COLORADO WATER

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WHAT CAN "HIGH TECH" DO FOR COLORADO WATER?

Just as a modern airplane is a far cry from the one flown by the Wright Brothers, today's water management system should perform better than a 19th Century one.

Everyone knows what an airplane is, but what is a water management system? It is a set of physical components that controls water from origin to destination, and it is highly governed by legal, social and political factors. In a sense, water management systems are more difficult to control than airplanes.

Water management systems are critical to Colorado's future. Can "high tech" improve them? The answer is surely yes, if the political and legal obstacles can be overcome.

Colorado has an opportunity to demonstrate the application of high tech to water management with its satellite data collection system and its emerging capabilities in computer modeling. The SAMSON model, for example, offers a high-tech tool to improve water management decisionmaking in the South Platte Basin. I hope that the South Platte Water Management Committee, which has adopted SAMSON for its planning activities, will show the way.

Computer-based water management models like SAMSON must be made to work within Colorado's complex network of water institutions that are based on legal and political precedents. The role of computer models is to provide information to improve decisionmaking. The difficulty comes at three points: providing accurate and well-managed data for the model; gaining expertise in using the complex model; and having the results accepted by decisionmakers who are skeptical about models.

Although SAMSON is not a perfect tool and needs further development, it offers a challenge to Colorado's water management institutions: can we make high tech work to improve water management?

Neil S. Grigg
Director

SAMSON MODEL COMPLETED

SAMSON is an acronym for a water resources simulation model developed at Colorado State University to simulate water management alternatives in the South Platte River Basin. The SAMSON acronym stands for Stream Aquifer Model for Management by Simulation and Optimization.

The Colorado Legislature authorized and funded completion and documentation of the model in 1983 to include the South Platte River from Denver to the Colorado-Nebraska State Line, and where alluvial aquifers can be incorporated in the model, to include the Cache la Poudre, Big Thompson, St. Vrain and Clear Creek Rivers.

The model code and a data tape have been transmitted to the State Engineer and Colorado Water Conservation Board as provided in the enabling legislation. The development of SAMSON was primarily by Dr. Hubert J. Morel-Seytoux and Dr. Jorge Restrepo at Colorado State University. Final reports issued by the Institute include a users' manual, a volume describing the calibration and verification of the model, and a two-volume documentation that describes the model in detail.

The South Platte Basin Water Management Study initiated in 1987 has selected SAMSON as the model to be used to evaluate water management alternatives in the South Platte Basin (see accompanying story).

SAMSON is a complex ground and surface water simulation model which needs further testing, verification and development in the years ahead. It has the potential for becoming a useful management model to improve the effectiveness of water use in the basin. The Institute is conducting discussions with the State Engineer's office and water-user organizations to provide for the management and further development of SAMSON in future years.

SAMSON SELECTED FOR SOUTH PLATTE WATER STUDY

The river basin simulation model SAMSON has been selected for use in the South Platte Basin Water Management Study after a review of various models by the

Colorado State University

study's Technical Support Committee. The model will be used to evaluate various management and development options and to simulate the effects of future water management alternatives in the basin. The study, begun in 1987, is directed by the South Platte Basin Water Management Committee, and sponsored by the four basin conservancy districts: Central Colorado, Lower South Platte, Northern Colorado and St. Vrain and Left Hand. It seeks ways to improve the management of available water supplies in the basin, both surface and groundwater. Financial support is from the U.S. Bureau of Reclamation. The conservancy districts will contribute personnel time for data collection including streamflow, irrigated acreage, water quality and river call information.

The Technical Support Subcommittee (TSS), designated by the Water Management Committee, handles study tasks. The TSS has conducted interviews with 13 of the largest ditch and reservoir companies along the mainstem of the South Platte below Denver. These interviews will provide valuable information as to how water is used and allocated within the basin. Representatives of the State Engineer's Office and Water Commissioners have also been contacted to get an administrative perspective on South Platte Basin water management.

Although the study team continues to compile information obtained in the interviews, it has made a few preliminary observations:

* With changing cropping patterns altering the water use patterns within the basin, water management strategies have been and must continue to be flexible enough to adapt to future changes in basin cropping patterns.

* Ditch companies have, for the most most part, been able to meet the changing needs of their customers.

* Many users feel their most serious problems may be related to the need for improved communications and fair distribution of supplies rather than lack of water.

* Water users truly want to work together to maximize their supplies within the limits of Colorado's priority system.

The study team will continue its interviews in the coming months, focusing on major suppliers in the South Platte's tributaries.

Source: **Water News**, Fall 1988, Northern Colorado Water Conservancy District.

SOUTH DAKOTA ORGANIZES NORTHERN GREAT PLAINS WATER RESOURCES RESEARCH CENTER

South Dakota has announced that it will organize a Northern Great Plains Water Resources Research Center. The announcement states that "...the development of water resources in South Dakota and the Northern Great Plains is a matter of high priority. Water problems will, in all likelihood, loom larger than oil shortages before this century is over. There is a critical need for a comprehensive program of research and investigation directed toward the solution of the full range of problems related to water."

The program represents an ambitious undertaking, but one of critical importance--and a statewide focus on establishment of a regional center has the support of South Dakota's Governor and other regional leaders, according to the announcement.

A position description for the director of this Center is included later in the newsletter.

CONGRESS FAILS TO PASS LEGISLATION

Reauthorization of the Water Resources Research Act, which expires in fiscal year 1989, did not pass this session of Congress. As reported in our November newsletter H.R. 5010, which reauthorized the Act through 1993, passed the House on a voice vote in August. The bill then went to the Senate's Environment and Public Works Committee where committee staff decided to include water research legislation in a groundwater research bill (HR791). Senator Daniel Moynihan (NY) introduced the bill and the Senate's version of 791 passed in early October, but with substantial differences from the House version. House and Senate staffs met informally to try and resolve the differences, but did not succeed.

Efforts to secure reauthorization for water research will continue in the next session of Congress.

COLORADO WATER CONGRESS HOLDS 31ST ANNUAL CONVENTION JANUARY 27-27, 1988

The 31st Annual Colorado Water Congress Convention will be held at the Northglenn Holiday Inn on January 26-27. Fourteen concurrent workshops are scheduled for the sessions with topics including dam safety regulations, nonpoint source management, water conservation, engineering and management developments, FLPMA issues, new developments in finance, Congressional relations and other items of interest.

Scheduled speakers at the Convention's General Session include Bill Hornsby, Senior Editor of the Denver Post, who will give the keynote address; James A. Smith, Chairman of VISION COLORADO 2000 and Vice President of U.S. West Communications; Walter Orr Roberts, President Emeritus of the National Center for Atmospheric Research; Attorney General Duane Woodard of Colorado; and Thomas F. Donnelly, Executive Vice President of the National Water Resources Association, Washington, D.C.

Governor Roy Romer will speak at the Wayne N. Aspinall Memorial Luncheon on Friday, when the Water Leader of the Year Award will be presented.

At one of the concurrent workshops held on Friday, January 27 Institute Director Neil S. Grigg will present an overview of water research and other programs conducted by CWRRI during 1988.

REGIONAL CONFERENCE PLANNED ON WATER AND SANITATION IN DEVELOPING NATIONS

A conference is planned for April 14-15, 1989, in Denver, Colorado, to learn more about both the technical and people challenges and solutions involved with water and sanitation conditions in developing nations.

An "Opportunity Fair" will be held along with the conference to demonstrate what different organizations

are accomplishing in developing nations.

For more information contact: Jim Horner, Bureau of Reclamation, Attention: Code D-3620, P.O. Box 25007, Denver, CO 80225-0007. Telephone: (303)236-3898.

CSU AWARDED $25 MILLION EGYPT PROJECT

As a result of successful accomplishments on past projects, Colorado State University has been awarded a new $25 million project to support the development of Egypt's water research centers.

Under the direction of Professors Everett Richardson and Dan Sunada, the project provides for the training of Egyptian scientists and for research to help solve comprehensive water problems in Egypt. Egypt, a country with a high growth rate and substantial food security problems, needs to fully utilize its land and water resources if it is to advance. This project is critical in the progress of Egypt's water resources management.

The next issue of **COLORADO WATER** will contain a detailed article of the objectives and activities of this project.

WATER TRANSFERS PROJECT ADVISORY COMMITTEE MEETS IN DENVER

The major challenge facing state water institutions is no longer **allocation** of water resources; rather, it is **reallocation** of water resources to meet changing demands. A regional water research effort currently underway is designed to evaluate the legal and institutional factors affecting water rights reallocation in the West. The research team includes investigators from six Colorado River Basin States: Arizona, California, Colorado, New Mexico, Utah and Wyoming.

The project's advisory committee met with investigators in Denver on October 4-5 to review progress to date and assess goals for the project's second-year phase. Committee members reviewed findings on appropriative water rights, contract water rights and a report detailing transfer law in the six study states. Each state's legal report included a discussion of Indian water rights and administration including the status of state authority over water on reservations, Indian water management codes, on-reservation and off-reservation transfer rules, and an examination of existing transfer activity involving Indian water.

The advisory committee meeting was scheduled to coincide with a conference at the University of Denver's College of Law--**Water Marketing 1988: The Move to Innovation**, on October 6 and 7. This was the third in an annual series of conferences on water marketing in the West held at DU. Advisory committee member Kenneth G. Maxey and investigators Bonnie G. Colby and Gary Woodard of Arizona participated in the conference program.

State representatives for the advisory group are: Arizona--Herb Dishlip, Deputy Director, Arizona Department of Water Resources and Herb Guenther, State Representative, Yuma area; California--Walter Pettit, Chief, Division of Water Rights, State Water Resources Control Board and Robert G. Potter, Deputy Director, California Department of Water Resources; Colorado--Jeris Danielson, State Engineer and "Chips" Barry, Executive Director, Department of Natural Resources; New Mexico--Steven Reynolds, State Engineer and Thomas G. Bahr, Director, Water Resources Research Institute; Utah--Robert Morgan, State Engineer and Lee Kapaloski of Parsons, Behle and Latimer, Salt Lake City; Wyoming--Gordon Fassett, State Engineer and Dennis Cook, Assistant State Attorney General. Representing other interests on the advisory committee are: Thomas J. Graff, Environmental Defense Fund; Bruce Driver, Western Governor's Association; Larry Morandi, National Conference of State Legislatures; Kenneth G. Maxey, Office of the Assistant Secretary for Water and Science; and D. Craig Bell, Western States Water Council.

Dr. Larry MacDonnell, Natural Resources Law Center, University of Colorado is Principal Investigator of the regional project, which is funded under the U.S. Geological Survey Matching Grants Program. Lead state investigators and study team members are: Arizona--Gary C. Woodard and Bonnie D. Colby, University of Arizona; California--Brian E. Gray, Hastings College of the Law and Henry J. Vaux, Jr., University of California; Colorado--Lawrence J. MacDonnell and Charles W. Howe, University of Colorado; New Mexico: F. Lee Brown, Charles DuMars and Timothy DeYoung, University of New Mexico; Utah: J. Paul Riley and Herbert Fullerton, Utah State University and Ray Jay Davis, Brigham Young University; Wyoming: Victor Hasfurther and Mark Squillace, University of Wyoming.

WATER DATA BASE NOW AVAILABLE AT MORGAN LIBRARY

HYDRODATA--over 100 years of streamflow and climatic data from U.S. Geological Survey reporting stations--is a new CD-ROM service now available at Colorado State University's Morgan Library. Also available is HYDRODATA II, The Climate Disc, which provides rapid access to the data contained in the National Climate Data Center files for cooperating stations--daily data representing more than 100 years of observations of temperature, precipitation, snowfall and evaporation.

With CD-ROM (Compact Disk-Read Only Memory) laser storage technology large data bases, formerly available only on main frame computers, can now be accessed through microcomputers. One CD-ROM disk holds 275,000 pages of text, the equivalent of an entire encyclopedia. Other CD-ROM services include NTIS: Bibliographic references and abstracts of U.S. Government-sponsored research, development, and engineering reports and analyses from federal agencies and their contractors; and AGRICOLA: Bibliographic references from the world journal and monographic literature on agriculture and related subjects.

To access the HYDRODATA CD-ROM, stop by a reference desk at CSU's Morgan Library.

CSU PROFESSOR ORGANIZES AGU SESSION ON DROUGHT

Drought is a complex phenomena involving meteorologic, hydrologic, social and other dimensions which are difficult to universally define and quantify. Prediction of frequency and management of droughts that are likely to occur during a project period is a fundamental issue in water supply system design, planning and operation. Population explosion in many parts of the world is causing increasing concern among the

managers of existing water resources systems as to reliability in the event of extreme water shortage due to a drought. Unlike floods, well defined techniques and procedures are not available for drought analysis, drought prediction and mangement of droughts. This hydro-meteorological phenomenon is especially important today in the United States, where the 1988 drought will likely be remembered as one of the worst in this century.

A special session entitled "Drought Concepts, Drought Management and Water Supply System Reliability" was held during the Fall Meeting of the American Geophysical Union in San Francisco in December 1988. This session brought together individuals from different disciplines to discuss the state-of-the-art and new developments in drought analysis and management in planning and operation of water supply systems. Papers dealing with objective definitions, frequency analysis, estimation of magnitude of droughts and their applications to investigate the reliability of water supply systems under extreme water shortage conditions were presented. Two of the papers examined and discussed specifically the characteristics, impacts and mitigation of the 1988 drought in the midwestern part of the country.

This special session was organized by Professor Jose D. Salas, Leader, Hydrology and Water Resources Program at Colorado State University and Dr. J. Obeysekera, Senior Hydrologist, South Forida Water Management District.

The 1988 AGU Fall Meeting was held December 5-9 in San Francisco, California.

AWRA ESTABLISHES MEDAL IN HONOR OF HENRY P. CAULFIELD, JR.

The American Water Resources Association (AWRA) has established the Henry P. Caulfield, Jr. Medal for Exemplary Contributions to Water Policy in honor of Henry P. Caulfield, Jr., retired Professor of Political Science at Colorado State University and current President of the City of Fort Collins Water Board.

The presentation was made to Caulfield on November 9, 1988, during the Association's Annual Conference in Milwaukee, Wisconsin, by AWRA President Raymond Herrmann. Herrmann stated that "this medal was established to honor an individual whose record of achievements and contributions in setting, designing, and implementing water resources policies at the national level have been extraordinary."

"Caulfield's achievements have been numerous: he has served in various capacities in the office of Secretary of the U.S. Department of Interior, was a former Director of the U.S. Water Resources Council, staff leader in drafting the Water Resources Planning Act of 1965, and he was instrumental in drafting and putting through Congress the Land and Water Conservation Act of 1964, the Federal Water Projects Recreation Act of 1965, and the Wild and Scenic Rivers Act of 1968."

Caulfield stated in his acceptance remarks..."I hope the establishment of this Award will help focus the attention of AWRA members in the years to come on national water policy problems, their solution, and implementation. Participation in the multidisciplinary community of AWRA should enable and encourage members to come up with significant professional proposals and achieve their adoption through public service."

The American Water Resources Association is a multidisciplinary, nonprofit, scientific society founded in 1964 and dedicated to the advancement of research, planning, management, development, and education in water resources.

PESTICIDE SAFETY MANUAL AVAILABLE FROM USBR

Safety guidelines for handling, storage and application of pesticides are provided in a new publication recently issued by the U.S. Bureau of Reclamation entitled,"Pesticide Applicators Safety Manual for Irrigation Systems." The manual is designed to be a ready reference during the planning phase of pesticide application projects, particularly when job hazards are analyzed and safety precautions are determined. Although the safety practices given are designed for Bureau of Reclamation personnel, others with pest management responsibilities will find the information useful.

The booklet stresses protecting people and includes chapters describing pesticides and pesticide safety; the handling and applying of pesticides; protective clothing and equipment; cleanup and pesticide waste disposal; spills, fires and vehicle accidents; symptoms of poisoning and first aid.

Microfiche or hard copy can be purchased from the Bureau of Reclamation, Denver Office, Attn D-7923A, P.O. Box 25007, Denver Federal Center, Denver, CO 80225-0007.

CSU HYDROLOGY GRADUATE ELECTED TO NATIONAL ACADEMY

Ignacio Rodriguez-Iturbe, 1967 Ph.D. graduate of Colorado State University, was inducted into the National Academy of Engineering in September 1988 for his contributions to the field of hydrology. He received a B.S. in Civil Engineering from the University of Zulia, Venezuela in 1963, an M.S. from Caltech in 1965, and a Ph.D from Colorado State University in Hydrology and Water Resources in 1967.

Dr. Rodriguez-Iturbe was a professor of Civil Engineering at the University of Zulia, Researcher of the Venezuelan Institute for Scientific Research, Visiting Professor of Civil Engineering at Colorado State University, Associate Professor and Associate Head of the Water Resources Division at MIT during 1971-1975, and Professor and Dean of Research at Simon Bolivar University, Venezuela. Currently he is Research Scientist of the International Institute for Advanced Studies, Venezuela and Visiting Scholar at MIT.

Dr. Rodriguez-Iturbe has received a number of other awards from technical and scientific societies. In 1974 he received the Hubert Research Prize of the American Society of Civil Engineers for his "original and significant contributions to hydrology, especially in the field of analysis, synthesis and sampling of hydrologic signals." In the same year he received the Horton Research Award from the American Geophysical Union (AGU) for "a paper of outstanding excellence considered the best in the field of hydrology in 1974." In 1977 he received the James B. Macelwane Award from AGU for "significant contributions to the Geophysical Sciences

by a young scientist of outstanding ability." Dr. Rodriquez-Iturbe has been a prolific contributor in scientific journals and recently he published the book "Random Functions and Hydrology" co-authored with R. Bras of MIT, Addison-Wesley, 1985.

DRCOG COMMITTEE PROVIDES ADVICE ON WATER MANAGEMENT POLICIES

Water supply, water quality, wastewater collection, treatment and disposal, urban drainage and pollution control are all issues that concern the Water Resources Management Advisory Committee (WRMAC) of the Denver Regional Council of Governments. The committee advises the DRCOG board of directors on matters related to water and recommended areas of needed study. It provides a representative, policy-making forum for Denver's six-county region, which is comprised of a wide variety of governmental bodies.

The Clean Water Plan, among WRMAC's advisory responsibilities, sets water quality planning policy for the six-county region. The plan includes wastewater service areas, stream standards and classifications, septic systems, reuse of wastewater, consolidation of facilities, guidelines for nonpoint source pollution control, and basin water quality issues.

WRMAC members also assisted in preparation of a 1985 Regional Water Study to determine the area's water supplies and projected demands through the year 2010.

All DRCOG member municipalities and counties are automatically entitled to have one representative and an alternate on the WRMAC. Each special district or other water discharger that contributes financially to DRCOG's Water Quality Management Planning Program is also allowed one representative and an alternate.

John Hendrick, Vice President of the Centennial Water and Sanitation District, is Committee Chairman, and Vice Chairman is Alan Matloz, Adams County Planner.

ROCKY FLATS CITED BY ENERGY DEPARTMENT FOR CONTAMINATED GROUNDWATER

On December 6 the U.S. Energy Department released a report containing a list of environmental problems at the Nation's nuclear weapons complexes. Two installations, Rocky Flats and Pantex, Texas, were cited as having the most serious individual problems related to groundwater contamination. The report is based on an initial survey which will be followed by a final report due in about a year.

According to a Denver Post story on December 7, the Energy Department plans to spend at least $20 million cleaning up groundwater contamination at Rocky Flats during the next year. A computer model is used to rank pollution problems, and on a scale of one to ten water degradation at Rocky Flats was rated a nine, the only nine in the report. The story said Fred Dowsett, Chief of the Hazardous Waste Management Unit of the State Health Department, acknowledged that state officials were aware of the problem.

A December 11 Post article said that the Energy Department sent a report to the White House recommending that Rocky Flats be closed and relocated as part of a "20-year plan" to resolve the Nation's problems at weapons sites. It also recommended spending an additional $50 billion to clean up environmental damage caused by the weapons industry, a significant portion of which is at Rocky Flats. Although a Department of Energy official refused to confirm contents of the report, sources in Washington said the relocation would occur over a period of years, not immediately.

MODIFICATIONS WILL INCREASE HORSETOOTH STORAGE BY 10,000 ACRE-FEET

The Northern Colorado Water Conservancy District will regain almost 10,000 acre-feet of storage capacity for northeastern Colorado water users when Horsetooth Reservoir modifications are completed. Capacity at Horsetooth had been restricted since 1984, when the Bureau of Reclamation placed a hold order on the reservoir. With a return to original storage capacity construction to raise the height of the reservoir's dams was begun last April. The work should be concluded before the end of 1989.

The costs for dam modifications are being split between NCWCD and the Bureau of Reclamation. The Bureau is responsible for overseeing project design and construction, although the District has an employee on-site to monitor work progress.

As an additional benefit County Road 23 which runs parallel to the shoreline will be straightened and made less hazardous. Guard rails will be added to the roadways across all the dams.

Source: **Water News**, Fall 1988, Northern Colorado Water Conservancy District.

BIG THOMPSON WATER USE HAS CHANGED, SAYS NCWCD

When the Colorado Big Thompson Project began operating in 1957, agriculture accounted for 98 percent of the water deliveries and municipal/industrial use was two percent. Although agriculture still uses the majority of CBT water, Northern Colorado Water Conservancy District figures for 1987 show an increased transfer of water from agriculture to the municipal/industrial sectors, with agricultural use at 76 percent and municipal/industrial use at 24 percent. Population within NCWCD boundaries grew from 125,000 in 1957 to 450,000 today.

Source: **Water News**, Fall 1988, Northern Colorado Water Conservancy District.

DNR OFFERS TO BUY YAMPA WATER RIGHTS

The Yampa River is a spawning ground for Colorado squawfish and habitat for the humpback and bonytail chubs, which are on the endangered species list.

The Colorado Department of Natural Resources has offered $6 million for an 844,000 acre-foot water right on the Yampa River as part of the new Colorado River endangered species recovery program.

The right is currently owned by the Colorado River Water Conservation District which has proposed building two dams on the Yampa River--the Cross Mountain and Juniper. The CRWCD Board voted to reject the sale, but has formed a committee to further study the proposal and report to the Board in early 1989. Craig and

Moffat County officials expressed concern about permanently giving up water rights. As an alternative, DNR Executive Director "Chips" Barry offered to buy all but 100,000 acre-feet of the water rights and lease the remainder for 15 years, at which time it would be stored in a reservoir.

Barry suggested the money be divided among the city of Craig, Moffat County and the Colorado River Water Conservation District, and used for economic development efforts.

Source: **U.S. Water News**, December 1988.

DENVER'S POTABLE WATER PROGRAM TO UNDERGO EXTENSIVE TESTS

A new phase of intensive testing has begun for the Denver Water Department's water recycling program. Test animals will be used to determine long-term generational effects of drinking the reclaimed water. The testing program will continue through 1992.

Denver's Potable Reuse Demonstration Plant treats water from a nearby sewage disposal plant, using a complex series of processes, which results in a product resembling distilled water. Plant Manager Bill Lauer said government agencies require more stringent testing for the reuse plant than they would for conventional drinking water treatment facilities. The program has already concluded two and one half years of testing.

The process is also being evaluated for cost. If the tests and evaluations are favorable, Denver may eventually construct a large-scale recycling plant.

Source: **U.S. Water News**, December 1988.

POTENTIAL ENVIRONMENTAL LITIGATION

Claiming that a Leadville mining tunnel has repeatedly violated federal environmental law, the Colorado Environmental Coalition and Sierra Club took steps on November 15 toward filing a lawsuit against the U.S. Bureau of Reclamation. The USBR acquired the tunnel from the U.S. Bureau of Mines in the late 1950s. Built during World War II to mine strategic metals, it has discharged more than double the legal amount of cadmium and zinc and also exceeded federal environmental standards for iron and silver since 1977.

Surveys by the Colorado Division of Wildlife show that above the drain inlet 3,200 trout per mile are supported, while downstream of the drain only 900 trout per mile survive.

A USBR spokesman said his agency completed a $275,000 study last summer and has requested $9 million from Congress to build a water treatment plant.

Source: **Denver Post**, Nov. 15, 1988.

RADIUM REMOVAL FOR A SMALL COMMUNITY WATER SUPPLY SYSTEM

In 1984 a radium removal treatment plant was constructed for the small community of Redhill Forest, located in the central mountains of Colorado. The treatment plant consists of a process for removing iron and manganese ahead of ion exchange process for the removal of radium. The raw water comes from deep wells and has naturally occurring radium and iron concentrations of about 30 to 40 pCi/L and 7 to 10 mg/L, respectively. Before the raw water enters the main treatment plant, the raw water is aerated to remove radon gas and carbon dioxide.

The unique features of the Redhill Forest Treatment Plant are related to the ways in which the radium removed from the raw water is further treated and eventually disposed of as treatment plant waste. A separate system removes only radium from the backwash/regeneration water of the ion exchange process, and the radium is permanently complexed on a Radium Selective Complexer (RSC) resin made by Dow Chemical. The RSC resin containing radium is replaced with virgin resin as needed and the resin waste transported to permanent final disposal site in Beatty, Nevada.

The aeration system reduces the radon gas by about 85 percent based upon the data obtained. Typically, the radon gas is reduced from 23,000 pCi/L to about 3,400 in the raw water after passing through the aerator.

The water quality data on the operation of the ion exchange system indicates that the radium in the inflow to the ion exchange tanks is reduced from about 22 to 35 pCi/L to 0.0 to 4 pCi/L in the outflow from the treatment system.

The RSC system has been very effective in the removal of radium from the ion exchange system wastewater by removal an average of over 99 percent of the radium in the inflow to the RSC system. The average inflow radium concentration was about 1,180 pCi/L with the average effluent at about 9.0 pCi/L.

This report presents a detailed discription of the Redhill Forest treatment system and the results of in-depth monitoring of the processes and other factors relating to the overall operation of the radium removal system. Included are descriptions of modifications made in the plant operation to improve the overall system operation and of the procedures for final disposal of the RSC resin containing radium.

By Kenneth A. Mangelson, Rocky Mountain Consultants, Inc., Englewood, CO 80111. Richard P. Lauch is the EPA Project Officer. The complete report, entitled **Radium Removal for a Small Community Water Supply System** (Order No. PB 88-235 551/AS; Cost: $14.95, subject to change) will be available only from:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: 703-487-4650

CHINA TO BE WRAPPED IN PLASTIC

On the heels of one of its worst droughts in recent years, China is importing up to $1 billion worth of plastic sheeting to literally wrap-up farmland in hopes of sealing in moisture and controlling weed growth.

Chinese officials consider the plastic sheeting plan to be the most effective means of controlling moisture loss on the nation's 138 million acres of farmland. During the past growth season, about two-thirds of this farming area was officially described as suffering from drought.

Actual demand for plastic sheeting is placed at about 6 million tons, but domestic production is less than a million tons. Many of China's 3,800 plastic production plants reportedly operate at about half capacity. In addition to buying the actual plastic sheeting material, China also intends to import such materials as polyethylene used in the manufacture of plastics.

Source: **WSTB Newsletter**, Nov. 1988.

RECREATION DESIGNATION PROPOSED FOR 150 MILES OF ARKANSAS RIVER

A 150-mile section of the Arkansas River between Leadville and Pueblo Reservoir would become a recreation area under a plan presented to Governor Roy Romer earlier this month. The proposal, developed by state officials and the U.S. Bureau of Land Management, would put the recreation area under control of the Colorado Division of Parks and Outdoor Recreation.

Proponents say the plan would enhance both fishing and boating by regulating commercial rafting, and would provide a boost for many economically depressed communities along the route.

Opponents contend the plan would overcrowd the river and its banks; disturb trout and fishermen; upset the drinking habits of bighorn sheep; and lead to confrontations between kayakers and groups of rafters.

Public comment on the plan, the Arkansas River Recreation Management Plan and Environmental Analysis, is invited until January 17.

Source: **Denver Post**, December 12, 1988.

BRIGHTON CONSIDERS BOND ISSUE TO IMPROVE WATER

On December 20 the Brighton City Council will decide on a $4.5 million bond issue that will finance improvements to the water system. The Environmental Protection Agency and the Colorado Health Department have set potable water standards for drinking water. The number for nitrates is not to exceed 10 milligrams per liter, but Brighton averages some 12-14 milligrams per liter.

Brighton is located several miles north of the Rocky Mountain Arsenal, and EPA and Health Department officials have found traces of other regulated compounds in the city's water supply. This could be the result of solvents that have saturated arsenal ground and found their way into the groundwater system, although it hasn't been proven.

However, nitrates remain a problem--not because of the arsenal, but because Brighton is surrounded by farms.

Reducing nitrate levels in the city's water system can be accomplished by simply mixing the water with other water that has little or no noticeable nitrate levels. A proposal to do this calls for water from the wells to be pumped to Barr Lake several miles southeast of Brighton. There it would be mixed on a 1-to-1 ratio with lake water, then delivered to the storage systems and homes. However, it will do nothing about the water's taste and odor--nor will it deal with other compounds now being found in trace amounts in the water.

These other water problems and chemicals, which health officials will start testing for next year, can be eliminated by treating the water supply with an electrically charged ozone process, a procedure currently being used in Avon, near Vail, and also in Los Angeles.

Adding the ozone treatment equipment to the proposed water exchange system will increase the price of the bond issue by about $500,000.

City officials say that even with the rate increases Brighton residents will have about the lowest water rates in the metropolitan area.

Source: **Denver Post**, December 4, 1988.

COLORADO WATER STUDIES DESCRIBED IN NEW USGS REPORTS

Recently released reports from the Denver office of the U.S. Geological Survey provide information about three Colorado water matters: (1) the 1976 Big Thompson disaster; (2) the decreasing groundwater supplies near Ellicott, Colorado; and (3) the probable effect of an underground mine shutdown in the Piceance Basin.

Big Thompson Flood--Study results indicate that the 1976 Big Thompson flood, in the area of most intense rainfall, has a recurrence interval of about 10,000 years. The flash flood in the Front Range west of Loveland was the largest natural disaster in Colorado history; 139 people were killed and $35 million in property damages occurred.

Difficulties encountered in interpreting the magnitude and frequency of this and other catastrophic floods using conventional hydrologic analyses demonstrated the need for a new methodology or modification of existing procedures. Because these analyses did not adequately characterize the area's flood hydrology, a multidisciplinary study analyzed foothill and mountain streams in Colorado's Front Range, with emphasis on the Big Thompson River basin. The study included precipitation and streamflow data and paleohydrologic studies of channel features.

In the foothills of Colorado annual floodflows are derived from snowmelt at high elevations in the mountain regions, from rainfall at low elevations in the plains or plateau regions, or from a combination of rain falling on snow (mixed-population hydrology). Above approximately 7,500 feet snowmelt dominates; rain does not contribute to the flood potential. Below about 7,500 feet rainfall-produced floods predominate. Regional flood-frequency relations were developed and compared with conventional flood-estimating technique results, including an evaluation of the magnitude and frequency of the probable maximum flood, which indicated the recurrence interval of about 10,000 years. The unique quality of the 1976 flood was that it covered a large number of tributaries.

"Evaluation of the flood hydrology in the Colorado Front Range using precipitation, streamflow, and paleoflood data for the Big Thompson River basin," by Robert D. Jarrett and John E. Costa. Water Resource Investigations Report 87-4117, Microfiche $4, Paper $6.25.

Ellicott's Declining Water Level--Water-level declines of as much as 30 feet have occurred in the alluvial aquifer near Ellicott, Colorado during 1974-84. In addition, large concentrations of dissolved nitrate as nitrogen have been detected in water samples from the aquifer.

These findings are included in a recent report by the U.S. Geological Survey, Department of the Interior. The report titled "Geohydrology, water quality, and preliminary simulations of groundwater flow of the alluvial aquifer in the upper Black Squirrel Creek basin, El Paso County, Colorado," by David R. Buckles and Kenneth R. Watts, was prepared as part of a cooperative investigation with the Cherokee Water District. The Cherokee Water District and the Pikes Peak Water Company export water from the alluvial aquifer out of the basin to suburbs of Colorado Springs and to the Falcon Air Force Station between Colorado Springs and Ellicott. Water from the alluvial aquifer also is used extensively within the basin for agricultural purposes.

The report includes results of model simulations of future water levels in the alluvial aquifer. On the basis of the simulations, water level declines from October 1984 to April 1999 north of Ellicott might be as much as 20-30 feet and as much as 1-10 feet in most of the aquifer.

Water Resources Investigations Report 88-4017. Microfiche $4, Paper $8.25.

Piceance Basin Water Quality--This report describes an analysis of the likely effects of an underground mine shutdown at the Piceance Basin in northwestern Colorado. The report was prepared in cooperation with Rio Blanco County in northwestern Colorado. According to the analysis, mine pumps that dewater mine workings and aquifers near the shafts will be shut off and three shafts will be allowed to remain open. The effects of drawdown in the aquifers and stream depletion will diminish rapidly and eventually water from the upper aquifers will drain very slowly through the shafts into the lower aquifers. A general contamination of water quality will not result unless convective or diffusion processes become active in the shafts, nearby pumping or injection wells are activated, or climatic changes are affected that increase the water levels in the lower aquifers.

"Predicted effects of underground mine flooding at Tract C-b in Piceance basin, northwestern Colorado, by O. James Taylor. Water Investigations Report 87-4189. Microfiche $4, Paper $3.

Microfiche and black and white paper copies of the reports are available from the U.S. Geological Survey, Books and Open File Reports, Federal Center, Box 25425, Denver, CO 80225-0425 at prices indicated above. Prepayment is required. Make check payable to the U.S. Geological Survey.

CALLS FOR PAPERS

9th Annual AGU "Hydrology Days"
April 17-21, 1989
Colorado State University

The AGU Front Range Branch is planning four or five HYDROLOGY DAYS during the week of Monday, April 17 through Friday, April 21, 1989, at Colorado State University, Fort Collins, Colorado. The objective of this meeting is to provide a forum for hydrologists and hydrology students to meet, get acquainted, hear each other's problems, analyses and solutions. Several special sessions will be held with keynote addresses by recognized hydrologists. The event is sponsored by the Hydrology Section of AGU, the Hydraulics and Irrigation and Drainage Division of ASCE, the American Water Resources Association and the Colorado Groundwater Association.

The Western Snow Conference is also conducting its annual meeting that same week in Fort Collins. On Wednesday, April 19, there will be a joint session of the two conferences on the subject of "Snow Hydrology". Registered participants at either conference are entitled to attend the joint session.

During Hydrology Days there will be presentations of volunteered papers (mostly), invited papers (a few) and papers by students (on the first day). The time allocated for presentation will depend on the response to this Call for Papers. Tentatively, the time allotted per paper will be about 25 minutes (including discussion). Standard audio-visual aids (slide and overhead projection) will be provided.

Hydrologists and hydrology students interested in presenting a paper should send a one-page sheet (original plus one copy) to include their name, affiliation, complete mailing address, telephone number, title of paper and brief double-spaced typed abstract (roughly one-half page) to:

Professor Morel-Seytoux or HYDROLOGY DAYS
Civil Engr. Dept.
Colorado State University
Fort Collins, CO 80523
(303)491-6762 or 482-9814

Janet Lee Montera, Mgr.
Conference Section
Civil Engr. Dept.
Colorado State University
Fort Collins, CO 80523
(303)491-7425

Deadline: January 20, 1989.

3rd Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst
October 1-4, 1989
St. Petersburg, Florida

Papers are invited on all subjects related to applied karst geology and hydrology, but are particularly encouraged in the engineering field. All authors will be expected to present a 20-minute talk and a written manuscript for publication in a professionally published proceedings volume. At this time, please submit a prospective title. Abstracts will be due by April 17, 1989, and manuscripts by June 30, 1989. Send to: 3rd Multidisciplinary Conference, Florida Sinkhole Research Institute, University of Central Florida, Orlando, FL 32816.

7th International Conference on Mathematical and Computer Modeling: An Integrative Forum on Engineering, Economics, Biological, Medical, Environmental, Social and Other Sciences
August 2-5, 1989
Chicago, Illinois

Several distinquished contributors who have played a significant role in the advancement of mathematical and computer modeling have been invited to present plenary lectures and "invited" papers. Participation in the conference is open to all interested persons.

Authors are invited to submit papers in three categories: (1) full length papers (20-minute presentation); (2) short reports (10-minute presentation); (3) papers for poster sessions. Full-length papers require abstracts of about 300 words in length and others up to 100 words. Authors are urged to specify the category to which they are submitting their papers. Papers on all aspects of mathematical and computer modeling and simulation are solicited. Deadline: February 10, 1989. Notice of acceptance will be mailed to the authors about March 31, 1989. A volume containing all abstracts of the accepted papers will be made available to the participants at the Conference.

Abstracts should be typed single-space on an 8 and 1/2 x 11 plain paper with 1" margin on all four sides. The title must be in capital letters followed by authors name(s), affiliation and full address placed symmetrically. The length of the abstract should not exceed one single space typewritten page (about 300 words). Send two copies of abstract to: Prof. Xavier J.R. Avula, Chairman, 7th ICMCM, Dept of Mechanical and Aerospace Engineering and Engineering Mechanics, University of Missouri-Rolla, Rolla, MO 65401. (314) 341-4661.

COOPERATIVE EXTENSION SPONSORS CENTRAL PLAINS IRRIGATION SHORT COURSE

The Cooperative Extension Services of Kansas State University, Colorado State University and the University of Nebraska will sponsor an **Irrigation Short Course** on February 13-14 at Colby Community College, Colby, Kansas. The course will provide a review of irrigation basics and an update on current research. Workshop moderators from Colorado State University will be Drs. Dale F. Heermann and Harold R. Duke, USDA/ARS Agricultural Engineers; R. Wayne Showcroft, Extension Irrigation Agronomist; and Dr. Israel B. Israeli, Assistant Professor of Agricultural and Chemical Engineering.

For more information contact:

Danny H. Rogers
Extension Irrigation Engineer
Seaton Hall
Kansas State University
Manhattan, Kansas 66506

(913)532-5813

POSITIONS AVAILABLE

Director, Northern Great Plains Water Resources Research Center, South Dakota State University. The Director would plan, organize, and implement a water resources research program applicable to the Northern Great Plains Region; provide regional direction for water research, assist in development of local and regional proposals, evaluate research projects, seek financial support, supervise professional and clerical staff and develop support networks for the center.

Minimum Qualificatons: Earned doctorate and academic, governmental or industrial experience in a technical area related directly to water resources research; a substantive publication record in water-related research; demonstrated effective communication, administrative, managerial, and leadership abilities and skills; familiarity with federal and state programs and political processes involved in developing large research programs; knowledge and understanding of educational institutions; and/or recognized achievement in the development of water-related research programs.

Desirable Qualifications: Knowledge of research capabilities and institutions in South Dakota's contiguous states.

Application Deadline: January 15, 1989 or until position is filled.

Application Procedures: Send resume, curriculum vitae and brief statement of interest to: Duane E. Sander, Search Committee Chair, South Dakota State University, P.O. Box 2219, Brookings, SD 57007.

Executive Director, Wyoming Water Development Association. The Wyoming Water Development Association is currently seeking applications for the newly-created position of full or part-time Executive Director. The successful applicant should have an understanding of the technical, legal and political aspects of the development of water in the State of Wyoming. He/she should be a self motivator who will have the ability to manage a large membership organization. Salary open, depending upon qualifications. Resumes or proposals should be sent to:

Mr. George Bartholomew, President
Wyoming Water Development Association
1560 Johnston St.
Wheatland, WY 82201
(307)322-9121

Deadline: December 31, 1988

Foundation Director, Water Pollution Control Federation. The Water Pollution Control Federation is forming the Water Quality Research Foundation and seeks an Associate Executive Director to launch this effort. Working closely with the Foundation Board, the Director will develop the foundation's structure and administrative procedures, identify areas for research, and begin the grant and fundraising process. Qualified candidates must have 10+ years in technical/water-related research and/or extensive foundation/grant management, an understanding of the issues, possess strong planning and organizational skills and demonstrated leadership ability to work independently with the volunteer leadership.

Send letter, salary requirements and resume to: The Water Pollution Control Federation, 601 Wythe Street, Alexandria, VA 22314-1994, Attn: Mrs. Magerfield, EOE

Research Plant Physiologist: EPA Environmental Research Laboratory, Corvallis, Oregon. Seeking a quantitative physiological ecologist to conduct research in effects of air pollutants on terrestrial ecosystems. This is a full-time GM-14 position and requires a Ph.D in quantitative ecology, plant physiology, forest science, or a closely related discipline. Candidates must be able to demonstrate the following skills: (1)

(1) an ability to plan, implement, and lead complex research programs; (2) experience in developing ecological and physiological process models, in particular with tree species; and (3) proven ability to communicate research results both orally and in the peer-reviewed literature. Position only open to U.S. citizens. Salary range: $48,592 to $63,172 per annum. For technical information on this position contact: Dr. Robert T. Lackey, Corvallis Laboratory: (503) 757-4634/4600. To obtain a complete vacancy announcement, application package, and instructions, write: EPA Personnel Office, P.O. Box 98516, Las Vegas, NV 89193-8516 no later than 30 December 1988.

Faculty Position, Water Resources Management, University of New Hampshire. The Department of Forest Resources invites applications for a tenure-track position at the rank of ASSISTANT PROFESSOR in WATER RESOURCES MANAGEMENT. The position is an academic-year appointment with responsibilities for both undergraduate teaching (50%) and independent research (50%). The successful candidate will be expected to teach courses in watershed management and in the ecology of polluted waters, to lead a seminar in some areas of professional interest in aquatic ecology, and to advise undergraduates in the Water Resources Management major within the department. A portion of the position will be supported by the Agricultural Experiment Station and the candidate will be expected to develop a research project that contributes to the broad resource management mission of the Station. In addition, the candidate will be expected to seek extramural funds to support independent research in some area of water science relevant to the department and program.

Candidates must have a Ph.D and preferably should have some post-doctoral experience. It is desirable that candidates have broad experience in ecosystems studies; preference will be given to candidates with teaching/reseach experience in the transport, fate, and biotic effects of aquatic pollutants.

Qualified applicants should submit a vitae, a statement of professional interests, and the names of references to: Dr. William B. Bowden, Dept. of Forest Resources, 215 James Hall, University of New Hampshire, Durham, NH 03824.

The deadline for receipt of applications is April 28, 1989, with an expectation that the candidate will be ready to teach fall semester 1989.

Supervisory Hydrologist, GS-1315-12/GM-1315-13, Everglades National Park. Position located at the South Florida Research Center, Homestead, Florida. This is a career-conditional appointment, full-time position with salary ranging from $33,218 - $51,354 per annum. Contact Valerie P. Lindsey (305) 247-6211, ext. 265 - National Park Service, Everglades National Park, P.O. Box 279, Homestead, Florida 33030.

NATIONAL PARK SERVICE 1989 SEASONAL EMPLOYMENT. Curecanti National Recreation Area, which includes the Blue Mesa Reservoir, is recruiting for Park Rangers and Laborers to work from approximately May through September. Park Rangers will perform various duties including law enforcement, fee collection, interpretive talks and guided tours. Laborers will perform manual duties including trail construction, general landscaping, and assisting with various maintenance projects. Applications for Park Ranger and Laborer positions are currently available from Curecanti National Recreation Area or any other office of the National Park Service. Deadline: January 15, 1989 (postmarked).

Questions concerning seasonal employment with the National Park Service may be referred to the Personnel Office, Curecanti National Recreation Area, 102 Elk Creek, Gunnison, Colorado 81230 (303) 641-2337, or any other office of the National Park Service.

CONFERENCES

Jan. 26-27	COLORADO WATER CONGRESS 31st ANNUAL CONVENTION, Holiday Inn, Northglenn. Contact: Dick MacRavey, Colorado Water Congress. 1390 Logan, No. 312, Denver, CO 80203. (303)837-0812.
Feb. 1-2	GLOBAL CHANGE AND INTERNATIONAL LAW: THE "GREENHOUSE EFFECT," COMPREHENSIVENESS AND THE THIRD WORLD, (Regional Meeting of the American Society of International Law), Univ. of Colorado School of Law, Boulder, CO. Contact: Global Change Colloquium, Katherine Taylor, Coordinator, Univ. of Colorado, School of Law, Campus Box 401, Boulder, CO 80309-0401. (303)492-1288.
Feb. 7	ROCKY MOUNTAIN WATER POLLUTION CONTROL ASSOCIATION (RMWPCA)/AWWA Joint Technical Luncheon, Denver, CO. Contact: Tim Shangraw, Engineering Science, 1100 Stout St., Denver, CO 80204. (303)825-8100.
Feb. 16-17	20th ANNUAL INTERNATIONAL EROSION CONTROL ASSOCIATION CONFERENCE AND EXPOSITION, Vancouver, British Columbia. Contact: International Erosion Control Assoc., P.O. Box 4904, Steamboat Springs, CO 80477. (303)879-3010.
Feb. 27-28	COLORADO WATER ENGINEERING & MANAGEMENT CONFERENCE, Ft. Collins, CO. Contact: Neil S. Grigg, Dept of Civil Engineering, Colorado State University, Ft. Collins, CO 80523. (303)491-5247 or (303)491-6308.
Mar. 15-16	NATIONAL CONFERENCE ON URBAN STREAM CORRIDOR MANAGEMENT AND STORMWATER. University of Colorado at Colorado Springs, CO. Contact: Jon Kusler, Box 2463, Berne, NY 12023. (518)872-1804.
Apr. 17-20	CHAPMAN CONFERENCE ON CAUSES AND CONSEQUENCES OF LONG-TERM SEA LEVEL CHANGES, Snowbird, UT. Contact: MMP: Sea Level, American Geophysical Union, 200 Florida Ave. NW, Washington, DC 20009. (202)462-6903.
Apr. 18-20	57th ANNUAL WESTERN SNOW CONFERENCE, Ft. Collins, CO. Contact: Jim Marron, Sec., Western Snow Conference, 12810 SW Hart Rd., Beaverton, OR 97005.
May 3-5	WESTERN SURFACE COAL MINING CONFERENCE, Gillette, WY. Contact: Society of Mining Engineers, Box 625002, Littleton, CO 80162. (303)973-9550.

May 22-25 — PARTNERSHIPS: EFFECTIVE FLOOD HAZARD MANAGEMENT, ASSOCIATION OF STATE FLOODPLAIN MANAGERS 13th ANNUAL CONFERENCE, Scottsdale, AZ. Contact: Rebecca Hughes, Maryland Water Resources Administration, Tawes State Office Bldg. D-3, Annapolis, MD 21401. (301)974-3825.

June 7-9 — DESIGN OF WATER QUALITY INFORMATION SYSTEMS, Ft. Collins, CO. Contact: Robert Ward or Jim Loftis, Agric. & Chem. Engr. Dept., Colorado State University, Ft. Collins, CO 80523. (303)491-5252.

June 27-30 — SYMPOSIA ON HEADWATERS HYDROLOGY AND INDIAN WATER RIGHTS AND WATER RESOURCES MANAGEMENT, Missoula, Montana. Contact: William W. Woessner, Dept. of Geology, University of Montana, Missoula, MT 59812. (406)243-5698.

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Colorado Water Resources Research Institute
Colorado State University
Fort Collins, Colorado 80523

COLORADO WATER ENGINEERING AND MANAGEMENT CONFERENCE
Colorado State University
February 27 - 28, 1989

CONFERENCE OVERVIEW

This 1989 Conference provides a forum to evaluate technical and management methods necessary to solve state water problems. It will be of interest to water resource engineers, water district managers, utility and municipal officials, agricultural and industrial water managers, public officials and other citizens interested in the engineering and managerial aspects of Colorado water management.

GENERAL INFORMATION

Registration

There is an advance registration fee of $125 if registration is postmarked and paid by 5:00 p.m., February 10, 1989. Registrations received after that date or on site will be $150. There is a one-day registration fee of $75. The registration fee applies to all authors and attendees. However, requests for partial waivers will be considered for individuals with special circumstances.

Cancellation with refund of the registration fee will be accepted if received by 5:00 p.m., February 10, 1989. Refunds cannot be made after this date. Substitution of participants is permitted. A $20 handling fee will be deducted from all refunds.

The registration package includes one copy of the Conference Proceedings, lunches, reception, refreshments during breaks and attendance at all sessions.

Accommodations

Block reservations have been made at the University Motor Inn, 914 South College Avenue, Fort Collins, CO 80524, 303-484-1984. The Motor Inn is within walking distance of Colorado State University. The rates are: government at $28/single, $34/double; regular at $32/single, $38/double. Please identify yourself as a participant of the "Colorado Water Conference" in order to obtain these special rates. Block reservations expire February 17, 1989. A complete listing of local motels/hotels will be included with the confirmation letter.

Correspondence

For further registration information call: Office of Conference Services (303-491-6222). For program/technical information call: Dr. Neil S. Grigg, Conference Chairman (303-491-5247).

TENTATIVE PROGRAM

PLENARY SESSION TOPICS

* Colorado Water Supply Issues
* Water Transfers in the West
* Agricultural Water Efficiency
* Satellite Hydrologic Monitoring
* Financing Water Supply
* Climate Change Impacts
* Protecting State Entitlements
* Instream Flow Protection
* Water Quality Issues and Trends
* Groundwater Issues

TECHNICAL SESSIONS

Planning & Policy Analysis

* Conservation
* Residential Water Demand
* Denver Water Supply Simulation
* Salinity Impacts/Complexity
* Optioning Agricultural Rights
* Computer-Aided Planning
* River-Basin Management Model
* Water Project Planning
* Pumped Storage

Water Engineering and Management

* Stormwater Mgt. by Utility Approach
* Urban Stormwater Mgt. Today
* Water Rights Engineering
* South Platte River Call Data
* Water Rights Software
* Study of Water Transfers, Colorado
* Colorado Springs Plan
* Administration in Pine River
* South Platte Bed Degradation

Water Quality and Environmental Mgt.

* Antidegradation
* New Approach to NPDES Permitting
* South Adams County Groundwater
* Blue River Reclamation Project
* Denver/South Platte Study
* Nonpoint Source Assessment
* Mining Policy
* Colorado River Salinity Control
* "Biomonitoring"
* Software for Water Quality
* EPA's Wetlands Protection Program
* Wetlands Evaluation
* Case History of NEPA Compliance

REGISTRATION FORM

Colorado Water Engineering and Management Conference
February 27-28, 1989

Please print or type:

NAME(S) _____

ORGANIZATION _____

ADDRESS _____

CITY _____ STATE ___ ZIP _____

TELEPHONE _____

REGISTRATION FEE:

Postmarked by February 10, 1989	# ____ @ $125	= $ _____
Postmarked after February 10, 1989	# ____ @ $150	= $ _____
One-Day Registration Fee	# ____ @ $ 75	= $ _____
TOTAL ENCLOSED		= $ _____

METHOD OF PAYMENT:

☐ Check (payable to Colorado State University)
☐ Purchase Order/Training Form
☐ MasterCard Card #_____ Exp. Date _____
☐ VISA Card #_____ Exp. Date _____

Mail completed form with payment to **Conference Services**, Rockwell Hall, Colorado State University, Fort Collins, CO 80523.

Colorado State University

COLORADO WATER RESOURCES RESEARCH INSTITUTE
Colorado State University
Fort Collins, Colorado 80523

Cooperative Extension
Colorado State University
Fort Collins, Colorado 80523

COLORADO WATER ISSUES PUBLIC FORUM

THIRD TUESDAY of Each Month
No-Host Noon Luncheon -- 11:45 a.m.-1:30 p.m.
WYATT'S CAFETERIA--Lakeside Shopping Center
on 44th Ave. between Sheridan & Harlan.

[Exit #270 on I-70 (Harlan St.) opposite Lakeside National Bank, then 2 blocks south on Harlan]

All interested citizens are invited to attend and provide input into the discussion generated by our expert presentor. Proceed through cafeteria line for meal service, then to designated meeting room.

Jan. 17 -- Tom McKee, Colorado State Climatologist: **"HOW WILL GLOBAL CLIMATE WARMING AFFECT COLORADO?"**

Feb. 21 -- Greg Parsons, Colorado Department of Health: **"COLORADO'S NON-POINT SOURCE POLLUTION MANAGEMENT STRATEGY"**

Mar. 21 -- Jeris Danielson, Colorado State Engineer: **"EMERGING ISSUES IN MANAGEMENT OF COLORADO GROUNDWATER"**

Please mark your calendar for the **3rd Tuesday of each month** through June 1989.

Jim C. Loftis

Jim C. Loftis
Extension Specialist
491-7923