THE U.S. GEOLOGICAL SURVEY FEDERAL-STATE COOPERATIVE WATER-RESOURCES PROGRAM IN FISCAL YEAR 1985

by B.K. Gilbert and T.J. Buchanan

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By Bruce K. Gilbert and Thomas J. Buchanan

ABSTRACT

The U.S. Geological Survey's Federal-State Cooperative Program comprises water-resources data collection, investigations, and research. In fiscal year 1985, these activities were conducted in cooperation with more than 900 State, regional, and local agencies; joint funding (50-50 matching) totaled about $108 million as combined input from both sides. The Cooperative Program amounts to almost half of the overall program of the Survey's Water Resources Division.

In 1985, hydrologic activities were underway in every State, Puerto Rico, and several territories. The principal concerns during the year included water quality, toxic-waste hydrology, erosion and sedimentation, water supply and demand, and hydrologic hazards.

This report presents information on development of program priorities. It also summarizes the status of coal-hydrology activities, and provides a few examples of current investigations.

INTRODUCTION

The U.S. Geological Survey's Federal-State Cooperative Program in fiscal year (FY) 1985 marks its 90th year of contributions to the development of knowledge about the Nation's water resources. The Cooperative Program began in Kansas in 1895 (Gilbert and Buchanan, 1981) and in 1985, hydrologic data collection and interpretive investigations were underway in every State, Puerto Rico, and several territories. The locations of the principal offices of the Survey's Water Resources Division (WRD) are shown in figure 1. The program was conducted in cooperation with more than 900 State, regional, and local agencies during the past year, as listed in the appendix. Joint funding in this 50-50 matching activity totaled about $108 million from all sources; this comprised almost half of the overall WRD program (fig. 2).

In FY 1985, the Federal-State Cooperative Program provided sole support for more than 3,200 of the 7,000 continuous-record discharge stations in the Geological Survey streamgaging network; and, in combination with other funding sources, provided partial support for another 1,600 stations (table 1).

Figure 1.--Map showing location of the principal offices of the U.S. Geological Survey's Water Resources Division.

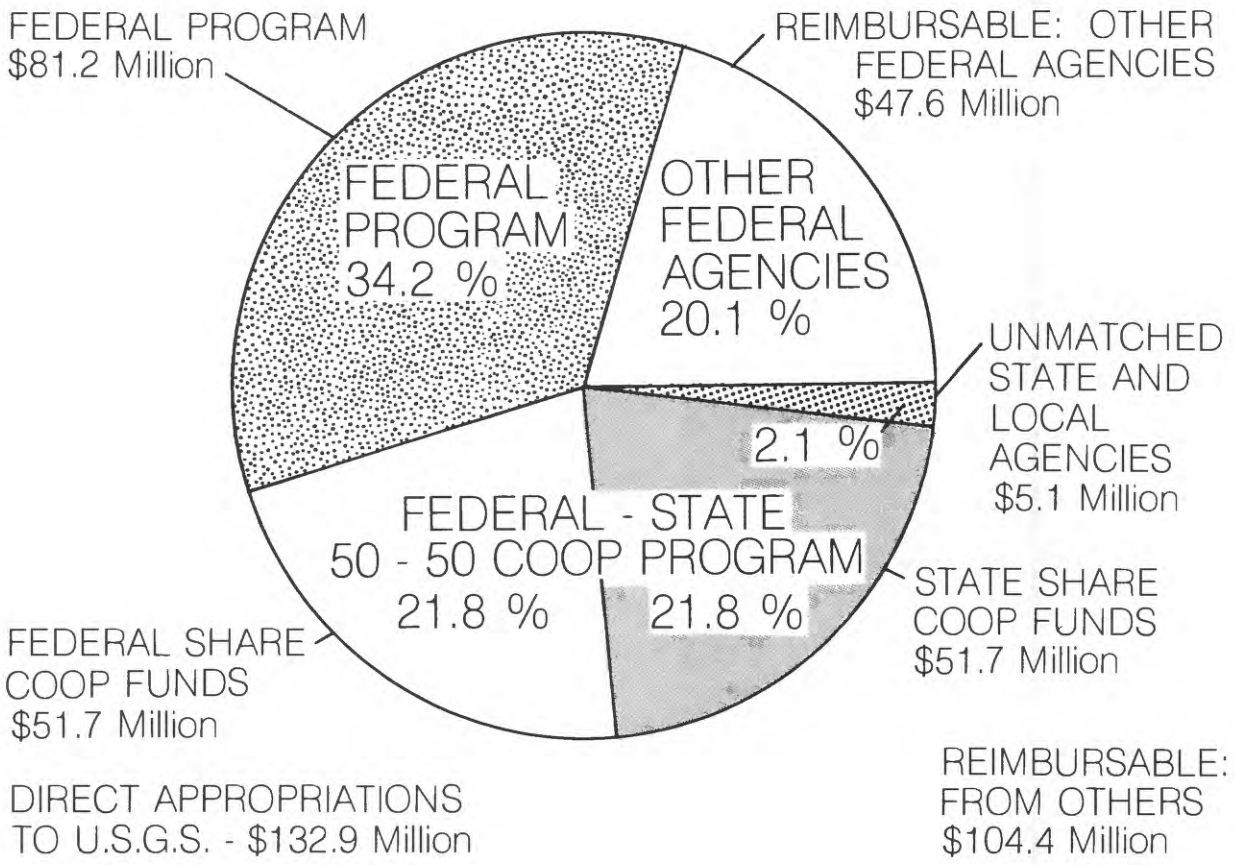

Figure 2.--Graph showing the fiscal year 1985 budget for the U.S. Geological Survey's Water Resources Division.

Table 1. Water-data collection activities of the U.S. Geological Survey, FY 1985.

Types of Stations	Number of Stations				
	A. Federal Program	B. Federal-State Cooperative Program	C. Other Federal Agencies	D. Combined Support	Total
SURFACE WATER					
Discharge					
Continuous record	554	3,223	1,607	1,635	7,019
Partial record	84	3,013	293	667	4,057
Stage Only--Streams					
Continuous record	13	198	212	24	447
Partial record	14	418	45	30	507
Stage Only--Lakes/Reservoirs					
Continuous record	21	338	254	169	782
Partial record	11	278	67	49	405
Quality					
Continuous record	111	284	252	96	743
Scheduled, long-term	519	1,346	352	229	2,446
Short-term or project	74	718	124	61	977
GROUND WATER					
Water Levels					
Continuous record	94	1,783	215	192	2,284
Scheduled, long-term	809	17,964	1,501	3,221	23,495
Short-term or project	2,973	7,411	974	636	11,994
Quality					
Scheduled, long-term	52	3,796	193	293	4,334
Short-term or project	546	3,709	468	206	4,929

EXPLANATION

Types of Stations

CONTINUOUS RECORD: The station is instrumented to monitor hydrologic conditions continually and, in some instances, transmit data in real time.

PARTIAL RECORD: Hydrologic information is collected only during selected periods, for example, during floods.

SCHEDULED, LONG-TERM OPERATION: Hydrologic information is collected on a fixed schedule over a long period to detect trends.

SHORT-TERM OR PROJECT STATIONS: Hydrologic information is collected to meet the needs of a specific study. Data supplement those available from scheduled long-term continuous record, and partial record stations.

Number of Stations

COLUMN A: Stations totally supported by funds appropriated to the Geological Survey Federal Program subactivity.

COLUMN B: Stations supported by funds appropriated to the Geological Survey Federal-State Cooperative Program subactivity.

COLUMN C: Stations totally supported by reimbursement from other Federal agencies.

COLUMN D: Stations supported by a combination of two or more of the above.

In addition to the data-collection activities, approximately 530 hydrologic investigations and water-resources research projects funded by the Federal-State Cooperative Program were underway in FY 1985. These included areal appraisals and special studies conducted throughout the Nation. Areal water-resources appraisals (which range in size from small basins or counties to States or regions) define, characterize, and evaluate the extent, quality, and availability of the water resource. During the past decade, increasing emphasis has been given to water-quality issues, including aquifer contamination, acid precipitation, river-quality assessments, and storm runoff.

The special studies address existing and foreseeable hydrologic conditions and problems, are somewhat more specific in nature and usually smaller in size than areal appraisals, and sometimes involve applied research. They may require from a few months to 2 to 3 years to complete. Data and information from these studies result in analytical, interpretive, and predictive reports. These reports may aid in the solution of problems or more complete utilization and protection of the Nation's water resources.

Federal matching funds for the Cooperative Program have grown from about $12 million in FY 1966 to more than $51 million in FY 1985--a four-fold increase in 20 years, as shown in figure 3. However, the spending power of the program as reflected by constant 1972 dollars has varied comparatively little--from about $16 million in 1966 to about $22 million in FY 1985, with a peak of nearly $25 million in FY 1977.

Despite the steady program growth in terms of actual dollars, cooperator proposals each year typically exceed the Federal funds available for matching by several million dollars. In the past 10 years, the greatest shortfall in this regard is estimated to have been more than $12 million in FY 1983.

PROGRAM PRIORITIES

Recent concerns about impending water crises have increased public interest in the availability and quality of the Nation's water resources. Analyses of conditions and issues have long been recognized as the baseline for evaluating the effectiveness of water programs and in formulating water policies. These analyses depend on information about the existing characteristics of water resources and the changes that occur as water supplies are developed, managed, and used. The Geological Survey is working to ensure that its programs are relevant to current and emerging issues; that its work is carried out in coordination and cooperation with other Federal, State, and local agencies; and that its products are timely and characterized by scientific excellence.

From the perspective of the Survey's Water Resources Division, several program and operational areas will be of principal interest during the next 5 years:

- Data collection, investigations, and research on the quality of surface and ground water, including the impacts of hazardous materials.

- Investigations and development of technical-assistance mechanisms for State and local agencies, as related to implementation of a national ground-water protection strategy.

- Strengthened capability in the operation of nationwide hydrologic data-collection programs--including surface water, ground water, water quality, and water use.

- Continued improvements in the scientific contributions to the Nation's body of knowledge of natural resources.

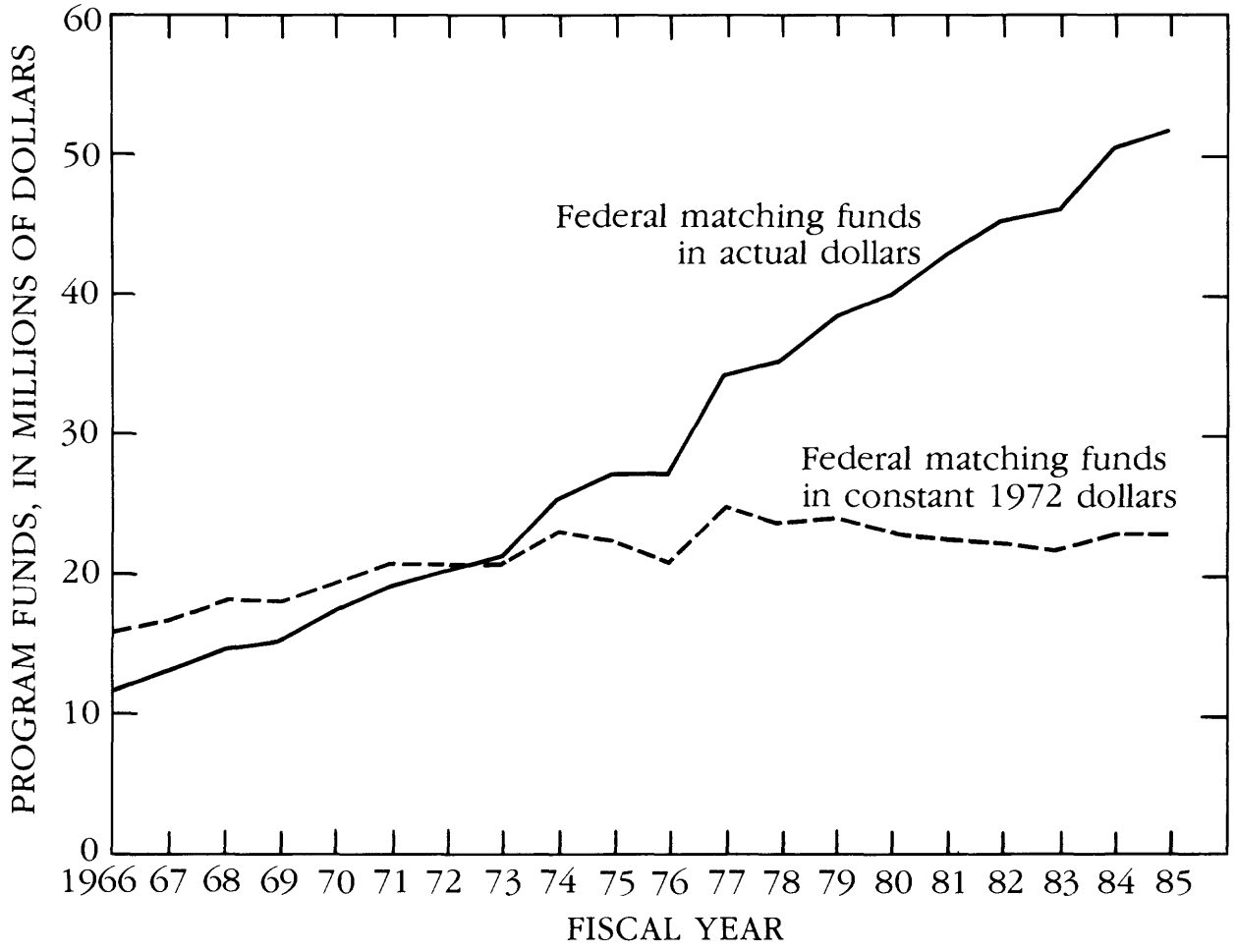

Figure 3.--Graph showing trends in Federal matching funds for the Federal-State Cooperative Program, fiscal years 1966-85.

All these activities are expected to continue to focus on the quality of surface and ground water, as well as on concerns regarding the availability and distribution of the resource. Of particular significance will be research and investigations of contaminants in the hydrologic systems, and studies of extreme events like floods and droughts. Economic and demographic trends are expected to bring increasing pressure on water supplies in terms of availability, contamination, and environmental impact. The recent release of the U.S.Environmental Protection Agency ground-water protection strategy, together with the Administration's re-affirmation of its position on State responsibility for ground-water protection, is expected to result in a growing number of requests from State and local agencies for assistance from USGS. The aggregate expression of interest in undertaking new and expanded cooperative investigations is expected to continue to exceed the level of matching funds and personnel resources presently available.

Priorities for data collection, hydrologic investigations, and research are based on continuing, detailed analyses of water problems and issues. For 1985, five categories were identified as major national concerns and were considered of highest priority in developing the program: water quality, toxic-waste hydrology, erosion and sedimentation, water supply and demand, and hydrologic hazards. Investigations focused on these and other topics respond to the increasing need for information at local, State, regional, and national levels. Three additional categories--hydrologic effects of fossil fuel and mineral extraction; wetlands, lakes, and estuaries; and acid rain--also were considered to be high priority for new studies. Of course, their importance may differ from region to region.

The priority categories also reflect the strong interdependence of the Cooperative Program and Federal Program, as well as the substantial amount of Survey research, analysis, and data collection funded by other Federal agencies. Every effort is made to provide for a balanced program. Investigations in the Cooperative Program are directed to the highest priority work not fully covered by other programs.

Overall, the need for accurate and timely water data is more critical now than at any other time in the Nation's history. Budgetary constraints and inflation have combined to reduce water data-collection activities on a national scale. Some stations have been discontinued and the frequency of visits to selected stations has been decreased, thus potentially creating a gap in the completeness and timeliness of some data-collection efforts. Closely tied to this problem is the need to improve the technology by which the data are collected and made available to others.

As described above, water-quality issues headed the 1985 list of priorities for the Cooperative Program. This continues the trend whereby the emphasis given to ground- and surface-water quality, including problems of contamination, has increased significantly during the past several years. At present, nearly three-fourths of the investigations undertaken in the Cooperative Program, in part, address water-quality concerns. Of these, one in four focuses principally on hazardous-substances contamination of surface water or ground water. Some aspects of water-quality issues in the United States are discussed in the National Water Summary 1984 (U.S. Geological Survey, 1985).

Table 2 is an analysis of new investigations in the Cooperative Program, FY 1979-85, as they pertain to the high-priority categories identified annually by the Water Resources Division in collaboration with other Federal, State, and local agencies nationwide. It may be inferred that the following numbers of new investigations were strongly oriented to water-quality activities from 1979 to 1985:

Fiscal Year	Total Number of New Investigations	New Investigations with Significant Water-Quality Components	
		Number	(Percent)
1979	171	64	(37)
1980	161	90	(56)
1981	172	125	(73)
1982	142	105	(74)
1983	136	98	(72)
1984	155	111	(72)
1985	143	107	(75)

Table 2.--New high-priority investigations, by year, in the Cooperative Program, FY 1979-85

FY 1979

Information base on nonpoint sources (urban)	17
Information base on hydrologic consequences of surface coal mining	11
Water use	20
Supplemental sources of supply, particularly ground water	34
Water-quality evaluation and monitoring	29
Water-borne toxic substances	3
Predictive modeling--stresses on the hydrologic system	20
Indian water rights	4
Environmental enhancement	4
Other	29
TOTAL	171

FY 1980

Water use	18
Urban hydrology	46
Energy (particularly coal)	11
River-quality assessment, evaluation, and modeling	10
Water-borne toxic substances	10
Indian water rights	2
Environmental enhancement	24
Other	40
TOTAL	161

FY 1981

Water use	4
Energy (including coal, waste management, synfuels)	10
Acid rain	5
Deteriorating ground-water quality	98
River-quality assessments	22
Indian water rights	1
Other	32
TOTAL	172

Table 2.--Continued

FY 1982

Quality of ground water and surface water	70
Impacts of hazardous wastes on ground water	17
River-quality assessments	2
Acid rain	3
Water use	2
Energy (especially coal mining and synfuels)	13
National Stream Quality Accounting Network station support	1
Indian water rights	3
Hydrology of lakes, reservoirs, wetlands, tidal reaches	12
Volcanic hazards and impacts	0
Drought studies	1
Other	18
TOTAL	142

FY 1983

Ground-water contamination	26
Water supply and demand	46
Stream-quality assessment	3
Hydrologic hazards	8
Acid rain	3
Energy hydrology	18
Erosion and sedimentation	6
Urban hydrology	6
Wetlands, lakes, estuaries assessments	14
Other	6
TOTAL	136

FY 1984

Ground-water contamination	28
Water supply and demand	59
Stream quality	12
Hydrologic hazards	16
Acid rain	6
Hydrologic effects of fossil fuel and mineral extraction	4
Erosion and sedimentation	8
Wetlands, lakes, and estuaries	16
Other	6
TOTAL	155

FY 1985

Water quality	27
Toxic-waste hydrology	18
Erosion and sedimentation	6
Water supply and demand	42
Hydrologic hazards	8
Hydrologic effects of fossil fuel and mineral extraction	23
Wetlands, lakes, and estuaries	7
Acid rain	2
Other	10
TOTAL	143

COAL-HYDROLOGY ACTIVITIES

The objective of the Survey's coal-hydrology effort in the Cooperative Program is to assess hydrologic conditions and water-supply problems related to coal mining and land reclamation, as these needs are identified jointly with State and local governments. These activities provide hydrologic information essential to the preparation of applications for mining permits and reclamation plans by the coal industry. The data also aid State authorities in reviewing the applications and plans.

The major activities in the coal-hydrology effort are:

1. Acquire and disseminate hydrologic information on existing and potential coal-mining areas.

2. Upgrade hydrologic data networks and implement hydrologic studies in major coal areas.

3. Improve techniques for interpreting hydrologic data, and develop mathematical models for predicting effects of mining and reclamation.

Included in this work are areal hydrologic investigations of surface and ground water, small watershed investigations, and water-quality studies in mined and reclaimed areas. Also included are research investigations of the effects of deep mining on ground water, effects of mine collapse on ground water, hydrology of last-cut coal-mine lakes, and effects of subsurface mining on salt-water migration.

Although work on coal hydrology started in the early 1950's, the Survey first identified coal hydrology as a separate entity in the Cooperative Program during 1976. This was done in anticipation that the FY 1977 appropriation would include funding specifically for cooperative coal-hydrology activities. Since 1977, Federal matching funds for this purpose have been included in the Survey's budget each year, and in FY 1985 funding exceeded $4 million. Table 3 shows the annual amount of Federal matching funds for coal hydrology for fiscal years 1977-85.

Table 3.--Federal matching funds appropriated for cooperative coal-hydrology activities, fiscal years 1977-85.

Fiscal Year	Appropriated Federal Matching Funds (Dollars, in thousands)
1977	$1,676
1978	2,866
1979	2,944
1980	3,030
1981	3,176
1982	3,137
1983	3,162
1984	3,315
1985	4,385

In FY 1985, $1 million was redirected from the Survey's Federal Program for coal hydrology into the Cooperative Program for coal hydrology. This was done to continue and strengthen the process begun with the FY 1984 budget by providing additional support to the States, consistent with the Office of Surface Mining's initiative to increase State primacy. Thus, with cooperators furnishing an equal amount of funds, an additional total of about $2 million was available in FY 1985. Through use of a ranking procedure to identify the highest priority activities, 20 investigations were selected from 39 proposals. As a result, additional coal-hydrology investigations were implemented to facilitate the State permitting process, which involves determination of probable hydrologic consequences of a particular mine and cumulative impact assessments of all anticipated mining in the area. The specific requirements of the process are being met by determining priority areas in which mining is currently, or is likely to become, of major economic importance. Hydrologic data networks have been established in these areas to collect information during premining baseline conditions for comparison with data gathered during and following mining so that the impacts of mining can be determined.

The titles of the coal-related cooperative investigations started in FY 1985 are listed in table 4, by USGS Region (figure 1). The 20 new projects involve 11 States. The titles indicate the wide range of activities and the many problems to be addressed in the coal-hydrology program.

Table 4.--New coal-hydrology investigations in the Federal-State Cooperative Program, by Region, fiscal year 1985.

Northeastern Region

State	
Ohio	Impacts of surface-mine reclamation on surface-water quality in Raccoon Creek basin, Ohio
Pennsylvania	Preliminary evaluation of the effects of long-wall and room-and-pillar coal mining on ground water, Pennsylvania
Pennsylvania	Preliminary evaluation of the effects of limestone application on water quality from coal spoils and of the effects of sludge on the hydrology of a reclaimed coal-mine site, Pennsylvania
Pennsylvania	Hydrology of small basins in coal areas in Pennsylvania
Virginia	Location of aquifers and determination of aquifer characteristics in the coal fields of southwest Virginia
West Virginia	Coal mining impacts on the water resources of the Elk River basin, West Virginia

Southeastern Region

Alabama	Investigation of attenuation of water-quality impacts relative to mine age in Alabama
Alabama	Modeling suspended sediment discharge of streams in Warrior Coal Field, Alabama
Alabama	Evaluation of the cumulative hydrologic impacts of coal mining for selected basins in Alabama
Kentucky	A technique for evaluating the cumulative impacts of mining as applied to the coal fields of Kentucky
Tennessee	Impacts of strip mining on channel geometry and movement of coarse material in the upper South Fork Cumberland River basin, Tennessee
Tennessee	Sediment transport and yields in the Tennessee River basin 1930-80
Tennessee	Application of watershed models in the coal mining area of Tennessee

Table 4.--Continued

	Central Region
Colorado	Modeled impacts of surface coal mining on dissolved solids in the Yampa River basin, northwestern Colorado
Colorado	Geomorphic stability of reclaimed land surfaces in the Green River coal resources region, Colorado
Colorado	Impacts of coal mine development on ground-water resources in the Twentymile Park area, northwestern Colorado
Missouri	Hydrology of abandoned strip mines and effects of reclamation of the Power Mine near Montrose in western Missouri
Oklahoma	Limnology of selected coal-mine ponds and streams in the coal-mining region of eastern Oklahoma
Wyoming	Ground-water resources in the overthrust area, Wyoming
Wyoming	Effects of population growth and coal-mining activity on the hydrologic system near Gillette, Wyoming

The amount of Federal matching money appropriated for the 1985 cooperative coal hydrology program was $4,385,000. The Survey, however, assigned more than $350,000 additional matching funds to this effort for a total of $4,737,000. This resulted from identification of "Hydrologic Effects of Fuel and Mineral Extraction" as one of the high-priority items for FY 1985, described earlier in this report. Table 5 shows how these funds were distributed among USGS Regions by various categories of activity. More than half of the funds were used for investigative work. The Western Region total for coal hydrology is small commensurate with the overall volume of coal produced by the States in that area.

Table 5.--Allocation of Federal matching funds for coal-hydrology activities by Region, fiscal year 1985.

	Funding (Dollars, in thousands)			
	Collection of Hydrologic Data	Continuing Investigations	New Project Investigations	Total
Northeastern Region	$ 349	$ 689	$ 378	$1,416
Southeastern Region	571	372	355	1,298
Central Region	1,040	460	354	1,854
Western Region	144	25	0	169
Total	$2,104	$1,546	$1,087	$4,737

WATER-USE INFORMATION PROGRAM

The Survey's National Water Use Information Program is designed to determine how much water is withdrawn for use; how much water is consumed during use; the purpose for which water is used; where and how much water is returned; the effect of use on water quality; and the factors which influence water use. The goal is to make accurate, consistent, and timely water-use information available to water policymakers, planners, managers, and other potential users.

This part of the Cooperative Program was started in fiscal year 1978 to provide for the comprehensive and systematic collection, storage, analysis, and dissemination of water-use data and information throughout the United States. In fiscal year 1985, 48 States and Puerto Rico participated in the program at various funding levels. The State Water-Use Data System has now been implemented in 30 States. This computerized storage and retrieval system expedites the transfer of site-specific water-use information to the National Water Use Data System.

EXAMPLES OF CURRENT INVESTIGATIONS

Highlights from selected Cooperative Program investigations underway in FY 1985 are presented below.

Alabama: MODELING OF SUSPENDED-SEDIMENT DISCHARGES, WARRIOR COAL FIELD

Surface coal mining continues to be an active process in Alabama. Discharge of suspended sediment resulting from these operations is one major impact of concern to regulatory agencies. The Geological Survey has underway a study in cooperation with the Alabama Surface Mining Commission to apply a physically-based computer model to selected streams in the Warrior Coal Field area. The model is being calibrated to simulate suspended-sediment yield characteristics in ungaged areas. If successful, this will provide significant opportunities for improved understanding of the sediment-related impacts of surface mining.

Arkansas: IDENTIFICATION OF GROUND-WATER PROBLEMS

The Geological Survey, in support of Arkansas' ground-water protection strategy, has prepared a report that identifies existing and potential ground-water problems in the State. The work was undertaken at the request of the Arkansas Department of Pollution Control and Ecology, and the Arkansas Soil and Water Conservation Commission. The problems documented include poor natural water-quality, salt-water intrusion, contamination, low yields from fractured-rock aquifers, and water-level declines in principal aquifers. Part of the process was to categorize areas of the State as high, medium, or low recharge zones. Waste-disposal sites located in the medium or high recharge zones are indicated as having the greatest potential for the occurrence of aquifer contamination.

California: EVALUATION OF GROUND-WATER RESOURCES, LOS OSOS BASIN, SAN LUIS OBISPO COUNTY

In the coastal areas of California, the limiting factor on future development is typically the availability of water supplies. Many of the aquifers in these areas are subject to contamination from land-use practices and from salt-water intrusion caused by declining ground-water levels. San Luis Obispo County and the California Department of Water Resources requested an investigation of the Los Osos basin to determine the extent of such problems and to develop plans for improved water-resources management in the area. The initial results of the Survey's work have provided considerable encouraging information. Clearer definition of the characteristics and areal extent of the confining layer indicates that contamination of the water-supply aquifer from the upper aquifer is not an immediate concern. In addition, a previously unmapped water-bearing formation has been identified, which presents potential for development of additional water supplies.

Southern Florida: AQUIFER DISCOVERED

In cooperation with the South Florida Water Management District, the Geological Survey has been conducting an investigation of the hydraulic, geologic, and water-quality characteristics of the Biscayne aquifer. This work has unexpectedly led to the identification of a previously unknown aquifer located beneath the Biscayne in southeast Florida. The recharge area for the newly-discovered aquifer is in eastern Collier and Hendry Counties. It is anticipated that the aquifer will be utilized as a supplemental water supply.

North Dakota: HYDROGEOCHEMICAL IMPACTS OF SURFACE MINING OF LIGNITE--THE SULFUR CYCLE

Sulfate is the principal cause of deterioration of ground-water quality in the vicinity of lignite mines. As a result, it is important that the sulfur cycle be understood to develop appropriate reclamation procedures. The purposes of this investigation, in cooperation with North Dakota State University and the North Dakota Geological Survey, are to quantitatively describe the sulfur sources that contribute to sulfate in ground water in recharge areas, and to determine the hydrogeochemical processes that control the movement of sulfate to the ground-water system. Preliminary indications are that oxidation of tiny particles of sulfide minerals occurs rapidly--within hours. Larger particles of pyrite may be insensitive to oxidation, at least for decades.

Central Oklahoma: SALT-WATER CONTAMINATION

An investigation of the impacts of salt water in the Vamoosa-Ada aquifer of central Oklahoma has been underway since 1979 in cooperation with the Oklahoma Geological Survey. Indices developed to identify brine contamination in surface- and ground-water resources in this area may have application in other parts of the country. More than 80 stream and well sites have been identified as contaminated by brine in the 1,700-square-mile area of study. Geophysical logs indicate a possible rise in the interface between the fresh-water and salt-water layers in the Vamoosa-Ada aquifer.

Pennsylvania: WATER-QUALITY CHARACTERISTICS OF THE PROPOSED SWATARA CREEK RESERVOIR

The quality of water to be impounded by a dam on Swatara Creek may not be acceptable for maintaining a warm-water fishery or for water-contact recreation, according to an investigation in cooperation with the Pennsylvania Department of Environmental Resources, Bureau of Parks. In addition, releases from the reservoir may degrade the water quality downstream in Swatara Creek. Acid-mine drainage has been identified as the principal contributor to the poor water quality. Construction on this $40 million dam project has been halted pending resolution of the water-quality issues.

Puyallup Indian Reservation, Washington: WATER RESOURCES OF THE LOWER PUYALLUP RIVER BASIN

This investigation, in cooperation with the Puyallup Indian Nation, is designed to determine the discharge characteristics of the Puyallup River and its tributaries within the boundary of the Puyallup Indian Reservation, and to evaluate the significant inputs that affect the discharge characteristics and quality. Within the reservation boundaries, it is planned to define the availability and quality of ground water in the Puyallup River valley, define the relation between the Puyallup River and the ground-water system, and to the extent available data allow, evaluate the short-term yields of aquifers in areas adjacent to the valley.

OUTLOOK FOR NEXT YEAR

The issues discussed in this section were identified in consultation with Federal, State, and local agency officials throughout the year. They represent a national perspective on those priority categories that need to be addressed in the Federal-State Cooperative Program for FY 1986 to serve the Federal interest as well as State and local needs.

The priority categories continue to reflect the strong interdependence of the Survey's Cooperative Program, Federal Program, and the program activities funded by other Federal agencies. These three programs are complementary, and every effort is made to balance the Division's work and direct it toward addressing the highest priority issues.

Major Issues of National Concern

Four issues of major national concern are considered of highest priority in developing the FY 1986 Cooperative Program:

Ground-water contamination:--Studies of the movement and behavior of contaminants, including toxic wastes, in the ground-water system are needed. Both naturally occurring contaminants and those resulting from the activities of man are of concern. There is a particular need for investigations of the impacts of waste disposal, for studies of contamination by nonpoint sources such as urban runoff and agricultural practices, and for evaluation of salt-water encroachment induced by pumping. Studies will address flow dynamics, solute-transport processes, and chemical and biological processes. Baseline water quality will be evaluated for comparison with future water-quality conditions. Emphasis will be placed on studies which advance knowledge on controlling processes such as solute transport, organic biodegradation, and contaminant movement between ground- and surface-water environments.

Stream quality--There is an increasing need for appraisals of the water quality of stream systems, particularly with respect to the occurrence and movement of toxic substances, and the impact of contamination on stream ecology. To better understand the movement and concentration changes of undesirable materials, investigations need to emphasize assessments of stream quality, including sediment chemistry, as related to land use, stream biota, ground-water contribution, and overland runoff. Particular emphasis will be placed on process-related studies.

Stream-quality studies need to include expansion of the data base on chemical properties and on the processes governing erosion, sediment transport, and deposition. Measurement of the impacts of land-use changes, including urban development, also are needed. In addition, an improved understanding of the effects of suspended and deposited sediments on land and water resources, and of the transport of toxic substances and other constituents sorbed or attached to sediment is needed.

Water supply and demand--Increasing diversion, withdrawal, and use of water stress both the quantity and quality of existing supplies, thus raising costs of both delivery and treatment. This presents ever more difficult problems of allocation and quality management. Information defining present water use is required to quantify stresses both spatially and temporally. Flow-system simulation is essential to anticipate stress response, especially for stream-aquifer systems. Topics in need of study include streamflow response to drought conditions, and system response both to projected uses and supply-augmentation schemes.

Hydrologic hazards--Annual economic losses from floods, mudflows, debris flows, sedimentation, and other hydrologic hazards continue to amount to billions of dollars. These hazards are related not only to meteorological conditions but also to such phenomena as landslides, volcanic eruptions, and earthquakes. Studies are needed to define the magnitude and probability of occurrence of hazardous hydrologic events and to better understand the processes by which they occur. Hazard studies in urban environments and flood-risk analyses associated with hydrologic-structure design are included in this category.

Major Issues of Regional Concern

There are three issues that are considered to have high priority for new work, but their importance may differ from region to region. A brief discussion of each issue follows.

Hydrologic effects of fossil fuel and mineral extraction--The extractive industries, whether oil and gas production and processing, solid-fuel mining and processing (such as coal and oil shale), or metallic and nonmetallic mining, are pervasive in their influence on hydrologic systems. Impacts may relate to a wide spectrum of hydrologic phenomena, including interaction of subsurface fluids with a contrasting chemical and physical environment,large-scale aquifer dewatering to permit mining, disruption of surface drainage, and disturbance of geochemical equilibria. Studies of such problems need to be pursued using high-technology, interpretive methods. They are important because of insidious and long-lasting effects of mineral, solid-fuel, and fluid hydrocarbon extraction, and the large areas commonly affected. Investigations need to include studies of the hydrologic effects of land reclamation, mining, and waste disposal.

Wetlands, lakes, and estuaries--Because of their importance to fish and wildlife resources, wetlands, lakes, and estuaries deserve special attention. These areas are especially sensitive to man's encroachment and there are growing concerns with lake eutrophication and the decrease in effectiveness of tidal flushing. Studies need to address the availability, movement, and quality of water, emphasizing physical, chemical, and biological processes. In addition, they need to include the interaction between surface-water bodies and aquifers, as well as the design of improved networks for baseline data collection.

Acid rain--Interpretive studies of the effects of precipitation chemistry on water quality and the interaction of acid rain with biological systems need to receive priority attention in terranes that have limited ability to buffer ground and surface waters, and in urban settings that produce large loads of atmospheric pollutants.

Collection of acid precipitation data, because of their importance to the mission of cooperating State and local agencies and to the responsibilities of other Federal agencies, and because of the importance of accurate, reliable data to current and future interpretive studies, continues to be of major importance in the hydrologic program of the Geological Survey. Research activities leading to the development of new principles or techniques will also be included in the Cooperative Program as appropriate.

REFERENCES CITED

Gilbert, B. K. and Buchanan, T. J., 1981, The U.S. Geological Survey Federal-State Cooperative Water Resources Program: U.S. Geological Survey Open-File Report 81-691, 27p.

U.S. Geological Survey, 1985, National Water Summary 1984--Hydrologic Events, Selected Water-Quality Trends, and Ground-Water Resources, Water-Supply Paper 2275, 467p.

APPENDIX

STATE, COUNTY, AND LOCAL COOPERATORS, FISCAL YEAR 1985

Alabama:
- Alabama Department of --
  - Conservation and Natural Resources
  - Environmental Management
  - Highways
- Alabama Surface Mining Commission
- Birmingham, City of
- Coffee County Commission
- Dauphin Island
- Geological Survey of Alabama
- Huntsville, City of
- Jefferson County Commission
- Linden, City of
- Montgomery, City of, Water Works and Sanitary Sewer Board
- Tuscaloosa, City of

Alaska:
- Alaska Department of --
  - Environmental Conservation
  - Fish and Game
  - Natural Resources, Division of --
    - Geological and Geophysical Surveys
    - Lands and Water Management
    - Technical Services
  - Transportation and Public Facilities
- Alaska Power Authority
- Anchorage, Municipality of --
  - Department of Health and Environmental Protection
  - Department of Planning
  - Department of Solid Waste Service
  - Water and Wastewater Utility
- Fairbanks North Star Borough
- Juneau, City and Borough of
- Kenai Peninsula Borough
- Matanuska Susitna Borough
- Sitka, City and Borough of
- Wasilla, City of

American Samoa: (See Hawaii)

Arizona:
- Arizona Department of --
  - Health Services, Bureau of Water Quality Control
  - Land, Parks and Tourism
  - Water Resources
- Arizona Municipal Water Users Association
- Gila Valley Irrigation District
- Maricopa County --
  - Flood Control District
  - Municipal Water Conservation District No. 1
- Metropolitan Water District of Southern California

Arizona--Continued
- Pima County, Board of Supervisors
- Salt River Valley Water Users Association
- San Carlos Irrigation and Drainage District
- Show Low Irrigation Company
- Tucson, City of
- University of Arizona, Water Resources Research Center

Arkansas:
- Arkansas Department of --
  - Parks and Tourism
  - Pollution Control and Ecology
- Arkansas Geological Commission
- Arkansas Soil and Water Conservation Commission
- Arkansas State Highway and Transportation Department

California:
- Alameda County --
  - Flood Control and Water Conservation District (Hayward)
  - Flood Control and Water Conservation District, Zone 7 (Livermore)
  - Water District
- Antelope Valley-East Kern Water Agency
- California Department of --
  - Boating and Waterways
  - Fish and Game (Sacramento)
  - Fish and Game, Region II (Rancho Cordova)
  - Health Services
  - Transportation, District 3 (Marysville)
  - Water Resources --
    - Central District (Sacramento)
    - Northern District (Red Bluff)
    - San Joaquin District (Fresno)
- California Regional Water Quality Control Board --
  - Central Coast Region (San Luis Obispo)
  - Colorado River Basin Region (Palm Desert)
  - Lahontan Region (South Lake Tahoe)
  - North Coast Region (Santa Rosa)
  - San Francisco Bay Region (Oakland)
  - Santa Ana Region (Riverside)
- California Water Resources Control Board
- Carpinteria County, Water District
- Casitas Municipal Water District
- Coachella Valley, County Water District
- Contra Costa County --
  - Department of Health Services
  - Flood Control and Water Conservation District
- Crestline-Lake Arrowhead Water Agency
- Desert Water Agency
- East Bay Municipal Utility District
- East Valley Water District
- El Dorado County

California--Continued

Fresno County, Department of Resources and Development
Fresno Metropolitan Flood Control District
Georgetown Divide Public Utility District
Goleta County Water Distict
Humboldt Bay, Municipal Water District
Imperial County, Department of Public Works
Imperial Irrigation District
Indian Wells Valley Water District
Inyo County Water Department
Kern County Water Agency
Kings River Conservation District
Lake County, Planning Department
Los Angeles County, Flood Control District
Los Angeles Department of Water and Power
Madera County, Flood Control and Water Conservation Agency
Madera Irrigation District
Marin County, Department of Public Works
Marin Municipal Water District
Merced, City of
Merced Irrigation District
Modesto, City of, Department of Public Works
Modoc County, Department of Public Works
Mojave Water Agency
Montecito County Water District
Monterey County Flood Control and Water Conservation District
Monterey Peninsula, Water Management District
Napa County Flood Control and Water Conservation District
Newport Beach, City of
Orange County --
  Environmental Management Agency
  Water District
Oroville-Wyandotte Irrigation District
Pacheo Pass Water District
Paradise Irrigation District
Placer County Water Agency (Auburn)
Placer County Water Agency (Foresthill)
Rainbow Municipal Water District
Rancho California Water District
Riverside County Flood Control and Water Conservation District
Sacramento Municipal Utility District
Sacramento Regional County Sanitation District, Department of Public Works
San Benito County Water Conservation and Flood Control District
San Bernardino County Flood Control District
San Bernardino Valley Municipal Water District
San Diego, City of
San Diego County, Department of --
  Planning and Land Use
  Public Works
San Diego County Water Authority

California--Continued

San Francisco, City and County of, Hetch Hetchy Water and Power
San Francisco Water Department
San Joaquin County Flood Control and Water Conservation District
San Luis Obispo County, Engineering Department
San Mateo County --
  Department of Planning
  Department of Public Works
Santa Barbara, City of, Department of Public Works
Santa Barbara County --
  Flood Control and Water Conservation District
  Water Agency
Santa Clara Valley, Water District
Santa Cruz County --
  Flood Control and Water Conservation District
  Planning Department
Santa Cruz, City of, Water Department
Santa Maria Valley Water Conservation District
Scotts Valley Water District
Siskiyou County Flood Control and Water Conservation District
Sonoma County--
  Planning Department
  Water Agency
Soquel Creek County Water District
Tahoe Regional Planning
Terra Bella Irrigation District
Thousand Oaks, City of
Tulare County, Flood Control District
Turlock Irrigation District
United Water Conservation District
University of California--
  Berkeley, Agricultural Experiment Station, Department of Forestry and Resource Management
Ventura County, Public Works Agency
Western Municipal Water District
Westlands Water District
Woodbridge Irrigation District
Yolo County, Flood Control and Water Conservation District

Colorado:

Arkansas River Compact Administration
Arvada, City of
Aspen, City of
Aurora, City of
Boulder, County of, Department of Public Works
Breckenridge, Town of
Castle Rock, Town of
Central Yuma Ground Water Management District
Cherokee Water and Sanitation District
Colorado Department of --
  Health

Colorado--Continued
- Colorado Division of Mined Lands Reclamation
- Colorado Division of Water Resources, Office of the State Engineer
- Colorado Geological Survey
- Colorado River Water Conservation District
- Colorado Springs, City of --
  - Department of Public Utilities
  - Office of the City Manager
- Crowley County, Board of Commissioners
- Custer, County of
- Delta County, Board of County Commissioners
- Denver, City and County, Board of Water Commissioners
- Denver Regional Council of Governments
- Douglas, County of
- Eagle County, Board of Commissioners
- El Paso County Water Users Association
- Englewood, City of
- Evergreen Metropolitan District
- Fountain Valley Authority
- Frenchman Ground Water Management District
- Fruita, City of
- Garfield, County of
- Glendale, City of
- Glenwood Springs, City of
- Grand County Board of Commissioners
- Kiowa-Bijou Ground Water Management District
- Larimer-Weld Regional Council of Governments
- Longmont, City of
- Lost Creek Ground Water Management District
- Marks Butte Ground Water Management District
- Metropolitan Denver Sewage Disposal District No. 1
- Mineral, County of
- Moffat County Commissioners
- Northern Colorado Water Conservancy District
- Pitkin County, Board of Commissioners
- Pueblo, City of, Board of Water Works
- Pueblo Civil Defense Agency
- Pueblo West Metro District
- Purgatoire River Water Conservancy District
- Rio Blanco County, Board of County Commissioners
- Rio Grande Water Conservation District
- Round Mountain Water and Sanitation District
- Sand Hills Ground Water Management District
- Southeastern Colorado Water Conservancy District
- Southern High Plains Ground Water Management District
- Southwestern Colorado Water Conservancy District
- St. Charles Mesa Water District
- Steamboat Springs, City of
- Trinchera Conservancy District
- Uncompahgre Valley Water Users Association

Colorado--Continued
- Upper Arkansas River Water Conservancy District
- Upper Black Squirrel Creek Ground Water Management District
- Upper Yampa Water Conservancy District
- Urban Drainage and Flood Control District
- W-Y Ground Water Management District
- Water Users No. 1 (Rangely)
- Yellow Jacket Water Conservancy District

Connecticut:
- Connecticut Department of Environmental Protection
- Enfield, Town of
- Fairfield, Town of, Conservation Commission
- Meriden, Town of, Department of Public Works
- New Britain, City of --
  - Board of Water Commissioners
  - Improvement Commission
- Northeast Connecticut Regional Planning Agency
- Norwalk, Town of
- Ridgefield, Town of
- Simsbury, Town of
- South Central Connecticut Regional Water Authority
- Stonington, Town of
- Torrington, City of

Delaware:
- Department of Natural Resources and Environmental Control
- Geological Survey
- New Castle County, Department of Public Works

District of Columbia:
- Department of Public Works

Florida:
- Big Cypress Basin Board
- Boca Raton, City of
- Bradenton, City of
- Brevard County, Board of County Commissioners
- Broward County --
  - Environmental Quality Control Board
  - Water Resources Management Division
- Cape Coral, City of
- Clearwater, City of
- Cocoa, City of
- Collier, County of
- Coordinating Council on the Restoration of Kissimmee River Valley and Taylor Creek-Nubbins Slough Basin
- Daytona Beach, City of
- Englewood Water District, Board of Supervisors
- Escambia County, Board of County Commissioners
- Escambia County, Utilities Authority
- Flagler County, Board of County Commissioners

Florida--Continued
Florida Department of --
Environmental Regulation, Bureau of Water Resources Management
Natural Resources, Division of Marine Resources
Transportation
Florida Division of Recreation and Parks
(Hope Sound and Tallahassee)
Florida Institute of Phosphate Research
Florida Keys Aqueduct Authority
Fort Lauderdale, City of
Fort Walton Beach, City of
Gainesville, City of
Hallandale, City of
Highland Beach, Town of
Hillsborough, County of
Hollywood, City of
Indian River County, Department of Planning and Human Resources
Jacksonville, Consolidated City of --
Department of Health and Environmental Services
Department of Planning
Department of Public Works
Jacksonville Electric Authority
Joshua Water Control District
Juno Beach, Town of
Jupiter Inlet District
Lake County, Pollution Control Department and Board of County Commissioners
Lee County, Board of County Commissioners
Leon County, County Courthouse
Leon County, Department of Public Works
Manatee County, Board of County Commissioners
Marion County, Board of County Commissioners
Metropolitan Dade County, Department of Environmental Resources Management
Miami-Dade Water and Sewer Authority
Northwest Florida Water Management District
Old Plantation Water Control District
Orange County, Board of County Commissioners
Palm Beach County, Board of County Commissioners
Palm Beach County Solid Waste Authority
Pasco, County of
Perry, City of
Pinellas County
Pinellas Park Water Management District
Plant City
Polk County, Board of County Commissioners
Pompano Beach, City of, Water and Sewer Department
Quincy, City of
Reedy Creek Improvement District
Sarasota, City of
Sarasota, County of

Florida--Continued
South Dade Soil and Water Conservation District
South Florida Water Management District
Southwest Florida Regional Planning Council
Southwest Florida Water Management District
St. Johns, County of
St. Johns River Water Management District
St. Petersburg, City of
Stuart, City of
Sumter County, Recreation and Water Conservation and Control Authority
Suwannee River Authority (Live Oak)
Suwannee River Authority (Trenton)
Suwannee River Water Management District
Tallahassee, City of, Underground Utilities
Tampa, City of
University of Central Florida
University of South Florida
Volusia County
Walton, County of
West Coast Regional Water Supply Authority
Winter Park, City of

Georgia:
Albany, City of, Water, Gas, and Light Commission
Bibb County, Board of County Commissioners
Brunswick, City of
Chatham County, Board of County Commissioners
Clayton County, Water Authority
Consolidated Government of Columbus
Covington, City of
Georgia Department of --
Natural Resources --
Environmental Protection Division
Geological Survey
Transportation
Macon-Bibb County, Water and Sewage Authority
Valdosta, City of

Guam: (See Hawaii)

Hawaii:
American Samoa, Government of
Guam, Government of
Hawaii Department of --
Health
Land and Natural Resources --
Division of Water and Land Development
Transportation
Honolulu, City and County --
Board of Water Supply
Department of Public Works

Hawaii--Continued
- Trust Territory of the Pacific Islands --
  - Government of the Northern Mariana Islands
  - Federated States of Micronesia --
    - Republic of Marshall Islands
    - State of Kosrae
    - State of Ponape
    - State of Truk
    - State of Yap
  - Republic of Palau
- University of Hawaii, Water Resources Research Center

Idaho:
- Idaho Department of --
  - Fish and Game
  - Health and Welfare, Bureau of Water Quality
  - Water Resources
- Sun Valley Water and Sewer District
- Teton County, Board of County Commissioners
- The Shoshone Bannock Tribes, Fort Hall Indian Reservation
- Twin Falls, City of
- University of Idaho
- Water District No. 1--Idaho Falls
- West Cassia Soil and Water Conservation District

Illinois:
- Bloomington and Normal Sanitary District
- Cook County, Forest Preserve District
- Decatur, City of
- Illinois Department of--
  - Energy and Natural Resources, State Water Survey Division
  - Nuclear Safety
  - Transportation, Division of Water Resources
- Illinois Environmental Protection Agency
- Metropolitan Sanitary District of Greater Chicago
- Springfield, City of

Indiana:
- Carmel, Town of
- Elkhart, City of, Water Works
- Indiana State Board of Health
- Indiana Department of --
  - Highways
  - Natural Resources --
    - Division of Water
    - Division of Reclamation
- Indianapolis, City of, Department of Public Works

Iowa:
- Cedar Rapids, City of
- Des Moines, City of
- Des Moines Water Works
- Fort Dodge, City of
- Iowa Department of --
  - Transportation, Highway Division
  - Water, Air, and Waste Management
- Iowa Geological Survey
- Iowa State University
- University of Iowa --
  - Institute of Hydraulic Research
  - University Hygienic Laboratory

Kansas:
- Arkansas River Compact Administration
- Hays, City of
- Kansas Department of --
  - Health and Environment
  - Transportation
- Kansas Geological Survey
- Kansas State Board of Agriculture, Division of Water Resources
- Kansas Water Office
- Sedgwick County, Department of Environmental Resources
- Southwest Kansas Ground Water Management District No. 3
- Western Kansas Ground Water Management District No. 1
- Wichita, City of

Kentucky:
- Elizabethtown, City of
- Kentucky Department of --
  - Natural Resources and Environmental Protection Cabinet
  - Transportation Cabinet, Division of Design
- Kentucky Geological Survey
- Louisville, City of
- University of Kentucky
- University of Louisville
- University of Western Kentucky

Louisiana:
- Baton Rouge City-Parish Government
- Capital-Area Groundwater Conservation Commission
- Jefferson Parish, Department of Public Utilities
- Louisiana Department of --
  - Environmental Quality, Water Resources Water Pollution Control Division
  - Natural Resources --
    - Louisiana Geological Survey
    - Office of Surface Mining
  - Transportation and Development --
    - Office of Highways
    - Office of Public Works
    - Office of Surface Mining
- Sabine River Compact Administration

Maine:
- Androscoggin Valley Regional Planning Commission
- Cobbossee Watershed District
- Maine Department of --
  - Conservation, Geological Survey
  - Environmental Protection
  - Human Services
  - Transportation
- Washington County Regional Planning Commission

Maryland:
- Anne Arundel County, Planning and Zoning Office
- Baltimore County --
  - Department of Permits and Licenses
  - Department of Public Works
  - Office of Planning and Zoning
- Calvert, County of
- Caroline, County of
- Carroll County, Board of County Commissioners
- Howard County, Department of Public Works
- Maryland Department of --
  - Health and Mental Hygiene, Office of Environmental Programs
  - Transportation, State Highway Administration
- Maryland Energy Administration
- Maryland Geological Survey
- Maryland Water Resources Administration
- Montgomery County --
  - Department of Environmental Protection, Office of Environmental and Energy Planning
  - Division of Pollution Control
- Poolesville, Town of
- St. Marys County, County Commissioners
- Upper Potomac River Commission
- Washington Suburban Sanitary Commission

Massachusetts:
- Barnstable County, County Commissioners
- Cape Cod Planning and Economic Development Commission
- Massachusetts Department of --
  - Environmental Management
  - Environmental Quality Engineering
  - Public Works
- Metropolitan District Commission, Water Division
- New England Interstate Water Pollution Control Commission
- Plymouth, Town of

Michigan:
- Ann Arbor, City of
- Battle Creek, City of
- Clare, City of
- Coldwater, City of, Board of Public Utilities

Michigan--Continued
- Elsie, Village of
- Flint, City of, Department of Public Works and Utilities, Water Supply and Pollution Control
- Genesee County Drain Commission, Division of Water and Waste Services
- Grand Traverse, County of
- Huron-Clinton Metropolitan Authority
- Imlay, City of
- Kalamazoo, City of, Department of Public Utilities
- Lansing, City of, Board of Water and Light, Water and Stream Division
- Macomb County
- Mason, City of
- Michigan Department of --
  - Agriculture, Soil and Water Conservation Division
  - Natural Resources
  - Transportation
- Michigan Tech University
- Oakland County, Drain Commission
- Otsego County, Road Commission
- Portage, City of
- St. Johns, City of
- Van Buren County, Board of Commissioners
- Ypsilanti, City of

Minnesota:
- Bassett Creek Watershed Management Organization
- Carnelian-Marine Watershed District
- Coon Creek Watershed District
- Eagan, City of
- Elm Creek Conservation Commission
- Fond du Lac Reservation Business Commission
- Iron Range Resources Rehabilitation Board
- Lower Red River Waste Management Board
- Metropolitan Council of the Twin Cities Area
- Metropolitan Waste Control Commission
- Middle River-Snake River Watershed District
- Minnesota Department of --
  - Energy, Planning and Development
  - Health
  - Natural Resources, Division of Waters
  - Transportation
- Minnesota Geological Survey
- Minnesota Pollution Control Agency
- Minnesota Waste Management Board
- Morrison County, Soil and Water Conservation District
- Red Lake Tribal Council
- Red Lake Watershed District
- St. Louis Park, City of
- St. Paul, City of, Board of Water Commissioners
- University of Minnesota
- Wesmin Resource, Conservation and Development Association
- White Earth Reservation Business Commission

Mississippi:
- Harrison County --
  - Board of Supervisors
  - Development Commission
- Jackson, City of
- Jackson County --
  - Board of Supervisors
  - Port Authority
- Laurel, City of
- Mississippi Department of --
  - Highways
  - Natural Resources --
    - Bureau of Geology
    - Bureau of Land and Water Resources
    - Bureau of Pollution Control
- Pat Harrison Waterway District
- Pearl River Basin Development District
- Pearl River Valley Water Supply District

Missouri:
- Little River Drainage District
- Missouri Department of --
  - Conservation
  - Natural Resources --
    - Division of Environmental Quality, Lab Service Program
    - Division of Geology and Land Survey
    - Land Reclamation Commission
- Missouri Highway and Transportation Commission
- Springfield, City of, City Utilities, Engineering Department

Montana:
- Daniels, County of
- Helena, City of
- Montana Bureau of Mines and Geology
- Montana Department of --
  - Fish, Wildlife, and Parks
  - Health and Environmental Sciences
  - Highways
  - Natural Resources and Conservation
  - State Lands
- Montana Reserved Water Rights Compact Commission
- Salish and Kootenai Tribes of Flathead Reservation
- State of Montana, Governor's Office
- University of Montana
- Wyoming State Engineer

Nebraska:
- Blue River Association of Ground Water Conservation Districts
- Central Platte Natural Resources District
- Grand Island, City of
- Kansas-Nebraska Big Blue River Compact Administration

Nebraska--Continued
- Lincoln, City of
- Little Blue Natural Resources District
- Nebraska Department of --
  - Environmental Control
  - Water Resources
- Nebraska Natural Resources Commission
- University of Nebraska, Conservation and Survey Division

Nevada:
- Carson City, Department of Public Works
- Douglas County, Department of Planning
- Elko County
- Las Vegas Valley Water District
- Mackay School of Mines
- Nevada Bureau of Mines and Geology
- Nevada Department of --
  - Conservation and Natural Resources --
    - Division of Environmental Protection
    - Division of Water Resources
  - Transportation
- Nye County
- Reno, City of
- Tahoe Regional Planning Agency
- University of Nevada, Reno

New Hampshire:
- Conway, Town of
- Nashua Regional Planning Commission
- New Hampshire Water Resources Board
- Water Pollution Control Commission

New Jersey:
- Bergen, County of
- Bridgewater, Township of
- Camden County, Board of Chosen Freeholders
- Cranford, Township of
- Delaware River Basin Commission
- Greenwich, Township of
- Logan, Township of
- Morris County, Municipal Utilities Authority
- New Jersey Department of Environmental Protection, Division of Water Resources
- North Jersey District Water Supply Commission
- Passaic Valley Water Commission
- Somerset County, Board of Chosen Freeholders
- West Windsor Township

New Mexico:
- Alamogordo, City of
- Albuquerque, City of

New Mexico--Continued
- Albuquerque Metropolitan Arroyo Flood Control Authority
- Bernalillo, County of
- Costilla Creek Compact Commission
- El Paso Water Utilities Public Service Board
- Jemez River Indian Water Authority
- Las Cruces, City of
- Navajo Indian Nation, Navajo Tribal Council
- New Mexico Bureau of Mines and Mineral Resources
- New Mexico Department of Highways
- New Mexico Environmental Improvement Division
- New Mexico Oil Conservation Division, Energy and Minerals Department
- Office of State Engineer
- Pecos River Commission
- Pueblo of Acoma
- Pueblo of Laguna
- Pueblo of Zuni
- Raton, City of
- Rio Grande Compact Commission
- Santa Fe Metropolitan Water Board
- Vermejo Conservancy District

New York:
- Albany, City of, Department of Water and Water Supply
- Amherst, Town of, Engineering Department
- Auburn, City of
- Brookhaven, Town of
- Chautauqua, County of, Department of Planning and Development
- Cheektowaga, Town of
- Clarence, Town of
- Cornell University --
  - Department of Natural Resources
  - Department of Utilities
- Cortland, County of, Planning Department
- Dutchess County Environmental Management Council
- Erie County, Division of Environmental Control, Department of Environment and Planning
- Genesee-Finger Lakes Regional Planning Council
- Hudson-Black River Regulating District
- Irondequoit Bay Pure Waters, Department of Engineering
- Kirkwood, Town of
- Kiryas Joel, Village of
- Long Island Regional Planning Board
- Monroe, County of, Engineering Department, Health and Water Authority
- Montgomery, County of, Planning Department
- Nassau, County of, Department of Public Works (Bellmore and Mineola)
- New York City --
  - Department of Environmental Protection, Air Resources-Water Resources-Energy
  - Department of Sanitation, Office of Resource Recovery

New York--Continued
- New York State Department of --
  - Environmental Conservation --
    - Division of Air
    - Division of Water
    - Heritage Task Force
  - Transportation, Bridge and Construction Bureau
- New York State Energy Research and Development Authority
- New York State Power Authority
- Newstead, Town of
- Nyack, Village of, Board of Water Commissioners
- Onieda, County of, Planning Department
- Onondaga, County of --
  - Department of Drainage
  - Environmental Management Council
  - Water Authority
- Orange, County of
- Oswego, County of, Planning Board
- Putnam, County of
- Rockland, County of, Drainage Agency, Planning Department
- Seneca Nation of Indians
- Shelter Island, Town of
- Southern Tier Regional Planning and Development Authority
- Suffolk, County of --
  - Department of Health Services
  - Department of Public Works
  - Water Authority
- Sullivan, County of, Planning Department
- Susquehanna River Basin Commission
- Temporary State Commission on Tug Hill
- Ulster, County of, County Legislators, Planning Department
- University of the State of New York, Regents Research Inc.
- Westchester, County of --
  - Department of Health
  - Department of Public Works

North Carolina:
- Ayden, Town of
- Charlotte, City of
- Durham, City of, Department of Water Resources
- Farmville, Town of
- Gifford, County of, S.W.C.D.
- Greene, County of
- Greensboro, City of, Department of Public Works
- Greenville Utilities
- Kinston, City of
- La Grange, Town of
- New Bern, City of
- North Carolina State Department of --
  - Human Resources
  - Natural Resources and Community Development
  - Transportation, Division of Highways
- Pinetops, Town of

North Carolina--Continued
- Rocky Mount, City of
- Snow Hill, Town of
- Stantonsburg, Town of

North Dakota:
- Burleigh County Water Resources District
- Dickinson, City of
- Lower Heart Water Resources District
- North Dakota Geological Survey
- North Dakota State Health Department
- North Dakota State University
- Oliver County, Board of Commissioners
- Public Service Commission
- State Water Commission

Northern Mariana Islands: (See Hawaii)

Ohio:
- Akron, City of
- Canton, City of, Water Department
- Columbus, City of --
  - Department of Public Services
- Freemont, City of
- Miami Conservancy District
- Northeast Ohio Areawide Coordinating Agency
- Northwood, City of
- Ohio Department of --
  - Natural Resources
  - Transportation
- Ohio Environmental Protection Agency
- Oregon, City of
- Seneca Soil and Water District
- Toledo, City of
- Williams, County of

Oklahoma:
- Ada, City of
- Altus, City of
- Association of Central Oklahoma Governments
- Central Oklahoma Master Conservancy District
- Claremore, City of
- Fort Cobb Reservoir Master Conservancy District
- Foss Reservoir Master Conservancy District
- Lawton, City of
- Lugert-Altus Irrigation District
- Mountain Park Master Conservancy District
- Oklahoma City, City of
- Oklahoma Department of --
  - Health
  - Transportation

Oklahoma--Continued
- Oklahoma Geological Survey, University of Oklahoma
- Oklahoma Water Resources Board
- Sapulpa, City of
- Tulsa, City of

Oregon:
- Benton County, Board of County Commissioners
- Burnt River Irrigation District
- Confederated Tribes of --
  - Umatilla Indian Reservation
  - Warm Springs Indian Reservation
- Coos Bay-North Bend Water Board
- Douglas, County of, Department of Public Works
- Eugene, City of, Water and Electric Board
- Lane Council of Governments
- Lane, County of, Office of the Chief Administrator
- McMinnville, City of, Water and Light Department
- North Wasco County People's Utility District
- Oregon Department of --
  - Fish and Wildlife
  - Transportation, Highway Division
  - Water Resources
- Oregon State University
- Portland, City of, Portland Water Bureau
- Rajneeshpuram, City of
- Salem, City of

Pennsylvania:
- Bethlehem, City of
- Chester, County of, Water Resources Authority
- Delaware River Basin Commission
- Harrisburg, City of, Department of Public Works
- Lancaster County Planning Commission
- Letort Regional Authority
- Millcreek, Township of
- Neshaniney Water Resources Authority
- New York State Department of Environmental Conservation
- Philadelphia, City of, Water Department
- Pennsylvania Department of --
  - Environmental Resources --
    - Abandoned Mine Reclamation Bureau
    - Mining and Reclamation Bureau
    - Oil and Gas Management Bureau
    - Office of Resources Management
    - Solid Wastes and Management Bureau
    - State Parks Bureau
    - Topographic and Geologic Survey Bureau
    - Water Quality Management Bureau
- Susquehanna River Basin Commission
- University Area Joint Authority

Pennsylvania--Continued
- Warren County Commissioners
- Washington County --
  - Conservation District
  - Supervisors

Puerto Rico:
- Puerto Rico Aqueduct and Sewer Authority
- Puerto Rico Department of --
  - Agriculture
  - Health
  - Natural Resources
- Puerto Rico Environmental Quality Board
- Puerto Rico Industrial Development Company
- Puerto Rico Rice Corporation
- Puerto Rico Vegetable Corporation
- University of Puerto Rico - CEER
- (See also Virgin Islands)

Rhode Island:
- Narragansett Bay Water Quality Commission
- Rhode Island State Department of Environmental Management,
  - Division of Water Resources
- State Water Resources Board

South Carolina:
- Charleston, Commission of Public Works
- Cooper River Water Users Association
- Grand Strand Water and Sewer Authority
- Hilton Head Island, Public Service District No. 1
- Jasper County Administration
- Myrtle Beach, City of
- North Myrtle Beach, City of
- South Carolina State --
  - Department of Highways and Public Transportation
  - Geological Survey
  - Health and Environmental Control
  - Public Service Authority
  - Water Resources Commission
- Spartanburg Water Works, Commissioners of Public Works

South Dakota:
- Black Hills Conservancy Subdistrict
- East Dakota Conservancy Subdistrict
- James River Watershed
- Lower James Conservancy Subdistrict
- Rapid City, City of
- Sioux Falls, City of
- South Dakota Department of --
  - Water and Natural Resources --
    - Geological Survey Division
    - Water Rights Division

South Dakota--Continued
- Watertown, City of

Tennessee:
- Lawrenceburg, City of
- Memphis, City of --
  - Light, Gas, and Water Division
  - Public Works Division
- Metropolitan Government of Nashville and Davidson County
- Shelby, County of
- Tennessee Department of --
  - Conservation, Geology Division
  - Health and Environment, Division of Surface Mines
  - Health and Environment, Division of Water Management
  - Transportation, Bureau of Planning and Development
- Tennessee Tech University
- Tennessee Wildlife Resources Agency

Texas:
- Abilene, City of, Water Utilities
- Alice, City of, Water Utilities
- Arlington, City of, Public Utilities
- Athens Municipal Water Authority
- Austin, City of, Public Works Department
- Bexar-Medina-Atascosa Counties, Water Improvement District No. 1
- Bistone Municipal Water Supply District
- Brazos River Authority
- Cleburne, City of
- Clyde, City of
- Coastal Industrial Water Authority
- Colorado River Municipal Water District
- Corpus Christi, City of
- Dallas, City of, Water Utilities
- Dallas, County of, Public Works Department
- Dallas-Ft. Worth Airport
- Edwards Underground Water District
- El Paso, City of, Public Service Board
- Franklin, County of, Water District
- Gainesville, City of
- Galveston, County of
- Garland, City of, Public Works Department
- Georgetown, City of
- Greenbelt Municipal and Industrial Water Authority
- Guadalupe-Blanco River Authority
- Harris, County of, Flood Control District
- Harris-Galveston Coastal Subsidence District
- Houston, City of, Public Works Department
- Lavaca-Navidad River Authority
- Lower Colorado River Authority
- Lower Neches Valley Authority
- Lubbock, City of, Water Utilities
- Mackenzie Municipal Water Authority

Texas--Continued
- Nacogdoches, City of
- North Central Texas Municipal Water Authority
- Northeast Texas Municipal Water District
- Orange, County of
- Pecos River Commission
- Red Bluff Water Power Control District
- Reeves, County of, Water Improvement District No. 1
- Runaway Bay, City of
- Sabine River Authority of Texas
- Sabine River Compact Administration
- San Angelo, City of
- San Antonio, City of --
  - Engineering Department
  - Water Board
- San Antonio River Authority
- San Jacinto River Authority
- Tarrant, County of, Water Control and Improvement District No. 1
- Texas Department of Water Resources
- Texas Parks and Wildlife Department
- Titus, County of, Fresh Water Supply District No. 1
- Trinity River Authority
- Upper Guadalupe River Authority
- Upper Neches River Municipal Water Authority
- Upper Trinity Basin Water Quality Compact
- West Central Texas Municipal Water District
- Wichita, County of, Water Improvement No. 2
- Wichita Falls, City of, Water Utilities
- Wood, County of

Trust Territory of the Pacific Islands: (See Hawaii)

Utah:
- Bear River Commission
- Salt Lake, County of --
  - Board of County Commissioners
  - Division of Flood Control and Water Quality
- Utah Department of --
  - Natural Resources --
    - Oil, Gas, and Mining Division
    - Water Resources Division
    - Water Rights Division
    - Wildlife Resources Division
  - Transportation
- Utah Health Department --
  - Division of Environmental Health
- Utah Geological and Mineral Survey

Vermont:
- Vermont Department of --
  - Water Resources and Environmental Engineering

Virginia:
- Alexandria, City of, Department of Transportation and Environmental Services
- Charles City, County of
- Hanover, County of
- James City, County of --
  - Department of Public Works
  - Service Authority
- New Kent, County of
- Newport News, City of, Department of Public Utilities
- Northern Virginia Planning District Commission
- Roanoke, City of, Utilities and Operations
- Southeastern Public Service Authority of Virginia
- University of Virginia, Department of Environmental Sciences
- Virginia Department of Highways and Transportation
- Virginia Division of Mined Land Reclamation
- Virginia Polytechnic and State University
- Virginia State Water Control Board
- Williamsburg, City of
- York, County of

Virgin Islands:
- Department of Public Works
- Virgin Islands, College of

Washington:
- Bellevue, City of, Public Works Department
- Chelan, County of, Public Utility District No. 1
- Hoh Indian Tribe
- Kitsap County Board of Commissioners
- King, County of, Department of Public Works
- Lewis, County of, Board of Commissioners
- Makah Tribal Council
- Municipality of Metropolitan Seattle
- Pullman, City of
- Puyallup Indian Nation
- Quinault Indian Business Committee
- Seattle, City of --
  - Department of Lighting
  - Skagit, County of
- Snohomish, County of
- Stillaguamish Indian Tribe
- Tacoma, City of --
  - Public Utilities Department
  - Public Works Department
- Washington Department of --
  - Ecology
  - Emergency Services
  - Fisheries
  - Natural Resources
  - Transportation
- Yakima Tribal Council

West Virginia:
- Marshall County Commission
- Morgantown, City of, Water Commission
- Washington Public Service District
- West Virginia Department of --
  - Highways
  - Natural Resources --
    - Division of Reclamation
    - Division of Water Resources
    - Division of Wildlife
- West Virginia Geological and Economic Survey

Wisconsin:
- Bad River Tribal Council
- Beaver Dam, City of
- Dane, County of --
  - Department of Public Works
  - Regional Planning Commission
- Delavah Lake Sanitary District
- Fond du Lac, City of
- Fowler Lake Management District
- Forest County Potawatomi Community
- Green Bay Metropolitan Sewerage District
- Green Lake Sanitary District
- Hills Lake District Association
- Lac du Flambeau Indian Reservation
- Lac la Belle Management District
- Madison Metropolitan Sewerage District
- Madison Water Utility
- Medford, City of
- Menominee Indian Tribe of Wisconsin

Wisconsin--Continued
- Middleton, City of
- Morris Lake Management District
- Okauchee Lake Management District
- St. Croix Tribal Council
- Southeastern Wisconsin Regional Planning Commission
- University of Wisconsin -- Extension, Geological and Natural History Survey
- University of Wisconsin -- Milwaukee
- Waupun, City of
- Wisconsin Department of --
  - Natural Resources
  - Transportation --
    - Bridge Section
    - Division of Highways
- Wolf Lake Management District
- Wood, County of

Wyoming:
- Cheyenne, City of
- Sublette, County of
- Teton County Board of Commissioners
- Uinta, County of, County Commissioners
- Wyoming Attorney General
- Wyoming Department of --
  - Agriculture
  - Economic Planning and Development
  - Environmental Quality
  - Highways
- Wyoming State Engineer
- Wyoming Water Development Commission

Source: Branch of Planning Support - 10/85