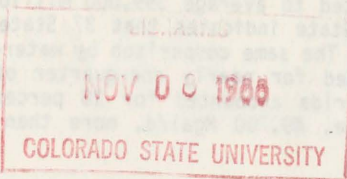


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# COLORADO WATER

Newsletter of the Colorado Water Resources Research Institute, Fort Collins, Colorado 80523



November 1988

## THE WATER RESEARCH INSTITUTES AT 25 YEARS

On November 8 the United States will elect a new President. About the time he takes office the national water resources research program will reach age 25. Confronted with a huge budget deficit and many pressing policy issues, the new President will hardly notice the state institute water research program. In fact, if past trends continue the attitude in Washington will be that water resources management is largely a state issue. In all likelihood only a small federal program will continue, and it will be up to the states to use it as a lever to help solve increasingly complex water problems.

In the 1960s when the water research program was launched the concept of "new federalism" had not yet blossomed. Senator Terry Sanford, just completing a term as Governor of North Carolina, made a tour of some state governments and concluded that the state governments were not yet ready for their responsibilities. Twenty-five years after Terry Sanford's conclusion it is clear that the states must take more leadership in many issues, especially water resources management, and that the federal government will be turning to other urgent matters such as the deficit. One result of this is that it is now up to the states to decide what kind of water resources research programs they need and to implement them. This will be a challenge in Colorado, which has almost completely relied on federal financing for its water research program.

The Colorado Water Resources Research Institute can expect only limited support from the federal government, and it must give priority to using state resources to identify water issues that need research and work to identify and support scientific teams to carry out the research. How to do this will be a challenge, and the Institute will welcome any suggestions from our readers. Perhaps we can involve more participants from government and industry to help plan our research and to contribute to project teams. In any case the Institute needs to attract funds to help support faculty and students at the State's research universities.

Neil S. Grigg

## COLORADO STATE UNIVERSITY ORGANIZES NATIONAL DROUGHT CONFERENCE

New ways to avoid the crippling effects of future droughts will be discussed by state, federal and university water representatives at a Washington, D.C. conference November 1-2.

The Drought Water Management Conference, which is organized by Colorado State University and sponsored by the National Science Foundation, will take a hard look at how state and federal water managers reacted when this year's drought seared crops and shrank lakes and rivers.

After the 1986 Southeastern drought Neil Grigg and Evan Vlachos of Colorado State University initiated a study, with support from the National Science Foundation, of how state governments can better manage water in humid areas. When the national drought of 1988 hit it became clear that the whole country, not just the Southeast, was interested in the same topic: drought water management.

The conference, which will be held at the National Science Foundation headquarters, will propose solutions for future dry years. Leading workshop speakers include Alan Hecht, the director of NOAA's National Climate Program; Stanley Changnon, Midwestern Climate Center, Illinois State Water Survey; Kyle Schilling, director of the U.S. Army Corps of Engineers; Policy Studies Institute for Water Resources; and Eleonora Sabadell, program director of the National Science Foundation's Natural and Man-made Hazard Mitigation Program.

The conference will look at better ways to allocate existing water supplies among competing users during future droughts. "If we look at better ways to have back-up irrigation systems, we can prevent disasters. Then some farmers can still come in with crops," Grigg said. Better communication between water managers at all levels of government and ways to anticipate and plan for droughts also will be discussed.

Some 75 water managers from state and federal government agencies and from universities are expected. Results will be available to the participants about three weeks after the conference, and the full project results will be published in 1989.



### 1985 NATIONAL WATER-USE ESTIMATES SHOW 10 PERCENT DECLINE SINCE 1980

Water use declined in 1985 for the first time since the U.S. Geological Survey began compiling its five-year national water-use estimates in 1950. Ten-percent less water was used during 1985 than during 1980, and the decline was observed in both surface and groundwater withdrawals. Thermoelectric power, industrial and irrigation categories showed the largest decreases.

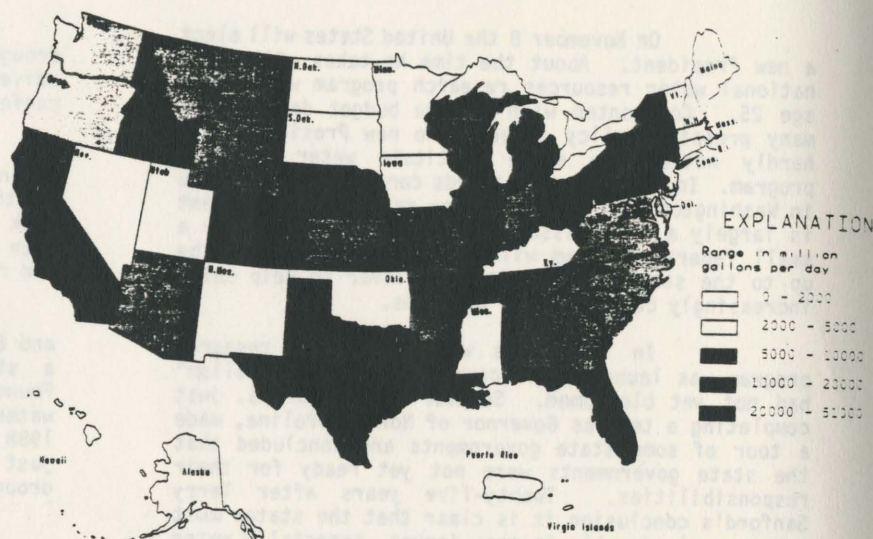
Water withdrawals in the United States during 1985 were estimated to average 399,000 million gallons per day (Mgal/d). A comparison of total withdrawals (fresh and saline) by State indicates that 37 States and Puerto Rico withdrew less water for offstream uses during 1985 than during 1980. The same comparison by water-resources regions showed that the California and South Atlantic-Gulf regions accounted for nearly one-quarter of the total water withdrawn in the United States. California, Texas, Idaho and Florida accounted for 28 percent of total water withdrawals. California withdrew the most water for offstream use, 49,700 Mgal/d, more than double the water withdrawn in either Texas or Idaho, the next largest users.

The average fresh water withdrawal was about 1,400 gallons per person per day for all uses, but this amount varied greatly from state to state. Irrigation accounts for about 80 percent of all consumptive water use in the United States, and those states with large acreages of irrigated land characteristically used much more water.

The USGS authors attribute the decline to several possible factors: more efficient groundwater use by irrigators due to higher pumping costs; increased use of recycled water; depressed commodity prices; and reduced production which decreased industrial and irrigation withdrawals.

Spot sampling for this year, however, suggests that water use is much higher than in recent years due to the current drought. Public water-supply withdrawals and irrigation withdrawals are well above the quantities withdrawn in recent years.

TOTAL WITHDRAWALS



U.S. Geological Survey Circular 1004: Estimated Use of Water in the United States in 1985."

The collection, compilation and analysis of water-use information by USGS was a two-year cooperative effort with other federal agencies and numerous state and local organizations. Copies of the circular may be obtained from the Books and Open-File Reports Section, U.S. Geological Survey, Federal Center, Box 25425, Denver CO 80225.

#### COLORADO RECEIVES TWO USGS GRANTS

Researchers at Colorado State University received two awards from a total of 38 projects selected for the FY1988 USGS Matching Grants Program. Funding of \$4.381 million was available for the national competitive program. Robert A. Young, Department of Agricultural and Resource Economics, will develop an inter-regional mathematical programming model that represents the allocation of Colorado River water. Young's project, **Economic Impacts of Alternative Water Allocation Institutions in the Colorado River Basin**, will measure the potential magnitude and distribution of economic value gains from establishing water markets in the Colorado River Basin. The second award went to H. J. Morel-Seytoux for his project, **Model for Regional Solute Transport Suited for Calibration and Management**. With this award the computer simulation model SAMSON (Stream Aquifer Model for Management by

Simulation) will be expanded to include economic and water quantity components.

#### WIRTH INTRODUCES GREENHOUSE BILL

Senator Tim Wirth's concern about how projected temperature increases might affect the West's water supply has resulted in the introduction of a comprehensive, 150-page bill (S.2662) to counter "global warming." The bill, which took two years to write, immediately acquired 17 cosponsors. While no action on the bill is expected in this Congressional session, another drought next year would surely stimulate interest in this or similar legislation.

Proponents of the "greenhouse theory" speculate that weather pattern shifts, resulting in a hotter and drier West, could reduce the Colorado River's annual flow by as much as 40 percent.



### REAUTHORIZATION SOUGHT FOR WATER RESOURCES RESEARCH ACT

At last word H.R. 5010, which reauthorizes the federal Water Resources Research Act through 1993, was before the Senate Environment and Public Works Committee. Congressman George Miller of California, chairman of the subcommittee that oversees the program, had introduced the bill in July. Colorado Representative Ben Nighthorse Campbell is among the bill's cosponsors. The Act's basic provisions remain, but it also includes the following amendments.

#### Section 104, State Water Institutes Program

The funding authorization level remains the same for State Water Institutes--\$10 million annually or \$150,000 per Institute. The Act also authorizes an annual \$5 million Institute matching-grant competitive program to focus on water problems and issues of a regional or interstate nature beyond those of concern to a single state and which relate to specific program priorities identified jointly by the Secretary of the Interior and the state water institutes. Research will be funded on a competitive basis subject to merit of proposal, need for the information to be produced, and the opportunity such funds will provide for training of water resources scientists or professionals. The new Act requires a 1:1 cost share throughout its five-year duration, and stipulates that cost share funds are to be used only for direct-cost expenditures.

The Act retains but simplifies the five-year mandatory review process for institute programs. If an institute does not qualify after review, no further grants will be made until it is reinstated to the satisfaction of the Secretary of the Interior.

#### Section 105, Matching Grants Program

In addition to grants authorized by Sec. 104, the Act authorizes \$20 million annually to continue the Matching Grants Program now administered by the U.S. Geological Survey. These grants are available to water institutes, other qualified educational institutions, private foundations, private firms, individuals, and agencies of local or state government.

#### Section 106, Technology Development

This authorizes an additional \$6 million for technology development, with a cost-share requirement of no more than 1:1 for state water institutes.

### STUDY URGES FEDERAL WATER POLICY AGENDA FOR NEXT ADMINISTRATION

The Harvard Water Policy Project released its findings on August 30 and advocated a streamlined federal water policy with a seven-point agenda for the new Administration, including:

- (1) appointment of a President's Water Council under an independent chairperson;
- (2) formation of regional councils for areas with water problems;
- (3) creation of a national water information program;
- (4) revision of the national water resources research program to include a national water extension service;

- (5) improved water resource public education including regional water resource forums to establish program priorities and improve communications between federal administrators and local water interests;
- (6) application of modern marketing and pricing techniques to all federally-produced water; and
- (7) creation of a national water trust fund to finance federal water programs through revenues such as user fees rather than general tax revenues.

The study noted that at least 25 federal and independent agencies, funded by no less than 70 separate congressional appropriations, exercise authority over water programs.

Harvard faculty and graduate students produced the study with grant assistance from Resources for the Future of Washington, D.C. and advice from ten outside experts including Henry P. Caulfield, Jr., Professor Emeritus of Political Science at Colorado State University, who participated in the study.

### THE RAINIEST TOWN IN THE WORLD...

Hydrology is usually regarded as a subject for specialists, but recently an event made the front page of the Wall Street Journal: the annual rainfall in Cherrapunji, India.

Cherrapunji lives under a cloud--literally. It is one of the rainiest towns in the world. Perched on a mountain above the plains of Bangladesh, it might sometimes resemble an underwater town.

Each June monsoon winds sweep across the Indian Ocean and Bay of Bengal and Cherrapunji is the first place they hit, bringing an average of 400 inches of rain a year. Some days the town receives 24 inches of rain--as much as the annual rainfall in London or Paris. In the 1800s Cherrapunji set a record, suffering the rainiest 12 months in recorded history (986 inches between August 1860 and July 1861).

The road to Cherrapunji takes the traveler through terraced rice paddies, waterfalls and cliffs of stone, and every trip is an adventure. Most cars are equipped with fog lamps, but local drivers still must dangle their heads out their car windows, even at noon, and collisions are frequent. Pedestrians suddenly appear out of the mist wrapped in plastic sheets or under black umbrellas.

Despite the heavy rains, however, the low level of the area's water table is a problem. Because the local forests have been denuded rain rushes to the plains below, and even with the abundance of rainfall there is not a lot of water to drink.

The rains are a part of the local consciousness. Townspeople rejoice when the rainy season ends in October, but if the rains don't begin again promptly in March many people become agitated and complain of disorientation and headaches. A local teacher says they simply like to see the rain, because for them it is natural and their way of life.

(An article about this appeared in the Wall Street Journal, 9/20/88)



#### WATER-EFFICIENCY PROGRAM TO BE DEVELOPED

The Rocky Mountain Institute, located at Snowmass, Colorado, states that it has been invited by Governor Roy Romer to help develop a statewide water-efficiency program. RMI states that the Denver metro area has the potential to save 100,000 acre-feet per year, and that retrofitting Denver metropolitan area homes with the best water-saving showerheads, toilets, and faucet aerators could save about 55,000 acre-feet of water a year.

RMI staff met with Governor Romer and his staff and presented a number of policy recommendations, including and extensive public education program; changing building codes to mandate installation of water-efficient indoor fixtures; and providing financial incentives, like sliding scale tap fees, to encourage construction of water-efficient buildings. (RMI Newsletter, August 1988).

#### WORKSHOP ON WATER CONSERVATION SCHEDULED- TRENDS FOR THE COMING DECADES

The Colorado Water Congress and Metro Water Conservation, Inc. will hold a one-day workshop on water conservation on November 17, 1988 at the Northglenn Holiday Inn (I-25 and 120th Ave.). The workshop will be an intensive information session on current water conservation developments and issues. The registration fee is \$60 (advance and prepaid) or \$75 (at the door, if seating available) for CWC or MWC members, and \$120 (advance and prepaid) or \$150 (at the door, if seating available) for non-members of CWC or MWC. Application to the Colorado Board of Continuing Legal and Judicial Education has been made for "CLE" credits. Registration is limited to 100. For further information contact Colorado Water Congress at 837-0812.

#### STORMWATER AND WATER QUALITY MODEL USERS GROUP HOLD CONFERENCE IN DENVER

Water managers and engineers from across the nation met in Denver on October 3 and 4 to exchange their experiences and provide information about the applications of urban stormwater quantity and quality models. The latest state-of-the-art modeling techniques and field investigations were described for a variety of climatic conditions from Washington and California to the southern Gulf Coast and up the Eastern seaboard. The program also included a paper on the application of modeling to water management in Africa.

Model applications in the Denver area were described by Michael P. Jansekoc and Ben Urbonas, Urban Drainage and Flood Control District; James Chang, Kiowa Engineering Corporation; Charles Huffman and Lynn Johnson, University of Colorado at Denver; S. Rocky Durrans, Merrick and Company, and Kenneth R. Wright and Ronald L. Rossmiller, Wright Water Engineers.

The conference was sponsored by the University of Colorado at Denver, Urban Drainage and Flood Control District, Denver, and the Environmental Protection Agency, Athens, Georgia. A conference proceedings will be issued.

#### EVANS RECEIVES LEGISLATIVE COMMENDATION

The Colorado General Assembly honored Norman A. Evans, Institute Director Emeritus, for his contributions to the water resources profession with a commendation presented at a special program which was organized to celebrate agricultural research achievements in Colorado.

The tribute read:

"Congratulations to NORMAN A. EVANS, in recognition of a distinguished career and outstanding achievements in water resources research, management and engineering;

... for dedicated service to the State of Colorado as director of the Colorado Water Resources Research Institute, developing it into one of the top water institutes in the nation and contributing many outstanding reports about Colorado's water resources;

... for accomplishments in teaching, research and service at Colorado State University for 37 years, including the establishment of a Department of Agricultural Engineering that has grown and achieved national recognition;

... for extensive public service to the people of Colorado through involvement in many local, state and national water resource organizations including 14 years on the Colorado Water Pollution Control Commission;

... and for commitment to solving global hunger problems by the improvement of water resources management throughout the World."

Senators Tilman "Tillie" Bishop and Robert Schaffer and Representatives John Ulvang and Scott McInnis requested the tribute acknowledging Evans' long tenure of service to the State of Colorado.

#### IRRIGATION EFFICIENCY PROGRAM CAN SAVE ENERGY, CUT WATER USE

A program underway in New Mexico shows that increasing irrigation system efficiency, including pump testing and better management, could save up to one third of the energy now used and up to 50 percent in water use. New Mexico farmers are participating in a field program, administered by the New Mexico Water Resources Research Institute; that will provide a number of energy services ranging from irrigation system efficiency tests to training courses. In addition to pump testing and engineering, the program addresses the economic end results by telling the farmer how long it will take for improvements or the installation of new equipment to pay off.

Information from the program will be used to evaluate the potential for energy and water savings, and results will be used to develop a plan for regional on-farm energy and water conservation. Educational materials such as video tapes, brochures, demonstrations, training courses and technical assistance will be available to agricultural producers and others associated with irrigation management.



**WYOMING WATER CENTER FUNDS  
16 NEW PROJECTS**

The Wyoming Water Center will fund 16 new water research projects in FY1989. A \$325,000 annual appropriation from the Wyoming Legislature to the Center, together with \$105,000 under the federal Water Resources Research Act, provides funds for the program.

The research focus will include: a study of long-term trends in glacier and snowmelt runoff; underground contaminant modeling; a study of the chemical, physical and biological characteristics that control the form of selenium and its distribution in soils and plants; a characterization of the mechanics, rates, water qualities and seasonal variations associated with groundwater recharge in the upland zones of two typical geological environments; the upgrading of a water quality model to incorporate the analysis of inherent uncertainties found in stream systems; a study of soil microorganisms and their role in the plant uptake of selenium and its conversion to toxic forms; an assessment of the potential environmental impacts of saline oil field discharges into Wyoming's Salt Creek and Powder River; an examination of the chemistry of molybdenum in alkaline mine spoils of Wyoming with emphasis on livestock risk factors; and a determination of habitat and instream flow requirements in the context of minimum populations necessary to maintain fish and other wildlife species.

**FIVE NEW MEXICO MATCHING GRANT  
PROJECTS AWARDED**

The New Mexico Water Resources Research Institute received \$1.1 million for five research projects under the USGS 1988-89 Matching Grant Program (Sec. 105). The program requires the state to appropriate funds to match half of the \$1.1 million.

Eleven proposals were submitted from three universities in the state, New Mexico State University, the University of New Mexico and New Mexico Institute of Mining and Technology. The selected projects are:

- The Effects of Wetting on Transport of Organics in Groundwater
- Increased Water Use Efficiency in Alfalfa by Selection for Two Key Heritable Physiological Traits
- Institutional Needs and Distribution of Benefits in Use of Hydrologic Criteria to Expedite Changes in Water Use
- A Field Study for Model Validation of Multi-dimensional Flow and Transport in the Vadose Zone
- Groundwater Quality in Pumping Wells Located Near Surface Water Bodies

**AMERICAN WATER FOUNDATION NAMES PRESIDENT**

F. E. Cassidy of Houston, Texas was named president of the American Water Foundation at the Foundation's annual meeting in August. Cassidy, a member of the AWF Board of Directors since 1986, is director of international development for Tenneco Inc. of Houston, Texas.

The American Water Foundation is a private, non-profit organization dedicated to the international transfer of U.S. water resources technology. AWF

also organizes international seminars, research and training programs in the field of water technology, irrigation and conservation. The Foundation is headquartered in Denver, with offices in Washington D.C. and Fort Collins, Colorado.

**IRRIGATION INSTITUTE DIRECTOR ELECTED  
TO NATIONAL ACADEMY OF ENGINEERS**

Marvin E. Jensen, Director of the Institute for Irrigation Management at Colorado State University, was elected to the National Academy of Engineers earlier this year. USDA agency administrator Terry B. Kinney, Jr. said, "This is the highest honor that can be conferred on an engineer in this country, because the election is by fellow engineers."

Jensen earned his Ph.D. in civil engineering from Colorado State University. He retired in 1987 after 32 years with USDA's Agricultural Research Service as national program leader for water management and salinity research. Jensen recently completed a three-year term as president of the International Commission on Irrigation and Drainage. In his role as CIIM director, Jensen is working to develop international irrigation projects that link university faculty with private U.S. firms.

**WATER MANAGEMENT PROCEEDINGS AVAILABLE**

The U.S. Committee on Irrigation and Drainage (USCID) has published **Water Management**, the Proceedings of two 1987 Regional Meetings held in Denver and Sacramento, California. The Proceedings includes 57 technical papers on water quality concerns, conjunctive use of surface/groundwater, management to meet competing needs, and use of computers. Authors represent academia, federal, state and local government agencies; and the private sector.

The Colorado Water Resources Research Institute was a cosponsor of the Denver meeting.

The proceedings is available from: USCID, P.O. Box 15326, Denver, CO 80215. Price: \$40 plus \$3 postage and handling. ISBN: 0-9618257-1-5. 1987.

**POLITICAL SCIENTIST EXAMINES U.S./MEXICO  
GROUNDWATER CONTROVERSY**

Stephen P. Mumme is the author of **APPORTIONING GROUNDWATER BENEATH THE U.S.-MEXICO BORDER, Obstacles and Alternatives**, a just-published monograph of the Center for U.S.-Mexican Studies, University of California at San Diego. The study examines the prospects for settling the controversy over ownership of unapportioned groundwater beneath the U.S.-Mexico border. It reviews the origin and background of the current groundwater dispute and provides an overview of the hydrologic, economic and management aspects involved. This is followed by profiles of groundwater disputes along various sections of the international boundary, from the lower Rio Grande Valley to the Tijuana-San Diego estuary, on which the author bases his identification of the principal obstacles to achieving a groundwater treaty. The most unyielding of these arise from the systemic political differences between the two countries which, the study argues, preclude a number of solutions in international law for resolving the groundwater dispute.

Among the remaining options, the most politically viable approach is one that is based on the doctrine



of equitable apportionment, employing a case-by-case rather than comprehensive approach to resolving groundwater disputes. The study concludes with a scenario for settling the groundwater controversy predicated on elaborating the jurisdiction of the International Boundary and Water Commission, United States and Mexico, and emulating the pattern of jurisdictional expansion found in preceding non-treaty agreements.

Mumme is Associate Professor of Political Science at Colorado State University. His research interests include U.S.-Mexican environmental relations, Mexican environmental policy and comparative environmental policy. He was a Bank of America Fellow at the Center for U.S.-Mexican Studies, University of California, San Diego in 1981.

#### NEW INSTITUTE PUBLICATIONS

Completion Report No. 148--**Integrating Tributary Groundwater Development into the Prior Appropriation System: The South Platte Experience**, by Lawrence J. MacDonnell. Price: TBA

Colorado has an abundant supply of tributary groundwater, and its development proceeded virtually unregulated until 1965. By that time important agricultural economies in the South Platte, Arkansas, and San Luis valleys had become highly dependent on the use of groundwater. However, because of the physical relationship between tributary groundwater and surface water, pumping of this groundwater was affecting the availability of surface flows.

In 1969, Colorado enacted a number of provisions aimed at integrating appropriative rights to surface water and tributary groundwater. This law required that well pumping be regulated according to the priority system but with the important modification that junior diversions not be curtailed unless they cause material injury to senior water rights. A number of provisions such as alternate points of diversion, plans for augmentation, and substituted supplies facilitated continued use of existing wells.

This report examines the experience of three organizations of well pumpers in the South Platte Valley in integrating their tributary groundwater use into the existing priority system.

The Groundwater Appropriators of the South Platte (GASP), which includes about 3000 wells, operates under a legal provision allowing wells to pump so long as adequate replacement water is provided. This program is supervised by the State Engineer under the substitute supply provision and involves annual review and approval. GASP has been making water available to the Division One Engineer equalling about 20 percent of the water pumped from its wells. This water is released to the stream at times and locations determined necessary by the division engineer to prevent injury to senior surface rights.

The Fort Morgan Reservoir and Irrigation Company has obtained a water court-approved plan for augmentation protecting the pumping of 90 wells on lands it serves. This approach requires a detailed analysis of the depletions to the stream caused by the wells, and a demonstration that the replacement scheme will fully offset those depletions both in quantity and in time. Water for replacement is provided primarily through a recharge program.

The Groundwater Management Subdistrict of the Central Colorado Water Conservancy District originally

had sought a single plan for augmentation covering 870 wells in its area. Difficulties in developing a replacement plan for all these wells has caused the Subdistrict to reorient its approach.

Colorado's success on integrating tributary groundwater use into the priority system is demonstrated by the fact that pumping from these wells has never had to be administratively curtailed. This success has resulted from a combination of flexible legal requirements, flexible administration by the State Engineer's Office, and cooperative efforts by well pumpers to meet the legal requirements. Now, nearly 20 years after the original legal provisions were enacted, it is time to move the next step toward clarifying the rules applying to tributary groundwater development. Requirements applying to pre-1969 Act wells should be distinguished from those applying to post-1969 Act wells. Injury to senior rights should include a consideration of the efficiency of that senior's water use. Efforts to increase usable supplies through conjunctive management should be encouraged.

#### HEC PLANS CHANGE IN COMPUTER SOFTWARE SUPPORT

The Hydrologic Engineering Center (HEC), U.S. Army Corps of Engineers, plans to encourage the use of the private sector for computer software support, as stated in the following Public Notice released in August, 1988.

The Hydrologic Engineering Center (HEC), U.S. Army Corps of Engineers, encourages private sector organizations to perform program and user's document distribution, hot-line support, training, and engineering assistance for the HEC-developed computer programs. The engineering software private sector has demonstrated the interest and capability to distribute and support both its own software and that developed by public agencies. As a consequence, HEC will no longer provide these services to non-Federal offices after 1 October 1988. Inquiries to HEC after that time will be referred to a list of private sector organizations that have expressed an interest and capability for providing such services. Financial arrangements for such services will be between the user and the organization.

This change will allow the limited HEC manpower resources to focus on the higher priority work of training, research, planning analysis and assistance to Corps offices. HEC will continue to support its computer programs for the profession through development, corrections, and periodic releases of new versions. HEC will analyze potential program errors which are brought to its attention. The status of new software developments will be announced in HEC newsletters.

Interested organizations are invited to request and complete a form stating their interest and capabilities to perform such services. A list of responding organizations will be compiled and furnished to those requesting programs and assistance.

Requests for the interest statement should be sent to:

The Hydrologic Engineering Center  
U.S. Army Corps of Engineers  
ATTN: NON-FEDERAL USER SUPPORT  
609 Second Street  
Davis, California 95616



### NEW COLORADO WATER RESEARCH

A summary of water research awards received and projects initiated during the past 12 months at Colorado State University, the University of Colorado and Colorado School of Mines is given below for those who may like to contact the investigators to receive information.

#### Colorado State University

**Prediction of Flood Hazards Based on Joint Distribution Functions, and Cooperative Research on Prediction of Floods and Precipitation Events**, Jose D. Salas, Civil Engineering (National Science Foundation)

**Snowpack Ground Measurement Support**, Harold S. Boyne, Earth Resources (Department of Defense)

**Morphology and Dynamics of a Major Anastomosing Channel System, Riverline Main, Australia**, Stanley A. Schumm, Earth Resources (National Science Foundation)

**National Atmospheric Deposition Program**, James H. Gibson, Natural Resources Ecology Lab (USDA/Cooperative States Research Service)

**Projection of Wildlife & Fish Recreational Demand for the 1989 National Assessment**, Richard G. Walsh, Agricultural and Resource Economics (USDA/ERS)

**Role of Water in Creating Income and Employment on Southwestern Indian Reservation**, Robert A. Young, Agricultural and Resource Economics (Oregon State University)

**Multivariate Methods for Evaluating Relationships Between Changes in Surface Water and Changes in Atmospheric Deposition**, Jim C. Loftis, Agricultural and Chemical Engineering (Kilkelly Environmental Associates)

**Weather Modification-Related Physical Studies of Rocky Mountain Cloud Systems**, Lewis O. Grant, Atmospheric Science (National Science Foundation)

**Study of Flow and Sediment Processes in the Fall River in 1988**, Colin R. Thorne, Civil Engineering (USDI/National Park Service)

**Alignment Characteristics of Large Alluvial Rivers in Venezuela**, Carl F. Nordin, Civil Engineering (Army Corps of Engineers)

#### University of Colorado

**Development and Implementation of Advanced Decision Support Systems for River Operations in the West**, Kenneth Strzepek, Civil Engineering (Bureau of Reclamation)

**A Multidisciplinary Precipitation Research Program in Support of the Earth Observing System**, Robert Chase, Aerospace Engineering (National Aeronautics & Space Administration)

**Biodegradation of Organic Compounds in Water**  
JoAnn Silverstein, Civil Engineering (National Science Foundation)

**Fluctuations in Basal Water and Sliding of Columbia Glacier, Alaska**, Mark Meier, Institute of Arctic and Alpine Research (National Science Foundation)

**Relative Sea Level Changes Along the Margin of the Hudson Strait/Frobisher Bay Ice Streams, Arctic Canada: A Contribution to Glacial Chronology and Glacial Isostasy**, John Andrews, Institute of Arctic and Alpine Research (National Science Foundation)

**Impacts of Water Transfers on Rural Regions and Communities**, Charles W. Howe, Institute of Behavioral Science (Ford Foundation)

**Reduce Uncertainty in Projection of Future Sea-Level Change Due to Ice Wastage**, Tissa Illangasekare, Civil Engineering (Department of Energy)

#### Colorado School of Mines

**Extraction and Analysis of Vadose Zone Water from Tuff Cores to Differentiate Primary Water from Infiltration Water by Determining Water Chemistry and Source**, Jerry Higgins, Institute for Groundwater Research and Education Program (Geological Survey)

**Development of Conceptual Models of Groundwater Flow and Solute Transport Characteristics Within Hanford Reservation Post-Basalt Sedimentary Deposits**, Eileen Poeter, Geology and Geological Engineering (Washington State University-Battelle Pacific Northwest Laboratory)

**Phytogeohydrology of the Vadose Zone**, John Emerick, Environmental Sciences and Engineering Ecology (Geological Survey)

**Methodology for Practical Flow-Pump Permeability and Specific Storage Measurements on Low-Permeability Cores**, Hal Olsen, Institute for Groundwater Research and Education Program (Geological Survey)

**Prototype Pore-Water Extraction by Triaxial Compression Test**, Jerry Higgins, Institute for Groundwater Research and Education Program (Geological Survey)



**NEW REPORTS AVAILABLE  
FROM USGS DENVER OFFICE**

**"U.S. Geological Survey urban-stormwater data base of constituent storm loads; characteristics of rainfall runoff, and antecedent conditions; and basin characteristics,"** by M.H. Mustard, N.E. Driver, John Chyr, and B.G. Hansen.

Water Resources Investigations Report 87-4036.  
Microfiche \$51.50; paper copy \$4.00

The data compiled represent 1,144 storms at 97 stations in 21 metropolitan areas. Storm loads of 18 constituents and 15 characteristics of rainfall, runoff and antecedent conditions are reported. Includes 28 selected basin characteristics with 11 categories of land use.

**"Extension of streamflow and dissolved-solids records at selected sites in the Colorado River Basin, Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming, 1940-83,"** by David K. Mueller and Timothy L. Liebermann.

Water Resources Investigations Report 87-4203.  
Microfiche \$4.00; paper copy \$12.00

USGS hydrologists have completed an analysis of streamflow and dissolved solids data in the Colorado River basin. They applied standard statistical techniques to extend records for 13 selected sites from October 1940 through the beginning of the period of record. These extended records complete the concurrent data sets for 20 streamflow and water quality gaging stations.

**"Estimation of natural dissolved-solids discharge in the Upper Colorado River Basin, Western United States,"** by D.K. Mueller and L.L. Osen.

Water Resources Investigations Report 87-4069.  
Microfiche \$4.00; paper copy \$10.25

Presents estimates that represent the hypothetical salinity that would have been measured during the past 80 years if there had been no water resources development. The estimates will be used in a Bureau of Reclamation computer program to predict when salinity standards may be exceeded.

**"Methods to determine transit losses for return flows of transmountain water in Fountain Creek between Colorado Springs and the Arkansas River, Colorado,"** by Gerard Kuhn.

Water Resources Investigations Report 87-4119.  
Microfiche \$4.00; paper copy \$28.50

To fully use its transmountain water supplies, the City of Colorado Springs intends to exchange the return flows from these water supplies for other water. Most of the transmountain return flows are discharged into Fountain Creek at the Colorado Springs Wastewater Treatment Facility and flow downstream to the Arkansas River. This study identifies and quantifies the sources of transmit loss for the transmountain return flows.

**"Water quality assessment of Arvada Reservoir, Denver metropolitan area, Colorado,"** by Linda J. Britton and Neville G. Gaggiani.

Water Resources Investigations Report 87-4107.  
Microfiche \$4.00; paper copy \$10.75

This study, completed in cooperation with the

the City of Arvada, assesses the physical, chemical and biological quality of the various source waters of the reservoir and estimates its trophic state.

**"Groundwater and the Rural Homeowner,"** by Roger Waller.

This 37-page booklet describes and illustrates the fundamentals of groundwater occurrence, the common types of household wells and methods of preventing or solving common well-water and septic-system problems. Single copies are available free of charge.

**"Methods for collection and analysis of aquatic biological and microbiological samples,"** edited by L.J. Britton and P.E. Greeson.

Open File Report 88-190.  
Microfiche \$4.00; paper copy \$101.00

This revised edition describes USGS methods to collect, preserve and analyze waters to determine their biological and microbiological properties. There are detailed descriptions of more than 45 individual methods.

The above reports are available from: U.S. Geological Survey, Books and Open File Reports, Federal Center, Box 2545, Denver, CO 80225. Prepayment is required. Make check or money order payable to the U.S. Geological Survey.

**POSITIONS AVAILABLE**

**Executive Director,** Water Resources Center, Desert Research Institute, Reno, NV. The Executive Director is responsible for the administration of the Water Resources Center and provides leadership in the acquisition of new research programs at the national and international levels, develops long-range plans for direction and expansion of the Center research base, and coordinates Center-wide research programs. The position requires a doctorate and demonstrated research experience in hydrology, hydrogeology or water resources; experience in developing, organizing and coordinating team research efforts; demonstrated ability to secure funds from government agencies and others; and the ability to work with groups, agencies and administrators at the national, regional and state levels. Send letter of application and resume to: Executive Director, Search Committee, President's Office, DRI Las Vegas Science Center, 2505 Chandler Ave., Suite 1, Las Vegas, NV 89120. Telephone: (702)673-7317. Deadline: January 15, 1989.

**Associate Technical Director and Director, Operations Research and Strategic Planning,** Naval Ocean Research and Development Activity (NORDA). Mandatory technical qualifications are: broad knowledge of ocean science, acoustics and technology with specific understanding of the current state-of-the-art; knowledge of current Navy needs in ASW, Mine Warfare, and Mapping, Charting and Geodesy; ability to construct and manage a broad spectrum of activities related to operations research and systems analysis with emphasis on incorporation of environmental effects; and broad knowledge of the Navy R&D process including requirement setting, studies and analyses of naval needs and program planning at CNO, CNR and SYSCOM level. Managerial qualifications desirable. For application forms and additional information contact Ms. Diddy Kirby at (601)688-4640. Deadline: November 10, 1988.

Apogee Research, Inc. seeks resource economists and water resources policy analysts with graduate-level



education and/or experience in the following fields: Economics, Natural Resources Management, Environmental or Civil Engineering, Public Finance, Administration or Policy, and Marine Science. Apogee Research, Inc. is a consulting firm serving federal, state, local and private clients in fields such as transportation, hazardous waste management and water resources management. Send resume to: Mark W. Mugler, Vice President, Apogee Research, Inc., 4350 East West Highway, Bethesda, MD 20814. Telephone: (301)652-8444.

The west coast regional office of the Environmental Defense Fund is seeking a water quality analyst with training in hydrology, ecology, chemistry or related fields. Basic familiarity with issues related to western water law, agriculture, forestry, fisheries, wetlands, and Native American rights and resources is desirable. Strong verbal and analytical skills are a must, together with an ability to work both cooperatively and independently in a diverse, multidisciplinary setting. Send resume and writing sample to David Yargas and Zach Willey, Environmental Defense Fund, Rockridge Market Hall, 5655 College Ave., Oakland, CA 94618. Telephone: (415)658-8008.

Graduate study opportunities in water sciences are presently available in the Agricultural Engineering Department at Oklahoma State University. For further information contact: Agricultural Engineering Department, Oklahoma State University, Stillwater, OK 74078-0497. Telephone: (405)744-5433.

#### AGRICULTURAL NONPOINT SOURCE POLLUTION TEXT AVAILABLE

The Water Resources Research Center at Purdue University has approximately 200 copies of the text "Agricultural Nonpoint Source Pollution: Model Selection and Application," A. Giorgini and F. Zingales, eds. To obtain a copy send \$5.00 for shipping/handling and your mailing address to: Water Resources Research Center, Purdue University, Lilly Hall of Sciences, West Lafayette, IN 47907.

#### CONFERENCES

- Nov. 6-11 WATER FOR THE YEARS AHEAD-QUALITY AND QUANTITY: 1990 AND BEYOND, 24th Annual AWRA Conference, Milwaukee, WI. Contact: Dr. N. Earl Spangenberg, College of Natural Resources, Univ. of Wisconsin, Stevens Point, WI 54481 (715)346-2372.
- Nov. 15-19 8TH ANNUAL INTERNATIONAL SYMPOSIUM ON LAKE AND WATERSHED MANAGEMENT, St. Louis, MO. Contact: North American Lake Management Society, P.O. Box 217, Merrifield, VA 22116. (202)466-8550.
- Dec. 5-9 AMERICAN GEOPHYSICAL UNION FALL MEETING, San Francisco, CA. Contact: AGU Meetings, 2000 Florida Ave., N.W., Washington, D.C. 20009. (202)462-6903.
- Mar. 13-16 SYMPOSIUM ON THE APPLICATION OF GEOPHYSICS TO ENGINEERING AND ENVIRONMENTAL PROBLEMS - SAGEEP, Lakewood, CO. Contact: Mr. C. E. Bierley. (303)980-1648.
- May 22-26 INTERNATIONAL CONFERENCE ON CHANNEL FLOW AND CATCHMENT RUNOFF, Charlottesville, VA. Contact: Dr. Ben C. Yen, Department of Civil Engineering, University of Virginia, Thornton Hall, Charlottesville, VA 22901.

#### WATER QUALITY MONITORING IS SUBJECT OF INTERNATIONAL SYMPOSIUM

Colorado State University will host an International Symposium on the **Design of Water Quality Information Systems** June 7-9, 1989. The symposium will examine water quality monitoring as an information system and present ways to design such systems. It should be of particular interest to those who manage and/or design water quality monitoring programs in government or industry and those who use such programs.

Symposium topics will include: Defining information goals; Identifying applicable statistics; Establishing appropriate data analysis protocols; Reporting formats; Computerizing data handling, analysis and reporting; Design documentation and implementation; and Case studies.

For further information contact: Robert C. Ward or Jim C. Loftis, Agricultural and Chemical Engineering Department, Colorado State University, Fort Collins, Colorado 80523. Telephone: (303)491-5252

#### FIRST ANNOUNCEMENT

The **Fifth Federal Interagency Sedimentation Conference**, scheduled for April 22-25, 1991 in Las Vegas, Nevada. The conference's theme will be "Practical Sediment Management, Issues and Answers." For the first time the conference invites papers from not only Federal agencies but from state and local agencies, universities and the private sector. A Call for Papers will be sent out in June 1989. Contact: Robert T. Joyce, FFISC Chairman; Tennessee Valley Authority, 320 Evens Bldg., Knoxville, TN 37902.

#### CALLS FOR PAPERS

A symposium on **Frozen Soil Impacts on Agricultural Lands** will be held in Spokane, WA March 21-22, 1990. Topics will include a wide range of subjects related to the occurrence, measurement, prediction and impacts of seasonally frozen soil. Those interested should submit a one-page abstract by November 15 to: Dr. Myron Molnau, Technical Program Chair, Department of Agricultural Engineering, University of Idaho, Moscow, ID 83843. Telephone: (208)885-6182.

The American Water Resources Association will celebrate its 25th anniversary when it holds its 25th Annual Conference, **Water: Laws & Management**, in Tampa, Florida on September 17-22, 1989. Professional papers and posters are requested which will address water and related environmental management laws and programs. Abstracts are due November 16, 1988. The abstract cannot exceed 200 words, and must include title of the paper or poster, all authors' names and their affiliations. Submitting author should include, on a separate page, full mailing addresses and telephone numbers for each author. Submit three copies to: L. M. Buddy Blain, General Chairman, Blain & Cone, P.A., 202 Madison St., Tampa, FL 33602. Telephone: (813)223-3888.

ASCE will sponsor a **National Symposium on Non-Point Water Quality Concerns-Legal and Regulatory Aspects** in New Orleans, LA December 11-12, 1989. Presentations are invited on federal, state or local laws, regulations, policies and institutional arrangements intended to preserve or enhance water quality. Deadline: December 1, 1988. Abstract forms are available from the Institute or from: Donald L. Pfost, Program Chairman, 205 Agricultural Engineering Dept., University of Missouri, Columbia, MO 65211. Telephone: (314)882-2731.



**SEMINAR SERIES AND GUEST LECTURE SERIES**

**Seminar Series on Water Resources Engineering** - This weekly seminar series continues its luncheon meetings through December 1.

|                           |  |                                   |
|---------------------------|--|-----------------------------------|
| November 3<br>12:10 p.m.  | <b>ONE DIMENSIONAL MODELING OF MOVING RAINSTORMS</b><br>J.R. Richardson and P.Y. Julien, Department of Civil Engineering     | Room B206<br>Engineering          |
| November 10<br>12:10 p.m. | <b>RUNOFF PREDICTION FOR SMALL UNGAGED WATERSHEDS</b><br>Greg Koch, Hydrologist, Simons and Li and Associates                | Room 203-5<br>Lory Student Center |
| November 17<br>12:10 p.m. | <b>ADVANCES IN REGIONAL FLOOD PREDICTION</b><br>Duane C. Boes, Professor, Department of Statistics                           | Room 203-5<br>Lory Student Center |
| December 1<br>12:10 p.m.  | <b>WATER RESOURCES DEVELOPMENT IN THE MEDITERRANEAN</b><br>Jure Margeta, Visiting Professor, Department of Civil Engineering | Room 203-5<br>Lory Student Center |

**Environmental Engineering Seminar Series**-Everyone is welcome. Feel free to bring a lunch.

|                           |   |                                 |
|---------------------------|---|---------------------------------|
| October 31<br>12:00 noon  | <b>ENVIRONMENTAL SITE ASSESSMENTS</b><br>Bob Montgomery, Project Manager, Woodward Clyde Consultants  | Room 201<br>Lory Student Center |
| November 7<br>12:00 noon  | <b>PROFESSIONAL ETHICS IN ENGINEERING</b><br>Ron McGlaughlin, President, McGlaughlin Water Engineers  | Room 201<br>Lory Student Center |
| November 14<br>12:00 noon | <b>THE FUTURE OF NON-POINT SOURCE WATER POLLUTION CONTROL</b><br>Greg Parsons, Non-Point Sources Coordinator<br>Colorado Water Quality Control Division | Room 201<br>Lory Student Center |
| November 21<br>12:00 noon | <b>RISK ASSESSMENTS IN HAZARDOUS WASTE INVESTIGATIONS</b><br>Alexis Fricke, Environmental Engineer, Engineering Science Inc.                            | Room 201<br>Lory Student Center |
| November 28<br>12:00 noon | <b>MINIMIZING EMBANKMENT DAMAGE DURING OVERTOPPING FLOW</b><br>Paul Klopper, Project Engineer, Simons Li and Associates                                 | Room 201<br>Lory Student Center |
| December 5<br>12:00 noon  | <b>SLOW SAND FILTRATION: RESEARCH AT THE UNIVERSITY OF COLORADO AND AN UPDATE FROM THE RECENT INTERNATIONAL CONFERENCE</b>                              | Room 201<br>Lory Student Center |

**Guest Lecture Series on Water Quality Management** - This series for AE/CE548 continues through November 14.

|                          |  |                          |
|--------------------------|--|--------------------------|
| October 31<br>2:00 p.m.  | <b>PLANNING TODAY'S WATER QUALITY MANAGEMENT EFFORTS</b><br>Rick Claggett, Chief, Water Quality Management Section, Region VIII, EPA | Room C102<br>Engineering |
| November 7<br>2:00 p.m.  | <b>THE EVOLVING CONSTRUCTION GRANTS (LOAN) PROGRAM</b><br>Larry Sheehan, Chief, Municipal Construction Program Management            | Room C102<br>Engineering |
| November 14<br>2:00 p.m. | <b>IMPLEMENTING THE NON-POINT EMPHASIS OF THE 1987 CWA AMENDMENTS</b><br>Greg Parsons, Colorado Water Quality Control Division       | Room C102<br>Engineering |



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