

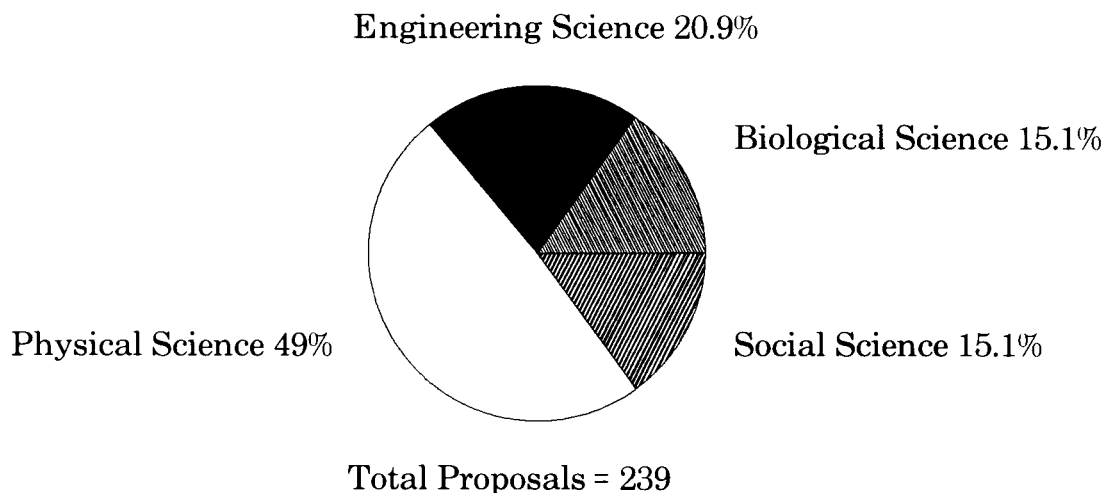
THE NATURE OF U.S.G.S. WATER RESOURCES RESEARCH PROGRAM PROPOSALS

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USGS Water Resources Research Proposals Distribution of Major Disciplines



In response to the request for proposals for the fiscal year 1988 Water Resources Research Program, Section 105 of Public Law 98-242, 66 public and private institutions submitted 239 proposals requesting a total of \$24,732,720 (Table 1). The 66 institutions (Table 2) submitting proposals in 1988 were located in 44 states (Table 3), clearly indicating that the interest and need for water resources research is widespread in the nation.

Of the 66 institutions submitting proposals, 51 were colleges/universities, and the remaining 15 were other public agencies or private firms. It is evident that private research firms do not participate in any significant way in the program even though the act states that the "... Water Resources Research Program will provide support to educational institutions, private foundations, private firms, and agencies of local and state governments."

However, this may be understandable since only \$4.381 million are available in 1988; thus, only 18 percent of the total request of \$24,732,720 will be

Table 1

USGS Water Resources Research Proposals: Analysis of Federal Funds Requested

Federal Funds Requested (\$):	Number of Proposals	Percent
0 - 9,999	1	0.42
10,000 - 39,999	23	9.62
40,000 - 69,999	55	23.01
70,000 - 99,999	43	17.99
100,000 - 129,999	34	14.23
130,000 - 159,999	33	13.81
160,000 - 189,999	49	20.50
190,000 - 220,000	1	0.42

Total Number of Proposals = 239

Total Federal Funds Requested = \$24,732,720

Mean = \$103,484

Median = \$98,858

Standard Dev. = \$49,613

Minimum Requested = \$8,015

Maximum Requested = \$214,457

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funded. Since the average request per proposal was \$103,484 (Table 1), this year only 42 of the 239 proposals will be funded—only 18 percent of the proposals submitted (an *average* estimate, since requests ranged from a minimum of \$8,015 to a maximum of \$214,457). When considering the substantial costs of proposal preparation and submission, it is understandable why few private firms and private foundations participated. Also, since most of the water resources research community was under the assumption that the research pro-

Table 2
USGS Water Resources Research Proposals:
By Institution

Institution	Biol. Sci.	Eng. Sci.	Social Sci.	Phys. Sci.	Total
New Mexico State Univ.	3	0	1	7	11
Louisiana State Univ.	0	2	2	6	10
Univ. Illinois	3	2	0	5	10
Colorado State Univ.	1	1	1	4	7
Univ. Alaska-Fairbanks	2	2	0	3	7
Penn State Univ.	1	0	0	5	6
Univ. Arizona	1	0	2	3	6
Univ. Maryland	1	2	1	2	6
North Carolina St. Univ.	0	3	0	2	5
Oklahoma State Univ.	1	1	1	2	5
Univ. Minnesota	1	2	0	2	5
Virginia Polytechnic Inst.	0	1	2	2	5
Texas A&M Univ.	1	0	1	2	4
Univ. Idaho	0	0	0	4	4
Univ. Missouri	0	2	0	2	4
Univ. Texas-Austin	1	0	1	2	4
Univ. Wisconsin	1	0	1	2	4
Utah State Univ.	0	1	1	2	4
Georgia Inst. Tech.	0	1	1	1	3
Massachusetts Inst. Tech	0	0	0	3	3
Michigan State Univ.	1	0	0	2	3
Ohio State Univ. Columbus	0	2	0	1	3
State Univ. New York	1	2	0	0	3
Tennessee Tech Univ.	0	2	0	1	3
Univ. California-Davis	1	0	1	1	3
Univ. Massachusetts	0	1	1	1	3
Univ. Nebraska-Lincoln	0	2	1	0	3
Auburn Univ.	0	1	1	0	2
City College of New York	0	1	0	1	2
Clemson Univ.	0	0	0	2	2
Cornell Univ.	0	0	1	1	2
Georgia State Univ.	0	0	0	2	2
Iowa State Univ.	0	2	0	0	2
Johns Hopkins Univ.	0	0	1	1	2
North Dakota State Univ.	0	0	0	2	2
Northeast Louisiana Univ.	1	0	0	1	2
Rutgers Univ.	0	0	0	2	2
Univ. Colorado-Boulder	0	0	0	2	2
Univ. Connecticut	0	1	0	1	2
Univ. Florida-Gainesville	1	1	0	0	2
Univ. Georgia	1	0	0	1	2
Univ. Iowa	1	0	0	1	2
Univ. Kentucky	1	1	0	0	2
Univ. Miami	0	0	0	2	2
Univ. New Hampshire	0	1	0	1	2
Univ. Virginia	0	1	0	1	2
American Planning Assc.	0	0	1	0	1
American Public Works Assc.	0	1	0	0	1
Arizona State Univ.	0	0	0	1	1

Table 2 (continued)
USGS Water Resources Research Proposals:
By Institution

Institution	Biol. Sci.	Eng. Sci.	Social Sci.	Phys. Sci.	Total
Bemidji State Univ.	0	1	0	0	1
Brigham Young Univ.	1	0	0	0	1
Brown Univ.	0	0	0	1	1
California Inst. Tech	0	0	0	1	1
Cape Cod Research	0	1	0	0	1
College of William & Mary	0	0	0	1	1
Desert Research Inst. Reno	0	0	0	1	1
Dpt. Pub. Wks.-Ft. Laud., FL	0	1	0	0	1
East Tennessee State	0	0	0	1	1
Elizabeth Cty. State Univ.	0	0	0	1	1
Florida Inst. Tech.	0	0	0	1	1
Georgia Dept. Nat. Res.	0	0	0	1	1
Harvard	0	0	0	1	1
Holcomb Research Inst.	0	0	0	1	1
Humbolt State Univ.	0	0	1	0	1
Internatl. Coalition	0	0	1	0	1
Irvine Ranch Water Dist.	0	1	0	0	1
Louisiana Tech. Univ.	0	1	0	0	1
Manhattan College	0	0	0	1	1
Michigan Tech Univ.	0	0	0	1	1
Midwest Research Inst.	0	0	1	0	1
Montana State Univ.	0	1	0	0	1
NAHB Resrch. Cntr.	0	0	1	0	1
New Jersey Inst. Tech.	0	0	0	1	1
Ohio Univ.-Athens	0	1	0	0	1
Old Dominion Univ.	0	0	0	1	1
Oregon Grad. Center	1	0	0	0	1
PMCL	0	0	1	0	1
Portland State Univ.	0	0	1	0	1
Princeton Univ.	0	1	0	0	1
Satellite Hydrology Inc.	0	0	0	1	1
Savannah State College	1	0	0	0	1
Siouxland Metro Planning	1	0	0	0	1
Southern Illinois Univ.	0	0	1	0	1
Southern Methodist Univ.	0	0	0	1	1
Southwest Missouri Univ.	0	0	0	1	1
Southwest Texas State	0	0	0	1	1
Suffolk Co. Dept. Health	1	0	0	0	1
SWTP	0	0	1	0	1
Univ. Louisville	1	0	0	0	1
Univ. Arkansas-Fayetteville	0	0	0	1	1
Univ. Arkansas-Little Rock	1	0	0	0	1
Univ. California-LA	0	1	0	0	1
Univ. Calif.-Santa Barbara	0	0	0	1	1
Univ. Central Florida	0	0	0	1	1
Univ. Cincinnati	0	1	0	0	1
Univ. Colorado-Denver	0	0	1	0	1
Univ. Delaware	1	0	0	0	1
Univ. Michigan	0	0	0	1	1
Univ. Nevada-Reno	0	0	1	0	1
Univ. Northern Iowa	1	0	0	0	1
Univ. Texas-San Antonio	0	0	1	0	1
Univ. Toledo	1	0	0	0	1
Univ. Utah	0	0	0	1	1
Univ. Washington	0	0	0	1	1
Univ. Wyoming	1	0	0	0	1
Vanderbilt Univ.	0	0	1	0	1
Villanova Univ.	0	0	1	0	1
Washington State Univ.	0	0	0	1	1
West Virginia Univ.	0	1	0	0	1
Western Contsm. for P.H.	0	0	1	0	1
Western Michigan Univ.	0	0	0	1	1
Worcester Polytech Univ.	0	0	0	1	1
Wright State Univ.	0	0	0	1	1

Table 3
USGS Water Resources Research Proposals:
By State

Institution	Biol. Sci.	Eng. Sci.	Social Sci.	Phys. Sci.	Total
ILLINOIS	3	3	3	5	14
LOUISIANA	1	3	2	7	13
NEW MEXICO	3	0	1	7	11
TEXAS	2	0	3	6	11
VIRGINIA	0	3	2	6	11
COLORADO	1	1	2	6	10
CALIFORNIA	1	2	3	3	9
GEORGIA	2	1	1	5	9
MASSACHUSETTS	0	2	1	6	9
MARYLAND	1	2	3	3	9
NEW YORK	2	3	1	3	9
ALASKA	2	2	0	3	7
ARIZONA	1	0	2	4	7
FLORIDA	1	2	0	4	7
MINNESOTA	1	3	1	2	7
OHIO	1	4	0	2	7
PENNSYLVANIA	1	0	1	5	7
IOWA	3	2	0	1	6
MICHIGAN	1	0	0	5	6
MISSOURI	0	2	1	3	6
NORTH CAROLINA	0	3	0	3	6
UTAH	1	1	1	3	6
OKLAHOMA	1	1	1	2	5
TENNESSEE	0	2	1	2	5
IDAHO	0	0	0	4	4
NEW JERSEY	0	1	0	3	4
WISCONSIN	1	0	1	2	4
ALABAMA	0	1	2	0	3
KENTUCKY	2	1	0	0	3
NEBRASKA	0	2	1	0	3
ARKANSAS	1	0	0	1	2
CONNECTICUT	0	1	0	1	2
NEVADA	0	0	1	1	2
NEW HAMPSHIRE	0	1	0	1	2
NORTH DAKOTA	0	0	0	2	2
OREGON	1	0	1	0	2
SOUTH CAROLINA	0	0	0	2	2
WASHINGTON	0	0	0	2	2
DELAWARE	1	0	0	0	1
INDIANA	0	0	0	1	1
MONTANA	0	1	0	0	1
RHODE ISLAND	0	0	0	1	1
WYOMING	1	0	0	0	1

gram had been reduced from \$4.4 million to \$1.8 million, the total number of proposals from the university community is lower this year than in 1987. This decline in submitted proposals does not bode well for the Nation's water resource problems. The costs to the nation of such problems are well known and continue to grow while our community of expertise may diminish. In light of the research and publication demands in the university community, competent researchers will likely shift their interest to problems other than water resources.

Over \$100 billion of capital expenditures for

rehabilitation and replacement of navigation, water supply, and municipal distribution facilities are expected to be needed between 1983 and 2000.¹ The costs from flood hazard, drought, water quality, and sedimentation are measured in the billions of dollars each year in this country. Yet, the U.S.G.S. Water Resources Research Program, which is a principal program for university water-related research, will spend only \$4.381 million this year.

The water resource problems are not going to diminish naturally, but only through research. Not only are substantial increases in research funds essential, but the research should be directed toward specific water resource problems, thus eventually reducing the costs to the nation. Greater efforts are needed to establish research priorities to maximize the potential dividends of every research dollar.

Types of Research

The research proposals were classified into four areas: (1) Biological Sciences, (2) Engineering Sciences, (3) Physical Sciences, and (4) Social Sciences. Admittedly, the process of classification was difficult since many research proposals are cross-disciplinary in nature. Nevertheless, three reviewers discussed each proposal in order to determine the disciplinary nature of the research objective.

Nearly half of the 239 proposals were submitted by researchers in the physical sciences, requesting a total of \$11,616,885. The remainder were nearly evenly divided with engineering accounting for 21 percent and biological and social sciences each submitting 36 proposals or 15 percent each of the total (Tables 4 and 5).

Within each discipline, proposals were grouped into sub-areas of research (Table 5). The majority of the proposals in biology were in microbiology

Table 4
Funds By Discipline

Discipline	Number of Proposals	Total Funds	Percent	Mean
Biological Sciences	36	\$ 4,126,845	16.69	\$114,635
Engineering Sciences	50	\$ 5,442,427	22.00	\$108,849
Physical Sciences	117	\$11,616,885	46.97	\$ 99,290
Social Sciences	36	\$ 3,546,563	14.34	\$ 98,516

Total Federal Funds Requested = \$24,732,720

¹Water in America. A report by the Office of Water Policy, U.S. Dept. of Interior, 1983.

Table 5
USGS Water Resources Research Proposals:
Analysis By Discipline

Discipline	No. of Proposals	% of Total	% of Biology
Biological Sciences	36	15.06	—
Ecology/Wildlife	4	1.67	11.11
Microbiology	10	4.18	27.78
Plant/Soil Science	10	4.18	27.78
Zoology/Physiology	9	3.77	25.00
Public Health	3	1.26	8.33

Discipline	No. of Proposals	% of Total	% of Engineering
Engineering Sciences	50	20.93	—
Agricultural Engineering	4	1.67	8.00
Civil/Urban Hydrology	8	3.35	16.00
Environmental/Sanitary	38	15.91	76.00

Discipline	No. of Proposals	% of Total	% of Physical
Physical Sciences	117	48.95	—
Chemistry/Geochemistry	17	7.10	14.53
Water/Groundwater Quality	33	13.81	28.21
Groundwater Hydrology	37	15.48	31.62
Climate/Hydrologic Processes	27	11.30	23.08
Geomorphology/Fluvial	3	1.26	2.56

Discipline	No. of Proposals	% of Total	% of Social
Social Sciences	36	15.06	—
Institutional/Policy Anal.	8	3.34	22.20
Economics/Planning	14	5.86	38.90
Issue-Specific Management	14	5.86	38.90

Total Number of Proposals = 239

and plant/soil science. Again, the reader is reminded of the difficulty in classifying proposals because of overlap, such as between public health and microbiology. Nevertheless, it is striking that only three proposals were submitted that focused on public health issues. The engineering sciences were primarily concerned with environmental/sanitary issues; there was little interest in problems of urban hydrology. Within the physical sciences, research in water/groundwater quality accounted for the majority of the proposed research. This particular response is not astonishing in light of the fact that the U.S.G.S. noted that

groundwater quality and water quality management were "...of particular interest in 1988." Of the 36 proposals submitted by social scientists, the focus was on problems in institutional arrangements, economics and planning, and management of specific issues.

During the past 18 years, especially since the report by the National Water Commission and subsequent reports such as those from the National Academy of Sciences, the predominant and increasing recognition of the nation's water resource problems focuses on management. With respect to the flood hazard, research was recommended on floodplain management, less so on flood prediction models. In urban water resources, the need is less for better estimates of supply than for analyses on more sophisticated estimates and evaluation of use, such as demand management, economic valuation and marketing, and revision of rates and pricing. And, in water quality management, the question facing society is again management. Armed with an arsenal of knowledge on the bio-chemical nature of water and the subsequent ecological and human effects, we face the problem of establishing *and* implementing standards which the consumers will accept—issues such as the ability and willingness to pay for improved water quality are paramount. In a recent paper, entitled "Challenges in Water Management," Viessman asserts, "...the greatest challenge is not that of dealing with the scarcity of water, real or perceived, instead, it is that of finding the key to unlock the constraining influences of the almost impregnable institutions and social customs that must be reckoned with in our efforts to efficiently manage this nation's water resources."²

Yet, while the U.S.G.S. recognized this overriding problem, and emphasized the problems of management in their list of "particular interest" problems (although the U.S.G.S.'s definition can be interpreted in many cases merely to mean more physical/biological research, rather than research on the issues of individual and societal choice), only 36 proposals (15 percent of the total) were submitted by the social sciences. One wonders why? One possible answer is that, relative to other disciplines, there has not been a tradition of water resources research in the social sciences, thus producing relatively fewer researchers. Or, perhaps, these social scientists view the review process as being biased toward water resource problems in the biological, physical, and engineering sciences. For example, even though management is the fundamental concern today in our water resource

²Warren Viessman, "Challenges in Water Management," *Update*, No. 76 (Jan., 1988), p. 11.

issues, only six proposals of the 34 funded last year (1987) were management oriented (\$708,182 of the \$4,361,108). While the Water Resources Research Program may emphasize management, greater efforts should be undertaken to guide the research program toward the predominant water resource issues, the range of problems directly concerning management—law, economics, and social choice.

Water Resources Research or Water Research

Another perspective was to observe the distribution of research proposals as to whether or not the objective was on water research or water resources research. Since the Water Resources Research Program clearly calls for “research concerning any aspect of a water resource related problem deemed to be in the national interest,” the emphasis is on water *resources*, and therefore excludes research simply involving water.

Of the 239 proposals, 21 (9 percent of the total) were considered proposals not on water resources but simply on water (Table 6). These 21 proposals requested approximately \$2.1 million, nearly half of the \$4.381 million available for funding. In light

of the nature of the nation’s water resource problems and the relatively small amount of funding available, an effort should be made to emphasize research on water *resources* and to exclude proposals that simply focus on water.

National or Local

Finally, proposals were evaluated as to the extent to which they addressed a problem of national interest (Table 6). Of the 239 proposals, 133 (56 percent) addressed water resource related problems that were national in scope; however, 108 (44 percent) focused upon regional/local problems without identifying their relevance to national need. The U.S.G.S. emphasizes that “Research that is related to small localities or other special situations will not be considered unless there is a basis for determining that the results are likely to have general applicability.” It is recommended that the U.S.G.S. more vigorously implement this requirement that proposed water resources related problems be in the national interest, and screen those proposals that do not meet this test prior to the review process, or require the reviewers to assess the extent to which the proposals contribute to the national interest.

Table 6

USGS Water Resources Research Proposals: Analysis By Research

Research Classification	Biol. Sci.	Eng. Sci.	Phys. Sci.	Social Sci.	Total	%
Type of Research						
Water Research	7	2	12	0	21	8.8
Water Resources Research	29	48	105	36	218	91.2
Nature of Research						
Application	17	40	80	12	149	62.3
Theoretical	2	1	15	4	22	9.2
Application & Theoretical	17	9	22	20	68	28.5
Area of Research Impact						
National	15	37	62	19	133	55.6
Regional	6	2	24	12	44	18.4
Local	15	11	31	5	62	26.0
<i>Number of Proposals</i>	36	50	117	36	239	

Summary and Recommendations

The need for research concerning problems with the nation’s water resources is well-documented; however, the support to fund research is woefully inadequate. Without an enormous increase in federal financial support, the nation’s water resource problems will continue to exact their toll, and with a diminishing pool of water resource researchers, the problems will become progressively more severe. Thus, federal support for research is now a critical national need.

A second recommendation calls for the U.S.G.S. and/or other relevant federal agencies to provide direction concerning the types of water resources research. Particularly at a time when financial support is so pitifully inadequate, the concern should be one of seeking the greatest dividends from the annual expenditures. Thus, much greater effort needs to be made in defining water resource research priorities and in implementing those priorities. At present, there is a striking imbalance between what is proposed and what is needed.