

HISTORY OF
THE STATE
WATER RESOURCES
RESEARCH INSTITUTE
PROGRAM
by James S. Burton

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UNITED STATES DEPARTMENT OF THE INTERIOR

WILLIAM P. CLARK, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

For additional information
write to:

Chief Hydrologist
U.S. Geological Survey
Water Resources Division
424 National Center
Reston, Virginia 22092

Copies of this report can be
purchased from:

U.S. Geological Survey
Western Distribution Branch
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HISTORY OF THE STATE WATER RESOURCES

RESEARCH INSTITUTE PROGRAM

by James S. Burton

ABSTRACT

The State Water Resources Research Institute Program and a national program in water resources research evolved from the Water Resources Research Act of 1964, as amended, the Water Research and Development Act of 1978, Public Law 96-457, and the Water Research and Development Act of 1984. These laws authorized the following components of the Institute Program: (1) the annual allotment and matching grants program for the institutes, and (2) the additional and saline water research programs for organizations in addition to the State Water Resources Research Institutes. The State Water Resources Research Program has been administered by the Office of Water Resources Research (OWRR) (1964-1974), the Office of Water Research and Technology (OWRT) (1974-1982), the Office of Water Policy (OWP) (1982-1983), and the U.S. Geological Survey (USGS) (1983-present).

INTRODUCTION

The State Water Resources Research Institute Program, established in 1964, consists of 54 Water Resources Research Institutes located at land-grant universities in each of the 50 States and Puerto Rico, the District of Columbia, Guam, and the Virgin Islands. The objectives of the program as stated in the Water Resources Research Act of 1964, as amended, are:

- (1) To develop through research new technology and more efficient methods for resolving local, State, and national water resources problems,
- (2) To train water scientists and engineers through on-the-job participation in research work, and
- (3) To facilitate water research coordination and the application of research results by means of information dissemination and technology transfer (Office of Water Resources Research, 1974 Annual Report, p. 1).

The history of the State Water Resources Research Institute Program will be discussed in terms of (1) the legislative history authorizing the program, and (2) the following components of the State Water Resources Research Institute Program:

- research
- training
- information dissemination and technology transfer.

LEGISLATIVE HISTORY

The State Water Resources Research Institute Program evolved from the following legislation: (1) Water Resources Research Act of 1964, Public Law 88-379; (2) Amendments to Public Law 88-379; (3) Water Research and Development Act of 1978, Public Law 95-467; (4) Public Law 96-457; and (5) Water Resources Research Act of 1984, Public Law 98-242. This section discusses the impact of legislation on the operation of the Institute program.

Water Resources Research Act of 1964, Public Law 88-379

The State Water Resources Research Institute Program along with a national program on water resources research can be traced to the establishment of the Senate Select Committee on National Water Resources. On April 20, 1959, Senate Resolution 48 established the Select Committee on National Water Resources (Water Resources, Hearings, 86th Congress, 1st Session, October 7, 1959, p. 1). The purpose of the Committee was to:

* * * make exhaustive studies of the extent to which water resource activities in the United States are related to the National interest, and the extent and character of water resource activities, both governmental and nongovernmental, that can be expected to be required to provide the quantity and quality of water for use by the population, agriculture, and industry between the present time and 1980, along with suitable provision for related recreational and fish and wildlife values, to the end that such studies and the recommendations based thereon may be available to the Senate in considering water resources policies for the future (Water Resources, Hearings, 86th Congress, 1st Session, October 7, 1959, p. 3).

Additionally, Senate Resolution 48 authorized the Committee to direct its attention to the

* * * character of legislation that may encourage the adoption of new technical methods and improved process for increasing the usefulness of available water resources, including but not limited to weather modification, evaporation and evapotranspiration reduction, desalination of saline and brackish waters, seepage control, wastewater salvage, and the application of nuclear energy (Water Resources, Hearings, 86th Congress, 1st Session, October 7, 1959, p. 3).

The Committee elected the late Senator Robert S. Kerr of Oklahoma as its Chairman.

The Senate Select Committee held extensive hearings across the Nation from October 1959 to May 1960. Based on those hearings, the Committee filed its report on January 30, 1961. Recommendation Number 3 of the Committee's report stated:

3. The Federal Government should undertake a coordinated scientific research program on water. This should include both research into ways to increase efficiency in the use of water required to produce manufactured goods and crops. The Committee recommends that existing programs be strengthened by taking the following action:

- (a) Expanding the program of basic research dealing with atmospheric physics, solar activity, hydrology of groundwater movement and recharge, the physical chemistry and molecular structure of water, photosynthesis, climatic cycles, and other natural phenomena associated with water in all its forms. Such research is essential to a major breakthrough in such fields as short- and long-range weather forecasting, weather modification, efficient management of underground reservoirs, evaporation reduction, desalination, and pollution abatement, as well as to major improvements in works for the storage and control of water.
- (b) Providing for a more balanced and better constructed program of applied research for increasing water supplies through desalinization, weather modification, and evaporation, and evapotranspiration reduction.
- (c) Providing for an expanded program of applied research for water conservation. Special emphasis should be given to research on improved waste treatment methods, on ways of increasing efficiency in the agricultural use of water, on fish and wildlife needs, and on methods of system planning for optimum development of water resources of river basins.
- (d) Evaluating completed projects with a view to determining modifications to enable them more effectively to meet changing needs, to provide better guidelines for future projects, and to better determine their effect on the local, regional, and national economy.

The Executive Branch should be requested to review present research programs in the field of water and to develop a coordinated program of research designed to meet the foregoing objectives. This should be submitted to Congress in January 1962, so that it can be considered along with the budget estimates for the 1963 fiscal year (U.S. Congress, Senate, Report No. 29, 87th Congress, pp. 18-19).

President Kennedy, on February 23, 1961, in his natural resources message to Congress, advised that he had asked the National Academy of Sciences to give him a report on the situation regarding scientific research on all natural resources (Congressional Record, Senate, 88th Congress, v. 109, pt. 1, p. 203; U.S. Congress, House Document No. 94, 87th Congress, 1st Session, p. 2). Pending recommendations from the Academy, President Kennedy directed his science advisor and the Federal Council for Science and Technology to "review ongoing Federal research activities in the field of natural resources and to determine ways to strengthen the total Government research effort relating to natural resources" (U.S. Congress, House Document No. 94, 87th Congress, 1st Session, p. 2). Following up on the President's request, the Federal Council for Science and Technology (FCST) established a subcommittee on Water Resources Research under its Committee on Natural Resources to review water resources research programs (Congressional Research Service, 1976, p. 16).

Before any studies were completed, however, the President, in January 1962, submitted his budget for fiscal year 1963 containing a proposal to establish an Institute of Water Research within the Geological Survey (Congressional Research Service, 1976, p. 16; the Budget of the United States for Fiscal Year ending June 30, 1963, Appendix, p. 488). The House Committee on Appropriations deleted this proposal "because it was felt that inadequate time had been spent in developing the expanded program and in determining how it should be coordinated with the work of other Federal water-related agencies" (Congressional Research Service, 1976, p. 16).

The Anderson Bill

Senator Clinton P. Anderson, as Chairman of the Interior Affairs Committee, in May 1962, "set in motion a Committee survey of water resources research in the Federal agencies, in land grant colleges and universities, and in a sampling of non-land grant colleges, universities, foundations, private firms, and by individuals." (Strong, B. J., Professional Staff Member, U.S. Senate, Interior and Insular Affairs Committee, written communication, 1964). The Committee received prompt responses and many of the conclusions which grew out of the survey were incorporated in a bill, S. 3579, which Senator Anderson introduced in the Senate on July 27, 1962.

Senator Anderson following the Committee's suggestion modeled Title I of S. 3579 after the Hatch Act of 1887, which created the state agricultural experiment stations system. Title I of the Bill authorized an "appropriation of \$75,000, increasing to \$100,000 to each of the States to help finance a college-wide or university-wide water resources research institute at its land-grant school, or schools..." (Congressional Record, Senate, 87th Congress, 2nd Session, pt. 11, p. 14942). The Bill also authorized "appropriation of an additional \$1 million, increasing to \$5,000,000 in the fifth year, which the Secretary of the Interior may use to match State, local, or donated funds for specific water research projects at these institutes..." (Congressional Record, 87th Congress, 2nd Session, v. 108, pt. 11, p. 14942).

Title II authorized the Secretary of the Interior to establish a Water Resources Service in the Department to administer the programs of the Bill. Title II also authorized a second, equal fund to be used for "matching, or for grants or contracts with any colleges and universities, private foundations, private concerns, or individuals to undertake useful water research work which could not otherwise be done." (Congressional Record, Senate, 87th Congress, 2nd Session, v. 108, pt. 11, p. 14942.)

The Bill, S. 3579, served as the bases for discussions between Congress and the Executive agencies and non-governmental groups on the merits of the proposal and its refinement (Strong, B. J., Professional Staff member, U.S. Senate, Interior and Insular Affairs Committee, written communication, 1964).

Senator Anderson, on January 14, 1963, reintroduced his proposal for a water resources research act as S. 2 in the 88th Congress (Congressional Record, Senate, 88th Congress, v. 109, pt. 1, p. 207). The Title I provisions of S. 2 and S. 3579 were about the same. However, the authorization of a water resources service in the Department of the Interior was eliminated in Title II of S. 2 and placed in Title III of S. 2.

Senator Anderson noted that he introduced S. 2 purposely near the close of the first session of the 88th Congress in order to permit "discussion, improvement, and refinement of the bill in the period between Congresses" (Congressional Record, 88th Congress, v. 109, pt. 1, p. 210). Furthermore, Senator Anderson stated that a rough draft of the measure had already been submitted to a number of college and university officials soliciting their suggestions. On July 17, 1964, S. 2 became Public Law 88-379, the Water Resources Research Act of 1964. See the report entitled, "The Water Resources Research Act of 1964: An Assessment," Committee print, Senate Committee on Interior and Insular Affairs, 94th Congress, 2nd Session, March 1976, pp. 19-38, for additional details on S. 2 including House hearings, Senate hearings, amendments, the conference report, and the signing of the enrolled bill by President Johnson.

Provisions of Public Law 88-379

Public Law 88-379 authorized two types of research programs, Title I and Title II. Title I authorized an annual allotment program to be carried out by a "competent and qualified water resources research institute or center located in each of the 50 States and the Commonwealth of Puerto Rico and a matching grant program whereby Federal funds were matched on a dollar-for-dollar basis by non-Federal funds to meet the necessary expenses of specific water resources research projects which could not otherwise be undertaken" (OWRR, 1965 Annual Report, p. 6). Title II of the Act authorized the Secretary of the Interior to "make grants, contracts, matching, or other arrangements with educational institutes (other than those establishing institutes under Title I of this Act), private foundations or other institutions; with private firms and individuals; and with local, State, and Federal Government agencies, to undertake research into any aspect of water problems related to the mission of the Department of the Interior" (Public Law 88-379, 78 Stat. 331).

Title I of the Act authorized \$75,000 to be appropriated to each of the States in the first year, \$87,500 in the second, and \$100,000 each year thereafter. The program was initiated in fiscal year 1965 when each State and Puerto Rico established a water resources research institute (Congressional Research Service, 1976, p. 3).

The Act authorized each institute

* * * to plan and conduct and/or arrange for a component or components of the college or university with which it is affiliated to conduct competent research, investigations, and experiments of either a basic or practical nature, or both, in relation to water resources and to provide for training of scientists through such research, investigations, and experiments * * * (Public Law 88-379, 78 Stat. 329).

The research and training included but were not limited to the following areas:

- aspects of the hydrologic cycle
- supply and demand for water

- conservation and best use of available supplies of water
- methods of increasing such supplies
- economic, legal, social, engineering, recreational, biological, geographic, ecological, and other aspects of water problems (Public Law 88-379, 78 Stat. 329).

Title I of the Water Resources Research Act of 1964 also authorized a matching grant program for the institutes whereby research funds made available for the institutes could be matched on a dollar-for-dollar basis by funds from non-Federal sources (Public Law 88-379, Stat. 330). The following funds were authorized for this activity: 1965, \$1,000,000; 1966, \$2,000,000; 1967, \$3,000,000; 1968, \$4,000,000; and 1969 and each of the succeeding years, \$5,000,000.

Title II authorized the appropriation of \$1,000,000 for the fiscal year 1965 and \$1,000,000 for each of the nine fiscal years thereafter. However, President Johnson did not request funds to implement Title II of the Act because he objected to the provision in the Bill (the Water Resources Research Act of 1964) that required the Secretary of the Interior, in administering the program, to obtain the approval of the committees of the House and Senate for each research grant and contract. This provision according to President Johnson "* * * violated the spirit of the constitutional requirements of separation of power between the executive and legislative branch * * *" (Congressional Research Service, 1976, p. 38). Also the President felt that delays would result from the suggested procedure which would be detrimental to both scientific research and "the timely achievement of the important mission of the legislation" (Congressional Research Service, 1976, p. 38).

In summary, the Water Resources Research Act of 1964 authorized two research programs for the Institutes under Title I, an appropriated allotment to each State and a matching grant program whereby research funds to the institutes would be matched on a dollar-for-dollar basis by funds from non-Federal sources. The Act under Title II also authorized funds for additional water resources research to be undertaken by educational institutions other than those established under Title I of the Water Resources Research Act of 1964. These institutions included private foundations or other institutions, firms, and individuals, and local, State, and Federal government agencies. However, President Johnson did not request funds for Title II.

Amendments to the Water Resources Research Act of 1964

Public Law 89-404

On April 19, 1966, the Water Resources Research Act of 1964, Public Law 88-379, was amended by Public Law 89-404 to change the amounts of funds authorized to be appropriated under Title II of the Act, to provide that all contracts and grants be submitted to the Congress sixty days prior to funding, and to change the date the Secretary of the Interior would report to the President and the Congress on the disposition of funds during the preceding calendar year.

Pertaining to funds appropriated to the Secretary of the Interior under Title II of the Water Resources Act of 1964, Public Law 89-404 changed the amount of funds authorized to be appropriated to the Secretary of the Interior from \$1,000,000 in fiscal year 1965 and \$1,000,000 in each of the nine fiscal years thereafter to \$5,000,000 for the fiscal year 1967, \$6,000,000 for the fiscal year 1968, \$7,000,000 for the fiscal year 1969, \$8,000,000 for the fiscal year 1970, \$9,000,000 for the fiscal year 1971, and \$10,000,000 for each of the fiscal years 1972-1976, inclusive.

Subsection (b) of Public Law 89-404 provided that all grants and contracts, and matching or other arrangements must be submitted to the President of the Senate and to the Speaker of the House of Representatives sixty days prior to being entered into under subsection (a) of Section 200 of the Law. The provision allowing the House and Senate Interior Committees to disapprove contracts was deleted (Public Law 89-404).

Additionally, the Law repealed the last paragraph of section 104 of the Water Resources Research Act which stated

The Secretary shall make an annual report to the Congress of the receipts and expenditures and work of the institutes in all States under the provisions of this Act. His report shall indicate whether any portion of an appropriation available for allotment to any State has been withheld and, if so, the reasons thereof.

and added section 307 which indicated that the Secretary of the Interior must make a report to the President and the Congress on or before March 1 of each year showing the following:

- the disposition during the preceding calendar year of money appropriated to carry out the Water Resources Research Act
- the results expected to be accomplished through projects financed during that year under sections 101 and 200 of the Act
- the conclusions reached or other results achieved by those projects which were completed during the year.

This reporting date was changed to July 1 in the Water Resources Research Act of 1964 to coincide with the beginning of the fiscal year (Public Law 89-404).

Public Law 92-175

Public Law 92-175 enacted on December 2, 1971, amended the Water Resources Research Act of 1964 by

- increasing the authorized allotment per institute from \$100,000 to \$250,000
- designating new research institutes at the District of Columbia, the Virgin Islands, and Guam

- authorizing that not more than \$125,000 be appropriated for each of the new institutes for the fiscal year 1973 and not more than \$200,000 be appropriated for each new institute for fiscal year 1974
- adding scientific information dissemination as an activity of institutes, and
- adding the requirement that annual programs submitted to the Secretary of the Interior for approval include assurances to the satisfaction of the Secretary that such programs were developed "in close consultation and collaboration with leading water resources officials within the State" (Public Law 92-175).

Water Research and Development Act of 1978 (Public Law 95-467)

On October 17, 1978, President Carter signed into law the Water Research and Development Act of 1978 (Public Law 95-467). The Act repealed the Water Resources Research Act of 1964 (Public Law 88-379, 78 Stat. 329; 42 U.S.C. 1961 et. seq.), as amended, and the Saline Water Conversion Act of 1971 (Public Law 92-60, Stat. 159; 42 U.S.C. 1959 et. seq.) as amended. This Act changed the Institute Program in the following manner.

- Expanded scope of the institute functions. The Act of 1978 expanded the scope of the institutes to take into account development as well as research. Instead of focusing only on research, the institutes under the Act of 1978 were designated "research and technology institutes."
- Expanded research areas. The Act of 1978 added saline water conversion and water reuse to the list included in research, investigations, and training.
- Added the responsibility of developing a five-year plan. The Act of 1978 called for the designated State institutes to cooperate with the Secretary of Interior to develop five-year water resources research and development goals and objectives. In addition, the Act of 1978 indicated that the Secretary of the Interior shall develop "a five-year water resources research program in cooperation with the institutes and appropriate water entities, indicating goals, objectives, priorities, and funding requirements" (Public Law 95-467, 92 Stat. 1308).
- Authorized a technology transfer program for the institutes. The Act of 1978 authorized the State institutes to carry out a program of technology transfer and/or information dissemination. According to the Act, any funds appropriated for this purpose were to be made available on a competitive basis to the State institutes, "based on the merit of project or program proposals submitted to the Secretary, for the purpose of transferring research and development results to other organizations for further development, demonstration, and practical application" (Public Law 95-467, 92 Stat. 1307).

- Introduced cost-sharing for the grant program. The Act of 1978 authorized to be appropriated \$150,000 to each participating institute, on a cost-sharing basis, for the fiscal year ending September 30, 1979; and \$175,000 to each participating institute, on a cost-sharing basis, for fiscal year ending September 30, 1980. The Act stipulated that the cost sharing should be on the basis of two Federal shares to not less than one non-Federal share (P.L. 95-467, 92 Stat. 1318).
- Authorized a technology transfer program for the Department of the Interior. The Act authorized the Secretary of the Interior to conduct a research assessment and technology transfer program "which transfers research and development results to other organizations and individuals for further development and practical application to water and water-related problems" (Public Law 95-467, 92 Stat. 1312).

The Act of 1978 authorized appropriations for the fiscal years ending September 30, 1979, and September 30, 1980.

Extension of the Water Research and Development Act of 1978

As indicated above, the Water Research and Development Act of 1978 only authorized the water research program for the fiscal years ending September 30, 1979, and September 30, 1980. On June 3, 1980, the Senate considered the Bill, S. 1640 "to extend certain authorities of the Secretary of the Interior with respect to water resources research and development programs, and for other purposes which had been reported from the Committee on Environment and Public Works..." (Congressional Record, Senate, 96th Congress, 2nd Session, v. 126, pt. 10, p. 13142). The Senate passed an amended version of the Bill.

On September 22, 1980, the House of Representatives considered a similar Bill, H.R. 5340 (Congressional Record, House, 96th Congress, 2nd Session, v. 126, pt. 20, p. 26452). The House passed the bill on September 23, 1980. On the same day, the House considered Senate bill (S. 1640) (Congressional Record, House, 96th Congress, 2nd Session, v. 126, pt. 20, p. 26743). The House amended S. 1640 by substituting the text of H.R. 5340 for that of S. 1640.

On September 24, 1980, the Senate considered the House's amendment to S. 1640 and amended the House amendment (Congressional Record, Senate, 96th Congress, 2nd Session, v. 126, pt. 20, p. 27053). The Senate accepted most of the House's amendments, except that the dollar figures in the Senate amendment were, in total, about halfway between the Senate passed bill and the lower figures of the House (Congressional Record, 96th Congress, House, 2nd Session, v. 126, pt. 17, p. H 10075). The House of Representatives considered S. 1640 on September 30, 1980, and concurred in the Senate amendment to the House amendment (Congressional Record, House, 96th Congress, 2nd Session, v. 126, pt. 17, p. H 10074). On October 15, 1980, Public Law 96-457, an Act to extend certain authorities of the Secretary of the Interior pertaining to water resources research and development and saline water conversion research and development, was approved.

The major provisions of Public Law 96-457 are as follows:

- Extended authorization for the allotment program. P. L. 96-457 authorized to be appropriated "* * * \$150,000 to each participating institute, on a cost-sharing basis, for the fiscal year ending September 30, 1981, and an amount sufficient to provide \$160,000 to each participating institute, on a cost-sharing basis, for the fiscal year ending September 30, 1982" (P.L. 96-457, 94 Stat. 2032).
- Extended authorization of a program of technology transfer and/or information dissemination for the institutes. P.L. 96-457 authorized to be appropriated the following funds for an institute program of technology transfer and information dissemination: \$1,000,000 for the fiscal year ending September 30, 1981, and \$1,000,000 for the fiscal year ending September 30, 1982 (P.L. 96-457, 94 Stat. 2032).
- Extended authorization of the matching grant program. P.L. 96-457 authorized the appropriation of the following funds for the matching grant program: \$8,000,000 for the fiscal year ending September 30, 1981 and \$9,000,000 for the fiscal year ending September 30, 1982 (P.L. 96-457, Stat. 2032).
- Extended contract authority. P.L. 96-457 authorized to be appropriated to the Secretary \$5,200,000 for the fiscal year ending September 30, 1981, and \$8,000,000 for the fiscal year ending September 30, 1982, for making grants to, and financing

* * * contracts and matching or other agreements with qualified educational institutions; private foundations or other institutions; and with private firms and individuals whose training, experience, and qualifications are adequate in his judgment for the conduct of water research and development projects; and with local, State, and Federal Government agencies * * * (P.L. 95-467, 92 Stat. 1308).

Further Reauthorizations and Appropriations

Fiscal Year 1983 Appropriations

The authorization under Public Law 96-457 for funding the programs of OWRT expired at the end of fiscal year 1982 and the Administration did not propose to reauthorize these programs for fiscal year 1983. Consequently, the President's fiscal year 1983 budget did not include funds for any OWRT programs (U.S. Congress, House, 97th Congress, 2nd Session, Department of the Interior and Related Agencies Appropriations for 1983, p. 1032; U.S. Congress, Senate, 97th Congress, 2nd Session, Fiscal Year 1983 Budget Review, 1982, p. 431; U.S. Congress, Senate, 97th Congress, 2nd Session, Department of the Interior and Related Agencies Appropriations for Fiscal Year 1983, p. 2). The Secretary of the Interior decided that the best way to handle the resulting reduced functions and staff at OWRT was within the Bureau of Reclamation (U.S. Congress, House, 97th Congress, 2nd Session, Department of the Interior and Related Agencies Appropriations for 1983, p. 1032).

However, the administration did propose to continue the operation of the Water Resources Scientific Information Center (WRSIC). In testimony before the House Committee on Appropriations, on May 26, 1982, Dr. Garry Carruthers, Assistant Secretary, Land and Water Resources, U.S. Department of the Interior stated:

* * * The WRSIC data base will be an ongoing component of the Department's natural resources information systems. This data base contains 160,000 abstracts of water resources research nationwide. The information is available to scientists, researchers and research managers through remote control terminals and the Government's Remote Console (RECON). * * * We believe it is a valuable asset.* * * (U.S. Congress, House, 97th Congress, 2nd Session, Department of the Interior and Related Agencies Appropriation for 1983, p. 1032).

On August 25, 1982, the Acting Secretary of the Interior issued Secretarial Order No. 3084 terminating the Office of Water Research and Technology and transferring the remaining functions of the Office to the Bureau of Reclamation, the U.S. Geological Survey (USGS), and the Office of Water Policy (OWP) (Secretarial Order No. 3084, August 25, 1982). The functions related to WRSIC went to USGS; the Water Resources Research Institute Program went to the Office of Water Policy and all the other functions including the competitive matching grants Research and Development Program administered through the Institutes, went to the Bureau of Reclamation. The Interior and Related Agencies Appropriations Act (P.L. 97-394 approved December 30, 1982) authorized the apportionment of \$6,350,000 including \$115,000 per Institute for the State Water Resources Research Institute Program and the transfer of \$6,000,000 from the Office of Water Policy to the Bureau of Reclamation (U.S. Congress, Senate Report No. 98-184, p. 59).

Fiscal Year 1984 Appropriations

On September 30, 1983, a conference report (House Report No. 98-399) recommended \$6,350,000 for grants to State water research institutes as described in Title I (except section 105, the matching grant program), P.L. 95-467, be transferred to "Surveys, Investigations, and Research", Geological Survey (House Report No. 98-399, p. 27). The report stated

* * * The managers believe that the expertise of the Geological Survey in a variety of water research areas makes that agency the best qualified to administer, and, where appropriate, to provide scientific support for this cooperative resource research institute program. The Department is expected to administer the program in a manner consistent with its present administration (House Report No. 98-399, p. 28).

Consistent with Congressional action the fiscal year 1984 appropriations legislation (P.L. 98-146), the Secretary of the Interior through a Secretarial Order abolished the Office of Water Policy and transferred the functions related to the State Water Resources Research and Technology Institute Program to the U.S. Geological Survey (Secretarial Order No. 3096, 1983).

Water Resources Research Act of 1984

In May 1983, the Senate passed S. 684, the "Water Resources Research Act of 1983," authorizing the Institute Program (Congressional Record, Senate, 98th Congress, 1st Session, pp. S 7610-S 7611; Senate Report No. 98-91). The House, in October 1983, passed a companion bill, H.R. 2911, as amended (Congressional Record, House, 98th Congress, 1st Session, p. H 8860). The Senate bill called for an annual program level of \$21,000,000 and the House bill called for a \$60,000,000 annual program. After passing H.R. 2911, the House amended the Senate bill, S. 684, by striking out all after the enacting clause of S. 684 and substituting in its place provisions of H.R. 2911 (Congressional Record, House, 98th Congress, 1st Session, p. H 8868).

On November 18, 1983, the Senate concurred with the House amendments with an amendment introduced by Senator Abdor. Senator Abdor's amendment set the annual funding level at \$36,000,000 for each of the five fiscal years, beginning in fiscal year 1985. This involved three separate programs.

- \$10,000,000 to be available annually to the State water research institutes,
- \$20,000,000 to be available annually for the matching research grants, and
- \$6,000,000 to be available yearly in technology development programs (Congressional Record, Senate, 98th Congress, 1st Session, p. S 16897).

The House agreed to the Senate amendment to the House amendment to the text of S. 684 and cleared S. 684 for the President's signature (Congressional Record, House, 98th Congress, 2nd Session, pp. H 534-H 537). However, the President vetoed the bill on February 21, 1984 (Congressional Record, Senate, 98th Congress, 2nd Session, p. S 1389; Weekly Compilation of Presidential Documents, v. 20, p. 250). In March 1984, the Senate and the House overrode the President's veto to enact the Water Resources Research Act of 1984, Public Law 98-242 (Congressional Record, Senate, 98th Congress, 2nd Session, p. S 2990; Congressional Record, House, 98th Congress, 2nd Session, p. H 1910).

The provisions of the Water Resources Research Act of 1984 are as follows (P.L. 98-242, 98 Stat. 100).

- Establishes water research and technology institutes. Sec. 104(a) of the Act, subject to the approval of the Secretary, permits one water resources research and technology institute, center, or equivalent agency to be established in each State. The term "State" includes the Commonwealth of Puerto Rico, the District of Columbia, the Virgin Islands, Guam, American Samoa, the Commonwealth of the Mariana Islands, and the Trust Territory of the Pacific Islands.

- Stipulates matching for grants to the institutes. Sec. 104(a) of the Act requires grants made to each institute to be matched on a basis of "no less than one non-Federal dollar for every Federal dollar during the fiscal years ending September 30, 1985, and September 30, 1986, one and one-half non-Federal dollars for each Federal dollar during the fiscal years ending September 30, 1987, and September 30, 1988, and two non-Federal dollars for each Federal dollar during the fiscal year ending September 30, 1989.
- Requires an evaluation of institutes. The Act requires the Secretary of the Interior to establish procedures "for a careful and detailed evaluation of each institute to determine that the quality and relevance of its water resources research and its effectiveness as an institution for planning, conducting, and arranging for research warrants its continued support under this section in the National interest.* * *"
- Authorizes grants on a dollar-for-dollar matching basis. Section 105 of the Act authorizes the Secretary of the Interior to make additional grants, on a dollar-for-dollar matching basis, to the institutes, "* * * as well as to other qualified educational institutions, private foundations, private firms, individuals, and agencies of local or State Government for research concerning any aspect of a water resource-related problem which the Secretary may deem to be in the national interest."

The Act authorizes to be appropriated to the Secretary \$10,000,000 for the purpose of carrying out Sec. 104 and \$20,000,000 for the purpose of carrying out Sec. 105 for each of the fiscal years ending September 30, 1985, through September 30, 1989.

BUDGET HISTORY

Table 1 summarizes the authorized and appropriated funds for the State Water Resources Research Institute Program from fiscal year 1965 through fiscal year 1983. It should be noted that except for the allotment program for fiscal years 1966 to 1970 and 1983 to 1984, the program was not funded at the authorized levels. Data for Table I were derived from the following sources: P.L. 88-379; P.L. 89-404; P.L. 95-84; P.L. 95-467; P.L. 96-457; P.L. 97-394; OWRR: 1973 Annual Report, p. 183; Annual Report 1975, p. 28; Annual Report 1976, p. 72; Annual Report 1979, p. 97; 1980-81-82 Annual Report, Unpublished; Congressional Research Service, March 1976, p. 56; U.S. Congress: Senate, Department of the Interior and related agencies appropriations for 1980, 96th Congress, 1st Session, Part 1, Justification Material, p. 245; Senate, Department of the Interior and related agencies appropriations for 1981, 96th Congress, 2nd Session, p. 286; House, Department of the Interior and related agencies appropriations for 1981, 96th Congress, 2nd Session, Part 5, p. 745; House, Department of the Interior and related agencies appropriations for 1981, 2nd Session, part 1, Justification of Budget Estimates, pp. 283-525; House, Department of the Interior and related agencies appropriations for 1982, 97th Congress, 1st Session, Part 1, Justification of Budget Estimates, pp. 316, 324, 329, and 342; House, Department of the Interior and related agencies appropriations for 1983, 97th Congress, 2nd session, Part 1, Justification of Budget Estimates, pp. 339-341; H.J. Res. 599; House Report

Table 1. Federal Funds Appropriated for the Water Resources Research Institute Program from Fiscal Year 1965 Through Fiscal Year 1984
(In thousands of dollars)

Fiscal Year	Annual Allotment		Matching Grants		Title II		Saline Water Conversion Research		Additional (focused) Water Research	
	Auth	Appro	Auth	Appro	Auth	Appro	Auth	Appro	Auth	Appro
1965	3,825	2,985	1,000	250	1,000					
1966	4,462	4,462	2,000	1,500	1,000					
1967	4,462	4,462	3,000	2,000	5,000					
1968	5,100	5,100	4,000	3,000	6,000	2,000				
1969	5,100	5,100	5,000	3,000	7,000	2,000				
1970	5,100	5,100	5,000	3,000	8,000	2,000				
1971	12,750(a)	5,100	5,000	3,000	9,000	3,500				
1972	12,750	5,100	5,000	3,000	10,000	4,300				
1973	13,125(b)	5,100	5,000	3,000	10,000	4,300				
1974	13,350	5,640	5,000	3,000	10,000	3,170				
1975	13,500	5,730	5,000	3,000	10,000	3,170	800	800		
1976	13,500	7,162(c)	5,000	3,750(c)	10,000	4,099(c)	1,710	1,710(c)		
1977	13,500	5,730	5,000	3,200	-- (d)	--	2,000	2,000		
1978	13,500	5,730	5,000	3,500	10,000(e)	2,290	1,500	1,500		
1979	8,100(f)	5,940	6,000	4,980	--	--	12,000(g)	2,400	5,200	2,800
1980	9,450(f)	5,940	8,000	4,980	--	--	14,000(g)	3,000	8,000	3,600
1981	8,100(h)	6,210	8,000	5,480	--	--	14,000(g)	3,010	5,200	3,400
1982	8,640(h)	5,961(i)	9,000	0	--	--	17,400(g)	384	8,000	912
1983	6,210	6,210	--	0	--	--	--	5,000(j)		
1984	6,210	6,210	--	0	--	--	--	--		
TOTAL	181,372	108,972	91,000	53,640	97,000	30,829	63,410	19,804	26,400	10,712

- (a) Authorized level for Title I, Sec. 100 of Public Law 88-379 increased
- (b) Appropriations authorized for the District of Columbia, the Virgin Islands, and Guam
- (c) Includes funds appropriated for the transition quarter (TQ) (Institutes - \$5,730,000 FY 1976 appropriation, \$1,432,000 TQ appropriation; Matching Grants - \$3,000,000 FY 1976 appropriation, \$750,000 TQ appropriation; Additional Water Resources Research - \$3,353,000 FY 1976 appropriation, \$746,000 TQ appropriation; Saline Water Conversion - \$1,410,000 FY 1976 appropriation, \$300,000 TQ appropriation)
- (d) Title II programs not authorized in FY 1977
- (e) Title II reauthorized by Public law 95-84
- (f) Does not include funds authorized for an institute technology transfer program, \$750,000 for FY 1979 and \$1,350,000 for FY 1980
- (g) Includes authorized appropriations for saline and other impaired water research and development
- (h) Does not include funds authorized for an institute technology program, \$1,000,000 for FY 1980 and 1981
- (i) Includes an appropriation fo \$3,216,000 for FY 1982 and \$2,745,000 deferred from FY 1981
- (j) Saline water conversion and additional (focused) water research combined

No. 97-834, Senate Report No. 98-184. In addition to Federal funds, there was a significant contribution from non-Federal sources reflective of the cooperative aspects of the Program. For the period fiscal year 1965 to fiscal year 1976 including the transition quarter, Federal funds appropriated to the Institutes amounted to \$124 million of the \$192 million for the Institute program, making a match of close to two to one for Federal dollars to non-Federal dollars. In fiscal years 1979 and 1980, the total scope of the institute program exceeded \$82 million, including \$3.6 million from the private sector, \$35 million of State funds, and \$19.8 million of other Federal funds (non-OWRT funds). Funds appropriated to OWRT available to the Institutes in the amount of \$23.5 million represented slightly more than one-fourth of the total Institute program for fiscal years 1979 and 1980. Table 2 shows the significance of non-OWRT Federal, State, and private monetary contributions to the Program for fiscal year 1980.

STATE WATER RESOURCES RESEARCH INSTITUTE PROGRAM

In fiscal year 1965, the State Water Resources Research Institute Program authorized by Public Law 88-379 was initiated when each State and Puerto Rico established a water resources research institute for a total of 51 institutes. Originally only fourteen State Water Resources Research Institutes were funded at \$75,000 each through the First Supplemental Appropriation Act of October 7, 1964 (Renne, 1966, p. 471; Warman, J. C., private communication, April 1984). Later, the other thirty-seven institutes received a little over \$52,000 through the Second Supplemental Appropriation Act of May 3, 1965 (Renne, 1966, p. 471). By the end of fiscal year 1965, the 51 research institutes were working on several hundred new projects (OWRR, 1965 Annual Report, p. i). Examples of research projects initiated during fiscal year 1965 are as follows:

- Water quality problems. In their respective fiscal year 1965 allotment programs, the States of Pennsylvania, West Virginia, and Ohio, began 10 projects dealing with separate aspects of acid mine drainage into streams. The studies involved "research on the geochemical behavior of iron and managanese in a reservoir fed by streams containing acid mine drainage water; algae relationships to the recovery of acid mine streams; effects of acid mine drainage on fish and wildlife and vascular aquatic plants; microbiological research; means of neutralizing acid mine streams; and development of a "'natural' laboratory to study acid mine drainage better" (OWRR, 1965 Annual Report, p. 22).
- Water resources planning. Of the 89 projects supported by the 10 Missouri River Basin States through the allotment and matching grant programs, 83 pertained to planning the water resources development in this large area. These projects varied from those related "directly to optimum plans for water resources development, to basic studies on the hydrologic cycle, chemical and physical properties of water, conservation of water supplies, water quantity and quality studies, improvement of engineering works, and other studies, which will provide information of use in water resource planning and management" (OWRR, 1965 Annual Report, p. 22).

TABLE 2

ALLOCATION AND SOURCES OF INSTITUTE FUNDS 1980

ALL INSTITUTES	ACTIVITY	OWRT FUNDS		NON-OWRT FUNDS		TOTAL
		ALLOTMENT	OTHER	FEDERAL	STATE	
	Research and Development Program					
	1. Allotment Projects	3,697,647	NA	170,043	3,094,870	6,992,129
	2. OWRT Matching Grant Projects	NA	4,585,559	NA	4,363,864	9,470,096
	3. OWRT Focused Research Projects	NA	946,418	--	896,092	1,851,248
	4. Non-OWRT Projects	NA	NA	9,122,263	4,934,519	15,046,236
	Subtotal	3,697,647	5,531,977	9,292,306	13,289,345	33,359,709
	Five-Year Water Research Priorities Development	243,543	9,350	1,000	283,535	540,428
	State Research Program Development and Coordination	609,892	--	1,000	1,293,406	1,918,298
	Technology Transfer and Information Dissemination	486,160	595,987	71,448	1,107,119	2,305,039
	Administration	703,359	NA	2,400	1,129,335	1,905,094
	TOTAL	5,740,601	6,137,314	9,368,154	17,102,740	40,028,568

This table depicts the allocation and sources of funds within the State Institute programs based on data furnished by the Institutes. It aggregates the amounts shown in the Tables for the individual Institutes, in Section I-C of the Appendix in the unpublished OWRT 1980-81-82 Annual Report. Columns show funding by sources; activities are those mandated by P.L. 95-467. Variation in individual University accounting practice has required some adjustments to assure consistency in reporting. Data may not be consistent with audited data except for gross totals. The column, OWRT FUNDS "OTHER" shows funds awarded to Institutes by OWRT under its Matching Grant, Focused Research, and Technology Transfer programs. Amounts shown in the column NON-OWRT "STATE" include budgeted support, other program support, and in-kind contributions. The "PRIVATE" column includes funds from private sources and institutions, regional councils, and municipalities.

Clerical expenses, payroll, administration and other overhead are included under "ADMINISTRATION." Professional expenses are distributed among appropriate activity categories.

SOURCE: OWRT Annual Report 1980-81-82, unpublished report; U.S., Congress, Senate, 1981, Department of the Interior and related agencies appropriations for fiscal year 1982, 97th Congress, 1st session, p. 654.

- Conservation. In the semi-arid, or arid West and Southwest, attention was focused on conservation and best use of available water supplies and means of developing new sources. For example, in Arizona, research covered such subjects as "development of surface storage facilities for paved catchment runoff water; artificial groundwater recharge of paved catchment runoff water; selection and testing of materials for surfacing watershed areas; and development of methods for making potable water from paved catchment runoff water" (OWRR, 1965 Annual Report, p. 23).

The California Center projects dealt with "the potential usefulness of transpiration retardants; optimization of water resources development; a dynamic input-output and mathematical programming analysis of western regional water resources; and the impact of water export on the area of origin" (OWRR, 1965 Annual Report, p. 23).

New State Water Resources Research Institutes

The 1971 amendments to the Water Resources Research Act of 1964 authorized OWRR support for the three new State Water Resources Research Institutes in the District of Columbia, the Virgin Islands, and Guam. Although these institutes were established in fiscal year 1973, appropriations were not made available for the operation of these new institutes until fiscal year 1974. In fiscal year 1974, the original 51 State Institutes each received \$110,000 and the newly authorized institutes received \$10,000 each (OWRR, 1974 Annual Report, p. 3). In subsequent years all of the 51 institutes received equal funding under the cooperative program.

Research Program Development - Title I

Establishing Research Priorities at the National Level

In administering the State Water Resources Research Institute Program, OWRR used a report, "A Ten-Year Program of Federal Water Resources Research," as one of its principal guides in identifying high priority research needs in February 1966.

Research projects conducted under Title I of the Water Resources Research Act of 1964 were classified according to the nine research categories of the Federal Council for Science and Technology Committee (FCST) on Water Resources Research (OWRR, 1966 Annual Report, Appendix C). These categories are shown in Figure 1.

The allocations of funds to research in these categories are shown in Figures 2 through 4. Figures 2 and 3 show the percentage of research effort in terms of annual allotment, matching grant, Title II, focused, and saline water conversion research funds spent in the FCST categories for the fiscal years 1965-1976 and 1979-1980, respectively. Figure 4 shows the percentage of annual allotment funds spent in the FCST categories for fiscal year 1983. The fiscal years covered in Figures 2 through 4 are the only ones for which data are readily available.

- I. Nature of Water: A - Properties of Water; B- Aqueous Solutions.
- II. Water Cycle: A - General; B - Precipitation; C - Snow, Ice, and Frost; D - Evaporation and Transpiration; E - Streamflow and Runoff; F - Ground Water; G - Water in Soils; H - Lakes; I - Water and Plants; J - Erosion and Sedimentation; K - Chemical Processes; L - Estuaries.
- III. Water Supply Augmentation and Conservation: A - Saline Water Conversion; B - Water Yield Improvement; C - Use of Water of Impaired Quality; D - Conservation in Domestic Use and Municipal Use; E - Conservation in Industry; F - Conservation in Agriculture.
- IV. Water Quantity Management and Control: A - Control of Water on the Surface; B - Ground Water Management; C - Effects on Water of Man's Non-water Activities; D - Watershed Protection.
- V. Water Quality Management and Protection: A - Identification of Pollutants; B - Sources and Fate of Pollution; C - Effects of Pollution; D - Waste Treatment Processes; E - Ultimate Disposal of Wastes; F - Water Treatment and Distribution; G - Water Quality Control.
- VI. Water Resources Planning: A - Techniques of Planning; B - Evaluation Process; C - Cost Allocation, Cost Sharing, Pricing and Repayment; D - Water Demand; E - Water Law and Institutions; F - Non-structural Alternatives; G - Ecologic Impact of Water Development.
- VII. Resources Data: A - Network Design; B - Data Acquisition; C - Evaluation, Processing and Publication.
- VIII. Engineering Works: A - Structures; B - Hydraulics; C - Hydraulic Machinery; D - Soil Mechanics; E - Rock Mechanics and Geology; F - Concrete; G - Materials; H - Rapid Excavation; I - Fisheries Engineering.
- IX. Manpower, Grants and Facilities: A - Education - Extramural; B - Education-In-Hours; C - Research Facilities; D - Grants, Contracts, Contracts and Research At Allotments.
- X. Scientific and Technical Information: A - Acquisition and Processing; B - Reference and Retrieval; C - Secondary Publication and Distribution; D - Specialized Information Center Services; E - Translation; F - Preparation of Reviews

Figure 1. Water Resources Research Categories

Source: OWRP Annual Report 1976, p. 79.

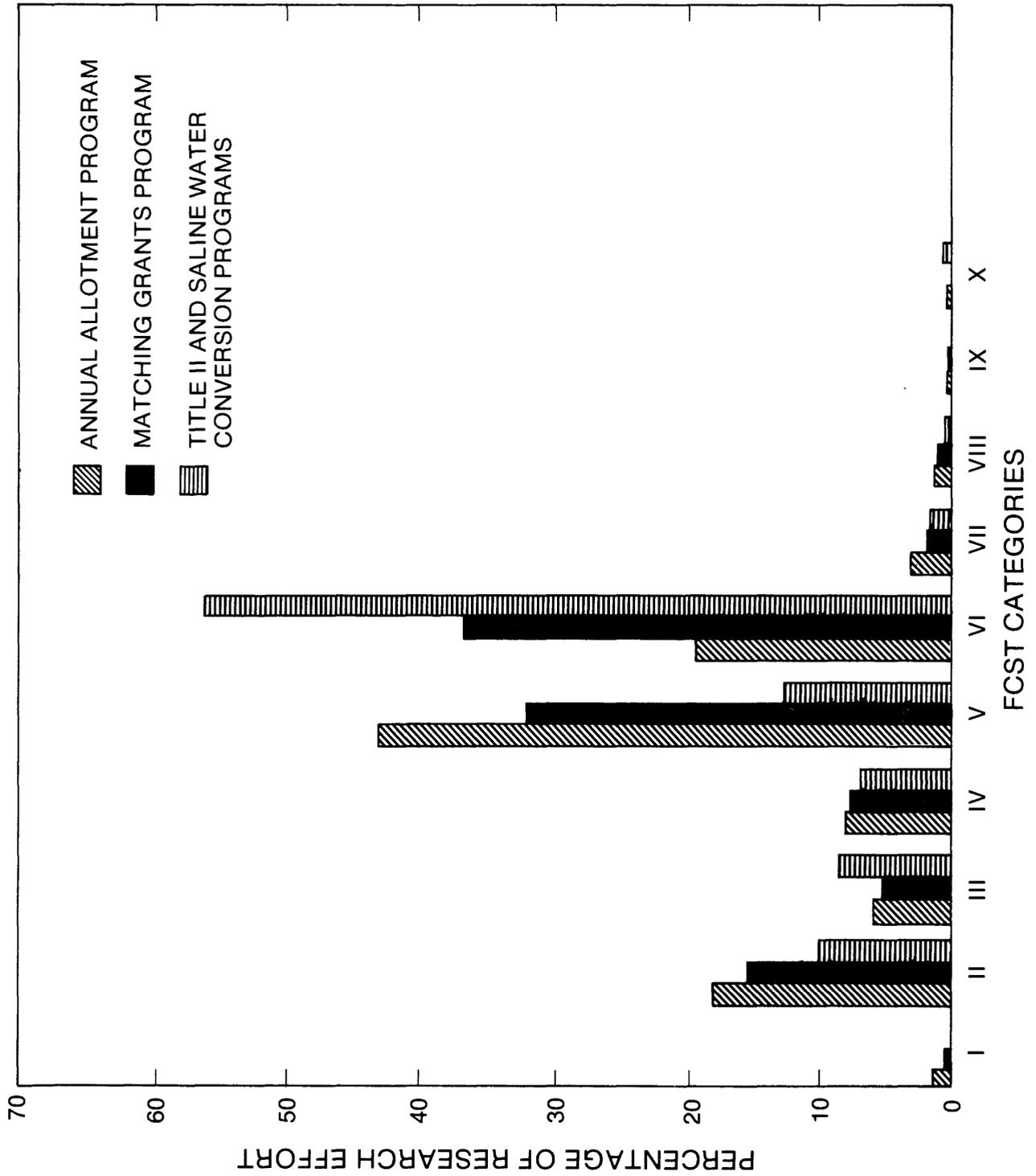


Figure 2. Percentage of research effort by Annual Allotment Program, Matching Grants Program, and Title II, focused and saline water conversion programs as related to the FCST categories, fiscal years 1965-76.

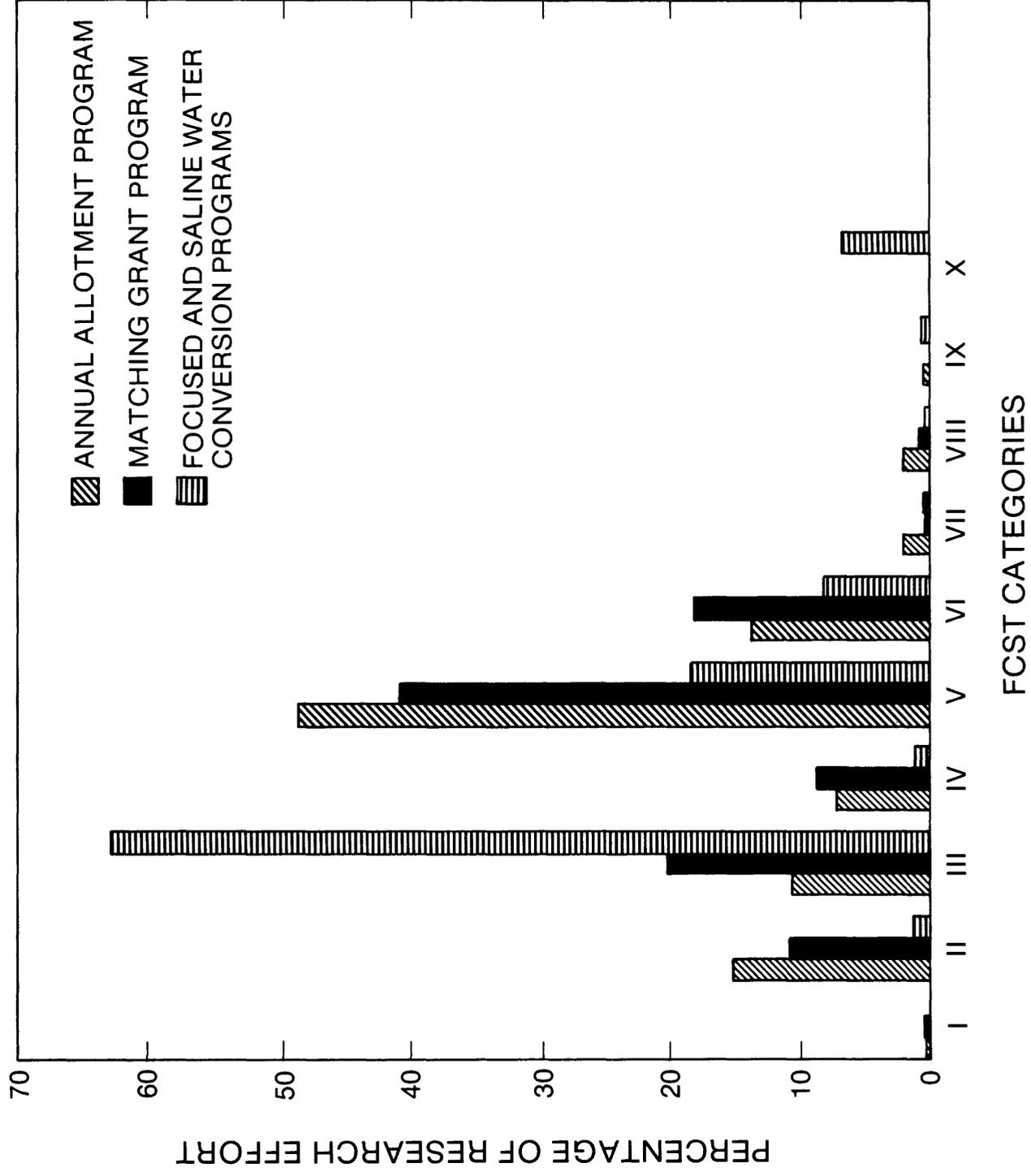


Figure 3. Percentage of research effort expended in FCST categories for the annual allotment, matching grant, focused, and saline water conversion programs, fiscal years 1979-80.

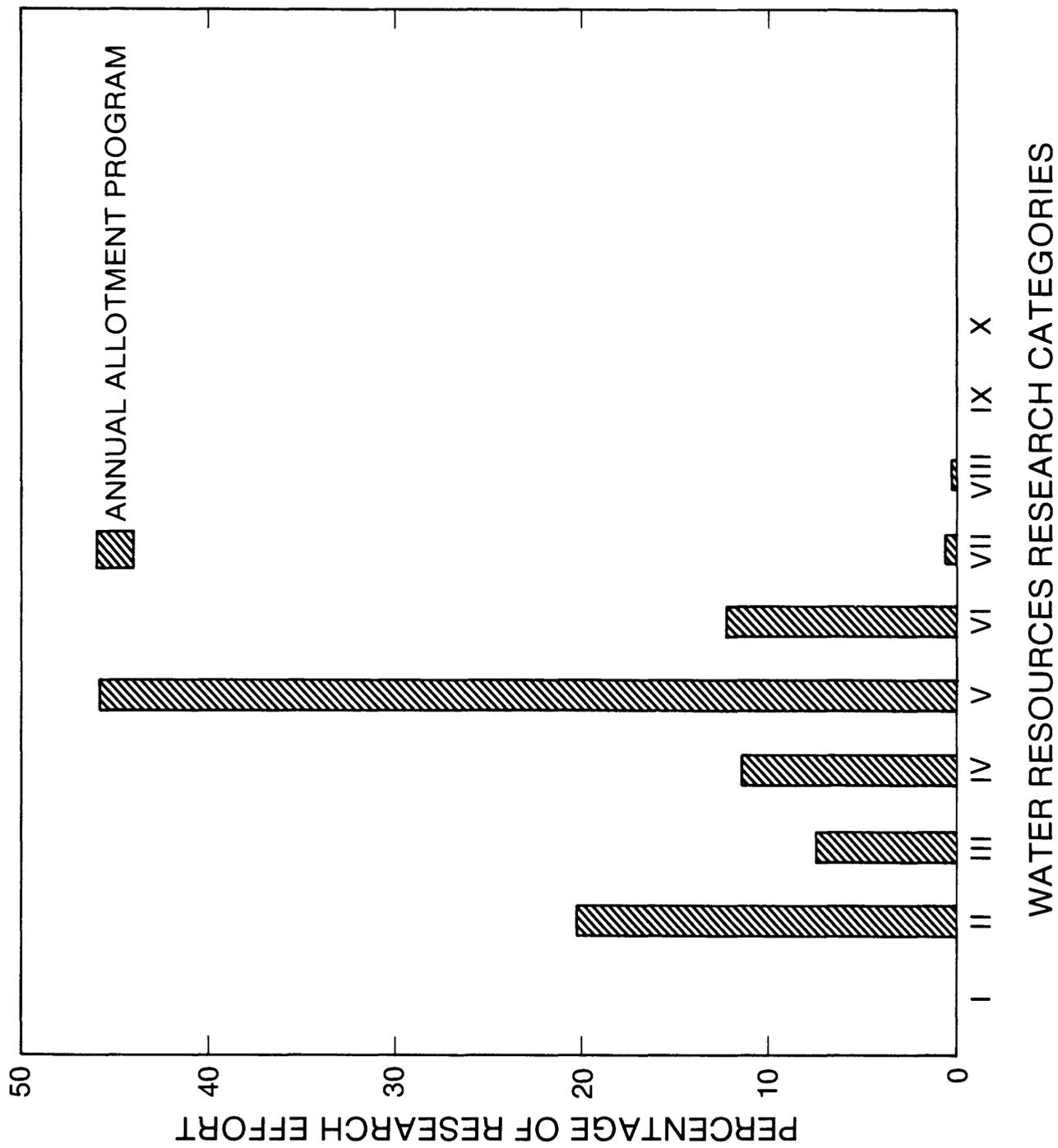


Figure 4. Percentage of research effort expended in FCST categories for the annual allotment program, fiscal year 1983.

Other efforts to identify high priority research needs include the use of a matrix developed by Warren A. Hall, in 1974, to match problem areas with research needs (U.S. Department of the Interior, Procedures Memorandum 74-3, 1974); the application of results from the Conference on Water Resources Research Goals and Objectives sponsored by OWRT and the Bureau of Reclamation in 1976 (U.S. Department of the Interior, Final Report on Research Goals and Objectives, 1976); the joint effort in 1980 of OWRT, the Office of Science and Technology Policy, an ad hoc water research group, and the 54 Water Resources Research Institutes to draft a 5-year program report (Anonymous, Proposed U.S. National Water Resources Research, Development, Demonstration and Technology Transfer Program, 1980); and the critique of the 5-year program report in 1981 by the National Water Research Council (Water Resources Research Review Committee, Commission on National Resources, National Research Council, 1981).

In order to show how the results of research contributed to problem-solving, the 1969 Annual Report discussed the results of OWRR-supported research as they applied to helping resolve the following twelve problem areas (Office of Water Resources Research, 1969 Annual Report, pp. 1-2).

1. Improving water resources systems planning and management processes.
2. Control of heated water discharges.
3. Control of sediment.
4. Water quality.
5. Meeting increased water supply requirements.
6. Mitigation of water-caused damages.
7. Conserving ecological values in water resources planning.
8. Metropolitan area water systems.
9. Conservation of the estuarial water resource.
10. Dissemination and application of knowledge.
11. Other problems related to the hydrologic cycle.
12. Research on other problems including engineering structures and data collection.

In 1971, the above list of 12 water resources problems deserving special emphasis was modified as follows. Numbers 11 and 12 of the above list were deleted and the following were added.

11. Hydrologic cycle
12. Engineering structures
13. Research not otherwise identified (OWRR, 1971 Annual Report, p. 2).

OWRR annual reports discussed research results in terms of these same areas through fiscal year 1974 (OWRR, 1972, 1973, and 1974 Annual Reports).

Establishing Advisory Committees at the Institute Level

The State Water Resources Research Institutes, at the beginning of the program, established advisory boards to assure an awareness of research needs and to enhance the development of research programs directed towards solving high priority problems (OWRR, 1966 Annual Report, p. v). Generally, a state water resources research institute had two councils, committees, or boards. One of these was ordinarily composed of deans or heads of departments that were concerned with water resources training and research and was located at the university, or universities participating in the Title I research program. This committee, or board, helped formulate policies at the local level, assisted with the review of project proposals, and advised on program formulation.

The other type of committee or council often had representatives from Federal, State, and local governmental agencies, from industry and private research firms, and informed citizens. The primary function of this committee was to advise the institute director of water resources research needs and to keep him or her and the principal investigators informed of what the various public and private agencies were doing in the water resources field.

Establishing the Eight Regional Associations of Institutes

The State Water Resources Research Institutes recognizing the need for regional cooperation and coordination began forming regional groups. The first regional group to form was the Northeast Water Institute Directors (NEWID). NEWID, originating at the first OWRR conference in the District of Columbia, "represented all the States from Ohio, West Virginia, Virginia, Maryland, and Delaware to and including Maine, Puerto Rico, and later DC (chiefly including Hawaii)" (Dodson, C. L., communication, 1984). During 1966, the New England institute directors formed the New England Association of Water Center Directors essentially completing the geographic coverage of such associations in the United States (OWRR, 1966 Annual Report, p. 23). In fiscal year 1973, OWRR recognized eight regional associations of State Water Resources Research Institutes for the purpose of improving the coordination of efforts among the several institutes (OWRR, 1973 Annual report, p. 32). The eight Regional associations of institutes were established with consideration of the commonality of water problems and included: Northeast Region, Ohio-Great Lakes Region, Missouri River Basin Region, South Atlantic-Gulf Region, Pacific Northwest Region, Insular Region, Southern Plains River Basin Region, and the Colorado River-Great Basin Region. Table 3 shows the first organization structure for these eight Regional associations. Table 4 shows the organizational structure of the Regional associations as they now exist and Figure 5 is a map showing the Regional boundaries.

Table 3. Regional Groups as Organized in February 1973

North East Region

(New England Subregion)

Maine
New Hampshire
Vermont
Massachusetts
Rhode Island
Connecticut

North East Region

(Middle Atlantic Subregion)

New York
New Jersey
Pennsylvania
Maryland
Delaware
Virginia
West Virginia
Ohio
District of Columbia

Ohio-Great Lakes Region

Pennsylvania
Illinois
Minnesota
Ohio
Kentucky
Michigan
West Virginia
Indiana
Wisconsin
New York

Southern Plains River

Basin Region

New Mexico
Oklahoma
Louisiana
Texas
Kansas
Colorado
Arkansas

Missouri River Basin Region

Montana
Wyoming
Colorado
North Dakota
South Dakota
Nebraska
Kansas
Iowa
Missouri

South Atlantic-Gulf Region

Virginia
Georgia
Mississippi
North Carolina
Florida
Louisiana
South Carolina
Alabama
Tennessee

Pacific Northwest Region

Washington
Alaska
Oregon
Idaho

Insular Region

Hawaii
Virgin Islands
Guam
Puerto Rico

Colorado River-Great

Basin Region

California
New Mexico
Wyoming
Nevada
Utah
Arizona
Colorado

Source: OWRR, 1973 Annual Report, pp. 32-33

Table 4. Current Regional Association of the State Resources Institutes

Middle Atlantic Region

Delaware
 District of Columbia
 New York
 Pennsylvania
 Maryland
 New Jersey
 West Virginia

South Atlantic-Gulf Region

Alabama
 Florida
 Georgia
 Mississippi
 North Carolina
 South Carolina
 Tennessee
 Virginia
 Virgin Islands
 Puerto Rico

Colorado-Great Basin Region

Arizona
 California
 Colorado
 Nevada
 Utah

New England Region

Conneticut
 Maine
 Massachusetts
 New Hampshire
 Rhode Island
 Vermont

Missouri River Region

Kansas
 Iowa
 Missouri
 Montana
 Nebraska
 North Dakota
 South Dakota
 Wyoming

Southern Plains Region

Arkansas
 Oklahoma
 Louisiana
 New Mexico
 Texas

Pacific-Northwest Region

Alaska
 Guam
 Hawaii
 Idaho
 Oregon
 Washington

Great Lakes-Ohio-Upper
 Mississippi Region

Illinois
 Minnesota
 Indiana
 Kentucky
 Michigan
 Ohio
 Wisconsin

Source: OWRT, 1976 Annual Report, pp. 7-9

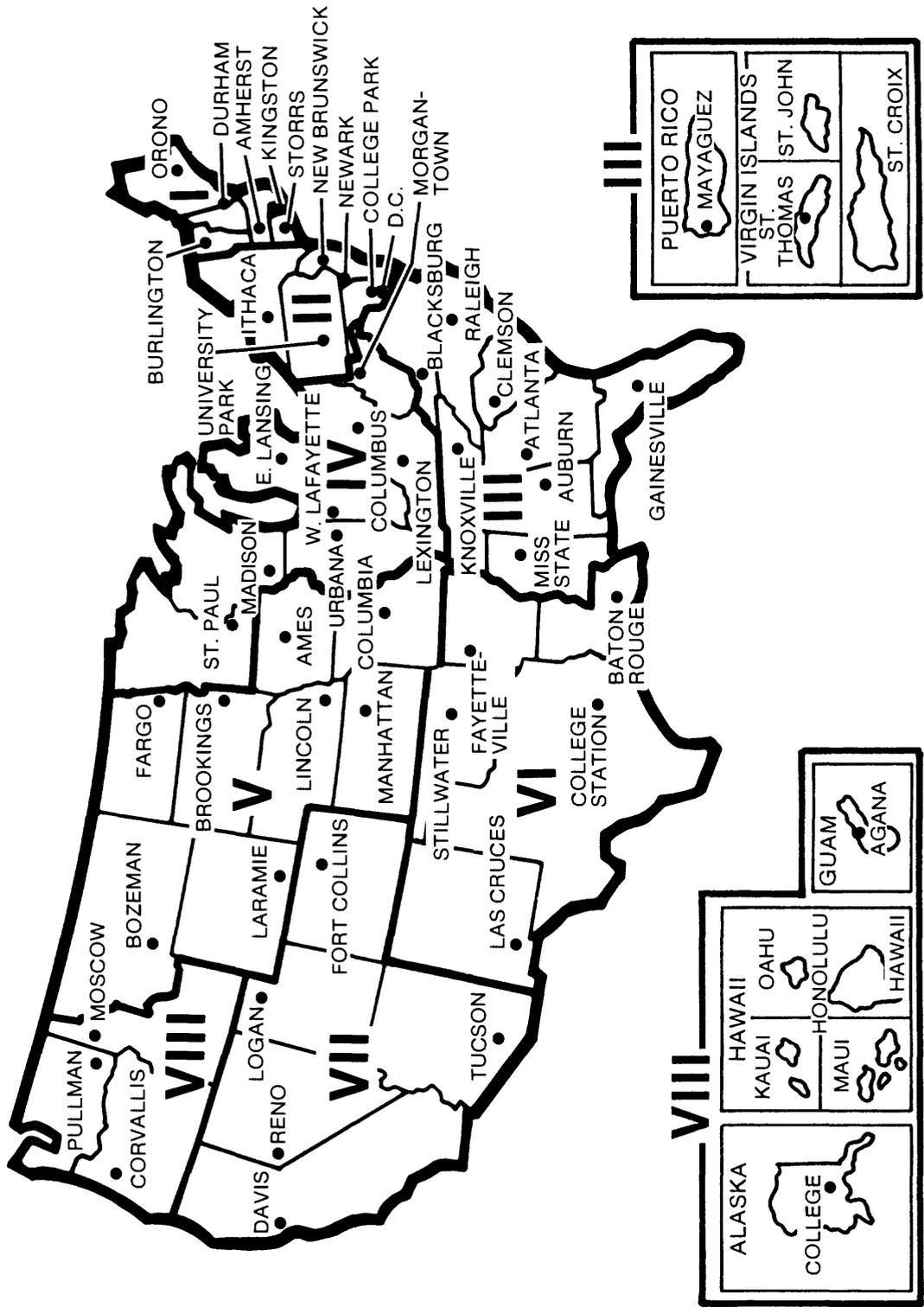


Figure 5. Institute locations and regions.

OWRR gave the following rationale for these Regional organizations.

* * * First, they provide the means of focusing attention on specific sets of critical problems involving water and water-related resources in the regions. Second, they provide an excellent mechanism for coordination of research and research planning between institutes. Third, it has proved to be a major stimulus to good coordination with State and local agencies and Federal field offices, particularly for the identification of the most important Regional water problems. Fourth, the Regional associations are helpful in defining research approaches which are feasible in terms of available manpower and relevance to the major problems of the Regions. Fifth, because of their close association with State and local agencies the adoption of research results by user agencies has been greatly facilitated (OWRR, 1974 Annual Report, p. 11).

Internally, the OWRR organization was matched with this Regional structure.

Organizing the National Association of Water Institute Directors (NAWID)

The National Association of Water Institute Directors (NAWID) formed in July 1974 is an organization of the directors of the 54 State Water Research Institutes. NAWID was formed to provide a unified voice of Institute directors on water resources. Articles of Organization state:

NAWID shall provide representation for the State Water Research and Technology Institutes in collective activities to implement the provisions of the Water Research and Development Act of 1978 (P.L. 95-467) and subsequent Federal legislation which amends or supersedes this Act; and shall facilitate, as appropriate, the response of its membership to other mutual concerns and interests in water resources (Articles of Organization, NAWID, May 1982).

The governing body of NAWID is a Council consisting of eight members elected from each of the OWRT Regional Associations (see Table 4). The Council, following consultation with its Regions, establishes policy for NAWID and serves as a means of transmitting information from the Regions on water-related issues.

Federal/Non-Federal Cooperative Effort in Establishing Research Priorities

The Water Research and Development Act of 1978 formalized Federal/State Water Resources Research Institute cooperative effort to establish research priorities and objectives. The Act stated

* * * (b) The Secretary shall develop a 5-year water resources research program in cooperation with the institutes and appropriate water entities, indicating goals, objectives, priorities, and funding requirements (Public Law 95-467, 95 Stat. 1308).

During 1981, each Institute developed State research priorities and each of the eight Regional associations developed Regional research priorities. OWRT summarized the State and Regional research priorities as follows:

- Surface and ground-water contamination

- Control of pollutants from non-point sources
- Transport and fate of contaminants
- Dynamics of ground-water movement
- Pollution effects
- Wastewater treatment processes
- Control of contaminants from energy development projects

- Shortages

- Water conservation
- Dynamics of ground-water movement
- Water allocation policy determination and implementation
- Reclamation and reuse of water
- Surface-ground-water interactions
- Institutional approaches for resolving water use conflicts
- Water for food and fiber production
- Conjunctive management of ground and surface water
- Property rights in water
- Water pricing
- Drought prediction

- Excesses

- Erosion and sedimentation
- Flood frequency determination
- Weather and hydrologic forecasting

- Environmental degradation

- Effects of pollutants
- Instream flow needs
- Wetlands hydrology
- Acid precipitation
- Effects of recreation pressure
- Fragile and sensitive ecosystems (OWRT, Five-Year Water Research Priorities, 1981)

Research Program Development - Title II and Other Research

Establishing Research Priorities for Title II

No funds were appropriated for Title II of the Water Resources Research Act of 1964 until fiscal year 1968. The limitation of Title II to educational institutions established under Title I of the Water Resources Research Act of 1964 was later modified to allow participation by host universities of the institutes. These host universities played a major role in the program not only in the conduct of the research but many of the institutes assisted OWRR

(even in FY 1968) in communicating awareness of the program, distributing guidelines, and helping agencies write proposals (Warman, J. C., written communication, April 1984).

In 1968, 31 universities and 30 research agencies were conducting Title II projects (OWRR, 1968 Annual Report, p. 41). Priority research areas in the Title II program for fiscal years 1971-73 and 1975 are shown in Table 5.

The subject areas emphasized in fiscal year 1971 reflected those subjects and problem areas requiring additional research attention recommended by the Federal Council for Science and Technology as indicated in the publication, "A Ten-Year Program of Federal Water Resources Research", issued by the Office of Science and Technology, August 1966. Additionally, specific emphasis was given to priority research subjects as developed within the Department of the Interior and relating to the Department's broad responsibilities in the areas of water development, management, and protection, and to recommendations of a special panel convened in accordance with the rules and regulations to advise the Secretary of the Interior on operations of the OWRR (OWRR, 1969 Annual Report, p. 102).

Establishing Research Priorities for Title II and Other Research Programs

The nature of the OWRR research program began to change in 1974 with the formation of the Office of Water Research and Technology (OWRT). The OWRT program consisted of the following activities:

- Assistance to State Water Resources Research Institutes
- Matching Grants to State Institutes
- Additional Water Resources Research
- Technology Development
- Scientific Information Center
- Administration

Thus, the OWRT administered the Title I, Title II, and the Saline Water Conversion Research Programs. The Title II program was not reauthorized for fiscal year 1977 (OWRT, 1976 Annual Report, p. 14). The program was, however, reauthorized for one year in fiscal year 1978 (see Table 1).

For fiscal year 1976, and the Fiscal Year 1976 Transition Quarter (transition from having the fiscal year begin on July 1 and end on June 30 to one in which the fiscal year begins on October 1 and ends on September 30), Congress appropriated \$25,321,000 for OWRT including \$4,099,000 for the Title II research program and \$1,840,000 for the saline water conversion research program. The research priorities for the 1976 fiscal year and the Transition Quarter Title II program were as follows:

- Improvement of water resources planning and management
- Encouragement of Indian self determination
- Solution of energy-related water problems
- Promotion of water use efficiency
- Protection of the environment (OWRT, 1976 Annual Report, pp. 14-16)

Research Program Development - Focused Research

As the Title II research program began to phase down after 1977, a third research and development program, with funding up to 100 percent of costs, began to open to industrial, academic, public, and private investigators. This was OWRT's national focused research program. In order to make the program responsive to national priorities, OWRT focused on problem areas representing a set of critical water problems and a set of research and development opportunities for solving those problems. The three areas selected for 1979 were water reuse, water conservation, and water problems for urbanizing areas (OWRT, 1979 Annual Report, p. 73).

Examples of Effective Research Projects - Title I

The following examples of effective research were selected to illustrate the applicability of research results to solving practical water resources problems. The source of this discussion is the draft OWRT 1980-81-82 Annual Report.

Transport of Hazardous Organic Chemicals Through Soil

The Connecticut Institute on project A-089 investigated the movement of hazardous organic chemicals through soil and water from an industrial site. Although a considerable amount of previous work had investigated transport of inorganic constituents, this project was one of the first to investigate organic chemical migrations. Organic chemicals are a major factor in contamination of ground water throughout the United States and have possibly caused over 90 percent of the contamination detected in Connecticut. In this study, the detection of high levels of chlorohydrocarbons from two monitoring wells suggested a multi-point source of contamination of ground water (Stuart, 1983).

Ground Water Depletion

Ground water depletion continues to be a major problem in Kansas where most of the irrigation water is withdrawn from aquifers. Research sponsored by the Kansas Water Resources Research Institute has possibly reduced by one-third the irrigation supplied to grain sorghum, and has provided the potential for increasing stability of dryland crop production--particularly that of wheat. The objective was to remove entire areas from dependence on irrigation water application. Between 1964 and 1981, the northwest Kansas crop reporting district averaged annually more than 30 bushels per acre yield of wheat despite having average annual precipitation equivalent to only about 19.5 inches per year. A cropping system built on alternate wheat crop and fallow years has given yields better than those achieved in any other Kansas crop reporting district, including those with average annual precipitation of as much as 40 inches per year.

Aquifer Study

In Arkansas, a recently completed hydrogeologic and hydrochemical study of the Boone-St. Joe limestone aquifer in Benton County yielded important new information. The study demonstrated that, because of the small amount of interconnection of fractures within the aquifer, a well field of many relatively shallow and inexpensive wells could be drilled in this aquifer

when large production was needed. Additionally, the study concluded that the water in the aquifer was easily contaminated by such pollution sources as septic tanks, chicken houses, fertilizer spreading, and landfills.

Project recommendations were of great assistance to well users in the area. The State Highway Department used the report to predict possible ground water contamination and flow-path directions along the route of a proposed highway through Benton County.

Salt-Tolerant Crop

A research team in Colorado concluded a new line of inquiry into the development of salt-tolerant crops. The team used tissue culture methods to select salt-tolerant mutant lines, from which they successfully regenerated whole plants. The resultant salt-sensitive and salt-tolerant oats and wheat were tested for tolerance to sodium chloride. Using a tobacco plant model system, it was conclusively shown that salt tolerance could be selected in cultured cells, passed through the regeneration process into whole plants, retained by whole plants, and inherited by two subsequent generations.

The indicated application of the newly developed technique would be the growth of salt and drought-tolerant plants in areas where irrigation is not possible, or is available in smaller quantities than are used for growth of nonselected crops. Many organizations from around the world have expressed interest in applying the new technique to produce salt-tolerant crop plants.

Consequences of Failure of the Old River Structure, Louisiana

In Louisiana an examination was made of the consequences of failure of the Old River Control Structure (ORCS), completed in 1962 to keep the Mississippi River in its present course past New Orleans. The Corps of Engineers constructed the ORCS at a cost of \$100 million to prevent the Mississippi River from being captured by its principal distributary, the Atchafalaya River, by 1975. In 1973, however, a flood badly damaged the structure. Since that time, approximately \$15 million has been expended to partially repair the damage, some of which was found to be irreparable.

A possible scenario in which the ORCS failed outlines the physical and economic consequences of the failure, and makes recommendations for immediate action to reduce and limit the damage. The report resulting from this project was the subject of considerable publicity.

Water Disinfection

A new chloramine agent tested for water disinfection in an Alabama laboratory-scale water treatment plant could be important in treating any water supply, with particular application to small-scale supplies such as wells, military field units, swimming pools, and perhaps for medical purposes. The slow-release agent eradicated bacteria with proficiency equal to that of chlorine gas, even though the agent is a nontoxic solid, much less hazardous than chlorine or ozone. The agent seemed to protect metals against oxidative corrosion. It has a long shelflife both in the solid state and in water solution, and is much less likely than chlorine gas to produce toxic halocarbons such as chloroform in water supplies. The research is being continued as a major project funded jointly by the Army and the Air Force.

Information Dissemination and Technology Transfer Program

Institute Program

Early in the program, both OWRR and the State Water Resources Research Institute stressed the importance of the shared function of distributing water resources information and technology data (OWRR, 1970 Annual Report). During fiscal year 1970, many of the Institutes kept the public and others concerned with water problems informed about developments by the preparation and distribution of newsletters. By fiscal year 1970, the number of State institutes using newsletters grew rapidly. In that year, North Carolina and Puerto Rico were added to those institutes, such as Minnesota, which had newsletters for some time (OWRR, 1970 Annual Report, p. 89). Also, Pennsylvania started its first newsletter in June 1970; Utah started its bimonthly newsletter, "Aquarius", in November 1969, and according to the OWRR 1970 Annual Report, the newsletter was distributed to approximately 2,600 readers; North Dakota's "Sprinkles" started in March 1970; and Nebraska initiated a monthly newsletter in May 1969 (OWRR, 1970 Annual Report, p. 90).

On December 2, 1971, the Congress enacted Public Law 92-175 which amended the Water Resources Research Act of 1964 to authorize scientific information dissemination for the Institutes. Public Law 92-175 stated:

The second sentence of Section 100(G) of the Water Resources Research Act of 1964 (78 Stat. 329; 42 U.S.C. 1961a) is amended by inserting after the word "problems", the following: "and scientific information dissemination activities, including identifying, assembling, and interpreting the results of scientific and engineering research deemed potentially significant for solutions of water resource problems, providing means for improved communication regarding such research results, including prototype operations, ascertaining the existing and potential effectiveness of such for aiding in the solution of practical problems, and for training qualified persons in the performance of such scientific information dissemination (Public Law 92-175, 85 Stat.)."

The Water Research and Development Act of 1978, Public Law 95-467 added technology transfer as another responsibility of the State Water Resources Research Institutes. However, funds were never appropriated for this portion of the Act.

Water Resources Scientific Information Center

The idea of an interagency facility to disseminate scientific information originated from initiatives taken by the Committee on Water Resources Research of the Federal Council for Science and Technology. That Committee's subcommittee on Information Storage and Retrieval conducted a six-month analytic study and concluded that a centralized information service was "needed to be responsible to the requirements of expanding water resources activity" and suggested that a centralized service should be located in a Federal agency which could most readily harness both the talents and physical resources required (Anon., 1968, Operating Policy (Water Resources Scientific Information Center), p. 2).

The Secretary of the Interior, noting the Department's participation with the Office of Science and Technology and the Federal Council for Science and Technology in seeking ways to solve the scientific and technical information problem, established the Water Resources Scientific Information Center through a memorandum dated January 25, 1966. The operation of WRSIC was initiated during fiscal year 1968 pursuant to a \$500,000 appropriation. A manager and an assistant manager were selected to operate WRSIC during September 1967 (OWRR, 1967 Annual Report, p. 17). According to an OWRR 1968 Annual Report:

The purpose of the Center was to insure the prompt flow of information concerning water research and related accomplishments to the Federal water resources community including officials engaged in research, management, and development programs; and thereby to promote improved communication, dissemination of knowledge, and the avoidance of undesirable duplication of research effort (OWRR, 1968 Annual Report, pp. 13-14).

During 1968-1969, WRSIC established eight literature centers of competence. These centers included, by subject area, and performing organization.

1. Ground and surface water hydrology - Water Resources Division, U.S. Geological Survey.
2. Hydraulic structures, soils, rock mechanics, and engineering materials - Office of Engineering Reference, U.S. Bureau of Reclamation.
3. Metropolitan water resources management - Center for Urban Studies, University of Chicago.
4. Water law in the Eastern United States - College of Law, University of Florida.
5. Policy models for water resources systems - Department of Water Resources Engineering, Cornell University.
6. Water resources economics - Water Resources Research Institute, Rutgers, the State University of New Jersey.
7. Eutrophication - Scientific Information Program in Eutrophication, Water Resources Center, University of Wisconsin.
8. Water resources in arid lands - Office of Arid Land Studies, University of Arizona.

In addition, with support from the Federal Water Pollution Control Administration, the WRSIC established the following two centers of competence:

9. Thermal pollution - Department of Sanitary and Water Resources Engineering, Vanderbilt University.
10. Textile wastes - School of Textiles, North Carolina State University at Raleigh (OWRR, 1969 Annual Report, pp. 89-90).

By fiscal year 1971, there were 20 literature centers of competence in operation. Seven of these centers were organized in 1971 (OWRR, 1971 Annual Report, p. 83). In fiscal year 1975, WRSIC considerably expanded the use and utility of its services to the water resources community. WRSIC was able to add 13,350 abstracts to its computer data base in fiscal year 1975 through the coordination of information flowing in from 13 Centers of Competence, 54 State Water Resources Research Institutes, 1 commercial abstracting service, several private consulting firms, 3 foreign, and numerous Federal agencies dealing with water-related research. This made altogether about 25,000 citations to existing documents available to users. Currently, approximately 170,000 citations are available to users (Jensen, R. A., written communication, 1984).

Manpower and Training Program

As mentioned in the Introduction, one of the objectives of the State Water Resources Research Institute Program was to train scientist and engineers. This objective was spelled out in the Water Resources Research Act of 1964, as amended, the Water Research and Development Act of 1978, and in current legislation, the Water Resources Research Act of 1984.

The Water Research and Development Act of 1984 states in Section 101 of Title I:

* * * The Congress finds and declares that - * * *
(7) the Nation must provide programs to strengthen research and associated graduate education because the pool of scientists, engineers, and technicians trained in fields related to water resources constitute an invaluable natural resource which should be increased, fully utilized, and regularly replenished.

The Act of 1984 further states in Section 103

* * * It is the purpose of this Act to assist the Nation and the States in augmenting their water resources science and technology or a way to - * * * (6) promote the development of a cadre of trained research scientists, engineers, and technicians for future water resources problems.

It should be noted, however, that funds can not be used directly for scholarships, etc. The training has to be incidental to work done on the projects.

Principal Investigators

In fiscal year 1980, over 1,152 principal investigators were engaged in projects carried out by State Water Resources Research Institutes under OWRT-sponsored programs. These researchers represented more than 40 scientific, engineering, and social science disciplines and specialized research fields. The disciplines and specialized fields included 27 hydrologists, 84 chemists, 353 engineers (all types), 55 geologists/mineralogists, 73 biologists, and 50 soil scientists (see Table 6). Approximately 90 percent of all principal investigators reported for fiscal year 1980 had doctoral degrees. Fiscal year 1980 was the last year for which these data were available.

Table 6. Scientific Disciplines of Professional Investigators on Allotment and matching Fund Projects (Fiscal Years 1966 through 1980)

Discipline of Investigator	1966-1976 (average)	1977	Fiscal Year		1980
			1978	1979	
Agriculture	14	12	8	5	6
Agronomy	13	39	38	31	36
Anthropology	3	2	2	3	8
Architecture	2	3	4	6	1
Atmospheric Sciences	12	-	-	1	2
Bacteriology	2	3	3	6	1
Biology	102	101	93	98	73
Botany/Plant Sciences	26	37	30	35	31
Business Administration	5	3	4	3	-
Chemistry	74	96	79	100	84
Climatology	2	3	3	1	-
Ecology	23	32	30	32	23
Economics	101	90	92	104	103
Education	1	-	1	2	-
Engineering (all types)	395	394	408	362	353
Entomology	3	12	7	3	2
Environmental Sciences	15	26	25	13	23
Fisheries	5	16	13	15	16
Forestry (watershed mgt.)	16	29	20	21	34
Fuel Sciences	2	-	4	2	-
Geography	13	20	16	11	10
Geology/Mineralogy	73	60	57	51	55
History	1	6	3	4	4
Horticulture	7	7	5	4	5
Hydrology	36	59	53	37	27
Hydraulics	4	19	9	6	10
Law	23	17	17	16	17
Limnology	16	11	10	8	9
Marine Science	5	1	4	6	5
Math/Computer Science/ Statistics	8	10	6	9	11
Meteorology	2	-	4	2	8
Natural Resources (conservation)	4	3	10	13	13
Oceanography	1	11	3	4	4
Physics (geo., soil, etc.)	25	24	13	14	9
Physiology	8	14	15	7	4
Planning	6	4	1	6	3
Political Science/Public Admin.	16	21	26	17	10
Psychology	2	1	4	3	-
Public Health	2	4	5	7	-
Recreation and Parks	3	6	6	4	2
Sociology	15	23	14	8	7
Soil Science	34	69	71	57	50

Table 6 (continued)

Discipline of Investigator	1966-1976 (average)	1977	Fiscal Year		1980
			1978	1979	
Veterinary Medicine	3	7	7	8	2
Water Resource/Science	12	17	46	39	11
Zoology	47	39	35	31	39
Miscellaneous	3	14	8	8	41
Total	1,185	1,365	1,312	1,223	1,152

Source: OWRT, Annual Report 1980-81-82, pp. 101-102

Student Assistants

Although students do not receive direct grants or support under the State Water Resources Research Institute Program, many thousands have been employed on projects where they receive valuable experience (Congressional Research Service, 1976, p. 100). A history of support up to 1980 is given in figure 6. In fiscal year 1980, of the 1,369 student research assistants reported, 458 (33.5%) were undergraduates, 591 (43.2%) were master candidates, 297 (21.7%) were doctoral candidates, and 23 (1.7%) were post doctoral students.

Subsequent Employment of Research Assistants Who Received Support Under the State Water Resources Research Institute Program

Table 7 provides a breakdown by degree by degree and type of post-education employment of those students who received financial support as a result of involvement in the State Water Resources Research Institute Program. Of those whose occupation was known to the academic institution, almost 50 percent entered water-related work.

ADMINISTRATION OF THE INSTITUTE PROGRAM IN THE U.S. DEPARTMENT OF THE INTERIOR

This section discusses the administration of the State Water Resources Research Program by the various organizations within the U.S. Department of the Interior. Since its formation in 1964, the State Water Resources Research Program has been administered by the Office of Water Resources Research (OWRR); the Office of Water Research and Technology (OWRT); the Office of Water Policy (OWP); and lastly, the U.S. Geological Survey (USGS).

Office of Water Resources Research (OWRR)

On July 17, 1964, the day that S. 2 became Public Law 88-379, the Secretary of the Interior delegated the authority to administer the Water Resources Research Act of 1964 Public Law 88-379 to the Director of OWRR (OWRR, 1965 Annual Report, p. 7). The major program purpose of OWRR was to:

develop through problem-oriented research new technology and more efficient methods for resolving local, State, and nationwide water resource problems; train water scientists and engineers through their on-the-job participation in research work; and facilitate water research coordination and the application of research results by furnishing information about ongoing and completed research (U.S. Government Manual, 1974-75, p. 277).

The Office of Water Resources Research's role in administering the Institute Program was specified in Section 104 of the Water Resources Research Act of 1964, as amended. According to Section 104, OWRR had the responsibility to:

- furnish advice and assistance to the institutes which would best promote the purposes of the Act.
- participate in coordinating research initiated by the institutes.
- indicate to the institutes "lines of inquiry" which seem most important to the Department.

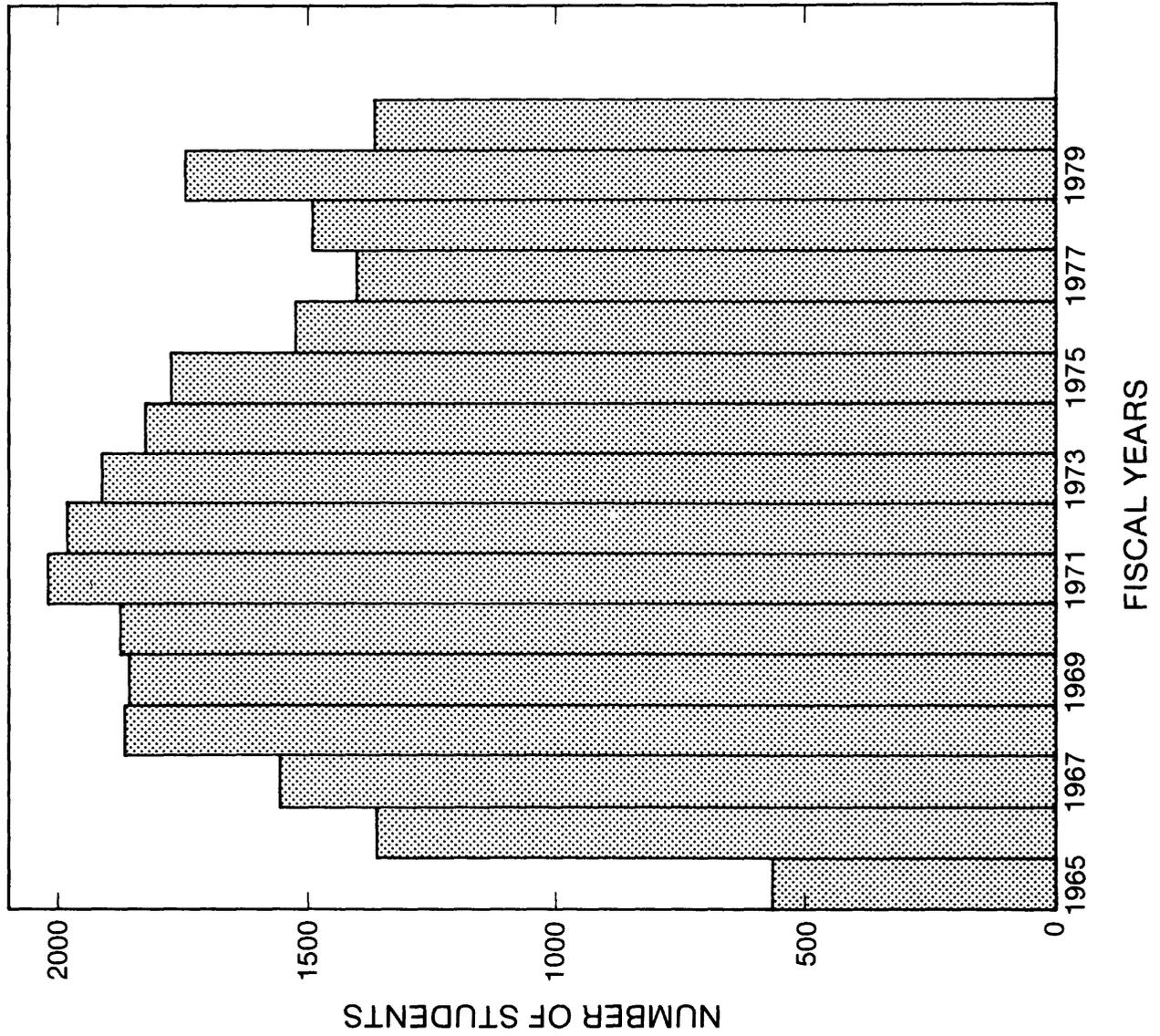


Figure 6. Students receiving financial support by serving as research assistants under the Water Resources Research and Development Act of 1978 (P.L. 95-467), Section 101 and 105(a).

Table 7. Types of Water-Related Positions Held by 1979 Graduates Who Received Financial Support from the State Resources Research Institute Program

Graduates Engaged In Water-Related Work With:	Degree			Total
	Bachelor's	Master's	Doctoral	
Federal Agencies In				
Primarily research	3	7	3	13
Primarily planning		5		5
Primarily development	2	1		3
Primarily operations	5	3		8
Primarily management		2	1	3
Other or unknown		1	2	3
Total	10	19	6	35
State and Local Agencies In				
Primarily research	2	4	1	7
Primarily planning	3	17		20
Primarily development				
Primarily operations	4	9	2	15
Primarily management	1	6		7
Other or unknown	2	2		4
Total	12	38	3	53
Universities or colleges In				
Primarily teaching	1	3	7	11
Primarily research	8	15	2	25
Primarily research & teaching	6	8	17	31
Other or unknown	3	2		5
Total	18	28	26	72
Industry Including Others In				
Primarily research		7	2	9
Primarily planning	1	13	1	15
Primarily development	5	10	3	18
Primarily operations	2	9	2	13
Primarily management		2		2
Other or unknown		18		18
Total	8	59	8	75
TOTAL	48	144	43	235

Source: OWRT, Annual Report, 1980-81-82, p. 105

- encourage and assist in the establishment and maintenance of cooperation between the institutes and between them and other research organizations, the United States Department of the Interior, and other Federal establishments.

The role of the institutes according to the rules and regulations pursuant to the Water Resources Research Act of 1964 was to:

- conduct competent "research, investigations, and experiments of either a basic or practical nature, or both, in relation to water resources," and
- train scientists through such research, investigations, and experiments.

The institutes were also required to pay attention to:

- the varying conditions and needs of respective States,
- water research projects being conducted (or supported) by Federal and State agencies, agricultural stations, and others,
- advice and assistance as provided by OWRR,
- coordination of their programs with programs of other institutes and agencies,
- avoidance of any undue displacement of scientists elsewhere engaged in water resources research (Rules and regulations pursuant to the Water Resources Research Act of 1964).

The rules and regulations allowed an institute to sponsor research at other colleges and universities other than the college or university with which the institute was identified.

In addition to the Institute Program, OWRR also operated a water resources scientific information center to furnish "information to the Nation's water resource community, in project abstract and other summary formats including publication of the journal "Selected Water Resources Abstracts", regarding ongoing water research projects and the results obtained from completed water resources studies and investigations" (U.S. Government Manual, 1974-75, p. 277). OWRR administered the Institute Program until July 26, 1974, when the Office of Water Research and Technology (OWRT) was established.

Office of Water Research and Technology (OWRT)

OWRT performed water resources research, development, demonstration, and technology transfer activities (through contracts and grants) and related functions vested in the Secretary of the Interior under the Water Research and Development Act of 1978 (92 Stat. 1305; 42 U.S.C. 7801) and the Water Research and Conversion Act of 1977 (P.L. 95-84; 91 Stat. 400; 42 U.S.C. 1959), as amended (U.S. Government Manual, 1974/1975, 1982/1983). The fundamental purposes of OWRT was:

to develop new and improved technology and methods for solving or mitigating existing and projected State, Regional, and nationwide resource problems; to train water scientists and engineers through their on-the-job participation in research work; and to accomplish water research coordination and research results information dissemination activities (U.S. Government Manual, 1982/1983).

The Office of Water Research and Technology Policy/Procedures Memorandum 81-1 outlined the Institute/OWRT management responsibilities which were established by the Water Research and Development Act of 1978 (P.L. 95-467).

The Office of Water Research declared its policy to:

1. Utilize information from the Institutes to provide State input to the national five-year water research program and its annual revisions.
2. Maintain sufficient familiarity with Institute programs to portray them accurately on individual and collective bases in budget justifications and congressional testimony.
3. Promote the role of Institutes as catalysts to formulate problem-oriented research, training, information, and technology transfer programs which address priority water problems of the States.
4. Oversee and assist Institutes through the issuance of timely and explicit policies, procedures, and guidelines which will assure that they carry out their responsibilities under the Act (Policy/Procedures Memorandum 81-1, p. 1).

The Institute responsibilities were to:

- (a) Develop and update annually State input to the national 5-year research program, including priorities, goals, objectives, and funding requirements;
- (b) Prepare and submit an Annual Cooperative Program of research and development that is consistent with its 5-year priorities. Such programs shall be developed in cooperation with State and regional water-related entities and with representatives from academic institutions within the State offering at least a bachelor's degree in a water-related discipline and having faculty with demonstrated competence to conduct water-related research.
- (c) Operate technology transfer information programs as appropriate to assure timely application of research and development results that meet priority needs of the water community.
- (d) Provide for training of future scientists and engineers, especially for fields in which manpower shortages can be anticipated by their participation in research projects.

- (e) Encourage the preparation and submittal of Matching Grant Program Proposals that are responsive to identified State, regional or OWRT priorities.
- (f) Transmit promptly to OWRT, with appropriate comment, all proposals originating in any academic institution within the State in response to announcements by OWRT of its national Research and Development (focused) Programs.
- (g) Oversee projects and activities co-sponsored with OWRT as necessary to assure that performance is on schedule and in pursuit of stated objectives; that review and revision of draft completion reports have been accomplished; and that transmission of a final completion report to OWRT is within the performance period.
- (h) Cooperate with OWRT and other Institutions in joint ventures in research and development, technology transfer information wherever practical to maximize return on Federal/State investments in those activities.
- (i) Submit on schedule annual reports to meet OWRT specified information needs.
- (j) Maintain auditable records of Federal and non-Federal funds.
- (k) Comply with OWRT policies, procedures, and guidelines (Policy/ Procedure Memorandum 81-1).

In addition to the Institute Program, OWRT operated the Water Resources Scientific Information Center (WRSIC) which compiled and synthesized research and development in the public and private sectors (U.S. Department of the Interior, America's Guardian of National Resources, 1978, p. 15).

Office of Water Policy (OWP)

The Office of Water Policy was the Department of the Interior's primary policy analysis and State liaison for water resources (U.S. Government Manual, 1983/1984, p. 312). In August 1983, the Office acquired the Annual Cooperative Program (Institute Program) for closeout following the termination of OWRT. In administering the OWRT program, OWP issued revised policies and procedures to institutes on the fiscal year 1982 closeout, issued policies and procedures for the startup of the fiscal year 1983 program, and prepared for the startup of the fiscal year 1984 State Water Research Institute Program by the Geological Survey (F. Carlson, written communications).

U.S. Geological Survey (USGS)

Currently, the State Water Resources Research and Technology Institute Program is administered by the Water Resources Division of the U.S. Geological Survey. The Water Resources Division has the primary responsibility within the Federal government for providing hydrologic information and appraising the Nation's water resources (U.S. Geological Survey Circular 893).

SUMMARY

The State Water Resources Research Institute Program evolved from a Congressional concern that the Nation would have at all times a sufficient supply of suitable quality water in both quality and quantity to meet the needs of an expanding population.

Congress established the Senate Select Committee on National Water Resources in 1959. Based on the Senate Select Committee's recommendations and the results of subsequent surveys of colleges, universities, private firms, and individuals, the Congress passed the Water Resources Research Act of 1964, Public Law 88-379. The Act authorized to be appropriated to the Secretary of the Interior funds to assist in "establishing and carrying on the work of" a water resources research institute or center in each of the 50 States and the Commonwealth of Puerto Rico. The Act authorized the Secretary to provide an annual allotment and matching grants to these Institutes; and to make grants, matching, or other arrangements with educational institutes (other than those established under Title I of the Act), private foundations, or other institutions; with private firms and individuals; and with local, State, and Federal Government agencies. In fiscal year 1973, three new State Water Resources Research Institutes were established in the District of Columbia, the Virgin Islands, and Guam as authorized by the 1971 amendments to the Water Resources Research Act of 1964. Ensuing legislation passed after the Act of 1964 included: (1) amendments to the Water Resources Research Act of 1964, Public Law 88-379; (2) the Water Research and Development Act of 1978; Public Law 95-467; and (3) Public Law 96-457 extending certain authorities of the Secretary of the Interior under Public Law 95-467 to the end of the fiscal year 1982.

Public Law 96-457 expired at the end of fiscal year 1982 and Congress made several attempts to reauthorize the Program. This effort culminated in March 1984 when the Congress overrode the President's veto to enact the Water Resources Research Act of 1984.

The State Water Resources Research Institutes have worked cooperatively with the Department of the Interior to develop and carry out a water resources research program. The Institutes established advisory boards to assure an awareness of research needs and to enhance the development of research programs; formed regional groups to enhance regional cooperation and coordination, and with the concurrence of the Office of Water Resources Research, Department of the Interior, the Institutes organized into eight regional associations; conducted technology transfer and information dissemination programs; promoted the training of scientists and engineers through on-the-job participation in research work; and cooperated with the Office of Water Research and Technology, Department of the Interior, to develop a five-year water resources research priorities plan in 1981. Since its formation in 1964, the State Water Resources Research Program has been administered by the Office of Water Resources Research (1964-1974); the Office of Water Research and Technology (1974-1982); the Office of Water Policy (1982-1983); and the U.S. Geological Survey (1983-present).

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