

CHAPTER 10 - LOWER MISSOURI SUBBASIN

SUBBASIN DESCRIPTION

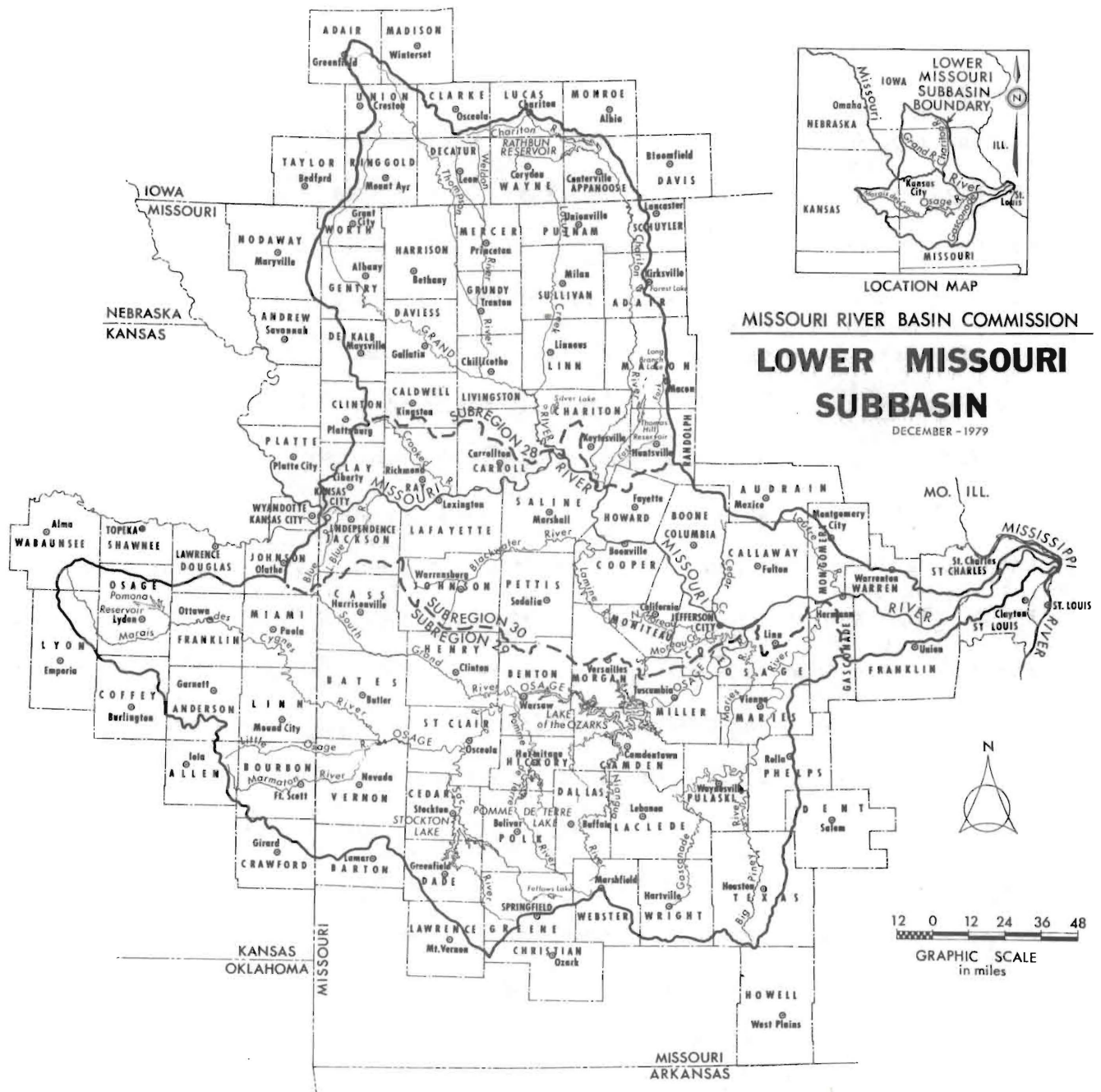
The Lower Missouri Subbasin, the furthest downstream of the Missouri River Basin subbasin, encompasses a total area of 25.4 million acres (as shown in Figure 10-1). It includes all of the tributaries of the Missouri River from Kansas City, Missouri, downstream to the confluence of the Missouri River with the Mississippi River, 15 miles above St. Louis, Missouri. The subbasin encompasses about one-half of Missouri and small parts of Kansas and Iowa. The subbasin has a maximum east-west and north-south extent of about 300 miles.

The principal northern tributaries of the Missouri River in this subbasin, the Grand and Chariton Rivers, flow southeastward from southern Iowa where the terrain is rolling and elevations reach 1,450 feet (mean sea level). South of the main stem, the Osage and Gasconade Rivers are the chief tributaries. The Osage River system drains the land eastward from headwaters extending from the Flint Hills of east-central Kansas to the Ozark foothills in south-central Missouri. The Gasconade River, which lies southeast of the Osage, originates in the foothills of the Ozarks, and flows northward to the Missouri River.

Mean annual precipitation is 32 inches in south-central Iowa, increasing to 42 inches in south-central Missouri. About 70 percent of the precipitation occurs during the growing season, between the months of May and September. January is normally the coldest month of the year. Mean daily maximum temperatures range from 33 degrees in the north to 46 degrees in the south in January, and in July the warmest mean daily maximum temperature ranges from 90 to 94 degrees. The frost-free period is approximately 180 days throughout the subbasin.

Seven percent of the land acreage is in public domain, with much of the wildlife is found on private land. Extensive agricultural ecosystems have

Figure 10-1—Lower Missouri Subbasin



replaced much of the native forest and prairie ecosystems. Wildlife habitat is of high quality where woodlands and a mixture of cropland provide favorable interspersions; all provide some of the best tree squirrel, cottontail, quail, and wild turkey hunting in the basin.

Considerable upland areas of eastern deciduous forest, largely oak, and hickory, still exist in the Ozark Plateau. Less extensive acreages occur in parts of the Grand, Osage, Missouri, and Chariton River Basins. Flood plain forests are found on bottomlands of the major streams and rivers. Forest land provides key habitat for deer, squirrel, quail, wild turkey, cottontail, raccoon and fox, and supports a few relict populations of ruffed grouse and a wide diversity of flora and fauna. Clearing of such forest land, appears to be accelerating, with 1.5 million acres lost in the past decade.

Much of the tall-grass prairie has been lost to cropland. Isolated acreages do still exist on private lands, mostly in the western portion of the subbasin. Three thousand acres have been acquired recently by State and private entities as wildlife habitat supporting populations of the northern greater prairie chicken, upland plover, black-tailed and white-tailed jackrabbits, and a host of other mammals, birds, and reptiles. The small white lady-slipper, a plant once common to most prairies in the subbasin, is an endangered species.

Other specialized ecosystems, including caves, cliffs, and bluffs, support a variety of flora and fauna rare or unique to the Missouri River Basin. Included are the endangered Indiana and gray bats and possibly the southern bald eagle.

Aquatic resources are diverse and often of high quality, although quantity is limited. These include natural and channelized streams, multipurpose reservoirs, spring-fed streams, oxbow lakes, small watershed reservoirs, fishing lakes, farm ponds, and various spring seeps and marshes. .

Fishery resources of national importance exist in several waters including most of the Gasconade River Basin and certain portions of streams and reservoirs in the Osage River Basin. The Lake of the Ozarks is nationally renowned among fishermen for large-mouth bass. Cold-water trout fisheries also are of excellent quality, although limited in quantity.

The Missouri River fishery is currently dominated by channel catfish and various rough fishes, but the original array of fish fauna still exists. Various sturgeons, including the pallid, shovelnose, and lake, however, are rare, threatened, or endangered and populations of blue catfish and paddlefish have declined greatly. Some small streams such as the Niangua support exceptionally diverse fauna including the rare endemic Niangua darter. A recent study by the State of Missouri recommends that this darter be federally listed for protection under the Endangered Species Act.

Other important inhabitants of stream environments include: (1) diverse mollusk fauna in the Ozark streams; (2) various species of fur bearers, including a few river otters, documented in only a few other areas of the basin; and (3) unique vertebrate and invertebrate fauna associated with subterranean streams and springs in caves.

Few waterfowl nest in the basin, limiting both propagation and hunting. It is estimated that wetlands have declined along the Missouri River by over 10,000 acres since 1951. However, giant Canadian geese have increased in recent years under careful State management at Trimble Wildlife Refuge. Nongame species including the king rail, yellow-headed blackbird, boblink, and osprey have also been declining. Only the endangered northern bald eagle, often found wintering around reservoirs or along the Missouri River, appears to be stable or increasing in population.

Favorable climate and diversity of land forms have supported or permitted the development of a variety of natural, cultural, and historic features which attract tourists. Such important resource areas include those of (1) the Missouri River corridor with its bluffs, forests, islands, sandbars, and rich cultural and historic backdrop; (2) the Devil's Icebox and Sinkhole Plain; (3) heavily forested segments of the Gasconade and Osage, and Grand River corridors including attractive agricultural landscapes, riverscapes, and reservoirs; (4) prairie lands in the western part of the subbasin; and (5) certain free-flowing streams such as the Cedar, Niangua, and Gasconade Rivers.

The subbasin's 1975 population was estimated at slightly more than 2 million, representing approximately 25 percent of the Missouri Basin's total. Within the subbasin, 66 percent of the population (1.4 million) was urban. Two Standard Metropolitan Statistical Areas, Kansas City, Missouri-Kansas, and Columbia, Missouri are located in the subbasin. The remaining 34 percent of the subbasin's population (707,900) lived in rural areas in 1975. Demographic projections for the period 1975 to 2000 suggest that the subbasin will experience continued population growth, but at a decreasing annual rate.

Over 1 million persons were employed in the subbasin in 1975; 102,000 agricultural workers and 908,300 nonagricultural workers. Employment projections suggest the number of agricultural workers may decline by 29 percent by the year 2000, with nonagricultural employment increasing 64 percent. Total employment, therefore, should increase by 35 percent to 1.4 million by the end of this century.

A significant portion of the land in the Lower Missouri Subbasin is used for agricultural production. Major dryland and irrigated crops consist of corn, winter wheat, alfalfa, fruits and nuts, and commercial vegetables. Further, beef, pork, and dairy products contribute substantially to agricultural sales.

Forests and woodlands cover a large portion of the subbasin and commercial forestry activities are profitable.

Assorted mineral and fuel resources are mined and refined throughout the subbasin. Coal deposits are the most notable. Manufacturing consists largely of processing food and some fuels, printing, and paper products manufacturing.

Natural outflow from the Missouri River Basin was calculated in 1971 to be about 65 million acre-feet. Based upon this total and accounting for State estimates of depletions, 1975 average annual remaining out flows were estimated to be 49.5 million acre-feet. Future flows at Hermann, Missouri, near the mouth of the Missouri River are predicted to decline to a level of 46 million acre-feet by 1985 and to 42 million by the year 2000.

Water withdrawals within the Lower Missouri Subbasin are moderate, considering available flows. Cooling at steam-electric power plants is the purpose for which the largest water withdrawals are made. However, consumptive use of water is minimal, with livestock and municipal and industrial uses accounting for about two-thirds of the total 177,000 acre-feet per year.

Overland runoff contributes large amounts of silt and organic material to streams throughout the subbasin. In reaches of the Osage, Marias de Cygnes, Grand, Chariton, and Blue Rivers, dissolved oxygen levels during occasional periods of low-flow drop below desirable levels for propagation of aquatic life.

Water quality in valley-fill aquifers lying along the Missouri River and its tributaries appears to improve in the downstream direction, probably because of progressively increasing average annual precipitation.

PROBLEMS AND OPPORTUNITIES

The principal problems in the Lower Missouri Subbasin are nonpoint source pollution; potential power shortages given expected future demands; and

uncertain water supplies for coal gasification and other potential energy development. Others of lesser impact include local ground water supplies of unacceptable quality in some parts of the subbasin; isolated flood problems; overcrowded recreation areas; declining acreage of wetlands and forests; and riparian habitat impaired by continuing development. The basin is just beginning to explore the opportunities available through modern irrigation practices, and coal gasification is possible, given the coal deposits available in some areas.

Nonpoint source pollution is the most serious problem in the Lower Missouri Subbasin. This problem results from agricultural runoff, urban storm-water drainage, acid mine drainage, and individual waste disposal systems.

In north- and west-central Missouri and in southern Iowa, active bank erosion is common and heavy sediment loads are consequently carried by many Missouri River tributaries. Steep slopes and soil types cause upland soil erosion, especially in northwestern Missouri and southwestern Iowa. The productive cropland soils in the South Grand, Blackwater, Grand, and Chariton Basins are primarily of loess or loess over glacial till and are often tilled.

Due to the rolling topography, annual soil loss on unprotected tilled cropland often exceeds 25 tons per acre. This loss is five times the rate of loss allowable to maintain sustained crop production and also is a major contribution to nonpoint water pollution. Storm-water runoff in several of the subbasin's metropolitan areas periodically adds to nonpoint source pollution.

Mine drainage, (including suspended solids and acid wastes), has been responsible for pollution on Cedar Creek; Locust Creek; lower east fork of the Chariton River; and the Chariton River in Putnam, Schuyler, Sullivan, and Adair counties. A major problem has occurred on the east fork of the Chariton River

with acid mine drainage in the Macon-Randolph county area. In Boone and Callaway and Henry and St. Clair counties, acid water from abandoned strip mines is a problem. Inactive strip mines developed prior to 1973 are not covered by State reclamation laws.

sewage collection lines, resulting in increasing use of individual septic tanks in turn contributing to nonpoint source pollution. No coordinated region-wide water delivery systems currently exist. Solution of the problem is further hampered by restrictions imposed or interpreted by the Farmers Home Administration that prevent the design of rural water and wastewater disposal systems for future expansion.

Power and energy is another area presenting problems in the Lower Missouri Subbasin. A number of proposals have been advanced by private industry for development of coal and electric power, and several low-head hydro sites have been investigated. Projected power demands will necessitate installation of additional power plants in the subbasin, and there are opportunities for additional hydroelectric generation at existing projects or at potential sites.

Coal gasification is possible in the Grand River Basin in north-central Missouri, if water supplies are sufficient, and along the Missouri River in central Missouri where there are considerable reserves of high-sulphur coal.

Tar sands in Bates, Vernon, and Barton counties possess potential for energy production, but water requirements for processing the sands are presently unknown. In all cases, attendant environmental problems would have to be addressed.

Local ground water of poor quality occurs in north- and west-central Missouri. There is strong potential for building rural water systems utilizing high quality surface water, especially from the Missouri River, and, in some areas, the reallocation of water in Federal reservoirs may be possible. As

more rural water supply systems are built or as existing systems increase their service areas, coordination between systems could reduce costs and the need for additional facilities and water.

The Grand River Basin has significant flood problems. Recurring flooding seriously hampers cropping and capital improvements in the flood plains. Annual flooding in the Grand River Basin affects some 370,000 acres, 80 percent of which is farmland. Flooding also occurs in the Chariton, Marais des Cygnes, Osage, and Fishing River Basins.

Problems with urban flooding occur in the subbasin's metropolitan areas and is especially noticeable along flood plains on many streams that flow through developed areas.

More leisure time has allowed subbasin residents to spend more time in recreational pursuits or to expand their interest in natural, historical, or cultural resources. As the public seeks outlets for their activities, existing recreational facilities become overtaxed and a lack of additional facilities exists in certain areas of the basin. Access to water-oriented recreation areas along the Missouri River and Marias des Cygnes Basin is limited.

Wetlands and forest land acreages are declining in the flood plains. Wetlands have been converted to agricultural or urban uses. Drainage of wetlands may also reduce flood storage capability, nutrient retention, and ground-water recharges.

On the Missouri River, channel improvements have reduced backwater areas, islands, and sandbars. Elsewhere, on tributaries such as the Grand, South Grand, Chariton, and Blackwater Rivers, channel straightening has reduced riparian habitat. All such action reduces the habitat of fish and wildlife.

Irrigation development is a relatively new opportunity in this particular subbasin compared to the other subbasins of the Missouri River Basin.

Irrigation has been limited so far, but the opportunity exists to conduct research in irrigation in this subbasin in an effort to overcome difficulties being experienced elsewhere.

PLANNING OBJECTIVES

The States in the Lower Missouri Subbasin, Iowa, Kansas and Missouri, recognize the need for continued refinement of State water planning, In addition, the need for level B planning for the entire subbasin is recognized, and specifically recommended below.

To address flooding problems in ths subbasin, Iowa stresses prevention of damage to lands through small projects or nonstructural means whereas long-range goals in Kansas are directed more toward reduction of flooding through structural means. Both Kansas and Missouri call for nonstructural alternatives in flood control, although both will consider structural or nonstructural combination measures for flood damage abatement on a case-by-case basis.

In Iowa, streams designated by the Iowa Conservation Commission as having exceptional recreation and fish and wildlife uses are of primary concern. The State recommends raising protected low flows and provides for strict regulation of water withdrawals and channel changes.

Policies toward municipal, industrial, and rural domestic water supplies in the three States are surprisingly different. The State of Iowa actively encourages water conservation measures. The State of Missouri has implemented training and technical assistance programs, monitors water quality, and reviews construction plans. The State of Kansas State policy calls for provision of suitable, sufficient, reliable water supplies for present and future uses within the State, including the development of adequate water supplies for small communities and rural users.

Iowa power and energy development policies call for location of plants on the major streams bordering the State rather than permitting ground water use for this purpose. Kansas water and energy policies have accorded hydroelectric power development in eastern Kansas a low priority because further development is limited by the terrain and because of higher priorities for water use for more beneficial purposes.

Iowa's objectives in water-related transportation reflect the State's recognized dependence on the Federal Government to finance and maintain the navigation on the Missouri River. Missouri's policy favors greater use of navigable waterways including port development.

Iowa maintain's a strong interest in allocation of instream flows and water resources throughout the Missouri River Basin. The State's intent is to ensure that Iowa receives its share for water supply needs and instream uses such as navigation. Missouri intends to consider the need for and desirability of establishing a permit system for water use, with provision for maintaining adequate quality and quantities of water for nonconsumptive uses.

PLAN OVERVIEW

The plan for the Lower Missouri Subbasin includes the recommendations presented in this chapter, the basinwide programs recommended in chapter 2, and the statewide programs recommended for Iowa, Kansas and Missouri, also found in chapter 2.

While the plan for the Lower Missouri Subbasin effectively addresses many of the problems and opportunities cited above, the great number of Federal and State planning efforts in the subbasin points to the need for a closely coordinated comprehensive planning effort. An important recommendation for this subbasin is, therefore, for the initiation of a level B study to cover the entire subbasin.

Some small watershed projects are recommended in the subbasin. In general, however, rural flooding problems remain unaddressed. Most structural flood control items such as dam levees and large scale channelization are not feasible, and use of the flood plain for cropland continues. In addition, adequate funding for small watershed programs is not available and the backlog will continue for many years.

The importance of water transportation on the Missouri River is recognized by an ongoing Corps program assigned to improve the navigation channel. Another Corps program, Missouri River Fish and Wildlife Mitigation Study, is a major effort to provide compensation for loss of habitat by construction, operation or maintenance of navigation, or habitat improvement or replacement. Several statewide soil conservation studies examine land conservation and management, and management of erosion and sediment problems.

Development of national historic trails such as Lewis and Clark, Mormon, Pioneer, and Oregon is considered important in this subbasin. The plan suggests that development of these trails be integrated with compatible water-associated outdoor recreation projects.

RECOMMENDED PROGRAMS - LOWER MISSOURI

NAME, LEAD AGENCY, AND FUNCTIONS

DESCRIPTION

COMPREHENSIVE PLANNING AND SUPPORT ACTIVITIES

1-STATEWIDE RIVER BASIN STUDY, MISSOURI
 USDA/Soil Conservation Service
 Comprehensive
 Also in Middle Missouri Subbasin

New start special study beginning in FY 82; statewide comprehensive study in water and land resources; involves SCS, ESCS & FS; study cost \$925,000.

2-NORTHERN MISSOURI TRIBS COOPERATIVE STUDY/MISSOURI AND IOWA
 USDA/Soil Conservation Service
 Comprehensive
 Also in Middle Missouri Subbasin

Ongoing river basin planning thru FY 82; eleven reports completed; develop alternate plans on major streams; study cost \$2.2 million.

3-SOUTHWEST IOWA WATER RESOURCES STUDY
 Iowa Geological Survey
 Comprehensive
 Also in Middle Missouri Subbasin

New start data collection & research beginning in FY 82; water supply availability study in S.W. IA; study cost \$750,000.

4-KANSAS AND OSAGE RIVERS, KANSAS STUDY
 Army Corps of Engineers
 Comprehensive
 Also in Kansas Subbasin

Ongoing special study thru FY 83; streambank stabilization on KS River & tribs, mineral pollution control in KS River Basin & additional water supply & distrib. in KS & Osage; study cost \$4.5 million.

5-SOUTHERN IOWA RESOURCE CONSERVATION & DEVELOPMENT PROJECT, IA
 USDA/Soil Conservation Service
 Comprehensive
 Also in Middle Missouri Subbasin

Ongoing program implementation thru FY 82; Adair, Adams, Taylor, Ringold, Decatur, Wagner & Clark counties; cost \$2.1 million.

6-CHARITON RESOURCE CONSERVATION & DEVELOPMENT AREA, IOWA
 USDA/Soil Conservation Service
 Comprehensive
 Ongoing program implementation thru FY 82; Wayne &
 Appanoose counties, others not in MRB;
 cost \$590,000.

7-LAKE REGION RESOURCE CONSERVATION & DEVELOPMENT PROJECT, KS
 USDA/Soil Conservation Service
 Comprehensive
 Ongoing program implementation thru FY 82;
 Anderson, Coffey, Franklin, Linn, Miami & Osage
 counties; cost \$577,000.

8-GREEN HILLS RESOURCE CONSERVATION & DEVELOPMENT PROJECT, MO
 USDA/Soil Conservation Service
 Comprehensive
 Ongoing program implementation thru FY 82;
 Harrison, Mercer, Putnam, Daviess, Grundy, Linn,
 Sullivan, Caldwell & Livingston counties; cost
 \$1.5 million.

FLOODING

9-FLOOD PLAIN MANAGEMENT PROGRAM FOR THE MISSOURI RIVER
 Missouri River Basin Commission
 Flooding
 Also in Middle Missouri & Eastern Dakotas Subbasin
 New start special study beginning in FY 81;
 Missouri River mainstem from near Sioux City, Ia,
 to the mouth near St. Louis, Missouri; study cost
 \$400,000.

10-MISSOURI RIVER LEVEE SYSTEM
 Army Corps of Engineers
 Flooding
 Also in Middle Missouri Subbasin
 Ongoing program implementation detailed study
 thru 81; flood protection main stem Sioux City,
 Iowa to mouth; active L385, L330-345, L329-319;
 cost FY 81 \$6.7 million; bal to complete \$85.3
 million.

11-BLUE RIVER CHANNEL, KANSAS CITY, MISSOURI
 Army Corps of Engineers
 Flooding
 Ongoing program implementation thru FY 84; twelve
 miles of modified channel Jackson County;
 cost \$93.9 million.

12-LITTLE BLUE RIVER CHANNEL, MISSOURI
Army Corps of Engineers
Flooding

Ongoing program implementation thru FY 82; channel
and levee improvements in conjunction with
upstream Little Blue River Lakes; Jackson County;
cost \$26.8 million.

13-LITTLE BLUE RIVER LAKES, MISSOURI
Army Corps of Engineers
Flood, F&W, Rec., Water Qual.

Ongoing program implementation thru FY 85;
Longview Lake and Dam, Jackson County, Lee's
Summit, Little Blue River, Grandview, Kansas City,
Missouri; cost \$129 million.

14-WEARS CREEK, JEFFERSON CITY, MISSOURI, PHASE II
Army Corps of Engineers
Flooding

New start beginning in FY 81; flood protection
lower flood plain Wears Creek; within
boundaries of urban renewal project, adjacent
State capitol complex; cost \$36 million.

15-LONG BRANCH LAKE, MISSOURI
Army Corps of Engineers
Flood, M&I Rural Supply, Rec., Water Qual., F&W

Ongoing program implementation thru FY 81; East
Fork of Little Chariton River, west of City of
Macon; cost \$21.5 million.

16-STOCKTON LAKE, IMPLEMENTATION OF DOWNSTREAM MEASURES, MO
Army Corps of Engineers
Flood, F&W, Energy, Rec.

Deferred program implementation; litigation;
Cedar, Dade, Polk counties; Sac River downstream
from Stockton Dam to reduce downstream damage.

17-HARRY S. TRUMAN DAM AND RESERVOIR, MISSOURI
Army Corps of Engineers
Flood, F&W, Energy, Rec.

Ongoing program implementation thru FY 82; Benton,
Bates, Henry, Hickory, St. Clair & Vernon counties;
cost \$469 million.

<p>18-FORT SCOTT LAKE RESTUDY, KANSAS Army Corps of Engineers Flooding</p>	<p>Deferred feasibility study thru FY 82; flood control, water supply and recreation on Marrnaton River; Bourbon County; cost \$1.2 million.</p>
<p>19-HILLSDALE LAKE, KANSAS Army Corps of Engineers Flood, F&W, M&I Rural Supply, Rec., Water Qual.</p>	<p>Ongoing program implementation thru FY 82; multipurpose reservoir, Big Bull Creek; Miami County; cost \$59 million.</p>
<p>20-BLACKBIRD-WILDCAT WATERSHED PROJECT, IOWA, MISSOURI USDA/Soil Conservation Service Flooding, Land Conservation & Management</p>	<p>Watershed in Appanoose County, Iowa and Putnam & Adair counties, Missouri, recommended for planning FY 82; project envisions 4 flood detention struc. & 25 grade stabilization struct.; cost \$1.4 million.</p>
<p>21-EAST FORK OF GRAND RIVER, WATERSHED PROJECT, IOWA USDA/Soil Conservation Service Flooding, Land Conservation & Management</p>	<p>Watershed in Ringold & Union counties; recommended for planning; project envisions 5 flood detention structures; cost \$4.5 million.</p>
<p>22-LONG CREEK WATERSHED PROJECT, IOWA USDA/Soil Conservation Service Flooding, Land Conservation & Management</p>	<p>Watershed in Dacatur & Clarke counties; recommended for planning; project envisions 4 flood retention structures; cost \$3.4 million.</p>
<p>23-MEDICINE CREEK WATERSHED PROJECT, IOWA, MISSOURI USDA/Soil Conservation Service Flooding, Land Conservation & Management</p>	<p>Watershed in Wayne County, Iowa and Mercer & Putnam counties Missouri; recommended for planning FY 84; project envisions 4 flood detention struct. & 20 grade stabilization structures; cost \$1.2 million.</p>
<p>24-UPPER POTTAWATOMIE WATERSHED PROJECT, KANSAS USDA/Soil Conservation Service Flooding, Land Conservation & Management</p>	<p>Watershed in Anderson, Franklin & Coffey counties; recommended for planning FY 96; project envisions 15 flood detention structures; cost \$4.8 million.</p>

25-LOWER POTTAWATOMIE WATERSHED PROJECT, KANSAS
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Anderson, Franklin, Miami & Linn
 counties; recommended for planning; project
 envisions 30 flood detention structures;
 cost \$5 million.

26-TAUY WATERSHED PROJECT, KANSAS
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Douglas & Franklin counties;
 recommended for planning FY 88; project envisions
 8 flood detention structures and one multipurpose
 structure; cost \$2.3 million.

27-CROOKED RIVER WATERSHED PROJECT, MISSOURI
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Clinton, Caldwell, Clay, & Ray
 counties; recommended for planning FY 84; project
 envisions 10 flood detention structures and 35
 ground stabilization structures; cost \$4.2 million.

28-BIG CREEK, HURRICANE WATERSHED PROJECT, MISSOURI
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Livingston & Carroll counties;
 recommended for planning FY 81; project envisions
 8 flood detention structures; and 40 ground
 stabilization structures; cost \$3.5 million.

29-BEE BRANCH WATERSHED PROJECT, MISSOURI
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Linn & Chariton counties; recommended
 for planning post 84; project envisions 2 flood
 detention structures and 2 miles levee;
 cost \$1.4 million.

30-MIDDLE FORK CHARITON RIVER WATERSHED PROJECT, MISSOURI
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Macon & Randolph counties; recommended
 for planning post 84; project envisions 6 flood
 detention structures and 10 grade stabilization
 structures; cost \$1.9 million.

- 31-MONITEAU CREEK WATERSHED PROJECT, MISSOURI
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Randolph, Howard & Boone counties; recommended for planning post FY 84; project envisions 10 flood detention structures and 15 grade stabilization structures; cost \$2.8 million.

- 32-SALT CREEK-GARDEN OF EDEN WATERSHED PROJECT, MISSOURI
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Chariton County; recommended for planning post FY 84; project envisions 2 flood detention structures and 20 miles of channel; cost \$2.8 million.

- 33-EAST YELLOW CREEK WATERSHED PROJECT, MISSOURI
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Sullivan, Linn & Chariton counties; recommended for planning in FY 82; project envisions 5 flood detention structures and 30 grade stabilization structures; cost \$2.4 million.

- 34-EAST LOCUST CREEK WATERSHED PROJECT, MISSOURI
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Putnam & Sullivan counties; recommended for planning in FY 82; project envisions 3 flood detention structures and 2 grade stabilization structures; cost \$1.8 million.

- 35-UPPER LOCUST CREEK WATERSHED PROJECT, IOWA-MISSOURI
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Wayne & Appanoose counties, Iowa and Sullivan & Putnam counties, Mo; recommended for planning FY 82; project envisions 10 flood construction & 45 grade stabilization struct.; cost \$4. million.

- 36-WEST FORK OF BIG CREEK WATERSHED PROJECT, IOWA-MISSOURI
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Ringold & Decatur counties, Iowa & Harrison & Daviess counties, Missouri; planning underway FY 81; project envisions 8 flood detention struct. & 35 grade stab. struct. cost \$6.4 million.

- 37-EAST FORK OF BIG CREEK WATERSHED PROJECT, IOWA-MISSOURI
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Dacatur County, Iowa & Harrison Co. Missouri; under construction; to be completed FY86; project envisions 2 flood detention structures and 11 grade stabilization structures; cost \$555,000.

- 38-LITTLE RIVER WATERSHED PROJECT, IOWA
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Decatur County; construction to begin FY 90; project envisions 6 flood detention struct. and 1 multipurpose structure; cost \$5.2 million.

- 39-THREE-MILE CREEK WATERSHED PROJECT, IOWA
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Adair & Union counties; construction to begin FY 85; project envisions 4 flood detention structures, 27 grade stab. structures & 1 multipurpose structure; cost \$7 million.

- 40-MIDDLE CREEK WATERSHED PROJECT, KANSAS
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Linn & Miami counties; construction to begin post FY 84; project envisions 7 flood detention structures & 1 multipurpose structure; cost \$2.4 million.

- 41-WILLOW CREEK WATERSHED PROJECT, MISSOURI
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Ray County; construction to begin FY 84; project envisions 3 flood detention structures & 10 grade stabilization structures; cost \$1.8 million.

- 42-CALLAHAN CREEK WATERSHED PROJECT, MISSOURI
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Boone county; under construction; project envisions 7 flood detention structures; cost \$1.4 million.

- 43-GRINDSTONE, LOST, MUDDY CREEKS WATERSHED PROJECT, MISSOURI
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Gentry, Daviess, Dekalb & Clinton counties; construction to begin FY 88; project envisions 24 flood detent. struct., 33 grade stab. struct. & 3 multipurpose struct.; cost \$6.2 million.

- 44-SOUTH FORK OF BLACKWATER WATERSHED PROJECT, MISSOURI
 USDA/Soil Conservation Service
 Flooding, Land Conservation & Management

 Watershed in Johnson County; under construction; project envisions 7 flood detention structures, 14 grade stabilization structures & 1 multipurpose structure; cost \$5.3 million.

45-LITTLE SNI-A-BAR WATERSHED PROJECT, MISSOURI
USDA/Soil Conservation Service
Flooding, Land Conservation & Management

Watershed in Lafayette County; under construction;
project envisions 2 flood detention structures &
16 grade stabilization structures;
cost \$3.2 million.

FISH AND WILDLIFE

46-MISSOURI RIVER FISH & WILDLIFE MITIGATION STUDY
Army Corps of Engineers
F&W
Also in Middle Missouri Subbasin

Ongoing special study thru FY 81; all counties
bordering main stem Missouri, NE, IA, KS, MO;
compensation for F&W loss & habitat improvement;
cost \$273,000.

IRRIGATION

LAND CONSERVATION AND MANAGEMENT

MUNICIPAL, INDUSTRIAL, AND RURAL DOMESTIC WATER SUPPLY

47-SMITHVILLE LAKE, MISSOURI
Army Corps of Engineers
M&I Supply, Flood, F&W, Rec., Water Qual.
Also in Middle Missouri Subbasin
million.

Ongoing program implementation of a multi-
purpose lake for water supply, flood control,
fish and wildlife, recreation and improved
water quality; total cost \$83.7

NATURAL, HISTORIC, AND CULTURAL RESOURCES

POWER AND ENERGY

WATER-ASSOCIATED OUTDOOR RECREATION

48-MELVERN AND POMONA LAKES-ROAD IMPROVEMENT, KANSAS
Army Corps of Engineers
Recreation

New start implementation study thru FY 83; Osage
County; recreation access road planning;
cost \$500,000.

TRANSPORTATION

49-MISSOURI RIVER NAVIGATION AND BANK STAB. CONTROL PROGRAM

Army Corps of Engineers
Transportation, Recreation
Also in Middle Missouri

Ongoing program implementation thru FY 83; main stem Missouri River from Sioux City to mouth, NE, IA, KS, MO; improve navigation channels, bank erosion & stab., rec. facil.; cost \$438 million.

WATER QUALITY

LEGAL AND INSTITUTIONAL FACTORS

INSTREAM FLOWS

WEATHER MODIFICATION

CONCLUSIONS AND ADDITIONAL RECOMMENDATIONS

- A. The Lower Missouri Subregion has a number of pressing water-related problems that need to be resolved within the next 15 years. A comprehensive analysis of this subregion is needed, as evidenced by the number of single or multi-purpose studies recently completed or currently underway within the area by the Corps of Engineers, Department of Agriculture, Department of the Interior, State of Missouri, and Mid-America Regional Council (MARC). A Level B study of Lower Missouri Subbasin would bring plans and proposals together for compatible solutions to the problems, and should be initiated by 1983.
- B. Nonpoint source pollution is one of the most serious problems in the Lower Missouri subbasin. To address the problem, it is recommended that the Rural Clean Water Program (Section 208(j)) of the Clean Water Act of 1977, which would control agricultural related nonpoint sources of pollution on private rural lands, be funded and implemented.
- C. Storm water runoff in some Missouri metropolitan areas adds to nonpoint source pollution. Programs to alleviate the problem already exist in the Kansas City and St. Louis areas and should be initiated in the Springfield area.
- D. Suspended solids and acid wastes from mining operations cause major problems in many parts of the Lower Missouri Subbasin. Information should be developed to accurately predict results of corrective measures to aid in making the measures more cost effective. Also, research should be conducted to analyze effects of various levels of pollution abatement.
- E. Urban-sprawl areas and recreation-oriented areas have rapidly grown beyond sewage collection lines, resulting in the use of individual septic tanks and contributing to nonpoint source pollution. Coordinated region-wide

water delivery systems are needed. Limitations and interpretation of the Farmers Home Administration programs restrict rural-water and waste-water disposal systems to accommodate new rural users and to improve the systems through consolidation. States should work toward removing these limitations.

- F. The Lower Missouri Subbasin lacks adequate data on land use and water needs necessary for proper planning and management. A study to obtain such information is recommended. The need for land-use and water-related program planning is particularly needed in Iowa.
- G. Projected power demands will necessitate construction of additional power plants in the subbasin. Resources are available for additional power generation, but attendant environmental problems and adequacy of sufficient water supplies remain to be determined.
- H. Existing recreational facilities are overtaxed, and a lack of facilities exists in certain areas of the subbasin. Also, access for water-oriented recreation along the Missouri River and Marias des Cygnes Basin is limited. One possible solution is additional development of recreation at Federal reservoirs. State constitutions prevent the future commitment of funding needed to obtain cost sharing for recreation purposes as required by section 221, 1974 Flood Control Act. It is thereby recommended that the States work with their respective Federal congressional delegations to amend the law and to develop workable cost sharing for recreational facilities on Federal reservoirs.