

In addition to the foregoing, there are at least three other types of intangible benefits, excluding those associated with presentation of sites having historical significance. Of principal import is the preservation of a varied and valuable wildlife habitat needed to assure a continued ecological balance and diversity of wildlife species, and the opportunity to harvest or otherwise enjoy it. Secondly, control of land use paralleling the streams and a program providing adequate cover will combine to create a natural filter bed for agricultural effluents and silt loads normally injected into the streams by surface runoff. The third type of intangible benefit concerns the commerical potential for forest production which, as an outgrowth of the planned recreational and environmental programs, will serve to encourage land owners participation. It has been concluded that the value of these intangible benefits, from either a social or environmental standpoint, will eventually exceed the acquisition and development costs, and that the corridors are required to satisfy these objectives.

d. Implementation. To date, the lands encompassed by the recreational-environmental corridors have been zoned for public use in the land-use plans adopted by the counties. These plans, however, have not been supplemented by necessary ordinances, nor have the economic implications that would be caused by removal of these lands from the tax rolls been ascertained. Consequently, while establishment of the 178 miles of stream corridor has been incorporated into the basin plan of improvement, additional studies will be required before acquisition and development are undertaken. Since the value of the three corridors is directly related to the basic water regimen control effected by the three Corps reservoirs, acquisition and development of these corridors should be phased and made part of these projects' recreational master plan.

Further discussions regarding actual planning and design of these corridors are presented in APPENDIXES H, Part 2, and M.

47. REHABILITATION OF STRIP-MINE AREAS

a. Alternative proposals for development. The effects of strip mining on the basin's land resources is a source of considerable concern to the State and local residents. Thousands of acres have been left in an esthetically blighted condition and are no longer economically productive. The Greater Egypt Regional Planning and Development Commission had included in its land-use plan various proposals

that should be considered in the rehabilitation of these acreages. Included were such agricultural endeavors as tree farms, orchards or pasture lands, or such urban uses as residential developments where feasible. Establishment of fish farms, hunting preserves, and other recreational activities was also recommended as alternative possibilities.

b. Proposed plan of improvement. During the investigation, the foregoing proposals were reviewed as part of the study effort responsive to both an area redevelopment and an environmental concern. While existing Illinois legislation for control of both water quality and mining are adequate to prevent undesirable effects from active and future works, the real problem involves those strip-mined areas that have been abandoned in the past. It was recognized that the main objective of any remedial program would be to restore a basic natural resource, land, to a potential for income production. By so doing, the environmental objective should automatically be achieved. Preliminary evaluations indicated that the restoration cost required for conversion to recreational usage would be comparatively less than that required for all other suggested uses. Furthermore, projections indicate that additional acreage for food and fiber production will not be required until after the year 2000; and then it would be more economical and effective to convert other lands to agricultural usage. Rehabilitation for commercial or residential usage may be a suitable alternative only if it contributes to the planned control of growth areas and urban concentrations, an implicit requirement in the adopted land-use plans. Hence, from both a need and cost standpoint, it was concluded that rehabilitation of the strip-mine areas should be designed primarily to meet the long-range recreational deficiencies, even though it would be undertaken to meet the immediate need of area redevelopment.

Additional information on the rehabilitation of strip mines is included in APPENDIX M.

48. ASSESSMENT OF MODIFIED BASELINE PLAN

a. General.

Subsequent to selection of the baseline plan and the modifications required for socio-environmental considerations, the plan of improvement was again reexamined. This reevaluation specifically sought to identify the level of need satisfaction achieved and to ascertain if any other changes were warranted, particularly in meeting future needs. The results of the review are discussed in the following subparagraphs. Set forth is a summary of the plan's effectiveness in solving the area's problems and those additional modifications required to improve the performance standards. A more detailed review is presented in APPENDIX M.

b. Flood control and drainage improvements. The final phase of investigation was confined to 10 of the 15 watersheds and involved the need to alleviate all or portions of the flood problems on 103,600 acres and to drain some 236,500 wetland acres. Of the 71 reservoirs in the baseline plan, 70 contained flood control storage. These projects, together with the 1,018 miles of channel improvements, combine to reduce the flood problems on 58,300 bottomland acres and provide the basis for draining 198,200 acres of wetland. Pertinent data relative to the acreage affected for both flood control and drainage improvements in each of the 10 watersheds are detailed in APPENDIX M.

It also was recognized that installation of the tributary channel improvements would have a comparatively minor but adverse effect on the flood characteristics of the Big Muddy River, particularly below Rend Lake. It was found that a general increase in flood flow elevations for the more frequent floods would be experienced with comparatively little effect on the rarer floods. The results of this hydraulic analysis are tabulated in APPENDIX M. Furthermore, damaging effects to the wildlife population through the loss of land habitat would result from the enhanced agricultural program. The Bureau of Sport Fisheries and Wildlife, Department of Interior, has recommended the need to mitigate these losses, particularly those caused by channel improvements. Lands necessary to offset these losses could be acquired and integrated, either as part of the local project or the river corridors.

c. Low-flow augmentation. Originally, the study of the low-flow regimen concluded that there were two types of problems in the basin. It was found that growth or urban centers have tended to locate on lateral tributaries of small drainage areas and, over time, quality and quantity problems have developed. Thus, one problem involved the need to improve the stream's assimilative capacity by supplementing low flows based on the then existing State requirements for at-source waste treatment. The supplemental flows in this case would be sufficient to support fish and aquatic life, the State-identified stream use. The second problem involved a need to maintain a minimum base flow through a community's environmental area where the demands for all water uses were approaching the ultimate yield capacity of the upstream drainage area. These supplemental flows would minimize the potential hazards to local residents from vector problems and other health and social nuisances while also enhancing the esthetics and environmental aspects of the area.

Since completion of the low-flow regimen study, the State of Illinois has issued implementing orders that now require a higher level of waste treatment of the major communities previously identified as the key load centers. Concurrently, construction and expansion of the Rend Lake intercity pipeline also has induced additional factors that may directly affect the basin's hydraulic regimen. With the advent of intra-basin and inter-basin (export) transfer of water supplies, a change in both the tributary and main stem low-flow regimen can be expected. Consequently, the Federal

Water Quality Administration and the State in particular have expressed the need for continued emphasis on augmenting low flows, though not necessarily from an assimilative consideration, but more as a quantified base flow. Also contributing to the problem are the timing and financial aspects involved in upgrading the treatment facilities and possible operational shortcomings of sewage treatment plants, including those resulting from increased flows during storm periods. It was thus concluded that there was a need to retain augmentation by the six reservoirs in those reaches of streams where key urban or growth centers were located. The State's Environmental Protection Agency has officially stated that the analysis and resultant findings contained in the original study does not conflict with the revised treatment requirements and utilizes a very practical approach in development of supplemental flows that will be required in the future. Therefore, the design rationale and formulation procedures previously used were considered still adequate for this stage of study. Since provision of supplemental flows reflects a functional interest in stream usage and vector problems, it is anticipated that, over time, increasing multiple-use considerations will at least equal the volume and value of needs originally identified.

d. General recreation.

(1) Reservoir-related. Of the 71 reservoirs, six were designed to meet the immediate and part of the long-range needs for water-related outdoor recreational activities. On a combined basis, sufficient water surface will be provided to eventually serve an average 4,000,000 visitors annually. These projects were designed to supplement the major role planned for Rend Lake and help satisfy the net remaining need incapable of being met by Crab Orchard Creek complex, Kinkaid Lake, and proposed developments in the Cedar Creek Watershed. Included in the initial phase of development was a modification of the recreational master plan for Rend Lake and the Crab Orchard complex. Increases were programed in the visitation currently anticipated and planned for at these projects. This increase was made possible by upgrading of selected project-associated lands to higher use and requiring installation of additional recreational facilities.

Even with these measures there still will be a long-range deficiency for both water surface acreage and potential visitation. Optimum development of the water surface acreage will meet all of the 1980 design loads but only 85 and 53 percent of the years 2000 and 2020 needs, respectively. With this in mind, 12 reservoirs identified by the Soil Conservation Service as having potential for multiple-purpose developments, but which were retained as single-purpose flood control projects in the baseline plan, were then reexamined. The feasibility of providing a permanent pool to help meet a portion of the long-range water surface deficiencies that would occur after the year 1995 was investigated. It was determined that an incremental, second-stage construction would be economically feasible at that time. Hence, it was concluded that the 12 reservoirs initially should be authorized

and constructed as a single-purpose flood control project; and that at such time as the needs and economic conditions warrant, additional authorization then should be sought to enlarge these reservoirs and develop them as multiple-purpose projects for both flood control and recreation.

(2) Stream-related. The river corridors will provide the opportunity to enjoy those recreational pursuits oriented primarily to a natural (primitive) land and stream usage. Thus, a variety of activities will be offered in an effort to enhance the experience of the recreationist. Contributing to the uniqueness of the linear parkways is the fact that these acreages also will serve as a gateway to the basin from three other developments having national recreational significance. These three are: the proposed Mississippi River linear recreational corridor, the Great River Road; the George Rogers Clark Recreational Way which connects recreational facilities constructed along the Mississippi and Ohio Rivers; and the Shawnee National Forest. Furthermore, the corridors will help implement the State's long-range program of connecting the developments in the Big Muddy Basin to the recreational facilities located immediately north of this study area in the Kaskaskia River Basin. General recreational usage is expected to ultimately range between 700,000 and 1,200,000 with facilities planned for an initial visitation of some 200,000 user-days annually. The potential for stream fishing will increase some seven-fold and approximate 88,200 user-days annually.

e. Area redevelopment. Since the early 1960's the area has received assistance under the Area Redevelopment Act and other similar programs. A rehabilitation of the total economic base is slowly being achieved by the infusion of various types of Federal and State aid programs, a significant portion of which provides planning and construction assistance. Notable examples of the latter type include Kinkaid Lake and the water-related developments of Rend Lake, the construction of which had area redevelopment as a primary project purpose. The resulting effects have been to stem out-migration from the region and stabilize the basin's economy at a somewhat higher level, although still below the national average. The induced economic impact from these programs has been most noticeable in the growth of the area's economic wealth as measured by bank deposits, but the level of personal income is still below that of the national average. This means that for the first time, an effective base has been achieved and that future aid programs will have a greater impact in upgrading the economic structure. The impact on the reorientation of the basin's economic structure creditable to the planning and construction programs currently underway will extend through the decade 1970-1980.

The developments in the modified baseline plan which are subsequently authorized for implementation as an early action program are expected to have their major impact on the area's economic structure during the 1980-1990 period. The economic stimulus that would be achieved during this latter time frame would include an extension of

the tourism and recreational industry, the base of which was established by Rend Lake, Kinkaid Lake, and the Crab Orchard complex; increased residential, commercial, and industrial development; and, local government investments in new and expanded service facilities. These types of induced developments will not only assist in the continuation of the planned economic growth, but will provide a greater employment potential by encouraging a new, diversified, and higher paying job structure. It is through this logical progression of redevelopment assistance that the area's economic structure will ultimately achieve parity with the nation.

f. Environmental quality. Within the multi-objective framework, emphasis was given the need to enhance the quality of the basin's environment. The resultant nonstructural program involved an intermix of development, conservation, and restoration proposals concerning selected portions of the area's natural and cultural resources and ecological systems. The major components were concentrated in the river bottoms where the greatest returns could be effected. Development of the three linear corridors was designed to minimize or avoid future irreversible losses to the environmental base. Aside from the recreational enhancement, the acquisition and management program for the corridors will provide the basis for the conservation of wildlife habitat and preservation of those sites having archaeological, historical, or natural esthetic values.

Studies to reverse the esthetic blight caused by abandoned strip mines have been recommended with restoration of these lands for recreation and conservation uses as the ultimate objective. Concurrently, better land management, implementation of zoning ordinances, and land treatment measures have also been included as part of the plan of improvement. These proposals will have a beneficial effect on the total stream and land ecosystems and help safeguard the natural and cultural resources.

Care was taken to avoid irretrievable commitments in resource use or sacrificing environmental values at the expense of strictly economic gains. In certain cases, the concept of tradeoffs was used to insure a balance in objectives, as example, replacing channel improvement in the lower portion of Little Muddy River with a linear corridor as part of the total system within that watershed. In addition to these positive proposals, a general evaluation was made of the effects that the proposed structural improvements would have on the environment of the basin, particularly the fish and wildlife aspects. The Bureau of Sport Fisheries and Wildlife has indicated that in general, a reservoir will support a warm water fishery of greater value than the strem fishery it displaces. In fact, reservoir development should create a net beneficial effect on the remaining stream fisheries, primarily through better regulation of flows and improvement of water quality and quantity. The adverse effects on the stream's ecological system caused by the major channel modifications, however, will require mitigation measures. Both the reservoirs and the channel

improvements will displace or otherwise harm resident species of wildlife within the project areas, particularly those specifically associated with the river bottoms. While it is desirable to concentrate the necessary mitigation measures locally where the losses occur, it may be preferable to incorporate many of these into the linear corridors. This will effect a more efficient program, from both a management and production standpoint, in offsetting those wildlife losses caused by the reservoirs and channel modifications. Conversely, the increase in impoundment waters will benefit waterfowl production and improve waterfowl hunting. The expected losses of hunting opportunities for upland game in the reservoir flood pool areas and areas developed for waterfowl production can generally be mitigated by development and management of other project lands and waters for maximum production and utilization.

The preliminary survey of historical and archaeological artifacts has also indicated that many of these sites can be easily integrated into the development of the linear corridors and certain reservoirs, most notably C-16A. The necessary restoration measures should be included as part of the project's recreational program. To insure proper site preservation, land acquisition guidelines have been established for each of the four types of Indian cultural remains. These guidelines are set forth in APPENDIX H, Part 1.

SECTION VIII - BASIN PLAN AND EARLY ACTION PROGRAM

49. PHASING OF DEVELOPMENTS

To determine an orderly sequence of development, various screening factors were used, among which were the projected time-patterns of resource needs. While the need evaluations are derived from the best information available, their dependability and accuracy lessen with the time span of the projection period. After completing each phase and segment of construction, the needs should be reexamined before continuing. Such reexamination could result in some modification of projects previously constructed as well as improvements planned for subsequent construction. To meet the immediate and long-range needs of the basin, the sequence of development was divided into two different time periods:

> Phase I - Early or near-future construction of those improvements which are economically justified and for which there is an immediate need and support as evidenced by local interests; and
>
> Phase II - Long-range construction of those improvements which may or may not be economically justified at this time, but for which there is a foreseeable need.

The structural and nonstructural improvements in the early action program (Phase I) are shown in TABLE 9. Included are five multipurpose reservoirs, five single-purpose flood retention structures, and 150 miles of recreational-environmental corridors. Two of the five multiple-purpose reservoirs are part of a work plan previously completed and approved by the Governor of Illinois for implementation under Public Law 566. Considered representative of the four alternatives available to meet the needs of the Carbondale community and the Cedar Creek Watershed, these two projects were included to help underscore the importance of assisting that community in meeting its water supply deficiency. The listed priority for implementation has been established as a guideline for administrative planning and budgetary purposes. The sequence was based on need considerations, logic of development, program effectiveness, and the desires of local interests. Total project first costs are estimated at $80,984,000, of which $68,284,000 is required for construction of the reservoirs and $12,700,000 for the corridors. An additional $9,228,000 is required to assure that the land is used within its capability and treated in accordance with its needs. It is essential that the necessary land treatment measures be carried out as an integral part of the construction program. Treatment of crop and pasture land will consist of such

TABLE 9

Early action program, structural and nonstructural

Watershed	Recommended Improvements Program Element	Priority1/	Project first costs
Nos. 1 & 9			
Main Stem Big Muddy River	Stream corridor	1	$ 9,200,000
No. 7	Corps reservoir		
Lower Crab Orchard Creek	C-16A	3	12,000,000
No. 8	Corps reservoir		
Little Muddy River	C-35	2	28,500,000
	Stream corridor	2	3,500,000
No. 12	Corps reservoir		
Middle Fork	C-7	7	20,600,000
	SCS reservoirs		
	12-1	5	851,000
	12-7A	6	285,000
No. 14	SCS reservoirs		
Upper Big Muddy River	14-7	8	1,070,000
	14-6	9	281,000
	14-2	10	645,000
	Subtotal No. 1		$76,932,000
No. 8	Land treatment		
Little Muddy River	measures	2	5,796,000
No. 12	Land treatment		
Middle Fork	measures	5	1,968,000
No. 14	Land treatment		
Upper Big Muddy River	measures	8	1,464,000
	Subtotal No. 2		$86,160,000
No. 2			
Cedar Creek 2/	Reservoirs	4	4,052,000
	Grand Total		$90,212,000
	Percent of overall basin plan cost		39

1/ Similar priority number indicates project element interrelationship.
2/ One of four alternatives available to meet the needs of Carbondale and the Cedar Creek Watershed.

conservation practices as contouring, terracing, grass waterways, conservation cropping system, minimum tillage, farm ponds, drainage field ditches, pasture planting, pasture renovation, and others. Conservation treatment of forest lands includes timber stand improvement, livestock exclusion, tree planting, planned harvesting, and insect and disease control.

The second phase or long-range construction program includes three multiple-purpose reservoirs, 60 flood retention structures, the time-phased staged construction of 12 reservoirs for recreational development, 28 miles of stream corridor, and 1,017.6 miles of channel improvement of which 283 miles are on the main stem. Total costs of these improvements are estimated at $115,916,000, of which $90,191,000 is required for reservoir construction, $23,125,000 for channel improvements, and $2,600,000 for the corridor. Land treatment measures are estimated to cost an additional $22,742.000.

50. SUMMARY

The physical plan of improvement consists of 73 reservoirs, 283 miles of main stem and 735 miles of lateral and sublateral channel improvements; 178 miles of river related land corridors, and installation of proper land treatment measures. The recommended structural developments, including the plan of improvement which may eventually be developed in the Cedar Creek Watershed, and the proposed corridors are shown on PLATE 3. Total cost of this plan is estimated at $228,870,000, based on July 1970 price levels.

These improvements would be part of a total system that includes certain other projects already built, authorized, or under construction. Included in this latter category and recognized as being an integral part of a total basin plan are such projects as: the Crab Orchard National Wildlife Refuge in Williamson County, maintained by the Bureau of Sport Fisheries and Wildlife; the Shawnee National Forest, a portion of which is located in the basin and managed by the U. S. Forest Service under a multi-use program and the multiple-purpose reservoirs, Rend Lake and Kinkaid Lake.

The plan of improvements will provide: (1) accelerated watershed protection, (2) flood control based on retention of the more frequent flood flows and optimum but controlled release rates, (3) channel improvements to further enhance agricultural productivity, (4) low-flow supplementation required to maintain an adequate stream quality and quantity or a minimum base flow where public health, esthetic and social considerations so warrant, all in accordance with State designated stream usage, (5) general recreational developments to meet the immediate and future needs to the fullest practical extent, (6) preservation of wildlife environment to protect against future growth reducing the area's habitat and ecology, (7) improvement of the basin's economic base structure with particular emphasis on the agricultural and tourism industries, and (8) enhancement of the area's environment and social well-being.

51. ADDITIONAL STUDIES REQUIRED

a. Basis for need.

Not all of the area's problems are of the type that lend themselves to an immediate and total solution. In some cases, there was a minimum of basic data available and the time and monies allotted for this study were insufficient to permit a detailed field investigation. While action programs have been formulated, additonal studies are still required to insure greater effectiveness and efficiency in solving these problems. It is felt that most of these studies can be undertaken concurrently with the preconstruction planning required before developing the various projects. Accordingly, there are presented in the following paragraphs specific areas of concern that warrant immediate consideration.

b. Sediment and erosion. During the study effort, it was recognized that man's use or misuse of the land has greatly increased the rate of erosion and the corresponding amount of sediment carried in the stream. Unfortunately, there are no sediment-discharge records available to pinpoint specific problem areas and facilitate formulating an effective conservation program. As a partial solution, emphasis has been given the need for land treatment and flood control measures. These will minimize sheet and channel erosion, thereby diminishing the stream's sediment load. What is still needed is a collection of basic data to identify actual problem areas and their causes. Then, additional corrective measures can be incorporated in a basin-wide remedial program; otherwise the losses will continue, although at a lesser rate.

c. Flood plain regulation. Efforts will be required to insure that once the flood retarding structures are installed, unwise occupation and use of the flood plain is prevented. This means the enactment and enforcement of management regulatory measures to prevent future indiscriminate encroachment of the flood plains. Such a program can only be achieved through the coordinated efforts of the local citizens and the counties. Development of a meaningful flood control program requires comprehensive planning with flood plain management measures based on adequate flood plain maps. The Corps of Engineers has been designated by Congress as the Federal agency responsible for assisting local governments. Based on a cooperative State program, the Corps surveys and maps the flood plain and undertakes the hydrologic and flood frequency studies necessary to establish the flood damage, potential flood heights, and the extent of inundation involved. Such information is provided to aid local interests in establishing rights-of-way lines, stream clearance lines, and land-use regulations. The Greater Egypt Commission and the individual counties should utilize this program in enacting the necessary zoning ordinances.

d. Reservoir recreational planning. A master plan for basin-wide recreational development is needed prior to construction of the multiple-purpose reservoirs in the early action program. The study would provide the necessary in-depth planning required to attain the projected visitation and define the relationships of the new reservoirs as satellite to the resort and convention center planned for the Rend Lake project. The master plan would seek to avoid unwarrented duplication of facilities and services; insure site compatability and adequacy of development by establishing the type of recreational opportunities and the number and size of sites that should be developed over time; and establish a proper basis for zoning the surrounding off-project lands. Also recognized would be the recreational potential offered by Kinkaid Lake, Shawnee National Forest, and the Crab Orchard National Wildlife Refuge.

When completed, this master plan will serve as a framework for the detailed planning required by the sponsoring Federal agency prior to actual construction of the projects. In addition, the master plan will establish the responsibility of various non-Federal participants, including State and local governments as well as private enterprise. The role of non-Federal interests should be defined in terms of the type of project-associated developments to be provided and the off-project land-use controls needed to insure a compatible and harmonious environment.

e. Low-flow augmentation. With the increased concern over the environmental and ecological values of the nation's streams, the role of low-flow augmentation is changing. Rather than just an alternative of at-source waste treatment, supplementation flows are now being required from a multiple-function basis more reflective of the design needs of the designated stream use. The changes will require increased emphasis on the quantative aspects of stream flow, not only for maintenance of a minimum base flow, but sufficient volume for the stream uses - such as recreation and aquatic life in the Big Muddy Basin. Further study is needed to reevaluate the target flows in the key major reaches and verify the adequacy of supplementation, particularly for the time period beyond 1980. At that time, the major communities should have installed the required advanced waste treatment.

Finally, a comprehensive gaging and data collecting system is needed to monitor and maintain records concerning the quality and flows of selected stream reaches. Sufficient surveillance is required to safeguard against: inadequately treated wastes, both urban and agricultural, being discharged into the streams; inappropriate land-use practices; improper application of agricultural chemicals as regards the effects on impounded waters; and, acid mine drainage.

f. Environmental control.

(1) Archaeological inventory. Archaeological field surveys to date have been preliminary in nature, identifying only the basic natural, historical, and archaeological resources of the area. With

the increasing interest in man's past, it is highly desirable to supplement this data, particularly establishing the chronological and development patterns that have occurred over time. The supplemental study would first investigate those areas not previously surveyed and then compile a basin-wide inventory of the archaeological and historical remains by type and location. From this inventory those sites of historical and cultural significance can then be integrated into the plan of improvement with restoration included in the development of the many public-use areas. If properly organized, these sites will afford an additional avenue of interest to the tourist as he seeks outdoor pursuits to fill his leisure time.

In addition, the study should review all reservoir areas, particularly those multiple-purpose projects which have a potential for a comprehensive recreational-environmental program. Planning should be directed to the preservation and complete integration of the major geological and geographical features that originally contributed to the archaeological site being selected. Where possible, this site should be considered as a proper base for a reservoir-related park development. This same concept would also apply to development of the river corridors.

(2) Land cover. Existence of the wide variety of animal life means that the basin has several major ecological or cultural (land cover) zones. Effective preservation of the area's wildife habitat from the effect of future growth will require a concentrated effort to conserve the remaining cultural resources for both wildlife and man's usage. Specific land cover programs and selection of those sites of esthetic value must be determined and integrated into the individual project's development.

g. River corridors. A detailed plan of development is required for the linear river corridors. In establishing these corridors, the counties may face the possibility of a minor reduction in the assessed land values which serve as their tax base. To help offset this potential loss, it was recommended that ownership of these lands should be varied, depending upon the specific use of the reach of stream involved. Therefore, not all of the land will be acquired in fee and special (use) easements restrictive in nature can be utilized. The options of scenic and cultural easements would permit certain acreages to be retained in agricultural production for which the owner would receive full value from any resultant sales. This income, together with possible reduced tax rates, should provide the owner a sufficient monetary return to further encourage development of a suitable environment. However, care should be taken to insure that the cultural plantings are controlled and interspersed, varying from field crops to pasture lands and timber cover.

The study for the recreational corridors should establish the design controls relative to: acreages; usage; first costs; operation and maintenance of the various stream reach areas; and the zoning, type of ownership, and adjusted tax structure needed to encourage local participation.

h. Strip-mined areas. While the general distribution and extent of the strip-mine areas are known and the adverse effects on the basin's environmental and economic structure can be established, more detailed studies will be needed before a suitable restoration program can be adopted. Accordingly, a study should be undertaken that would first define the strip-mine problems and then establish a program designed to restore the ecosystem and esthetics and income potential of these areas. The remedial measures should be based on a research and engineering study of the applicable drainage, geographic, geologic, and and mining conditions in each of the five counties. Rehabilitating the damaged environment must be evaluated from the standpoint of at-source technological treatment. To determine what combination of reclamation methods should be applied will require a comprehensive field survey and analysis of the total natural resources system. This should include an assessment of not only the mine drainage problem, but the aquatic ecosystem and its physical, chemical, and biological conditions. The report should contain recommendations specifically dealing with: (1) any proposed land management controls and restoration measures required to achieve the environmental and socio-economic objectives; and, (2) suggested areas of responsibility between Federal, State, and local governments for accomplishing and funding the recommended action program. The study also will have to evaluate the necessity and extent of a combined acquisition program involving both fee and easement. Where easements are considered, public control should be on a long-term lease basis. In defining the acquisition program, proper consideration should be given not only to those lands requiring restoration, but also the need for both research and administrative controls.

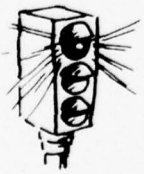
i. Local planning. There is a definite need for a major planning effort on the part of local interests. Implementation of the early action program will necessitate the needs for certain studies by the Greater Egypt Planning and Development Commission. There is an immediate need to update the existing land-use plan by recognizing the impact that the early action program will have on the patterns and allocations of specific land-use categories and by incorporating the induced effects on the area's socio-economic resources as will accrue from the growth-center concept. Another study should evaluate the effects of water supply distribution systems on the five-county tax structure and its demographic patterns. This study would determine the impact that the present and proposed intercity water systems have on growth patterns and establish the necessary controls required for orderly development. These controls would include technical and administrative guidelines necessary to both protect the planned public investments and to help support the municipal and industrial growth. A third study should investigate the feasibility of intercity sewage collection and treatment. There is a growing economic interdependence between the communities and a need to avoid duplication of services. Since a study is required to qualify for Federal assistance in constructing waste treatment facilities, the study should include an evaluation of all feasible alternative solutions for regional control of sewage collection and treatment of effluents.

There also will be the need for the Conservancy Districts to coordinate their studies for off-project developments with the regional planning agency. The build-up that will logically occur, will require correlation in updating existing land-use plans; passage of zoning ordinances; and in-depth studies relative to community services, jobs, industrial developments, transportation facilities, agricultural improvements, and those facilities designed to satisfy the total spectrum of tourism and recreational demands.

j. Summary. In addition to the foregoing, the Corps of Engineers and the Soil Conservation Service will be required to submit separate reports to the United States Congress requesting authorization to participate in the development of those project elements in the early action program assigned for their implementation. The report that will be prepared by the Corps of Engineers should specifically include the basic framework for both the reservoir recreational master plan and the development of the two corridors as previously set forth. The two plans can then be completed as part of the normal preconstruction planning effort required by that agency. Since the scope of the preauthorizing studies and the procedures for submitting these studies to Congress are already established, no attempt has been made to identify the duration or estimated cost of these studies. This will be determined by the two agencies under their normal institutional arrangements. However, the institutional constraints that govern the individual agencies relative to the other studies will require a specific basis before participation is permitted. Consequently, a preliminary assessment has been made which will facilitate the administrative process. Listed in TABLE 10 are those studies which will require a coordinated planning effort and for which the suggested participants will require authority and funds. The estimates of duration and costs are preliminary in nature and subject to change once the designated agencies have had the opportunity to better define the scope of study.

52. INSTITUTIONAL CONSTRAINTS

a. Governmental units.



To provide the needed land, water, and social services, consideration must be given the local governmental structure, its composition and its ability to effectively coordinate the necessary phases of local participation. What is required are two types of responsive governmental entities: (1) a unit responsible for local planning; (2) a political and legal unit needed to meet and carry out the terms of local cooperation.

Presently, there is a grand total of 262 governmental units in the five core counties that perform various local functions. Of this total, 139 can be considered special functional units. There are five counties, 58 municipalities, 44 townships, five soil and water conservation districts, 91 school districts, three mosquito abatement districts, three river conservancy districts, two hospital districts,

TABLE 10

Early Action Program, Special Studies Required

Study		Suggested Participants 1/	Estimated Study Duration (yrs.)	Estimated Study Cost ($1,000)
Strip-mine rehabilitation (basin wide)	Fed:	Corps of Engineers*; the Bureaus of Mines, Outdoor Recreation, and Sport Fisheries and Wildlife; Environmental Protection Agency, Public Health Service; Forest Service	6-8	1,500-1,800
	State:	Departments of Mines and Minerals, Conservation, and Agriculture; Environmental Protection Agency		
	Local:	Greater Egypt Regional Planning and Development Commission, Rend Lake and Kinkaid-Reeds Creek Conservancy Districts		
Archaeological field surveys (basin wide)	Fed:	National Park Service*, Bureau of Outdoor Recreation, Corps of Engineers, Forest Service	4-5	200-300
	State:	Department of Conservation, Natural History Survey		
	Local:	Greater Egypt Regional Planning and Development Commission, Southern Illinois University		
Sediment and erosion control (basin wide)	Fed:	Soil Conservation Service*, Forest Service, Geological Survey	4-6	300-400
	State:	Departments of Agriculture and Conservation; Environmental Protection Agency; Geological Survey		
	Local:	Rend Lake and Kinkaid-Reeds Creek Conservancy Districts and all organized soil and water districts		

TABLE 10 (cont'd)

Study	Suggested Participants 1/		Estimated Study Duration (yrs.)	Estimated Study Cost ($1,000)
Flood plain information 2/	Fed:	Corps of Engineers, Geological Survey	3-5	500-600
	State:	Division of Waterways*, Geological Survey		
	Local:	Greater Egypt Regional Planning and Development Commission		
Stream monitoring program (basin wide)	Fed:	Corps of Engineers*, Geological Survey Environmental Protection Agency, Public Health Service, National Weather Service	3-4	300-400
	State:	State Water Survey, Division of Waterways Environmental Protection Agency		
	Local:	Greater Egypt Regional Planning and Development Commission		
Update of regional land-use plan (basin wide)	Fed:	Department of Housing and Urban Development	2-3	150-250
	State:	Deparment of Business and Economic Development		
	Local:	Greater Egypt Regional Planning and Development Commission*		
Impact of water supply distribution system on tax structures and demographic patterns (basin wide)	Fed:	Economic Development Administration	1-2	50-80
	State:	Department of Business and Economic Development		
	Local:	Greater Egypt Regional Planning and Development Commission *		
Feasibility study of inter-city sewage collection and treatment (basin wide)	Fed:	Department of Housing and Urban Development, Economic Development Administration, Environmental Administration, Corps of Engineers	2-3	150-250
	State:	Department of Local Governmental Affairs, Environmental Protection Agency		
	Local:	Greater Egypt Regional Planning and Development Commission *		

TABLE 10 (cont'd)

Study	Suggested Participants 1/		Estimated Study Duration (yrs.)	Estimated Study Cost ($1,000)
Evaluation of local intergovernmental organization (basin wide)	Fed:	Department of Housing and Urban Development, Economic Development Administration	1-2	50-80
	State:	Department of Local Governmental Affairs		
	Local:	Greater Egypt Regional Planning and Development Commission *		

1/ Agency selected to request initiation of study which would then serve as basis for other agencies' participation has been designated by *. Listings should not be considered as precluding others from contributing to the study effort.

2/ Confined to watersheds where early action programs are involved. Other areas can be surveyed under normal authority.

three airport authorities, seven park districts, 11 special water districts, two health district, five drainage districts, and two fire prevention districts.

If the basin plan of improvement is to be successfully implemented, a reorganization of the existing governmental structure may be a necessity. What is needed are the two types of governmental entities effectively organized on a functional basis.

b. Planning. Of all the political entities in the basin, the five core counties have set an example of local leadership. To avoid waste and duplication in planning and to foster proper development, they have jointly created the Greater Egypt Regional Planning and Development Commission. The Commission, with a board membership of four representatives from each county, has a permanent planning staff in addition to various resource-related advisory committees.

The Commission, as a legal entity, has the authority to prepare plans which, in the judgment of the governing board, will be in accordance with the area's present and future needs. These plans are designed to best promote the health, safety, order and convenience, prosperity, efficiency, and economy in the region's development process and for its general welfare.

Four of the five counties have adopted a land-use plan, but to date none have been implemented by the necessary ordinances. Until such action is undertaken, successful attainment of the potential offered by the plan of improvement cannot be assured. With completion of the land-use plan for Jefferson County, the Commission must increase its effort to enhance the area's environment and consolidate the public services offered by the fragmented governmental units. This should specifically include regulation of urban growth, consolidation and improvement of such county and municipal functions as education, health, road networks, sewage and refuse treatment; rehabilitation of strip mines; and of principal import, examination of the area's tax structure and local governmental services.

c. Local sponsorship. In order to implement the objectives of the basin plan, certain non-Federal governmental entities should be regarded as logical co-sponsors. Because of its responsibility for controlling intra-state stream quality and its declared commitment for development of tourism and recreation, the State of Illinois has a vested interest requiring its participation.

The Soil and Water Conservation Districts are responsible for those watershed protection programs involving installation of land-regulated conservation measures. These districts are created and regulated by State laws and are charged with the responsibility for implementing the land treatment measures required in conjunction with Public Law 566 improvements. These districts will be needed to carry out the recommended land programs and serve as co-sponsors of the individual watershed projects.

Another legal entity is the River Conservancy District(s) which, by the nature of its legal charter, has vested interest in the preservation and conservation of the land- and water-related resources. This usually involves construction and maintenance of various facilities operated for flood control, drainage, water supply, recreation, fish and wildlife conservation and sanitary purposes. There are three districts whose legal boundaries include portions of the basin. They are the Rend Lake Conservancy District, the Kinkaid-Reeds Creek Conservancy District, and the Saline Valley Conservancy District. Practically all of the lands within the corporate boundaries of the first two districts are within the basin boundaries. However, the Saline Valley Conservancy District has but minor acreage within the basin, essentially being oriented to the adjoining Saline River watershed. Unfortunately, the legal boundaries of the three districts do not encompass the basin's total drainage area. If local interests are to take an active role in the area's development, a coordinated program must be established regarding sponsorship and commitments for project operation and maintenance. Ideally, the plan of improvement for flood control and drainage, wildlife conservation and general recreation lend themselves to a basin-wide conservancy district program. The districts, as logical co-sponsors, must coordinate their programing efforts and action commitments and eventually explore the feasibility of merging into a single entity. This course of action would offer a valuable supplement to the local governmental structures in providing the total services and developments needed to sustain the projected growth.

53. LEGAL CONSTRAINTS

As the actual development of the basin plan takes place, there will be a concurrent need for certain legal actions required to successfully control the basin's resources. The plan of development, by its effects on the basin's stream-flow characteristics, the counties' land-use and future tax base, will necessitate legal implementation.

The State of Illinois established the water uses and general quality criteria for the basin's individual streams. Within this framework, the Work Committee for Water Quality then established the applicable stream flow standards. As part of a cooperative monitoring program, regulatory controls will be required to insure that no unauthorized withdrawals are made of the supplementation provided for low-flow augmentation. To achieve this objective, the State of Illinois eventually will have to change its existing laws dealing with riparian rights. The right of the individual land owner to unregulated use of waters passing through his land needs to be reevaluated relative to the effects on all the area's residents.

All local governmental units in Illinois operate under constitutional and statutory restrictions on their taxing and borrowing powers. These restrictions are specified in terms of the assessed valuation of locally taxable property. Generally, a referendum is required to approve bond issues and to raise tax levees. Due to the depressed economic conditions experienced during the past decades, these debt and taxing limitations have seriously jeopardized the ability of the local area to undertake needed developments. This has resulted in an increased financial dependence on both the State and Federal governments.

In light of the multiple-governmental units in the basin, the local residents should seek to streamline these entities into a more functional form, recognizing efficiency as well as taxing capability. Local interests should work very closely with the State in seeking increased responsibility and establishing a more effective framework for local governmental financing. Changes in the existing laws regarding governmental entities and local taxing authorities would require a revision to the Illinois constitution. However, such a change should be given serious consideration as a long-range step toward improving the ability of local interests to finance their own local developments. All of these matters are of real concern to the State and a discussion of these subjects is contained in the State's "Water for Illinois - A Plan for Action".

54. PARTICIPATION

The present interagency coordination will have to be redefined and then maintained until the early action program is successfully completed. Certain planning efforts will be required from individual State and local governmental agencies to supplement those normally provided by Federal government. There follows a listing of the major participants and the general scope of future activities for which they will be responsible.

a. Federal construction agencies.

(1) General. Due to the systemized hydraulic considerations, it is imperative that the two construction agencies properly phase and coordinate their preconstruction planning activities. Both should work closely with local, State, and other Federal agencies to insure that the required supplemental studies and necessary terms of local cooperation are completed before construction is undertaken. If at all possible, the State should be regarded as the prime sponsor for the multiple-purpose projects. While these reservoirs essentially satisfy local needs, they are nonetheless responsive to the State-indicated

desires for establishment of tourism and recreational industry in southern Illinois and maintenance of intra-state stream standards. Before flood water retention storage is provided, commitments from the same local sponsorship should be sought by both agencies. If this fails, then the multi-purpose reservoirs should be reanalyzed, with the flood control storage reallocated to recreation until such time as local interests can meet the terms of local sponsorship. On the other hand, if the State is unable to proceed with sponsorship on the recreational portion of the multiple-purpose reservoirs, the structures should be reanalyzed and the retention storage added at such time as sponsorship can be found.

(2) Soil Conservation Service. The Soil Conservation Service should assist the Corps of Engineers in obtaining local participation in the required land treatment measures. In particular, it should provide the necessary technical and administrative support required for implementing the conservation practices in the drainage areas above the multiple-purpose projects. Furthermore, it should assist local interests in updating the basin's land classification maps and expanding those agricultural programs that are conducive to furthering production efficiencies.

(3) Corps of Engineers. The Corps of Engineers should coordinate its preparation of the reservoir recreational master plan and the development plan for the recreational-environmental corridors in the early action program. Since the improvements to be developed by this agency will have an economic impact beyond the project area, technical assistance should be given the State and local planning agencies in their efforts to upgrade the basin's economy. In establishing the scope of study for rehabilitating the strip-mined areas, active participation by the mining industry and State regulatory agencies is required, particularly in the research phase.

b. Bureau of Outdoor Recreation. The Bureau of Outdoor Recreation should work very closely with local interests, particularly in the planning of off-project land use. Such cooperative work will insure that these developments will supplement the plan's long-range recreational development. In particular, it should take an active role in the final selection and determination of the acreage and design criteria required for development of the recreational corridors and for rehabilitation of the strip mines. The agency also should work very closely with the construction agencies in establishing the master plan for those reservoirs with recreational developments.

c. National Park Service. The National Park Service, in cooperation with the Greater Egypt Regional Planning and Development Commission, should supplement its previous investigations and survey the remaining areas for remnants of archaeological and historical significance. The supplemental study should also delineate areas of special esthetics and natural science values. Emphasis should be placed on identifying those sites that warrant specific development and integration into the basin's master plan for reservoir-related recreation and the river corridors.

d. Bureau of Sport Fisheries and Wildlife. The Bureau has expressed a need to preserve the area's wildlife habitat and to improve the streams' ecosystem. To accomplish these objectives, the agency should work very closely with the other agencies in establishing the recreational corridors and rehabilitating the strip mines. Any land required for mitigation could properly be incorporated in the plan of development. In addition, the agency should work with the construction agencies in establishing the master plan for reservoir-related recreation.

e. Forest Service. The Forest Service should assist in formulating a forestation program for both the recreational corridors and the rehabilitation of the strip mines. In addition, its program for acquiring private in-holdings should be accelerated to supplement the recommended recreational developments located within the boundaries of the Shawnee National Forest.

f. U. S. Public Health Service and Environmental Protection Agency. Since the functions of both Federal agencies are closely related in the health and environmental aspects of water resources planning, it is imperative that they coordinate their future study efforts. The Public Health Service should prepare the necessary vector studies for those project elements recommended in the early action program and insure that proper sanitary facilities are provided at all public use areas. The U. S. Environmental Protection Agency should continue to promote sound planning for public water supply and water quality management. All proposals for water resource management which may affect or be affected by air pollution, solid wastes, pesticides, and radiological sources should be reviewed. In addition, the agency's grant-in-aid programs should be effectively used to supplement the early action program wherever possible. Furthermore, the plan of improvement for Federal projects should be reviewed for their effects on water quality and to insure compliance with the Federal Water Pollution Control Act, as amended.

g. Geological Survey. The U. S. Geological Survey should work very closely with the State and the construction agencies in formulating a comprehensive gaging program. Location and operation of key control points should be coordinated as part of the agency's cooperative program. An agreement should be obtained as to what stream flow parameters should be monitored in order to successfully operate both the flood control and low-flow augmentation programs. The agency should also assign high priority for updating its topographic quadrangle maps to conform with the present 7-1/2 minute services. Coverage is required for those areas within the basin's boundaries that are north of latitude 38°.

h. National Weather Service. The National Weather Service should expand and improve its existing streamflow forecasting program in keeping with changing requirements. Special attention should be given to

the immediate effects of rainfall, either observed or indicated by meteorological conditions. Early indications of runoff should improve the efficiency of reservoir operations through evacuation, or storage, as required to prevent synchronized peaks from releases and runoff from uncontrolled downstream areas. Long range outlooks for potential low flows should permit operations to stabilize water quality and quantity through augmented flows. Flood forecasts will permit orderly evacuation of unprotected flood plains and a saving of life and movable property.

i. Economic Development Administration and the Department of Housing and Urban Development. Both agencies should work very closely with the State, Greater Egypt Regional Planning and Development Commission, the Conservancy Districts, and local communities for formulating programs that would alleviate unemployment and/or underemployment. By the very nature of their financial assistance programs, funds can be made available for public works, business developments, technical (assistance) studies, and training programs.

j. Bureau of Mines. The Bureau of Mines should work very closely with the appropriate State and Federal agencies in planning the rehabilitation of lands disrupted by mining. It should prepare projections identifying the extent of future mining operations in all parts of the basin. This report then will serve as the basis for achieving an effective land-use plan that balances future commitments relative to all uses, including commercial mineral production. The Bureau also should provide the responsible agency an evaluation of those mineral resources that may be lost in implementing each of the project elements contained in the early action program.

k. State of Illinois. Through its participation and official correspondence to date, the State has indicated general satisfaction with the scope of planning undertaken for the basin. Prior to construction of reservoirs, particularly those selected for recreational development, the degree of State participation, both in cost sharing and operation of specific areas, should be determined before any commitments are obtained from other (local) entities. It is anticipated that the State will take an active role in the planning, development, and operation of selected projects. Under a comprehensive State program, operation of the recreational facilities could be satellite to their existing commitments in the development and operation of Kinkaid Lake, Rend Lake, and the Giant City State Park. In addition, the State, working through its concerned agencies, should participate in the strip mine study and help establish the required monitoring and gaging stations needed to regulate the basin's low-flow regimen. This monitoring system is needed to insure that the required standards and base flows are maintained in accordance with the established water uses.

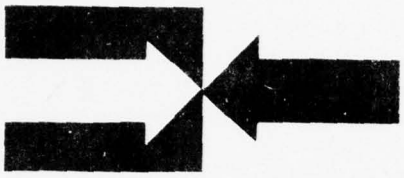
l. Greater Egypt Regional Planning and Development Commission. It is desired that the individual counties through the Commission play a predominant role in the preconstruction planning effort. The

Commission should be responsible for preparation of supplemental, in-depth zoning controls for those lands surrounding the proposed reservoir projects. These land-use plans will augment the master plan for project-associated land use that will be prepared by the construction agencies under normal agency requirements. The Commission should also attempt to expedite the other studies of resource management and control required to supplement the physical developments in the early action program. Concurrent action is essential if the plan's full socio-economic potential is to be realized. Hopefully, most of the needed financial support can be obtained from the various Federal and State grant-in-aid programs now in existence. Where possible, these studies should be coordinated with the authorizing and preconstruction planning of the Federal construction agencies. In addition, the Commission should take an active role in the in-depth studies required for the nonstructural improvements: the recreational-environmental corridors and the rehabilitation of the strip-mined areas. The Commission should also prepare zoning ordinances for adoption by the counties and municipalities. These zoning ordinances should include the acreage in the flood plain in order to prevent any future encroachment which would negate the recommended improvements.

m. Conservancy Districts. The Soil and Water Conservation Districts and the River Conservancy Districts should enter into an agreement clarifying the planning and sponsorship roles that each will undertake. Early consideration should be given the feasibility for expanding the boundaries of the existing River Conservancy Districts to include all lands within the basin and for jointly evolving a concerted action program. Ultimately, these districts should also investigate the advantages of combining into one legal entity. This might best be done with State guidance since revisions in charters and/or State laws would be required. Either way, there should be a definite involvement in the programs of the Soil Conservation Service and the Corps of Engineers. This involvement would encompass sponsorship and operation and maintenance of specific projects. Furthermore, information that is eventually received from the Federal and State cooperative gaging programs should be used to formulate specific remedial measures to further the program for erosion and sediment control.

SECTION IX - DISCUSSIONS AND CONCLUSIONS

55. GENERAL



The distribution of resource developments has been balanced so that all parts of the basin will share in the resulting social and economic growth. While the proposals are in consonance with the regional planning framework for the Upper Mississippi River (Type I study) the actual construction and implementing programs will still involve extensive coordination between Federal and non-Federal interests, as the first step in a total redevelopment effort. Long-range commitments are needed on the part of the State, counties, and local residents to supplement the action programs. Obtainment of the socio-economic enhancement cannot be a piece-meal process and requires that non-Federal interests provide institutional and governmental services on an area-wide basis. The regional approach adopted by the counties must be continued and every effort made to consolidate and avoid duplication of effort. Such facilities as hospitals, school districts, parks, utilities, roads, sewer and water systems, and all of the social-related services must be expanded on a coordinated basis by the counties and municipalities. Until this area becomes truly self-reliant, the basin will not be able to effectively contribute to the State's and the Upper Mississippi River region's development.

56. LOCAL RESPONSE

In the interim since the basin needs were inventoried, State and local efforts have continued in an attempt to resolve certain local problems. The State has indicated that efforts to improve the mine drainage situation in the area are proving successful. In general, the major coal companies are taking an increasingly active role in stream pollution abatement measures. Programs are being established that not only deal with refuse disposal but also with attempts to correct acid discharges induced from the spoil material generated in the strip-mine operations. The general result of this program has been a gradual improvement in the water quality of the tributary streams. While much work still remains to be undertaken, there is tangible evidence of improved water quality. The State has indicated that all major problems in the Lake and Pond Creek Watershed are in some stages of correction except for those involving the township roads that are surfaced with refuse materials. In fact, the water quality has so improved that fish life is now returning to these streams for the first time in many years. Further evidence of this local involvement is the

fact that the Federal Water Qualtiy Administration has authorized a demonstration grant to the Traux-Traer Coal Company to undertake a study and evaluate various means of controlling the discharge from above-ground refuse piles. This research project is being undertaken at the abandoned New Kathleen mine which is located in the Beaucoup Creek Watershed.

The concern evidenced in this report regarding the problems facing the community of Carbondale and the need for a higher degree of waste treatment has been recognized by the city itself. The city has now prepared final plans and specifications for a new activated-sludge treatment plant and an interceptor sewer system. These new facilities, together with an upgrading of the two existing plants, will, according to the city, eliminate the adverse stream quality problem in the lower portion of Crab Orchard Creek. Construction is now underway and by the summer of 1971, the waste effluent discharged into the stream will be above standard. This action, together with the maintenance of a minimum base flow, will enable the community to avoid a public health and nuisance problem while enhancing the esthetics of the environmental area.

57. ECONOMIC CONSIDERATIONS

While development of the area's resources has been the basic concern of this study, local interests should be aware of the need to control certain aspects of the economic structure. There are factors which could easily alter the evolution of the basin's development causing substantial, long-run deviations from the projected population and economic growth. These factors specifically involve the basin's available labor supply and its present industrial mix.

The entire southern Illinois labor market is dominated by low and semi-skilled labor, and this basin is no exception. Excluding agriculture, the key industrial employers are manufacturing and services which have certain employment characteristics that should be recognized. The manufacturing firms now entering the basin are generally small, assembly-type operations, while the service industries are often seasonal and offer only part-time employment. This situation is one of the predominant causes of a below-average per capita income which, in turn, acts as a constraint on the economic acceleration. Within this framework, a lower middle-income society evolves with a resultant lower tax base, both individual and corporate. These factors then limit the municipal services that can be offered to the residents and what would serve to attract future industry. In addition, the quality of services provided the public by schools, hospitals, roads, and utilities becomes commensurate with the standard of living in the basin. The economic study assumed that this extreme condition will not continue, but that a realistic approach to land use and urban planning will be provided by the appropriate State and local agencies.

What is needed is a coordinated effort to control all aspects of economic growth, i.e., land, labor, and capital. There is an abundance of unskilled labor in southern Illinois which must be trained. Skilled labor must be created, not only for personal benefit, but as a base to attract new types of industry. Labor must be prepared to supply the skills necessary to satisfy the demands of various industries. If the economic base structure is to be enhanced, the planning entities must identify the type of industry that will improve the economic base; and then provide adequate training of labor to serve these types of industries. The industrial employers should be approached on the basis of their ability to satisfy two criteria: first, as a user of the basin's labor skills; and second, on their potential contribution to the area's balance of payment. Typical of most undeveloped areas, the limited amount of manufacturing industries found in the area seldom complement each other's demands. Usually, the industries are forced to obtain their raw material or semi-finished products from outside the basin. Local assembly plants purchase components from St. Louis, replace machine parts in Chicago, and ship their finished products out of the basin to be distributed by a metropolitan wholesaler. While all materials cannot logically be expected to be produced locally, an attempt should be made to provide a wider range of services in the basin. Where the finished products are produced regionally, the various firms that manufacture the components of a particular type of produce should be encouraged to operate within the region. The local entities should try to concentrate on developing industrial services to meet their own manufacturing needs. This will contribute to a self-sustaining economy and produce a positive balance of payment for the region.

58. LOCAL COOPERATION

The specific definition of the institutional arrangements required for implementation of the various projects and programs included in the recommended basin plan is to be accomplished in separate actions by the sponsoring Federal agencies, in this case, the Corps of Engineers and the Soil Conservation Service. However, since the Federal interest is heavily involved in the first phase of the plan, presentation of current policy relating to local cooperation requirements for Federally authorized projects is cited below. These general requirements for the types of projects recommended for implementation are outlined below. It should be borne in mind that specifying the precise terms of local cooperation in any Federal project or program is a prerogative of Congress which authorizes the program. Hence, the requirements for local cooperation for any project or program which may ultimately be authorized by the Congress may differ from the information presented herein.

a. Corps of Engineers reservoirs.

(1) Recreation and fish and wildlife enhancement. In accordance with the Federal Water Project Recreation Act agree to: (a) administer project land and water areas for recreation and fish and wildlife preservation; (b) pay, contribute in kind, or repay (which may be through user fees) with interest one-half of the separable first cost of the reservoir project allocated to recreation and fish and wildlife enhancement; (c) pay all cost of maintenance, operation, and replacement of recreation and fish and wildlife lands and facilities; (d) acquire necessary water rights.

(2) Low-flow control. (a) Exercise to the fullest extent of their legal capability control against removal of stream flow made available for low-flow augmentation purposes until it accomplishes its purposes and becomes a resource to the stream; (b) through adequate treatment or other methods of controlling wastes at their source, contribute to pollution control in the streams for which low-flow augmentation is provided; (c) acquire all necessary water rights.

(3) Flood control. (a) Protect channels downstream of the reservoirs from encroachment which would adversely affect operations of the reservoirs; (b) adequately inform all affected persons at least annually that the projects will not provide complete flood protection; (c) provide guidance with leadership in preventing unwise and uneconomical future development of the flood plain areas by encouraging prudent use of floodproofing, land regulation planning, or other flood plain management techniques to reduce future flood losses; (d) cooperate with the Corps of Engineers in public dissemination during the release, at least once a year, of the design capacity flows from the damsites. These flow releases serve a dual purpose, that of stream flushing in the interest of public health and visual pollution and for channel sizing in the interest of discouraging unwise or unknown encroachments.

b. Public Law 566 flood prevention programs. Local organizations will be required to assume the following costs of installing structural works for both reservoirs and channel improvements for which Federal financial assistance is provided.

(1) The cost of acquiring land, easements, or rights-of-way for all works of improvement for purposes other than public fish and wildlife or recreational development.

(2) At least 50 percent of the cost of the land, easements and rights-of-way to be acquired for works of improvement for public fish and wildlife and recreation.

(3) The cost of acquiring water rights.

(4) The cost of administering contracts on non-Federal land when the local organization chooses to perform contract administration.

(5) The construction cost allocated to purposes other than: (a) flood prevention, (b) the agricultural water management, and (c) public fish and wildlife or recreational development.

(6) At least 50 percent of the construction cost allocated to: (a) agricultural water management, and, (b) public fish and wildlife or recreational development.

(7) The cost of project administration allocated to purposes other than: (a) flood prevention, (b) the agricultural water management, and, (c) public fish and wildlife or recreation.

(8) At least 50 percent of the engineering and other installation services required in connection with minimum basic facilities for public fish and wildlife or recreational development.

(9) The cost of operating and maintaining works of improvement on non-Federal land.

(10) An equitable part of the cost of operating and maintaining works of improvement on Federal land in consideration of the benefits that accrue to non-Federal land.

c. Cost sharing. A division of first costs between Federal and non-Federal interests was determined on a functional basis in accordance with existing Federal statutes and the institutional cost sharing procedures utilized for the Rend Lake project, the nucleus of the recommended basin plan. Authorization of the Rend Lake project indicated a Congressional intent and commitment to this portion of southern Illinois that was and still is uniquely different from other water and related land development proposals. At that time, the limited financial capability of both the State and local governmental entities was recognized as a major factor in the basin's failure to keep pace with the national growth, and Federal assistance was provided to help attain socio-economic parity. Accordingly, comparable cost-sharing provisions have been used, supplemented by those required by the Federal Water Project Recreational Act, Public Law 89-72; the Soil Conservation Act, Public Law 46, 74th Congress; and the Watershed Protection and Flood Prevention Act, Public Law 566, 83rd Congress. The results of the cost allocation and apportionment study as set forth in APPENDIX M, are summarized in TABLE 11. The apportionment should be considered preliminary in nature and has been evaluated only to indicate the scope of non-Federal investment required in implementing the early action program.

59. CONCLUSION

The plan of improvement provides the best use or combination of uses of water and related land resources to meet all foreseeable short and long term needs. Each project is engineeringly feasible and justified either economically or from a social standpoint as part of a

TABLE 11

Apportionment of costs, early action program

Project Element	First Costs ($)	Federal Costs ($)	Non-Federal Costs ($) PL 89-72	PL 566	Total
Corps of Engineers Reservoirs					
C-7	20,600,000	18,865,000	1,735,000	-	1,735,000
C-16A	12,000,000	11,138,000	862,000	-	862,000
C-35	28,500,000	25,833,000	2,667,000	-	2,667,000
	61,100,000	55,836,000 1/	5,264,000	-	5,264,000
Soil Conservation Service Reservoirs					
12-1	851,000	572,000	-	279,000	279,000
12-7A	285,000	190,000	-	95,000	95,000
14-2	645,000	428,000	-	217,000	217,000
14-6	281,000	221,000	-	60,000	60,000
14-7	1,070,000	638,000	-	432,000	432,000
2-1	898,000	267,000	-	631,000	631,000
2-2	3,154,000	441,000	-	2,713,000	2,713,000
Subtotal	7,184,000	2,757,000	-	4,427,000	4,427,000
Stream Corridors					
Main Stem Big Muddy River	9,200,000	4,600,000	4,600,000	-	4,600,000
Little Muddy River	3,500,000	1,750,000	1,750,000	-	1,750,000
Subtotal	12,700,000	6,350,000	6,350,000	-	6,350,000
Land Treatment Measures					
Watershed No. 8	5,796,000	3,478,000	-	2,318,000	2,318,000
Watershed No. 12	1,968,000	1,181,000	-	787,000	787,000
Watershed No. 14	1,464,000	878,000	-	586,000	586,000
Subtotal	9,228,000	5,537,000	-	3,691,000 2/	3,691,000
Grand Total	90,212,000	70,480,000	11,614,000	8,118,000	19,732,000

1/ Includes cost assignments for flood control, general recreation, low-flow augmentation, and area redevelopment comparable to that authorized by Congress for Rend Lake, nucleus of the basin plan.

2/ Includes costs required under Public Law 46.

total system, in each of the ten watersheds. Implementation of the recommended action programs will result in the enhancement of the agricultural-related industries, low-flow stream management, greater outdoor recreational opportunities, improved environmental control, and the establishment of an improved investment framework as part of the effort to redevelop the area's economic structure.

The projects recommended for Phase I construction to meet the immediate needs are consistent with the planning efforts of both the State and local entities. The State's recreational plan, the local land-use plan, and the Conservation Needs Inventory all served as guidelines for final development.

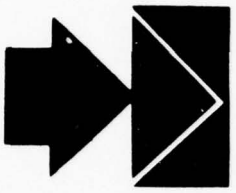
The basin's population and economic structure has recently begun to stabilize after continuous decline since 1930; and now a modest growth is predicted for the future. The area is essentially rural in nature and should retain its basic characteristics for the next 50 years. However, the transition from farm to a non-farm type population has occurred and should become more pronounced with the passage of time. Now the area has progressed to the point where implementation of the recommended action programs will assist its attaining a level of socio-economic development more consistent with the national average. Thus, the role of the basin as both a market and supplier to the rest of the region and to the nation will become more significant.

Limited financial capability of both the State and the local governmental entities has been a governing factor in the area's failure to keep pace with the national growth. Consequently, responsibility for development of specific projects has been assigned the individual construction agencies in order to take advantage of the various institutional cost-sharing arrangement. This should encourage maximum participation while affording local interests a logical and expanding income base for providing the services required by its participation. In recognition of past commitments by local interests, additional studies have been requested to insure attainment of the plan's full potential while at the same time, preserving certain environmental aspects. These future studies will allow local interests to specifically identify the managerial role needed to safeguard these natural resources as a balance to its economic growth.

The degree of success in attaining the projected growth will depend largely on the ability of the local people and the State to change some of the institutional and legal constraints that now govern their participation. Local residents must also recognize the need for altering their governmental structure and controlling the type of industries brought into the basin to enlarge its economic structure. These latter actions will maximize the flow of revenue into the area and avoid excessive tax burdens which could adversely affect the degree of cooperation required of local interests.

SECTION X - RECOMMENDATIONS

60. RECOMMENDATIONS



The plan of improvement is intended to serve as a flexible guide for the preconstruction planning and subsequent development of the water- and land-related resources of the Big Muddy River Basin. The future role of each participant has been established and set forth in paragraphs 51 and 54 in order to assure proper continuity in the subsequent planning effort. Therefore, to implement the plan of improvement, certain actions should be taken at the Federal, State and local levels, as appropriate.

It is recommended that this report, prepared under the direction of the Coordinating Committee, be used as a supporting document for authorizing requests initiated by the implementing agencies and that the following be accomplished within the next 10 to 15 years.

- at the Federal level -

1. That a development program be undertaken by the Corps of Engineers (Corps) and the Soil Conservation Service (SCS) for those structural and nonstructural projects summarized below, all in accordance with the planning concepts set forth in APPENDIX M.

Watershed 1/		Reservoirs			Recreational-Environmental Corridors
		Corps	SCS		(Corps) (miles)
No. 7	Crab Orchard Creek	1	2	2/	---
No. 8	Little Muddy River	1	---		47.0
No. 12	Middle Fork Creek	1	2		---
No. 14	Upper Big Muddy River	---	3		---
Nos. 1&9	Main Stem Big Muddy	---	---		103.0
	Total	3	7		150.0

1/ Watershed numbers correspond to the hydraulic sub-areas shown on PLATE 3.

2/ One of four alternatives available to meet the needs of the community of Carbondale and the Cedar Creek Watershed.

The net cost to the United States after local participation for those improvements in the early action program is presently estimated at $70,480,000 as set forth in Paragraph 58c, Table 11 of this report.

2. That the Corps of Engineers be authorized to undertake a study that would define strip mine problems in the basin and to establish a program, which it, in cooperation with others, would implement to restore the ecosystem and esthetics and income potential of these areas; said programs to be consistent with and integrated into the State Recreational Plan and the five-county land use plan.

3. That planning by the U. S. Department of Agriculture also provides for the accelerated and expanded treatment of agricultural and forest lands as part of the improvements needed for land management conservation programs.

4. That SCS, in cooperation with the River Conservancy Districts and the Soil and Water Conservation Districts, establish a program to trace and identify the major erosion and sediment problems. This should be accomplished under authority of Public Law 46, 74th Congress, 16 U.S.C. (59 a-f).

5. That the U. S. Public Health Service and the U. S. Environmental Protection Agency, in cooperation with the State, undertake the necessary study effort to insure protection of public health by establishing vector control programs and requiring installation of adequate sanitary facilities at all recreational (public use) sites.

6. That basin-wide field surveys be undertaken by the National Park Service to identify those areas of significant esthetic, archaeological, historical, and scientific values; and that the preservation of these areas be incorporated into the basin's reservoir recreational master plan and the individual river corridors where appropriate.

7. That during preconstruction planning the Corps help establish a cooperative program with other State and Federal agencies for the collection and monitoring of certain hydraulic and stream quality data.

8. That the Corps continues its work with the State and local interests through the Flood Plain Management Program in providing technical services regarding nonstructural measures that would be helpful in alleviating flood problems; and that funds for these specific services be budgeted annually through the Flood Plain Management Program.

9. That all existing and proposed land and water areas designated for recreation and fish and wildlife enhancement be expanded in accordance with experienced visitation patterns and administered in accordance with the Federal Water Project Recreation Act (Public Law 89-72).

10. That the existing National (Shawnee) Forest Program incorporate the specific proposals of this plan, particularly in regard to an accelerated program of in-holdings contiguous to the recommended recreational projects.

11. That lands obtained for mitigation of wildlife losses be licensed to respective State game agencies.

- at the State level -

12. That all State agencies having statutory or vested interest in the plan of development take an active role during the authorizing and preconstruction planning stages.

13. That the existing laws, policies, and programs relating to the possible institutional and legal implementation of the plan of improvement be reviewed and modified where appropriate.

14. That studies should be prepared and information published on land requirements for mineral production and trends in the subsequent rehabilitation of these lands; this being useful to aid the counties and local communities in preparing realistic zoning regulations.

15. That the responsible agencies exercise to the full extent of their legal capability control against removal of stream flow made available for water quality and/or maintenance of minimum base flows.

- at the local level -

16. That the Greater Egypt Regional Planning and Development Commission and the River Conservancy Districts undertake, as soon as practicable, the planning studies itemized in Table 10 of this report and all others necessary to supplement the early action program.

17. That local interests reexamine their laws, policies, programs and institutional structures relating to implementation of the water and land resource developments.

18. That the Greater Egypt Regional Planning and Development Commission participate in the work committee convened by the Corps of Engineers for its study for development of the river corridors. Particular emphasis should be given establishment of the design requirements and the socio-economic effects on the local governmental entities.

19. That programs for the development of more precise data relating to the definition of flood hazards be instituted in cooperation with the State and Corps of Engineers.

20. That the Greater Egypt Regional Planning and Development Commission and local agencies provide guidance and leadership in preserving the sites of those projects included in the basin plan and preventing an unwarranted future development of the flood plain areas.

21. That the Greater Eygpt Regional Planning and Development Commission, under State supervision and approval, undertake the detailed water quality management studies required by Federal guidelines for applicable grant-in-aid programs. This will insure that any future construction of waste treatment facilities is efficient, effective, and economical and that the State standards will be achieved through necessary waste treatment and regulated flows.

22. That the River Conservancy Districts protect the channel downstream of the reservoirs from encroachment which would adversely affect operations of the reservoir.

23. That local interests adequately inform all affected persons at least annually that the projects will not provide complete flood protection.

- at all levels -

24. That those Departments of the Federal and State Governments and those local planning entities which will be involved in the subsequent planning and development programs establish a committee to coordinate the individual field agencies work efforts.

25. That each of the affected and concerned Federal, State, and local agencies keep current the segments of the comprehensive plan for which it is assigned responsibility.

26. That cooperative action be taken to expand and improve river and flood forecasting services.

27. That proper recognition be given: the official State report, "Water for Illinois - A Plan for Action" as amended; the local land-use plan; and the proposed basin-wide master plan for outdoor recreation in all recreation planning and development activities.

EXHIBITS
TO ACCOMPANY

SUMMARY REPORT

BIG MUDDY RIVER, ILLINOIS,
COMPREHENSIVE BASIN STUDY

MAY 1971

EXHIBIT NO. 1

DESCRIPTION OF INVESTIGATIONS

The purpose of this addendum is to acknowledge the specific study contributions made by the various participating Federal agencies. While the complexity of the planning effort required that each agency have membership on more than one work committee, responsibility for specific phases of work was assigned those agencies having expertise in the particular field of study. There is inclosed a list of the more significant work performed by the individual agencies. This summation identifies the responsible source should additional data or information be desired by the reader. The office addresses of the various participating agencies are also included.

DESCRIPTION OF INVESTIGATION

BIG MUDDY RIVER, ILLINOIS, COMPREHENSIVE BASIN STUDY

Department of Agriculture

The Soil Conservation Service, the Economic Research Service, and the Forest Service participated in the USDA part of the study. Participation of each agency was coordinated through a field advisory committee. The individual agencies performed the following functions:

a. Inventoried the natural resources for agricultural-related enterprises and identified future land use, crop patterns and yields, and other economic factors;

b. Evaluated the water-related problems involving land-drainage, erosion, irrigation, and both forest-based industrial and rural community water requirements;

c. Analyzed potential water- and land-related developments in upstream watersheds and assessed the capabilities for meeting known local and basin-wide needs;

d. Determined the impact of the developments on the agricultural resources and enterprises and assisted in evaluating the hydraulic effects of these improvements in the tributary watersheds and on the main stem of the Big Muddy River;

e. Participated in program formulation and system design;

f. Prepared APPENDIX K, AGRICULTURE;

g. Assisted in preparation of APPENDIX A, CLIMATOLOGY, METEOROLOGY, AND SURFACE WATER HYDROLOGY; APPENDIX F, FLOOD CONTROL AND DRAINAGE; and, APPENDIX L, ECONOMIC BASE SURVEY.

Department of the Army

a. Determined the current and future economic development potential of the basin;

b. Investigated the navigation problems and needs, made navigational economics studies and traffic analyses; and estimated the costs and benefits applicable to studied projects;

c. Analyzed potential water- and land-related developments only in those tributary watersheds that required multiple products and services in a specific attempt to minimize any conflict with P. L. 566 programs.

d. Coordinated:

(1) The establishment of flood profiles, current (with Rend Lake) and future conditions on the main stem of the Big Muddy River, with and without improvements in place;

(2) Evaluation of the impact of proposed projects on all local and basin-wide needs, exclusive of agricultural-related resources;

(3) The establishment of design criteria for yield-storage capability of drainage areas.

e. Participated in program formulation and system design; and,

f. Prepared Appendices: A, CLIMATOLOGY, METEOROLOGY, AND SURFACE WATER HYDROLOGY; D, FLUVIAL SEDIMENT; F, FLOOD CONTROL AND DRAINAGE; G, NAVIGATION; L, ECONOMIC BASE SURVEY; M, PLAN FORMULATION; N, BENEFIT EVALUATION; and SUMMARY REPORT with appropriate assistance from the study participants.

Department of Commerce

The Environmental Science Services Administration* assisted in preparation of APPENDIX A, CLIMATOLOGY, METEOROLOGY, AND SURFACE WATER HYDROLOGY. The Economic Development Administration assisted in preparation of APPENDIX M, PLAN FORMULATION. Both agencies participated in program formulation and system design.

Department of Health, Education and Welfare

The Public Health Service participated in analyzing the potential health problems in the Carbondale urban area, where the vector problems and unsanitary conditions existed due to low-flow conditions. It also participated in the program formulation and system design.

Federal Power Commission

a. Determined the projected power loads in the market area, and the potential for hydropower and mine-mouth power generation in relation to the market load;

*Effective 3 October 1970, National Oceanic and Atmospheric Administration

b. Prepared APPENDIX J, POWER; and,

c. Participated in the program formulation and system design.

Department of Interior

a. U. S. Geological Survey prepared APPENDIX B, AVAILABILITY OF GROUND WATER and assisted in the preparation of APPENDIX A, CLIMATOLOGY, METEOROLOGY, AND SURFACE WATER HYDROLOGY; and, APPENDIX D, FLUVIAL SEDIMENT.

b. Bureau of Sport Fisheries and Wildlife

(1) Analyzed existing and projected demand-supply relationship for fish and wildlife resources; also determined, where possible, the effects of proposed developments on these resources;

(2) Prepared APPENDIX I, FISH AND WILDLIFE CONSERVATION; and,

(3) Participated in program formulation and system design.

c. Bureau of Mines

(1) Determined the nature and extent of mineral deposits and the potential of the mineral industry in the basin. Also assisted in the evaluation of the impact on the mineral industry by the proposed improvements; and,

(2) Prepared APPENDIX C, MINERAL RESOURCES, and assisted in the preparation of APPENDIX L, ECONOMIC BASE SURVEY.

d. Bureau of Outdoor Recreation

(1) Developed the projected demands in terms of user-day attendance, water surface acreage and land acreage required for general recreation. Also established design and cost criteria applicable for ascertaining and implementing the use potential for the reservoir developments considered;

(2) Prepared that portion dealing with general outdoor recreation in APPENDIX H, RECREATION; and,

(3) Participated in program formulation and system design.

e. National Park Service

(1) Contracted with Southern Illinois University for preparation of that portion of APPENDIX H, RECREATION, concerning archaeological, historical, and natural resources;

(2) Participated in program formulation and system design.

f. Federal Water Quality Administration*

(1) Evaluated the current and projected municipal and industrial water supply requirements and the action programs currently under way to meet these needs.

(2) Established the target flows and creditable values of the supplemental storage required to maintain the desired stream quality standard approved by the State of Illinois. Also assisted in establishing the governing design criteria for yield-storage capability of drainage areas.

(3) Participated in program formulation and system design; and,

(4) Prepared APPENDIX E, WATER USE AND STREAM QUALITY.

*Effective 2 December 1970, Water Quality Office, U. S. Environmental Protection Agency

ADDRESSES OF PARTICIPATING AGENCIES
FEBRUARY 1971

Department of Agriculture -

State Conservationist
Soil Conservation Service
U. S. Department of Agriculture
200 West Church Street
Champaign, Illinois 61820
Ph: 217-356-3785

Economic Research Service
U. S. Department of Agriculture
303 Manly Miles Building
1405 South Harrison Road
East Lansing, Michigan 48833
Ph: 517-355-1772

U. S. Forest Service
U. S. Department of Agriculture
Federal Building
210 Walnut Street
Des Moines, Iowa 50309
Ph: 515-284-4638

Department of the Army

District Engineer
Department of the Army
St. Louis District, Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101
Ph: 314-268-3411

Department of Commerce

Regional Hydrologist
Natural Oceanic and Atmospheric Administration
U. S. Department of Commerce
601 East 12th Street
Kansas City, Missouri 64106
Ph: 816-374-3229

Regional Director
Economic Development Administration
Region VI
U. S. Department of Commerce
Civic Tower Building
32 West Randolph Street
Chicago, Illinois 60601
Ph: 312-353-7706

Department of Health, Education, and Welfare -

Public Health Service
Region V Office
U. S. Department of Health, Education, and Welfare
433 West Van Buren Street
Chicago, Illinois 60607
Ph: 312-353-7736

Federal Power Commission

Regional Engineer
Federal Power Commission
610 South Canal Street
Chicago, Illinois 60607
Ph: 312-353-6171

Department of the Interior

Regional Director
Bureau of Sport Fisheries and Wildlife
U. S. Department of the Interior
Fort Snelling
Federal Building
Twin Cities, Minnesota 55111
Ph: 612-725-3533

Regional Director
Bureau of Outdoor Recreation
Lake Central Region
U. S. Department of the Interior
3853 Research Park Drive
Ann Arbor, Michigan 48104
Ph: 313-769-7100

National Park Service
Northeast Region
U. S. Department of the Interior
143 South Third Street
Philadelphia, Pennsylvania 19106
Ph: 215-597-7018

Bureau of Mines
Office of Mineral Supply
U. S. Department of the Interior
Federal Building
Twin Cities, Minnesota 55111
Ph: 612-725-4535

Department of the Interior, cont'd -

Regional Director
Federal Water Quality Administration*
Great Lakes Region
U. S. Department of the Interior
33 East Congress Parkway
Chicago, Illinois 60605
Ph: 312-353-5250

Geological Survey
U. S. Department of the Interior
West of 19th and Iowa Street
Lawrence, Kansas 66044
Ph: 913-864-4321

Regional Coordinator
Upper-Mississippi Western Great Lakes Area
U. S. Department of the Interior
2510 Dempster Street
Des Plaines, Illinois 60016
Ph: 312-396-2433

State of Illinois -

Director
Illinois Department of Business and Economic Development
222 South College Street
Springfield, Illinois 62706
Ph: 217-526-6135

Local Participants -

Rend Lake Conservancy District
P. O. Box 497
1600 Marcum Branch Road
Benton, Illinois 62812
Ph: 618-439-4321

Kinkaid-Reeds Creek Conservancy District
Jackson County Courthouse
Murphysboro, Illinois 62966
Ph: 618-687-1722

Greater Egypt Regional Planning and Development Commisssion
211-1/2 West Main Street
Carbondale, Illinois 62901
Ph: 618-549-3306

*Effective 2 December 1970, Water Quality Office, U. S. Environmental Protection Agency

EXHIBIT NO. 2

PUBLIC VIEWPOINTS EXPRESSED

The basin plan of improvement was presented at a public hearing held on 26 November 1968 at Carbondale, Illinois. At that time the public made known its views regarding the study, its findings, and conclusions.

The purpose of the addendum is to present a sample of those letters received from local planning and action agencies concerning the plan of improvement. The letters selected and reprinted herein are only intended to show the range of viewpoints expressed. Verbatim transcript of the public hearing is on file in the office of the District Engineer, U. S. Army Engineer District, St. Louis, and is available for review by all interested parties.

EXHIBIT NO.	SUBMITTED BY
Exhibit 2-1	Greater Egypt Regional Planning and Development Commission
Exhibit 2-2	Herrin Trades Council
Exhibit 2-3	City of Sesser Planning Commission
Exhibit 2-4	Perry County Soil and Water Conservation District
Exhibit 2-5	Rend Lake Conservancy District
Exhibit 2-6	Shawnee Resource Conservation and Development Executive Committee
Exhibit 2-7	Southern Illinois Incorporated
Exhibit 2-8	Vinyard-Givenrod Associates, Consulting Engineers
Exhibit 2-9	Washington County Soil and Water Conservation District

GREATER EGYPT REGIONAL PLANNING & DEVELOPMENT COMMISSION

2111 2 west main st. carbondale, illinois/62901 area code 618-549-3306

November 26, 1968

Colonel Edwin R. Decker
District Engineer
St. Louis District, Corps of Engineers
906 Olive Street
St. Louis, Missouri 63101

Dear Colonel Decker:

The Greater Egypt Regional Planning and Development Commission was created by the counties of Franklin, Jackson, Perry and Williamson and joined in 1967 by Jefferson to PLAN for the future development of the Regional area. In 1964, the Regional Comprehensive Plan (page 9) made a statement regarding the Commission's plans and their relationship to the Big Muddy Basin Plan.

"Since the movement toward concentration of urban development in many areas, the development of large open spaces into areas for recreational activity is of primary importance to the Region. Thus, the concept of concentration is in line with the long-range desire of the Region toward maximizing recreational developments.

"The same concept of reserving open space has a secondary effect of protecting the agricultural base of the Region which presently supports about seven percent of the Region's population. While the preliminary report did note that basic soil and land forms were less than ideal for general agricultural activities, it also pointed out that there was ample opportunity for development of particular specialty crops which could be of increased economic value to the farms of the Region. Therefore, the development of the agricultural base of the Region depends partly upon the reservation of land for agricultural purposes. The concept of concentrated urban development assists in achieving this end.

"In general, therefore, the dispersed concentration concept of urban development in the Greater Egypt Region is a basic device by which the resources of the Region can be utilized to maximum advantage at minimum cost. If the basic concept can be carried out by the citizens of the Region, there can be a reversal of the trend toward depopulation, the trend toward underdevelopment, and an increase in the economic activity and income of the citizens of the Region."

Therefore, the Big Muddy Basin Plan as a tool to assist in this objective receives the support of the Greater Egypt Regional Planning and Development Commission. The Commission further encourages the early development of the

five major Corps of Engineers Reservoirs to assist the concentrated population concept.

The augmentation of the stream flow made possible by these reservoirs will enhance their function as dividers that will discourage urban sprawl. This enhancement will hopefully in turn have a progression effect of motivating local people to develop, implement and maintain the River Recreation Corridors.

Sincerely for the Commission,

Franklyn H. Moreno
Executive Director

mm

HERRIN TRADES COUNCIL

Meets First and Third Tuesdays at C. C. Hall
HERRIN, ILLINOIS

December 4, 1968

At our Council meeting of December 3rd, 1968, the delegates of our various local unions, unanimously adopted the following resolution.

WHEREAS, The U.S. Army Corps of Engineers, St. Louis District has developed a plan of improvement for water, land, and socioenvironmental purposes in the Big Muddy River Basis located in Southern Illinois, and

WHEREAS, The major benefits of the plan are flood control, adequate drainage, land treatment, stream quality, recreation and tourism, hunting and fishing and industrial development.

THEREFORE BE IT RESOLVED:

That this message be conveyed to the Corps of Engineers, St. Louis District, as evidence of support of aforementioned plan by the delegates of our twenty eight local unions of the Herrin Trades Council.

ALSO BE IT FURTHER RESOLVED, that a copy of this resolution be spread upon the minutes of our meeting of December 3rd, 1968.

Clarence Miller
Clarence Miller President
Angelo L. Calcaterra
Angelo L. Calcaterra Secy.

HERRIN TRADES COUNCIL ILLINOIS

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EXHIBIT 2-2

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Novemver,20,1968

Col. Edwin H.Decker,
St.Louis District,Corps of Engineers,
906 Olive Street,
St. Louis,Mo 63101

Dear Col. Decker:

I am sorry but I will not be able to attend the hearing in Carbondale Illinois on November,26, relative to the Big Muddy Basin Project,but I would like to express my saniments on the project.

I have been (nearly) a life long resident of the Big Muddy Basin, I have covered a lot of it from the Mt.Vernon area to the Grand Tower area.

The past several years I have been Chairman of the City of Sesser Planning Commission.

For some twenty five years many thoughts have been expressed concerning the canalization of the Big Muddy Basin, many of these thoughts have been brought to the surface in recent years, lots of problems could be solved with a project of this nature. The big problem will be the availibility of adequate water for humans as well as industry,the intended project will serve that purpose. With water and availibility of ground there should be very little problem in showing industry that we do have what is needed. Our younger generation will not have to leave home,too far, to find good employment.

The development of the Big Muddy Basin would provide many acres of useable surface to meet the growing population needs for recreational area.Hunting and fishing would be better, the better to attract retirees to the area.

Many acres of now worthless bottom land would become tillable, flood damage would be reduced to nothing, the farmers would benefit,no end.

In this immediate locality the people are ,right now, interested in Rend Lake,it is becoming a reality,but there is a possibility of bargeing coal from this area.

Other areas I know of,are interested in the pollution problems, that is a big problem in places and only time will tell when certain towns will be forced to act,now is the time to get the things off the drawing boards and into the dirt.

Yours very truly,

William A Schottler

William A.Schottler.

BEST AVAILABLE COPY

EXHIBIT 2-3

PERRY COUNTY SOIL & WATER CONSERVATION DIST.

PINCKNEYVILLE, ILL. - Phone 2182
907 South Main Street

We the Directors of the Perry County Soil and Water Conservation District believe that the Big Muddy River Basin overall plan has many benefits to offer Perry County.

There are several times annually that flooding causes great damage to agricultural land and crops. Therefore, benefits from the flood control plan would be great.

There are many acres of land needing drainage that would be greatly improved by the proposed channel improvement and other drainage work.

We think that the proposed water retention structures would not only serve as flood control measures but would add a lot to the wildlife and recreational aspects in the county, as well as providing water for industry.

Then in accordance with the already existing District Program every effort would be made by the District Board to get the needed land treatment on all the land involved both above and below the proposed structural and vegatative work.

We the Directors of the Perry County Soil and Water Conservation District do hereby endorse the Big Muddy River Basin Plan.

Robert L Linnemann
Secretary

Put Every Acre to its Proper Land Use and Treat it According to its Needs

EXHIBIT 2-4

REND LAKE
CONSERVANCY DISTRICT

610 WOOD BUILDING
BENTON, ILLINOIS 62812
Telephone:
618/439-4321

RICHARD D. JONES
MANAGER
FRANK COFFMAN
TREASURER
WAYNE LEWIS
ATTORNEY

TRUSTEES
J. D. DOUGLAS, PRESIDENT
BENTON
C. J. COVINGTON, SECRETARY
MT. VERNON
ROY E. PATTON
WEST FRANKFORT
KENNETH COCKRUM
SESSER
FRANK FELTMEIER
MT. VERNON
ANGELO BIONE
CHRISTOPHER

November 25, 1968

Colonel Edwin R. Decker
District Engineer
U. S. Corps of Engineers
906 Olive Street
St. Louis, Missouri 63101

Dear Colonel Decker:

Re: Statement in Support of the Plan for Improvement of the Big Muddy River Basin, Illinois

My name is Richard D. Jones, Manager of the Rend Lake Conservancy District. This District is a municipal corporation created in 1955 by a vote of the people of all of Franklin County and six townships of Jefferson County, as the best means of solving the critical water shortage problem in the area. The Conservancy District has authority to build, own and operate lakes and reservoirs, and to enter into contracts with other units of government for the building of these facilities. Since the creation of this District, it has been the sole aim and purpose of the six member Board of Trustees to build the Rend Lake Reservoir which would provide municipal water to the area communities. The District has also supported related water development projects in the area and has been very instrumental in formulating area wide land use planning.

We have taxed the people of the District to raise the necessary revenue to plan Rend Lake and to qualify it for State and Federal assistance. We are taxing the property of the District

EXHIBIT 2-5

at the maximum rate permitted by law in order that we may continually support and develop the water related resources within the watershed of the District. The Conservancy District will build and operate the $13.5 million Rend Lake Intercity Water System which will provide municipal water from the Rend Lake Reservoir to 31 communities in seven counties through a distribution work of 125 miles of waterlines. The District is developing a 1200-acre recreational resort complex on the shores of Rend Lake, assisting in soil conservation work in the watershed of Rend Lake, local legal sponsor of the 566 Middle Fork Creek Watershed Project, initiated land use planning in the Rend Lake area, was instrumental in creating the Greater Egypt Regional Planning Commission, instrumental in locating the Rend Lake College near the Rend Lake Reservoir Project, and participated in industrial development programs. All of our activities indicate that the District is performing the functions for which it was created back in 1955.

The Board of Trustees of the Rend Lake Conservancy District has reviewed thoroughly the synopsis of the comprehensive basin study of the Big Muddy River, and endorses favorably the proposed projects as described in the basin study. Specifically, we make the following comments:

1. Flood Control. Flood control has been a large concern of the Conservancy District. Annually the Big Muddy and its tributaries cause flood damage into the millions of dollars. The basin study that was presented will alleviate this flood damage and would return to the basin benefits much greater than the cost of this flood control. We, therefore, endorse the proposed flood control structures in the basin.

2. Drainage. We endorse the drainage improvements proposed in the Big Muddy Basin and its tributaries since it would greatly increase the agricultural potential of the basin. Since the plan has such a large drainage program, we find that it will be very acceptable to the farmer in the basin.

3. Land Treatment. The Conservancy District has long been active in cooperation with the Soil Conservation Service in

programs that will control and minimize the erosion and sediment losses presently occuring on lands in the basin. Far too often the erosion and sedimentation damage are overlooked in flood control projects, and we commend the architects of this plan for going to the very heart of water resource development and that is that the headwaters and on the agriculture soil where the first rain drop lands. We endorse the land treatment measures offered in the report.

4. Stream Quality. Because of poor quality of surface run off and low flows in the Big Muddy River Basin, stream quality has been extremely poor. If the area is to ever realize the total development potential of the basin, it is very important that stream quality be improved both for industrial development, fish and wildlife, recreation, and all of the other ramifications that stream quality contributes. The downstream low flow augmentation program is presented in an excellent light in the basin study and we, therefore, endorse this overall stream control program.

5. General Recreation. Almost a fourth of the nation's population lies within 400 miles of the area covered by the study. Within this 400-mile radius live 54 million people with an annual income of approximately $125 million. Furthermore, most tourists and vacationists travel in by highway, and this will contain the intersection of the major East-West, North-South Interstate Highway network. Obviously, this area is in an inevitable position as far as national location is concerned. We, therefore, as a Conservancy District, endorse the recreational proposals in the basin study. Especially, the five satellite Corps reservoirs that surround the Rend Lake Project making Rend Lake the center of recreation and tourism in the Basin. These satellite reservoirs would also generate the necessary interest in the area for the building of the smaller Soil Conservation Service reservoir project. We feel that it is important that the five Corps reservoirs be constructed as soon as possible since they will add greatly to the potential of the recreational resort market of the area. The recreational corridors in the study is a concept that is receiving much favorable comment by recreationists throughout the country, and by providing these corridors in the Basin, it will greatly

enhance the recreational potential of the area.

"Water, Water, Who's Got the Water" is an expression often used throughout the country for those areas that have been successful in economic development of the industrial potential. We believe it very important that a very close and serious look of the water supply needs of the basin be reevaluated thoroughly prior to final completion of the engineering proposals for the basin development. Based upon the Conservancy District's engineering surveys made by Clark, Dietz & Associates, the water supply projections for the basin are incorrect in that they are underestimating the future water supply needs of the basin. We believe that additional water storage for municipal water supplies should be incorporated in numerous other reservoir sites projected in the basin study. The tributaries above the Rend Lake Dam and Reservoir according to independent engineering studies could provide additional ten million gallons of water per day for water supply needs in the Rend Lake Intercity Water System area. The District requests that this water supply storage be provided in the structures proposed.

The District has long accepted the land use plan of the Greater Egypt Planning Commission and we were extremely pleased that the Basin study incorporates this basin land use plan into the total project. We endorse the concept of land use planning and therefore endorse the concept proposed in the basin study.

The rehabilitation of the strip mine areas in Southern Illinois has long been a goal of many of municipal governments and residents of the area. We would endorse and encourage the federal and state governments to initiate productive programs in rehabilitation of these areas for recreational developments. It is our belief also that the private coal mining companies would be in agreement and would participate with the governmental agencies in programs to utilize this land for recreational pursuit.

We, therefore, endorse this program to construct 71 reservoirs, 1,017 miles of channel improvement at strategic points on the Big Muddy River and its tributaries and establish 178 miles of river corridors (green belts) including 103 miles on the Big Muddy, 47 miles on the Little Muddy and 28 miles on the Beaucoup for

recreational development and wildlife habitat and the restoration of strip mined areas.

Very truly yours,

Rend Lake Conservancy District

Richard D. Jones

Richard D. Jones
Manager

RDJ:jft

EXHIBIT 2-5 (cont'd)

SHAWNEE RESOURCE CONSERVATION AND DEVELOPMENT PROJECT

BOX 992 CARBONDALE, ILLINOIS 62901

November 20, 1968

Edwin R. Decker
Colonel, CE
District Engineer
Chairman, Coordinating Committee
906 Olive Street
St. Louis, Missouri 63101

Dear Sir:

The Shawnee Resource Conservation and Development Executive Committee, at its regular meeting held on November 12, 1968, passed a resolution authorizing me to present this statement indicating our interest in the Big Muddy River Basin Study.

We have reviewed the Synopsis of Findings, October, 1968. Based on this limited amount of information we encourage the general acceptance of the overall basin plan. We recognize that some changes may be made in detailed planning but the overall basin needs have been identified and solutions proposed. These improvements are in accord with our objectives in the Shawnee RC&D Project Plan.

The portion of the RC&D Project area drained by the Big Muddy River and its tributaries includes only parts of Jackson, Williamson, Johnson and Union counties. This is only a part of the total RC&D Project area. However, we feel the development of the resources in the entire basin will not only affect the basin area but will have a significant impact on the economy of the entire RC&D project area in Southern Illinois.

The proposed need for an accelerated land treatment program is real. We strongly support the proposed flood control and drainage improvements as this will add tremendous benefit to the agricultural economy.

EXHIBIT 2-6

The additional recreation uses proposed in the large structures plus the recreational benefits resulting from the many small structures and the recreational corridors are in line with the objectives of the RC&D Project Plan. We wish to point out the importance, also, of land based recreation that would likely result from the many proposed improvements.

We urge early approval and implementation of this plan.

We appreciate the opportunity to comment on this plan and will lend our full support.

Yours very truly,

William V Brown

William V. Brown,
Executive Committee
Member, Williamson County
SHAWNEE RC&D PROJECT

A RESOLUTION BY SOUTHERN ILLINOIS INCORPORATED

Whereas, it was Southern Illinois Incorporated that organized the local presentation supporting a provision to make Big Muddy River and Baucoup Creek navigable to the Mississippi River in a public hearing held at Murphysboro, Illinois on February 21, 1956 and presided over by Col. George White of the U. S. Corps of Engineers.

Whereas, area leaders presented strong evidence and great enthusiasm, with a record breaking crowd, encouraged such proposal.

And, not withstanding some disappointment that the whole program as conceived has run into changing economic factors that reduce the cost-benefit ratio — we still contend that into the study benefits accuring as in-bound heavy freight such as refined petroleum products, all kinds of fertilizer, and raw materials should be considered. In addition to benefits of shipping coal out, the shipment of agriculture products out sustains us in our hopes that full recognition of all in-bound and out-bound flow of products will justify a revival of the canalization projects.

Therefore, at this time, and in view of the above, we the members of Southern Illinois Incorporated accordingly resolve to endorse the plans being presented at Carbondale, Illinois, November 26, 1968 calling for improvements for the water, land, and socio-environmental purposes in the Big Muddy River Basin Illinois.

Passed at a regular monthly meeting of the Board of Directors of Southern Illinois Incorporated at DuQuoin, Illinois this 25th day of November, 1968.

Attest:

Executive Director

President

brs

EXHIBIT 2-7

VINYARD-GIVENROD Associates

CONSULTING ENGINEERS

601 WOOD BLDG. PHONE (618) 439-3176 OR 439-3177

BENTON, ILLINOIS 62812

December 9, 1968

Colonel Edwin R. Decker
District Engineer
U. S. Corps of Engineers
906 Olive Street
St. Louis, Missouri 63101

RE: Big Muddy River Comprehensive Basin Study.

Dear Colonel Decker:

My name is Lawrence A. Lipe, Vice President of Vinyard-Givenrod Associates, Consulting Engineers. Our firm is the engineering representatives for the Rend Lake Conservancy District, and ten (10) local governments within the Big Muddy River Basin. As an individual and as a firm I am quite concerned with the physical and economical development of the Big Muddy River Basin.

I have reviewed thoroughly the synopsis of the comprehensive basin study of the Big Muddy River, and endorse favorably the proposed development of the river basin. The following specific comments and remarks accompany my endorsement:

1. Flood Control and Drainage. Flood Control and drainage go hand in hand in alleviating the flooding problems which presently exist in the Big Muddy River Basin. All of the communities which we represent have acute storm drainage problems. Many of the problems can be attributed to lack of adequate drainage down stream from the communities storm sewer outfalls.

   Much of the down stream flooding on the Big Muddy River Basin can be attributed to the fluctuation of the Mississippi River. This flooding problem in the lower reaches of the river basin cannot be alleviated until better control of the Mississippi River is obtained. I recommend immediate action be taken to complete Upper Mississippi Comprehensive Basin Study.

EXHIBIT 2-8

2. Stream Quality. In approximately two (2) years, more than thirty one (31) communities will derive their domestic water supply from the Big Muddy River and its tributaries. To protect and improve these domestic water supplies, strict stream quality criteria must be inforced.

3. Water Supply. For years this area has experienced a shortage of water. The proposed Rend Lake is being constructed to take care of part of this problem. However, many communities within the basin are unable to derive water from this source. I believe it is very important that a close look into the water supply needs of the basin be made, prior to final completion of this engineering study. I believe that the future water needs can be incorporated into many of the proposed reservoir sites throughout the basin.

The agencies contributing to this study should be complimented for a fine, outstanding report. It is not very often that a group of federal, state, and local agencies can work together and obtain such outstanding results.

Sincerely yours,

VINYARD-GIVENROD ASSOCIATES

Lawrence A. Lipe
Vice President

LAL/sag

Washington County Soil and Water Conservation District

P. O. BOX 88

Nashville, Illinois 62263

December 9, 1968

Erwin R. Decker
Colonel, C. E.
District Engineer
St. Louis District Corps of Engineers
906 Olive Street
St. Louis, Missouri 63101

Dear Col. Decker:

The Washington County Soil and Water Conservation District wishes to go on record as supporting the Big Muddy River Comprehensive Basin Study as outlined in the synopsis of findings.

The land treatment aspects have our full support in that the longevity of all improvements will be greatly increased only when land treatment is applied in proper and timely manner. We recognize there is a great need for this land treatment and feel that this plan will help instill interest in speeding up its application to the land.

Our support is given in anticipation of closer cooperation of all Federal, State, and local agencies and organizations being one of the benefits resulting from this plans development and implementation. The lines of communication need to be established soon to enable all concerned groups to become aware of all aspects of the plan as a means of combating mis - information and rumors so often connected with an endeavor of this magnitude. Information is needed in order to enable all concerned the opportunity of determining their part in carrying the project on toward completion.

Sincerely Yours,

Directors of Washington County
Soil & Water Conservation District

Orval Pasmer
Chairman

Albert Hasse Jr.
Vice-Chairman

Wayne B. Herbert
Secretary

Raymond F. Callaway
Treasurer

Earl H. Schnitker
Historian

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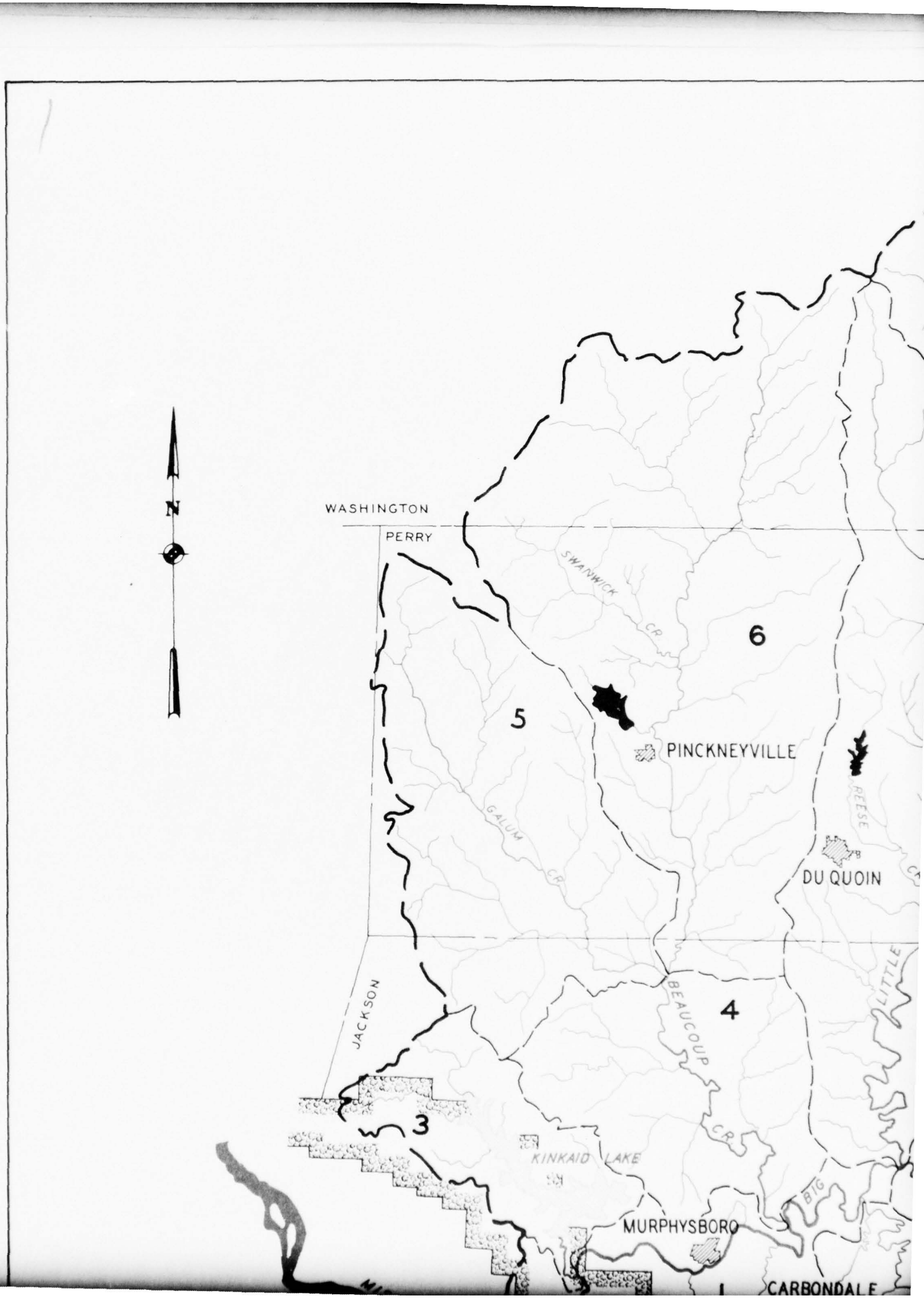
EXHIBIT 2-9

MAPS
TO ACCOMPANY

SUMMARY REPORT

BIG MUDDY RIVER, ILLINOIS,
COMPREHENSIVE BASIN STUDY

MAY 1971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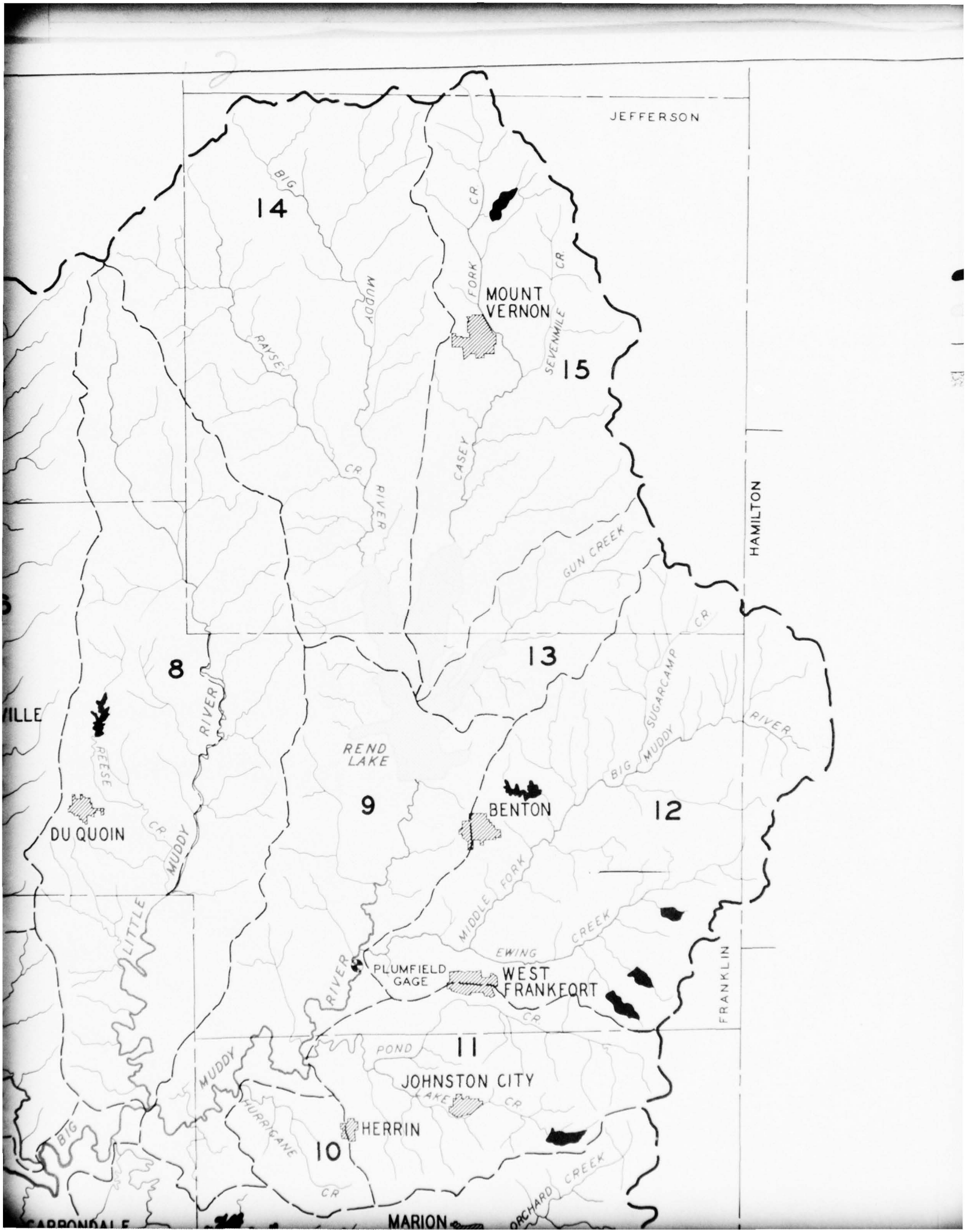
JEFFERSON
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MOUNT VERNON
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DU QUOIN
PLUMFIELD GAGE
WEST FRANKFORT
JOHNSTON CITY
HERRIN
REND LAKE
BIG MUDDY RIVER
MUDDY RIVER
LITTLE MUDDY
CASEY FORK
SEVENMILE CR
GUN CREEK
SUGARCAMP CR
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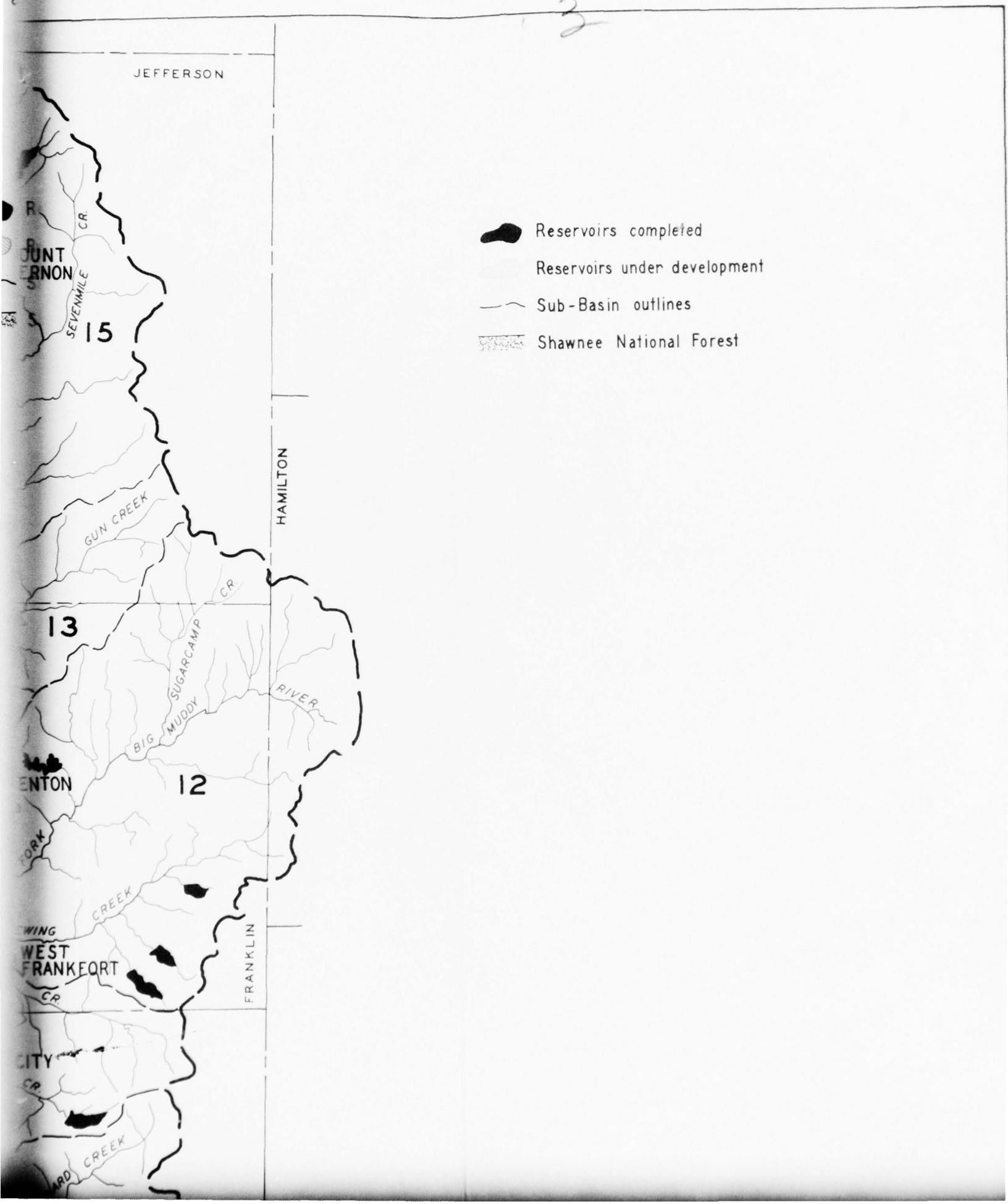
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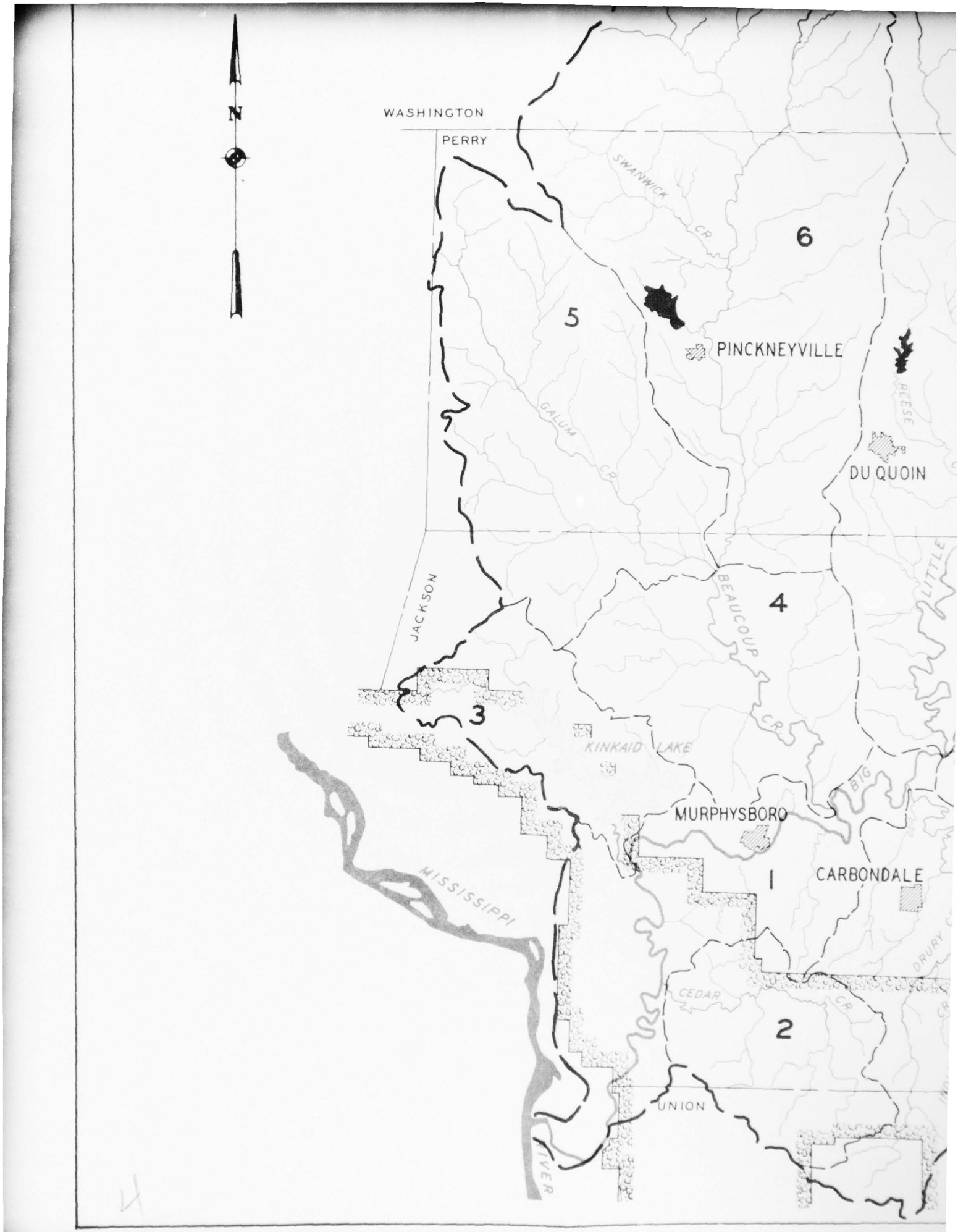
Reservoirs under development
Sub-Basin outlines
Shawnee National Forest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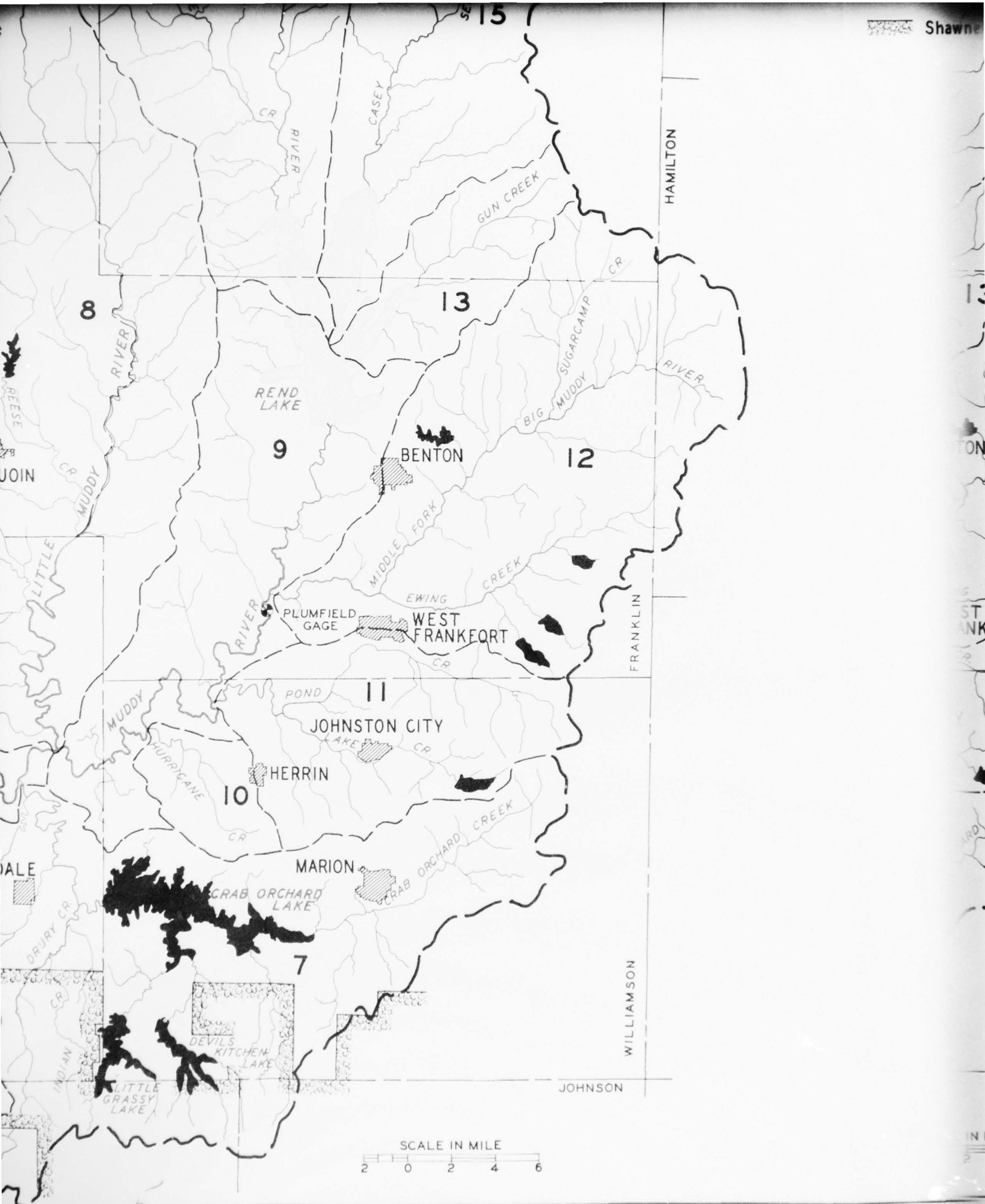
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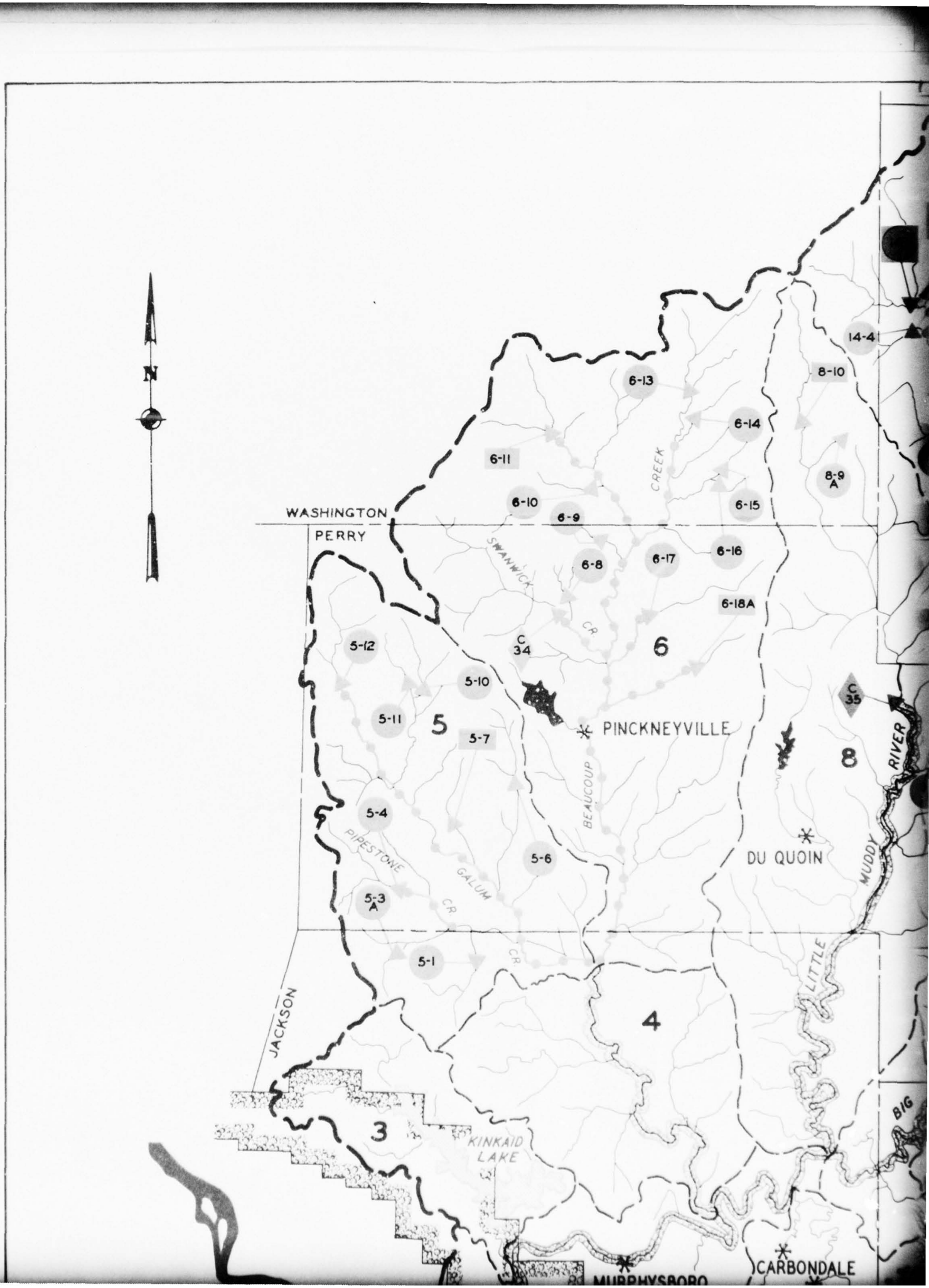
TRIBUTARY STREAMS AND WATERSHEDS
BIG MUDDY RIVER BASIN, ILLINOIS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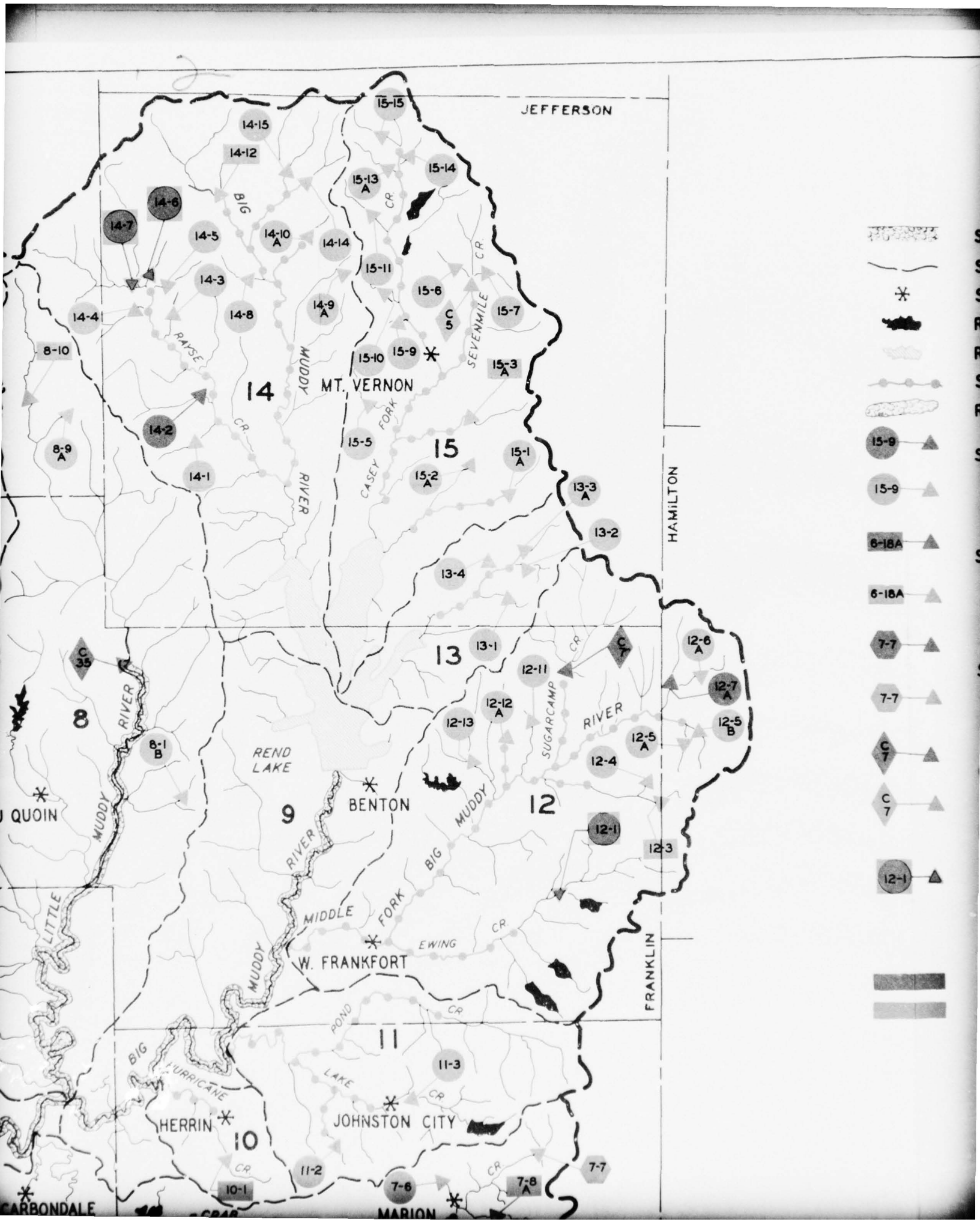
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LEGEND

Shawnee National Forest

Sub-basin Outlines

Sewage Treatment Plant Outfall - Existing

Reservoirs Completed

Reservoirs Under Construction

Soil Conservation Service Channel Improvements

Recreational Corridors

15-9

Soil Conservation Service - Single - Purpose
Floodwater Retarding Structure

6-18A

Soil Conservation Service - Dual - Use Reservoir
Flood Control and Recreation

7-7

Soil Conservation Service - Multiple - Purpose Reservoir

C 7

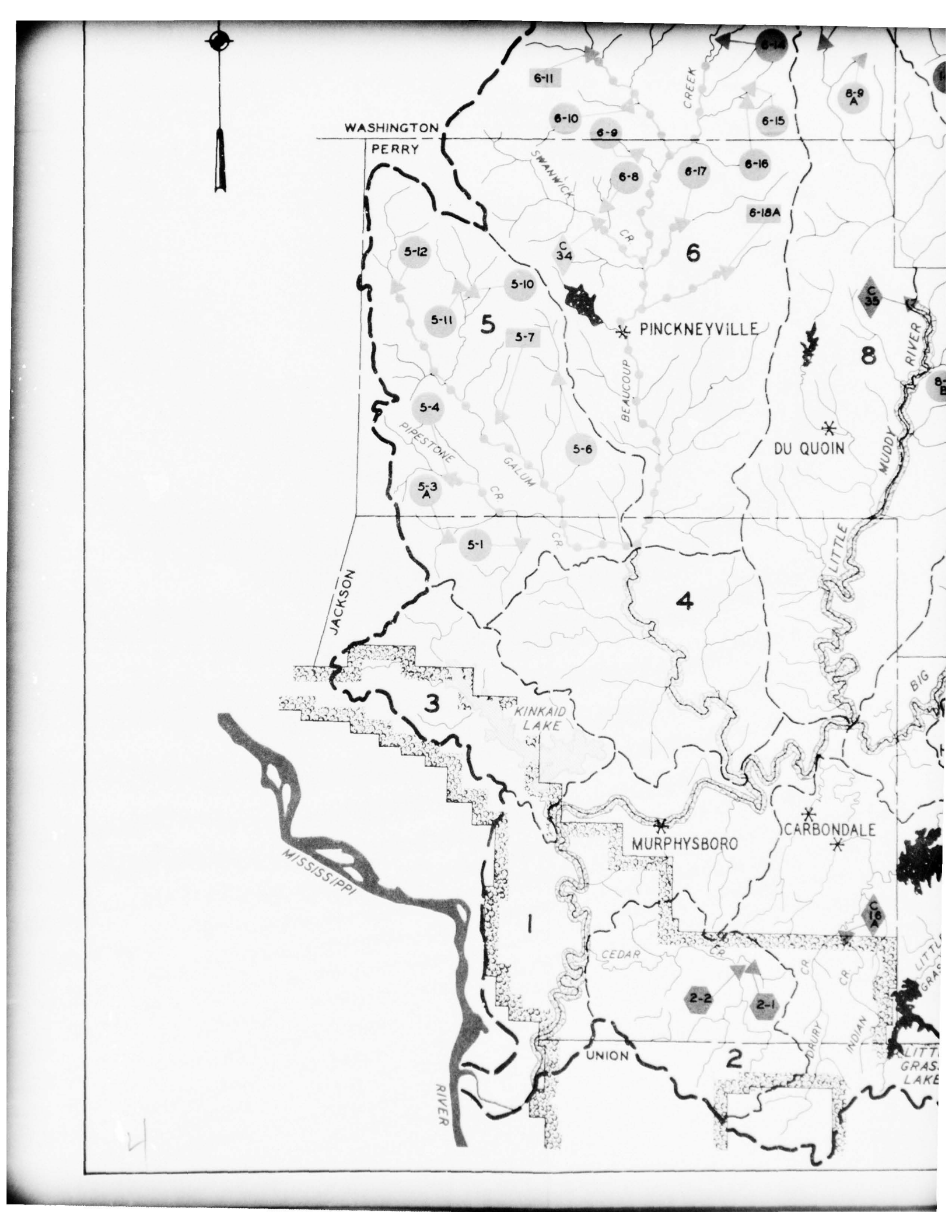
Corps of Engineers - Multiple - Purpose Reservoir

12-1

Soil Conservation Service - Two - Stage Reservoir
Construction:
a.) Single Purpose Flood Control
Initial Construction
b.) Second Stage Addition for
Recreational Storage

10 - 15 Year

Long Range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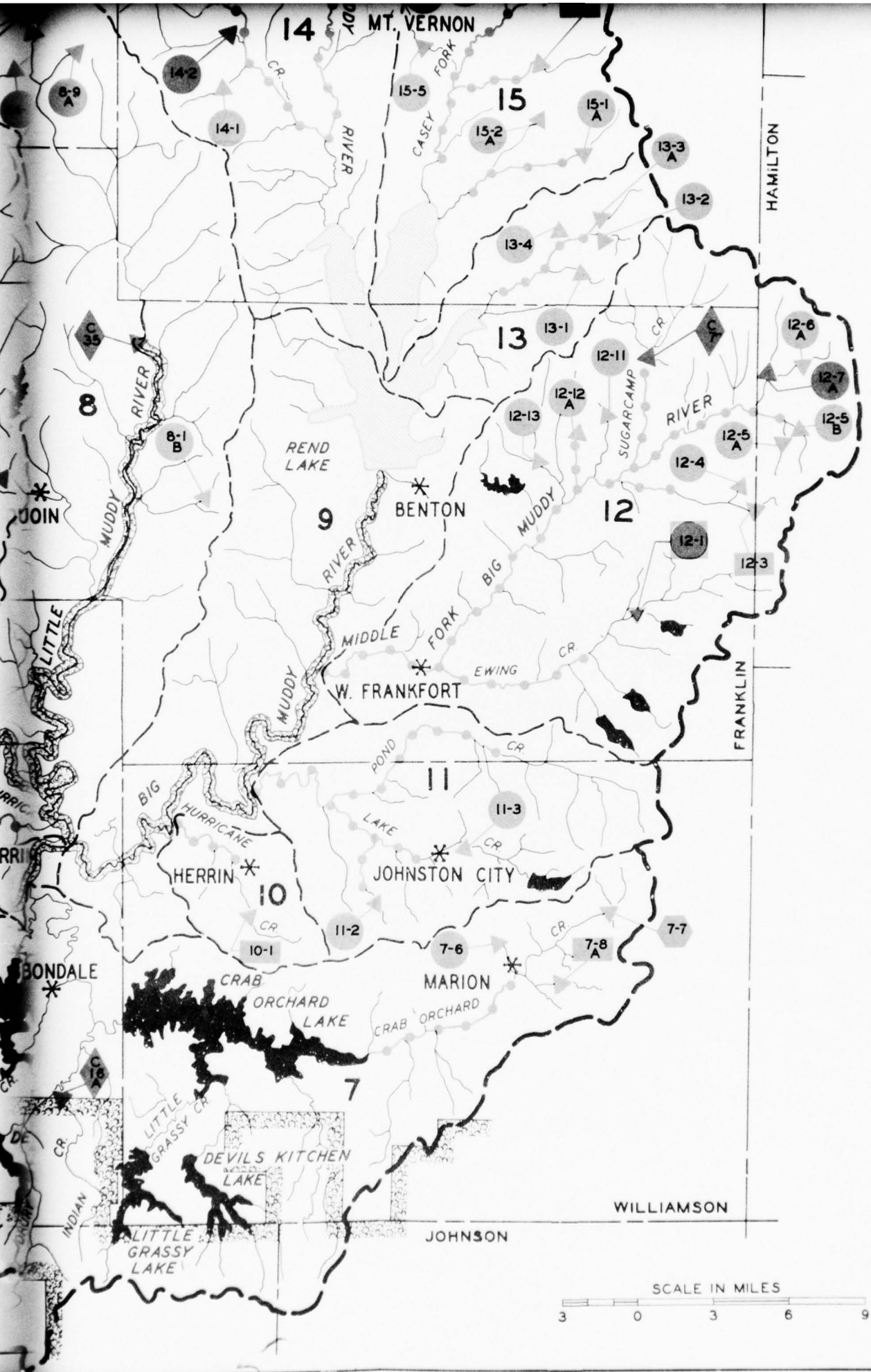
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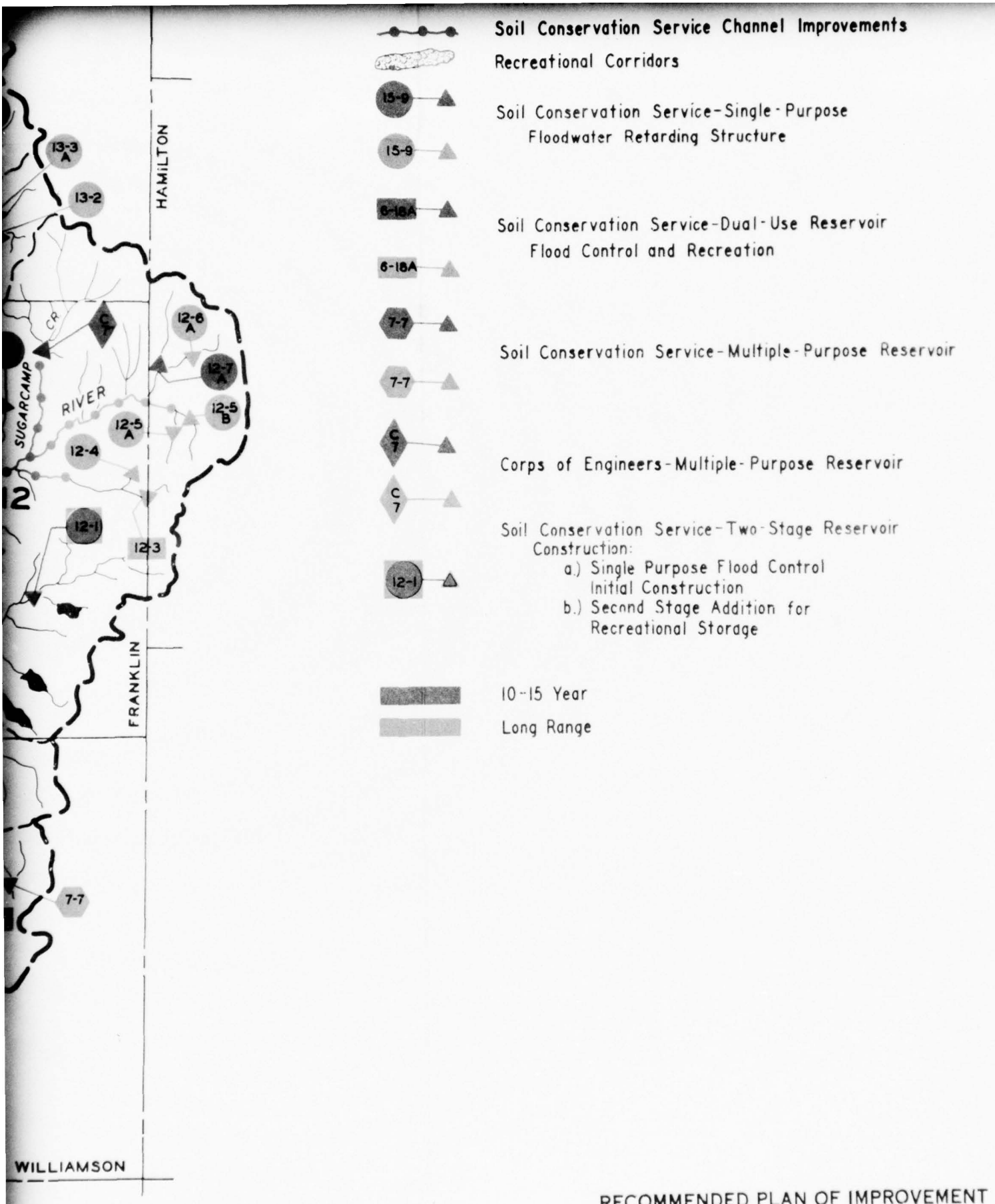

RECOMMENDED PLAN OF IMPROVEMENT
BIG MUDDY RIVER BASIN, ILLINOIS

PLATE 3

FORMAL COMMENTS
TO ACCOMPANY

SUMMARY REPORT

BIG MUDDY RIVER, ILLINOIS,
COMPREHENSIVE BASIN STUDY

MAY 1971

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

P.O. Box 678, 200 W. Church St., Champaign, Illinois 61820

April 26, 1971

Colonel Carroll N. LeTellier
District Engineer, LMSED-BG
U. S. Army Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101

Dear Colonel LeTellier:

The Forest Service, Economic Research Service, and Soil Conservation Service have reviewed the final version of the Summary Report of the Big Muddy River Basin Study and the Environmental Impact Statement.

The report is well written, concise, and to the point. The plan sets forth the key actions needed to enhance the farmers position, develop the forestry resource, and give proper consideration to environmental factors. It should be noted that reference to land treatment measures in the report includes forestry measures as well.

We appreciate the opportunity to comment on the report.

Sincerely,

Howard W. Busch
Chairman, USDA Field
Advisory Committee

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 NORTH 12TH STREET
ST. LOUIS, MISSOURI 63101

IN REPLY REFER TO

LMSED-BG

16 April 1971

Big Muddy River Basin Coordinating Committee
Office of the Chairman
U. S. Army Engineer District, St. Louis
210 North 12th Street
St. Louis, Missouri 63101

Gentlemen:

This is in response to your letter, dated 12 March 1971, requesting formal comments for inclusion in the final field version of the Summary Report for the Big Muddy River, Illinois, Comprehensive Basin Study.

The recommended plan and the early action program are not only responsive to the basin needs, but also are reflective of a multiple-objective concern for the conservation and proper management of the area's natural resources. These multiple objectives are the same as those set forth by the Water Resources Council in its policy statement, dated 22 July 1970, and by the United States Congress in Section 209 of the Flood Control Act of 1970 (Public Law 91-611). In this act, Congress expressed its intent "that the objectives of enhancing regional economic development, the quality of the total environment, including its protection and improvement, the well-being of the people of the United States, and the national economic development are the objectives to be included in federally financed water resource projects, and in the evaluation of benefits and cost attributable thereto, giving due consideration to the most feasible alternative means of accomplishing these objectives."

It should be recognized that the plan of improvement is intended to serve as a guideline for Federal and State assistance in helping local residents achieve their rightful role in the future expansion of the Upper Mississippi River region of which the basin is a part. The coordination recommended in implementing the early action program is therefore heartily endorsed, particularly the emphasis on Stae and local involvement.

Sincerely yours,

CARROLL N. LeTELLIER
Colonel CE
District Engineer

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service Central Region
Room 1836, 601 E. 12th Street
Kansas City, Missouri 64106

April 19, 1971

WFC2

Colonel Carroll N. LeTellier
District Engineer
Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101

Subject: Summary Report - Big Muddy River

Dear Colonel LeTellier:

The Summary Report of the Big Muddy River Comprehensive Basin Study has been reviewed and found to be a well-balanced approach to redevelopment of the area. It brings into proper perspective the needs for environmental control, agricultural enhancement, streamflow management, and recreation.

Perhaps one of the most important features is the built-in flexibility which is so essential to a long-range plan of this magnitude. Another highlight is the attainment of full coordination of local, State, and Federal action programs.

In my opinion this study is an outstanding accomplishment toward presenting a plan which is within the financial capabilities of local and State participants.

Sincerely,

Verne Alexander

VERNE ALEXANDER
Regional Hydrologist

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service Central Region
Room 1836, 601 E. 12th Street
Kansas City, Missouri 64106

April 19, 1971

WFC2

Colonel Carroll N. LeTellier
District Engineer
Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101

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Sincerely,

Verne Alexander

VERNE ALEXANDER
Regional Hydrologist

U.S. DEPARTMENT OF COMMERCE
Economic Development Administration
MIDWESTERN REGIONAL OFFICE
32 WEST RANDOLPH STREET
CHICAGO, ILLINOIS 60601

April 23, 1971

Colonel Carrol N. LeTellier
District Engineer
Chairman, Coordinating Committee
Department of the Army
St. Louis District, Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101

Dear Colonel LeTellier:

This letter is in response to your communication of March 22, 1971.

It is noted that EDA is a suggested participant in three studies in the Early Action Program, Special Studies Required: Impact of water supply distribution system on tax structures and demographic patterns (basin wide); feasibility study of intercity sewage collection and treatment (basin wide); and evaluation of local intergovernmental organizations (basin wide).

This agency recognizes the need for this planning and is interested in its implementation. Our participation, however, will be determined by the availability of funds and on the project's impact on long range employment opportunities.

Very truly yours,

FRED VAN REMORTEL
REGIONAL DIRECTOR

By James E. Peterson
James L. Peterson
Deputy Regional Director

JLP/cf

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION V
433 WEST VAN BUREN STREET, ROOM 712
CHICAGO, ILLINOIS 60607
PUBLIC HEALTH SERVICE

April 20, 1971

Colonel Carroll N. LeTellier
District Engineer
U. S. Army Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101

Attention: Mr. James M. Maas
Head, General Planning Section

Dear Colonel LeTellier:

Acknowledgment is made of your letter dated 12 March 1971 transmitting the final field version of the Summary Report for the Big Muddy River, Illinois, Comprehensive Basin Study.

A cursory review by this office indicates that we have no comments of significance concerning the Summary Report.

We are pleased to note that the discussion on participation and the recommendations provide for future consideration of the public health and environmental aspects in the early action program, as well as the overall plan of improvement.

Please accept our sincere appreciation for the opportunity to participate in the Big Muddy River Basin Coordinating Committee and the development of the Comprehensive Basin Study Report.

Sincerely yours,

Donald W. Marshall

Donald W. Marshall, P.E.
Sanitary Engineer Director

for:
Department of Health, Education,
and Welfare, Region V, Chicago

cc:

Dr. Raymond T. Moore
Special Assistant to Surgeon General, OS-DHEW

Mr. Albert G. Giles
Assistant Regional Director for Intergovernmental
Operations and Community Affairs, DHEW, Region V

Mr. F. Donald Maddox
Division of Water Hygiene, EPA

United States Department of the Interior

OFFICE OF THE SECRETARY
UPPER-MISSISSIPPI WESTERN GREAT LAKES AREA
2510 DEMPSTER STREET
DES PLAINES, ILLINOIS 60016

March 29, 1971

Colonel Carroll N. LeTellier
District Engineer
U. S. Army Engineer District,
St. Louis
210 North 12th Street
St. Louis, Missouri 63101

Dear Colonel LeTellier:

My first impression of the Summary Report for the Big Muddy River, Illinois, Comprehensive Basin Study is its readability. The style is attractive and it is prepared in a way which makes interesting reading.

The needs of the Basin are clearly demonstrated and the solutions carefully delineated. The Baseline Plan is developed in a logical manner and fully evaluated to show that it forms the most effective program to satisfy the needs. The recommendations are clearly defined to show what action each participant must take to implement the improvements.

In my opinion, implementation of this Plan will make a measurable contribution to the economy, social well-being, and the environment of the Basin.

Very truly yours,

Burton H. Atwood

Burton H. Atwood
Field Representative
North Central Region

United States Department of the Interior

BUREAU OF MINES

Twin Cities Mineral Supply Field Office
Federal Building, Fort Snelling
Twin Cities, Minnesota 55111

April 21, 1971

Colonel Carroll N. LeTellier
Department of the Army
St. Louis District, Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101

Dear Colonel LeTellier:

We have reviewed the Summary Report for the Big Muddy Comprehensive Basin Study and the revision relative to the Bureau of Mines participation on page 104. We concur with the report as it is now written.

Very truly yours,

Donald F. Klyce

Donald F. Klyce
Industry Economist

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF OUTDOOR RECREATION
LAKE CENTRAL REGION
3853 RESEARCH PARK DRIVE
ANN ARBOR, MICHIGAN 48104

D6427UM
Big Muddy

March 19, 1971

District Engineer
U. S. Army Engineer District,
St. Louis
210 North 12th Street
St. Louis, Missouri 63101

Dear Sir:

In response to your letter (LMSED-BG) of March 12, 1971, we have made a formal field level review of the Summary Report for the Big Muddy River Comprehensive Study, Illinois.

The appendix is well written, easily understood, and presents a desirable program for early action development and study in the basin. We concur with the recreational and environmental aspects as they are presented.

We note that projects and study programs which we espoused are included in the early action plan, and we are particularly pleased that the environmental stream corridors are recommended to receive top priority in the plan of development.

We would like to take this opportunity to thank you and your staff for the coordination and assistance extended during the study.

Sincerely yours,

ROMAN H. KOENINGS
Regional Director

By: Robert H. Myers

Robert H. Myers
Acting

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
Mpls. Area Office, RBS
Federal Bldg., Fort Snelling
Twin Cities, Minn. 55111

April 19, 1971

AIRMAIL

Col. Carroll N. LeTellier
District Engineer
U. S. Army Engineer District
St. Louis
210 North 12th Street
St. Louis, Missouri 63101

Dear Col. LeTellier: Re: Your file LMSED-BG

I have reviewed the final field version of the Summary Report for the Big Muddy River Illinois Comprehensive Basin Study.

It is evident that much hard work has gone into this effort. The total program is all encompassing. It delineates a broad spectrum of water and land-related measures, both structural and non-structural, for ultimate development of the Big Muddy River Basin.

The Early Action Program proposes five multi-purpose reservoirs. These reservoirs will store waters which can improve downstream fisheries significantly by supplying releases for low-flow augmentation. These releases, in combination with 150 miles of Recreational-Environmental Corridors proposed for the Big Muddy and the Little Muddy, will significantly improve the quality of the stream fishery in the Big Muddy Basin. The corridors will assure preservation of a significant amount of the basin's rich river bottom ecology. They will also make it possible for recreational planners to develop the full potentials of these areas for future generations to enjoy. The associated land treatment measures will foster soil and water conservation and lengthen reservoir life.

Stream channelization is currently receiving close scrutiny, both by ecologists and by the construction agencies. I am pleased to note that the many miles of stream channelization work, which has such great potential for damaging associated natural resources, has been deleted from the Early Action Program.

I believe that your emphasis on selected reservoirs, flood detention structures, and recreational-environmental corridors is both timely and appropriate. It is consistent with the intent of the Environmental Policy Act (P. L. 91-190).

The proposed additional studies will supply a great amount of information needed to help formulate action programs involving such matters as the strip mine problem, river corridors, and other environmental considerations. Such studies are a necessary prerequisite to detailed project formulation.

In summary, the proposed Early Action Program is both sound and progressive. It is attuned to such matters as wildlife habitat preservation, improvement of stream fisheries, soil and water conservation, and general improvement of the environment. It recognizes and provides for numerous intangibles which are sometimes overlooked. The planners deserve much credit for their efforts on this difficult assignment. This Summary Report attests to the success of their efforts.

Sincerely,

Donald B. Vogtman

Donald B. Vogtman
Supervisor

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
NORTHEAST REGION
143 SOUTH THIRD STREET
PHILADELPHIA, PA. 19106

IN REPLY REFER TO:
L7423
NER(CP)

Colonel Carroll N. LeTellier
District Engineer
Department of the Army
St. Louis District, Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101

Dear Colonel LeTellier:

The opportunity to review the Summary Report of the Big Muddy River Comprehensive Basin Study is sincerely appreciated. The Summary Report is impressive for both the wide scope and indepth treatment of the planning approach.

I am pleased by the stress placed on environmental quality, and concur with the Early Action Program recommendation for a comprehensive archeological investigation of the Basin. Preliminary surveys indicate that this area has diverse and wealthy archeological resource base of great survival value. A definitive inventory and appraisal of these resources is definitely in order. In fact, it is mandatory in view of the nature of the construction devices.

Equally significant and relevant is Recommendation #6 on page 114 of the Report, which calls for surveys of all those resources which are an integral part of the Basin's heritage and which are the ingredients, in a sense, of a quality environment. The survey should, of course, not only identify but evaluate the individual resources on the inventory.

Very truly yours,

Harold I. Lessem
Federal Liaison, Division of Federal,
State & Private Agency Assistance

United States Department of the Interior

GEOLOGICAL SURVEY

2222 Schuetz Road, Suite 212
St. Louis, Mo. 63141

April 19, 1971

Colonel Carroll N. LeTellier, CE
District Engineer
St. Louis District, Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101

Dear Colonel LeTellier:

We have reviewed the final field version of the Summary Report for the Big Muddy River, Illinois, Comprehensive Basin Study and have no comments to make other than to acknowledge the role of the U. S. Geological Survey as one of the listed participants in future studies.

We would anticipate being an active member on the study teams to the extent that funding and personnel are available.

Very truly yours,

Elwood R. Leeson
Regional Hydrologist, MCR
Water Resources Division

FEDERAL POWER COMMISSION
REGIONAL OFFICE

610 South Canal Street, Room 1051
Chicago, Illinois 60607

March 29, 1971

Colonel Carroll N. LeTellier
Chairman, Coordinating Committee
Comprehensive Study, Big Muddy River, Ill.
District Engineer
St. Louis District, Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101

Dear Colonel LeTellier:

Receipt is acknowledged of your letter dated March 12 and attachments thereto concerning the Comprehensive Basin Study.

We have reviewed the draft of the Environmental Statement furnished as Enclosure No. 3 to the referenced letter and concur in its contents. We have also reviewed the final field version of the Summary Report for the Comprehensive Basin Study and concur in its contents. This report was reviewed by the Coordinating Committee at a meeting on February 10 in your offices.

Our review and concurrence in the Environmental Statement and the Summary Report is made at field level and is not to be construed as a commitment on the part of the Federal Power Commission.

Sincerely yours,

Lenard B. Young
Regional Engineer

UNITED STATES OF AMERICA
ENVIRONMENTAL PROTECTION AGENCY
REGION V
WATER QUALITY OFFICE
33 East Congress Parkway
Chicago, Illinois 60605

April 20, 1971

Colonel Carroll N. LeTellier
District Engineer
U. S. Army Engineer District,
St. Louis
210 No. 12th Street
St. Louis, Missouri 63101

Dear Colonel LeTellier:

The Summary Report for the Big Muddy River Comprehensive Basin Study has been reviewed by my staff. This report has been developed through interagency discussions at field staff level and, therefore, presents a program for water resources development that incorporates the ongoing and necessary future programs for water quality management.

However, as a matter of record, the following points are presented to hopefully avoid any misunderstanding of the water quality management aspects in the report.

1. The report in no way modifies the state water quality standards, including the immediate need for advanced waste treatment where required to insure after July 1972 stream dissolved oxygen level of 5 mg/l during at least 16 hours of each 24-hour period. The reference to a 3 mg/l of dissolved oxygen on page 51, is part of the methodology used to estimate quantitative flow criteria and not a basis for future water quality planning.

2. The feasibility study of intercity sewage collection and treatment, shown on page vi of the syllabus, and Table 10, page 97, were intended to include the detailed water quality management studies required by Federal guidelines as discussed on page 116, paragraph 21. These studies would include the role of low-flow augmentation as a management tool.

3. The preliminary evaluation of low-flow regulation was included in this report as required by Section 3(b) of PL 84-660, as amended (Federal Water Pollution Control Act). This presentation is not the view of the Administrator of the Environmental Protection Agency as required by law. The policy issues affecting the cost sharing inter-relationship between flow regulation for quality under PL 84-660, flow regulation under PL 89-72 (Federal Water Project Recreational

Act), and the proposed flow augmentation program in this basin should be resolved during the Water Resources Council review. The recommendation for full Federal participation in quantitative low-flow management is not based on the two acts cited above.

4. Federal policy in PL 84-660 recognizes the primary responsibility of the State in preventing and controlling water pollution. It should therefore be expected that the strip-mine rehabilitation study, sediment and erosion control study, stream monitoring program, and water quality management studies will involve major input from the State Environmental Protection Agency with support from the U. S. Environmental Protection Agency.

The preparation of Appendix E, Water Use and Stream Quality, and the cooperative effort in preparing the Summary Report has already contributed significantly to the ongoing water quality management program in the basin. We will continue to provide available resources in implementing the recommendations of the report.

Sincerely yours,

Clifford Risley Jr

Clifford Risley, Jr.
Acting Regional Director

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
360 NORTH MICHIGAN AVENUE, CHICAGO, ILLINOIS 60601

REGION IV

April 19, 1971

IN REPLY REFER TO:

CP

Colonel Carroll N. LeTellier
District Engineer
Chairman, Coordinating Committee
Department of the Army
St. Louis District, Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101

Dear Colonel LeTellier:

We would like to acknowledge receipt of the Big Muddy River, Illinois Comprehensive Basin Study (Type II).

We have reviewed the document with particular attention to the Department of Housing and Urban Development's role in relation to the basin study's proposals. In general, the three study elements of the Early Action Program that require DHUD's participation are justified. However, we would like to point out one qualification - the feasability study of intercity sewerage collection and treatment could not be funded to include any engineering and construction details but only for general planning purposes. We would like to point out that the Federal Environmental Protection Agency's Planning Funds could be used to fund this particular proposal. FEPA planning funds have been limited so far, but it is expected that they will be increased as a result of their new planning requirement of river basin plans. Finally, we would like to state that DHUD's participation in the proposed Early Action Program is subject to the availability of funds.

In conclusion we would like to say that the Comprehensive Basin Study of the Big Muddy River is of great benefit to the Greater Egypt Region both as a source of needed basic data and as a future action outline. We would like to be invited to participate in subsequent planning efforts initiated by your agency in this area.

Thank you very much for soliciting our review comments.

Sincerely yours,

William C. Fucik
Director of Planning Division
Metropolitan Planning & Development Office

RICHARD B. OGILVIE
Governor

RAY C. DICKERSON
Director

STATE OF ILLINOIS
DEPARTMENT OF BUSINESS AND ECONOMIC DEVELOPMENT

April 7, 1971

Colonel Carroll N. LeTellier
District Engineer
St. Louis District
Corps of Engineers
Department of the Army
210 North 12th Street
St. Louis, Missouri 63101

Dear Colonel LeTellier:

Reference is made to your request of March 12, 1971, File LMSED-BG, for review and comment on your final field version of the Summary Report for the Type II Big Muddy River, Illinois Comprehensive Basin Study.

The Illinois Natural Resource Development Board has reviewed the Report and has no adverse comment to make at this time. However, the Department of Conservation wishes to make the following observation:

> "The principal comment the Department of Conservation wishes to make at this time on the foregoing named report is that we do not approve of so-called 'channel improvements.' While channel work may be beneficial to agriculture and urban developments, it completely disrupts the environment of the flood plains in the basin.
>
> There may be areas where such work is unavoidable in which case the losses to fish, wildlife, woodlands, and the environment in general would have to be sustained.

We recommend that channel straightening, enlarging, clearing, and cleaning be used only as a last resort and that it be the last flood control measure to be applied. Land treatment measures and construction of reservoirs should be implemented first. We recommend that there then be an interim period of five (5) years in which to determine the effectiveness of the land treatment measures and reservoirs in reducing flood damages and to reassess the need for channel work. If channel work is needed, we will want to make recommendations to minimize damages at the time such work is planned.

Comment is reserved on other features of the Plan, pending determination of the demand for reservoir recreational facilities at the time and the financial capabilities of the State to participate."

Sincerely,

Ray C. Dickerson

Ray C. Dickerson

AD-A043 946 BIG MUDDY RIVER BASIN COORDINATING COMMITTEE IL F/G 8/6
COMPREHENSIVE BASIN STUDY. BIG MUDDY RIVER ILLINOIS.(U)
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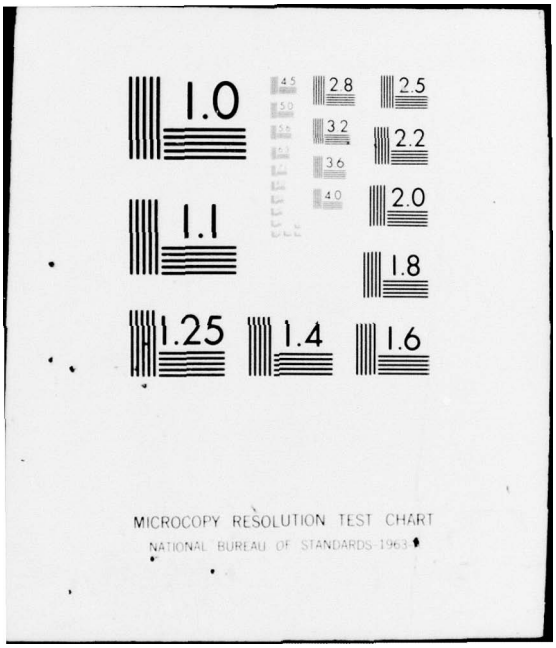
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DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 NORTH 12TH STREET
ST. LOUIS, MISSOURI 63101

IN REPLY REFER TO

LMSED-BG

16 April 1971

Mr. Ray C. Dickerson, Director
Illinois Department of Business
and Economic Development
222 South College Street
Springfield, Illinois 62706

Dear Mr. Dickerson:

This is to acknowledge receipt of your letter, dated 7 April 1971, furnishing the State's comments on the Summary Report for the Big Muddy River, Illinois, Comprehensive Basin Study.

Acceptance of the study's findings and recommendations by the Illinois Natural Resource Development Board is appreciated in light of the extensive interagency coordination undertaken to date. It is felt that adoption of this basin plan will benefit the State in its long-range commitments for the redevelopment of southern Illinois.

The concern expressed by the Department of Conservation has been duly noted. As you know, appropriate safeguards against the indiscriminate damage and misuse of the flood plain's environment have been incorporated in the planning concepts adopted by the Coordinating Committee. As stated in both the Summary Report and Appendix M, Plan Formulation, the channel improvements were designed as last-added increments to the flood reduction programs effected by the reservoir systems. This implies a phasing of construction which must be evaluated as to both need and acceptability before actual installation is recommended. The necessity for this type of continuous reevaluation before implementing each phase of the basin plan of improvement is specifically set forth in the Summary Report and hence should provide an adequate framework for the required decision-making process. By officially stating its concern, the Department of Conservation has underscored the need for such an ongoing reappraisal. The reiteration of this concern is warranted and is in consonance with the State's position furnished this office by separate correspondence which indicated approval of the early action program since channel improvements were not included.

For your information, a copy of this letter will be bound as part of the formal comments to the Summary Report in order to insure that these points are made a matter of record.

Your continued cooperation is appreciated.

Sincerely yours,

CARROLL N. LeTELLIER
Colonel, CE
District Engineer
Chairman, Coordinating Committee

GREATER EGYPT REGIONAL PLANNING & DEVELOPMENT COMMISSION

211 1/2 west main st. carbondale, illinois/62901/area code 618-549-3306

April 21, 1971

Colonel Carroll N. LeTellier
U.S. Army Corps of Engineers
210 North 12th Boulevard
St. Louis, Missouri 63101

RE: Comprehensive Basin Study
Big Muddy River, Illinois

Dear Colonel LeTellier:

At its regular monthly meeting on Tuesday, April 13, 1971, held at the Perry County Courthouse, Pinckneyville, Illinois, the Greater Egypt Regional Planning and Development Commission went on record as reaffirming its support of the Big Muddy River Comprehensive Basin Study.

Over the past several years the Commission staff has been assisting the Project Formulation Work Committee on this study. The staff has attempted to translate to this Committee the planning concerns of the five counties that are not only the Greater Egypt Region, but also the major geographic portion of the Big Muddy Basin.

The early action program as outlined within the Summary Report presents a well-rounded approach to solving some of the Region's economic, environmental, recreational, and land development problems. The anticipated creation of the major structural improvements bring with them the hope of furthering the goals as set forth by the Commission in the Comprehensive Plan for the Greater Egypt Region 1964, as well as in the Comprehensive Plan-Jefferson County, Illinois 1970, an addition to the Regional Plan.

The Basin Plan goes beyond the normal structural improvements, however, to also consider the environmental and land development concerns so essential to the Region's strategy of dispersed concentration. It affords the balance being demanded today in our efforts to develop with nature. The Comprehensive Basin Study further considers some very pressing physical and governmental problems. These are concerns for strengthened local planning, rehabilitation of strip mines, preservation of archaeological and flood plain environments, and further studies leading to the understanding of relationships of water distribution, sewage collection and local government tax base and revenue on future development areas.

As a representative of local interest, we thank the members of the Coordinating Committee and yourself as Chairman of that Committee for the opportunities extended to local interests (both of the Planning Commission and the Conservancy Districts) to give inputs at an early enough stage in the planning process to feel the inputs were truly part of the development of this Plan.

Again, on behalf of the Commission, I want to restate our support for this program and assure you that we will continue in our efforts to work with those agencies that will have the tasks of implementing the Plan after its approval by the Water Resources Council.

Sincerely for the Commission,

Franklyn H. Moreno
Executive Director

FHM:mm

Kinkaid-Reeds Creek Conservancy District

Jackson County Courthouse
Murphysboro, Illinois 62966

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April 14, 1971

Colonel Caroll LeTellier, Chairman Coordinating Committee
U.S. Army Corps of Engineers
210 North 12th Boulevard
St. Louis, Missouri 63101

Dear Colonel LeTellier:

The Kinkaid-Reed's Creek Conservancy District is presenting you with their official comments relative to the "Summary Report", "Big Muddy River, Comprehensive Basin Study".

The Kinkaid-Reed's Creek Conservancy District Board of Trustees are of the opinion that the proposals of the "Summary Report" are excellent and if implemented this basin would move up toward national averages in income, age, and education. The Board of Trustees are aware of the Congressional intent of funding projects that are most feasible when regional benefits are accured along with national benefits, quality of life, and social welfare. It is the hope of this board that the Water Resource Council and the Congress continue this important evaluation of regional benefits as this may well be the way to make our area a national norm rather than a national burden to the nation as a whole.

The Conservancy District would like further to comment on Section two of the recommendations. In as much as the Conservancy District will be looked to as

an action agency for implementation of the Basin Plan if approved and funded, therefore we feel we should inform you of the district's sincere interest in the strip mine reclamation of our basin. The funding of this program would have far reaching effects on stream quality, general taxation, quality of life, and social welfare. We realize the need to utilize this resource, but we feel a need for stricter regulations on mining methods, as well as, technicalogical research on reclamation of those areas that were mined many years ago without concern for the enviromental qualities. We truly appreciate the responce given to strip mine problems by the Coordinating Committee and hope that the Water Resource Council and Congress also understand the need for rectifying this situation.

We of the Board wish to further recommend the undertaking of the entire "Early Action Program"; since this plan shows the most promising resource use in relation to the basin is ecology especially in the "Green Belt" concept. This concept not only preserves the stream ecology but will assist in the wisest use of the river flood planes.

If this Board can be of any assistance in the finalization of this plan, please feel free to contact us.

Sincerely,
for
Kinkaid-Reed's Creek
Conservancy District

David V. Fligor

David V. Fligor
Manager

DVF:blt

REND LAKE CONSERVANCY DISTRICT
P.O. BOX 497 · 1600 MARCUM BRANCH RD. · BENTON, ILLINOIS 62812 · TELEPHONE (618) 439-4321

April 23, 1971

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Colonel Carroll N. LeTellier
District Engineer
Department of the Army
St. Louis District, Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101

Dear Colonel LeTellier:

I have just completed my review of the Summary Report on the Big Muddy River Comprehensive Basin Study. I found it to be a very excellent master plan for water resource development of this Southern Illinois area.

I have been privileged to participate in monitoring the study as it has progressed over the last few years, and was asked to contribute to its content. With this privilege, I feel that the voice of local people has been heard, and many of our needs, ideas and hopes are contained in the report.

It is my hope that the Water Resource Council of the United States receives the recommendations favorably and place a high priority on the "Early Action Program" so desperately needed in this area. Any assistance I may offer to its presentation to higher bodies would be welcomed.

I want to congratulate you and the Committee for a job well done.

Sincerely,

Rend Lake Conservancy District

Richard D. Jones

Richard D. Jones
Manager