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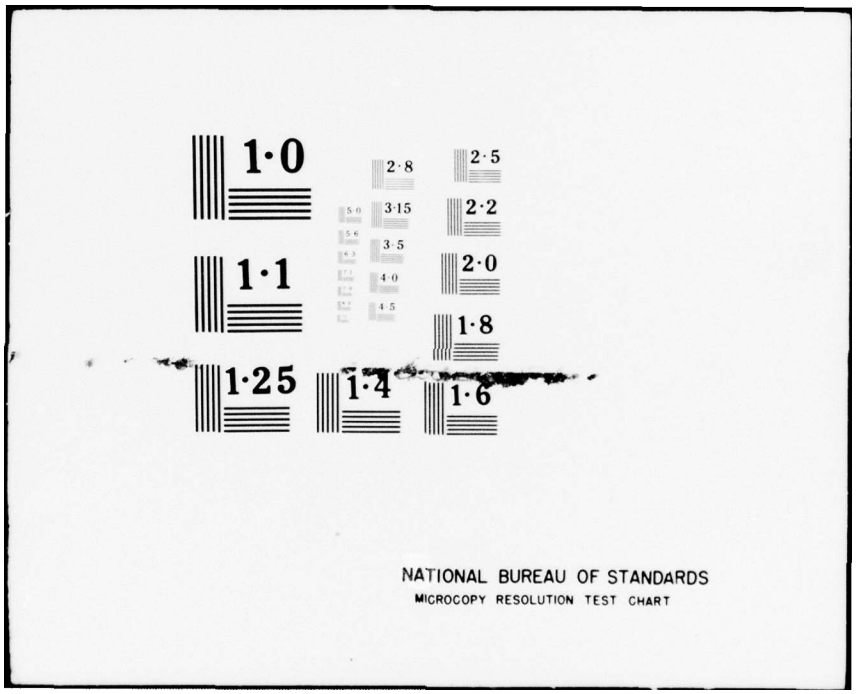
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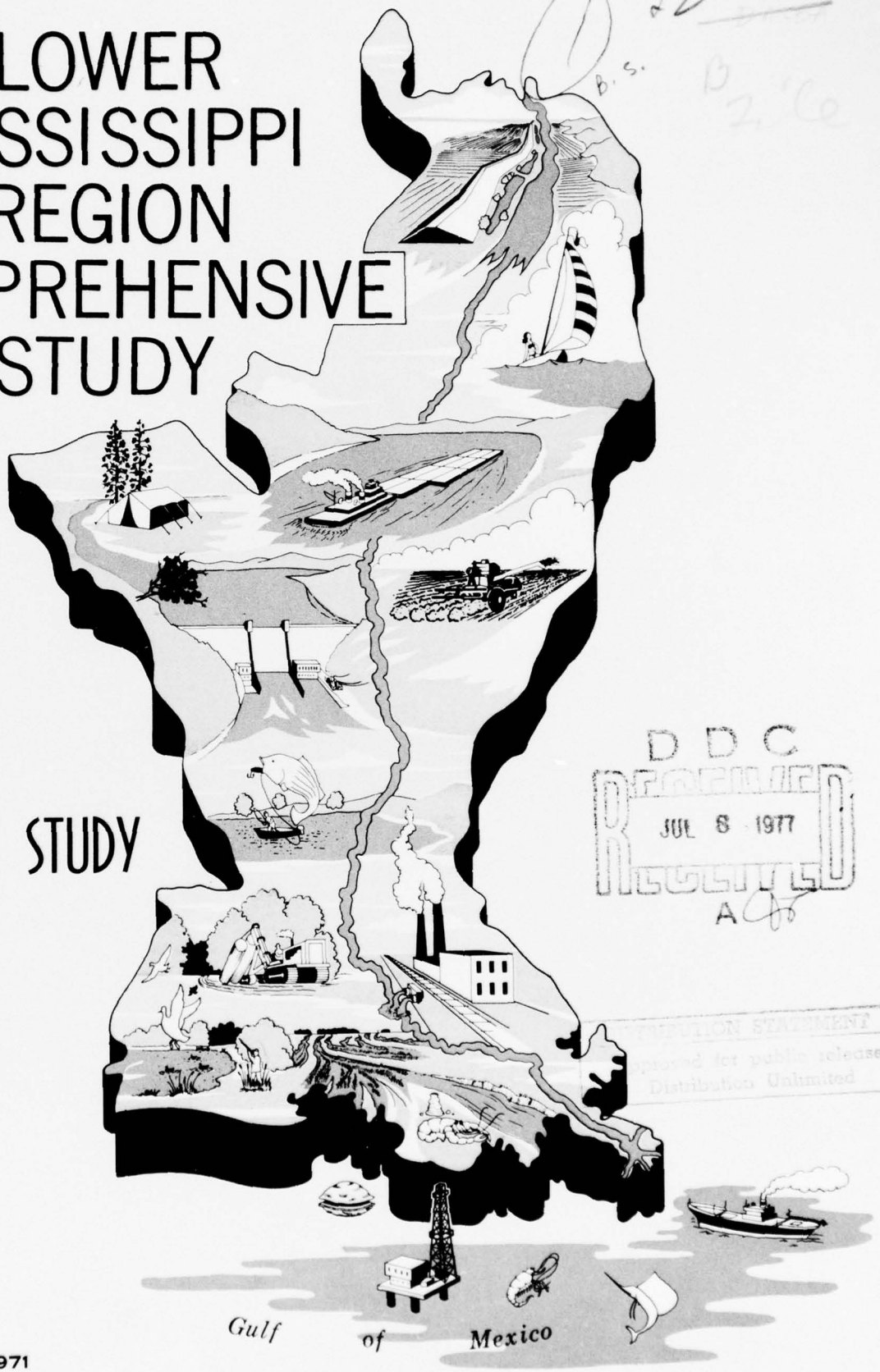

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LOWER MISSISSIPPI REGION COMPREHENSIVE STUDY
PLAN OF STUDY

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LOWER MISSISSIPPI REGION COMPREHENSIVE STUDY
PLAN OF STUDY

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PLAN OF STUDY
LOWER MISSISSIPPI REGION COMPREHENSIVE STUDY

SUMMARY

The Lower Mississippi Region Comprehensive Study is being conducted under the general authority of Section 209 of Title I of the Flood Control Act of 1966 to provide a framework plan as a guide for the wise development of water and related land resources in the Lower Mississippi Region. The study will be generally conducted in accordance with the Water Resources Council's guidelines, and the advice of the Water Resources Council's liaison team will regularly be sought. The area in the Lower Mississippi Region and the subdivision of the area into water resource planning areas are shown on Plate I.

Development of the plan is a partnership responsibility of seven Alluvial Valley States and the agencies of the concerned Federal Departments. Policy guidance at field level is provided by a coordinating committee composed of representatives of these States and agencies and chaired by the President of the Mississippi River Commission. A number of subcommittees are provided to assure the needed coordination between related functions.

To facilitate the selection of an optimum plan or program, four separate programs will be formulated that give special emphasis to measures that will meet environmental, national income, regional development, and well-being demands. An effort will then be made to select the proper blend of these four programs to best satisfy the desires of the people. The resulting program will be presented in three phases; measures needed by 1980; by 2000; and by 2020. Priorities will be established, and agencies responsible for conducting further studies to recommend specific measures required to implement the program will be identified.

The study was initiated in late FY 70. According to the present schedule, the recommended plan will be available by the end of FY 72, and the report presenting the program and the recommendations of the Coordinating Committee will be completed in FY 73.

PLAN OF STUDY
LOWER MISSISSIPPI REGION COMPREHENSIVE

I. PURPOSE

The purpose of the Plan of Study is to present:

The objectives of the study, including the products to be obtained;

The geographic area of the study and the breakdown into appropriate subdivisions;

The organization that will execute the study, including the areas of responsibility;

The methodology that will be employed to develop the demands, resources, and programs, including the relationship between elements and necessary exchange;

A schedule for conducting the study that will be a satisfactory tool for measuring progress; and

A description of the method of reporting the results of the study.

II. AUTHORITY

In response to the recommendations of the Senate Select Committee on National Water Resources, the executive branch prepared a program for comprehensive planning that provides for framework studies for 18 major river basins in the United States, including the Lower Mississippi. In Section 209, Title I of the Flood Control Act of 1966, Congress directed the Secretary of the Army to have the Chief of Engineers prepare a framework plan for the Lower Mississippi, thus providing the basic authority for this study. The States of Arkansas, Illinois, Kentucky, Louisiana, Mississippi, Missouri, and Tennessee; and the Departments of Agriculture; Commerce; Health, Education, and Welfare: Housing and Urban Development; Interior; Labor; Transportation; Federal Power Commission; and the Environmental Protection Agency are participating in the study under appropriate general and specific authorities. Congress appropriated funds to initiate the study in Fiscal Year 1970 as one of the Water Resources Council's program of 18 comprehensive studies to be undertaken within the provision of the Water Resources Planning Act.

III. REGION AND SUBREGIONS

BRIEF DESCRIPTION OF THE REGION

The area in the Lower Mississippi Region includes the drainage area of the Mississippi River below the mouth of the Ohio, except for the

White, Arkansas, and Red Rivers above the effects of Mississippi River backwater; the Louisiana Coastal Area between the drainage divides of the Pearl and Sabine Rivers; and the flood-protected area at Cairo, Illinois. Approximately one-third of this area is located within the alluvial valley of the Mississippi River, which is relatively flat and extremely fertile. The area surrounding the valley varies from the more gentle relief of Bayou Meto and Grand Prairie to the more rugged, mountainous area in the Ouachita Basin. All of the Louisiana coastal marshes are considered to be within the study area. The Lower Mississippi River drains 41 percent of the 48 continental States in the United States. The drainage area of the Mississippi River includes areas in 31 States and two Canadian provinces.

WATER RESOURCE PLANNING AREAS BY HYDROLOGIC AREAS

While some of the water problems and demands relate to the entire region, the total problems in this vast area are too complex to attempt a solution on a regional basis. To provide a practical basis for plan formulation, the region has been subdivided into the following hydrologic areas which are referred to as water resource planning areas, and which can be found on Plate 1:

WRPA 1. The main stem of the Mississippi River below the mouth of the Ohio extending to and including the levees or to the top bank where levees do not exist.

WRPA 2. The St. Francis, Lower White, and Bayou Meto Basins, including the Arkansas River below Pine Bluff.

WRPA 3. The basins in west Kentucky, west Tennessee, and the Cairo area.

WRPA 4. The Yazoo Basin.

WRPA 5. The Ouachita Basin, including the Lower Red River below Hot Wells, Louisiana.

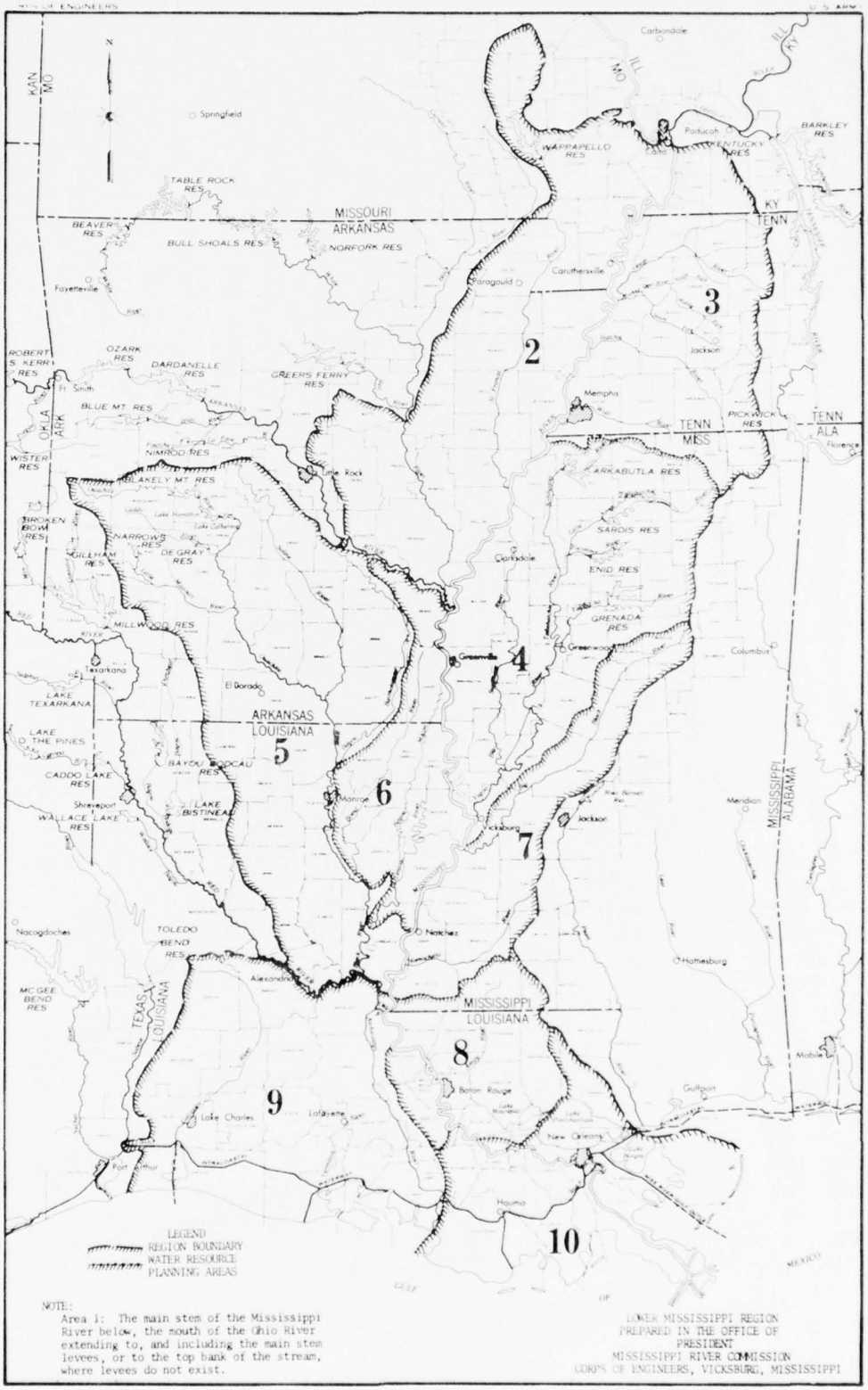
WRPA 6. The Boeuf and Tensas Basin.

WRPA 7. The Big Black Basin and basins of southwest Mississippi streams that drain into the Mississippi River.

WRPA 8. The Baton Rouge area, including the drainage area of streams that flow into Lake Pontchartrain except for the Tchefuncta River and streams to the east.

WRPA 9. The Louisiana Coastal Area from the east limits of the Atchafalaya Floodway to the Sabine River.

WRPA 10. The New Orleans area, including the Tchefuncta area and the area east of the Atchafalaya Floodway.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GREERS FERRY RES
ROBERT S. KERR RES
Ft. Smith
Memphis
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Little Rock
ARKABUTLA RES
BROKEN BOW RES
NARROWS RES
DE GRAY RES
GILLHAM RES
SARDIS RES
ENID RES
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MILLWOOD RES
Texarkana
El Dorado
Columbus
LAKE TEXARKANA
ARKANSAS
LOUISIANA
LAKE O' THE PINES
BAYOU BODCAU RES
CADDO LAKE RES
Monroe
Meridian
Shreveport
WALLACE LAKE RES
LAKE BISTINEAU
Vicksburg
Jackson
MISSISSIPPI
ALABAMA
Natchitoches
TOLEDO BEND RES
Natchez
Hattiesburg
MCGEE BEND RES
TEXAS
LOUISIANA
MISSISSIPPI
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Alexandria
Mobile
Baton Rouge
Gulfport
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Lafayette
New Orleans
Houma
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10
LEGEND
REGION BOUNDARY
WATER RESOURCE PLANNING AREAS
NOTE:
Area 1: The main stem of the Mississippi River below the mouth of the Ohio River extending to, and including the main stem levees, or to the top bank of the stream, where levees do not exist.
LOWER MISSISSIPPI REGION
PREPARED IN THE OFFICE OF
PRESIDENT
MISSISSIPPI RIVER COMMISSION
CORPS OF ENGINEERS, VICKSBURG, MISSISSIPPI

Plate 1

WATER RESOURCES PLANNING AREAS BY COUNTIES AND PARISHES

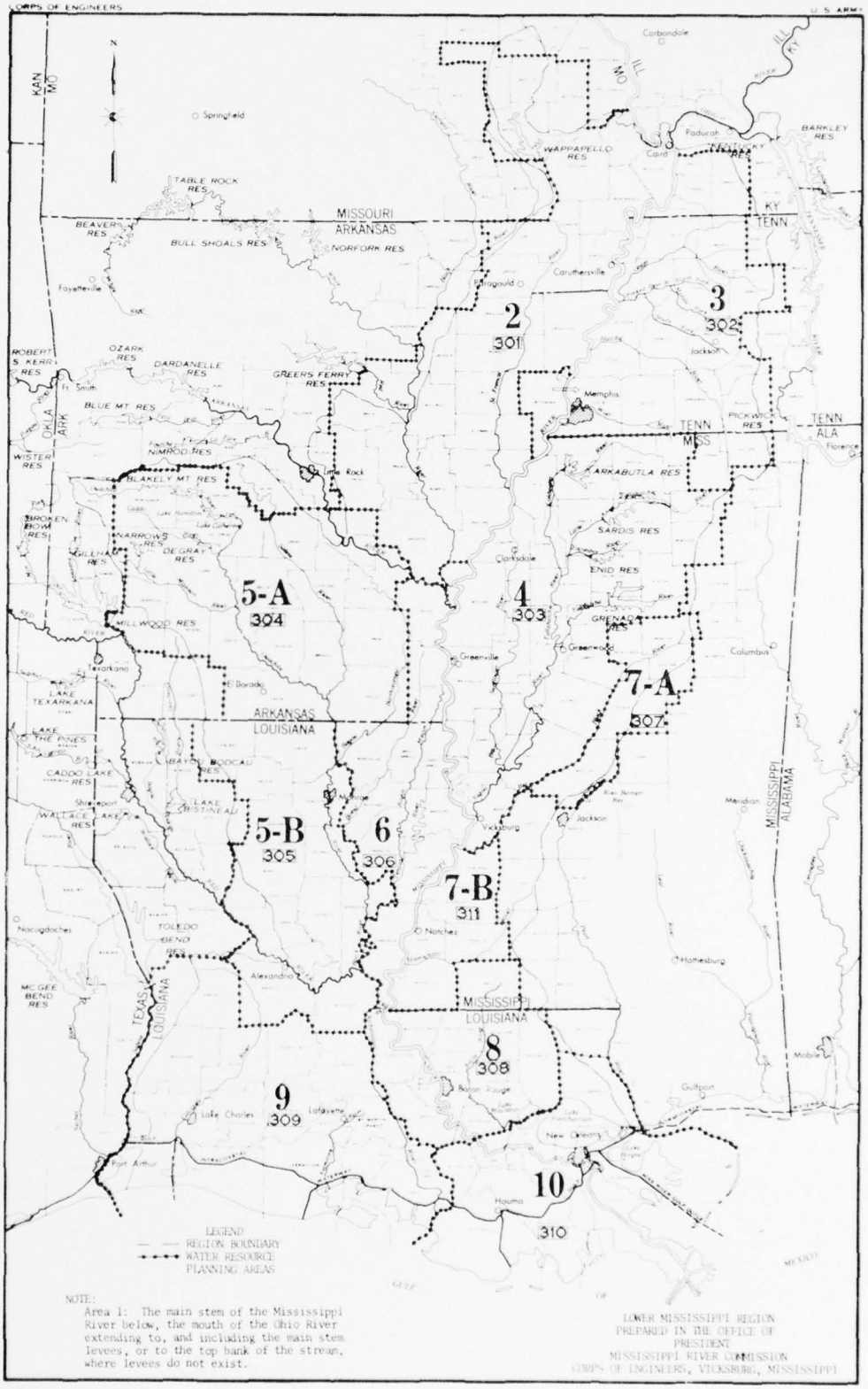
All of the purposes considered in water resource development do not follow hydrologic boundaries. In fact, if the region were subdivided to form related areas for each purpose, such as recreation or water supply, there would probably be as many subdivisions as purposes. This approach is impractical for presentation purposes. Therefore, planning may be done on other subdivisions but will be converted to WRPA boundaries. For economic purposes only, the hydrologic boundaries are adjusted to conform to county and parish lines. The county line boundaries are shown on Plate 2. Information will not be presented on a State breakdown in the report. However, if the States need such information, it will be furnished as accurately as possible without extensive additional investigations.

IV. OBJECTIVES OF THE STUDY

The objective of the Lower Mississippi Region Comprehensive Study is to develop a program which integrates a system of measures that will assure an orderly development of the water and related land resources of the region, and which is responsive to the majority of the people. To be meaningful, the program must include specific measures so decision makers can readily see what is intended. At the same time, the program must be sufficiently flexible to accommodate change as the region changes or as the demands of the people change. A unified program will be presented which is responsive to the demands; one which will probably require the combined efforts of Federal, State, local, and private efforts to implement.

One of the first steps in the study is to analyze the potential resources available in terms of ground water, surface water, and land. These resources may be complemented by measures in an effort to satisfy demand.

Demand for water resources to the year 2020 will be expressed for such purposes as municipal and industrial water supply; irrigation; water and related needs for water quality control; land needing flood control; water and land for outdoor recreation; scenic and historic area enhancement; fish and wildlife enhancement; hydropower; land treatment; and navigation. In order to estimate these demands, the population, the standard of living, and the employment distribution and industrial production will be projected. Significant changes in the population from rural to urban, in employment from agricultural to industrial, and an increased standard of living may produce corresponding changes in the magnitude and in the distribution of water demands. At the present, conflicts are arising over attempts to satisfy water needs that compete for resources. Adequate response to public demand in the future may necessitate a shift in the emphasis of development, and also an increase in the rate of funding for water programs.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WAPPAPELLO RES
TABLE ROCK RES
MISSOURI
ARKANSAS
BEAVER RES
BULL SHOALS RES
NORFORK RES
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OZARK RES
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MILLWOOD RES
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El Dorado
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ARKANSAS
LOUISIANA
LAKE OF THE PINES
BAYOU BODCAU RES
CADDO LAKE RES
Shreveport
LAKE BISTINEAU
WALLACE LAKE RES
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Alexandria
Hattiesburg
MCGEE BEND RES
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Baton Rouge
Gulfport
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309
Lafayette
Lake Charles
New Orleans
Port Arthur
10
Houma
310
LEGEND
REGION BOUNDARY
WATER RESOURCE PLANNING AREAS
NOTE:
Area 1: The main stem of the Mississippi River below, the mouth of the Ohio River extending to, and including the main stem levees, or to the top bank of the stream, where levees do not exist.
LOWER MISSISSIPPI REGION
PREPARED IN THE OFFICE OF
PRESIDENT
MISSISSIPPI RIVER COMMISSION
CORPS OF ENGINEERS, VICKSBURG, MISSISSIPPI

Plate 2

Measures that expand the ability of resources to meet demands or that reduce the demand will be fused into four alternative programs that give primary emphasis to the environment, regional development, national income, and well-being. Each program will attempt to meet the other objectives after satisfying the objective of primary emphasis.

The program or a blend of programs that best reflect the demands of the people in the region will be selected. The impact of this program, particularly on the economy and natural environment, will be assessed and any irreversible commitments will be identified.

The program will be time-phased to indicate the portions that should be operational by the years 1980, 2000, and 2020. Means of implementing the program and agencies or States responsible for implementation will be indicated for the 1980 and 2000 phases.

In view of the plentiful supply of land and water throughout the region, including underground supplies, rainfall, and streamflows, a primary goal of the framework study will be to formulate plans for water and related land resource development which can serve as a catalyst for growth throughout the Lower Mississippi Region.

Preliminary economic projections by OBERS forecast a lower rate of development for the Lower Mississippi Region than for any other major water basin of the country, except the Souris-Red in northern North Dakota and Minnesota.

Of equal significance, moreover, is the forecast by OBERS that the income per resident of the Lower Mississippi Region will be lower than in any other water basin throughout the period 1970-2020.

The availability of the resources in the Lower Mississippi Region for development and the disparity between economic parameters for the Lower Mississippi Region and the national averages as evidenced by OBERS projections suggest there are opportunities for expansion at the economic base of the region.

The cost of the programs will be estimated and compared with the historic expenditures for water resource development in the region in order to point out the present rate of development, and to indicate the magnitude of the demands on the Nation's future expenditures. Effects of failure to meet the demands will be discussed.

V. ORGANIZATION AND MANAGEMENT

THE COORDINATING COMMITTEE

The guidance and direction of the Comprehensive Study at the field level will be provided by a Coordinating Committee chaired by the President of the Mississippi River Commission, representing the Department

of the Army. Representatives of the States of Arkansas, Illinois, Kentucky, Louisiana, Mississippi, Missouri, and Tennessee, and the Federal Departments of Agriculture; Commerce; Health, Education, and Welfare; Housing and Urban Development; Interior; Transportation; Federal Power Commission; and the Environmental Protection Agency complete the remainder of the committee as shown in Annex 1. The organization established to conduct the study effort is shown on page 8. Some of the functions of the Coordinating Committee are:

1. Establish the general objectives for the study.

2. Review and adopt a plan of study that will show methodology, schedules, and agency responsibilities.

3. Receive information from the Water Resources Council and arms of the executive branch regarding national policy and see that it is carried out.

4. Review and annually submit a coordinated Federal budget.

5. Hear conflicts between participants and attempt an amiable resolution.

6. Monitor progress on the study and suggest actions needed to stay on schedule.

7. Solicit views, primarily through State members of the public concerning water needs in the region.

8. Organize and instruct committees and subcommittees as necessary to conduct the study.

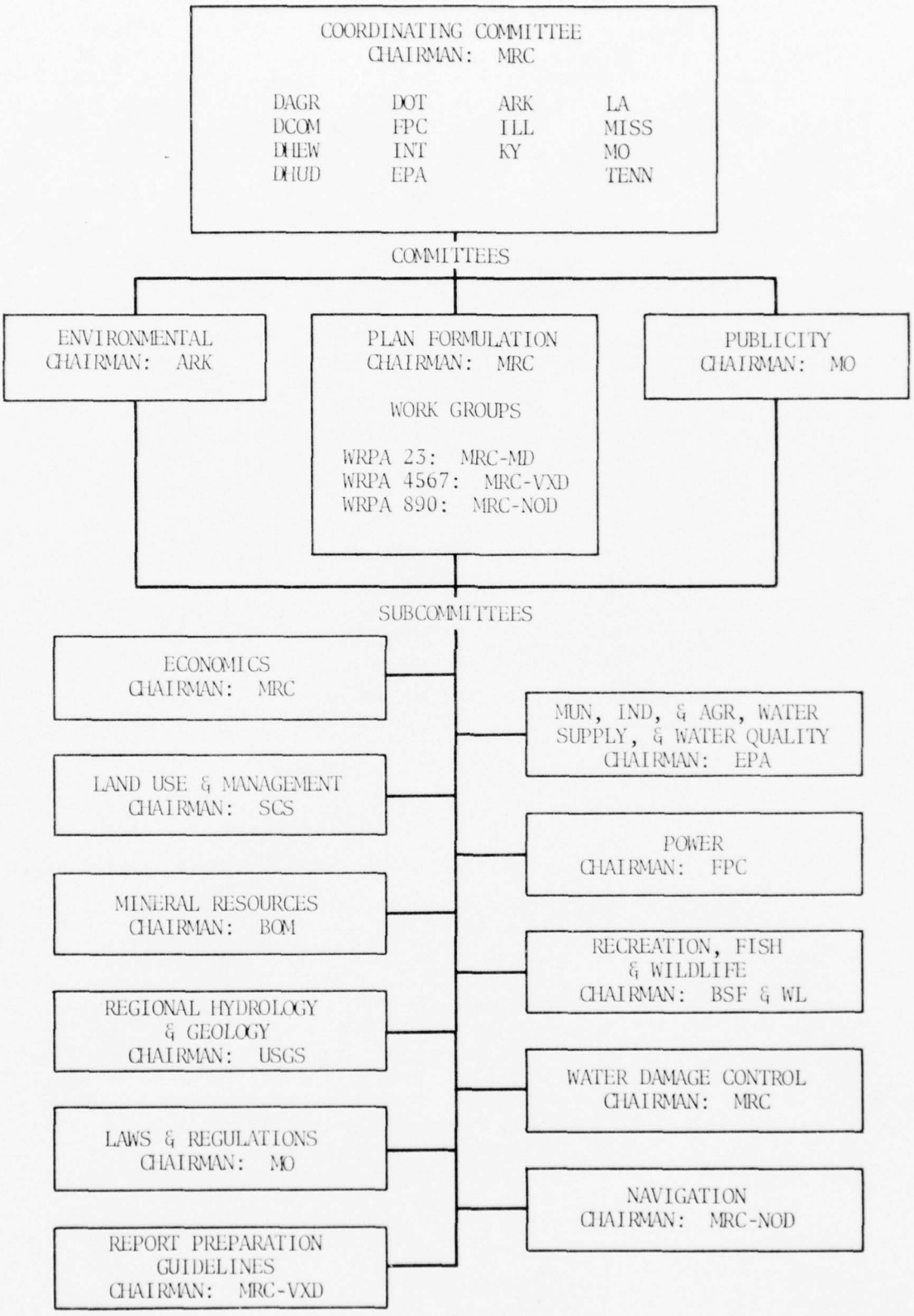
9. Adopt a recommended program of development.

10. Present the results of the study to the public.

11. Review and approve a report transmitting the results of the study.

The Coordinating Committee will meet on an "as needed" basis which will probably result in three or four meetings per year. Normally, the meetings will be held in Memphis, Tennessee; Jackson, Mississippi; or New Orleans, Louisiana; because of transportation facilities. Many of the meetings will be held near the respective airports to reduce the time required. Members will determine the additional representation from the State or agency that should attend. Except for executive sessions, the meetings will be open to the public. However, little interest is anticipated until results are presented. The announcement and the program for the meetings will be prepared by the Executive Secretary, who is the Chief of the Planning Division at the Mississippi River Commission. Items suggested by members for inclusion on the agenda will be submitted

LOWER MISSISSIPPI REGION COMPREHENSIVE STUDY
ORGANIZATION CHART



to the Executive Secretary at least 2 weeks prior to the meeting. In matters requiring a decision by the Coordinating Committee, the Chairman will develop and announce the sense of the group. In matters where differing opinions surface, sincere efforts will be made to remove objections and develop unanimous opinions. However, on occasions it may be necessary to proceed with the consensus of the group. "Voting will not be employed" in decision making. Summaries of meetings will be furnished by the Executive Secretary to all participants.

THE PLAN FORMULATION COMMITTEE

Implementing the decisions of the Coordinating Committee and serving as a central clearinghouse between coordinating committee meetings is the responsibility of the Plan Formulation Committee. Agency and State representation making up this committee and the current membership are listed in Annex 2. This group, since it bears a heavy administrative function, will probably meet more often than any other element of the study team. The Chairman will maintain regular contact with subcommittee chairmen to assure timely coordination; to avoid duplication; to be sure the pieces fit together; and to avoid delays. The Chairman of the Plan Formulation Committee (PF) will serve as the coordinator for the total study effort. He will be assisted in this effort by the Plan Formulation work group leaders. Problems of policy nature will be referred to the Coordinating Committee, with a suggested course of action.

PLAN FORMULATION WORK GROUPS

Primary responsibility of the work group leaders is the formulation of the development programs for their respective areas of responsibility. Generally, the various programs will be developed for each WRPA. The organization and membership of these work groups are shown in Annex 2.

THE SUBCOMMITTEES

Some of the elements of the comprehensive studies are more closely related than others. These elements have been grouped by subcommittees to provide a ready mechanism to coordinate efforts where the timing of assumptions on outputs affecting these elements need to be discussed. Meetings should be on an infrequent basis and agencies may have an information membership, which means they are informed of the meetings and receive minutes of the meetings, but attend only when items refer specially to their area of concern. Subcommittee chairmen will exchange information regularly with the leaders for each element under the subcommittee. Unresolved problems will be reported to the Chairman of the PF Committee. Progress reports submitted through the subcommittee chairmen should relate to items on the activities sequence diagrams. These diagrams, which have been prepared for each study element, are shown in Section XIII. The various committees, subcommittees, the pertinent study elements, and members are listed in Annex 2. A directory is also provided (Annex 5) which gives the names and addresses of all study participants by their respective agencies.

AD HOC COMMITTEES

Functions that may not require an active organization for the full duration of the study will be handled by ad hoc committees. To date, two ad hoc committees have been formed. The first, the Publicity Committee, is guiding the establishment of advisory groups in each State that will be informed of the study effort and asked to suggest areas of concern; to review programs of development; and to discuss alternatives and degree of development before a recommended program is selected. The second, the Environmental Committee, is developing a list of natural land and water areas that should be specially treated because of their value as scenic, historic, or fish and wildlife habitat, and a description of the action needed to enhance, restore, or preserve these areas. This information will be channeled through PF to the Economics Subcommittee to determine if it will restrict the anticipated economic development under the National Income or Regional Development concepts. The information will be furnished other subcommittees in an attempt to avoid suggestions for competitive development where possible. The list will ultimately be used by Plan Formulation as possible input to the Environmental, Regional Development, National Income, and Well-being Programs.

VI. RESUME OF EXISTING WATER AND RELATED LAND RESOURCE DEVELOPMENT

FLOOD PREVENTION AND CONTROL

Extensive flood control measures have been installed throughout the Lower Mississippi Valley Region. A large portion of the study area, or approximately 55,000 square miles, would be overflowed by a great flood on the Mississippi River if it were not for a system of main line and backwater levees, floodways, reservoirs, and channel improvements in the alluvial valley. As a result of these improvements, approximately 24,000 square miles receive essentially complete protection and about 3,600 square miles in backwater areas and floodways receive a lesser degree of protection. In addition, systems of reservoirs, levees, and channel improvements reduce or prevent flooding from the runoff from hill and mountain streams. Completed and under-construction reservoirs include a total flood control storage of 5,384,700 acre-feet, comprising 3,835,000 acre-feet in the Yazoo Basin; 586,400 acre-feet in the St. Francis Basin; and 972,400 acre-feet in the Ouachita Basin. In addition, 150 watershed work plans have been completed, of which 90 percent are in Mississippi, Arkansas, and Louisiana. These plans include over 800 floodwater-retarding structures that will provide over 727,000 acre-feet of flood control storage. Over 50 percent of these structures, which provide 375,000 acre-feet of flood control storage, have been completed. Major outlet works have been constructed in the St. Francis, Boeuf-Tensas, and Sunflower Basins to speed the runoff of rainfall on these flat delta areas. These systems are enlarged as land clearing is continued and lateral improvements are extended. Major channel-improvement projects have been constructed or are authorized in other

areas such as the Amite River in Louisiana, and the west Kentucky, and west Tennessee tributaries.

HURRICANE PROTECTION

The increasing concentration of population in the Lower Mississippi Region's coastal area is very significant. The present population is in excess of 3,600,000 and the rate of growth associated with this population figure is in excess of 2 percent. This population growth and the frequency and severity of hurricanes reaching the coastal area have justified the authorization of four projects which, when completed, will provide a degree of assurance to the metropolitan New Orleans area, the Mississippi River Delta communities in Plaquemines Parish, the communities on the Bayou Lafourche ridge, and the Morgan City-Franklin area.

NAVIGATION

The main stem of the Mississippi River within the alluvial valley is the hub of our inland waterway system. A 12-foot inland waterway is authorized for the Mississippi River above Baton Rouge in the Lower Mississippi Valley Region. A 9-foot channel is currently maintained and realization of the full 12-foot channel is dependent on availability of funds. In 1969, 76 million tons of waterborne commerce were moved between Cairo and Baton Rouge; 110 million tons, between Baton Rouge and New Orleans; and 142 million tons, between New Orleans and the Gulf of Mexico. The Gulf Intracoastal Waterway, which passes through New Orleans, traverses the entire coastal portion of the region. Deepwater ship channels are maintained to Baton Rouge on the Mississippi River, with an authorized depth of 40 feet; to New Orleans through the Gulf Outlet Project with an authorized depth of 36 feet; on the Calcasieu River upstream to Lake Charles, with an authorized depth of 40 feet; and a channel 20 feet deep is authorized on the Atchafalaya River to the vicinity of Morgan City. A 9-foot navigation project is under construction to Camden on the Ouachita and Arkansas River, and a shallow-draft channel is maintained on the White River. Numerous access channels and harbors are maintained along the Louisiana coast and the inland rivers.

WATER SUPPLY (MUNICIPAL, INDUSTRIAL, RURAL, AND DOMESTIC)

The primary sources of water supply in the Lower Mississippi Region at the present time are the Mississippi River and its tributaries and ground water from the alluvial and deep aquifers. Storage, specifically for water-supply releases, is included in DeGray Reservoir, which is now under construction on Caddo River, a tributary of the Ouachita. The largest municipal and industrial water-supply users at the present time are the city of New Orleans and the chemical industries located along the Mississippi River from Baton Rouge to New Orleans, which use over 5 billion gallons of water per day. Both the city and industries rely on the Mississippi as the principal source of water supply. Many industries rely upon ground-water supplies. Other water users of growing importance

are the urban areas and their industries, particularly the Lake Charles area and its industrial complex. Electric power condenser cooling (in 1965) required withdrawals in excess of 1.6 billion gallons per day from fresh water sources, of which in excess of 16 million gallons per day were consumed.

RECREATION

The water-based recreation facilities are receiving primary attention today because of the public demand. The seven Federal reservoirs in operation in 1969 recorded a visitation of 12,088,500 recreation days. There are seven national forests, all or parts of which are managed and open to the public for recreation, fishing, and hunting. Eleven of the watershed work plans contain multiple-purpose reservoirs serving recreation and fish and wildlife purposes on over 20,000 surface-acres of water. The six National Park Service areas in operation in 1967 enjoyed a visitation of 4,115,500 recreation days. In addition, the states operate 31 state parks within the Lower Mississippi Region, many of which are water-oriented. Outdoor-recreation demands will be partially satisfied through developments on individual farms and other elements of the private sector of the economy. In the fishing area, heavy use is made of the cutoff bendways on the Mississippi River and other streams; of the lakes, such as Pontchartrain and Maurepas; of natural streams; of farm ponds and commercial fee fishing ponds; and of the coastal bays. However, actual participation data are not available.

WATER QUALITY

Water-quality storage is included in DeGray Reservoir for downstream release; and the other reservoirs, while not designed for that purpose, also provide releases that improve downstream water quality. Four control structures are authorized for construction below New Orleans to release Mississippi River waters to the adjacent bays to improve quality. The planned treatment and upstream water-control measures reduces the silt load that otherwise would enter the streams in the region. Also, some access channels and pumping plants have been installed to divert water for water-quality purposes. The bank stabilization program on the Mississippi and its tributary rivers will improve the quality of the water by reducing the silt load. The existing and planned treatment facilities for municipal and industrial wastes will improve the quality of the Mississippi River and tributaries and the water supplies of many users.

FISH AND WILDLIFE

There are 11 Federal fish and wildlife management areas within the region, in addition to the areas set aside by the respective states. The bay and estuary area along the Louisiana coast is an important source of the Nation's seafood. It provides approximately 20 percent of the national seafood production, including large quantities of shrimp, oysters, fishes, and other seafood. Fish farming is rapidly becoming a major industry in the region. This is of particular importance in a comprehensive study because of the large water requirements involved.

IRRIGATION

Approximately 2,500,000 acres of land were irrigated in 1966 and all indicators point to substantial increases in the future. A large percentage of the acres irrigated were used for rice production. Estimated growth in water requirements for irrigation parallels the growth in acres irrigated. Ground water is available to sustain additional irrigation development in much of the alluvial valley. As the demand increases in the future, additional use of surface water is anticipated, with some storage for these purposes indicated. As an example, three watershed work plans now include storage for irrigation, totaling approximately 46,000 acre-feet.

POWER

The region relies on thermal power resources to meet the major base load requirements, with limited integrated hydroelectric facilities to assist in meeting peaking power needs and reserve requirements. Within the boundaries of the region, the existing, under-construction, and definitely planned hydroelectric power resources total 233,800 kilowatts of installed capacity of which 65,300 kilowatts are owned by private interests and operated under the Federal Power Commission license.

WATERSHED IMPROVEMENT

There is a wide range of land use and cover conditions in the region. Large areas in the alluvial valley are approaching 75 to 80 percent cleared and are being used for cropland or pasture areas, while woodlands still occupy over 80 percent of the land area in the mountain areas of the Ouachita but reduces to about 40 percent in some hill areas. The runoff and erosion can be reduced considerably by management of land uses, such as cropland, forest, and grassland. To date, approximately 150 watershed work plans have been completed that would affect about 8.4 million acres of land within these watershed areas. The land-treatment measures are estimated to be about 52 percent complete. In the Yazoo River Basin, an accelerated land-treatment program has been in effect since 1944. As a result, about 75 percent of the land treatment measures have been completed. The small watershed program is being developed extensively in all parts of the region except for the portion in the State of Missouri and the Ouachita Basin. Over 86,000 soil and water conservation plans have been prepared, covering about 17,000,000 acres of land. Two of the largest resource conservation and development projects in Mississippi cover 3.6 million acres.

COASTAL AND ESTUARINE

The southern extremity of the Lower Mississippi Region is comprised of the coastal and estuarine area. The area extends from the Pearl River on the east to the Sabine River on the west and from the Gulf of Mexico on the south, northward to include all of the area within the tidal

influence or roughly the 5-foot contour. The shoreline is heavily indented, particularly in the eastern half, where the topography is dominated by the deltas, both present and past, of the Mississippi River. The area is composed predominantly of marsh, lying at or near the sea level, packed with a multitude of shallow lakes and bays, and interlaced with a labyrinthine network of channels and canals, both natural and manmade. The marsh area encompasses some 3.7 million acres. The salinity of the waters of the lakes, bays, and channels varies from near zero to over 20,000 parts per million, depending upon location and numerous climatological, meteorological, and hydrological factors.

The estuarine environment provides habitat, sanctuary, and breeding grounds for many forms of fish and wildlife. The commercial fish and fur industries represent vital increments of the region's enconomy. The contributions of the estuarine zone to the sports fishery, hunting, and recreational resources are, literally, beyond exaggeration.

VII. CURRENT WATER AND RELATED LAND PROBLEMS

Some of the current water problems in the Lower Mississippi Region are just emerging, while others have been present for some time but have not been solved because of an inadequate Federal or State budget or because of the absence of an organization to promote solutions.

All of the problems discussed in this section are not quantified, since the determination of the extent and magnitude of the region's problems are the major endeavors of the study. Generalization of the magnitude and the extent of the region's problems are made for those areas where these problems have been assessed on a regional basis.

For many years the major water quality problems of the Lower Mississippi River and tributaries were associated with high turbidity, high salinities caused by natural and oil-field brines, and pollution from untreated wastes on the smaller streams. Today the situation is changing rapidly with the increase of municipal and industrial effluents along the Mississippi River from Baton Rouge to New Orleans and in the Memphis and Lake Charles areas. Insufficiently treated wastes in these trade and industrial centers have caused taste and odor problems, toxic metal and chemical contamination, and other hazards to man and his environment.

As the population shifts from rural to urban and people realize a higher disposable income, the water-connected recreation demand grows and shifts. In line with the national surge, concern is being expressed for more consideration of scenic and cultural values. Water courses played a major role in the early development of this country. Many historic sites exist in this region that need marking, access, and other measures to make them valuable to the public.

Erosion, while being checked in many locations by land-treatment measures, still plagues much of the runoff area and reduces the productive capacity of both the area of origin and the area of deposit. To a more

limited extent, losses are being experienced along the Louisiana shoreline. Eroding action, coupled with extensive subsidence, results in the loss of a valuable marshland at a substantial rate. Changes are also being experienced in oceangoing shipping. Large ships are exerting an additional demand for newer, deeper, and larger locks with corresponding channels or some alternate, such as off-shore handling facilities. The port of New Orleans, the second busiest in the United States, is one of the primary areas requesting larger navigation channels and facilities. The combined flow of deep and shallow draft movements through the industrial canal lock at New Orleans often causes delays of several hours. Growth of inland waterway traffic on the Mississippi River and the Gulf Intracoastal Waterway continues to exceed projections. Critical problems do not exist at present, but a systematic analysis of the lower Mississippi area, which is the trunk of the inland waterway system is needed.

The lower Mississippi area is considered to be an area of abundant water supply, but New Orleans is already looking for sources other than the Mississippi River, because of problems resulting from intrusion of the salt-water wedge which sometimes advances to the municipal intake, as well as taste and odor problems resulting from industrial effluent. Houma, Louisiana, likewise, experiences supply problems. Irrigation development is restricted in southwest Louisiana because of salt-water intrusion in the supply aquifer. A large portion of the major flooding problems of the region has been solved and awaits construction of authorized solutions yet, flooding, particularly of flat delta areas, continues in many cases, accelerated by on-farm drainage improvements and urban development.

Perfection of the flood control systems of the region has not been accomplished without adverse effects. Probably one of the greatest adverse effects has been that of the reversal of the dynamism of the estuarine area. Deprived of the cyclical overflow and concomitant sedimentary nourishment which has fixed its essentially-expansionist regime for nearly a thousand years, the estuarine zone is now experiencing areal attenuation and retrograde change in many of the physical and chemical parameters which comprise the estuarine environment. In addition, developmental activities in the area have, in many cases, operated to accelerate these parametric changes, and in recent years it has become evident that the actual existence of the zone is, in fact, threatened. The range of specific problems in water resources development in the coastal area embraces very nearly the full spectrum. The functions of the coastal area are assets which the region and the Nation cannot afford to lose. Hence, the identification of the problems and needs and development of the measures to satisfy these problems and needs in order to ensure the retention of at least a portion of the coastal area is of major priority in the comprehensive study.

In addition to the overall threat to the estuarine environment, specific major water resource problems of concern on coastal areas include hurricane vulnerability and beach erosion. A compelling need exists to identify the long-term needs for hurricane protection and to determine means to satisfy these needs. Of the approximately 8,000 miles of coastal shoreline, only a

small increment, about 20 miles, is protected, and nearly all of the remainder is in retreat.

The streambank erosion problems in the Lower Mississippi Region vary, with locations and streams, from critical to immaterial. Streambanks in the Lower Mississippi River Valley have always eroded and the river, with its tributaries coursing through the alluvium, has meandered over much of the entire valley. On a regional basis, these problems are relatively minor at the present time, with most streams in a stable condition which would indicate that the problems will continue at about the present level. There are, however, individual streams and reaches where the bank-erosion problem is critical and, basically, all streams have a greater problem in the upper reaches where stream gradients are greatest. While some erosion is occurring incident to normal potamological processes on many of the numerous streams in the region, the problem is, by and large, of significant dimensions mainly at bridge and utility crossings. The streambank erosion problem on water courses carrying significant marine traffic is generally minor with respect to intensity except at isolated sites where heavy development is located on, or immediately contiguous to, the bank. All of the erosion problem is, however, of significance due to its widespread extent. Further, the loss of lands may not appear to be significant now or over the next 50 years, but in a longer time frame, may become very significant. There are no urban areas in the Lower Mississippi Region experiencing severe erosion problems. In other areas of the region, of an estimated 180,000 miles of bankline, there are serious bank erosion problems on about 6,000 miles, or about three to four percent of the total length. There are, of course, minor erosion problems on a large percentage of the 180,000 miles of the bankline.

The advent of the soybean as a major export crop economically justified the clearing of vast areas that were not previously profitable to farm. In many cases, these areas were important wildlife habitats. Remaining valuable areas need to be identified and measures recommended that would preserve and enhance these areas.

VIII. SCOPE OF STUDIES

This Comprehensive Study will utilize all readily available information. Collection of additional basic data, particularly if it involves costly field work, will be limited to that absolutely necessary to develop a program. Data collected will normally be of reconnaissance scope. The Plan Formulation Committee is attempting, early in the study, to describe the specific information required to formulate a program to prevent the generation of data that have no bearing on the study recommendations. Data produced by one agency will be made available to other participants to prevent a duplication of effort. The judgment of experienced planners will be sufficient to eliminate measures from further consideration and to make decisions in many instances.

ECONOMIC STUDIES

The economic projections are a very important part of this study since, in most areas, they control the magnitude of the water demand. Information prepared by Office of Business Economic Research Service (OBERS) will be used where available. Data developed by Gulf South Research Institute (GSRI) may be integrated with that for OBERS as an additional means of defining water demands for the water resource planning areas. Potential increases in economic activity will be selected based on the judgment of specialists in each two digit Standard Industrial Classification level that involves water resources. Regrouping of information to fit other planning boundaries used by participants will be done by the Economics Subcommittee without more extensive study. The impact of the various alternative programs considered on the regional and national economy will be analyzed. All of the water demands that can be quantitatively measured will be expressed in a computer program, so that the impact of different assumptions and criteria can be systematically analyzed, and so these demands can be updated as conditions change in the future.

ENGINEERING STUDIES

Engineering studies will be compatible with the assumption that specific projects will not be economically analyzed or scaled. Rather, the feasibility will be judged by experienced planners and costs will be rough estimates. Costs are needed to compare the desirability of projects producing similar outputs and to indicate the magnitude of recommended programs. Cost curves will be used where possible rather than individual estimates. The location and limits of measures proposed will be general, sufficient to accommodate major modifications in the implementation studies.

CONSTRAINTS

One of the primary constraints in this study is that the well-being of all the people is the overriding determinant in selecting measures. Measures that irreversibly commit a resource will be avoided if possible, and specifically indentified if the output appears to justify it use. The public will be encouraged to participate in the Comprehensive Study throughout the study period.

Another basic constraint involves the effect to Mississippi River flows that the upper regions have. The effects that the development of the upper regions will have on the Lower Mississippi Region will be analyzed and evaluated by the study.

OTHER STUDIES

This Comprehensive Study is closely related to a study underway by the Mississippi River Commission, in cooperation with the Southwestern Division of the Corps of Engineers and the Bureau of Reclamation, to determine

the feasibility of exporting any surplus Mississippi River water to arid areas in west Texas and eastern New Mexico. In order to estimate surpluses, if any, in the Mississippi River, it was necessary to estimate water needs in the alluvial valley. These needs were developed for the same water resource planning areas employed in the Comprehensive Study to make as much of the data adaptable as possible. A slightly different set of assumptions was followed in the Import Study from those employed in the Comprehensive. In the Import Study, water is considered needed that could be put to a practical and reasonable use. In the Comprehensive Study, the level of activity for the objectives is projected and corresponding probable demands are developed. The Import Study results are probably most comparable with the regional development objective. Regardless, the preliminary water needs studies for the Import Study will be made available to the participants in the Comprehensive for possible use, and results of comprehensive studies may be used to adjust the final import demands. Both studies are scheduled for completion at the same time to assure comparison for compatibility.

IX. PROGRAM FORMULATION - FOUR BASIC PROGRAMS

Framework plans will be formulated for each of the 10 WRPA's in the region. Work groups have been formed for each WRPA in order to use planners that have a more intimate knowledge of the problems and potential of a more limited area. Occasionally, optimum solutions may span more than one WRPA; in this case formulation will be done concurrently. If a large number of solutions appear feasible, a supply model will be used to assure systematic comparison.

Demands will be expressed for each water resource purpose, for each WRPA, and for each objective (environmental, regional development, national income, and well-being) for the years 1970, 1980, 2000, and 2020. Where a range in demands is furnished, plan formulation will normally attempt to satisfy the midpoint. If failure to meet a demand for a purpose would cause irreparable damage, demands higher than the midpoint should be considered.

A separate program will be formulated for the environmental, regional development, national income, and well-being objectives. The National Income Program will be based on the economic activity indicated by the OBERS projections. The Regional Development Program will be based on the economic activity that would prevail if production is increased through regional economic development programs, which will improve the region's industrial comparative advantage, and more fully utilize the available resources. The Environmental Program will be based on economic levels possible with the full range of natural environment measures in effect that appear practical. The Well-Being Program will be formulated using the alternatives presented in the national income, regional development, and environmental objectives, and other measures as necessary, to enhance social, cultural, and economic opportunities.

In the formulation process, priority will be given to measures

that satisfy the demands that are most responsive to the objective that is emphasized in the program. Those measures will be selected that produce the maximum output per unit of cost. Since the output will not always be expressed in monetary terms or identical units, judgment will be required. Where alternative measures appear equally desirable in a program, both may be included, and the advantages and disadvantages described. This will be the exception rather than the rule, however. After the demand levels are met to the extent practical for the primary objective, additional measures will be included to satisfy any unmet demands for the other two objectives. Since the world of the future may not be as envisioned in the projections, measures that can be easily modified to serve different purposes will be given preference. Nonstructural measures will receive equal treatment with structural measures. All measures must be feasible for implementation to qualify for inclusion in a program.

The four alternative programs will be presented to the advisory groups for each state included in the WRPA. The advisory groups will be asked to select the program, or a mixture of measures from the programs, that best meet the demands of the majority of the people. Based on this input, the Plan Formulation Committee will develop a recommended plan and present it to the Coordinating Committee. After any required modifications, the Coordinating Committee will present the plan to the public by holding public meetings, distributing brochures, and through the news media. The program will be subject to further revision to respond to comments received from the public.

The recommended program will be presented in three stages to show the measures that should be in place and operational by the years 1980, 2000, and 2020. In most cases, feasibility studies will be needed to analyze measures in more detail before they are constructed or implemented. For the 1980 and 2000 phases, these studies will be listed by priority and the states or agencies that should be responsible indicated. Definite information will be required for studies of measures needed by 1980 since these studies should be initiated as soon as the program is approved.

Total expenditures by states and agencies, and by the private sector, when available, will be compiled for the past years to determine an optimistic but realistic annual budget level. This figure is available for Corps programs through the Planning, Programming, and Budgeting System and may be available for other agencies and states. The part of the recommended program that can be constructed under this budgetary limitation will be shown and the impact of failure to fund the remainder of the program will be discussed. This comparison will be one of several factors analyzed in developing the budgetary recommendations.

The impact of the recommended program on the economy and the natural environment will be described, and measures that result in an irreversible commitment of resources will be pointed out.

X. SCHEDULE

Funds for the Lower Mississippi Region Comprehensive were appropriated by Congress in FY 70, and were made available to the field offices in February 1970. The Activities Sequence Diagram, Plate No. 3, shows completion of the study in FY 73. Schedules for individual elements are shown on the activity sequence diagrams for each element. A generalized description of the work by fiscal years is:

FY 70 - Conduct orientation and initiate plan of study.

FY 71 - Complete plan of study and economic projections and start demand studies.

FY 72 - Complete demand studies and formulation of alternative plans.

FY 73 - Draft, review, and complete summary report and appendixes. Some key dates to be met are:

January 1971 - Complete economic projections.

September 1971 - Complete demand studies.

April 1972 - Complete alternative plans.

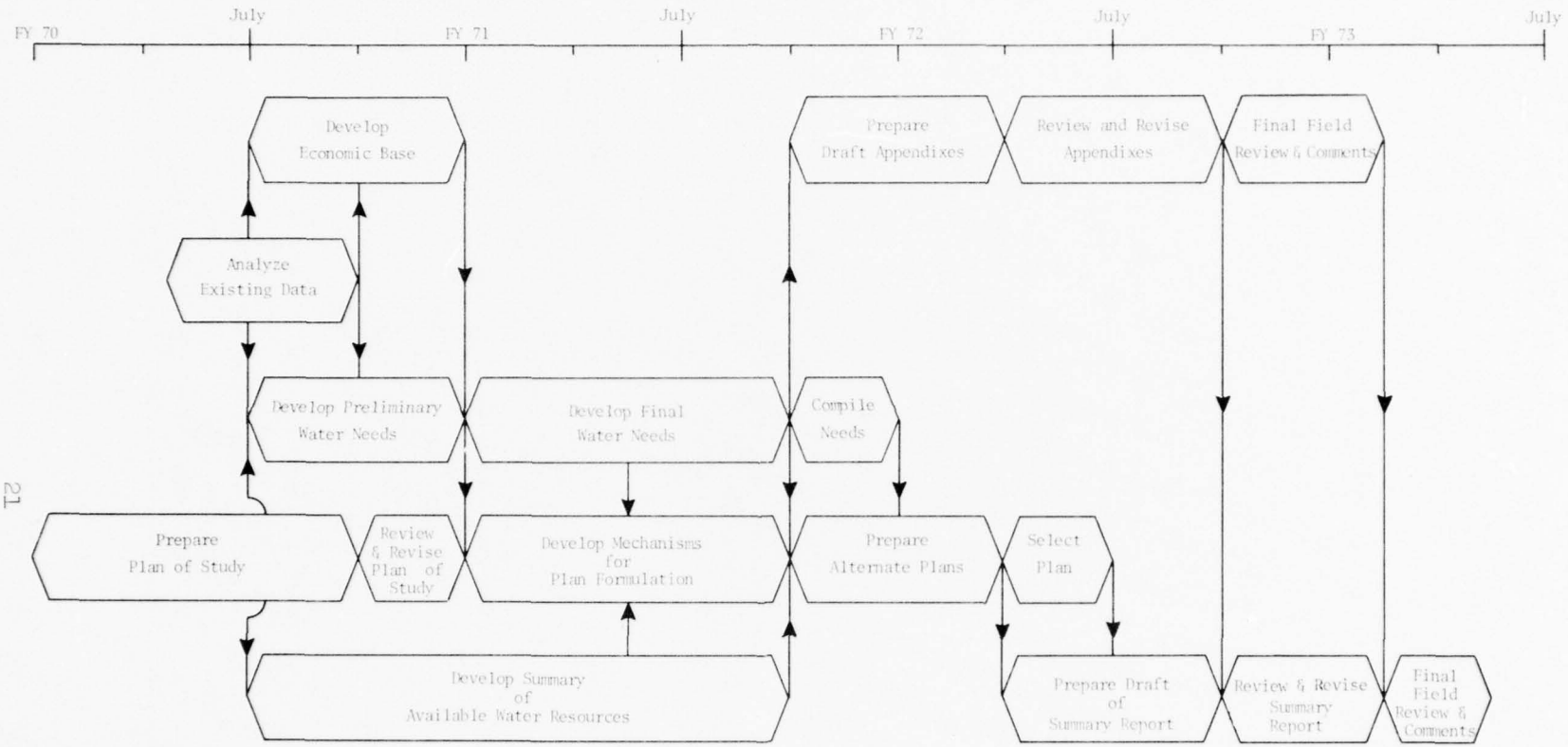
July 1972 - Complete recommended plan.

October 1972 - Complete draft of reports.

April 1973 - Complete final report.

XI. REPORT

The results of the study will be presented in a report consisting of a summary report of about 50 pages and an appendix for each study element. The summary report and the plan formulation appendix will be prepared by the Plan Formulation Committee, and each element appendix will be prepared by the lead agency for the element. The format and guidelines for report preparation will be completed by the Report Preparation Subcommittee and distributed by September 1971. The draft of each report will be submitted to the Report Preparation Subcommittee, who will print sufficient copies for review and furnish to all participants and to designated parties interested in comprehensives in other regions of the country. Comments on the draft will be furnished to the study element leader, who will revise the report as necessary. The revised reports will be submitted to the Coordinating Committee and the study participants for a 45-day period for review, comment, and approval before they are returned to the Report Preparation Subcommittee for final printing. Formal comments of the States and Federal Departments will be appended to the reports. Printing cost will be covered by the Mississippi River Commission. The formal submission of the final report will



Lower Mississippi Region Comprehensive Study
Activities Sequence Diagram

go from the Coordinating Committee to the Mississippi River Commission and then to the Water Resources Council. Participating agencies may submit copies of the report through normal channels to meet the review requirements of individual agencies.

XII. COST ESTIMATES

The estimated cost for each Federal agency broken down by study elements is shown in Annex 4. Only total costs are shown for the States. It is often difficult for States to estimate cost since much of their participation is a part-time effort by personnel from a large number of State agencies interested in water resource development. A coordinated budget is prepared each March showing the total cost of the study and a breakdown by fiscal years. Each agency submits a request. The total budget is compiled by the Plan Formulation Committee and submitted to the Coordinating Committee for approval before it goes to the Water Resources Council. Modifications are accepted only for specific justified reasons. Since the preparation of the budget in the preliminary plan of study, only minor changes have been made to cover salary increases and additional effort on environmental emphasis. Barring unforeseen difficulties, the final coordinated budget submission will be in March 1971, which will be for budget year FY 73.

XIII. PLAN OF STUDY BY ELEMENTS

The following section presents a work plan, an appendix outline, and an activities sequence diagram for each study element. The work plan covers the objective, organization, management, and methodology to be employed for the element. The Activities Sequence Diagram shows the order of study effort, and establishes the responsibility for that effort.

Although each study element will be prepared and presented as a separate unit within the context of the entire study, many of the study elements are interrelated and will be dependent on each other to provide information and data necessary to complete their studies. This exchange of information will be handled at the subcommittee level, or perhaps, at times, even at the study element level. It is important that the agencies or States responsible for preparation of each study element be aware of all the inputs and outputs required of them, and that close coordination be maintained throughout the study with the agencies or States which are to receive or furnish information. This exchange of information, between the various study elements, will be vital to the efficient functioning of the overall study.

The accompanying activities sequence diagram illustrates the schedule for preparing the information required for each study element based on the time limitation for completing the framework study. The strict adherence to the schedule of inputs and outputs as shown on the activities sequence diagram will determine, to a large extent, how well the study maintains the proposed schedule. The letter identification used for each agency and study element is as follows:

AGENCY AND STUDY ELEMENT SYMBOLS

Agency		Study Elements	
B	Commercial Fisheries, NOAA	a.	Economics
C	Mississippi River Commission	b.	Climate, Meteorology, and Hydrology
D	Bureau of Domestic Commerce	c.	Geology and Groundwater
E	Office Business Economics	d-e	Flood Problems
F	Forest Service		
G	Geological Survey	f.	Related Land Use and Management
H	Health, Education, and Welfare	g.	Related Mineral Resources
I	Southwestern Power Administration	h.	Irrigation
J	Sport Fisheries and Wildlife	i.	Land Drainage
K	U.S. Maritime Administration	j.	Navigation
L	Labor	k.	Municipal and Industrial Water Supply
M	Mines	l.	Water Quality and Pollution
N	National Park Service	m.	Health Aspects
O	Outdoor Recreation	n.	Recreation
P	Federal Power Commission	o.	Coastal and Estuarine
Q	Environmental Protection Agency	p.	Aesthetic and Cultural
R	Economic Research Service	q.	Fish and Wildlife
S	Soil Conservation Service	r.	Power
T	Transportation	s.	Sediment and Erosion
U	Housing & Urban Development	t.	Plan Formulation
V	States	u.	Legal and Institutional
W	National Oceanic & Atmospheric Administration	v.	Inventory of Facilities
X	WRPA 23	w.	Report Preparation Guidelines
Y	WRPA 4567		
Z	WRPA 890		

PLAN OF WORK
STUDY ELEMENT a
ECONOMIC BASE

OBJECTIVE

The purpose of study element a is to provide a series of economic indicators or conditional forecasts which can be used in projecting water needs of each WRPA in the Lower Mississippi Region.

An Economics Appendix will be prepared presenting the economic structure and trends of the Lower Mississippi Region. Specific economic projections will be developed for three programs: (1) National Income Program establishing projections under WRC criteria, (2) Regional Development Program to reflect resource and industry potentialities which can eventually increase the personal and per capita income of the area to more nearly approach the anticipated national averages, and (3) Environmental Program to incorporate quality standards for water and land use.

ORGANIZATION

The economic base studies will be accomplished under the guidance of the Economics Subcommittee (EB), which is chaired by the Mississippi River Commission. The Mississippi River Commission will be the study element leader and will have the responsibility for the preparation of this appendix. Participants in the study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Outputs from the Economic Base study element to other study elements are as follows:

Study element	Type of output required
Flood Problems (d and e)	Projection of population, industrial, and agricultural production for Programs A, B, and C
Related Land Use and Management (f)	Projections of population, employment, and income
Related Mineral Resources (g)	Projections for mineral commodities, population, employment, and income

Study element	Type of output required
Navigation (j)	Projections of population, income, employment, value added by manufacturing, value of farm products sold, and petroleum or energy demand
Municipal and Industrial Water Supply (k)	Projections of population, employment, and industrial production
Water Quality and Pollution (l)	Population, urbanization, and heavy water-using industries
Recreation (n)	Population and urbanization
Coastal and Estuarine (o)	Projection of population and industrial production for programs A, B, and C
Fish and Wildlife (q)	Projection of population
Power (r)	Projections of population, income, and employment
Plan Formulation (t)	Economic impact of development programs

Study Control and Schedule.

Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress reports to the Chairman of the EB Subcommittee. The subcommittee chairman will be responsible for maintaining schedule control within this subcommittee and will coordinate schedule changes with the PF Committee.

Economic and demographic data to be used by the various other elements will be substantially completed by December 1971. The first draft of the appendix will be completed by April 1972. Review and revision of the first draft will be completed by October 1972. Final field review and comments will be completed by February 1973.

METHODOLOGY

Economic and demographic data will be developed for each WRPA covering historical and current periods. Projections for population, earnings, income, employment, and production will be prepared for the national income, regional development, and environmental objectives.

Projections of the future growth of economic areas and WRPA's for the national income objective are based on assumptions that have been agreed upon by the Water Resources Council. These assumptions are as follows:

A. The population of the United States will grow at an average rate of 1.3 percent per year.

B. The total labor force will grow at a slightly higher rate than population on the assumption that the participation rate of women in the working force will rise in order "to avoid boredom and to participate meaningfully in economic life." By 1990, slightly more than 58 percent of the working-age population will be gainfully employed.

C. The hours worked per year per person will decline somewhat. By 2020, this will average 1,750 hours versus 2,000 today.

D. Productivity or output per man-hour worked will increase 3 percent annually.

E. GNP will grow at around 4 percent annually, which is a function of labor productivity, employment, and hours worked.

F. Personal per capita income will rise at 2.9 percent annually. This means that per capita income will increase from approximately $3,000 today to more than $16,000 by 2020 in dollars of constant purchasing power.

A second set of economic projections will be prepared for each WRPA based on the regional development objective. The WRC recognizes the following five principal objectives as applicable to this approach:

A. Increased income so that per capita income will more nearly approach the national average.

B. Increased regional employment to overcome the typical higher rate of unemployment and underemployment found in much of the Lower Mississippi Region.

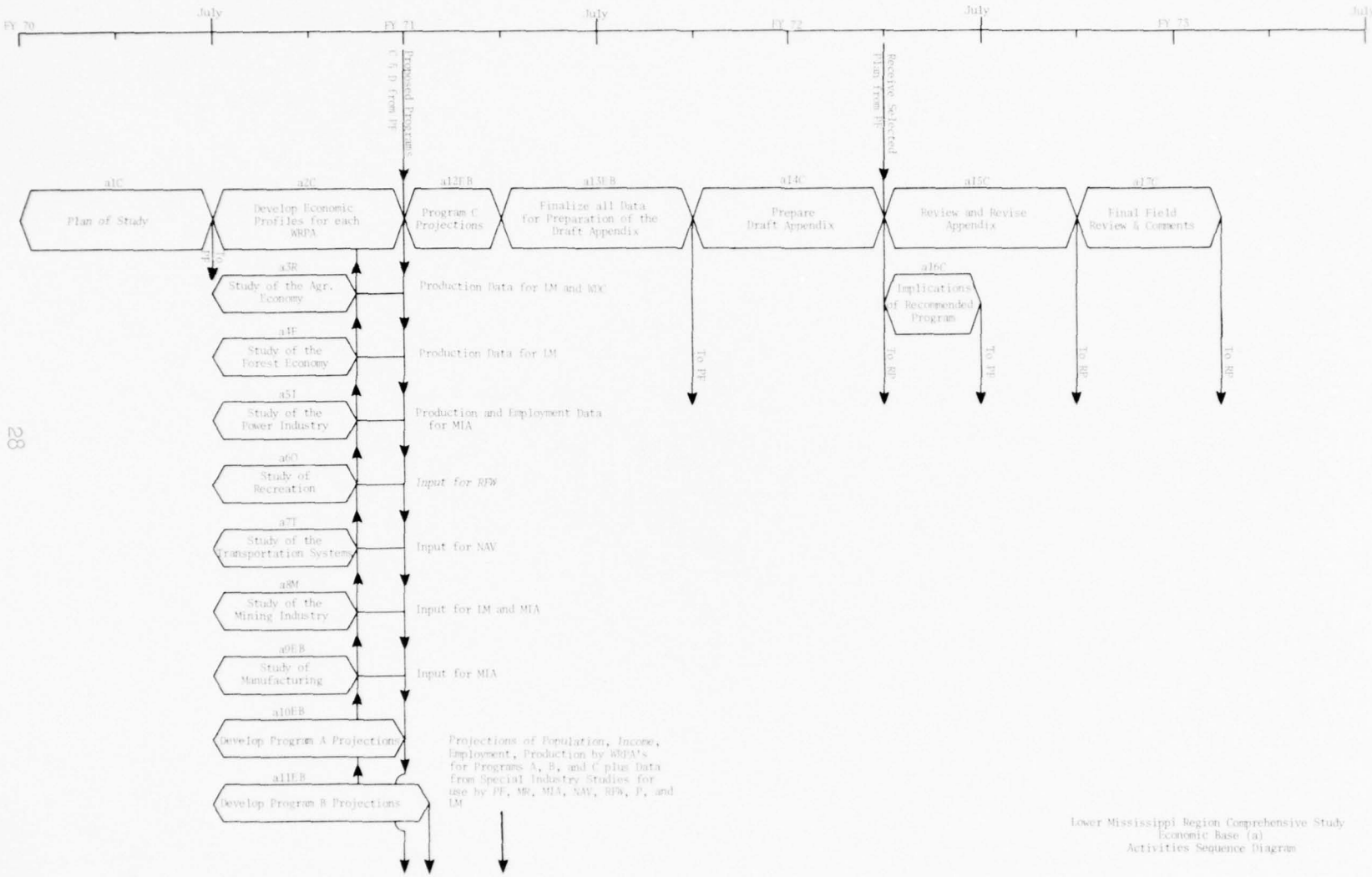
C. Diversification in the economic base of an area so that economic activity will not be dependent upon one or two crops or industries.

D. Improved quality of services within a region, particularly improved education, health, recreational, and related facilities.

E. Improved income distribution; i.e., abolishment of hunger and, possibly, poverty.

In preparing the projections under the regional development concept, the EB Subcommittee proposes to analyze the economy of each basin to determine which local resources offer an opportunity for growth at a rate higher than is predicted by the base line forecasts. Studies of specific industries will be made to serve as supporting data for such modifications.

Projections for the environmental objective will be similar to the format used in the National Income Program, but will reflect applicable restrictions or opportunities concerning quality standards.



Lower Mississippi Region Comprehensive Study
Economic Base (a)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT a
ECONOMIC BASE

I. INTRODUCTION

A. Authority

B. Purpose of Study

C. Study Organization – Specific Agency Assignments

D. Study Areas and Basis of Delineations

1. Economic areas

2. WRPA's

II. SUMMARY

Historical and future economic trends for Programs A, B, and C.

A. National Income Program

B. Regional Development Program

C. Environmental Program

III. METHODOLOGY

A. Problems

B. Data Sources

C. National Model (OBE and ERS)

D. Economic Areas and WRPA's

IV. ECONOMIC STRUCTURE, TRENDS, AND PROJECTIONS

Information in tabular form will be prepared for the Lower Mississippi Region and for each WRPA covering Programs A, B, and C.

V. SUPPLEMENTAL INDUSTRY STUDIES

Eight industry studies will be prepared in order to evaluate potentials for regional growth (Program B). Primary responsibility for each study is assumed by the agency indicated.

A. The Agricultural Economy (ERS)

B. Forest Resources and Industries (FS)

C. Mineral Resources and Industries (BOM)

D. Power Resources and Production (SWPA)

E. The Recreation Industry (BOR)

F. The Transportation Industry (DT)

G. Manufacturing - Water-Using Industries (OBE and DL)

H. Service Industries (DL and OBE)

VI. ECONOMIC PROFILES

An analysis of each WRPA will be prepared covering the resource base and opportunities for accelerated economic growth. The Corps of Engineers District representative on the Economics Subcommittee will prepare the analysis of each WRPA as specified below:

WRPA 1 - Land between the levees (NOD)
WRPA 2 - St. Francis-Lower White (MD)
WRPA 3 - West Kentucky-West Tennessee (MD)
WRPA 4 - The Yazoo (VXD)
WRPA 5 - A: Upper Ouachita (VXD)
B: Lower Ouachita (VXD)
WRPA 6 - Boeuf-Tensas (VXD)
WRPA 7 - A: Big Black (VXD)
B: SW Mississippi Streams (VXD)
WRPA 8 - Baton Rouge (NOD)
WRPA 9 - Lake Charles (NOD)
WRPA 10 - New Orleans (NOD)

VII. USE OF ECONOMIC INFORMATION BY STATES

Each State representative will indicate the possible methods for using information in water resource planning, especially the relation to the State's water plan.

PLAN OF WORK
STUDY ELEMENT b
CLIMATE, METEOROLOGY, AND HYDROLOGY

OBJECTIVE

The purpose of study element b is to describe the climate, meteorology, and hydrology of the Lower Mississippi Region pertinent to the development of plans for the utilization of the water and related land resources, including the problems and needs to the year 2020.

Study element b will contain a brief summary of basic hydrologic data and hydrologic studies for the Lower Mississippi Region, main river, and tributaries. This summary will include basin descriptions, complete climatological summary, hurricane data, complete streamflow summary, surface water quality data, hydrologic investigations, and standard project floods for tributaries, as needed.

ORGANIZATION

Studies of the climate, meteorology, and hydrology study element will be accomplished under the guidance of the Regional Hydrology and Geology Subcommittee (RHG), which is chaired by the U. S. Geological Survey. The Mississippi River Commission will be the study element leader, and will have the responsibility for the preparation of this appendix. Participants in the study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Inputs to study element b, Climate, Meteorology, and Hydrology, from other study elements are as follows:

Study element	Type of input required
Geology and Ground Water (c)	Data on ground water, hydrology, and interrelation of surface water and ground water

Outputs from study element b, Climate, Meteorology, and Hydrology, to other study elements are as follows:

Study element	Type of output required
Geology and Ground Water (c)	Climatological data, streamflow data, and hydrologic studies

Study element	Type of output required
Flood Problems (d and e)	Climatological data, streamflow data, sedimentation data, and hydrologic studies
Irrigation (h)	Streamflow data and hydrologic studies
Land Drainage (i)	Streamflow data and hydrologic studies
Municipal and Industrial Water Supply (k)	Streamflow data and hydrologic studies
Water Quality and Pollution (l)	Streamflow records, hydrologic analysis of streams, i.e., flow-duration tables, low flow, and peak flow probability tables
Coastal and Estuarine (o)	Hydrologic studies
Fish and Wildlife (q)	Streamflow data and hydrologic studies
Plan Formulation (t)	Hydrologic studies - water availability

Study Control and Schedule.

Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress reports to the Chairman of the RHG Subcommittee. The subcommittee chairman will be responsible for maintaining schedule control within this subcommittee, and will coordinate schedule changes with the PF Committee.

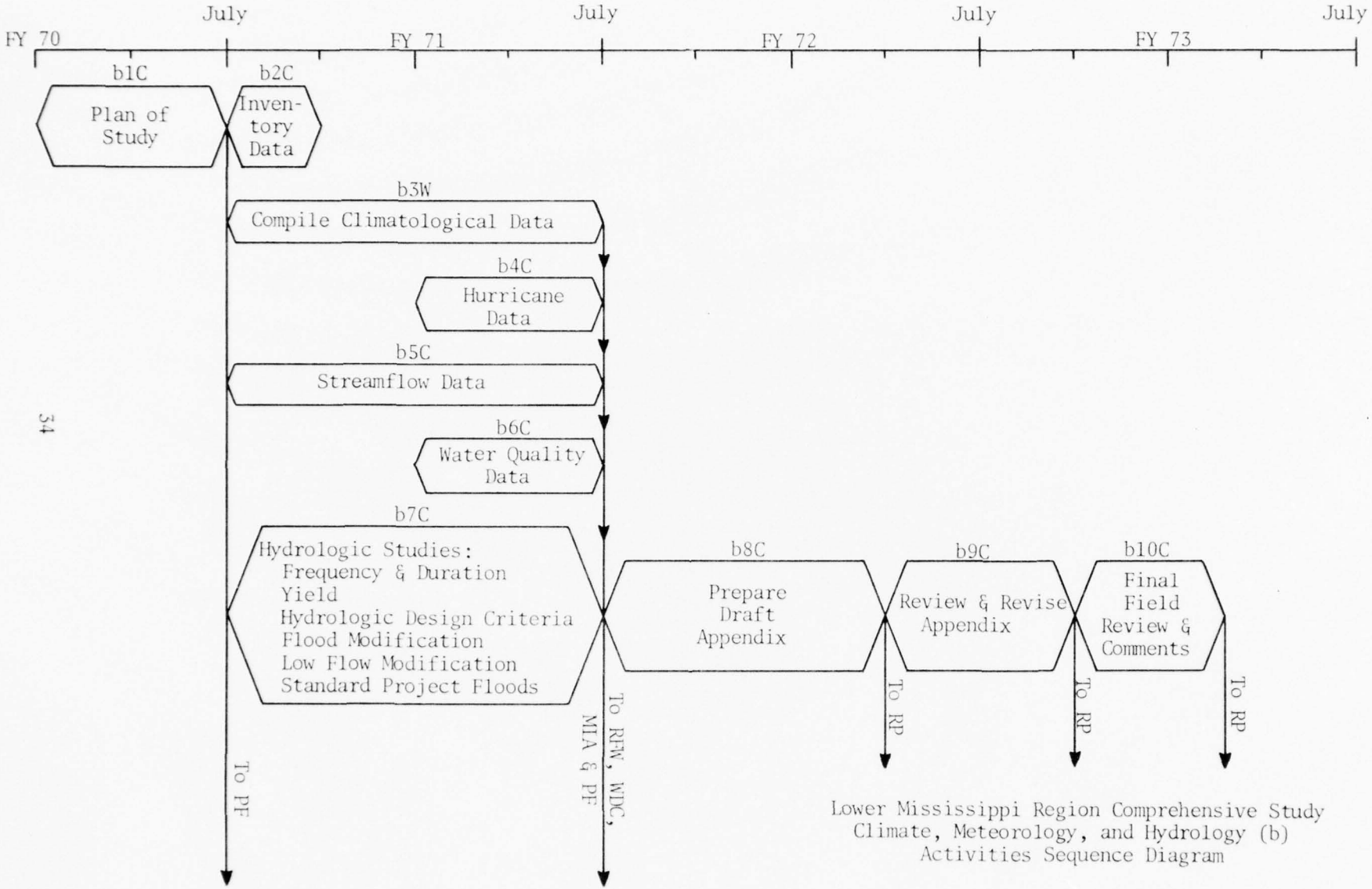
Data compilation will be substantially completed by July 1971. The first draft of the appendix will be completed by April 1972. Review and revision of the first draft will be completed by October 1972. Final field review and comments will be completed by February 1973.

METHODOLOGY

The output of the climate, meteorology, and hydrology study element will be a description of the hydrologic system at the 1970 level of development. It will serve as a point of departure for those study elements proposing actions which will modify the system. The work performed will be to the precision normally attainable by the disciplines.

The studies of this element will be based on the assumption that the long-term supply of water in the form of precipitation is constant, but will vary in space, seasonably and from year to year. Changes from acts of man will be assumed to affect the water only after it reaches the ground.

Output will be largely in the form of maps, charts, graphs, and tables, supported by explanatory text. Streamflow will usually be described in cubic feet per second. Impoundment volumes will be in acre-feet. Runoff may be in inches, acre-feet, or cubic feet per second per square mile.



Lower Mississippi Region Comprehensive Study
Climate, Meteorology, and Hydrology (b)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT b
CLIMATE, METEOROLOGY, AND HYDROLOGY

I. INTRODUCTION

- A. Authority
- B. Purpose of Study
- C. Relationship to Other Parts of Report
- D. Cooperation

II. BASIN DESCRIPTION

- A. General
- B. Stream Patterns and Channel Characteristics

III. CLIMATOLOGICAL SUMMARY

- A. General
- B. Temperature
  - 1. Averages
  - 2. Extremes
  - 3. Growing Season
- C. Precipitation
  - 1. Quantity, Seasonal, and Areal Distribution
  - 2. Variation and Extremes
  - 3. Drought Periods
  - 4. Storms
- D. Wind
- E. Evaporation
- F. Weather Forecasts
- G. Transpiration

IV. HURRICANES

A. General Description

B. Recent Occurrences

1. Precipitation Amounts

2. Distribution

V. STREAMFLOW

A. Records Available

B. Runoff Characteristics

1. Averages for Subregions

2. Variability by Subregions

a. By Years

b. By Seasons

C. Flood Frequency

D. Water Surface Profiles

E. Channel Capacities

F. Floods of Record

G. Drought and Low Flows

H. Water Supply Characteristics of Streams

I. Stream Regulation

J. Basin Developments Affecting Streamflow

1. Existing - 1970

2. Planned - 2000-2020

VI. WATER QUALITY

A. Chemical

B. Biological-Biochemical

C. Temperature

D. Suitability for Various Uses

E. Effects Development

VII. SEDIMENTATION

A. Available Data

B. Origin

C. Reservoir Sedimentation

D. Deposition in Channels

VIII. HYDROLOGIC INVESTIGATIONS (Guidelines to be given to PFC)

A. General

B. Soil Cover Conditions

C. Frequency

D. Duration

E. Water Yield (Due to changing crop pattern)

F. Sediment Investigations

G. Channel Stability

H. Unit Hydrographs

I. Flood Routing

1. Main Stem

2. Upstream Watersheds

J. Reservoir Storage

1. Main Stem

2. Upstream Watersheds

K. Hypothetical Floods

1. Major Reservoirs

2. Approximation of Standard Project

3. Upstream Watersheds

4. Levees

L. Reservoir Design Criteria

1. Main Stem

2. Upstream Watersheds

M. Levee Design Criteria

1. Interior Drainage

2. Pumping Plants

N. Channel Design Criteria

O. Flood Modification

1. Main Stem

2. Upstream Watersheds

3. Modified Frequency

P. Low Flow Modification

Q. Hydrologic Networks

1. Existing

2. Needed

R. River and Flood Forecast Service

IX. DESIGN FLOOD - MISSISSIPPI RIVER

A. Storm Combinations

B. Flood Routing

C. Reservoir Regulation

D. Flow Line

X. STANDARD PROJECT FLOOD APPROXIMATION ON TRIBUTARIES

A. Storm Combinations

B. Flood Routing

C. Reservoir Regulation

D. Flow Line

PLAN OF WORK
STUDY ELEMENT c
GEOLOGY AND GROUND WATER

OBJECTIVE

The purpose of study element c is to make a general appraisal of the ground-water resources of the Lower Mississippi Region and to present the information in a form that will be readily usable as a basis for planning and implementing the development of the water resources of the region.

A general appraisal of the ground-water resources of the region, including descriptions of the geologic framework, the geologic units that form the significant aquifers, and the hydrologic characteristics of the aquifers, will be made. The chemical quality of water and the potential yield of ground water will be determined. Areas where there is a need for additional studies will be identified. The study will include all significant aquifers where they contain less than 1,000 milligrams per liter of dissolved solids.

ORGANIZATION

The geology and ground-water studies will be accomplished under the guidance of the Regional Hydrology and Geology Subcommittee (RHG), which is chaired by the U. S. Geological Survey. The U. S. Geological Survey will be the study element leader and will have the responsibility for the preparation of this appendix. Participants in this study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Inputs to study element c, Geology and Ground Water, from other study elements are as follows:

Study element	Type of input required
Climate, Meteorology, and Hydrology (b)	Climatological data, streamflow data, and hydrologic studies
Irrigation (h)	Ground-water use data
Municipal and Industrial Water Supply (k)	Ground-water use data
Water Quality and Pollution (l)	Chemical-quality data

Outputs from study element c, Geology and Ground Water, to other study elements are as follows:

Study element	Type of output required
Climate, Meteorology, and Hydrology (b)	Data on ground-water hydrology and interrelation of surface water and ground water
Flood Problems (d and e)	Interrelation of surface water and ground water
Related Mineral Resources (g)	General geologic data
Irrigation (h)	Ground-water supply data
Land Drainage (i)	Ground-water hydrology, descriptions of aquifers, interrelation of surface water and ground water
Municipal and Industrial Water Supply (k)	Ground-water supply data
Water Quality and Pollution (l)	Availability, distribution, quality, and quantity of ground water; important aquifers, ground-water withdrawals, changes in ground-water levels, possibility of deep-well withdrawals, and disposal
Coastal and Estuarine (o)	Ground-water hydrology, descriptions of aquifers, interrelation of surface water and ground water
Plan Formulation (t)	Ground-water availability

Study Control and Schedule.

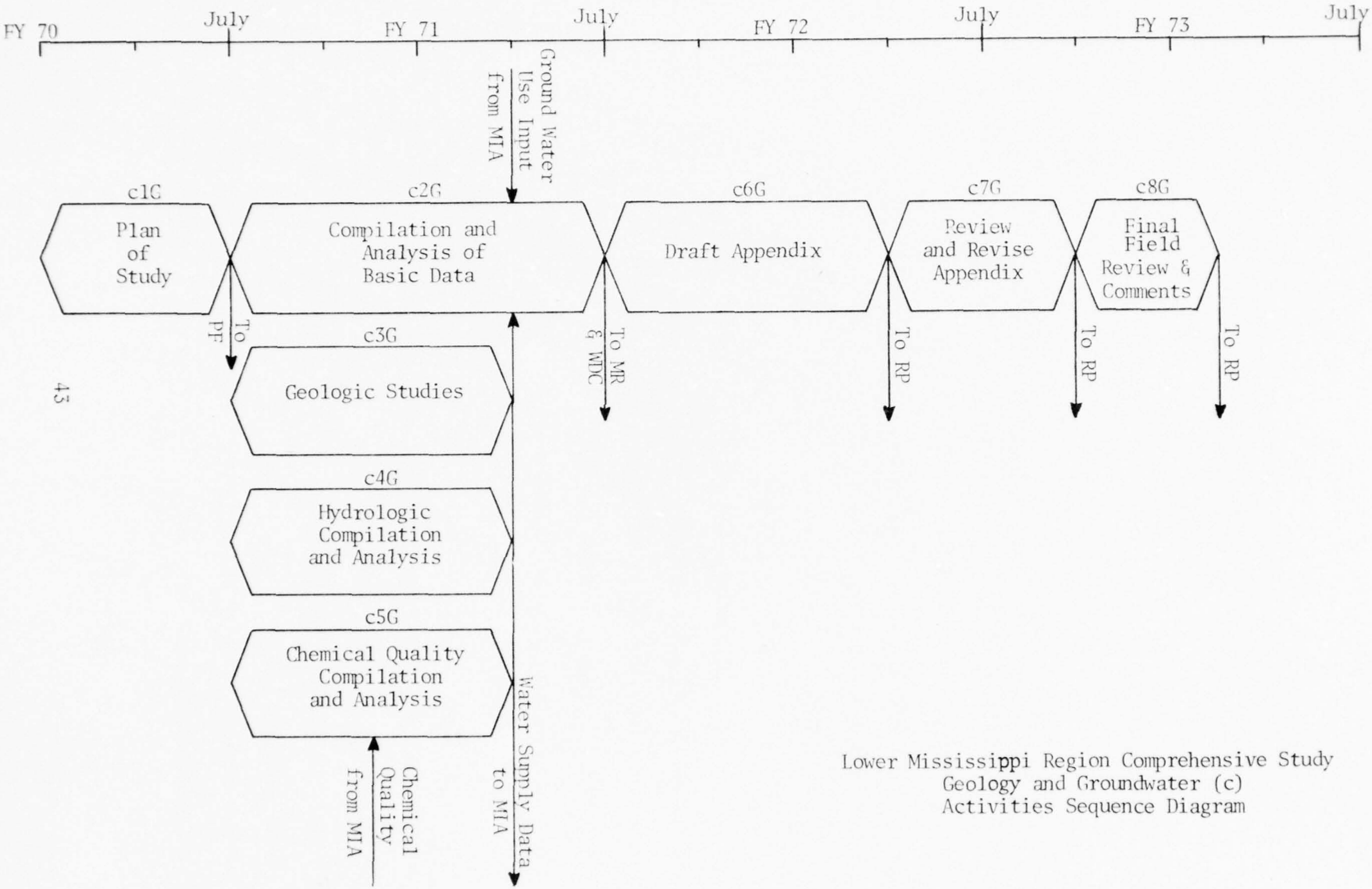
Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress reports to the Chairman of the RHG Subcommittee. The subcommittee chairman will be responsible for maintaining schedule control within this subcommittee, and will coordinate schedule changes with the PF Committee.

Data compilation will be substantially completed by July 1971. The draft of the appendix will be completed by April 1972. Review and revision of the first draft will be completed by October 1972. Final field review and comments will be completed by February 1973.

METHODOLOGY

The study will be based on the assumption that the Lower Mississippi Region is a single, large, complex hydrologic system. The understanding of the ground-water hydrology of the region is based on interpretation of the relation of streams and aquifers and the interrelation of aquifers. The work will be done to the precision required for areal reconnaissance-type studies intended for publication at a map scale of 1:1,000,000.

Output will consist of maps, charts, graphs, and tables, supplemented by explanatory and supporting text. The unit of measurement will be acre-feet.



Lower Mississippi Region Comprehensive Study
Geology and Groundwater (c)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT c
GEOLOGY AND GROUND WATER

I. INTRODUCTION

- A. Authority
- B. Purpose of Study

II. GENERAL GEOLOGY

III. GROUND-WATER HYDROLOGY

- A. Occurrence of Ground Water
- B. Movement of Ground Water
- C. Types of Aquifers
  - 1. Unconfined Aquifers
  - 2. Confined Aquifers
- D. General Water Quality

IV. DESCRIPTIONS OF AQUIFERS (APPROXIMATELY 15)

- A. Character, Extent, and Thickness
- B. Hydraulic Characteristics
- C. Water-Quality Considerations
- D. Potential Yield

V. INTERRELATION OF SURFACE WATER AND GROUND WATER

VI. MANAGEMENT CONSIDERATIONS

VII. ADDITIONAL NEEDS FOR DATA

VIII. GENERAL SUMMARY

IX. SUMMARY BY WATER RESOURCES PLANNING AREAS

X. REFERENCES

PLAN OF WORK
STUDY ELEMENTS (d and e)
FLOOD PROBLEMS

OBJECTIVE

The purpose of study elements d and e will be to:

A. Assess and provide a general description of the nature, location, and extent of the flood problems in urban and rural areas.

B. Assist the Plan Formulation Committee in determining means and timing of resolving those flood problems to form four distinct programs representing the national income, regional development, environmental, and well-being goals, and the selected program which may be one, or a combination, of these goals.

ORGANIZATION

The flood control studies will be accomplished under the guidance of the Water Damage Control Subcommittee (WDC). The Mississippi River Commission (MD) will have the responsibility for the preparation of this appendix. Participants in the study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Inputs to the study element, "Flood Problems", from other study elements are as follows:

Study element	Type of input required
Economic Base (a)	Crop yields and projections of agricultural and industrial production for programs A, B, and C.
Climate, Meteorology, and Hydrology (b)	Climatological data, streamflow data, sedimentation data, and hydrologic studies.
Geology and Hydrology (c)	Interrelation of surface water and ground water.

Study element	Type of input required
Related Land Use and Management (f)	Current and projected land use.
Sediment and Erosion (s)	Sediment yields and damages and erosion problems.

Outputs from the Flood Problems study element to other study elements are as follows:

Study element	Type of output required
Related Land Use and Management (f)	Nature and scope of flood problems.
Plan Formulation (t)	Storage potential (physical capacity and costs), and nature and scope of flood problems.
Coastal and Estuarine (o)	Nature and scope of flood problems
Inventory of Facilities (v)	Flood control facilities

Study Control and Schedule.

Exchange of information between the various study elements will be vital to the efficient functioning of the overall study. The accompanying activities sequence diagram illustrates the schedule for preparing the information required for this study element based on the time limitation for completing the framework study. The strict adherence to the schedule of inputs and outputs as shown on the activities sequence diagram will determine, to a large extent, how well the study maintains the proposed schedule.

Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress reports to the Chairman of the WDC Subcommittee. The subcommittee chairman will be responsible for maintaining schedule control within this subcommittee and will coordinate schedule changes with the PF Committee.

The first draft of the appendix will be completed by April 1972. Review and revision of the first draft will be completed by October 1972. Final field review and comments will be completed by February 1973.

METHODOLOGY

The flood problem must be defined in terms of:

A. Acres subject to flooding.

B. Existing and projected residual damages with the existing and authorized projects (to be initiated by FY 73) in place.

Acreage subject to flooding will be defined by a flood approximating the Standard Project Flood for the larger streams and floods of record for smaller streams. The SPF outline will not be shown in the report, nor will the depth be shown. Only the acreage subject to flooding is required. The SPF inundated area will be determined with going projects in place except for the main stem Mississippi River inundated area, which will be determined both with and without the going levee project.

Existing and residual damages will be developed to a degree of accuracy dictated by the time available and the approved overall study cost estimate. Within these parameters, complete, new studies cannot be made. Recent reports must be updated and utilized. In instances where there have been no recent studies, the study effort will still be limited. To arrive at residual damages for the larger streams within these areas, the following procedure will be utilized:

A. Develop existing stream profiles showing natural ground and stream bottom. These profiles will come from old studies, the Mississippi River and Tributaries studies, or from quads and field reconnaissance. No field surveys will be undertaken.

B. From established gage records (or slop-area method - generalized hydrology), develop discharge-frequency and stage-discharge relationships. From these relationships, construct approximate flood profiles (without routing flows or computing flow lines) for enough frequencies of flooding to develop stage-area curves (with that point of flooding defined) from the stage of zero damage up to the stage at the 100-year-flood outline (in the delta, probably 3-year-, 10-year-, 25-year-, and 100-year-frequency flood outlines; in the hill areas, probably 1-year-, 3-year-, 25-year-, and 100-year-frequency flood outlines.)

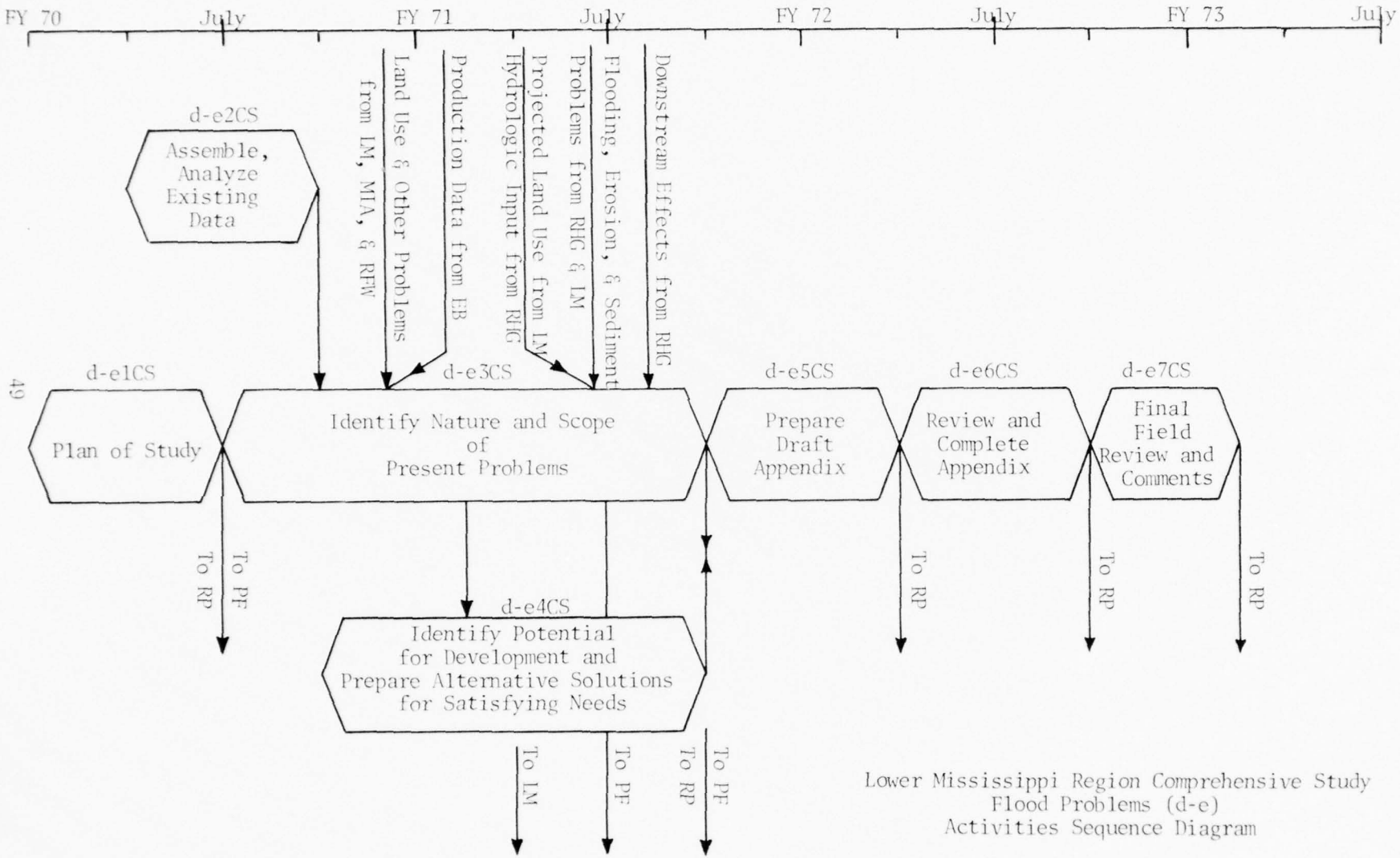
C. From these flood outlines, develop the stage-area cleared and total curves. Employing current and projected yields on cropland, develop average annual damages, including noncrop damages, such as: damages to fences and other farm improvements, and roads and bridges. For urban areas and rural communities, available information should be updated, and reconnaissance should be made of those that may have flood problems, obtaining data on the nature of drainage or flood problems and the type of urban development subject to damage. Emphasis should be placed on the problems and needed developments in the urban and rural communities in order to develop a significant program effort in the

Lower Mississippi Region for providing the greatest good to the greatest number of people.

For the smaller streams and watersheds the problems will be identified by the Conservation Needs Inventory and other study data. A limited amount of reconnaissance will be required in some areas to further identify problems.

Once the problems have been identified, applicable alternative measures which would alleviate the current and projected flood problems will be listed for consideration in plan formulation, showing miles of levees, channels, floodwalls, and stabilization measures; number of pumping plants; reservoir and floodwater retention storage requirements; and number of flood plain management programs, including studies required. Potential water storage will be identified. Unit costs will be developed which can be applied to the alternative measures for order of magnitude costs of the programs.

Working under the guidance and direction of the Plan Formulation Committee, flood control programs under the national income objective, the regional development objective, the environmental objective, and the well-being objective will be developed and provided the Plan Formulation Committee as the recommendations of the WDC Subcommittee.



Lower Mississippi Region Comprehensive Study
Flood Problems (d-e)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENTS d and e
FLOOD PROBLEMS

I. INTRODUCTION

A. Authority

B. Purpose of Study

C. Relationship to Summary Report and Other Appendixes

D. History of Flood Problems

II. GENERAL METHODOLOGY, PROCEDURES, AND DEFINITIONS

A. Glossary of Terms

B. Assumptions

C. Constraints

D. Methodology

III. REGIONAL SUMMARY

A. Description of the Region

1. Topography

a. Alluvial Lands

b. Uplands

c. Coastal Area

2. Land Use and Development

a. Urban

b. Rural Cleared

c. Rural Wooded

d. Other

3. Climate

4. Flood Characteristics

B. Current Water Damage Control Program and Project Accomplishment

1. Alluvial Area

   a. Private

   b. Local Public

   c. State

   d. Joint (Federal participation)

2. Uplands

   a. Private

   b. Local Public

   c. State

   d. Joint (Federal participation)

3. Coastal Area

   a. Private

   b. Local Public

   c. State

   d. Joint (Federal participation)

C. Nature and Scope of Residual Flood Problems

1. Alluvial Area

   a. Urban

   b. Non-urban

2. Upland Area

   a. Urban

   b. Non-urban

3. Coastal Area

   a. Urban

   b. Non-urban

D. Applicable Water Damage Control Measures

1. Structural Flood Control Measures

2. Nonstructural Flood Damage Prevention Measures

E. Alternative Programs and Effects of Programs on Other Water and Related Land Resource Problems and Needs

1. National Income Objective

a. Program Summary

b. Effects

c. Remaining Needs

2. Regional Development Objective

a. Program Summary

b. Effects

c. Remaining Needs

3. Environmental Objective

a. Program Summary

b. Effects

c. Remaining Needs

4. Well-Being Objective

a. Program Summary

b. Effects

c. Remaining Needs

IV. WRPA SUMMARY

A. Description of the Region

1. Topography

a. Alluvial Lands

b. Uplands

c. Coastal Area

2. Land Use and Development

   a. Urban

   b. Rural Cleared

   c. Rural Wooded

   d. Other

3. Climate

4. Flood Characteristics

B. Current Water Damage Control Program and Project Accomplishment

1. Alluvial Area

   a. Private

   b. Local Public

   c. State

   d. Joint (Federal participation)

2. Uplands

   a. Private

   b. Local Public

   c. State

   d. Joint (Federal participation)

3. Coastal Area

   a. Private

   b. Local Public

   c. State

   d. Joint (Federal participation)

C. Nature and Scope of Residual Flood Problems

1. Alluvial Area

a. Urban

b. Non-urban

2. Upland Area

a. Urban

b. Non-urban

3. Coastal Area

a. Urban

b. Non-urban

D. Applicable Water Damage Control Measures

1. Structural Flood Control Measures

2. Nonstructural Flood Damage Prevention Measures

E. Alternative Programs and Effects of Programs on Other Water and Related Land Resource Problems and Needs

1. National Income Objective

a. Program Summary

b. Effects

c. Remaining Needs

2. Regional Development Objective

a. Program Summary

b. Effects

c. Remaining Needs

3. Environmental Objective

a. Program Summary

b. Effects

c. Remaining Needs

4. Well-Being Objective

a. Program Summary

b. Effects

c. Remaining Needs

V. VEHICLES OF ACCOMPLISHMENT

A. State or Local Interest Action

B. Agency Programs

C. Timing

VI. RECOMMENDED LEGISLATIVE CHANGES

VII. SUMMARY AND CONCLUSIONS

PLAN OF WORK
STUDY ELEMENT f
RELATED LAND USE AND MANAGEMENT

OBJECTIVE

The purpose of study element f will be to:

A. Determine the present, projected, and potential uses of water and related land resources and their problems, agricultural and non-agricultural, and to recommend solutions whereby future needs may be satisfied through alternative land and water resource programs.

B. Assess the costs and impacts of such programs to the land and water resource base and the agricultural economy of the region.

ORGANIZATION

The land use and management studies will be accomplished under the guidance of the Land Use and Management Subcommittee (LM), which is chaired by the Soil Conservation Service. The Soil Conservation Service will be the study element leader and will have the responsibility for the preparation of this appendix. Participants in the study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Inputs to study element f, Related Land Use and Management, from other study elements are as follows:

Study element	Type of input required
Economic Base (a)	Projections of population, employment, and income
Flood Problems (d and e)	Nature and scope of flood problems
Related Mineral Resources (g)	Mineral resource needs
Irrigation (h)	Irrigation data
Land Drainage (i)	Land drainage problems and needs

Study element	Type of input required
Recreation (n)	Centers of recreation needs by type, class, and category, including amount and kind of development, etc.; alternatives
Coastal and Estuarine (o)	Coastal and estuarine problems and needs
Aesthetic and Cultural Values (p)	Need for preservation and enhancement of environmental resources, historic and cultural areas
Fish and Wildlife (q)	Fish and wildlife problems and needs

Outputs from study element f, Related Land Use and Management, to other study elements are as follows:

Study element	Type of output required
Flood Problems (d and e)	Current and projected land use
Water Quality and Pollution (l)	Current and projected land use
Irrigation (h)	Current and projected land use and soil classification
Land Drainage (i)	Current and projected land use and soil classification
Recreation (n)	Current and projected land use and management
Coastal and Estuarine (o)	Current and projected land use
Aesthetic and Cultural Values (p)	Current and projected land use
Fish and Wildlife (q)	Current and projected land use
Plan Formulation (t)	Current and projected land use
Inventory of Facilities (v)	Sediment, erosion control, and small watershed facilities

Study Control and Schedule.

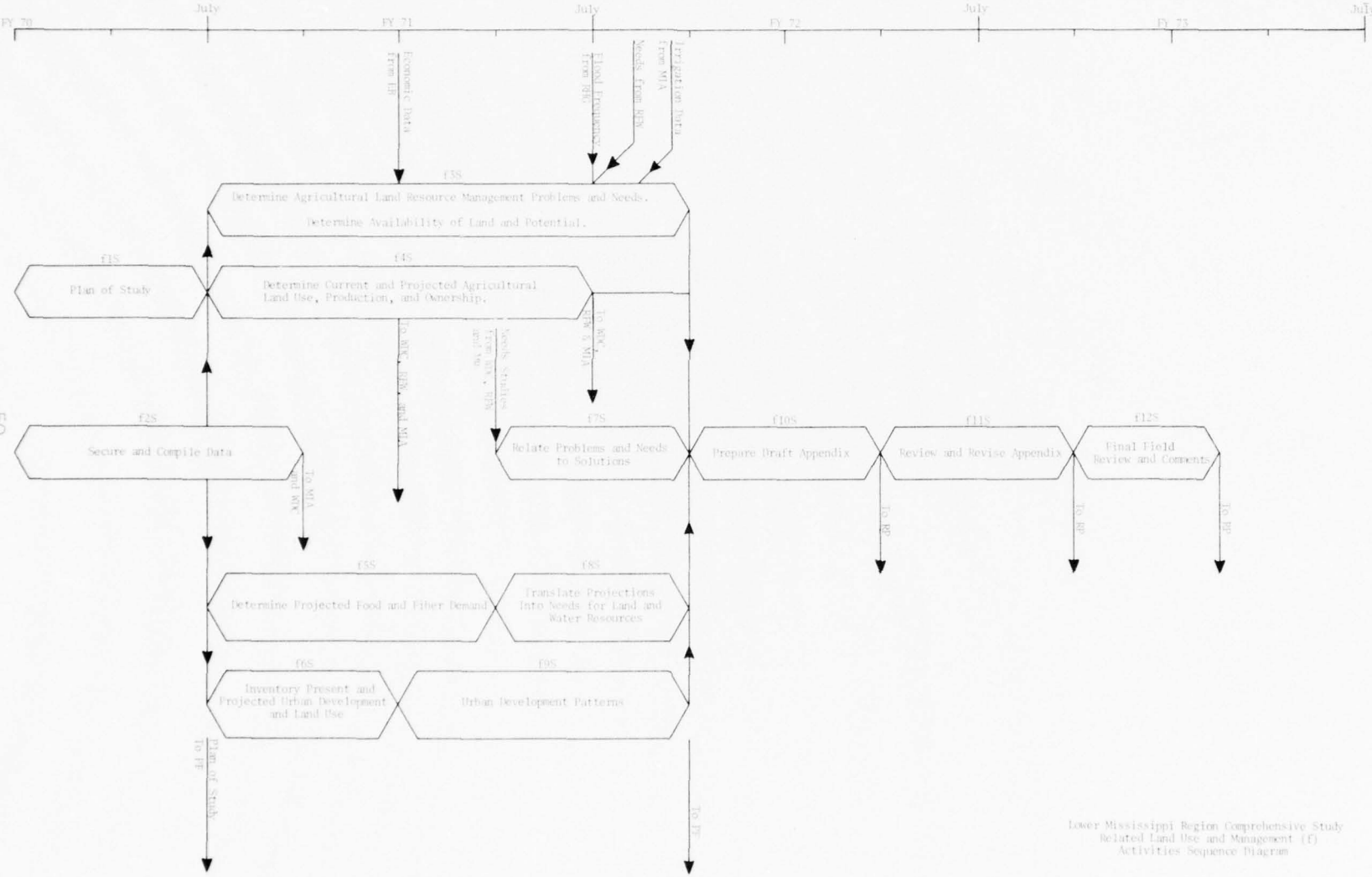
Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress reports to the Chairman of the LM Subcommittee. The subcommittee chairman will be responsible for maintaining schedule control within this subcommittee and will coordinate schedule changes with the PF Committee.

The first draft of the appendix will be completed by April 1972. Review and revision of the first draft will be completed by October 1972. Final field review and comments will be completed by February 1973.

METHODOLOGY

An examination and analysis of existing source material will provide the basis for current determinations and trends for some projections. Where necessary, reconnaissance-type investigations will be made. These will involve significant classifications of land use, cover types, soils, and related data. Crop yields, cost of production budget, land capability data, and other related data will be inputs for linear programming models to determine the relationship of the land and water base to food and fiber requirements against alternative development plans.

The USDA 1967 CN Inventory, Forest Service inventories, research publications, river basin and watershed work plans will provide much of the data needs for USDA.



Lower Mississippi Region Comprehensive Study
Related Land Use and Management (f)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT f
RELATED LAND USE AND MANAGEMENT

I. INTRODUCTION

A. Authority

B. Purpose of Study

C. Relationship to Other Subcommittee Reports

D. Description of the Study Area - Universe and WRPA's

E. Agencies Participating in Study

II. LOWER MISSISSIPPI REGION

A. Inventory of Current Land and Water Area

1. Nonagricultural Land and Water Area

a. Urban and Built-up Areas

b. Federal (excluding forest land)

c. Water (40 acres or larger - streams one-eighth of a mile in width, or wider)

2. Agricultural Land and Water Area

a. Cropland

b. Pasture

c. Forest

(1) National

(2) Private

(a) In Farms

(b) Not in Farms

d. Other

e. Water (areas under 40 acres and streams less than one-eighth of a mile in width)

B. Development of Input-Output Relationships

1. Develop Enterprise Budgets

a. Crops

b. Livestock

c. Forests

2. Develop Yield Estimates

a. Crops - For Different Soil Types

b. Pasture - For Different Soil Types

c. Livestock (animal units)

d. Forests

3. Develop Soil Classifications

a. Land Resource Grouping

(1) Land Resource Grouping

(2) Productivity Grouping

b. WRPA's

c. County

C. Development of Projected Parameters

1. Nonagricultural Parameters

2. Agricultural Parameters

III. WATER AND RELATED LAND USE AND MANAGEMENT ORIENTED TO DEVELOP ALTERNATIVES

A. National Income

B. Regional Development

C. Environmental

D. Well-Being

IV. TRANSLATION OF PROJECTIONS INTO NEED FOR WATER AND RELATED LAND

A. Food and Fiber

B. Recreation

C. Fish and Wildlife

D. Environmental Considerations

E. Other

V. WATER AND RELATED LAND RESOURCE PROBLEMS WITH RECOMMENDED ADJUSTMENT TO MEET IDENTIFIABLE NEEDS

A. Land Drainage

B. Irrigation

C. Flood Control

D. Land Treatment

E. Institutional Arrangements

VI. IMPACTS OF WATER AND RELATED LAND USE ADJUSTMENTS ORIENTED TO ALTERNATIVE DEVELOPMENT

A. National Income

1. Employment, Income, and Population

2. Environment

3. Other

B. Regional Development

1. Employment, Income, and Population

2. Environment

3. Other

C. Environmental

1. Employment, Income, and Population

2. Environment

3. Other

D. Well-Being

1. Employment, Income, and Population

2. Environment

3. Other

VII. RECOMMENDATIONS

PLAN OF WORK
STUDY ELEMENT g
RELATED MINERAL RESOURCES

OBJECTIVE

The purpose of study element g is to describe the significance of mineral resources and industries to the future economy, and to the water and environmental needs and problems of the Lower Mississippi Region. The information will be arranged to meld with data from other sources and be readily applicable in planning the best use of water, land, and other resources of the region.

ORGANIZATION

The mineral resource studies will be accomplished under the guidance of the Mineral Resources Subcommittee (MR), which is chaired by the Bureau of Mines. The Bureau of Mines will be the study element leader and will have the responsibility for the preparation of this appendix. Participants in this study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Inputs to study element g, Related Mineral Resources, from other study elements are as follows:

Study element	Type of input required
Economic Base (a)	Economic data for special industry studies
Geology and Ground Water (c)	General geologic data

Outputs from study element g, Related Mineral Resources, to other study elements are as follows:

Study element	Type of output required
Related Land Use and Management (f)	Mineral resource needs
Water Quality and Pollution (l)	Water problems and pollution control
Municipal and Industrial Water Supply (k)	Water and land needs for mineral resource development

Study element	Type of output required
Sediment and Erosion (s)	Open-pit areas
Plan Formulation (t)	Mineral resource needs

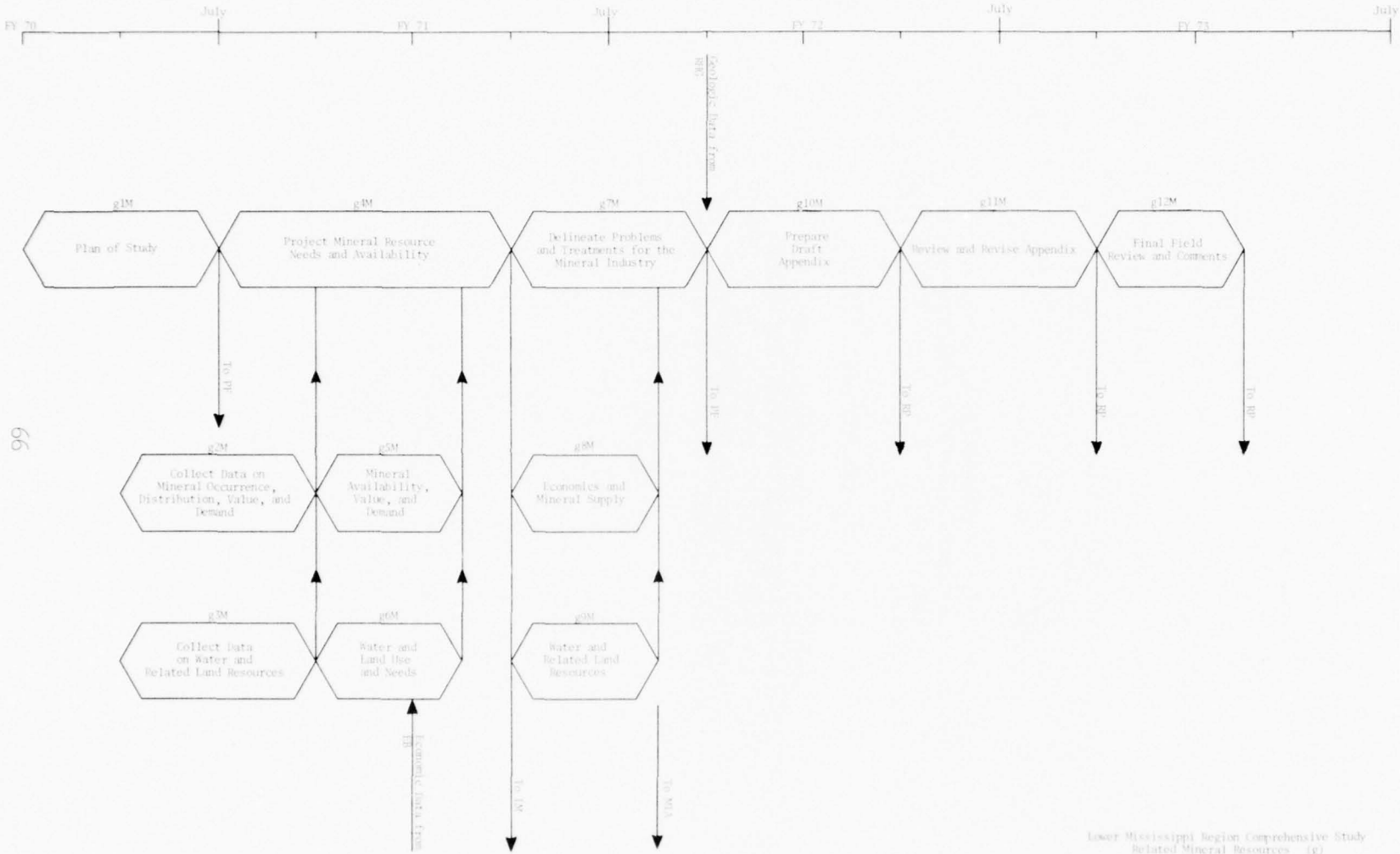
Study Control and Schedule.

Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress reports to the Chairman of the MR Subcommittee. The subcommittee Chairman will be responsible for maintaining schedule control within this subcommittee and will coordinate schedule changes with the PF Committee.

Data compilation will be substantially completed by October 1970. The first draft of the appendix will be completed by April 1972. Review and revision of the first draft will be completed by October 1972. Final field review and comments will be completed by February 1973.

METHODOLOGY

The mineral base, mineral extraction activities, requirements for water and land, and their significance to the economy of the region will be projected to the year 2020. Problems in the economy, mineral base, water supply and quality, and with the environmental change will be anticipated, and plans developed for their alleviation.



Lower Mississippi Region Comprehensive Study
Related Mineral Resources (g)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT g
RELATED MINERAL RESOURCES

I. INTRODUCTION

- A. Authority
- B. Purpose of Study
- C. Methods of Study
- D. Acknowledgments
- E. Summary and Conclusions

II. PHYSICAL ENVIRONMENT

- A. General Location
- B. Study Subregions
- C. Physiography
- D. Geology

III. ECONOMIC ENVIRONMENT

- A. Population
  - 1. Distribution
  - 2. Growth
  - 3. Projected
- B. Income
  - 1. Gross
  - 2. By Occupation
  - 3. Projected
- C. Transportation
  - 1. Highway
  - 2. Rail

3. Water

4. Air

IV. MINERAL INDUSTRY AND RESOURCES

A. Resume

1. General Summary

a. Type of Mineral

b. Production

c. Value

2. Historical Summary

a. Type of Mineral

b. Production

c. Value

3. Significance of Mineral Industry in the Economics of the Region

B. Commodity Sketches

1. Introduction

a. Objectives

b. Manner of Presentation

c. Sources of Data and Applied Methodology

(1) Land and Water Requirements

(2) Projected Demand and Production

(3) Estimates of Reserves and Resources

2. Individual Commodities-Brief

a. Definition

b. Production and Value

c. General Distribution of Activity

d. Use of Substance and Markets

e. Nature and Distribution of Deposits

f. Extent of Resources

g. Land and Water Requirements

h. Transportation Requirements

i. Projected Demand and Productivity

j. Environmental Impact

C. Summary of Mineral Industry and Resources Projections

V. SUMMARY OF WATER AND LAND NEEDS

A. By Commodity

1. Regional

2. Subregional

B. By Total

1. Regional

2. Subregional

C. By Specific Critical Areas

D. Projections

VI. SUMMARY OF ENVIRONMENTAL PROBLEMS

A. Water Pollution

B. Multiple Land Use

1. Urban Versus Mineral Use

2. Estuarine Environment

3. Rural Activities and Mineral Production

4. Other

C. Reclamation and Rehabilitation of Mined-Land or Mineral-Polluted Environment

VII. ALTERNATIVE PROGRAMS

A. Water Pollution

1. Regulation

2. Technologic Improvement in Mineral Processing

B. Resource Management

1. Priorities

2. Zoning

C. Land Reclamation or Improvement

1. Economic Use

2. Recreational

3. Wildlife Enhancement

PLAN OF WORK
STUDY ELEMENT h
IRRIGATION

OBJECTIVE

The purpose of study element h is to determine:

A. The extent of the drought problem for agricultural production throughout the region.

B. The soils that have a physical potential for irrigation.

C. The relative response of selected crops on these soils to supplemental irrigation water.

D. The economic feasibility of irrigation.

ORGANIZATION

The irrigation studies will be accomplished under the guidance of the Municipal, Industrial, and Agricultural Water Supply and Water Quality Subcommittee (MIA), which is chaired by the Environmental Protection Agency. The Soil Conservation Service will be the study element leader and will have the responsibility for the preparation of this appendix. Participants in the study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Inputs to the irrigation study element from other study elements are as follows:

Study element	Type of input required
Climate, Meteorology, and Hydrology (b)	Streamflow data and hydrologic studies
Geology and Ground Water (c)	Ground-water supply data
Related Land Use and Management (f)	Current and projected land use and soil classification

Outputs from the irrigation study element to other study elements are as follows:

Study element	Type of output required
Geology and Ground Water (c)	Ground-water use data
Plan Formulation (t)	Supplemental irrigation requirements
Related Land Use and Management (f)	Irrigation data
Water Quality and Pollution (l)	Effects of irrigation on water quality

Study Control and Schedule.

Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress reports to the Chairman of the MIA Subcommittee. The subcommittee chairman will be responsible for maintaining schedule control within this subcommittee and will coordinate schedule changes with the PF Committee.

The first draft of the appendix will be completed by April 1972. Review and revision of the first draft will be completed by October 1972. Final field review and comments will be completed by February 1973.

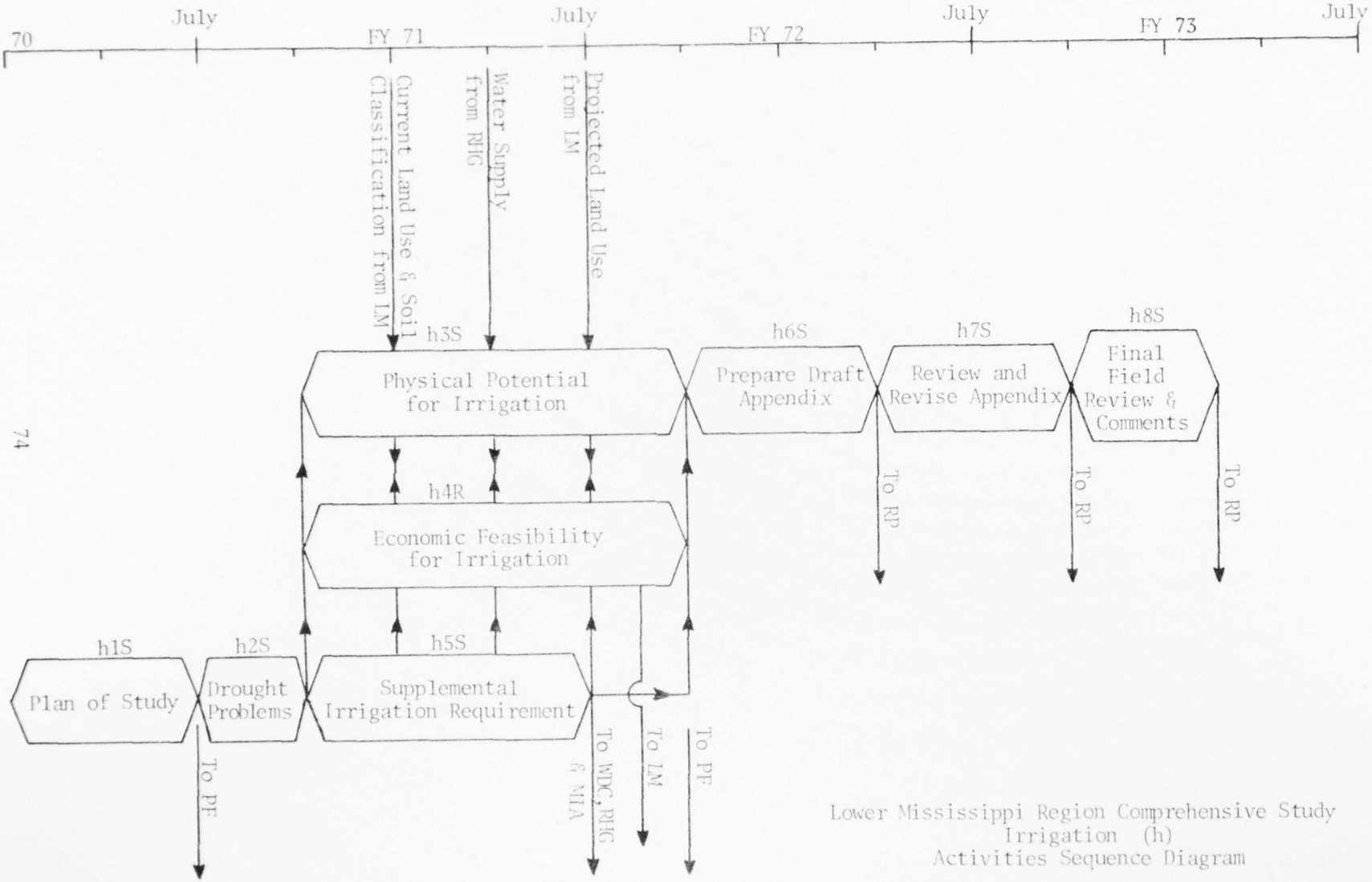
METHODOLOGY

Soils will be classified according to their response to irrigation. An analysis of the properties of the major soil series as related to the production of crops and pastures under irrigated and nonirrigated conditions will be made for each State. Soils will be grouped according to their available water-holding capacity in the normal root-zone depths, as taken from the latest irrigation guide of the individual States. The level of water deficiency (drought problem) will be established from an analysis of published reports, such as irrigation project plans, experiment station bulletins, National Weather Service data, and the publication "Drought and Water Surplus in Agricultural Soils of the Lower Mississippi Valley Area," by C. H. M. VanBavel.

The physical potential for irrigation will be determined by an analysis of the soils that will respond to irrigation, to their cropping pattern, location in respect to available water, how they lend themselves to irrigation development, the types of enterprises in the general area, etc.

The economic feasibility of supplemental irrigation will be determined by an analysis of the costs of irrigation as obtained from project plans, experiment station data, and irrigation publications; and the benefits from irrigation will be defined in terms of increased production, efficiency in management, regional development, resource development, etc.

The supplemental irrigation requirements will be determined by crops by subregions in line with the procedure outlined in the USDA-SCS Technical Release No. 21, with appropriate modifications to make the data appropriate to subregional analysis.



Lower Mississippi Region Comprehensive Study
Irrigation (h)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT h
IRRIGATION

I. INTRODUCTION

A. Authority

B. Purpose of Study

C. Relation to Other Parts of the Report

II. METHODOLOGY, BASIC DATA, AND ASSUMPTIONS

A. Establish Study Areas

1. WRPA

2. Sub-WRPA

3. Other

B. Utilization of Existing Data, Records, and Reports

C. History

1. Past Trends

2. Irrigated Land

a. Areas Where Most Intensive

b. Types of Crops

3. Rates of Water Usage

4. Sources of Supply

D. General Inventory, Study, and Analysis

1. Classification of soils according to response of selected crops to irrigation.

2. Grouping of soils by available moisture-holding capacity in the normal root-zone depths.

3. Determine the consumptive-use requirements for plants grown in the region. (Analyze the properties of plants as combined with climatic factors that affect the use of water.)

4. Determine the amount of water that will be available from nature, under various soil, climatic, and growing-season conditions, to meet all or a portion of the plants' consumptive-use requirements.

5. Determine the water requirements, including losses, that are required to supplement nature in supplying sufficient water to meet the plants' consumptive-use requirement.

6. Water Sources

7. Water Quality Standards

III. REGIONAL SUMMARY

A. Present Status

1. Existing, Planned, and Considered Projects

a. Trends

b. Economic Relationships

c. Types of Crops

d. Water Sources and Quality

e. Types of Systems and Methods of Distribution

2. Inventory study of irrigation where little or no data are available.

a. Subregional location where irrigation is feasible, based on general soil grouping.

b. Economic Subregional Relationship

(1) Trends, Including Markets, Labor Forces, etc.

(2) Types of Crops

(3) Water Sources and Quality

(4) Systems and Methods of Distribution

c. Water Used for Irrigation

B. Translation of food and fiber (and related items) projections for 1980, 2000, and 2020 under the national income, regional development, environmental, and well-being objectives into need for irrigation.

C. Assess the role of irrigation in the consideration of alternative methods of resource development to meet study objectives.

1. Possible relations with other agencies on other water uses and demands.

2. General evaluation of benefits and costs.

3. Probable development of irrigation by farm operators as projected from past trends.

D. Needed Research

1. Brief summary of research needs for irrigation development

a. Types of Crops

b. Systems

c. Effects of Salt-Water Intrusion

d. Accurate Economic Methods for Determining Soil Moisture

e. Long-Range Weather Forecasts

2. Effects of crop production under irrigated conditions.

a. Change in the quality of the product produced.

b. Change in the quality and quantity of water downstream from the place or irrigation.

E. Conclusions

a. Evaluation of the irrigation aspects of the framework plan, alternative consideration, and relationship as degree of importance to other water resource needs.

b. Recommendations for future detailed studies subregional, basin, and/or local projects.

IV. SUBREGIONAL AND MAJOR RIVER BASIN STUDY

A. Present Status

1. Existing, Planned, and Considered Projects

   a. Trends

   b. Economic Relationships

   c. Types of Crops

   d. Water Sources and Quality

   e. Types of Systems and Methods of Distribution

2. Inventory study of irrigation where little or no data are available.

   a. Subregional location where irrigation is feasible, based on general soil grouping.

   b. Economic Subregional Relationship

      (1) Trends, Including Markets, Labor Forces, etc.

      (2) Types of Crops

      (3) Water Sources and Quality

      (4) Systems and Methods of Distribution

   c. Water Used for Irrigation

B. Translation of food and fiber (and related items) projections for 1980, 2000, and 2020 under the national income, regional development, environmental, and well-being objectives into need for irrigation.

C. Assess the role of irrigation in the consideration of alternative methods of resource development to meet study objectives.

   1. Possible relations with other agencies on other water uses and demands.

   2. General evaluation of benefits and costs.

   3. Probable development of irrigation by farm operators as projected from past trends.

D. Needed Research

   1. Brief summary of research needs for irrigation development

a. Types of Crops

b. Systems

c. Effects of Salt-Water Intrusion

d. Accurate Economic Methods for Determining Soil Moisture

e. Long-Range Weather Forecasts

2. Effects of crop production under irrigated conditions.

a. Change in the quality of the product produced.

b. Change in the quality and quantity of water downstream from the place of irrigation.

E. Conclusions

a. Evaluation of the irrigation aspects of the framework plan, alternative consideration, and relationship as degree of importance to other water resource needs.

b. Recommendations for future detailed studies subregional, basin, and/or local projects.

PLAN OF WORK
STUDY ELEMENT i
LAND DRAINAGE

OBJECTIVE

The purpose of study element i is to:

A. Determine the lands that have a drainage problem and develop solutions to meet current and future land-drainage needs for the alternative land and water programs.

B. Discuss the impacts of land drainage on agricultural development, land utilization, fish and wildlife, and other elements.

ORGANIZATION

The land-drainage studies will be accomplished under the guidance of the Water Damage Control Subcommittee (WDC), which is chaired by the Mississippi River Commission. The Soil Conservation Service will be the study element leader and will have the responsibility for the preparation of this appendix. Participants in the study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Inputs to the land drainage study element from other study elements are as follows:

Study element	Type of input required
Economic Base (a)	Projection of population and industrial productions for programs A, B, and C
Climate, Meteorology, and Hydrology (b)	Streamflow data and hydrologic studies
Geology and Ground Water (c)	Ground-water hydrology, description of aquifers, interrelation of surface water and ground water
Related Land Use and Management (f)	Current and projected land use and soil classification

Study element	Type of input required
Fish and Wildlife (q)	Fish and wildlife demands and needs.

Outputs from the land-drainage study element to other study elements are as follows:

Study element	Type of output required
Related Land Use and Management (f)	Land-drainage problems and needs.
Coastal and Estuarine (o)	Land-drainage problems and needs.
Plan Formulation (t)	Land-drainage problems and needs.

Study Control and Schedule.

Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress reports to the Chairman of the WDC Subcommittee. The subcommittee chairman will be responsible for maintaining schedule control within this subcommittee, and will coordinate schedule changes with the PF Committee.

The development of drainage needs will be essentially completed by July 1971. The first draft of the appendix will be completed by April 1972. Review and revision of the first draft will be completed by October 1972. Final field review and comments will be completed by February 1973.

METHODOLOGY

The Department of Agriculture Conservation Needs Inventory will be the main source of information for determining soils that have a drainage problem. Soils will be identified in each WRPA, and subbasin, if needed, by Land Resource Area (LRA), Land Capability Unit (LCU), and major land use.

The nature and scope of the problem will be defined as follows:

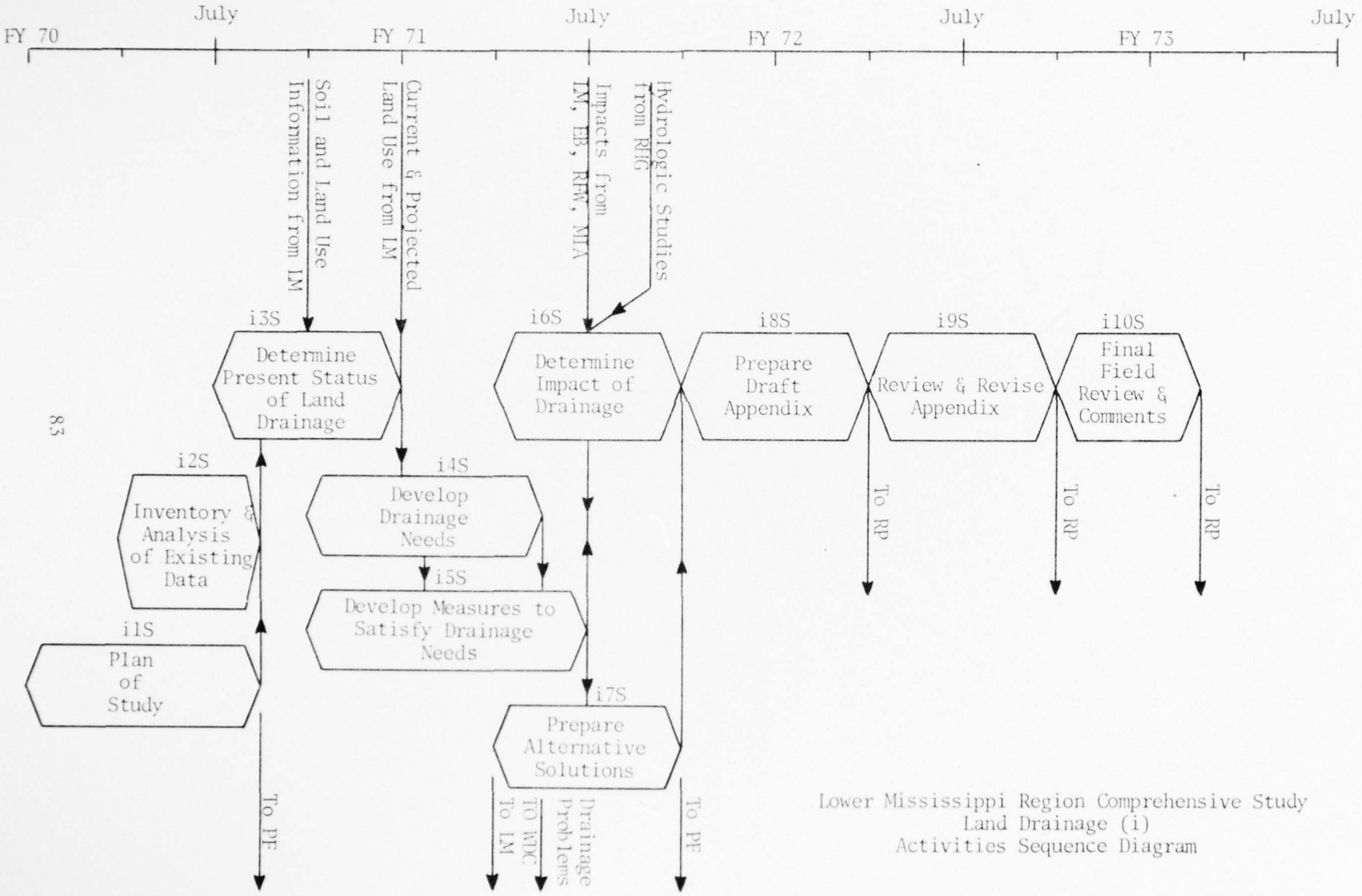
A. The number of acres that is presently inadequately drained in each WRPA by LRA, LCU, and major land use.

B. The number of acres where drainage is not needed to meet the current and projected needs in each WRPA by LRA, LCU, and major land use.

C. The number of acres where drainage measures should be established to meet the current and projected needs in each WRPA by LRA, LCU, and major land use.

D. The impacts of drainage, to include costs of drainage measures, economic benefits and impact on land development, land utilization, fish and wildlife, recreation, health aspects, and other related elements.

E. Alternative solutions to meet the needs of national income, regional development, environmental and well-being objectives, and identification of programs for each of these objectives.



Lower Mississippi Region Comprehensive Study
Land Drainage (i)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT i
LAND DRAINAGE

I. INTRODUCTION

A. Authority

B. Purpose of Study

C. Relation to Other Appendixes

D. History and Background

II. GLOSSARY OF TERMS

A. Surface Drainage (Definitions)

B. Subsurface Drainage (Definitions)

III. BASIC DATA AND ASSUMPTIONS

IV. REGIONAL SUMMARY

A. Present Status

1. Lands having drainage problem by Land Resources Areas, Land Capability Units, and Major Land Use

2. Existing and Authorized Drainage Projects

a. Major Outlets

b. On-Farm Drainage

B. Drainage Needs

1. Current (by Land Resource Area and Land Capability Units)

a. Agriculture

(1) Cropland

(2) Pasture

(3) Woodland

b. Other

2. Projected (1980, 2000, 2020)

a. Agriculture

(1) Cropland

(2) Pasture

(3) Woodland

b. Other

C. Measures Needed to Satisfy Drainage Needs

1. Current (by Land Resource Area and Land Capability Units)

a. Agriculture

(1) Cropland

(2) Pasture

(3) Woodland

b. Other

2. Projected (1980, 2000, 2020)

a. Agriculture

(1) Cropland

(2) Pasture

(3) Woodland

b. Other

D. Impact of Drainage

1. Economic Impact

a. Benefits

(1) New Crops

(2) Yields

(3) Increased Efficiencies

(4) Other

b. Costs

(1) On-Farm

(2) Project

2. Other Impacts

a. Agriculture Development

b. Fish and Wildlife

c. Recreation

d. Other

E. Summary and Conclusions

V. WRPA SUMMARY

A. Present Status

1. Lands having drainage problem by Land Resources Areas, Land Capability Units, and Major Land Use

2. Existing and Authorized Drainage Projects

a. Major Outlets

b. On-Farm Drainage

B. Drainage Needs

1. Current (by Land Resource Area and Land Capability Units)

a. Agriculture

(1) Cropland

(2) Pasture

(3) Woodland

b. Other

2. Projected (1980, 2000, 2020)

a. Agriculture

(1) Cropland

(2) Pasture

(3) Woodland

b. Other

C. Measures Needed to Satisfy Drainage Needs

1. Current (by Land Resource Area and Land Capability Units)

a. Agriculture

(1) Cropland

(2) Pasture

(3) Woodland

b. Other

2. Projected (1980, 2000, 2020)

a. Agriculture

(1) Cropland

(2) Pasture

(3) Woodland

b. Other

D. Impact of Drainage

1. Economic Impact

a. Benefits

(1) New Crops

(2) Yields

(3) Increased Efficiencies

(4) Other

b. Costs

(1) On-Farm

(2) Project

2. Other Impacts

a. Agriculture Development

b. Fish and Wildlife

c. Recreation

d. Other

E. Summary and Conclusions

VI. SUMMARY AND CONCLUSIONS

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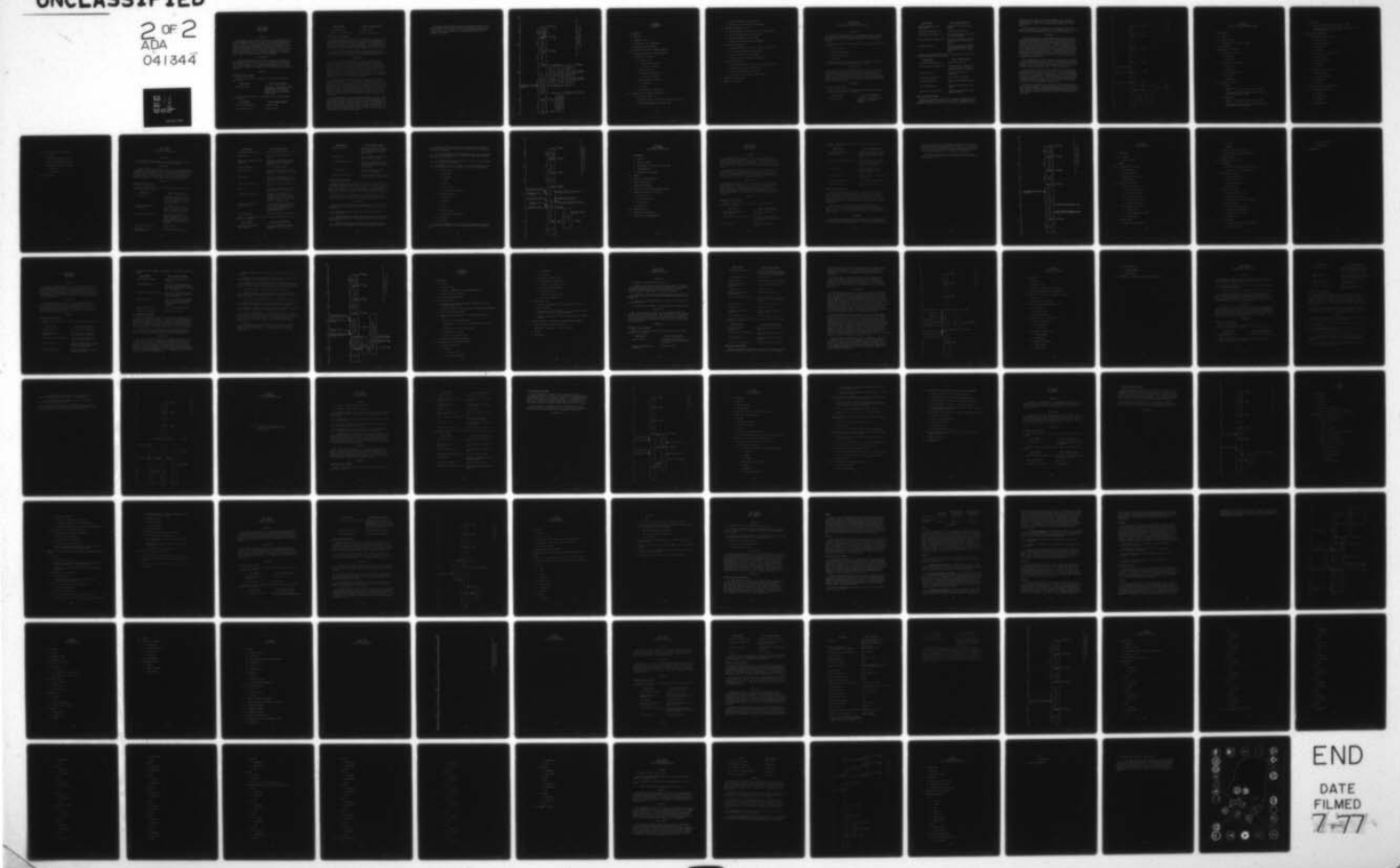

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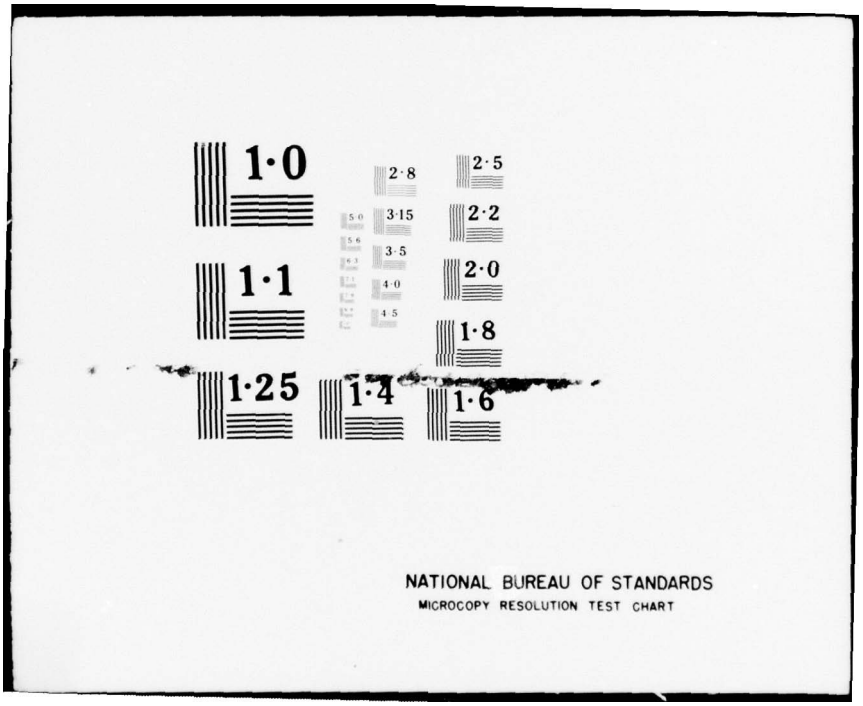
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NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

PLAN OF WORK
STUDY ELEMENT j
NAVIGATION

OBJECTIVE

The purpose of study element j is to make a broad determination of those improvements which will be required to satisfy navigational needs over the 50-year time period 1970-2020 within the Lower Mississippi Region. Needs will be identified with respect to the national income, regional development, environmental, and well-being objectives. The impact of these improvements on other objectives and social values could require development of possible alternative measures to satisfy the needs. The results will be utilized in the formulation of alternative water resources development plans by other appendixes.

ORGANIZATION

The navigation studies will be accomplished under the guidance of the Navigation Subcommittee (NAV), which is chaired by the Mississippi River Commission (NOD). The Mississippi River Commission (NOD) will be the study element leader and have the responsibility for the preparation of this appendix. Participants in the study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Inputs to study element j, Navigation, from other study elements are as follows:

Study element	Type of input required
Economic Base (a)	Projections of population, income, and employment value added by manufacturing, value of farm products sold, and petroleum or energy demand

Outputs from study element j, Navigation, to other study elements are as follows:

Study element	Type of output required
Coastal and Estuarine (o)	Navigation needs
Fish and Wildlife (q)	Navigation needs

Study element	Type of output required
Plan Formulation (t)	Navigation needs
Inventory of Facilities (v)	Navigation facilities

Study Control and Schedule.

Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress reports to the Chairman of the NAV Subcommittee. The subcommittee chairman will be responsible for maintaining schedule control within this subcommittee and will coordinate schedule changes with the PF Committee.

The first draft of the appendix will be completed by April 1972. Review and revision of the first draft will be completed by October 1972. Final field review and comments will be completed by February 1973.

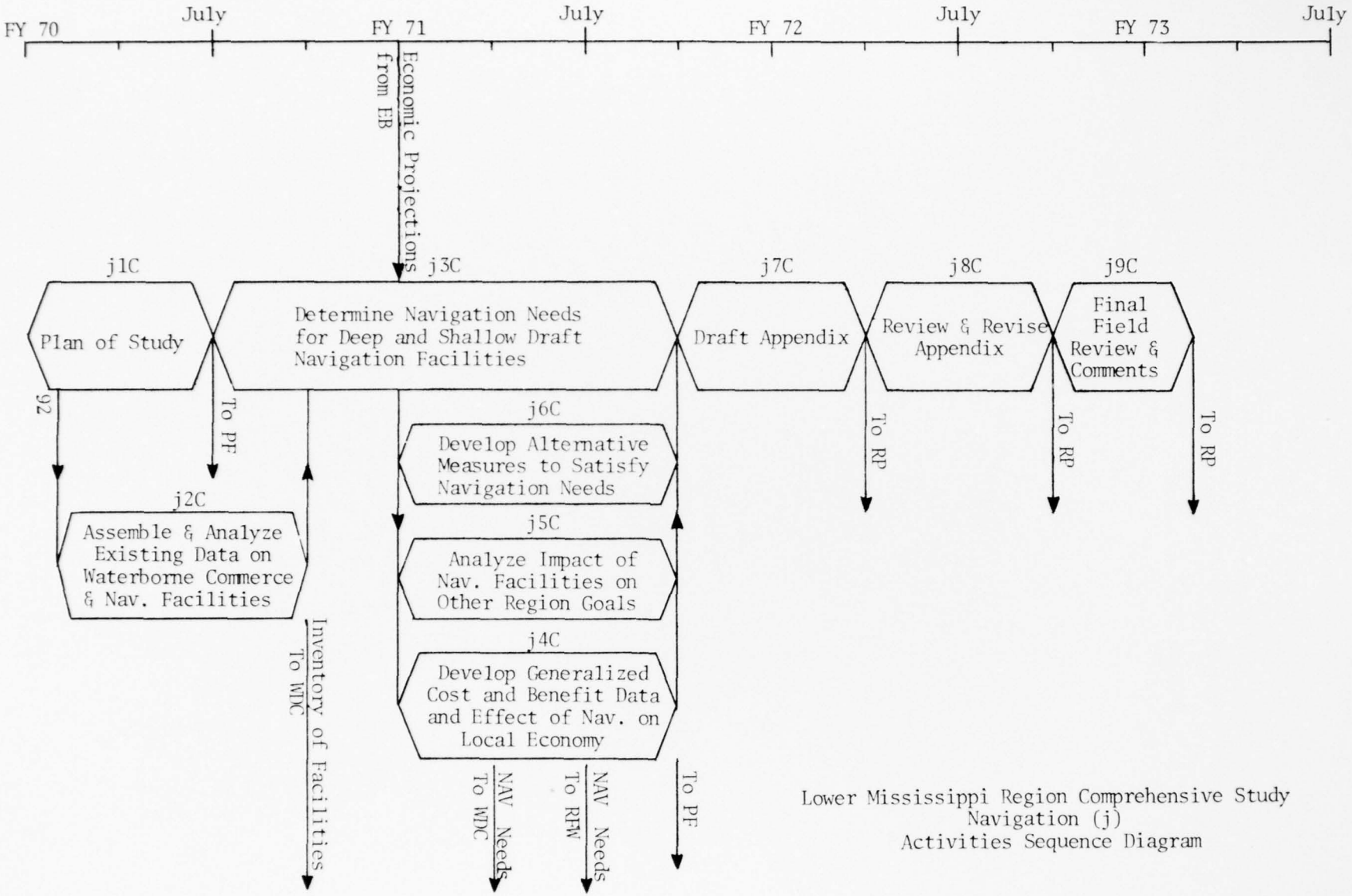
METHODOLOGY

The scope of a Type I study does not permit a comparative rate analysis of all modes of transportation competing for the region's commerce. Therefore, historical and projected commerce evaluated in this study will be limited to that tonnage moving and expected to move over the waterways. An analysis of waterborne statistics for the last 10 years will be made for both domestic and foreign commerce. The analysis will define current traffic pattern of commerce over the Lower Mississippi Region system and subsystems located in the water resource planning areas. The 1970 traffic will serve as the base year from which to project future growth of waterborne commerce.

In each system and subsystem, individual commodities making up the 1970 base-year commerce will be categorized and assigned an economic indicator deemed apposite for the commodity category in question. Appropriate area economic indicators will be selected from those developed by the Economic Base for projecting alternative goals of the region. Growth trends for the selected indicators will be projected over the 50-year period 1970-2020. Projected growth patterns for other areas, such as the upper Mississippi and Ohio River Basins, will be ascertained as they exert significant influence on the magnitude of commerce moving in the study area.

An assessment will be made of the existing waterways and their capacities, authorized waterways and improvements, current and future vessel requirements, and other innovations expected to accommodate prospective commerce, as developed. This assessment will point to the problems that can be expected during the 50-year period of study. Determination can then be made of the proper means to solve such problems - whether it be deeper and wider waterways, larger locks, waterway extensions, improved harbor facilities, or offshore terminals.

Generalized cost and benefit data will be prepared to apply to the miles of channel work proposed for best satisfying the navigation needs of the region. The cost data will also be applied to any alternative navigation proposals resulting from a compromise with other water resource requirements.



Lower Mississippi Region Comprehensive Study
Navigation (j)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT j
NAVIGATION

I. INTRODUCTION

A. Authority

B. Purpose of Study

C. Relationship - Other Appendixes

D. Assumptions and Constraints

II. LOWER MISSISSIPPI SYSTEM - CURRENT CONDITIONS

A. General Descriptions - Region Navigation

B. Components of the System

1. Existing Projects

a. Shallow-Draft Facilities

b. Deep-Draft Facilities

2. Authorized Projects

a. Shallow-Draft Facilities

b. Deep-Draft Facilities

3. Existing Waterborne Traffic

a. Commodities

b. Vessels

4. Current Problems - WRPA Areas

III. LOWER MISSISSIPPI SYSTEM - FUTURE NEEDS

A. National Income Objective

1. Growth Projections for Years 1970, 1980, 2000, and 2020

2. Most Appropriate Means to Satisfy Needs

3. Alternative Methods to Satisfy Needs

4. Generalized Cost Estimates for Each Method

B. Regional Development Objective

1. Growth Projections for Years 1970, 1980, 2000, and 2020

2. Most Appropriate Means to Satisfy Needs

3. Alternative Methods to Satisfy Needs

4. Generalized Cost Estimates for Each Method

C. Environmental Objective

1. Growth Projections for Years 1970, 1980, 2000, and 2020

2. Most Appropriate Means to Satisfy Needs

3. Alternative Methods to Satisfy Needs

4. Generalized Cost Estimates for Each Method

D. Well-Being Objective

1. Growth Projections for Years 1970, 1980, 2000, and 2020

2. Most Appropriate Means to Satisfy Needs

3. Alternative Methods to Satisfy Needs

4. Generalized Cost Estimates for Each Method

IV. COMPARISON OF ALTERNATIVES

V. SUMMARY AND CONCLUSIONS

PLAN OF WORK
STUDY ELEMENT k
MUNICIPAL AND INDUSTRIAL WATER SUPPLY

OBJECTIVE

The purpose of study element k is to determine municipal, thermal power production, and industrial water supply needs by Water Resource Planning Areas (WRPA) and subareas for the years 1970, 1980, 2000, and 2020.

Water supply needs will be prepared for each of the following study objectives:

A. National Income

B. Regional Development

C. Environmental Quality

D. Well-Being

Problem areas will be defined and possible solutions determined by comparison with available and potential water supplies.

ORGANIZATION

The municipal and industrial water supply studies will be accomplished under the guidance of the Municipal, Industrial, and Agricultural Water Supply and Water Quality Subcommittee (MIA), which is chaired by the Environmental Protection Agency. The Mississippi River Commission will be the study element leader and will have the responsibility for the preparation of this appendix. Participants in the study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Inputs to study element k, Municipal and Industrial Water Supply, from other study elements are as follows:

Study element	Type of input required
Economic Base (a)	Projections of population, employment, and industrial production

Study element	Type of input required
Climate, Meteorology, and Hydrology (b)	Streamflow data and hydrologic studies
Geology and Ground Water (c)	Ground water supply data
Related Mineral Resources (g)	Water and land needs for mineral resource development
Water Quality and Pollution (1)	Present and future water quality and potential hazards to water supply
Health Aspects (m)	Municipal water supply inventory information and identify health related municipal water supply needs

Outputs from study element k, Municipal and Industrial Water Supply, to other study elements are as follows:

Study element	Type of output required
Geology and Ground Water (c)	Ground water use data
Water Quality and Pollution (1)	Present and future municipal and industrial water use, requirements, problems; use categories
Health Aspects (m)	Water users and water use projections
Coastal and Estuarine (o)	Water supply requirements
Fish and Wildlife (q)	Municipal and industrial water use
Plan Formulation (t)	Municipal and industrial water needs
Inventory of Facilities (v)	Municipal and industrial water supply facilities

Study Control and Schedule.

Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress

reports to the chairman of the MIA Subcommittee. The subcommittee chairman will be responsible for maintaining schedule control within this subcommittee and will coordinate schedule changes with the PF Committee.

The first draft of the appendix will be completed by April 1972. Review and revision of the first draft will be completed by October 1972. Final field review and comments will be completed by February 1973.

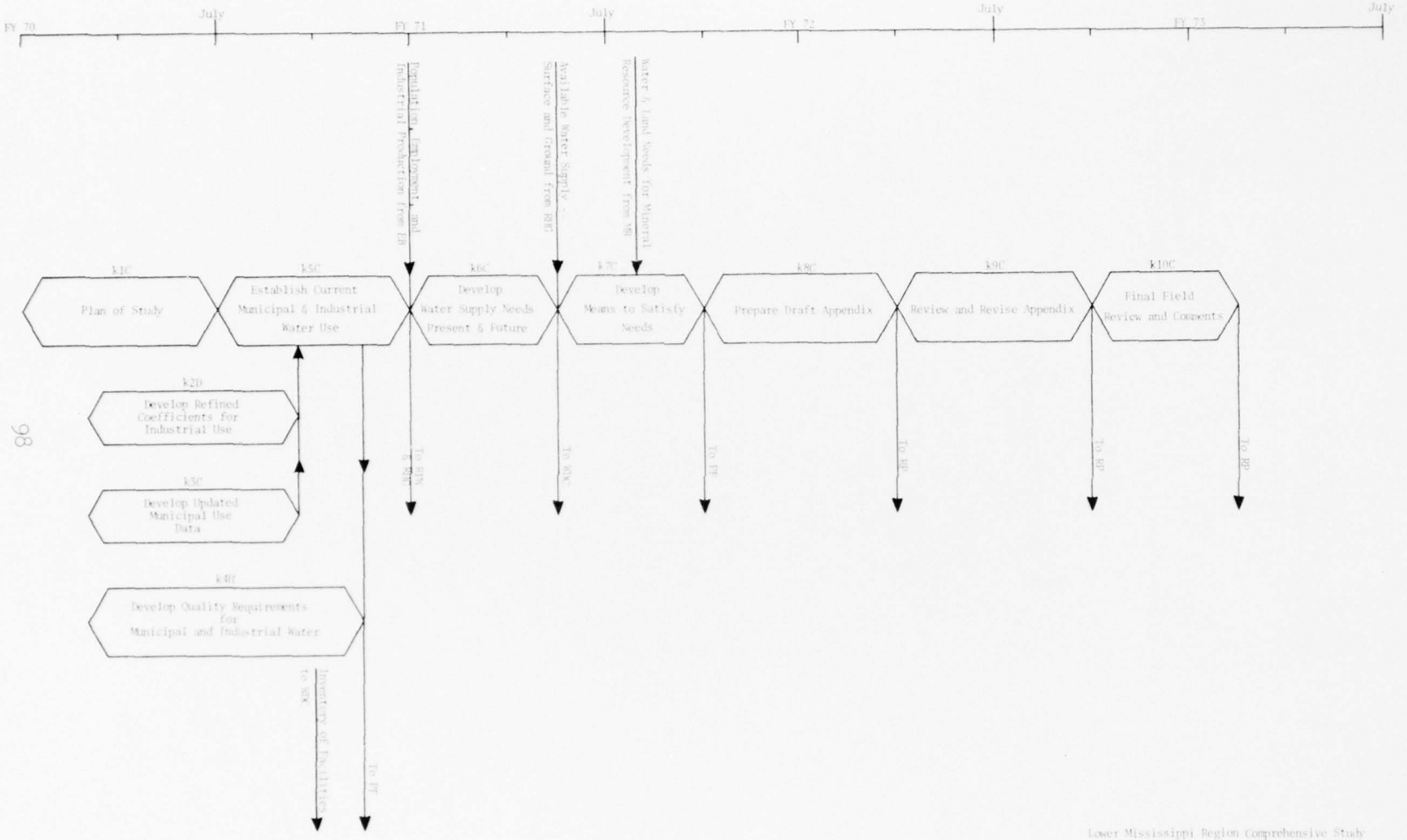
METHODOLOGY

Assessment of municipal and industrial water supply will be based upon existing information and data, and particularly upon the survey and reports prepared by Gulf South Research Institute, Baton Rouge, Louisiana (GSRI) for use by the Corps of Engineers in the West Texas-Eastern New Mexico Water Import Study. The GSRI comprehensive survey of 1968 water use by industrial interests in the Lower Mississippi Valley permits analysis of industrial water use at the Standard Industrial Classification three-digit levels and aggregation of data to the two-digit level for reporting purposes. Municipal water use will be developed for Standard Metropolitan Statistical Areas (SMSA) and non-SMSA categories. Water use will be developed and reported as intake, consumption, and return flow.

Water requirements for power generation, and possibly for dilution of thermal loads discharged into streams, will be based upon data prepared by the Federal Power Commission for use in the West Texas-Eastern New Mexico Water Import Study. These requirements may be refined, as indicated by current knowledge to meet the various objectives.

For projection of future water use coefficients of water use per employment/units of production as developed in the GSRI analysis will be refined as justified by current knowledge. Similar consideration will be given to the gallons per capita/day coefficient for the municipal water use determinations. Economic parameter, as developed by the Economics Subcommittee, will be applied to the water-use coefficients to establish future water demand by WRPA for each of the four Lower Mississippi Region Comprehensive Study objectives.

Water supplies available in each WRPA will be compared with the above water use demand to identify area deficiencies in acre-feet units. Subwork groups oriented to common planning interests will develop possible solutions to water-supply needs considering development of ground water supplies, storage or interstream transfer of surface supplies, and others.



Lower Mississippi Region Comprehensive Study
Municipal and Industrial Water Supply (k)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT k
MUNICIPAL AND INDUSTRIAL WATER SUPPLY

I. INTRODUCTION

A. Authority

B. Purpose of Study

C. Relationship to Other Study Elements

D. Definitions

II. METHODOLOGY AND ASSUMPTIONS

A. Municipal Water Supply

1. Assumptions

2. Methodology

B. Thermal Power Water Supply

1. Assumptions

2. Methodology

C. Industrial Water Supply

1. Assumptions

2. Methodology

III. WATER SUPPLY PARAMETERS

A. Municipal

1. Summary of Current and Historical Use by WRPA

2. Estimation of Future Per Capita Use for Years 1970, 1980, 2000, and 2020 by WRPA

B. Thermal Power

1. Summary of Current and Historical Use by WRPA

2. Estimation of Future Per Capita Use for Years 1970, 1980, 2000, and 2020 by WRPA

C. Industrial

1. Summary of Current and Historical Use by WRPA

2. Estimation of Future Use Per Unit of Production for Years 1970, 1980, 2000, and 2020 by WRPA

IV. WATER SUPPLY REQUIREMENTS

A. Municipal Water Supply by WRPA

1. National Income

2. Regional Development

3. Environmental

4. Well-Being

B. Thermal Power Water Supply by WRPA

1. National Income

2. Regional Development

3. Environmental

4. Well-Being

C. Industrial Water Supply by WRPA

1. National Income

2. Regional Development

3. Environmental

4. Well-Being

V. AVAILABLE SUPPLY AND ADDITIONAL NEEDS

A. Available Supply by WRPA

1. Municipal

2. Thermal Power

3. Industrial

B. Additional Needs

VI. COST OF DEVELOPING WATER SUPPLIES

A. Storage

B. Developing Ground Water Supplies

C. Inter and Intraregional Transfer

D. Treatment of Substandard Supplies

1. Municipal

2. Industrial

VII. WRPA ANALYSES

PLAN OF WORK
STUDY ELEMENT 1
WATER QUALITY AND POLLUTION

OBJECTIVE

The purpose of study element 1 is to develop alternative quality plans to improve the water quality and to abate pollution.

ORGANIZATION

The Water Quality and Pollution studies will be accomplished under the guidance of the Municipal, Industrial, and Agricultural Water Supply and Water Quality Subcommittee (MIA), chaired by the Environmental Protection Agency. The Water Quality Office will be the study element leader and will have the responsibility for the preparation of this appendix. Participants in the study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Inputs to study element 1, Water Quality and Pollution, from other study elements are as follows:

Study element	Type of input required
Economic Base (a)	Demographic and economic data: population, urbanization, heavy water using industries (labor force, employment by SIC, manufacturing output)
Climate, Meteorology, Hydrology (b)	Streamflow records, hydrologic analysis of streams, i.e., flow duration tables, low flow and peak flow probability tables
Geology and Ground Water (c)	Availability, distribution, quality and quantity of ground water; withdrawals, changes in ground water levels, possibility of deep-well withdrawals and disposal
Flood Problems (d and e)	Storage potential
Related Land Use and Management (f)	Current and projected land use

Study element	Type of input required
Related Mineral Resources (g)	Water problems and pollution control
Irrigation (h)	Effects of irrigation on water quality
Municipal and Industrial Water Supply (k)	Present and future municipal and industrial water use requirements; problems; and use categories
Fish and Wildlife (q)	Fish and wildlife demands
Health Aspects (m)	Areas of needed health protection relating to water quality, including vectors
Recreation (n)	Centers of recreation needs by type, class, and category including amount and kind of development
Coastal and Estuarine (o)	Coastal and estuarine problems and needs
Power (r)	Projections of thermal power needs and associated water requirements
Sediment and Erosion (s)	Sediment yield characteristics, determination of sediment yield, sediment yield values for project planning, effects of water control projects on sediment yields
Legal and Institutional Environments (u)	Laws and institutions that affect water resource development, status of interstate compacts directly involving water quality and pollution abatement
Plan Formulation (t)	Water quality problems and needs

Outputs from study element 1, Water Quality and Pollution, to other elements are as follows:

Study element	Type of output required
Municipal and Industrial Water Supply (k)	Present and future water quality and potential hazards to water supply

Study element	Type of output required
Health Aspects (m)	Present and future water quality and potential hazards to water supply, organic and inorganic water quality
Recreation (n)	Advice on water quality criteria for recreational purposes
Coastal and Estuarine (o)	Advice on the effects of water quality that alterations to the shoreline may have in the development programs
Fish and Wildlife (q)	Advice on water quality and water quality standards
Inventory of Facilities (v)	Sewerage treatment, water quality control, and water supply facilities

Study Control and Schedule.

Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress reports to the Chairman of the MIA Subcommittee. Ths subcommittee chairman will be responsible for maintaining schedule control within this subcommittee and will coordinate schedule changes with the PF Committee.

The first draft of the appendix will be completed by April 1972. Review and revision of the first draft will be completed by October 1972. Final field review and comments will be completed by February 1973.

METHODOLOGY

Water quality control plans will be developed to serve as a basis for determination of methods to improve the water quality and to abate pollution:

A. Inventory of existing water quality and its suitability for beneficial water uses.

B. Analyzing present and future pollution sources with an inventory of the existing situation, and estimating problems which may develop in the future.

C. Appraising the adequacy of present physical and institutional control measures in the handling of man-made and natural pollutants.

D. Comparing existing water quality with water quality standards to delineate problem areas where present water quality does not meet present water quality standards.

1. Make recommendations for strengthening water quality standards and recommending the adoption of water quality standards where they are inadequate or do not exist.

2. Estimating the need for and value of storage for water quality control by regulation of streamflows.

E. Development of current and future water quality management needs (1970, 1980, 2000 and 2020) for Programs A, B, C, and D in each WRPA.

1. National Income

   a. Population

   b. Employment

   c. Income

   d. Water Use

   e. Water Pollution

   f. Pollution Control Measures

2. Regional Development

   a. Population

   b. Employment

   c. Income

   d. Water Use

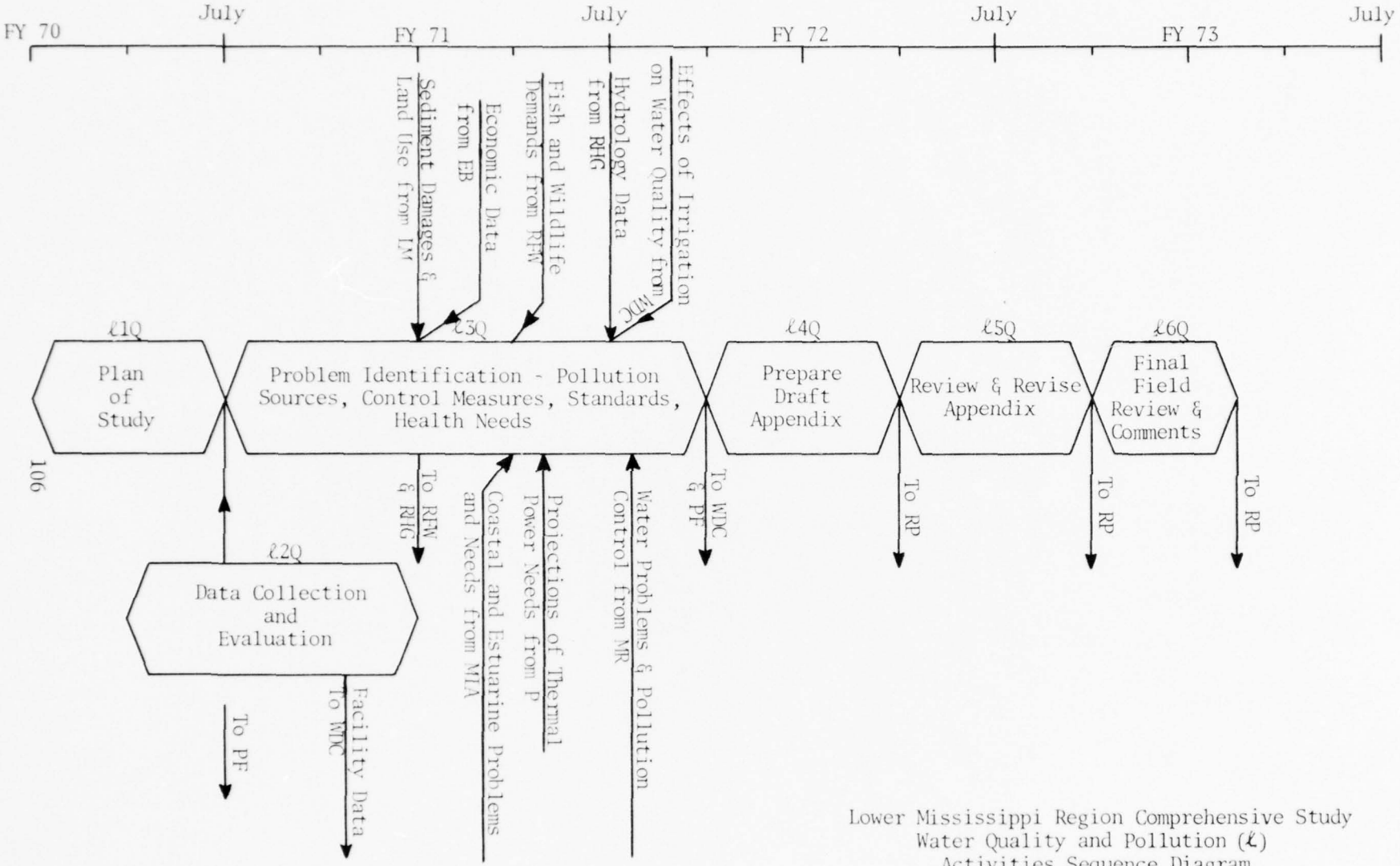
   e. Water Pollution

   f. Pollution Control Measures

3. Environmental

4. Well-Being

F. Making recommendations for legislative considerations and indicate field investigations needed to augment available data and future research needs.



Lower Mississippi Region Comprehensive Study
Water Quality and Pollution (ℓ)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT 1
WATER QUALITY AND POLLUTION

I. INTRODUCTION

- A. Authority
- B. Purpose of Study
- C. Relationship to Other Parts of the Study
- D. Acknowledgements
- E. Description of the Region

II. SUMMARY

III. PRESENT AND FUTURE WATER USE

IV. PRESENT WATER QUALITY

V. WATER QUALITY PROBLEMS

VI. EXISTING WATER QUALITY MANAGEMENT PROGRAMS

VII. FUTURE WATER QUALITY CONTROL NEEDS

- A. National Income
- B. Regional Development
- C. Environmental
- D. Well-Being

VIII. WATER SUPPLY PLAN

IX. WATER QUALITY CONTROL PLAN

X. CONCLUSIONS AND RECOMMENDATIONS

PLAN OF WORK
STUDY ELEMENT m
HEALTH ASPECTS

OBJECTIVE

The purpose of study element m will be to bring together in one document all health related aspects of water resource and related land development in the Lower Mississippi Region. It will deal with man and his environment and will include drinking water, air, recreational and shellfish waters, liquid and solid wastes, and disease and nuisance vectors.

The Health Aspects study will define the present health status of the basin and project future health needs of the basin to cover the national income, regional development, environmental and well-being objectives. Included in the study will be guidance for health protection in water and related land resource developments.

ORGANIZATION

The public health studies will be accomplished under the guidance of the Municipal, Industrial, and Agricultural Water Supply and Water Quality Subcommittee (MIA), which is chaired by the Environmental Protection Agency. The Environmental Protection Agency will be the study element leader, and will have the responsibility for the preparation of this appendix. Participants in the study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Inputs to the Health Aspects study element from other study elements are as follows:

Study element	Type of inputs required
Municipal and Industrial Water Supply (k)	Water users and water use projections
Water Quality and Pollution (l)	Water quality data on streams intended for water supply and/or recreational use
Recreation (n)	Recreational development proposals

Outputs from the Health Aspects study element to other study elements are as follows:

Study element	Type of output required
Municipal and Industrial Water Supply (k)	Municipal water supply inventory information and identify health related municipal water supply needs
Water Quality and Pollution (l)	Health related water quality criteria for drinking water and water-contact recreation and identify areas of need
Recreation (n)	Quality criteria for water-contact sports and sanitary facility standards
Fish and Wildlife (q)	Quality criteria for shellfish growing waters
Coastal and Estuarine (o)	Public health considerations
Plan Formulation (t)	Health related problems and needs

Study Control and Schedule.

Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress reports to the Chairman of the MIA Subcommittee. The subcommittee chairman will be responsible for maintaining schedule control within this subcommittee and will coordinate schedule changes with the PF Committee.

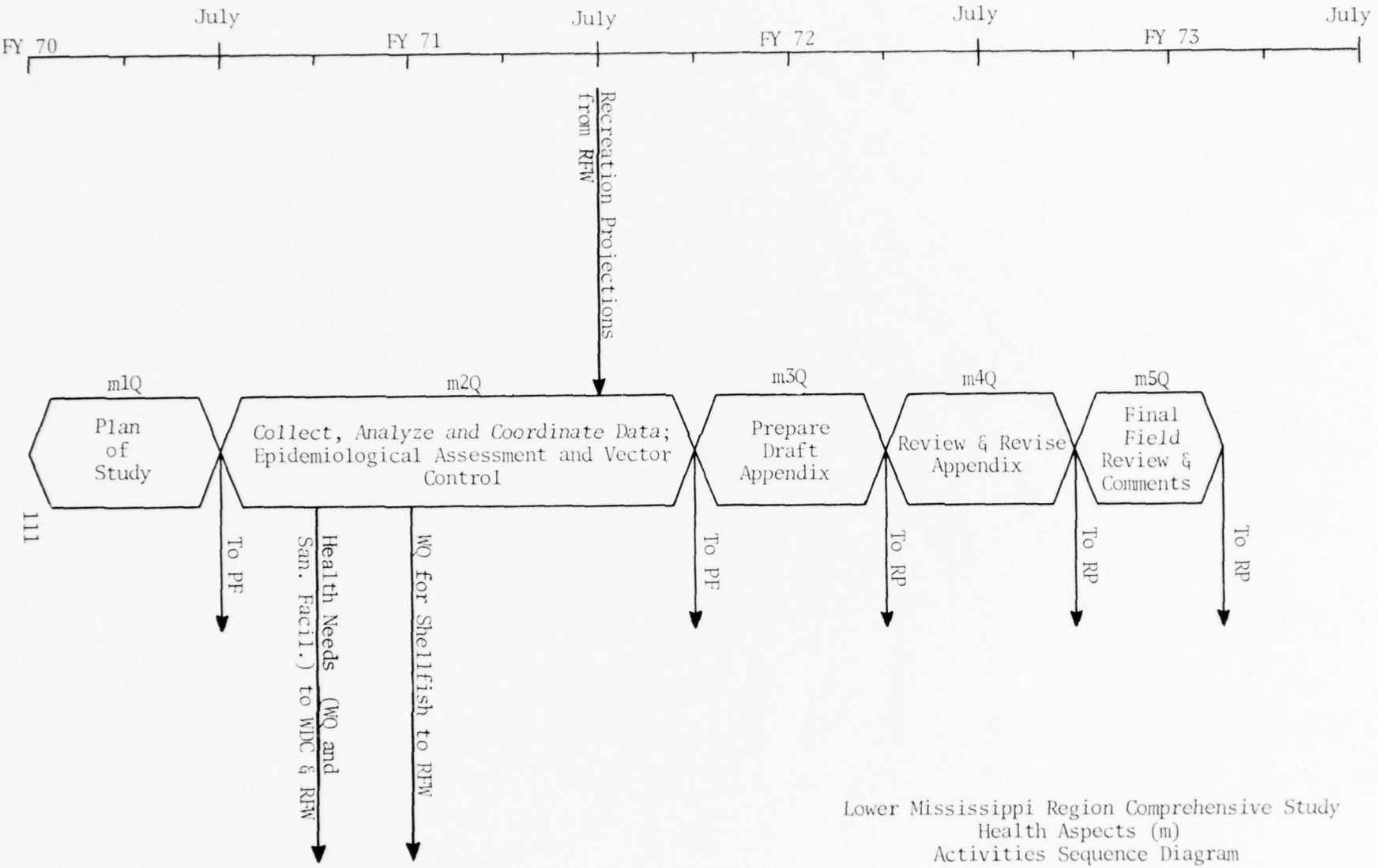
The compilation of Health Aspects data will be completed by October 1971. The first draft of the appendix will be completed by April 1972. Review and revision of the first draft will be completed by October 1972. Final field review and comments will be completed by February 1973.

METHODOLOGY

The Health Aspects appendix will discuss the water of the region as a usable source of drinking water and the ability of the water purveyer to produce and deliver a safe product. It will analyze the waters of the

region as to their use for water-contact sports, and call for inclusion of related recreation and sanitary facilities. In addition, the appendix will discuss environmental factors such as vector control, solid waste disposal, shellfish sanitation, radiological health, and air pollution which affect man's existence in the region.

Particular coordination will be maintained with each of the seven State health departments in the region as well as with several Federal agencies.



Lower Mississippi Region Comprehensive Study
Health Aspects (m)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT m
HEALTH ASPECTS

I. INTRODUCTION

A. Authority

B. Purpose of Study

II. SUMMARY

III. EPIDEMIOLOGICAL ASSESSMENT

A. Disease Records

B. Disease Occurrence

C. Epidemiological Programs

D. Regional Needs

IV. DRINKING WATER SUPPLIES

A. Municipal Water Supply

1. Drinking Water Quality

2. Source and Treatment

3. Operation and Control

4. Distribution Protection

5. Health Surveillance

B. Individual Water Supplies

1. Present Status

2. Water Treatment and Quality

3. Regional Needs

V. VECTOR CONTROL

A. Status of Vector Problems

1. Diseases

2. Nuisance

B. Status of Vector Control Programs

C. Effects of Water Resource Developments

D. Regional Needs

VI. ENVIRONMENTAL HEALTH ANALYSIS

A. Recreation

1. Water Quality for Body-Contact Sports

2. Sanitary Facilities and Practices

B. Solid Waste Disposal

1. Public Health Problems

2. Disposal Inventory

3. Regulatory Capability

4. Regional Needs

C. Shellfish Sanitation

1. Location of Growing Areas

2. Present Water Quality

3. Effect of Water Resource Developments

D. Radiological Health

1. Radiological Water Quality

2. Sources of Potential Hazard

3. Surveillance and Control

4. Regional Needs

E. Air Pollution

1. Effect of Water Resource Developments

2. Present Air Quality

3. Regulatory Capability

4. Regional Needs

VII. CONCLUSIONS

PLAN OF WORK
STUDY ELEMENT n
RECREATION

OBJECTIVE

The purpose of study element n is to determine outdoor recreation needs for water and related land in terms of recreation days for the Lower Mississippi Region by water resource planning areas (WRPA) for the years 1970, 1980, 2000, and 2020. This element will also prepare a framework plan, embodying the National Income, the Regional Development, the Environmental, and the Well-Being Programs, defining problem areas and possible solutions.

ORGANIZATION

The recreation studies will be accomplished under the guidance of the Recreation and Fish and Wildlife Subcommittee (RFW), which is chaired by the Bureau of Sport Fisheries and Wildlife. The Bureau of Outdoor Recreation will be the study element leader and will have the responsibility for the preparation of this appendix. Participants in the study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Inputs to study element n, Recreation, from other study elements are as follows:

Study element	Type of input required
Economic Base (a)	Demographic and economic data.
Related Land Use and Management (f)	Major land uses, projections of use and management problems
Water Quality and Pollution (l)	Advice on water quality criteria for recreational purposes.
Health Aspects (m)	Advice on health; areas of needed health protection relating to recreation development.
Fish and Wildlife (q)	Man-days of hunting and fishing; management program.

Outputs from study element n, Recreation, to other study elements are as follows:

Study element	Type of output required
Flood Problems (d and e)	Centers of recreation need; etc.; alternatives
Plan Formulation (t)	Centers of recreation needs by type, class, and category including amount and kind of development; etc.; alternatives
Water Quality and Pollution (l)	Recreation needs by type, class, and category including amount and kind of development
Health Aspects (m)	Centers of recreation need, magnitude of class, type and category including amount and kind of development
Coastal and Estuarine (o)	Centers of needs; alternatives
Inventory of Facilities (v)	Recreation facilities

Study Control and Schedule.

Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress reports to the Chairman of the RFW Subcommittee. The subcommittee chairman will be responsible for maintaining schedule control within this subcommittee, and will coordinate schedule changes with the PF Committee.

The first draft of the appendix will be completed by April 1972. Review and revision of the first draft will be completed by October 1972. Final field review and comments will be completed by February 1973.

METHODOLOGY

The study will provide estimates of the quantity and quality of water to reach a desired level of recreation opportunities as well as early- and long-range estimates of recreation use resulting from analyses of significant factors relating to class, type, and category. Realistic programs to reach these goals will be identified which provide optimum outdoor recreation opportunities to region residents and, where applicable, to visitors through the enhancement of the environmental quality and the development of the region resources.

In order to accomplish these, the study will address itself to the following:

A. Analysis of projected population, economic data, trends, environmental problems and issues pertinent to outdoor recreation.

B. Inventory of existing and potential environmental and recreational resources, analysis of regional recreation deficits and compilation and analysis of related water and land resources having recreation potential.

C. Alternative means of providing recreation opportunities.

D. Empirical estimate of present and future use in terms of available leisure time and recreation opportunities to meet national income, regional development, environmental, and well-being goals.

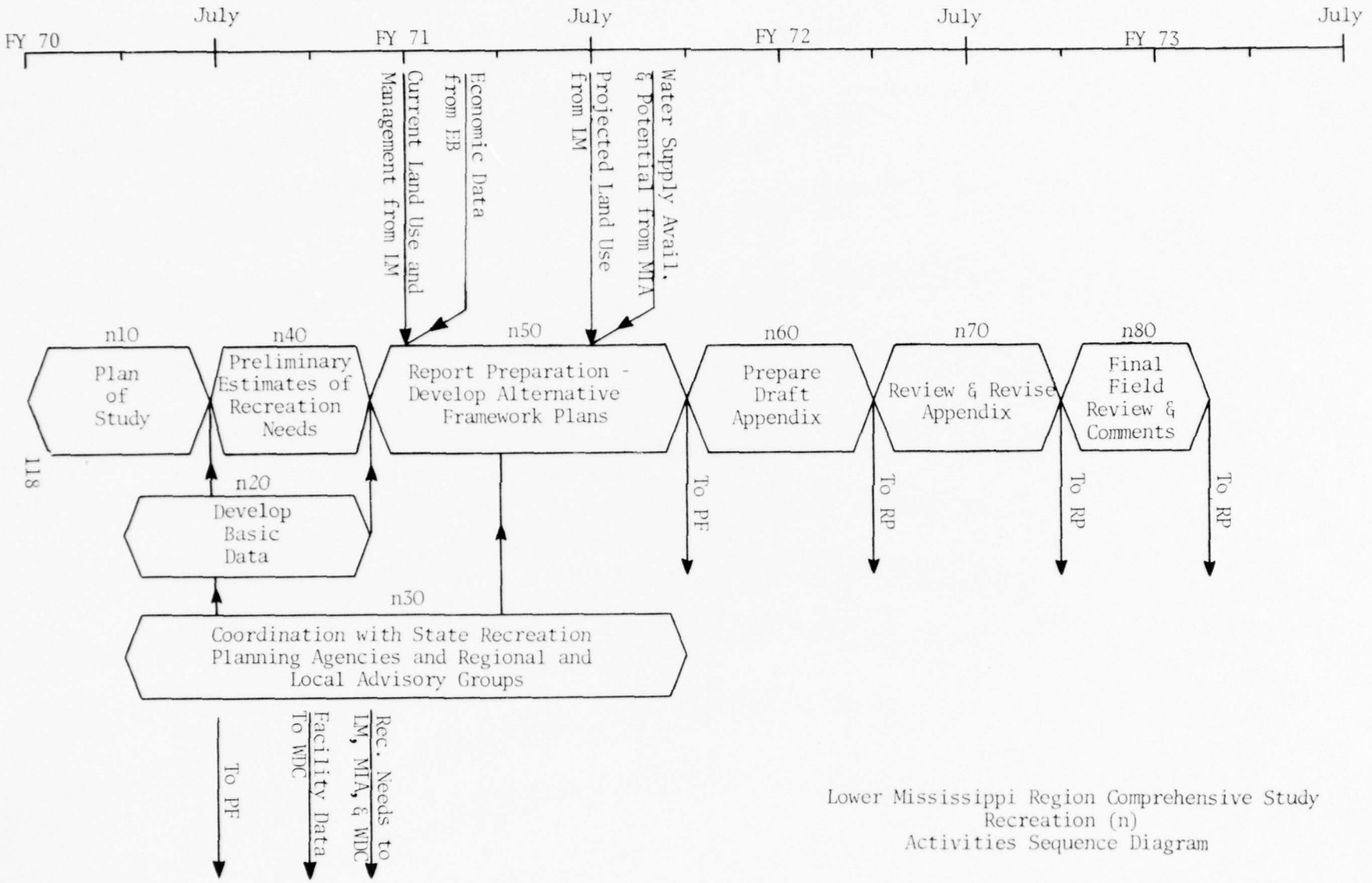
E. Policies and goals stated in Section 101 of Public Law 91-190.

F. Methods and procedures relating environmental values, amenities, and aesthetic considerations with economic and technical problems.

G. Standards, schedules, investment levels, and management techniques needed to achieve stated goals of the Environmental Program.

H. Outline of characteristics of recreation use, including water related use, and suggested actions to meet recreation needs. Alternatives will suggest levels of administration or recommended recreation development, needed legislation, and methods of financing after complete analysis of alternatives with respect to environmental and identified social values.

I. Subregional requirements within the Lower Mississippi Region adjusted to meet environmental goals and indicating prompt detailed planning with particular emphasis on changing land use and estuarine considerations.



Lower Mississippi Region Comprehensive Study
Recreation (n)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT n
RECREATION

I. INTRODUCTION

A. Authority

B. Purpose of Study

C. Procedures, Methodologies, and Major Assumptions

D. Trends in Outdoor Recreation

E. Environmental Considerations

II. DESCRIPTION OF REGION

A. Description and Pertinent Information and Data of Physical and Socioeconomic Factors

B. Inventory of Outdoor Recreation Resources (Adjacent Opportunities)

C. Analysis of Existing Programs

D. Identification and Discussion of Significant Problems and Issues

E. Estimates of Outdoor Recreation Needs

1. Time Frames - Base Year 1970 - Projections to 1980, 2000, and 2020

2. Resources by Area-Class and Use-Types

3. Categories of Activities

4. Water and Related Land Needs

F. Appraisal of Recreation Potentials

III. DEVELOPMENT PLANS FOR OUTDOOR RECREATION

A. Recreation Alternatives

1. Programs

a. National Income

b. Regional Development

c. Environmental

d. Well-Being

2. Features of Alternative Plans

a. Environmental Relationships

b. Analysis of Alternative Plan

c. Guidelines for Development

d. Benefits and Costs

e. Efficiency in meeting needs

f. Water and Related Land

B. Comprehensive Plan

1. Program of Development for the Recreation Study Element

2. Plan Formulation

3. Broad Recreation Cost Estimates of Development and Estimated Benefits Derived from Plan of Development

4. Analysis of Comprehensive Plan with Respect to Environmental Objective

IV. FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS--ADDENDUM

A. Study Methodology and Planning Criteria

B. Supplementary Information - Statistical Tables

C. Glossary

D. Bibliography

PLAN OF WORK
STUDY ELEMENT o
COASTAL AND ESTUARINE

OBJECTIVE

The purpose of study element o will be to:

A. Identify the location, extent, and nature of water and related land resources problems in the coastal and estuarine areas, such problems to include, but not necessarily be limited to, flooding, erosion, subsidence, and water supply both as to quantity and quality.

B. Determine the needs for preserving and developing the water and related land resources of the coastal and estuarine areas, under various objectives.

C. Identify and structure programs for meeting the needs under each applicable objective.

D. Establish the consequences of implementing the programs derived.

ORGANIZATION

The coastal and estuarine studies will be accomplished under the guidance of the Water Damage Control Subcommittee (WDC), which is chaired by the Mississippi River Commission. The Mississippi River Commission (NOD) will be the study element leader and will have the responsibility for the preparation of this appendix. Participants in the study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Inputs to the Coastal and Estuarine study element from other study elements are as follows:

Study element	Type of input required
Economic Base (a)	Projections of population and industrial production for programs A, B, and C
Climate, Meteorology, and Hydrology (b)	Hydrologic studies

Study element	Type of input required
Geology and Ground Water (c)	Ground water hydrology, descriptions of aquifers, interrelation of surface water and ground water
Flood Problems (d and e)	Flood problems
Land Drainage (i)	Land drainage problems and needs
Related Land Use and Management (f)	Current and projected land use
Navigation (j)	Navigation needs
Municipal and Industrial Water Supply (k)	Water-supply requirements
Water Quality and Pollution (l)	Advice on the effects of water quality criteria for recreational purposes
Health Aspects (m)	Public health consideration
Recreation (n)	Centers of needs
Aesthetic and Cultural Values (p)	Aesthetic and cultural developmental demands
Fish and Wildlife (q)	Fish and wildlife demands

Outputs from the Coastal and Estuarine study element to other study elements are as follows:

Study element	Type of output required
Related Land Use and Management (f)	Coastal and estuarine problems and needs
Water Quality and Pollution (l)	Coastal and estuarine problems and needs
Plan Formulation (t)	Coastal and estuarine problems and needs
Inventory of Facilities (v)	Shoreline Protection facilities

Study Control and Schedule.

Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram.

Assessment of progress will be made by submission of quarterly progress reports to the Chairman of the WDC Subcommittee. The subcommittee chairman will be responsible for maintaining schedule control within this subcommittee and will coordinate schedule changes with the PF Committee.

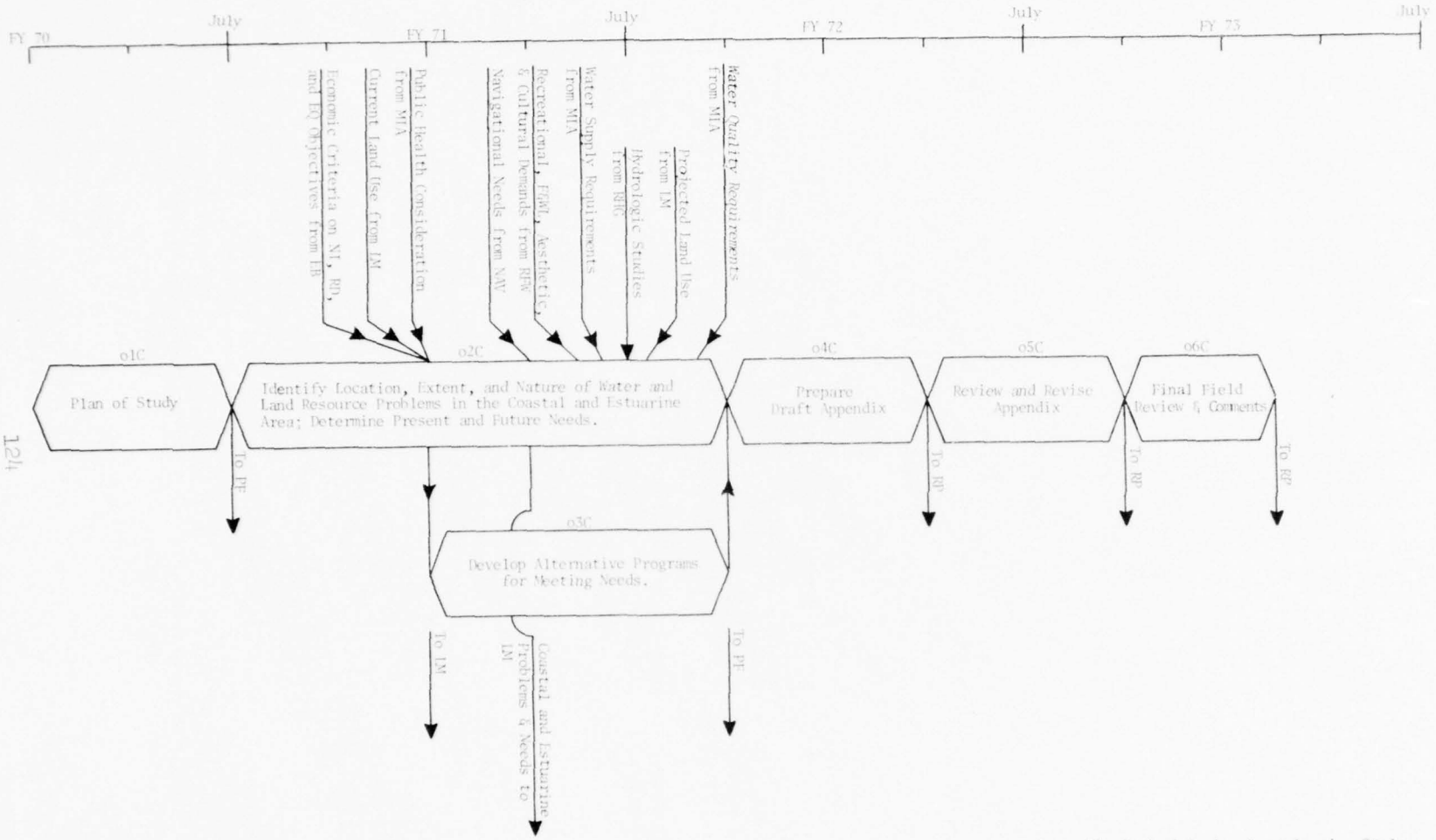
The identification of problems and needs and the development of alternative programs for meeting these needs will be completed by October 1971. The first draft of the appendix will be completed by April 1972. Review and revision of the first draft will be completed by October 1972. Final field review and comments will be completed by February 1973.

METHODOLOGY

Environmental characteristics which define the coastal and estuarine area's present conditions will be developed from analysis of available data. The analysis will include delineation of the geological, hydrological, ecological, and developmental characteristics of the area and establishment of the relationship between characteristics and the nature of water and related land resource problems. The locations, extent, and magnitude of problems in each WRPA will be defined in physical and economic terms. Present and future water and related land resource needs in the years 1970, 1980, 2000, and 2020 will be based on current and projected economic data and land-use data furnished, respectively, by the Economic and Land Management Subcommittees and guidelines furnished by the Plan Formulation Committee for the various objectives.

Water and related land resource needs in the coastal and estuarine area derived in other study elements will be utilized in this element. Present and future problems and needs to be developed in this element include, but will not necessarily be limited to, erosion and subsidence. Identification of the location, extent, and magnitude of erosion and subsidence problems will be based on pertinent data derived from existing and current studies; estimation by individuals with a working knowledge of the area involved; comparison of time-separated photos, maps, and surveys; and visual reconnaissance surveys. The present and future needs for protection of shorelines and estuarine areas from erosion and subsidence will be developed by identifying the areas suitable for satisfying developmental demands in the interest of preserving recreational, aesthetic, cultural, fishing, and wildlife resources.

Possible measures for meeting needs will be identified. Each of the the measures will be analyzed to determine for the various objectives the effects on the estuarine environment, desirability, and economic benefits, both tangible and intangible. Alternative programs for each of the various objectives will be developed, along with a generalized cost estimate and evaluation of the physical and economic changes that would accompany implementation.



Lower Mississippi Region Comprehensive Study
Coastal and Estuarine (o)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT o
COASTAL AND ESTUARINE

I. INTRODUCTION

A. Authority

B. Purpose of Study

C. Relation to Other Parts of the Report

II. DEFINITIONS, METHODOLOGY, AND ASSUMPTIONS

III. DESCRIPTION OF COASTAL AND ESTUARINE ENVIRONMENT

A. Physical

B. Socioeconomic and Cultural

IV. COASTAL AND ESTUARINE PROBLEMS AND NEEDS

A. General Nature

B. Extent and Magnitude

C. Present and Future Needs

V. ALTERNATIVE PROGRAMS TO SATISFY NEEDS

A. National Income Objective

1. Program Summary

2. Effectiveness

B. Regional Development Objective

1. Program Summary

2. Effectiveness

C. Environmental Objective

1. Program Summary

2. Effectiveness

D. Well-Being Objective

1. Program Summary

2. Effectiveness

VI. COMPARISON OF ALTERNATIVE PROGRAMS AND CONCLUSIONS

PLAN OF WORK
STUDY ELEMENT p
AESTHETIC AND CULTURAL VALUES

OBJECTIVE

The purpose of study element p is to obtain an evaluation of the total environment within the Lower Mississippi Region. The overall objectives of this element will be to:

A. Provide a broad-scale analysis of factors which affect natural heritage and cultural aspects.

B. Isolate these aspects as they relate to the region as a whole.

C. Identify resource potentials of natural or cultural nature which concern landscape matters including water and related lands and their effect on the environment. This would include archeology, history and natural history, ecology, geology, and geographic features of significance to national and State interests.

ORGANIZATION

The studies of Aesthetic and Cultural Values will be accomplished under the guidance of the Recreation and Fish and Wildlife Subcommittee (RFW) which is chaired by the Bureau of Sport Fisheries and Wildlife. The National Park Service will be the study element leader and will have the responsibility for the preparation of this appendix. Participants in the study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Inputs to study element p, Aesthetic and Cultural Values, from other study elements are as follows:

Study element	Type of input required
Related Land Use and Management (f)	Current and projected land use

Outputs from study element p, Aesthetic and Cultural Values, to other study elements are as follows:

Study element	Type of output required
Plan Formulation (t)	Need for preservation and enhancement of environmental resources, historic and cultural areas
Related Land Use and Management (f)	Need for preservation and enhancement of environmental resources, historic and cultural areas
Coastal and Estuarine Problems (o)	Aesthetic and cultural development demands
Inventory of Facilities (v)	Water oriented aesthetic and cultural facilities

Study Control and Schedule.

Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress reports to the Chairman of the RFW Subcommittee. The subcommittee chairman will be responsible for maintaining schedule control within this subcommittee and will coordinate schedule changes with the PF Committee.

The first draft of the appendix will be completed by April 1972. Review and revision of the first draft will be completed by October 1972. Final field review and comments will be completed in February 1973.

METHODOLOGY

The Aesthetic and Cultural Value appendix will identify and evaluate aesthetics and cultural aspects of the Region by:

A. A visual study of the environment (landscape, land forms, etc.) including ecology.

B. Identify and evaluate, archeological, historical, and certain natural science aspects of the Region.

C. Make an assessment in the following broad areas.

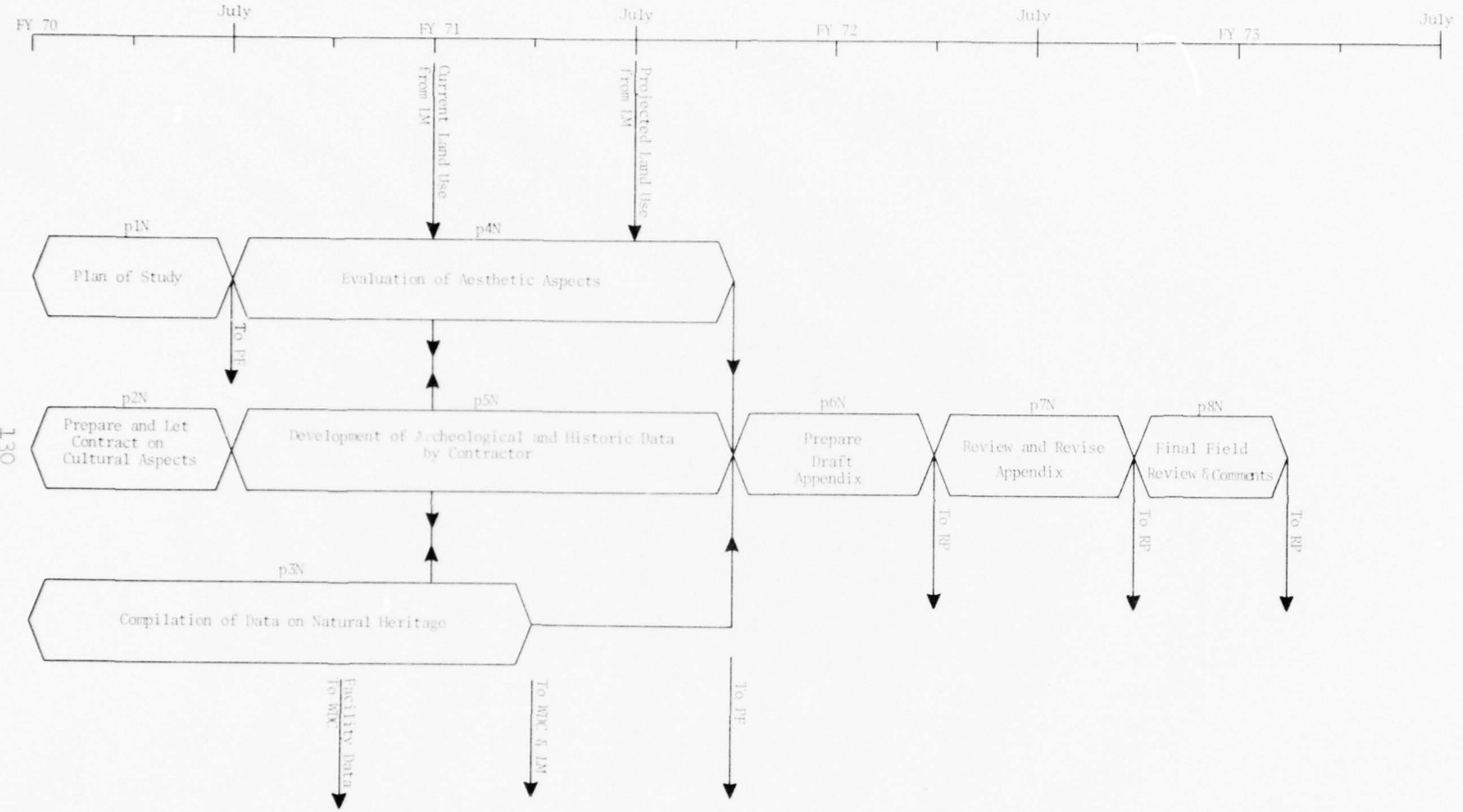
1. Prehistory of the Region as presently known together with limited identification of various types of surviving archeological resources.

2. History of the Region including identification of major historic sites, events, and location.

3. Identification and evaluation of outstanding types of special natural aspects which contribute to regional culture.

4. Identify location of National Park Service interests in the Region both existing and proposed.

5. Identify land and stream areas of significant aesthetic deterioration. The study design will be based upon research, a visual landscape study, and utilization of basic secondary sources.



Lower Mississippi Region Comprehensive Study
Aesthetic and Cultural Values (p)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT p
AESTHETIC AND CULTURAL VALUES

NOTE: Preparation of this outline to be Coordinated with the ad hoc Environmental Committee

PLAN OF WORK
STUDY ELEMENT q
FISH AND WILDLIFE

OBJECTIVE

The purpose of study element q will be to:

A. Inventory fish and wildlife resources.

B. Determine hunting, fishing, and other fish and wildlife-oriented use demand for the present and projected future time periods of 1980, 2000, and 2020.

C. Determine the present and projected hunting, fishing, and other fish and wildlife needs.

D. Assess the fish and wildlife resources influenced by existing water and related land resource programs.

E. Evaluate the fish and wildlife aspects of the National Income, Regional Development, Environmental, and Well-Being Programs.

F. Recommend programs for immediate and long-range implementation that emphasize effective environmental conservation, particularly fish, wildlife, and other natural resources. The Fish and Wildlife Study Element will provide interim fish and wildlife data or criteria as may be required by the Recreation, Fish and Wildlife Subcommittee, and other subcommittees and their study elements.

ORGANIZATION

The fish and wildlife studies will be accomplished under the guidance of the Recreation and Fish and Wildlife Subcommittee (RFW), which is chaired by the Bureau of Sport Fisheries and Wildlife. The Bureau of Sport Fisheries and Wildlife will be the study element leader and will have the responsibility for the preparation of this appendix. Participants in the study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Inputs to the Fish and Wildlife study element from other study elements are as follows:

Study element	Type of input required
Economic Base (a)	Projection of population
Climate, Meteorology, and Hydrology (b)	Streamflow data and hydrologic studies
Related Land Use and Management (f)	Land and water use inventories and projections
Navigation (j)	Navigation needs
Municipal and Industrial Water Supply (k)	Municipal and industrial water use
Water Quality and Pollution (l)	Advice on water quality and water quality standards
Health Aspects (m)	Quality criteria for shellfish growing waters
Sediment and Erosion (s)	Sediment yields and damages

Outputs from the Fish and Wildlife study element to other study elements are as follows:

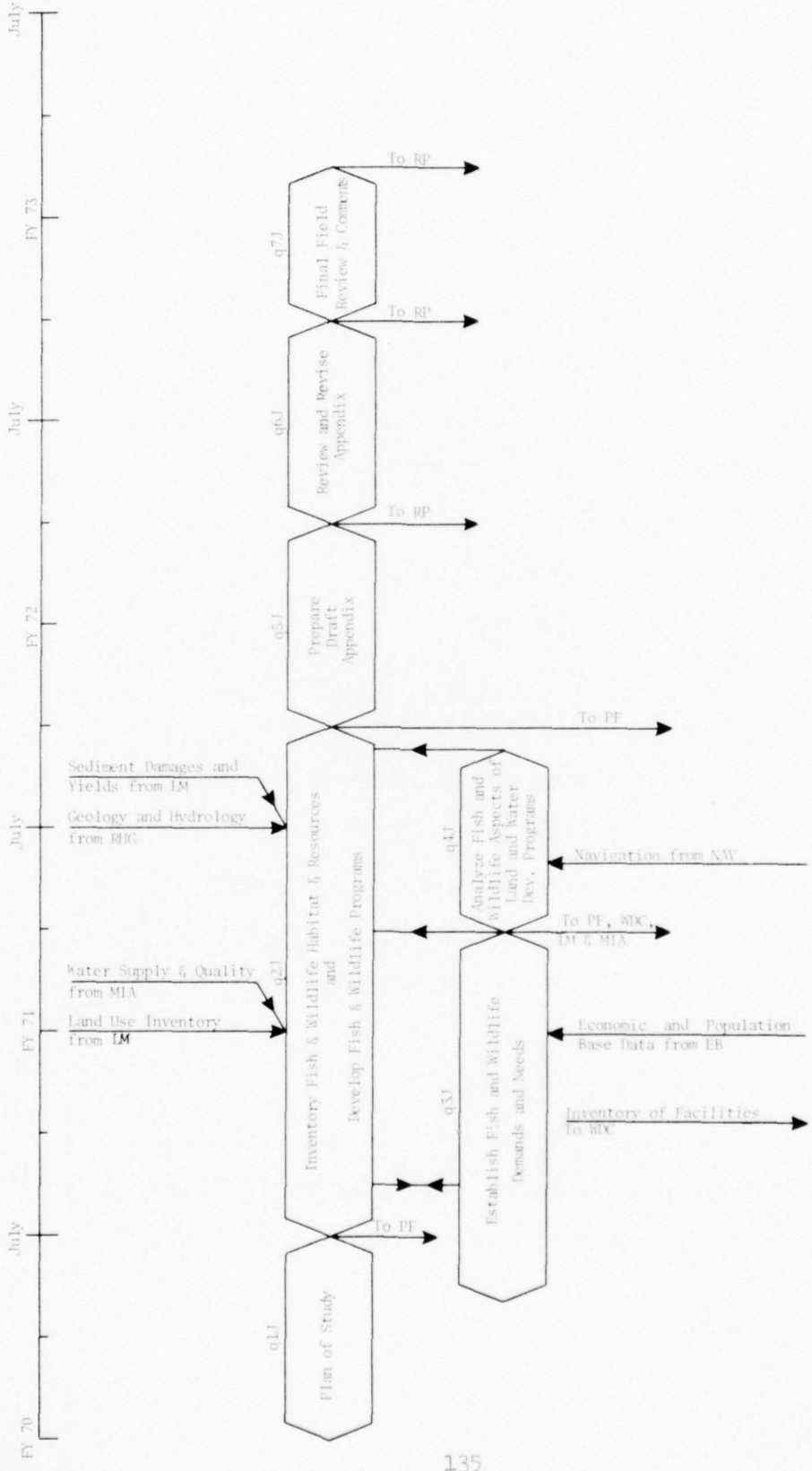
Study element	Type of output required
Plan Formulation (t)	Fish and wildlife demands and needs
Related Land Use and Management (f)	Fish and wildlife problems and needs
Land and Drainage (i)	Fish and wildlife demands and needs
Water Quality and Pollution (l)	Fish and wildlife demands
Recreation (n)	Man-days of hunting and fishing; management program
Coastal and Estuarine (o)	Fish and wildlife demands
Inventory of Facilities (v)	Water oriented fish and wildlife facilities

Study Control and Schedule.

Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress reports to the Chairman of the RFW Subcommittee. The subcommittee chairman will be responsible for maintaining schedule control within this subcommittee, and will coordinate schedule changes with the PF Committee.

The first draft of the appendix will be completed by April 1972. Review and revision of the first draft will be completed by October 1972. Final field review and comments will be completed by February 1973.

METHODOLOGY



Lower Mississippi Region Comprehensive Study
Fish and Wildlife (q)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT q
FISH AND WILDLIFE

I. INTRODUCTION

A. Authority

B. Purpose of Study

C. Acknowledgments

D. Relation to the Overall Comprehensive Study

II. DESCRIPTION OF THE STUDY REGION

A. Geography

B. Topography and Geology

C. Climate and Hydrology

D. Population

E. Economic and Cultural Development

F. Diversity Within Region and Water Resource Planning Areas

III. DESCRIPTION OF FISH AND WILDLIFE RESOURCES - 1970

A. Historical Perspective and Present Status

B. Fish and Wildlife Inventory

1. Fish Habitat and Resources (Commercial and Sport)

a. Fresh Water

b. Estuary

c. Salt Water

2. Wildlife Habitat and Resources

a. Upland

b. Bottom Land

c. Open Water and Wetland

3. Rare, endangered, or particularly noteworthy wildlife and wildlife habitat areas

4. Fish and wildlife management areas and refuges: Federal, State, and private

IV. HUNTING, FISHING, AND OTHER FISH AND WILDLIFE USE DEMAND--PRESENT AND PROJECTED (YEARS 1970, 1980, 2000, AND 2020)

A. Analysis of Economic Base Study Population Data for Region and WRPA by Age Class (12 Years and Older), and by Rural and Urban Categories, Present and Projected

B. Analysis of Existing Hunting and Fishing Survey Data

C. Estimates of Man-Days' Utilization of Fish and Wildlife Resources

V. HUNTING, FISHING AND OTHER FISH AND WILDLIFE USE NEEDS--PRESENT AND PROJECTED

A. Fish and Wildlife Supply and Demand Analysis

B. Problem Areas

C. Needs for Fish and Wildlife Preservation and Development

VI. REVIEW OF EFFECTS OF EXISTING WATER AND LAND RESOURCE DEVELOPMENT PROJECTS ON FISH AND WILDLIFE RESOURCES

A. Mississippi River and Tributaries Project and Similar Corps of Engineers Projects

B. Coastal Louisiana Projects for Water Export, Navigation, etc.

C. Soil Conservation Service Public Law 566 Projects

D. Other Water Resource Development Projects

E. Losses of Fish and Wildlife Resources and Concept of Mitigation

F. Benefit to Fish and Wildlife and Concept of Enhancement

G. Future Outlook

VII. FISH AND WILDLIFE ENVIRONMENTAL QUALITY

A. Land Uses and Ecology

B. Water Uses and Ecology

VIII. PROGRAMS FOR FISH AND WILDLIFE CONSERVATION AND DEVELOPMENT

A. Fish and Wildlife in a National Income Program

B. Fish and Wildlife in a Regional Development Program

C. Fish and Wildlife Resources in an Environmental Program

D. Fish and Wildlife Resources in a Well-Being Program

E. Recommended Early Action and Future Action Fish and Wildlife, and Environmental Program

IX. COST ESTIMATES-FISH AND WILDLIFE DEVELOPMENT (COMMERCIAL AND SPORT)

A. National Income Program

B. Regional Development Program

C. Environmental Program

D. Well-Being Program

E. Recommended Development Program

X. DISCUSSION OF BENEFITS AND WELL-BEING OF PEOPLE FOR DEVELOPMENT PROGRAMS CONSIDERED

XI. SUMMARY AND CONCLUSIONS

XII. RECOMMENDATIONS

PLAN OF WORK
STUDY ELEMENT r
POWER

OBJECTIVE

The purpose of study element r is to determine the past and to estimate future power requirements, existing thermal and hydro-electrical resources, the need for additional power supply, and potential hydroelectric projects.

ORGANIZATION

The power studies will be accomplished under the guidance of the Power Subcommittee (P), which is chaired by the Federal Power Commission. The Federal Power Commission will be the study element leader and will have the responsibility for the preparation of this appendix. Participants in the study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Inputs to study element r, Power, from other study elements are as follows:

Study element	Type of input required
Economic Base (a)	Projections of population, income, and employment

Outputs from the Power study element to other study elements are as follows:

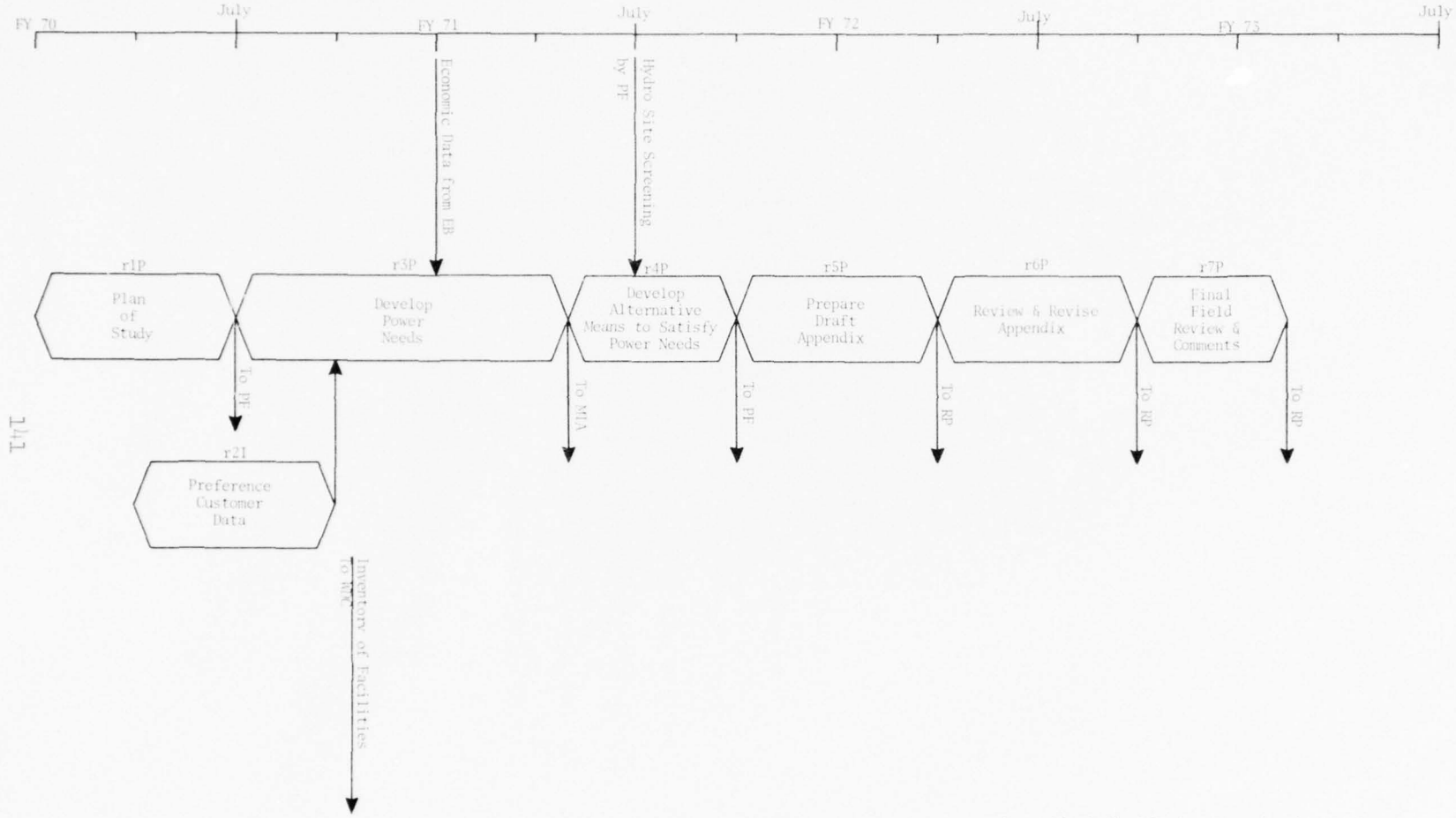
Study element	Type of output required
Water Quality and Pollution (1)	Projections of thermal power and associated water needs
Plan Formulation (t)	Power needs
Inventory of Facilities (v)	Power facilities

Study Control and Schedule.

Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress reports to the Chairman of the P Subcommittee. The subcommittee chairman will be responsible for maintaining schedule control within this subcommittee and will coordinate schedule changes with the PF Committee.

The first draft of the appendix will be completed by April 1972. Review and revision of the first draft will be completed by October 1972. Final field review and comments will be completed by February 1973.

METHODOLOGY



Lower Mississippi Region Comprehensive Study
Power (r)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT r
POWER

I. INTRODUCTION

A. Authority

B. Purpose of Study

C. Objectives

D. Relation to Other Appendixes

E. Preparation and Coordination of Appendix

II. MARKETING TO SOUTHWESTERN POWER POOL AREA SYSTEMS

A. Description of Power Market Area

1. General Description

2. Population

3. Economic Features

B. Past and Estimated Future Power Requirements

1. Annual Power Requirements

2. Monthly Power Requirements

C. Existing Power Supply Facilities

1. Power Market Area Facilities

a. Utility Systems

b. Industrial Plants

c. Interarea Transfers

d. Retirements

e. Scheduled Additions

2. Hydroelectric Resources

a. Projects in the Lower Mississippi Area

b. Projects in Other Basins in Power Market Area

c. Summary of Hydroelectric Projects in Power Market Area

D. Need and Utilization for Additional Capacity

1. Additional Capacity Required in Market Area

2. Estimated Future Load Shapes

3. Hydrothermal System Coordination

4. Hydroelectric Capacity Utilization

5. Summary of Future Loads Which Could be Supplied by Hydroelectric Generation in the Power Market Area

III. MARKETING TO SOUTHWESTERN POWER ADMINISTRATION PREFERENCE CUSTOMERS SYSTEMS

A. Introduction

1. Flood Control Act of 1944

2. Contractual Obligations to the Federal Government, Public Bodies, Cooperatives, and Private Utilities

3. Characteristics of Market Area Resulting From Contractual Commitments

B. Description of Power Market Area

1. General Description

2. Preference Users served and Characteristics of the Preference Power Users' Load

C. Past and Estimated Future Power Requirements

1. Annual Power Requirements

2. Monthly Power Requirements

D. Existing Power Supply Facilities in Power Market Area

1. Preference Power Users' Utility Systems and Thermal Resources

2. Existing Hydroelectric Resources Available to Meet Preference Power Users' Load

3. Exchange Contracts

4. Purchase Contracts

5. Interarea Transfers

6. Scheduled Additions

E. Need and Utilization for Additional Capacity

1. Preference Power Users' Future Load

2. Thermal Generating Facilities of Preference Power Users, Projected

3. Hydroelectric Generating Facilities, Constructed and Authorized

4. Hydroelectric Capacity Utilization

IV. HYDROELECTRIC CAPACITY DEVELOPMENT

A. Criteria for Screening Hydroelectric Power Development

B. Potential Hydroelectric Resources in the Lower Mississippi Area

C. Relationship of Potential Resources to Environmental Factors

D. Conclusions

PLAN OF WORK
STUDY ELEMENT s
SEDIMENT AND EROSION

OBJECTIVE

The purpose of study element s is to determine the extent and degree of erosion and sediment yields, the measures needed to reduce erosion and sediment damages, and the effects and costs of these measures. An assessment of the total sediment and erosion problem will be related to the National Income, Regional Development, Environmental, and Well-Being Programs.

ORGANIZATION

The sediment and erosion studies will be accomplished under the guidance of the Land Use and Management Subcommittee (LM), which is chaired by the Soil Conservation Service. The Soil Conservation Service will be the study element leader and will have the responsibility for the preparation of this appendix. Participants in the study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Inputs to study element s, Sediment and Erosion, from other study elements are as follows:

Study element	Type of input required
Related Land Use and Management (f)	Land-use data
Mineral Resources (g)	Open-pit areas

Outputs from the Sediment and Erosion study element to other study elements are as follows:

Study element	Type of output required
Flood Problems (d and e)	Sediment yields and damages Erosion and sedimentation problems

Study element	Type of output required
Water Quality and Pollution (l)	Sediment yield characteristics, determination of sediment yield, sediment yield values for project planning, effects of water control projects on sediment yields
Fish and Wildlife (q)	Sediment yields and damages
Plan Formulation (t)	Sediment yields and damages

Study Control and Schedule.

Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress reports to the Chairman of the IM Subcommittee. The subcommittee chairman will be responsible for maintaining schedule control within this subcommittee, and will coordinate schedule changes with the PF Committee.

The first draft of the appendix will be completed by April 1972. Review and revision of the first draft will be completed by October 1972. Final field review and comments will be completed by February 1973.

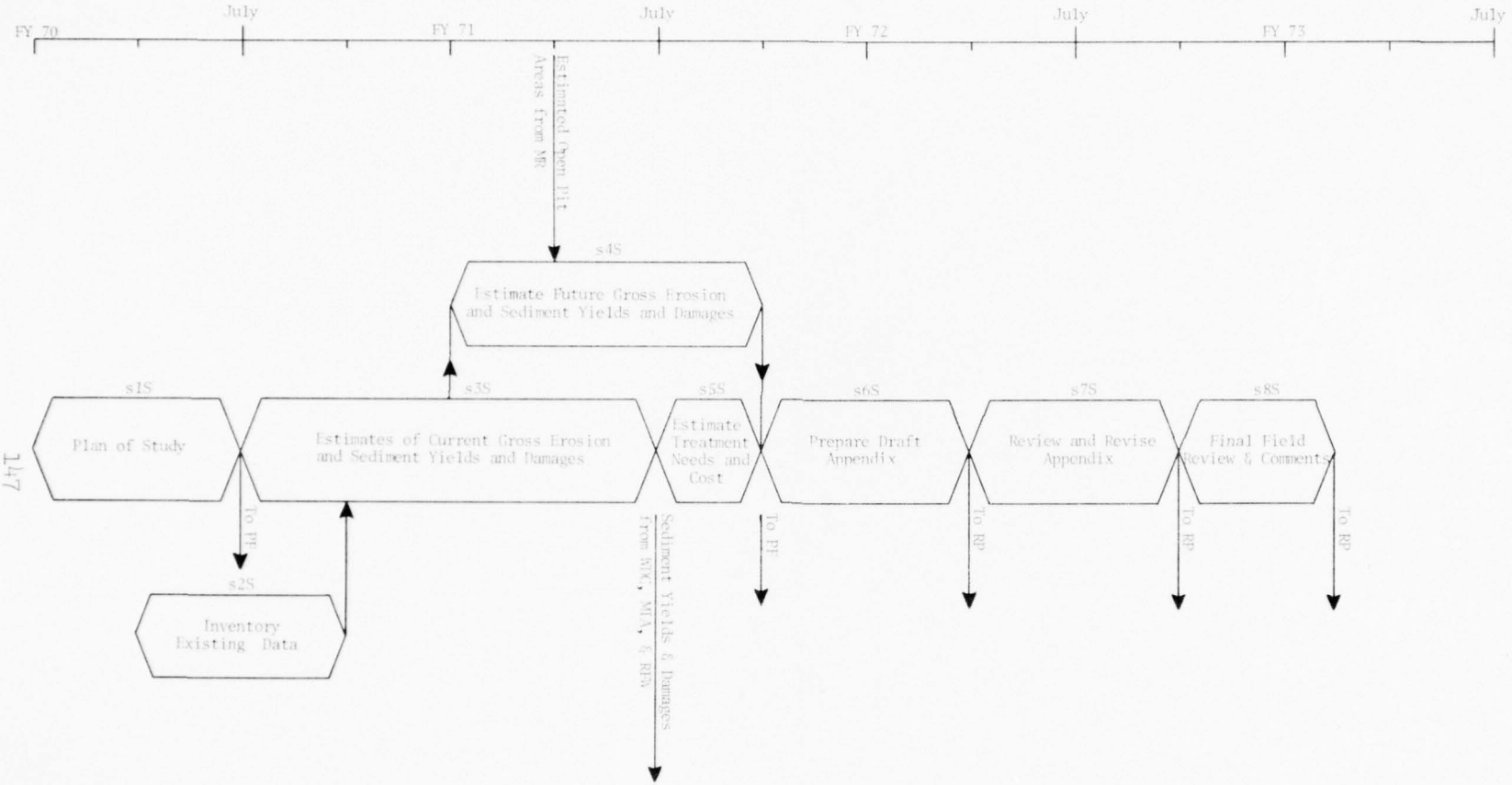
METHODOLOGY

The purpose of this study element will be to determine the extent and degree of erosion and sediment yields and damages, the measures needed to reduce erosion and sediment damages, and the effects and costs of these measures.

An examination and analysis of existing source material will provide the basis for current determinations and trends for some projections. Reconnaissance-type investigations will be made where necessary. The work to be performed will include:

A. Identification of the sources of erosion and estimation of the quantity of sediment yields from these sources in units of acre-feet, ppm, or tons/square mile of drainage area.

B. Estimation of the type of measures needed and costs to effectively reduce yields or damages. Measures will be in the form of land treatment (vegetative) and structural (dam-jacks); and damages will be expressed in terms of dollars, land base, and acre-feet of reservoir filling. Costs of measures will be expressed in dollars per acre of treated land, miles of streambank, etc.



Lower Mississippi Region Comprehensive Study
Sediment and Erosion (s)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT s
SEDIMENT AND EROSION

I. INTRODUCTION

A. Authority

B. Purpose of Study

C. Relationship to Other Study Elements or Subcommittees

D. Relationship to Study Area - Universe and WRPA

E. Agency Responsibility

II. GENERAL METHODOLOGY AND PROCEDURES

III. PHYSICAL CONDITIONS WHICH INFLUENCE EROSION AND DEPOSITION OF SEDIMENT

Relate land use and cover conditions to the erosion problems.

IV. THE EXTENT AND DEGREE OF EROSION AND SEDIMENT YIELDS AND DAMAGES

A. Sources

1. Sheet

2. Gully

3. Roads

4. Streambank

B. Sediment Yields

1. Upstream Areas

2. Main Stem

3. Others

C. Damages

1. Upstream

2. Main Stem

3. Other

D. Critical Sediment-Source Areas in Respect to Damage

V. LAND TREATMENT, LAND STABILIZATION, AND STRUCTURAL MEASURES NEEDED TO REDUCE SEDIMENT AND EROSION DAMAGES

A. Land Treatment Measures (Vegetative)

B. Critical Area Stabilization Measures

C. Structural Measures

VI. EFFECTS AND COSTS OF PROPOSED MEASURES TO REDUCE SEDIMENT AND EROSION DAMAGES

VII. ESTIMATE OF FUTURE GROSS EROSION AND SEDIMENT YIELDS WITH PROPOSED MEASURES

VIII. RELATIONSHIP OF THE SEDIMENT AND EROSION PROBLEM TO OTHER NATURAL RESOURCES AND THE ENVIRONMENT

IX. RECOMMENDATIONS FOR ADDITIONAL FIELD STUDIES OR RESEARCH

PLAN OF WORK
STUDY ELEMENT t
PLAN FORMULATION

OBJECTIVE

The purpose of the Plan Formulation Committee is to:

A. Serve as the central committee under the Coordinating Committee to carry out directives and coordinate activities of other subcommittees, where necessary.

B. Prepare four programs which will emphasize environmental, regional development, national income, and well-being objectives.

C. Develop a recommended program.

D. Draft a Plan Formulation Appendix.

E. Draft the summary report.

ORGANIZATION

The plan formulation studies will be accomplished under the guidance of the Plan Formulation Committee (PF), which is chaired by the Mississippi River Commission. The Mississippi River Commission will be the study element leader and will have the responsibility for the preparation of this appendix. The Chairman of the PF Committee will be assisted by Work Group Leaders who will be responsible for formulating the program of development for the various WRPA's. The participants in the study element and the membership of the Work Groups are shown in Annex 2. As in the case of the subcommittees, the membership will probably change during the course of the study. In this event, the annex will be reissued in looseleaf form as necessary, but no more often than quarterly.

MANAGEMENT

Relation to Other Subcommittees.

The Plan Formulation Committee, as the central working committee for the Lower Mississippi Region Comprehensive Study, is responsible for carrying out the policies established by the Coordinating Committee. In this role, Plan Formulation coordinates efforts of the subcommittees, where necessary, and will attempt to resolve conflicts as they occur. Conflicts involving policy will be referred to the Coordinating Committee, usually with recommendations for resolution. The Chairman of the Plan Formulation Committee is the overall Study Leader.

WRPA's.

Programs will be developed for each of the Water Resource Planning Areas shown on Plate I. To assure a systematic approach for the entire region, the guidelines for developing measures to satisfy demands and relating demands to objectives will be approved by the overall Plan Formulation Committee. To assure that planners formulating the program are familiar with the area, a separate group has been established for each WRPA except WRPA 1, which is the main stem of the Mississippi River. The program for this WRPA will be formulated by the total committee. The WRPA work groups will be organized only in the PF Committee. The membership of the formulation groups for each WRPA is shown in Annex 2.

Duties.

The program, both structural and nonstructural, will be developed on a multidisciplinary basis. Specialists in technical areas will be expected to furnish information on measures that may be considered as possible solutions. Agencies will not submit lists of projects to be consolidated. Thus, the committee is expected to operate as a planning team with expertise in many fields, and not as individuals promoting agency interests. Agencies or States may be asked to submit recommendations on courses of action on an ad hoc basis, but the duties of the committee will not be assigned to individuals on a permanent basis.

Study Control and Schedule.

As the central committee, Plan Formulation will monitor the progress of the subcommittees or the elements through progress reports, and more importantly, through regular telephone contact with subcommittee chairmen and agency representatives. It is sometimes the tendency of agencies to assign first priority to action programs and let comprehensive assignments slide. It is imperative that not only adequate manpower, but also key personnel be assigned to the comprehensive if a worthwhile program is produced. The need to bolster staffing to maintain schedule will be recommended by Plan Formulation, if necessary.

Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress reports to each subcommittee chairman, who will be responsible for maintaining schedule control within his subcommittee and for coordinating schedule changes with the PF Committee.

Schedules for completion of the summary report and Plan Formulation appendix are as follows:

	First draft	Review and revise first draft	Final field review and comments
Summary Report	October 1972	February 1973	May 1973
Plan Formulation Appendix	April 1972	October 1972	February 1973

METHODOLOGY

General.

Programs responsive to demands for emphasis on the basic objectives in water resource planning, i.e., environmental, regional development, national income, and well-being will be prepared. The impact of giving emphasis on one objective at the expense of the others will be demonstrated either in narrative, or hopefully, in the format of the new standards for evaluation under preparation by the Water Resources Council. In any event, comparison of project-type benefits is beyond the scope of this study. A recommended program will be developed that is designed to express the preference of the majority of the people. Both systematic analysis of programs and experienced judgment will be required to display the impact properly. It is important that the effects of the four programs be adequately described since the preferences expressed during the study may change with time.

Demands.

Demands should be expressed for each objective, each WRPA, each purpose, and specific time periods, in measurable units and by quality required, if appropriate.

A. National Income - Program A. Demands for the National Income Program are those which must be set to sustain the anticipated national economy. The projections of OBERS for employment, population, and income will be translated into water demands for the various purposes.

B. Regional Development - Program B. Most of the Lower Mississippi Region is below the national per capita income. Industrial and agricultural resources will be examined by the Economics Subcommittee in order to estimate levels of production that could reasonably be sustained that would diversify industry, decrease unemployment, and increase the per capita income. Employment, population, personal income, and food and fiber needs will be modified accordingly, and these new projections will, in turn, be translated into demands for water resources that would be required to sustain this level of economy.

C. Environmental - Program C. Natural areas (land or water) that should be enhanced, restored, or preserved for historic, scenic, and cultural purposes and fish and wildlife habitat will be identified and

located by an ad hoc environmental committee. The committee will receive input from Federal and State agencies, universities, conservation groups, such as the Sierra Club and the Audubon Society, and possibly, consultants. Maps showing these areas, along with a description of the limitations and improvements envisioned, will be furnished to the Economics Subcommittee to determine if the economic and demographic parameters projected for National Income and Regional Development Programs would have to be revised downward, if the environmental programs are provided. A revision of these projections would require an accompanying revision in demands for other purposes that could be accommodated with this program in effect.

D. Well-Being - Program D. The Well-Being Program will be formulated using the alternatives presented in the national income, regional development, and environmental objectives, and other measures as necessary, to enhance social, cultural, and economic opportunities.

E. Time Frame. Demands should be estimated for the years 1970, 1980, 2000, and 2020.

F. Purposes. The demands will be expressed for the purposes listed in Annex 3.

G. Units. Some of the purposes, such as health aspects and legal needs, do not lend themselves to quantitative measurement. Most of the purposes, including many of environmental aspects, can be defined in terms such as acres for flood control or drainage, m.g.d. or c.f.s. for water supply, stream miles for navigation, land and water acres for recreation, miles of shoreline for beach protection, etc.

Resources.

The stream flow probabilities for major streams in each WRPA will be furnished, along with the average yield. Ground-water pumpage that can be sustained on an annual basis will be provided, along with the average pumpage cost for the aquifers in each WRPA. Quality will be provided for surface and ground water, where available. Land resources will likewise be presented for each WRPA. All of the available resources will be projected for the benchmark years of 1970, 1980, 2000, and 2020. Units will be acre-feet, c.f.s., acres, etc.

Measures.

Some of the measures that may be employed to formulate a program that will satisfy the demands are shown in Annex 3. This list of measures is not intended to be all inclusive. The elements and subcommittees estimating demand will indicate those measures considered most likely to fulfill demands, but will make no attempt to formulate a program to meet demands for each purpose. Plan Formulation will develop rough costs for the measures considered in each WRPA, both for comparative purposes in

selection and to show the approximate magnitude of programs developed. These costs will be taken from curves rather than individual estimates, where possible. Structural and nonstructural measures will be generally located on maps, where possible, but no definite limits will be established.

Programs.

A program will be developed emphasizing measures to satisfy demands for each of the basic objectives. Measures will be included for the objectives considered important only if investment appears reasonable. It may not be possible to satisfy all demands in every WRPA. Naturally, the four objectives are not independent; explicit measures to meet one demand may implicitly satisfy others. After the major emphasis is given to meeting the primary objective for each program, measures will be included to satisfy as much of the demand for the other objectives as possible. Objectives will be considered in the following order; however, it will probably not always be practical to follow this pattern completely.

Environmental Program = Environment - Regional Development - National Income - Well-Being.

National Income Program = National Income - Environment - Regional Development - Well-Being.

Regional Development = Regional Development - National Income - Environment - Well-Being.

Well-Being Program = Well-Being - Regional Development - Environmental - National Income.

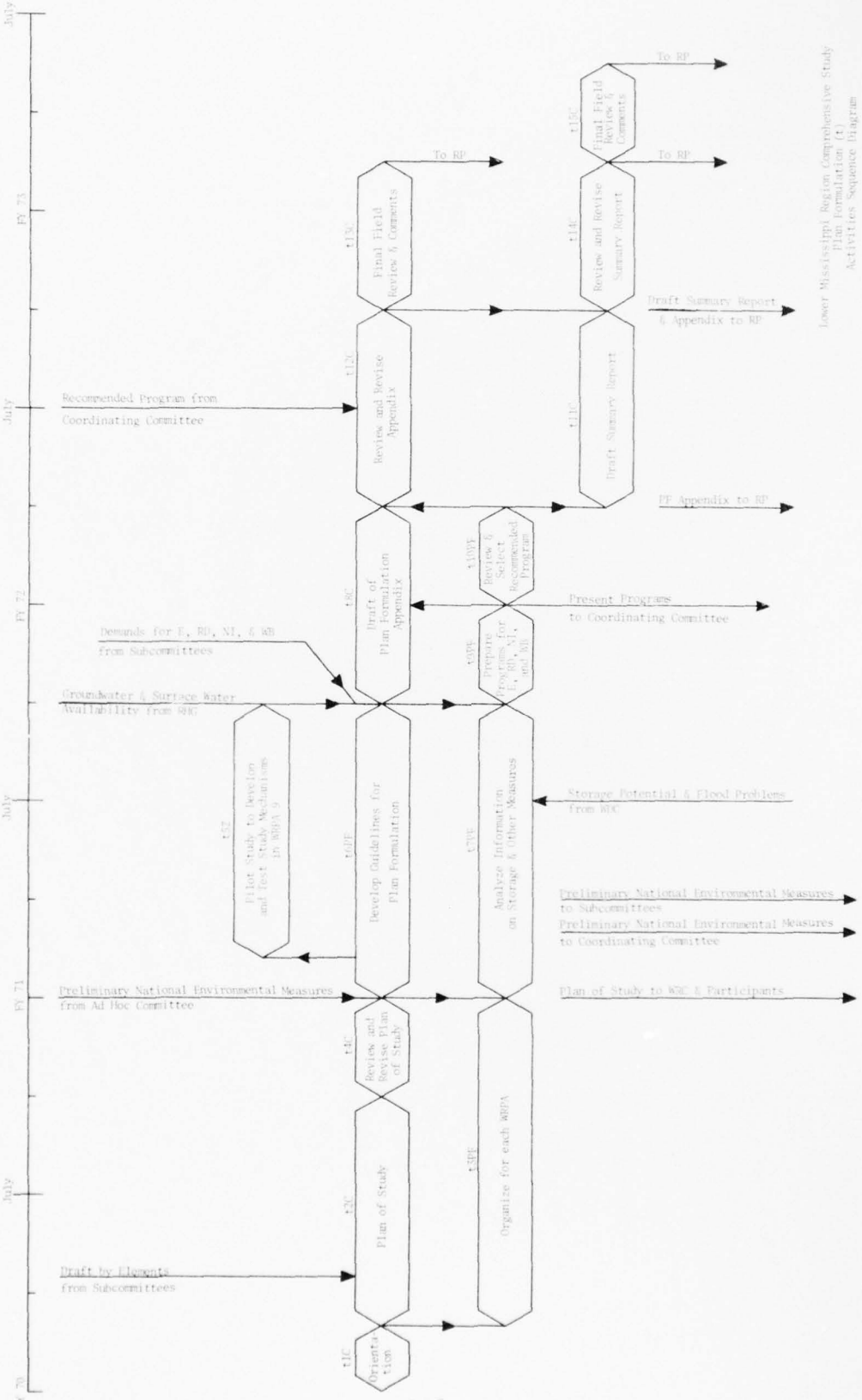
Recommended Program.

A mix of the programs for the four objectives probably will produce the recommended plan. The decision will be made by the Coordinating Committee. A suggested program will be provided by the Plan Formulation Committee for consideration. The blend of objectives will be based on views of advisory committees for each State, public hearing, and other sources that State representatives may employ.

Priority.

The recommended program will be divided into three phases: Phase I measures needed by 1980; Phase II measures needed by 2000; and Phase III measures needed between 2000 and 2020. To implement Phases I and II of this program, a list of detailed studies will be provided, with priorities indicated. The appropriate agency or State to accomplish the study will be included in specific terms for Phase I, and in more general terms for Phase II. No indication of studies to implement Phase III will be made.

In addition, the cost of this program will be compared with the normal expenditure for water resource development in the past. The constraint of an optimistic but realistic budget level on the accomplishment of the program will be described.



Lower Mississippi Region Comprehensive Study
Plan Formulation (t)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT t
PLAN FORMULATION

I. INTRODUCTION

A. Authority

B. Purpose of Study

C. Organization

II. DESCRIPTION OF THE REGION

A. Physical

B. Socioeconomic

C. Water and Related Land Development

D. Water and Related Land Problems

III. PLANNING RATIONALE

A. Senate Document 97

B. Multiobjectives

C. Social Preference

IV. FUTURE TRENDS

A. Economy

B. Land Use

C. Natural Environment

V. WATER AND RELATED LAND DEMAND

VI. RESOURCES

A. Surface Water

B. Ground Water

C. Land

VII. MEASURES

VIII. ALTERNATIVE PROGRAMS

A. Environmental

B. Regional Development

C. National Income

D. Well-Being

E. No Development

IX. RECOMMENDED PROGRAM

A. Features

B. Budget Constraint

C. Implementation

OUTLINE
SUMMARY REPORT

I. SYLLABUS

- A. Purpose of Study
- B. Methodology
- C. Water and Related Land Resource Demands
- D. Recommended Plan
- E. Impact
- F. Implementation

II. INTRODUCTION

- A. Authority
- B. Purpose of Study
- C. Organization and Management

III. REGIONAL DESCRIPTION

- A. Physical
- B. Social Patterns
- C. Economy

IV. STATUS OF RESOURCE DEVELOPMENT

V. WATER AND RELATED LAND RESOURCE AVAILABILITY

VI. PROBLEMS AND DEMANDS

VII. ALTERNATIVE PROGRAMS

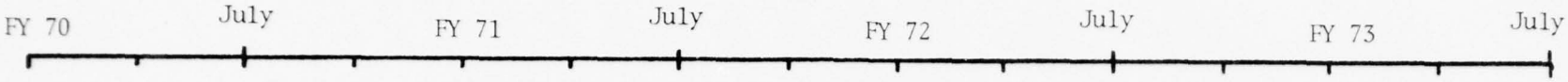
VIII. RECOMMENDED PROGRAM

IX. IMPACT OF RECOMMENDED PLAN

X. IMPLEMENTATION OF THE RECOMMENDED PROGRAM

XI. RECOMMENDATION

PLAN OF WORK
STUDY ELEMENT u
LEGAL AND INSTITUTIONAL



Lower Mississippi Region Comprehensive Study
Legal and Institutional (u)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT u
LEGAL AND INSTITUTIONAL

PLAN OF WORK
STUDY ELEMENT v
INVENTORY OF FACILITIES

OBJECTIVE

The purpose of study element v is to provide a reference publication listing and describing all water-related projects within limits of the Lower Mississippi Region. This includes privately owned, as well as Federal, State, and local government projects.

ORGANIZATION

The inventory of facilities study element will be prepared under the guidance of the Water Damage Control Subcommittee (WDC), which is chaired by the Mississippi River Commission. The Mississippi River Commission (VXD) will be the study element leader and will have the responsibility for the preparation of this appendix. Participants in the study element are shown in Annex 2.

MANAGEMENT

Relation to Other Elements.

Inputs to study element v, Inventory of Facilities, from other study elements are as follows:

Study element	Type of input required
Flood Problems (d and e)	Flood control facilities
Related Land Use and Management (f)	Sediment, erosion control and small watershed facilities
Navigation (j)	Navigation facilities
Municipal and Industrial Water Supply (k)	Municipal and industrial water supply facilities
Water Quality and Pollution (l)	Sewerage treatments, water quality control, and water supply supply facilities
Recreation (n)	Recreation facilities

Study element	Type of input required
Coastal and Estuarine (o)	Shoreline protection facilities
Aesthetic and Cultural (p)	Water oriented aesthetic and cultural facilities
Fish and Wildlife (q)	Water oriented fish and wildlife facilities
Power (r)	Power facilities

Outputs from the study element will consist basically of tabulations of project data for any agency, State, or subcommittee needing certain project information for completion of its studies.

Study Control and Schedule.

Progress throughout the study will be measured by estimation of work accomplished versus work proposed in the activities sequence diagram. Assessment of progress will be made by submission of quarterly progress reports to the Chairman of the WDC Subcommittee. The subcommittee chairman will be responsible for maintaining schedule control within this subcommittee and will coordinate schedule changes with the PF Committee.

Data collection from other agencies and subcommittees will be essentially completed by July 1971. The first draft of the appendix will be completed by January 1972. Review and revision of the first draft will be completed by July 1972. Final field review and comments will be completed by January 1973.

METHODOLOGY

The project descriptions contained in this appendix will consist basically of three parts: brief narratives, data sheets, and maps. These parts will be grouped by WRPA's. In sections with relatively few projects, such as "Power," information will be presented with narratives, data sheets, and one map of the entire Lower Mississippi Region. Whereas, in categories with many projects, such as "Flood Control," a narrative, data sheets, and a map will be presented for each WRPA having that type project.

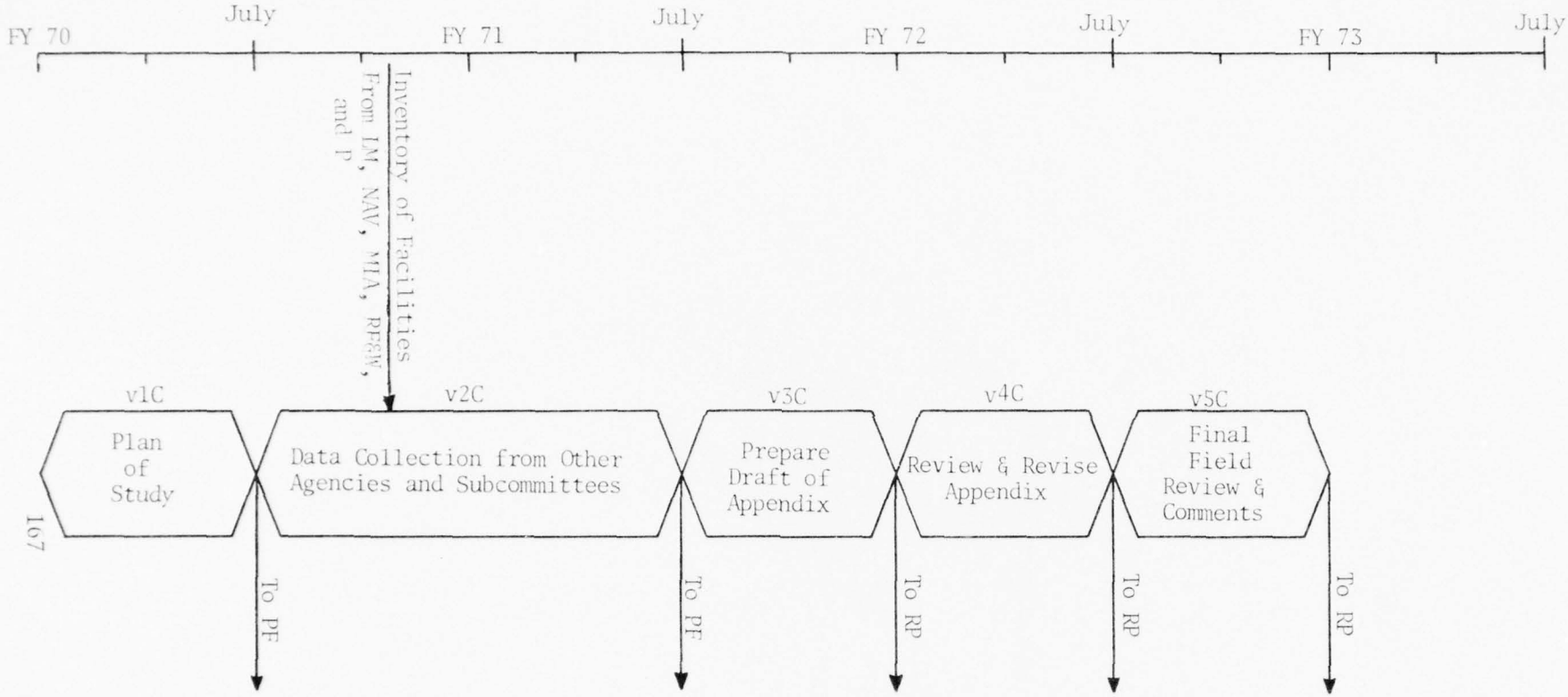
Each narrative will be general in nature, describing the physical characteristics of the project, its main features, its authority, pertinent dates, and statistics on costs and benefits. The data sheets will show the responsible agency, year of project completion, project uses, and a physical description of the project, using the following parameters:

Facilities	Units of Measure
Reservoirs	Acres of water-surface area Acre-feet of storage Drainage area (square miles)
Channel improvement (flood control or navigation)	Length (miles) Depth and width (feet)
Floodways and auxiliary channels	Length (miles)
Levees and walls	Miles
Pumping stations	Capacity (c.f.s)
Floodgate structures	Number
Channel stabilization	Miles of revetment and linear feet of operable dikes
Area protected	Acres
Degree of protection	High, medium, low*
Angler man-days per year	Number
Hunter man-days per year	Number
Commercial fish and wildlife harvest	Tons and pelts annually
Lock and dam size	Length, width, and lift in feet
Freight (tonnage)	Ton-miles annually
Dams with navigation	Flow releases, c.f.s.
Industrial port size	Acres
Length of harbor channel	Feet
Average annual cargo	Total tonnage
Power production	1000 KWH
Municipal and industrial water supply	Pumping capacity, g.p.d.
Agricultural water supply	Acre-feet/year Acres irrigated

* High - 50-year frequency or higher
Medium - 10-year to 50-year frequency
Low-less than 10-year frequency

Facilities	Units of Measure
Low flow augmentation	Released annually, c.f.s.
Sewage-treatment facilities	Adequate (secondary treatment) Partial (primary treatment) Future (tertiary or advanced treatment)

Each project or project feature listed on the data sheet will be number coded to the map which will indicate the location of the project or feature. Length of project or area covered will be illustrated on the map, if applicable. A three-color code will be used to show projects complete, under construction, or proposed for the future. Projects expected to be complete by 30 June 1972 will be shown in black; projects under construction and long-term continuing projects will be shown in green, and future projects that will be authorized by 30 June 1972, will be shown in red.



Lower Mississippi Region Comprehensive Study
Inventory of Facilities (v)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT v
INVENTORY OF FACILITIES

I. INTRODUCTION

A. Authority

B. Purpose of Study

C. Environmental and Ecological Considerations

D. Glossary of Terms

E. Basic Data and Assumptions

II. FLOOD CONTROL

A. WRPA 1

1. Narratives

2. Data Sheets

3. Map

B. WRPA 2

1. Narratives

2. Data Sheets

3. Map

C. WRPA 3

1. Narratives

2. Data Sheets

3. Map

D. WRPA 4

1. Narratives

2. Data Sheets

3. Map

E. WRPA 5

1. Narratives

2. Data Sheets

3. Map

F. WRPA 6

1. Narratives

2. Data Sheets

3. Map

G. WRPA 7

1. Narratives

2. Data Sheets

3. Map

H. WRPA 8

1. Narratives

2. Data Sheets

3. Map

I. WRPA 9

1. Narratives

2. Data Sheets

3. Map

J. WRPA 10

1. Narratives

2. Data Sheets

3. Map

III. RECREATION AND FISH AND WILDLIFE

A. WRPA 1

1. Narratives

2. Data Sheets

3. Map

B. WRPA 2

1. Narratives

2. Data Sheets

3. Map

C. WRPA 3

1. Narratives

2. Data Sheets

3. Map

D. WRPA 4

1. Narratives

2. Data Sheets

3. Map

E. WRPA 5

1. Narratives

2. Data Sheets

3. Map

F. WRPA 6

1. Narratives

2. Data Sheets

3. Map

G. WRPA 7

1. Narratives

2. Data Sheets

3. Map

H. WRPA 8

1. Narratives

2. Data Sheets

3. Map

I. WRPA 9

1. Narratives

2. Data Sheets

3. Map

J. WRPA 10

1. Narratives

2. Data Sheets

3. Map

IV. NAVIGATION AND HARBORS

A. WRPA 1

1. Narratives

2. Data Sheets

3. Map

B. WRPA 2

1. Narratives

2. Data Sheets

3. Map

C. WRPA 3

1. Narratives

2. Data Sheets

3. Map

D. WRPA 4

1. Narratives

2. Data Sheets

3. Map

E. WRPA 5

1. Narratives

2. Data Sheets

3. Map

F. WRPA 6

1. Narratives

2. Data Sheets

3. Map

G. WRPA 7

1. Narratives

2. Data Sheets

3. Map

H. WRPA 8

1. Narratives

2. Data Sheets

3. Map

I. WRPA 9

1. Narratives

2. Data Sheets

3. Map

J. WRPA 10

1. Narratives

2. Data Sheets

3. Map

V. POWER

A. Narratives

B. Data Sheets

C. Map of the Lower Mississippi Region

VI. SEWAGE TREATMENT, WATER QUALITY, AND WATER SUPPLY

A. WRPA 1

1. Narratives

2. Data Sheets

3. Map

B. WRPA 2

1. Narratives

2. Data Sheets

3. Map

C. WRPA 3

1. Narratives

2. Data Sheets

3. Map

D. WRPA 4

1. Narratives

2. Data Sheets

3. Map

E. WRPA 5

1. Narratives

2. Data Sheets

3. Map

F. WRPA 6

1. Narratives

2. Data Sheets

3. Map

G. WRPA 7

1. Narratives

2. Data Sheets

3. Map

H. WRPA 8

1. Narratives

2. Data Sheets

3. Map

I. WRPA 9

1. Narratives

2. Data Sheets

3. Map

J. WRPA 10

1. Narratives

2. Data Sheets

3. Map

VII. MULTIPURPOSE PROJECTS

A. WRPA 1

1. Narratives

2. Data Sheets

3. Map

B. WRPA 2

1. Narratives

2. Data Sheets

3. Map

C. WRPA 3

1. Narratives

2. Data Sheets

3. Map

D. WRPA 4

I. Narratives

2. Data Sheets

3. Map

E. WRPA 5

1. Narratives

2. Data Sheets

3. Map

F. WRPA 6

1. Narratives

2. Data Sheets

3. Map

G. WRPA 7

1. Narratives

2. Data Sheets

3. Map

H. WRPA 8

1. Narratives

2. Data Sheets

3. Map

I. WRPA 9

1. Narratives

2. Data Sheets

3. Map

J. WRPA 10

1. Narratives

2. Data Sheets

3. Map

VIII. SUMMARY OF PROJECTS

PLAN OF WORK
STUDY ELEMENT w
REPORT PREPARATION GUIDELINES

OBJECTIVE

The purpose of study element w is to:

A. Provide guidelines for preparation of all field drafts of the appendixes and summary report.

B. Be responsible for reproduction and distribution of all field drafts.

C. Prepare informational brochures for public release.

ORGANIZATION

The work of the report preparation element will be accomplished by the Report Preparation Subcommittee (RP), which is chaired by the Mississippi River Commission (VXD). The Mississippi River Commission (VXD) will be the study element leader and will have the responsibility for the preparation of these guidelines. Participants in the study element are shown in Annex 2.

MANAGEMENT

The guidelines are necessary for the sake of uniformity and efficiency in report preparation. They will be prepared and furnished to all participants in time for use in preparing the initial drafts of each appendix and the summary report. It is very important that these guidelines be followed by all study participants having the responsibility for the preparation of any portion of this report in order to eliminate the need for costly and time-consuming rewriting by the RP Subcommittee.

TIME SCHEDULE

Early submittal of drafts would eliminate a possible overburden in the printing shop and would expedite the reproduction process. This would also allow for the distribution and review of the various appendixes as they are completed, and tend to minimize each participant's workload in the review periods. Schedules from the activities sequence diagram for submittal of the appendixes, summary report, and final comments to RP Subcommittee Chairman for reproduction are as follows:

Item	Submittal date
First draft of appendix	April 1972
Revised draft of appendix	October 1972
First draft of summary report	October 1972
Revised draft of summary report	February 1973
Final field comments	May 1973

METHODOLOGY

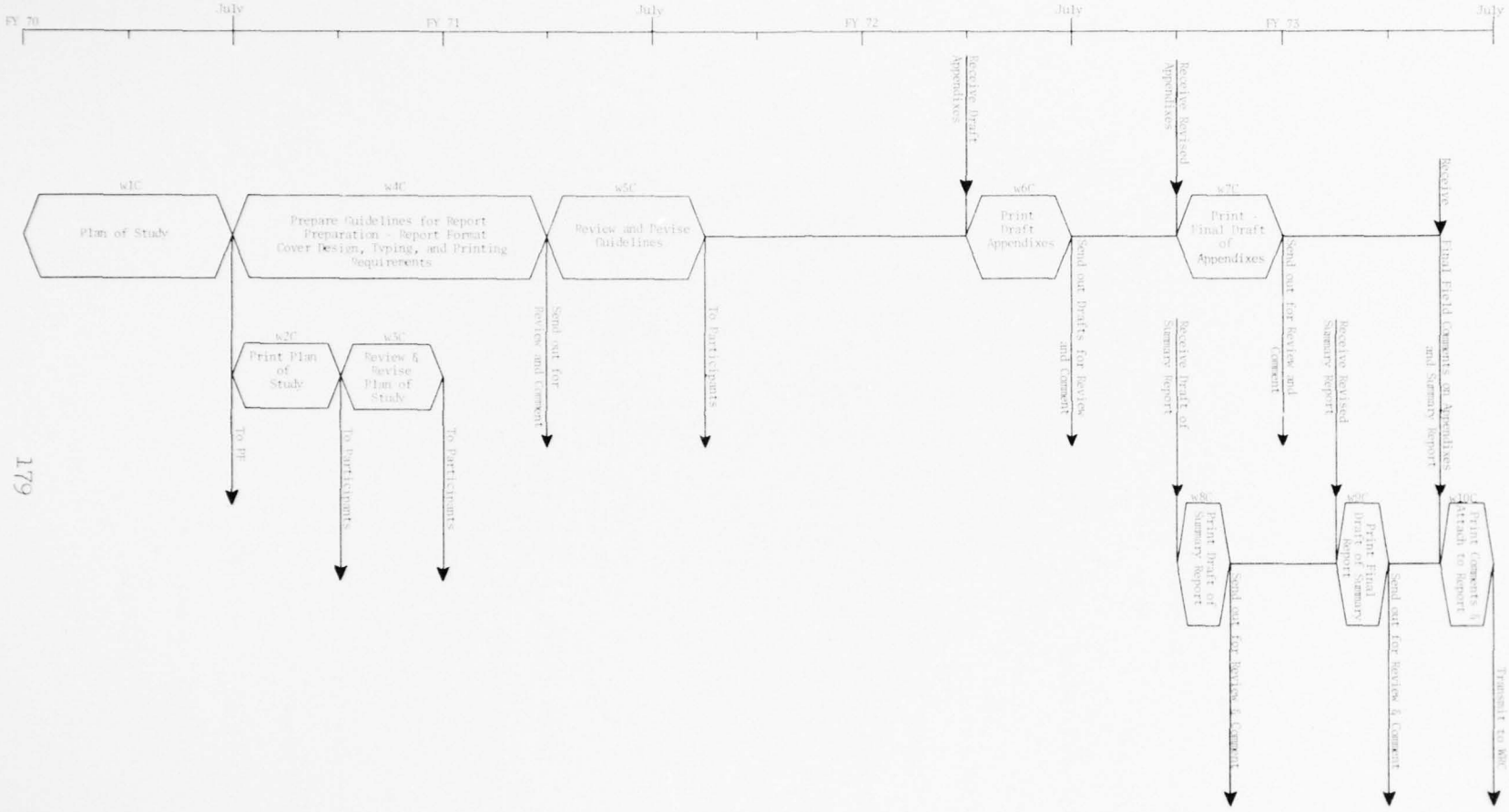
The guidelines provided by the RP Subcommittee will include typing format, layout of figures and tables, base maps, and report cover designs. The RP Subcommittee will prepare a draft of these guidelines and submit them to all participants for review and comments. Guidelines that have been prepared for previous Type I studies will be reviewed and utilized when possible.

It is anticipated that all appendixes and the summary report will be reproduced twice. This will consist of a first and final field draft. The submittal and reproduction process will be as follows:

A. The master copies for each appendix and the summary report will be submitted to the RP Subcommittee chairman for reproduction. Master copies will be in a final form suitable for offset reproduction and will be accompanied by an assembled duplicate copy and a transmittal letter to the participants who are to receive that portion of the report for review.

B. Reproduction will be done at the Corps of Engineers, Waterways Experiment Station at Vicksburg, Mississippi.

C. Copies of the Appendixes and the summary report will be transmitted from the printing shop directly to the participants who are responsible for reviewing and commenting on that particular portion of the report.



Lower Mississippi Region Comprehensive Study
Report Preparation Guidelines (w)
Activities Sequence Diagram

OUTLINE
STUDY ELEMENT w
REPORT PREPARATION GUIDELINES

I. INTRODUCTION

A. Authority

B. Purpose of Study

II. REPRODUCTION

A. Submission of Field Drafts

B. Reproduction of Drafts

C. Transmitting Drafts for Review

III. REPORT PREPARATION SCHEDULE

IV. REPORT PRESENTATION

A. Text

1. Page Size

2. Binding

3. Type

4. Spacing

5. Image Size

6. General Format

7. Report Covers

B. Tables

1. General Format

2. Use of Foldouts

C. Figures and Photographs

1. General Format of Base Maps

2. Use of Foldouts

3. Color

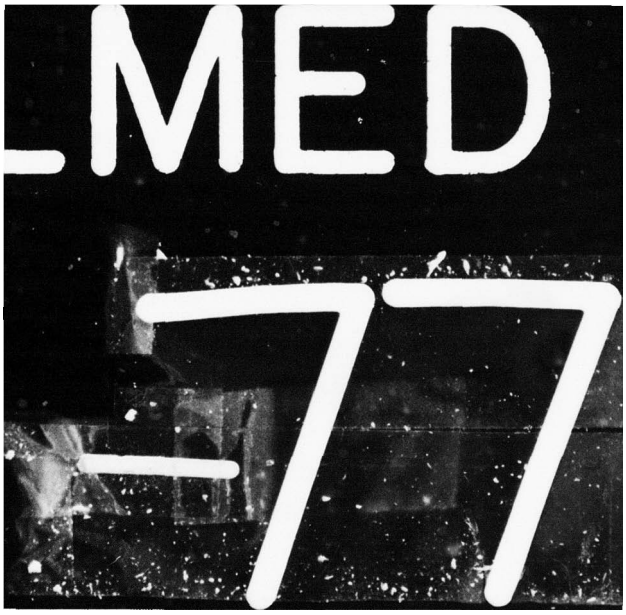
4. Photograph Use

V. EDITORIAL STANDARDS

XIV. APPROVAL AND ACCEPTANCE BY PARTICIPANTS

This Plan of Study has been prepared by the Plan Formulation Committee under the direction of the Lower Mississippi Region Comprehensive Study Coordinating Committee. The Plan Formulation Committee utilized the input prepared by the various participating State and Federal agencies for each study element. This Plan of Study has been approved by the Lower Mississippi Region Comprehensive Coordinating Committee

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ECONOMIC RESEARCH SERVICE
NATIONAL FOREST SYSTEM
COOPERATIVE FORESTRY FORESTRY RESEARCH
U.S. DEPARTMENT OF COMMERCE
OFFICE OF BUSINESS ECONOMICS
AND
NATIONAL OCEANIC ATMOSPHERIC ADMINISTRATION
BUREAU OF DOMESTIC COMMERCE
DEPARTMENT OF COMMERCE
UNITED STATES OF AMERICA
ENVIRONMENTAL PROTECTION AGENCY
FEDERAL POWER COMMISSION
COMMONWEALTH OF KENTUCKY
DEPARTMENT OF HEALTH EDUCATION & WELFARE
USA
DEPARTMENT OF TRANSPORTATION
UNITED STATES OF AMERICA
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
DEPARTMENT OF LABOR
UNITED STATES OF AMERICA
STATE OF LOUISIANA
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
UNITED STATES GEOLOGICAL SURVEY
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
SOUTHWEST POWER ADMINISTRATION
CORPS OF ENGINEERS
U.S. ARMY
DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA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