CHAPTER 5 - WESTERN DAKOTAS SUBBASIN

SUBBASIN DESCRIPTION

The Western Dakotas Subbasin, an area of 64.9 million acres, is geographically the largest subbasin in the Missouri River Basin. As illustrated in figure 5-1, it includes those parts of Montana, Wyoming, North Dakota, South Dakota and Nebraska drained by the Missouri River from the mouth of the Yellowstone River near the Montana-North Dakota border, downstream to the Fort Randall Dam near the Nebraska-South Dakota border. The main tributaries to the river include the Little Missouri, Cannonball, Grand, Moreau, Cheyenne, Bad, and White Rivers. The subbasin has maximum north-south and east-west extents of over 400 miles.

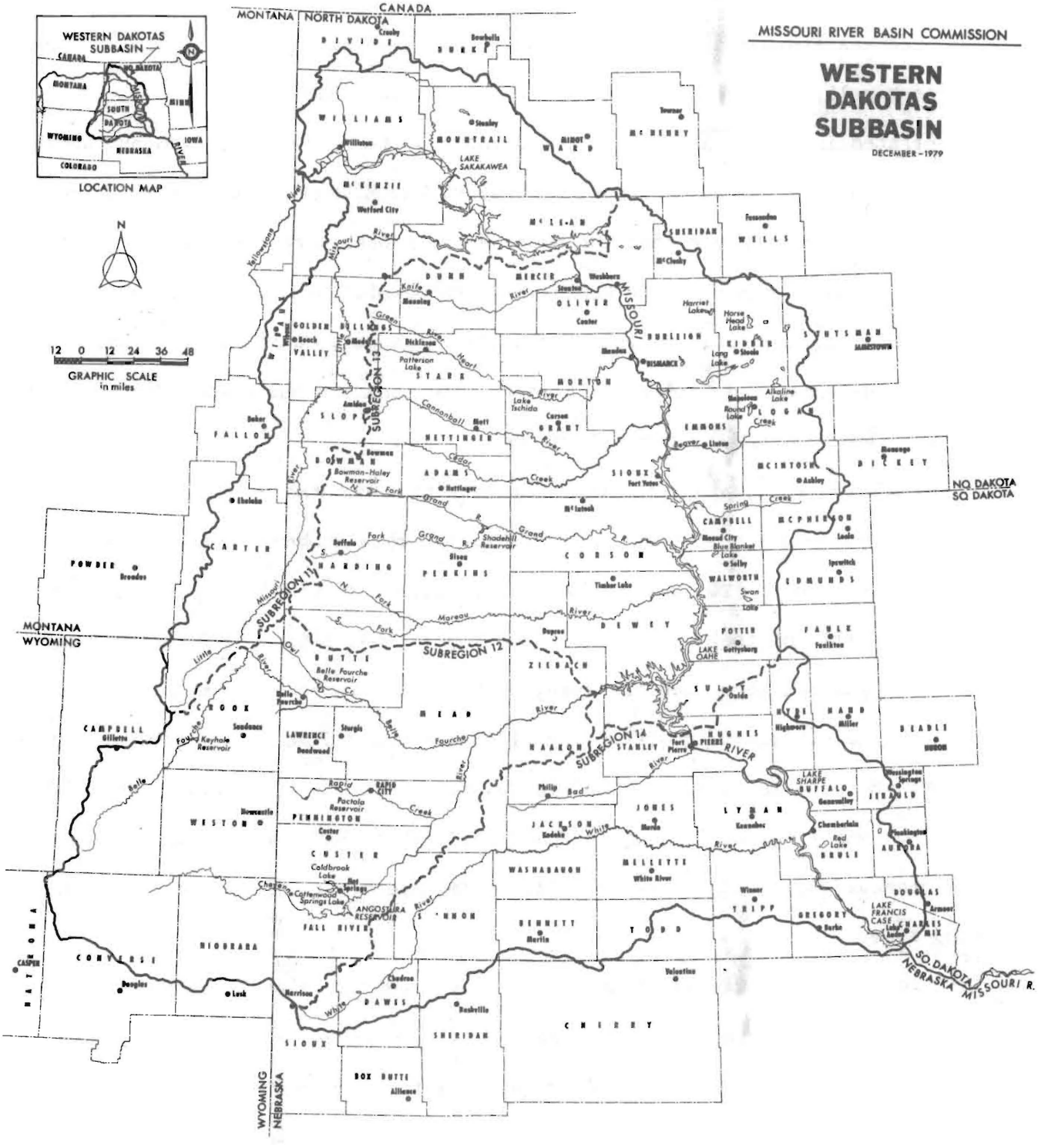
A rolling topography with wide expanses of level tablelands and accompanying deep stream trenches characterize this subbasin. Elevations average 2,000 feet. Two unique topographic areas are found in this subbasin: the Black Hills of the west, an isolated mountainous region; and the Missouri Coteau, a plateau-like highland lying east of the Missouri River.

Prairie grassland ecosystems provide antelope and mule deer habitat and support sharp-tailed grouse. Prairie dog towns are scattered widely in these areas and sightings of the rare black-footed ferret have been documented. The northern swift fox and a near-pristine assemblage of prairie species also are found here.

Flood plain woodlands occur along major streams. Pine forests occur throughout southeast Montana, northeast Wyoming, western South Dakota, and northwest Nebraska. Both of these provide habitat for important animal groups.

In North Dakota, cropland ecosystems have developed in areas of suitable soil and topography. Comparatively, less cropland development has occurred elsewhere in this subbasin. In areas with favorable interspersion of habitat,

Figure 5-1-Western Dakotas Subbasin



huntable populations of ring-necked pheasant, Hungarian partridge, and other upland game occur.

Aquatic resources are limited in most of the subbasin. Cold-water lakes, streams, and reservoirs are confined to the Black Hills area. Warm-water fisheries include only a few reaches and reservoirs along tributaries. Sport fisheries at some reservoirs have declined due to unsuitable spawning habitat. Waterfowl populations are significant in the Missouri Coteau region of North and South Dakota and along the Missouri River and its reservoirs.

Natural and scenic resources include the Black Hills, the Badlands of North and South Dakota, the Pine Ridge Escarpment, the Buffalo Gap, Little Missouri and Fort Pierre National Grasslands, and a number of free-flowing rivers with wooded or grass valleys. Other landscapes such as the prairie-pothole, prairie-reservoir, prairie-butte, and ponderosa pine stands also add to the visual diversity.

Cultural and geological resources include paleontological sites, Indian villages, and historic sites which reflect settlement and exploration. The Knife River Indian Village National Historic Site and the Lewis and Clark National Historic Trail will integrate several natural, historic, and cultural areas along the Missouri River.

The population of the subbasin, estimated at 410,700 in 1975, is expected to reach 464,100 by the year 2000 with the majority of the population remaining rural. In addition, the subbasin is now and is expected to remain the least populous in the Missouri River Basin. The American Indian population is the largest of any of the subbasins in the basin numbering about 35,000 or 8.5 percent of the total population.

Twenty-two percent of all subbasin workers are currently employed in agriculture. This figure is expected to decline to 16 percent by the year

2000. The total work force, currently 158,000, is expected to increase by 16,800 workers by the year 2000 some of which will be caused by energy developments in the subbasin. Livestock continues to dominate agricultural production, with one out of every four agricultural workers directly engaged in ranching. Dryland crops include wheat, corn and hay, with irrigated acreage producing alfalfa, corn, dry beans, and sugar beets.

Energy fuels production is of increasing importance to the subbasin economy. Coal and lignite deposits are significant as are crude oil and natural gas. Gold mined in the Black Hills accounted for 31 percent of the nation's production in 1974.

Manufacturing is centered in urban areas such as Rapid City, South Dakota and Bismarck, North Dakota although small manufacturing firms mainly agri-related are found throughout the subbasin. Important tourist centers include the Black Hills, Badlands, and the large reservoirs on the Missouri River.

Water supplies are limited in this subbasin except in the Missouri River and its reservoirs. Surface water is generally intermittent during the year except where flows are regulated in some streams in the Black Hills, and the Missouri River. Many other streams have high concentrations of sediment and minerals producing very poor water quality. Ground water quality is generally poor throughout the subbasin. Irrigation accounts for most of the water use.

All surface waters in all five States are legally considered public property and are allocated only for beneficial uses by each State regulatory agency. All five States allocate by prior appropriation. Beneficial water uses as defined in each State are listed below. Those uses with higher priority are listed above uses with lower priority under each State heading, except as noted.

NORTH DAKOTA

Domestic
Municipal
Livestock
Irrigation
Industrial
Fish, wildlife, and recreation

SOUTH DAKOTA

Domestic
Other uses such as municipal, industrial, irrigation, water quality management, fish, wildlife, and recreation receive equal consideration

WYOMING

Drinking water
Municipal
Steam engines and general railway use; culinary, laundering, bathing, refrigerating; and the manufacture of ice; steam and hot water heating plants; and steam-power plants and industrial purposes
Irrigation
Hydropower

NEBRASKA

Domestic
Irrigation
Power and manufacturing

MONTANA

Agricultural (including stockwater)
Domestic
Fish and Wildlife
Industrial
Irrigation
Mining
Municipal
Power and recreational uses
(Note: uses are not prioritized).

PROBLEMS AND OPPORTUNITIES

The major problems in the Western Dakotas Subbasin are the limited availability of good quality drinking water, irrigation water shortages, erosion, point and nonpoint source pollution, and urban and rural flooding. Other problems include fishery habitat destruction, limited access to and lack of water-oriented outdoor recreation facilities, and the dewatering of streams.

In general, the Western Dakotas Subbasin does not have water supplies of quality suitable for most uses. Recent surveys in the South Dakota portion of the subbasin indicate that there are nine communities with water supply problems. A similiar survey by North Dakota indicates that there are 22 communities with water supply problems, 10 of which have severe problems. All these communities have expressed an interest in obtaining a new or supplemental water supply. The Cheyenne River Basin, extending from east-central Wyoming to southwestern South Dakota, has the most severe problems involving water quality and supply.

In general, ground-water quality for rural domestic uses does not meet drinking water standards. The quantity of water for rural domestic supply is insufficient in the Bad River Basin. The South Dakota counties of Ziebach, Perkins, and Dewey and the Cheyenne Indian Reservation have poor water quality and insufficient water quantity for domestic, livestock and other agricultural purposes.

Irrigation water shortages occur annually throughout the subbasin. Areas of severe shortages are Perkins and Corson Counties, South Dakota, and along the Grand River. The Belle Fourche irrigation project is in need of rehabilitation. Lands that could be served by diversions from the Belle Fourche River are located along and below the project.

All streams in this subbasin, except the Missouri main stem, annually experience water shortages. This is especially true after mid-July, and causes a deterioration in water quality.

Bank erosion along the Missouri River between Garrison Dam and Lake Oahe causes the loss of agricultural lands, degrades water quality, and threatens residences. Elsewhere, severe erosion of agricultural lands occurs in many tributaries, especially the White and Bad Rivers. Upland erosion problems are especially significant on the lands near the Little Missouri, Grand, Moreau, Cheyenne, Bad, and White Rivers. Sedimentation is a problem in most lakes in the Black Hills and at the headwaters of Lake Oahe and Lake Sakakawea. Higher river levels caused by river bed aggradation are contributing to high ground water and salinity in the headwater areas of the main stem reservoirs.

The Heart and Little Missouri Rivers have high concentrations of nitrates, phosphates, TDS, and coliforms. Coliform bacteria often indicate the occurence of point source pollution from feedlots. However, cattle grazing over large areas may also contribute to this problem. Increases in energy-related activity are adding to the waste load carried by the Knife River and tributaries. It is expected that increased strip mining and oil drilling activities could affect both ground water and surface water adversely over large segments of the Missouri River Basin.

Spring runoff causes urban flooding at many locations. The most severe problems occur in South Dakota along Hay Creek and Redwater River at Belle Fourche, along the Bad River at Ft. Pierre; and in North Dakota along the Cannonball River at Mott, Little Missouri River at Medora, Antelope Creek at Hazen, Heart River at Belfield, and Apple Creek south of Bismarck.

There is an opportunity to expand hydroelectric power production by adding additional units to existing main stem dams and placing some pump-back storage hydropower units along the Missouri River and main stem reservoirs. Other

opportunities exist for energy, industrial, and agricultural development, if large quantities of good quality Missouri River water was available where it could be utilized.

PLANNING OBJECTIVES

The States in the Western Dakotas Subbasin actively support the concept of State and regional planning. Approaches vary from State to State, but generally focus on the objective of giving full consideration to all water resources functions in the formulation of State policies toward water resources management.

It is the objective of all five States to develop irrigation to its potential and to provide adequate water supplies accordingly. Montana, North Dakota, and South Dakota strongly endorse irrigation water conservation and support rehabilitation and improvement of existing systems.

Another common objective is to meet municipal, industrial, domestic, and livestock water supply and quality needs wherever feasible. Wyoming emphasizes water storage while also stressing water conservation measures.

PLAN OVERVIEW

The plan for the Western Dakotas Subbasin includes the recommendations presented in this chapter, and the recommended basinwide and statewide programs for South Dakota, North Dakota, Montana, Wyoming, and Nebraska in chapter 2.

Since water quality and quantity problems affect most of the residents of this subbasin, a number of programs are included in the plan to address them. A Corps of Engineers study of the Western Dakotas Region of South Dakota, is designed to examine all drinking water problems in western South Dakota. When completed in FY 1983, this study should present alternatives and recommended approaches for satisfying many water supply needs for this area. The Water and Power Resources Service's Water Management Study Upstream of Gavins Point,

recommended program No. 1, also has as one of its objectives satisfying water supply needs for municipal and rural domestic users. Another important recommended program is South Dakota's Department of Water and Natural Resources West River Aqueduct Study, which involves the investigation of the feasibility of supplying water by pipeline to western South Dakota and possibly to eastern Wyoming. Two recommended programs in North Dakota, the Minot Extension Reformulation, and Versippi Unit Feasibility Study, are structured to provide needed water supplies respectively for Minot and Dickinson, North Dakota. The Farmers Home Administration's program to assist development of rural water systems basinwide is also a key program in this subbasin. Several rural water organizations have been and are being formed to actively promote and facilitate construction of water supply systems.

The availability of water for irrigation is being addressed by a number of programs including the Water Management Study Upstream of Gavin's Point by the Water and Power Resources Service. Other important recommended irrigation programs include the Grass Rope Unit in South Dakota, Apple Creek Unit in North Dakota, the Apple Creek Unit Ground-Water Studies in North Dakota, the Pollock-Herreid Unit in South Dakota, Lower Brule Indian Reservation Area in South Dakota, Oahe Riverside Irrigation Study in South Dakota, Lower James-Fort Randall Water Diversion Proposal Study in South Dakota, and Reevaluation of the Pine Ridge Irrigation Unit in South Dakota. Conservation of irrigation water is stressed in two Soil Conservation Service programs--a Cooperative Irrigation Water Conservation Study in Wyoming, and Rehabilitation of Existing Irrigation Systems Cooperative Special Studies in Montana. An important program recommended to address bank erosion along the Missouri River main stem is the ongoing Corps of Engineers Missouri River Bank Stabilization Demonstration Project, which is investigating erosion control at a number of sites along the Missouri River. The recommended basinwide Rural Clean Water Program, to be administered by the U.S. Department of Agriculture, will be an integral program

in this subbasin. When the program is funded, it will help landowners implement land conservation practices and address most major types of erosion and nonpoint source pollution problems. In general, rural flooding problems in this subbasin remain unaddressed. Only three small watershed projects are recommended. Most structural flood control alteratives such as dams, levees, and large-scale channalization are not economically feasible. Nonstructural flood damage reduction measures may be needed. A continuing program of channel clearing and snag removal, and a program to prevent sediment deposition in stream channels could possibly minimize the problems. However, adequate funding for such programs is not readily available.

RECOMMENDED PROGRAMS - WESTERN DAKOTAS

NAME, LEAD AGENCY, AND FUNCTIONS ADDRESSED	DESCRIPTION
COMPREHENSIVE PLANNING AND SUPPORT ACTIVITIES	
1-WATER MANAGEMENT STUDY UPSTREAM OF GAVINS POINT DOI/Water and Power Resources Service Comprehensive Also in Upper Missouri, Yellowstone & E. Dakotas Subbasins	Ongoing special study of water supply and use scheduled to be completed in FY 81; at a total cost of $871,000, $136,000 of which is programmed to be spent in FY 81.
2-WILLISTON BASIN RC&D PROJECT, NORTH DAKOTA USDA/Soil Conservation Service Comprehensive	Ongoing feasibility study that assists local groups in conserving and developing natural resources; Divide, McKenzie, & Williams Co; FY 82 funding $100,000.
3-ROOSEVELT CUSTER RC&D PROJECT, NORTH DAKOTA USDA/Soil Conservation Service Comprehensive	Ongoing feasibility study that assists local groups in conserving & developing natural resources; Adams, Billings, Bowman, Dunn, Golden Valley, Hettinger, Scope, & Stark Co; cost $1.1 million.
4-LEWIS AND CLARK RC&D PROJECT, NORTH DAKOTA USDA/Soil Conservation Service Comprehensive	Ongoing feasibility study that assists local areas in conserving & developing natural resources; Burleigh, McLean, Mercer, Oliver, Morton, Grant, Sioux, Emmons, Kidder & Sheridan Co; cost $884,000.
5-RANDALL RC&D PROJECT, SOUTH DAKOTA USDA/Soil Conservation Service Comprehensive Also in Eastern Dakotas Subbasin	Ongoing feasibility study that assists local areas in conserving & developing natural resources; Gregory, Charles Mix, Douglas, Bon Homme, Brule, & Buffalo Co; cost $1.1 million.
6-BLACK HILLS RC&D PROJECT, SOUTH DAKOTA, WYOMING USDA/Soil Conservation Service Comprehensive	Ongoing feasibility study that assists local areas in conserving & developing natural resources; Butte, Meade, Pennington, Custer, & Fall River Co; cost $322,000.

7-NORTH CENTRAL RC&D PROJECT, SOUTH DAKOTA USDA/Soil Conservation Service Comprehensive	Ongoing feasibility study that assists local areas in conserving & developing natural resources; Campbell, Walworth, Huges, Hyde, Sully, & Potter Co; cost $567,000.
8-NEBRASKA RIVER BASINS SPECIAL STUDIES USDA/Soil Conservation Service Comprehensive Also in E. Dakotas, Platte-Niobrara, and Missouri Subbasins	Ongoing special studies of erosion, sediment, rural water, & flooding in Mo trib. & White-Hat basins; prime farmland mapping in Platte critical habitat areas; cost is $1,334,000; FY 79-84.
9-WATER RESOURCES MONITORING W. CENTRAL COAL REGION, N. DAKOTA DOI/Geological Survey Comprehensive	Ongoing data collection program involving additional gaging stations in the coal mining region of North Dakota; total cost $415,000.

FLOODING

10-BELFIELD WATERSHED PROJECT, NORTH DAKOTA USDA/Soil Conservation Service Flooding and Land Cons. & Mgt.	Approved for planning project for flood protection that includes 2 flood retention structures and land treatment; Stark & Billings Co; total cost $1 million scheduled after 1980.
11-MUSKRAT LAKE WATERSHED PROJECT, NORTH DAKOTA USDA/Soil Conservation Service Flooding and Land Cons. & Mgt	Approved for planning project for flood protection that includes land treatment scheduled after 1980; total cost to be determined.
12-SQUARE BUTTE WATERSHED PROJECT, NORTH DAKOTA USDA/Soil Conservation Service Flooding and Land Cons. & Mgt.	Watershed under construction for flood protection that includes 5 flood retention structures, one mile of floodway & land treatment; Morton & Oliver Co; cost $3.6 million.

FISH AND WILDLIFE

13-GARRISON DIVERSION UNIT SPECIAL STUDY, NORTH DAKOTA
DOI/Fish and Wildlife Service
Fish and Wildlife

Ongoing special study to identify and manage habitat for mitigation; FY 81 $170,000, FY 82 $185,000.

14-INVENTORY OF SMALL DAMS AND SITES FOR WATERFOWL PRODUCTION
DOI/Fish and Wildlife Service
Fish and Wildlife

Ongoing data collection program to identify and evaluate small impoundments for waterfowl.

IRRIGATION

15-COOPERATIVE IRRIGATION WATER CONSERVATION STUDY, WYOMING
USDA/Soil Conservation Service
Irrigation
Also in Yellowstone and Platte-Niobrara Subbasins

New start special study of irrigation systems to improve efficiency of distribution and use; total cost $1,140,000; programmed through FY 85.

16-REHABILITATION OF EXISTING IRRIG SYSTEMS COOP SP STUDIES MT
USDA/Soil Conservation Service
Irrigation, Land Conservation, & Management
Also in Upper Missouri & Yellowstone Subbasins

New start special study to develop inventory of problems and to identify costs and benefits to rehabilitate irrigation systems; cost FY 81 $122,000.

17-GRASS ROPE UNIT
DOI/Water and Power Resources Service
Irrigation

Ongoing implementation program with completed plans to develop an additional 3,490 acres of irrigable land in Lyman Co.; ready for construction funds, estimated cost $13 million.

18-APPLE CREEK UNIT, NORTH DAKOTA
DOI/Water and Power Resources Service
Irrigation, M&I Rural Supply, F&W

Resumption of feasibility study to investigate and develop plans to deliver water from Missouri River for Irrig., M&I Supply, F&W; Burleigh, Kidder and Emmons Co; total cost $898,000.

19-APPLE CREEK UNIT GROUND WATER STUDIES, NORTH DAKOTA North Dakota State Water Commission Irrig., M&I Rural Supply, F&W, Flood, Energy, Water Qual.	Feasibility study to investigate ground water as a potential supplemental water source as part of the ongoing Apple Creek Unit; total cost $150,000 over 2 yrs.
20-POLLOCK-HERREID UNIT, SOUTH DAKOTA DOI/Water and Power Resources Service Irrigation, F&W, M&I Rural Supply	Ongoing program implementation to divert water from Oahe reservoir to irrigate 15,000 acres and for rural needs; Total cost $1,249,000.
21-LOWER BRULE INDIAN RESERVATION AREA, SOUTH DAKOTA DOI/Water and Power Resources Service Irrigation, M&I Rural Supply	New start appraisal study to assess the irrigation potential on the Lower Brule Indian reservation; Total cost $302,000.
22-OAHE RIVERSIDE IRRIGATION STUDY, SOUTH DAKOTA DOI/Water and Power Resources Service Irrigation	New start appraisal study to examine irrigation potential; Campbell, Walworth, Potter, Sully, Hughes & Hyde Co; Total cost $754,000.
23-REEVALUATION OF PINE RIDGE IRRIGATION UNIT, SOUTH DAKOTA DOI/Water and Power Resources Service Irrigation	New start feasibility study to reassess a proposal to irrigate 6,940 acres on the Pine Ridge Indian Reservation.
24-LOWER JAMES-FORT RANDALL WATER DIVERSION PROPOSAL STUDY DOI/Water and Power Resources Service Irrigation subdistricts;Also in Eastern Dakotas Subbasin	Ongoing feasiblity study to be completed in FY 83; project may divert water from Missouri River into Lower James & Fort Randall Conservancy study cost is $1.1 million.
25-GREGORY COUNTY WATER SUPPLY STUDY, SOUTH DAKOTA USDA/Farmers Home Administration Irrigation, M&I Rural Supply	New start feasibility study to determine availability & costs to supply water for irrigation & municipal and rural users.

LAND CONSERVATION AND MANAGEMENT

26-MONTANA TIMBER WATER FEDERAL-STATE COOPERATIVE SPECIAL STUDY USDA & Montana Dept. of Natural Resources Land Conservation and Management & Water Quality Also in Upper Missouri & W. Dakotas Subbasins	New start special study with SCS, ESCS, FS, and Montana DNR to determine effects of timber harvest on water yield and sedimantation; cost FY 80 $115,000; FY 81 $120,000; FY 82 $145,000.

27-MISSOURI RIVER BANK STABILIZATION DEMONSTRATION PROJECT (Sec 32)
Army Corps of Engineers
Land Conservation and Management
Also in Eastern Dakotas Subbasin

Ongoing program implementation to provide stream-bank erosion control at sites along Missouri River by demonstrating new techniques.

28-SALINE SEEPS STUDIES
USDA
Land Cons. & Mgt., F&W, M&I Rural Supply, Water Qual.

Ongoing special study to define the extent of the saline seep problem and the effect on agricultural land and water quality.

MUNICIPAL, INDUSTRIAL, AND RURAL DOMESTIC WATER SUPPLY

29-WESTERN DAKOTAS REGION OF SOUTH DAKOTA
Army Corps of Engineers
Municipal, Industrial, and Rural Domestic Water Supply

New start feasibility study to develop a comprehensive water resource mgt. plan for water supply, flood control, and other measures.

30-EASTERN SOUTH DAKOTA AND UPPER BIG SIOUX RIVER STUDY
Army Corps of Engineers
M&I Rural Supply and Flooding
Also in Eastern Dakotas Subbasin

Ongoing feasibility study to examine water supply needs for urban and rural areas in S. Dakota east of the Mo. River & to coordinate development efforts; completed in FY 83; cost is $2.5 million.

31-MINOT EXTENSION REFORMULATION, NORTH DAKOTA
DOI/Water and Power Resources Service
Municipal, Industrial, and Rural Domestic Water Supply

Resumption of feasibility study to investigate alternate water supplies for Minot, ND; total cost $250,000.

32-VERSIPPI UNIT FEASIBILITY, NORTH DAKOTA
DOI/Water and Power Resources Service
Municipal, Industrial, and Rural Domestic Water Supply

Ongoing feasibility study to study solutions to solve water supply problems for Dickinson; total cost $130,000.

33-EVALUATION OF AQUIFER DISTURBANCES
DOI/Geological Survey
M&I Rural Supply, Water Qual.

New start special study effects of exploration on ground water aquifers 2 yr. study; total cost $90,000.

34-WEST RIVER AQUEDUCT STUDY
South Dakota Dept. of Water and Natural Resources
M&I Rural Supply, Irrig., Energy, Legal & Inst.

Ongoing feasibility study to provide water to W. South Dakota & E. Wyoming by a pipeline from the Missouri River for rural needs & energy; cost averages $7,000 each year.

35-GARRISON DIVERSION UNIT M&I WATER SUPPLY FACILITIES STUDY
DOI/Water and Power Resources Service
M&I Rural Supply
Also in Eastern Dakotas Subbasin

Ongoing feasibility study to develop detailed plans for delivery of water from features of the Garrison Unit to North Dakota communities; completion in FY 83; cost is $821,000.

NATURAL, HISTORIC, AND CULTURAL RESOURCES

36-KNIFE RIVER INDIAN VILLAGE NATIONAL HISTORIC SITE
DOI/National Park Service
Natural, Historic and Cultural

Ongoing program implementation to develop a historic site of the Hidatse Indians; total cost $2.4 million.

POWER AND ENERGY

37-MISSOURI RIVER REVIEW REPORT, NEBR., MONT., N. & S. DAKOTA
Army Corps of Engineers
Power and Energy

Resumption of feasibility study to consider additional hydropower units at Fort Randall, Oahe, Ft. Peck & Garrison Dams, additional pumped storage at Lake Sakakawea & fish rearing facilities at lakes Oahe and Francis Case; cost FY 81 $500,000, FY 82 $500,000.

WATER-ASSOCIATED OUTDOOR RECREATION

38-RECREATIONAL AREAS BELOW GARRISON DAM (Sec 32)
Army Corps of Engineers
Recreation

New start program implementation to acquire & develop 3 sites below Garrison Dam; schedule not established; total cost $213,000.

TRANSPORTATION

WATER QUALITY

LEGAL AND INSTITUTIONAL FACTORS

39-INDIAN RESERVATION WATER RIGHTS
DOI/Bureau of Indian Affairs
Legal and Institutional Factors

Ongoing feasibility study to identify the water resource base, present & future requirements and to formulate a plan selecting programs to meet the needs on Ft. Berthold Reservation; Cost $126,000.

INSTREAM FLOWS

40-INSTREAM FLOW TECHNICAL STUDY
South Dakota Dept. of Game, Fish, and Parks
Instream Flows
Also in Eastern Dakotas Subbasin

Ongoing special study to evaluate instream flow methodologies and determine water quantity needs.

WEATHER MODIFICATION

CONCLUSIONS AND ADDITIONAL RECOMMENDATIONS

A. Flooding is a problem in rural areas throughout this subbasin. Specific problem areas in South Dakota include the Battle Creek and Bear Butte watersheds and in North Dakota along Apple Creek, Painted Woods Creek, Shell Creek, and the Little Missouri River. These areas are currently without any programs to determine the extent and magnitude of rural flooding or to consider corrective measures to abate and remedy the flooding problem. Rural flooding problems, particularly those mentioned above, should be addressed by the Soil Conservation Service in cooperation with State water planning agencies.

B. The water supply problems for irrigation are being considered by the Water and Power Resources Service's Water Management Study Missouri River Upstream of Gavins Point. Potential solutions to irrigation water-shortage problems should be available from this study shortly. However, some earlier irrigation studies need to be reassessed. Studies of the Grand, Moreau, Cheyenne, Lower Belle Fourche, Bad, and White River Basins completed from 25 to 40 years ago should be reviewed and updated by the Water and Power Resources Service.

C. The lack of water-oriented outdoor recreation facilities and public access at lakes and streams are problems throughout this subbasin. It is recommended that individual State recreation programs examine alternatives for improving facilities and public access for water-based recreation.

D. Shallow wells used for domestic water supply purposes in rural areas of North Dakota have been affected by seismic exploration, sometimes impairing the supply and quality of water. It is recommended that the Geological Survey study alternatives to alleviate this problem.

E. Stream bed aggradation in the headwaters areas of the Missouri River main stem reservoirs is causing high ground water table and salinity problems. It is recommended that the Corps of Engineers review this problem for potential solutions or mitigation alternatives.

F. The Missouri River Review Report of the Army Corps of Engineers, completed in 1978, recommended feasibility study and installation of additional hydroelectric units at Garrison Dam and a pumped storage hydroelectric facility at Lake Francis Case in Gregory County, South Dakota. In addition, the review report recommended fish rearing facilities for reinstitution of northern pike fisheries at Lake Oahe and Lake Francis Case. It is recommended that the Army Corps of Engineers be authorized to proceed with advanced planning studies for these facilities beginning in FY 1981.

G. The Missouri River Basin Commission completed the Yellowstone River Basin and Adjacent Coal Area Level B Study in November 1978. Recommendations from this study include modifications or additions to Federal laws, policies, or priorities and the State of North Dakota's laws and policies. These revisions and changes, which are summarized below, are intended to suggest courses of action which will further water resource management on a coordinated basis.

Suggested revisions in Federal laws, policies, or priorities include:

Accelerate ongoing comprehensive studies of irrigable land
Accelerate research on cropping and tillage practices
Manage rangeland to encourage the maintenance and protection of native grasslands
Return a fair profit over costs to producers of grain and livestock
Develop pollution standards for all toxic materials emitted from coal conversion facilities
Increase research on rehabilitation of strip mined lands
Increase research on renewable resources for energy use
Fund streambank protection works
Survey historic, archaeological, and other unique areas
Develop a uniform method of inventorying recreation resources and capabilities

Expand and maintain a comprehensive water quality monitoring network
Develop environmental projections using varying assumptions about future economic conditions
Accelerate programs for acquiring environmental base data
Expand funding for air quality sampling network

The recommended North Dakota legal and institutional changes include:

Require a certificate of soil and water compatibility for irrigation
Enact an Agricultural Lands Protection Act to protect agricultural lands
Limit amount of allowable acreage on irrigation water permits
Provide low-interest loans for agricultural products processing plants
Plan for land use to provide for the orderly growth of North Dakota communities
Preserve public conservation efforts through State policies and programs
Reserve water for future use
Reexamine State water allocation procedures and policies
Strengthen water rights monitoring program
Strengthen land reclamation law
Enact Surface Owners Protection Act
Enact industrial development tax
Accelerate flood plain survey
Provide for instream flow as a beneficial use
Establish a ground-water quality and quantity surveillance and data reporting program
Control and monitor instream sediment
Assess public proposals having significant impact on the environment

H. The Yellowstone Level B Study recommended that the Soil Conservation Service undertake action to address rural flooding problems in North Dakota tributaries situated in the Western Dakotas Subbasin. Two programs were proposed--one for flood control near Hazen, North Dakota, and the other the Cabin Creek Project in Northeast Wyoming. The Cabin Creek project includes a proposal to construct a dam for flood control, using the impounded water for irrigation. This project should be undertaken as part of this recommendation.

I. To address the problem of soil erosion and improve water quality the Yellowstone Level B Study recommended accelerated land treatment on 1,787,000 acres of private and State lands, 14,000 acres of public lands,

and 5,500 of forest lands. To implement this recommendation, action is required by the Soil Conservation Service, the Forest Service, and the Bureau of Land Management. Acreages and treatment cited above are subject to modification through further planning. This plan recommends continuation of this proposal by these agencies named.

J. In order to preserve an irreplaceable archaelogical resource and a natural setting, the Yellowstone Level B Study recommended that the Army Corps of Engineers study the erosion problems at the Knife River Historical Site. This study should be conducted in the near-term future.

K. The Yellowstone Level B Study recommended three multipurpose projects, the Cannonball Unit, Thunderhawk Unit, and Broncho Reservoir, to be studied by the Water and Power Resources Service. Each of these projects would provide water for municipal, rural domestic, and industrial use, provide flood control, and provide with irrigation water to new acreage. It is recommended that the Service undertake appraisal level studies for these proposed projects.

L. Preservation and management of rare and unique woodland areas by the North Dakota State Forestry Department was proposed in the Yellowstone Level B Study. It is recommended that this State agency assume the responsibility for this objective in the near-term future.

M. In order to retain options for preserving certain North Dakota rivers and streams, the Yellowstone Level B Study recommended that the Heritage Conservation and Recreation Service undertake studies to determine possibilities for State and national preservation. Potential State recreational river reaches include the Yellowstone River, 22 miles from the North Dakota State line to the Missouri River; the Knife River, 76 miles from Manning, North Dakota, to the Missouri River; and the

Cannonball River, 45 miles from Shields, North Dakota, to North Dakota Bridge 1806. Designation is possible for the the Missouri River for 86 miles in North Dakota as a national scenic river. It is recommended that the Heritage Conservation and Recreation Service undertake these studies.

N. The Yellowstone Level B recommended that the Fish and Wildlife Service designate flow rates needed for conservation of fish and wildlife on selected streams in North Dakota tributaries. The streams selected include the north fork of the Grand River, Cannonball River, Little Missouri River, Knife River, and the Heart River. This recommendation should be implemented in the near-term future.