

COLORADO WATER

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

WATER ITEMS AND ISSUES . . .

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AWRA - COLORADO SECTION PRESENTS

HOW SHOULD COLORADO UTILIZE ITS REMAINING COMPACT ENTITLEMENT OF THE COLORADO RIVER?

Friday, June 21, 1991 - 10:00 - 3:00
Ramada Inn, 124 6th Street, Glenwood Springs

Luncheon address by Congressman Ben Nighthorse Campbell; other speakers will be invited to provide perspective on this issue. Members \$18, non-members \$20 (includes lunch). For more information, call Dave Mueller in Denver (236-9404) or Dave Merritt in Glenwood Springs (945-8522).

AWRA - COLORADO SECTION PRESENTS

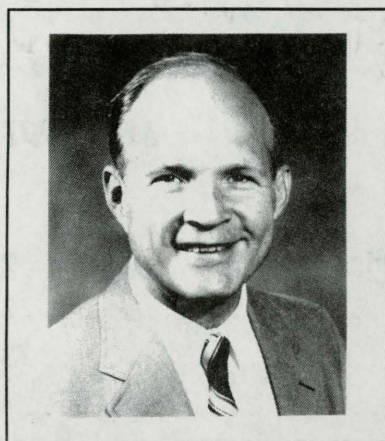
DEALING WITH SOIL FACTORS IN IRRIGATION STRATEGY

Thursday, May 23, 1991
Lunch 12:15 Program Wyatt Cafeteria
Lakeside Mall, 44 & Harlan, Lakeside

Robert Malmgren will describe soil characteristics that need to be considered for efficient water use, with emphasis on irrigation of urban and suburban recreational areas. For more information, call Dave Mueller at 236-9404.

WATER MANAGEMENT: A CHALLENGE TO TEST PEOPLE AND NATIONS

Editorial by Neil S. Grigg



Here at Colorado State University we get a broad view of international water problems. We have students from over 100 nations studying at the university, and many study water; in fact, many will be water leaders when they return to their countries. This internationalization of studies is good; it provides American

students with an opportunity to understand other cultures and to prepare for international business. Examples: during the Iraq war we were able to discuss issues directly with Iraqis here in Fort Collins; when the Kurdish problem hit the television screens I could discuss the issue with one of my students, a Kurd; during the student protest disaster in China, we could hear about it directly from our Chinese students; and there are many other examples.

There is one clear lesson about water resources: water problems are pervasive across the globe, and they will not be easy to solve. The truth is that they challenge our skills,

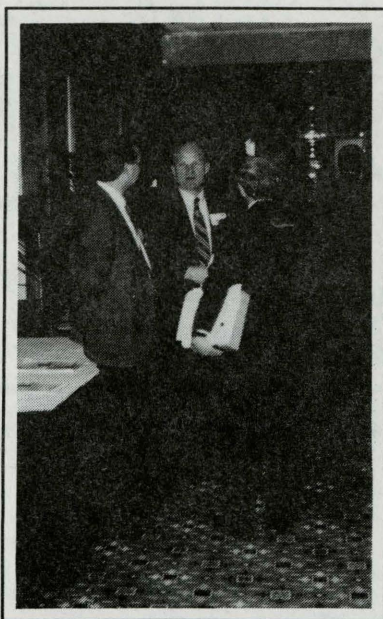
diplomacy and institutions to their limits. This was apparent at a water panel we organized in April as part of the celebration of our new President's inauguration. Our panel discussed water issues such as drought, environmentalism, global change and institutional conflict. Evan Vlachos, Professor of Sociology and Civil Engineering, coined the term "hydrodiplomacy" to describe the need to make peace over the use of water. That's what we need in Colorado - some hydrodiplomacy.

It's hard to resolve the issues of water politics, and technical solutions are not adequate by themselves to solve water problems. We need combinations of technical and political solutions. This is the way we approach water education and research at CSU and at other universities, and we see increasingly the important role that a broad understanding of water issues plays in finding solutions. John Kennedy said, "Anyone who can solve the problem of water deserves not one Nobel Prize but two: one for science and the other for peace."

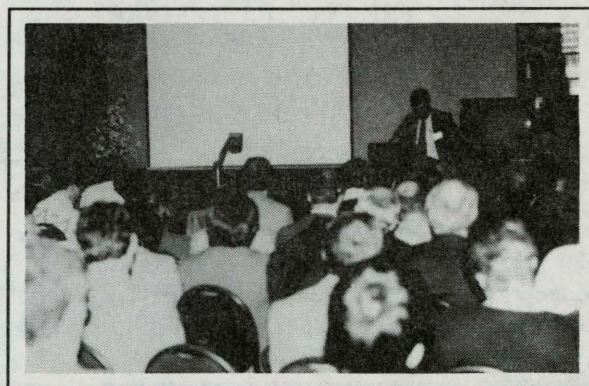
I like to think of water solutions in terms of six "C's". The first three involve the problem-solving part: the need to unravel COMPLEXITY with COMPETENCE and thereby reduce CONFLICT. The other three are the harmonizing "C's": the need to facilitate COOPERATION and COORDINATION through better COMMUNICATION. Education has a role in all of these. So does good public policy.

CONFERENCE SPOTLIGHTS WATER PROBLEMS AND THE SEARCH FOR SOLUTIONS

More than 200 participants gathered at the Colorado Water Engineering and Management Conference for a program covering a broad spectrum of issues related to Colorado water problems. The conference was held February 27-28, 1991 at the Denver Marriott Hotel. Concurrent sessions featured presentations on a variety of water topics: Water Policy and Management, Controlling Salinity in



Neil Grigg chats with participants



Conference sessions were well-attended

the Colorado River System, Groundwater Management, Water Supply Development, Water Quality Management, Groundwater Issues and Possibilities, Computer-Aided Decision Support, Water Resources Engineering, Water Administration and Management, Agricultural Water Issues, Stormwater, and Progress on Non-Point Source Control.



Jeris Danielson, State Engineer; Ed Carpenter, rancher and former legislator, and Evan Vlachos, Professor of Sociology, CSU

Speakers at Wednesday's plenary session on Water Resources Decisionmaking included: William McDonald of the Bureau of Reclamation - "USBR Water Programs;" Barbara Green, Attorney, Popham, Haik, Schnobrich & Kaufman, Ltd. - "Water Management Decisionmaking;" Legislator Scott McInnis - "Colorado water policy;" and Lawrence J. MacDonnell, Natural Resources Law Center - "Water Transfers in Colorado." Evan Vlachos, Wednesday's luncheon speaker, provided a look at water resources management in the '90s and beyond.

Thursday's plenary session on Colorado's Environment: Issues and Options featured: Melinda Kassen, Environmental Defense Fund - "Environmental Water Issues in Colorado;" Robert D.

ILLINOIS' RESPONSE TO FEDERALISM IN WATER MANAGEMENT

Editor's Note: In March 1990, COLORADO WATER published an editorial entitled "Adapting to Federalism in Water Management." The editorial was reprinted in the Illinois WRRRI newsletter with the following response from a state government official.

The more aggressive stance of federal agencies toward water rights is eliciting angry reproaches by some water officials in Illinois. Bruce Barker, from the Illinois Department of Transportation, wrote in response to Grigg's editorial that federal agencies are once again preempting state's water rights despite the expressed intent of Congress.

What has angered Barker are recent applications of Section 404 of the Clean Water Act to veto metropolitan water supply reservoirs by pitting one goal of the Act against another. In Barker's opinion, the provisions of the Act calling for fishable and swimmable waters have been abused by federal agencies, in particular the U.S. EPA, to halt water supply projects. Their actions have been at the expense of the state and in defiance of the clear intent of the Congress. In support of his argument, Barker cites what he sees as violations of the intent of two sections of the Act.

Jacobson - "View From the U.S. Fish and Wildlife Service;" and Ronald J. Schuster, Bureau of Reclamation - "An Overview of the Global Climate Change Response Program." At Thursday's luncheon program water resources education took center stage with remarks by John Kaliszewski of the State Engineer's Office and Tom Cech of the Northern Colorado Water Conservancy District.

Educational displays at the conference included: "The Western World of the Bureau of Reclamation" - USBR; "Management and Engineering of Limited Municipal Water Resources" - the Parker Water and Sanitation District; "The Historical Development of Water" - Northern Colorado Water Conservancy District; a display by the Colorado Division of Water Resources about river compacts and water supply; and an exhibit by the CWRRI.

The conference was organized by the Colorado Water Resources Research Institute and the Office of the State Engineer, and cooperating organizations were: American Water Resources Association, Colorado Section; Bureau of Reclamation; Colorado Water Conservation Board; League of Women Voters; Natural Resources Law Center, University of Colorado; U.S. Geological Survey, Water Resources Division, Colorado District; and Wyoming Water Research Center, University of Wyoming. Colorado State University cooperators were the Agricultural and Chemical Engineering Department, Agricultural Experiment Station, Civil Engineering Department, Colorado Institute for Irrigation Management, Cooperative Extension, and International School for Water Resources.

The first is Section 404(c) which lists the two conditions under which EPA is granted veto power over a project permit approved by the Corps. One of these conditions that authorizes EPA to veto is that the project will have "unacceptable adverse effects." Barker argues that between 1972 and 1988 the EPA found only seven instances in which this provision of the Act applied to a project, which indicates that the EPA agreed with the Corp that the majority of projects did not have unacceptable environmental impacts. This changed, however, in 1989. Within that one year, EPA used its veto power three times claiming that projects violated this condition. What changed, Barker wonders, to cause such differing assessments of projects?

The other section of the Act that Barker cites as evidence of federal agencies overstepping their jurisdictional boundaries is Section 101(g). There, the Act clearly says that states' rights to allocate water supplies shall not be superseded by EPA. And he quotes: "It is the policy of Congress that the authority of each State to allocate quantities of water within its jurisdiction shall not be superseded, abrogated or otherwise impaired by this Act. It is the further policy of Congress that nothing in this Act shall be construed to supersede or abrogate

rights to quantities of water which have been established by any State."

Distorted administrative interpretations that preempt state water resources management over the express prohibition of Congress are not new, says Barker. The Bureau of Reclamation did, over many decades, increasingly disregard Section 8 of the Reclamation Law, which requires substantive compliance with state water management plans and decisions in the development of projects.

The Bureau of Reclamation proceeded to construct New Melones dam and impound water in express violation of 25 conditions imposed on the project by the California Water

Resources Control Board, Barker says. The Bureau argued that the Reclamation law preempted state water law. That interpretation was rejected and the California Water Resources Control Board was upheld by the Supreme Court in *California vs. United States*, 438 U.S. 645 (1978).

Barker says that Congress has always recognized the unitary nature of state water resources management, which is to say that the United States cannot have dual federal and state systems of water rights. This principle is so essential and self evident that he says it is always a wonder to water resources administrators that federal agencies cavalierly discard it as a guide in interpreting federal law.

WATER BOARD CREATOR HARVEY JOHNSON DIES AT AGE 95

by Molly Nortier, Secretary, Fort Collins Water Board

"I think every man should do what he can for his community." Harvey Johnson, the man who made that statement, died on January 29, 1991 at his Fort Collins home at the age of 95. That philosophy became one of the cornerstones of Harvey Johnson's life. He served his "community" in so many ways!

After being elected mayor of Fort Collins in 1962, one of Mr. Johnson's first projects was to organize the Water Board. He remained an active member of the Board for many years. When he retired from active status, he was made honorary lifetime member. During his two terms in office as mayor, he was responsible for acquiring much-needed water and storage capacity for the City of Fort Collins. Prior to that, according to Mr. Johnson, the City had made little or no effort to purchase additional water. Making certain that the City had adequate water for now and the future continues to be a priority for the City today.

Mr. Johnson's neighbors and friends nearly always looked to him for leadership and guidance. Through the years, he served as state secretary of the Colorado Farm Bureau, also secretary to what was called the Farm Improvement Association. He developed the Colorado Farm Bureau and the Farm Bureau Mutual Insurance Company, as well as being active in the creation of many agricultural programs.

Even the famous author, James Michener, consulted with Mr. Johnson as a Western water expert, when he was doing research for his novel *Centennial*. The novel, among other things, dealt with water issues in Northern Colorado.

Harvey Johnson was born in a sod house in Kansas in 1895. In 1902, his father decided that there were new opportunities further west for his family. His wife, 8 boys and three girls prepared two covered wagons and a surrey for the long journey over the prairies of Colorado. Mr. Johnson remembered being thrilled by his first glimpse of the snow-covered panorama of the Rockies as they approached what

would be their new home. He lived elsewhere for a short time, years later, but he yearned to return to the "blue skies and sunshine of Colorado." The family traded a homestead and timber claim in Kansas for a quarter section of farm land five miles south of Fort Collins. Harvey Johnson spent a good many hard hours behind the plow as a youngster. "Those were days of real toil," he once said, "but they were pleasant days," he added. Thus began his life of dedication to agriculture with all of its ramifications.

He started his own farm in the spring of 1916. In the spring he married Margaret Capps in Denver. She died in 1966. He later married her sister Myra. She is also deceased. In 1920, he went into sheep feeding with a partner. In the 1920s the pattern of farm life for the Johnsons was sheep-feeding in the wintertime and beet growing in the summertime.

In 1935, Mr. Johnson purchased his own quarter section of land four miles out of Fort Collins. He eventually accumulated a total of 300 acres. During that time period Mr. Johnson was asked to sign a request to the government for the Big Thompson project. He was the only farmer among the 18 people who signed the document. He was recognized as knowledgeable about farming and irrigation. It should also be noted that although he worked at other jobs, farming was always in his blood.

In the hard times of the 1930s, farmers were realizing how the shortage of water and lack of storage were cutting their production in half. It was during those times that Mr. Johnson began to recognize the need for acquiring more water for agriculture and using that water more efficiently.

In 1928, Mr. Johnson bought some irrigated farm land. This was his initial contact with the Water Supply and Storage Company, and he eventually became one of the members of the Board. The Company charged him with the responsibility of improving the inefficient ways that water was being

delivered to and used on farms in those days. He managed to accomplish this task along with improving other facets in the organization.

Mr. Johnson served as director and president of Water Supply and Storage Co. for 54 years. He continued to be active in the Company until just prior to his death at the age of 95. Harvey Johnson is survived by two sons, H. Gordon Johnson and John L. "Bud" Johnson of Greeley, and a daughter Louise Weitzel

of Fort Collins. Grandchildren, great grandchildren and great, great grandchildren are scattered all over the United States.

His achievements and contribution to Northern Colorado were recognized in 1988 when he received the first Rotary Community Service award. The City of Fort Collins, the Water & Wastewater Utility, the Water Board and the State of Colorado are indeed fortunate that Harvey Johnson "did what he could for his community."

WHO'S WHO IN COLORADO WATER QUALITY

Clean, bountiful waters are one of Colorado's more precious resources. However, water pollution from nonpoint source runoff is an increasing concern in Colorado. We now have a State plan for nonpoint source pollution control, funded in part under Section 319 of the Water Quality Act of 1987. The following agencies and groups are major players in Colorado's effort to meet the requirements for nonpoint source pollution control as authorized in the Act.

COLORADO DEPARTMENT OF HEALTH, WATER QUALITY CONTROL DIVISION--This state agency has the primary responsibility for managing the nonpoint source (NPS) program in Colorado. The responsibilities include such activities as preparing and updating the State Nonpoint Assessment Report and Management Program, maintaining the statewide manual of best management practices, preparing nonpoint source funding priorities and the contract administration necessary to achieve the goals of Section 319. The Division is the contracting agency for funds provided by the Environmental Protection Agency (EPA) to implement Section 319.

WATER QUALITY CONTROL COMMISSION--The Commission consists of nine members appointed by the Governor. It serves as the regulatory and policy setting entity for water quality issues in Colorado. The Commission holds public meetings, as necessary, to allow public input into the State NPS Assessment Report, management program activities and priorities for nonpoint source funding. The Division serves as staff to the Commission. The Commission's adoption of documents, recommendations and regulations serves as final state agency action.

COLORADO NONPOINT SOURCE TASK FORCE--The Task Force was formed in May 1987 at the request of the Division. It serves as a combination advisory and work group to assist the Division in developing Colorado's nonpoint source program. The Task Force assists in developing and updating the NPS Assessment Report and the Management Program, and recommends projects for funding. Membership on the Task Force is limited by its rules of operation to 25, and consists of representatives of various government agencies, environmental groups and special interest groups.

SUBCOMMITTEES OF THE NONPOINT SOURCE TASK FORCE--Four subcommittees provide guidance to the Task Force on specific areas of nonpoint source concern; agriculture/silviculture, mining, urban and construction runoff, and hydrologic modifications. Membership on each subcommittee is unlimited, to provide broad public input. Proposals for funding projects are initiated through each subcommittee.

ENVIRONMENTAL PROTECTION AGENCY--EPA is charged with the national leadership to implement Section 319 of the Water Quality Act. All NPS assessment reports, management programs and updates must be approved by the agency. In addition, EPA provides grants, when available, to the states to carry out the 319 program.

OTHER AGENCIES--EPA is responsible for overall national leadership, and the Colorado Department of Health administers the program at the state level, but there are many other agencies and groups involved with implementing a successful 319 program. SCS participates by providing technical assistance to many of the agricultural projects. Badger Creek Watershed in Fremont County is a good example of where SCS has taken the lead in developing a whole watershed water quality improvement plan that involved many agencies.

The agencies listed above represent those involved in approving projects for funding under the provisions of the Water Quality Act. However, many other agencies are involved in water quality in Colorado. The Soil Conservation Service prepares projects, implementation plans and provides technical assistance to several agricultural projects on private lands. The Bureau of Land Management and U.S. Forest Service are actively pursuing water quality improvements on their lands. The State Soil Conservation Board provides direction to soil conservation districts on water quality issues and also sponsors projects. The Colorado Mined Land Reclamation Division is instrumental in developing projects addressing nonpoint pollution from mining activity. The Denver Regional Council of Governments serves as the primary organization dealing with water quality in the urban setting.

UPDATE ON COLORADO'S WELLHEAD PROTECTION PROGRAM

The following is an abstract of a presentation by Kathleen Reilly and Brad Austin, of the Colorado Department of Health, at the January meeting of the Colorado Groundwater Association.

Wellhead protection in Colorado is off to an auspicious start. The wellhead protection program, launched by the state health department last July, is a preventive concept that aims to avoid costly contamination of community groundwater drinking supplies. This will be accomplished by delineating wellhead protection areas (WHPAs) around community drinking water systems and setting in place methods to protect them from contamination.

A citizen advisory group has been appointed to assist with the effort, and within two meetings has defined its mission and goals and has begun the task of defining criteria to be used in delineating wellhead protection areas. The latter is a particularly critical element of the overall effort, and will take into account Colorado's unique hydrogeology. A separate subcommittee of the advisory group is looking into the management approaches that can be employed to ensure that the community wellhead areas are adequately protected over the short and long term. Examples of these are public education, training, best-management practices, public/private agreements, zoning and land use measures.

Everyone involved in the wellhead protection effort in Colorado recognizes that its success will rely heavily on acceptance and support from affected communities and water suppliers, which will be developing plans to protect their water systems. To achieve this, the advisory group has recommended an intensive public education effort to inform people of the economic and health benefits of a well-designed wellhead protection program that can be readily installed by local governments and other community water systems. The Health Department will make speakers available to address community and other groups about the aims of the wellhead protection program.

For information contact Kathleen Reilly at the Colorado State Health Department, 4210 E. 11th Ave., Denver, CO. Phone: (303)331-4573.

Colorado Groundwater Association, Feb. 1991

MCI PROGRAMS PROMOTE WATER CONSERVATION

Water Use Efficiency--As part of National Drinking Water Week, Metro Water Conservation, Inc. sponsored a program on May 8 to learn about residential, commercial and industrial water audits and retrofit. Speakers Eddie Hernandez, P.E., conservation specialist of the Denver Water Department and

Cliff Bjorgum, P.E., engineer for Black and Veatch, talked about their research on 36 audits of different commercial/industrial businesses in the metro area. They gave figures on potential and actual results of savings from a sample of their study. Pat Cannon of Environmental Assets Recovery Service then demonstrated their residential water and energy audit/retrofit program.

Xeriscape--Metro Water Conservation Inc. offers a full schedule of Xeriscape seminars in 1991 across the metro area. At no cost or for a nominal fee, property owners can learn from some of the area's best landscape professionals how to plan and install new water-efficient landscapes, as well as maintain or make gradual changes to existing yards using Xeriscape methods. To receive a copy of the schedule, call the Denver Water Department at 628-6343. For more information, contact Kathy Richardson at 628-6700 or 399-8421.

WATER FOR PEOPLE

An organizational meeting of the Water for People Committee was held at 9 a.m. Friday, April 26 at Gronning Engineering Company, 1333 West 120th Avenue, Suite 314, Denver, Colorado. Water for People is an organization dedicated to the improvement of drinking water supplies and sanitation in less developed countries. If you have any interest in this new RMS-AWWA committee please call Lloyd Gronning at (303)450-0100.

CRAIG GOEHRING PROMOTED

Craig Goehring, water program director at Brown and Caldwell's Denver office, has been named the consulting division's executive vice president and director of operations. Goehring joined Brown and Caldwell in 1976 and moved to Denver in 1981 to assist in opening a new office there. He became chief engineer of that office in 1985, and one year later was appointed vice president and manager of the Denver operation. He had been water program director since 1989. Goehring takes over for Lynn Hartford, who has been named president of Brown and Caldwell Consultants (BCC).

WORLD WATER CRISIS FORESEEN

Environment magazine reports that about 40 percent of the world's population suffers from serious water shortages, according to the working paper of the 115-nation Global Consultation on Safe Water and Sanitation for the 1990s. Conferees found that governments and international organizations are losing ground in the water crisis and that the number of nations lacking adequate renewable water resources is expected to double from 19 in 1975 to an estimated 37 by 2025. WHO says that of the world's 5 billion people, 1.2 billion do not have safe drinking water and 1.7 billion do not have adequate sanitation facilities.

WSTB Newsletter, Vol. 8, No. 1

WATER EDUCATION

KIDS FIND IT'S FUN TO LEARN AT CONSERVANCY DISTRICT'S CHILDREN'S WATER FESTIVAL

Tom Cech's enthusiasm for his subject, water education, showed as he described his ideas to his audience. Cech, Executive Director of the Central Colorado Water Conservancy District, was a luncheon speaker at the Colorado Water Engineering and Management Conference held in Denver in February. Believing that we must start with the kids, Cech invited

1,500 fourth and fifth graders to spend a few hours at Aims Community College in Greeley at a Children's Water Festival to learn about water. He said the response was phenomenal - he turned away hundreds of kids. Mary DeMartini and Jonnie Hamdan of CWRRI were helpers at the festival, held Tuesday, March 26, and this is their description of the day's activities.



Mary Adams takes samples of pond muck in "Something's Fishy Here"

and Norman Blake, pretending to be the creatures of the pond (marsh munchers) with Larry Rogstad of the Colorado Division of Wildlife, and becoming hydrologists for a day with Steve Vandas of the USGS.

Festival events included panning for gold with miners "Choppo" Fetterhoff



Learning about the importance of irrigation



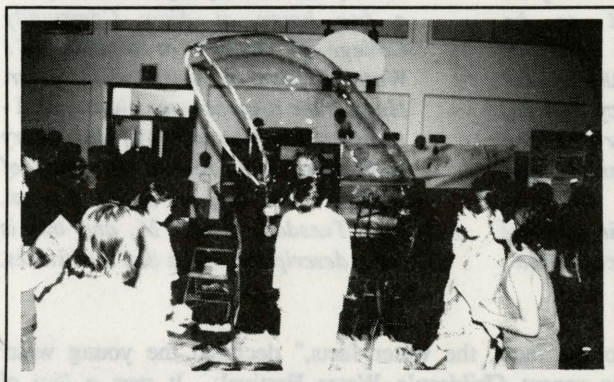
Ed Greene of KCNC Channel 4 hosts Water Wizards

Ed Greene of KCNC Channel 4 hosted water wizards, where classes competed against one another answering water trivia questions and showing off their newly acquired knowledge. Classes cheered as fellow students responded correctly to such questions as: "What is the annual precipitation in Greeley?" (12-14 inches) and "How much water is needed to grow an average crop?" (24-30 inches per year).



Mary DeMartini and Vanna Waterdrop take a break

Vanna Waterdrop of the Colorado Water Wheel of Fortune also visited the Festival, bringing glamour and smiles to all she met. Bubbleology was popular with the kids, as they returned time and time again to be engulfed by the hula-hoop-sized bubbles. These were only a few of the many events organized by Tom Cech, executive director of the Central Colorado Water Conservancy District.



The Bubble Machine

there is a great need for public education on the subject of water. Most agree that the place to start is with the kids, and that a trickle up effect will occur when their parents see what they have learned. "Colorado is 10 to 15 years behind the times in water education," said Tom Cech at the recent Colorado Water Conference held in February. We have to teach the people basic things and it can't be too political; it has to be basic, honest and for real."

UTAH--Based at Utah's Water Research Laboratory, Utah State University, the International Office for Water Education (IOWE) was organized in 1983 to bring together numerous activities in water education that had been in progress for many years. IOWE's major purpose is to promote water education in Utah from kindergarten through adulthood - teaching citizens the basic principles of water, its occurrence, development, use and administration.

In 1986 IOWE initiated The Young Artists' Water Education Poster Contest in Utah's elementary schools. The theme for the 1991 contest is: **Water, Essential to Life.** Utah Governor Bangerter has declared October as Water Education month, and during that time elementary students (K-6) throughout the state will draw water posters and enter them in the contest. Last year, IOWE arranged for over \$580,000 worth of prizes for teachers to award students in their classrooms.

Each November at a Governor's Conference on Water Education trophies are given to student winners, teachers and educators are recognized for their contributions, and a grand prize is awarded. The grand prize for the last two years has been free use of

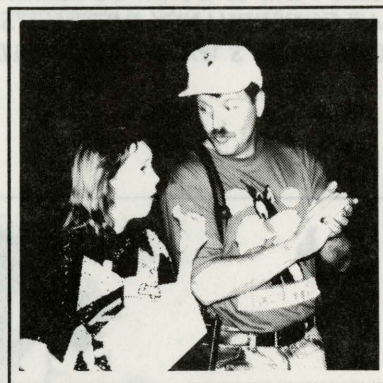
a houseboat on Lake Powell, a ski boat, and ground transportation. Winning posters are featured on a calendar that also contains water activities, questions, and facts.

Doug James, Director of the Utah Water Research Laboratory, says the impact of the poster contest is so positive that IOWE is sponsoring a 1991-92 *Western States Water Education Poster/Calendar Contest*. Governor Bangerter has written letters of challenge to the western governors, and members of the Western States Water Council were to discuss the contest at their April meeting. James would also like to open discussions on how water education efforts might be linked among the state water institutes so that all could benefit.

WYOMING--The University of Wyoming Water Research Center and the Wyoming Institute for the Development of Teaching will hold a **Wyoming Water Institute for Teachers** July 8-19, 1991. Teachers will have the opportunity to: expand their knowledge about water and water issues affecting Wyoming; experience classroom activities that can be used to help students better understand water and water related issues; take field trips to water research sites; and explore ways these concepts and

The "Water Gods," also known as experts in their fields, taught the kids about the importance of water to life, its many uses and the need to protect and conserve this valuable resource. Children eagerly participated and developed a new perspective on water.

This was the first Children's Water Festival in Colorado. It has aroused interest and enthusiasm among other school districts in Colorado, as well as other states. Tom Cech attended a similar program in Nebraska, observed its success and used the same approach to develop the Colorado Festival. According to water officials,



Tom Cech and daughter April

activities can be integrated into existing school curricula. For information write or call the Wyoming Institute for the Development of Teaching, Box 3992, University of Wyoming, Laramie, WY 82071-3992 or (307)766-6381.

On page 16 of *COLORADO WATER* John Kaliszewski describes the results of a survey conducted in conjunction with the Water Resources exhibit at last year's State Fair. John polled about 10,000 of the 140,000 people who passed through the exhibit, trying to identify what the public knows about water and how it prioritizes water issues. Some of the results may surprise you. Here are a couple of the questions and responses:

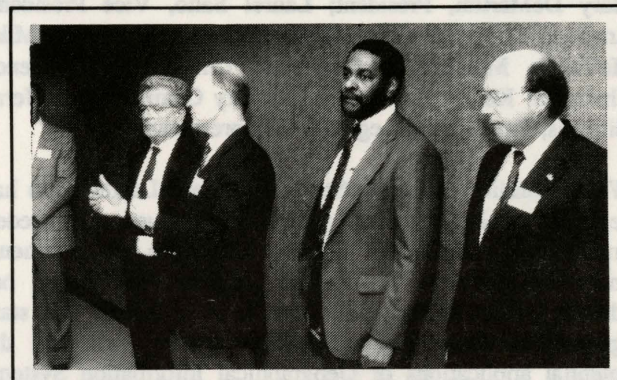
What percent of water consumed in Colorado is consumed by the Denver Metropolitan area? Almost 60 percent of those polled believe Metro Denver consumes more than 35 percent.

What percent of water consumed in Colorado is consumed by agriculture? Fifty-seven percent of the respondents believe that agriculture consumes 40 percent or less.

UNIVERSITY WATER NEWS

"What should our priorities be for the coming year? Let me give you my list. It begins with education."
Governor Roy Romer, State of the State Address,
1/10/91

Governor Romer Tours Programs of Excellence at Colorado State--Colorado State's Water Resources Education Program and Department of Chemistry were named 1991 Programs of Excellence by the Colorado Commission on Higher Education in December. On March 21 Governor Romer toured the two programs and reaffirmed his commitment to education, saying, "It is the most critical investment we can make to ensure the economic success of Colorado."



*Governor Roy Romer, Neil Grigg, CSU President
Albert Yates and John Nelson,
Head, Civil Engineering Department*

Romer was greeted by President Albert Yates and other University officials. During his visit he was brought up-to-date on a number of water research projects involving groundwater, hydrology, and other water research involving computer modeling. Individual projects included computer modeling of groundwater contamination at the Rocky Mountain Arsenal; computer programs used to resolve conflicts in water resource system management; drought analysis; the use of computer expert systems for irrigation management; and computer modeling of floods and severe storms. Tour hosts for Governor Romer's visit to the Water Resources Education Program were Frank Kulacki, Dean of the College of Engineering, and Neil Grigg, CWRRI Director.



*Jud Harper, CSU Vice President for Research
and Governor Roy Romer*

Romer also toured laboratories in the Chemistry Department where students and researchers were hard at work on chemistry experiments. He commented on the importance of bringing higher education's expertise in chemistry education to the K-12 level. He also discussed the impact research labs have on business in Colorado. High-tech research and training programs draw high-tech industry to the state, Romer said. Dr. Oren Anderson, Chairman of the Chemistry Department, hosted the Governor's chemistry tour.

ASCE President visits Colorado State - by Laurel Saito--James E. "Tom" Sawyer, President of the American Society of Civil Engineers, visited CSU on April 11 in conjunction with his attendance at the Colorado Section "Annual Student Night" in Denver. The Civil Engineering Department hosted a luncheon for Sawyer, which was followed by an informal discussion with students. Sawyer encouraged students to get advanced degrees, noting that U.S. engineering programs are the best in the world. He was impressed in his first visit to CSU with the breadth of faculty, emphasis on professional interaction and the senior design requirements.

"Student Night" was attended by over 100 students and section members to honor outstanding senior students at each of the six area colleges and universities with civil engineering programs. Barbara Fisher was honored as CSU's outstanding senior student. In his address to this group, Sawyer emphasized the importance of education and research in the future of civil engineering, noting the Coalition of Engineers for Education's goal of pairing an engineer with every school in the U.S. to increase awareness and opportunities in engineering.

In other ASCE news, the student chapter at CSU recently established its officers for next year. Incoming officers are: Mary DeMartini, President; Laurel Saito, Vice President; Kristiann Choy, Secretary; Andrew Garton, Treasurer; Mike McVaugh, Membership Chairman; Tim Kraft, Conference Chairman; Kelley Thompson, Publicity Chairman; and Jerry Gibbons, Engineering Legislature Representative.

Water Quality Database Study Initiated--Laurel Saito has begun a promising research project, the evaluation of needed improvements in **Water Quality Database Management**, under the direction of CWRRI Director Neil Grigg, her advisor. Her research will look at both federal and state agencies currently managing water quality data and the potential applications of Geographical Information Systems (GIS) to water quality data.

Fort Collins Chamber Names New Research Assistant--Lindsay Sweetser, graduate student in Agricultural and Resource Economics at CSU, is the 1991 research assistant for the Fort Collins Chamber of Commerce. She will work with the Chamber Water Resources Committee and also on other research projects including the cost of living index. Sweetser received her B.A. in geography from the University of Colorado.

Staff Member of State Engineer's Office Completes Dissertation on Reservoir Options--"Operating a reservoir system in real-time under the Prior Appropriation Doctrine" was the dissertation topic of John R. Eckhardt, who recently completed requirements for a Ph.D degree in Civil Engineering at Colorado State University. John's dissertation will be published by CWRRI as Technical Report No. 57, and a more detailed description of the research can be found under the section **New Reports** in this newsletter. Now an Assistant Division Engineer with the State Engineer's Office in Denver, he formerly was assigned to the Division I Engineer's Office in Greeley and also was employed by the Northern Colorado Water Conservancy District.

Colorado State Receives \$3.2 Million to Continue Long-Term Ecosystems Study--A \$3.2 million grant from the

National Science Foundation will support continuation of a long-term study of grassland ecosystems by Colorado State University and Agricultural Research Service scientists. For nine years, an interdisciplinary team of researchers has studied the influences of soil properties, land use, and climate on a 15,000-acre research site near the Pawnee National Grasslands in northeastern Colorado. The new grant will support work at the Central Plains Experimental Range through 1996.

Source: The Green Sheet, NASULGC, Jan 1991

NASULGC Names New Chairman of Water Resources Committee--Robert D. Varrin, Associate Provost for Research at the University of Delaware, has been named the new chairman of the Water Resources Committee of the National Association of State Universities and Land Grant Colleges. Dr. Varrin is a registered professional engineer and geologist and holds faculty positions in the Departments of Civil Engineering and Geology. He has served as the Director of the Delaware Water Resources Center since its founding in 1965. Dr. Varrin succeeds Dr. Archie J. McDonnell, Director of the Environmental Resources Research Institute at The Pennsylvania State University, who served as the Committee's chair for the past five years and will continue to serve as a Committee member.

Wyoming Institute Director is Chair Elect of NAWID--Steve Gloss, Director of the Wyoming Water Research Center at Laramie, is the Chair Elect of the National Association of Water Institute Directors. The association is comprised of eight regional groupings of institutes based on geography, hydrologic boundaries and common water-related interests. The regional groups form the basis of the national organization. Membership in NAWID consists of the directors of the 54 institutes. A council of representatives, drawn from each of the regional associations, serves as a governing board. A chair, chair-elect and secretary-treasurer are elected by the council, and along with the past chair serve as an executive council to manage the affairs of NAWID. An annual meeting is held in Washington, D.C. involving the total membership, while the council of representatives assembles quarterly for meetings.

COLORADO STATE AND THE BLM FORM COOPERATIVE RESEARCH UNIT FOR GLOBAL CHANGE RESEARCH

by Lisa Helme

Public Relations Department, Colorado State University

Colorado State University and the Bureau of Land Management have formed a cooperative research unit to conduct global climate research. The offices for the Environmental Science and Technology Center opened in April in Fort Collins. Approximately 10 Colorado State and BLM researchers will operate out of the center.

"The creation of the center is an extension of the ongoing cooperative environmental research conducted by Colorado State's College of Forestry and Natural Resources and the

Wyoming State Office of the BLM," said Bill Marlatt, Colorado State's earth resources professor, principal scientist and the university's executive officer for the center.

Center objectives include development of more efficient methods for air resource and wildland management. The center also aims to develop technology to detect climate related environmental change, to investigate and test wilderness baseline monitoring techniques, to develop new computer models for smoke management and develop courses in the

application of new computer techniques and resource management methods for distribution to the public.

"The BLM already has several on-going cooperative research projects with Colorado State on smoke management from natural and prescribed fires, wilderness monitoring and global change," said Al Riebau, BLM Wyoming senior technical specialist for air resources. "The center will give new focus to the management of this work and the new projects to be added."

Two major global change projects the center researchers will work on are establishing monitoring sites at 15 to 20 remote locations in North America and a joint research project with the Soviet Union. In the Soviet study, Colorado State, BLM and Soviet scientists will examine the relationship between environmental quality and environmental stresses at four paired sites in the Soviet Union and North America.

"By operating out of one centralized location we will be able to more easily share instrumentation, computer facilities and data, and work more closely on our cooperative research projects," Marlatt explained. The center's work will be funded by the BLM through the United States Global Change Research Program and other internal funding sources. The unit is located in Colorado State's Research Park at 2401 Research Drive, Suite 205.

Soviet Union Joins with Colorado State and BLM Researchers to Study Global Warming

Researchers hope the first indications of global warming impacts on the earth's surface will be detected through a comparison of paired ecological regions in the Soviet Union and North America.

Scientists from Colorado State University, the Bureau of Land Management and the U.S.S.R. Branch of the World Laboratories are undertaking the study of the relationship between environmental quality and environmental stresses at the paired locations.

"The potential impacts of global climate change will require agencies like the BLM to adopt new methods of managing our many natural resources," said Ray Brubaker, BLM Wyoming state director. "Many land management issues, such as protection of air and water quality, are similar in both countries. By working together, we will be able to better understand the impact of modern society on our environment. We're excited about this study."

While a guest lecturer last spring of the U.S.S.R. Academy of Sciences, Colorado State earth resources Professor Bill Marlatt spoke with Soviet Scientists about the possibility of a U.S./Soviet research project on climate change. Details of the joint endeavor were then developed with work scheduled to begin this year. Marlatt will direct the project.

Researchers will monitor four ecological regions. The first is the polar front Boreal Forest characterized by mixed coniferous-deciduous forests. The U.S. study area will be in southern Alaska. The Soviet Union site will be at Pleshcheyevo, located approximately 90 miles north of Moscow.

The mid-latitude sites consist of alpine areas located near timberline. The U.S. Forest Service's Glacier Lake Ecosystem Experiment Study station in the Snowy Range, west of Laramie, Wyoming is the North American study site. The Soviet site is located in the Caucasus Mountains on the slopes of Mt. Elbrus at the border between the Republics of Russia and Georgia.

The desert-shrubland study site in the United States will be located at the BLM's El Malpais National Conservation Area in west-central New Mexico. The Soviet monitoring site is located in the Kyzyl Kum region near the village of Bazay, northwest of Tashkent, Uzbekistan.

The fourth ecological region, the continental-high pressure area, will allow scientists to study possible ozone depletion. The two areas have climates similar to Antarctica where the ozone "hole" was discovered 10 years ago. The Soviet site is on the Siberian Plateau near the town of Yakutsk. The corresponding North American site is proposed to be near Yellowknife in the Northwest Territories of Canada.

"The first places that may be impacted by warming temperatures which could be caused by global climate change will probably be seen in the desert areas that encroach on grasslands," Marlatt said. "If the earth's increased greenhouse effect does result in climate warmings, we should begin to see the deserts expand and the grasslands recede."

The project is expected to continue for at least five years. Along with ongoing monitoring work, teams of U.S. and Soviet scientists will annually conduct intensive field studies at each site. Scientists will monitor air and water quality and will study changes in aquatic and vegetative life.

"Interpreting data will be a major part of this project. Not only will there be large amounts of information, but we have the additional problems of language and different scientific organizations to deal with as well," said Al Riebau, Wyoming BLM senior technical specialist for air resources.

The estimated U.S. cost of the five-year study is \$2 million. BLM receives its funding from the U.S. Government's Global Change Resources Program and is the primary financial sponsor for the program. Soviet costs will be paid by their government.

Colorado State and BLM researchers will work cooperatively out of the new Environmental Science and Technology Center located in Fort Collins.

NEW REPORTS

Real-Time Reservoir Operation Decision Support Under the Appropriation Doctrine, by *John R. Eckhardt*. Technical Report No. 57. Price: TBA.--In the Western United States as competition for water from over-appropriated rivers escalates, water rights decrees continuously increase in numbers and become more complex. The result is that the task of operating a multiple-reservoir system in accordance with the Doctrine of Prior Appropriation is becoming so formidable that the current procedures used by reservoir operators are unusable except for the obvious and straightforward water rights operations. To make matters worse, real-time data acquisition systems have further complicated the operating process by creating an information management crisis for reservoir operators.

With a focus on identifying and resolving the problems of operating a reservoir system in real-time under the Prior Appropriation Doctrine, systems engineering methods were employed to analyze the currently used and accepted reservoir operations practices in order to develop a formalized reservoir operations procedure that could be used in real-time. Based on the latest decision support system technology, a framework for real-time reservoir operations decision support was then developed to implement the procedure. The framework represents an organizing concept in which the developed reservoir operations procedure was integrated with automatic data acquisition into a real-time, computer-based decision environment. Using the framework, a demonstration decision support system was developed and implemented for a typical multiple-reservoir system in Colorado.

Hydroclimatic Variability in the Rocky Mountain Region, by *David Changnon, Thomas B. McKee, and Nolan J. Doesken*.--Water stored in the winter snowpack of the Rocky mountains is a variable resource for the West. This project

investigated interrelated hydroclimatic elements to determine characteristics of the spatial and temporal climate variability in a five-state region located in the Northern Rocky Mountain Region. The study covered a 35-year period from 1951-1985. It included (1) developing an interrelated hydroclimatic database, (2) analyzing 14 carefully selected watersheds, (3) analyzing all complete and consistent snowpack and precipitation measurement sites in the five-state region, and (4) describing the association of large-scale circulation indices and winter synoptic patterns to hydroclimatic variability in the Rocky Mountains.

A database was developed to provide a foundation for thoroughly analyzing hydroclimatic variability in the Rockies. The three primary hydroclimatic elements analyzed included total water-year streamflow, winter accumulated precipitation, and April 1 snowpack. Investigators found three basic and persistent patterns of annual snowfall values: (1) years that were consistently either wet or dry; (2) years with a distinct north-to-south gradient; and (3) average years that had isolated areas of wet and dry located throughout the study region. Patterns of snowfall distribution during the 35-year period showed that wet, dry and average patterns occurred throughout the period. However, the wet-north/dry south gradient patterns occurred only before 1974 and dry-north/wet-south gradient patterns did not occur before 1973. The investigators suggest that this change is the result of a physical phenomena that is part of the global ocean-climate system.

Climatology Report No. 90-3, Department of Atmospheric Science, Colorado State University. Paper No. 475. The research was supported by the U.S. Geological Survey and the Colorado Agricultural Experiment Station.

COLORADO WATER RESEARCH AWARDS

A summary of water research awards and projects is given below for those who would like to contact investigators. Direct inquiries to investigator, c/o indicated department and university.

COLORADO STATE UNIVERSITY, Fort Collins, CO 80523

International Satellite Cloud Climatology Project Sector Processing Center for GOES, Thomas H. Vonderhaar, CIRA Admin Unit
 Studies of Ice Initiation in North Dakota Cumulus Clouds, Paul J. Demott, Atmospheric Science
 Ecosystem Processes in Treefall Gaps of a Lowland Tropical Rain Forest, Robert Sanford, Natural Resource Ecology Lab
 Sediment Entrapment in Vegetated Channels, Steven R. Abt, Civil Engineering
 A Modeling & Observational Study of Colorado Front Range Winter Storms, Roger A. Pielke, Atmospheric Science
 Evaluation of Management Regimes for Dryland Western Turfgrass Cultivars, Anthony J. Koski, Horticulture
 Economic Impacts of Severe Sustained Drought, Robert A. Young, Agric. & Resource Economics
 Controls on Alpine - Subalpine Channel Morphology, Ellen E. Wohl, Earth Resources
 Coupling Ecosystems Processes & Vegetation Pattern Across Environmental Gradients, William K. Lauenroth, NREL
 Studies of Winter Storms in Colorado with the CSU-CHILL Radar, Steven A. Rutledge, Atmospheric Science
 Dynamical and Electrical Studies of Mesoscale Precipitation Systems, Steven A. Rutledge, Atmospheric Science
 Effects of Gradation & Cohesion of Scour, Albert Molinas, Engineering Research Center

Impact Assessment of Urban Return Flow Quality on Agricultural Water Use, Timothy K. Gates, Civil Engineering
Response of a Temperate Grassland Eco-system to Climate Change: Importance of Biotic Interactions and Feedbacks, William H. Hunt, Natural Resource Ecology Lab
Monitoring the Response of the Uppertroposphere/Lower Stratosphere to a Greenhouse Gas Scenario, Stephen K. Cox, Atmospheric Science
Impacts of Water Management of the Fishery Resources of the Wind River, Eric P. Bergersen, Coop. Fish & Wildlife Research
Hillside Revegetation for Bunker Hill, Edward F. Redente, Range Science
Efficient Use of Fertilizer and Soil Nitrogen, Ingrid C. Burke, Natural Resource Ecology Lab
Ecological Risk Assessments of the Aberdeen & Yuma Proving Grounds, Patricia L. Kennedy, Fishery & Wildlife Biology

UNIVERSITY OF COLORADO, Boulder, CO 80309

Fundamental Studies on Hydrology, Hydraulics, and Geometry of River Networks, V.K. Gupta, CIRES
A Clearinghouse on Natural Hazards Research and Applications, William Riebsame, Inst. of Behavioral Science
Effects of Climate Change in the Colorado Alpine, Nelson T. Caine, Inst. of Arctic & Alpine Res, Geological Sciences
Establishment of a Steering Committee for Paleoclimates of Arctic Lakes and Estuaries, John Andrews, IAAR
Using Multi-Sensor Data to Model Factors Limiting Carbon Balance in Global Grasslands, Carol Wessman, CIRES
Development and Experimental Verification of Models for Estimation of Uplift Water Pressures in Cracks in Dams, Bernard Amadei, Civil, Environmental and Architectural Engineering
Development of Scientific Workstations in Support of "Hydroclimate International Project", Kenneth Strzepek, CEAE
Measurements of Stable Isotope Ratios in Atmospheric Gases: Expanding the University of Colorado - NOAA/GMCC Cooperation, James White, Inst. of Arctic and Alpine Research
Design Reliability for Estimating Costs of Pile Foundations Phase 2: From Theory to Application, George Gobel, CEAE
The Role of Natural Organic Matter in the Partitioning and Transport of Polynuclear Aromatic Hydrocarbons in Groundwater, Gary Amy, Civil, Environmental & Architectural Engineering
Studies of Vertical Deformation, the Rotation of the Earth and Sea Level Variability, John Wahr, CIRES
Icesheet Sea-Level, Climatic Interactions, During the Younger Dryas/Cockburn Interval (11-8 KA): Evidence based on a lake Coring Program, Outer-most SE Baffin Island, NWT, John Andrews, IAAR
National Ice Core Curatorial Facility, Mark Meier, Inst. of Arctic & Alpine Research
Development of Chromatography and Vacuum Apparatus for the AMS 14C Dating of Microgram Carbon Samples: New Tools for Resolving the Timing of Environmental Events, Thomas Stafford, IAAR
Arctic Ocean Atmosphere-Ice System Studies Program, Roger Barry, CIRES
Comparative Lithological Mapping Using Multipolarization, Multifrequency Imaging Radar and Multispectral Official Remote Sensing, Fred Kruse, CIRES

WATER NEWS DIGEST

Water Supply

The National Weather Service has released its Spring national water outlook which will be in effect at least through May. Despite recent storms, the NWS reports that water supplies are seriously depleted in California, Nevada, Utah, Oregon, North Dakota and in the Missouri and Colorado river systems. "The entire water supply system in the West is under stress," says Frank Richards of NWS. Arizona and New Mexico had a good winter and neither is on the drought list for 1990-91. Nevada is probably in the worst shape, because the Sierra Nevada Mountains trapped much of this year's moisture for California. While the West suffers from a lack of water, Richards said the Eastern U.S. is "ripe for flooding."

Fort Collins Coloradoan 4/11/91

Bureau of Reclamation, April 1991--The water supply picture in the Upper Colorado River basin has improved slightly over

the past month. Inflow into Lake Powell for the April through July runoff period is currently forecast at 4,600,000 acre-feet, or 57 percent of normal. The Colorado River Basin is once again experiencing drought conditions. This is the fourth consecutive year of below normal runoff. If the current forecast holds, the 1988-1991 period will be the driest four consecutive years on record, and runoff will total 3.12 million acre-feet less than in the 1933-1936 period.

Even with the continued drought, the Upper Basin will be able to meet its 8.23 million acre-foot commitment to the Lower Basin this year. If the drought continues, some minor shortages will occur in areas with insufficient storage.

State Engineer's Office, April 1991--Snowpack percentages increased substantially across Colorado in March, improving water supplies in many river basins. Although conditions have improved, water conservation measures remain important since most of the state can expect below normal runoff this year.

The Northern Colorado Water Conservancy District announced on April 13 that farmers, municipalities and other large water users will be allowed to have only 60 percent of the water they own this summer. Snowpack on the Eastern Slope is only 66 percent of average this year and has been below average for the past five years. Larry Simpson, District Manager, says NCWCD hopes to regain storage and reservoir backup and replace reserves to meet future dry years.

Fort Collins Coloradoan 4/13/91

Water Development

A draft statement for regional planning of water delivery and treatment facilities should be released by the NCWCD in mid-May. The study focused on three areas: seven counties now in the district including Fort Collins and Loveland; the portions of Weld, Larimer, Boulder and Morgan Counties that aren't in the district; and suburbs north of Denver including Aurora, Thornton, Northglenn, Arvada, Westminster and Commerce City.

Fort Collins Coloradoan 4/11/91

Aurora has pulled out of the Collegiate Range water project, planned to divert water from the Gunnison River for municipal use on the Front Range. Aurora Mayor Paul Tauer hopes that by backing off the project it will dissolve divisiveness and eventually lead to a water project that benefits both sides. Arapahoe County, which had a cooperative agreement with Aurora for the project, says it will continue to pursue its own development plans.

Associated Press 3/8/91, Rocky Mountain News 3/8/91

Western Slope water lawyers say a new Gunnison Basin court ruling that upholds instream flow rights in the Taylor River protects the basin against transmountain water diversions. Last year Aurora had challenged the instream flow rights on the Taylor River and two tributaries, rights held by two local landowners. Water leaders hope the ruling will convince Arapahoe County to drop its Gunnison Basin water claims.

Grand Junction Daily Sentinel 3/29/91

The Thornton/Northern Colorado Water Conservancy District trial to determine senior water rights to the Poudre River ended March 25. The trial focused on the district's proposal to dam the Poudre to create the Grey Mountain and Glade reservoirs and a hydroelectric power plant. Thornton officials say that this would drain their future water supply. Five years ago Thornton bought up farms in Weld and Larimer County for their water rights. Closing arguments are set for June 4 in Greeley Division I Water Court.

Fort Collins Coloradoan 3/26/91

Officials of Parker Water and Sanitation District, Douglas County, have applied to the state water court in Greeley for a 600-acre reservoir near the site of the old Castlewood Dam on Cherry Creek. Frank Jaeger, Manager of the District, said Arapahoe County could participate in the project as a user and water provider. Opponents say the project would flood much of Castlewood Canyon State Park. Four operators of large ranches, developers and other nearby landowners have filed statements against the reservoir.

Denver Post 3/11/91

NaTec Resources Inc. of Houston has applied for a permit from the Federal Energy Regulatory Commission to conduct a three-year feasibility study of a 45-foot high dam in Horsethief Canyon. The proposed hydropower project would create a nine-mile long reservoir from Salt Creek east to Skipper's Island, and produce power for a sodium bicarbonate mine. It would inundate the Colorado River along a new state wildlife area in Horsethief Canyon. Federal officials say the dam faces two major roadblocks - conflicts with recreational users and endangered fish. The company had previously tried to sell its Colorado River water rights to the federal government, asking \$15 to \$20 million for the rights.

Grand Junction Daily Sentinel 4/5/91

Just as the outlook for the Animas-la Plata project appeared brighter, Navajo Nation President Petersen Zah announced that four Indian tribes - the Navajo Nation, the Jicarilla Apache, and the Ute Mountain Ute and the Southern Ute Indian Tribes - will not agree to any proposed federal water projects until all prior federal commitments to Indian water projects are fulfilled. Zah made his announcement at the annual meeting of the Southwestern Water Conservancy District on April 4.

Grand Junction Daily Sentinel 4/5/91

Energy Legislation - Hydropower

On April 16 the Senate Energy and Natural Resources Committee will begin mark-up of S.341, the National Energy Security Act. Senator Larry Craig of Idaho, with the support of Senator Malcolm Wallop (WY), the Ranking Minority Member, will introduce as an amendment S.106 to assure that applicants for hydropower licenses comply with state substantive and procedural water law. The Western States Water Council has expressed strong support for the Craig bill.

Western States Water, 4/5/91

Endangered Species

The U.S. Fish and Wildlife Service says Flaming Gorge Dam must have major operational changes to prevent extinction of the Colorado squawfish, humpback chub, bonytail chub and razorback sucker. The USFWS says the dam has harmed the

four fish species by eliminating spring flood flows, reducing river silt and cooling water temperatures. Biologists want to curb rapid flow changes which are aimed at meeting peak electric power demands. A formal written decision is expected in July.

Denver Post 2/20/91

The National Marine Fisheries Service has invoked the Endangered Species Act to protect sockeye salmon on the Columbia River. The numbers of salmon, which breed in the river and then migrate to the ocean to mature, continue to decline. The Columbia system's 69 dams produce abundant and cheap hydroelectric power. If federal protection of the salmon stands, the law requires fishery managers to devise a recovery plan without regard to economic consequences.

Grand Junction Daily Sentinel 4/3/91

Water Quality

The U.S. Senate has approved \$283 million to begin cleanup of Rocky Flats. The bill includes an amendment to fund a water diversion project to protect water supplies of four Denver suburbs from Rocky Flats nuclear weapons plant contamination. The amendment, by Senators Tim Wirth and Hank Brown, directs the Department of Energy to release \$10 million to start the water diversion projects in Broomfield, Westminster, Thornton and Northglenn. Both reservoirs were found to have plutonium contamination in their sediment and on the ground around them.

Rocky Mountain News 3/21/91

The Army and Shell Oil Company have made a new settlement offer in the seven-year old lawsuit by Colorado over pollution at the Rocky Mountain Arsenal. Tom Looby, Deputy Director of the Colorado Health Department, said the offer is "promising enough to merit serious negotiations."

Rocky Mountain News 3/31/91

Congresswoman Pat Schroeder introduced a bill in early March to designate Rocky Mountain Arsenal as a national urban wildlife refuge and transfer responsibility for it from the Defense Department to Interior. U.S. Senator Hank Brown, who has been working with Adams County officials, also plans to introduce legislation to preserve the arsenal grounds.

Associated Press 3/14/91, Denver Post 3/18/91

Bob Barles, Acting Director of EPA's Office of Groundwater, told participants at a groundwater conference in Fort Collins that local and state governments need to identify and handle groundwater contamination sites. Barles said EPA is unable to take care of the millions of sites nationwide, which "...will cost billions." Barles said states that have developed their own

groundwater protection programs will fare better when national guidelines are developed over the next few years. Cooperative Extension representatives from Colorado State explained the developments in Colorado groundwater legislation. The conference was sponsored by the Colorado Departments of Agriculture and Health, Cooperative Extension, EPA and CSU's Political Science Department.

Greeley Tribune 3/12/91

Water Conservation

The Denver City Council has mandated the use of low-water-volume plumbing fixtures in all new homes, businesses and other public and private buildings. Denver water officials say by the year 2000 the city will have saved enough water to serve the needs of 20,000 people.

Denver Post 3/19/91, 3/20/91

The Denver Parks Department's new computerized irrigation system reduced water use at ten city parks by 27 percent last year. The water saved totaled 30 million gallons, or enough to handle the annual water needs of 368 metro-area residents. Parks managers plan to use \$4.5 million from last year's city bond election to put an additional 55 percent of the city's 3,000 acres of irrigated park lands onto the new system. At least \$10 million is needed to completely update the rest of the park irrigation system, and the city hopes to find the money and complete the improvements by the year 2000. This would result in water savings of about 600 million gallons annually.

Denver Post 4/13/91

Arkansas River Litigation

Because of the illness of its chief technical expert, Kansas has been granted a delay of seven to nine months to prepare and train a replacement in its lawsuit claiming that Colorado has violated the 1948 Arkansas River Compact. Colorado was scheduled to begin presenting its technical case, which is expected to take from three to six weeks, the second week in April. Kansas has sued Colorado for up to 100,000 more acre-feet per year, claiming that at least three factors have removed water from the Arkansas River before it reaches Kansas: wells drilled since the 1948 pact; operating practices at the Trinidad Reservoir on the Purgatoire River; and winter water storage at Pueblo Reservoir. Colorado says the lawsuit was motivated by depletion of the Ogallala aquifer and notes that Kansas has five or six times more land under irrigation than it had in 1948. Colorado witnesses also say Kansas has drilled thousands of wells with little regulation. The 1948 compact did not specify how much water Kansas was to receive, and the trial marks the third time since 1903 that Kansas has asked the courts for more Arkansas River water.

Source: Pueblo Chieftain, 4/5/91; Denver Post 1/6/91, 3/17/91

Missouri River Litigation

In a lawsuit filed February 4th the States of Montana, North Dakota and South Dakota accuse the Army Corps of Engineers of violating the Flood Control Act of 1944 in managing water releases from federal dams and reservoirs on the Missouri River. The lawsuit pits recreation against barges, and the three states against their downstream neighbors, Missouri, Iowa, Nebraska and Kansas.

The suit illustrates the intensifying struggle over the future of one of the last unapportioned waterways in the Midwest and West. Its outcome will affect the economic development of 10 states - and shape legal precedent for a tangled web of Western water management issues. Virtually every water issue of the contemporary West is present in the Missouri Basin, according to Montana's Northern Lights Institute. The issues range from water rights for Indian reservations to water demands for energy projects, and from out-of-basin water transfer to states' rights.

The three states say that even as a prolonged drought depletes the reservoirs for fishermen and boaters, the Corps keeps drawing the water down to serve out-of-state barge traffic. The lawsuit asks the court to order the Corps to give recreation a higher priority, even at the expense of barge traffic.

The Corps of Engineers says it has to base its administrative decisions on the 1944 Pick-Sloan Plan, legislation that jumbled together many competing uses for the river and chiefly focused on flood control and hydroelectric power. The Corps' legal

position is that Pick-Sloan all but ignored recreation, and that if somebody wants to give recreation a higher priority they should get Congress to change the law. What we're trying to do is figure out how to run this system in a drought," says Arvid Thomsen, Chief of Civil Works for the Missouri River Division.

The dispute's wild card is Indian water rights, and recent Supreme Court decisions have held that reservation water rights take precedence. Don Snow of the Northern Lights Institute says the Indians, though few in number, could conceivably control enough water to compel other interests to bid for it like Persian Gulf oil.

Wall Street Journal 4/2/91, Western States Water 2/8/91

"Decisions, essentially political, must be made about what the West is going to be. They will affect the rest of us, not only when we vacation but also when we buy food...Water will increasingly force the West to make, as no other region must, semi-socialist choices. It must choose between government policies that will plan different futures. So henceforth the West's wide open spaces, home to rugged individualists, will ring with political rhetoric. Westerners are condemned to a grand argument about the collective decisions that will allocate the scarce resource on which everything depends."

George F. Will, Washington Post Writer's Group, Rocky Mountain News 3/31/91

ASSESSING THE PUBLIC'S KNOWLEDGE AND PERCEPTIONS OF COLORADO WATER

by John Kaliszewski, State Engineer's Office

Presented at the Colorado Water Engineering and Management Conference
February 28, 1991

Water resources education really is critical to the State of Colorado. I can tell you for a fact that we're years and years behind other states in the Western United States. It's incredible how states like Utah and North Dakota have programs that are 10 or 15 years ahead of ours. I think that we're already starting to see problems with that lack of emphasis on water resources education. An exhibit at last year's State Fair, called Colorado Resources: Liquid Gold, was one of the first attempts to bring together a large cross-section of the Colorado water community to work on an educational effort. There were about

Nearly 30 percent of the individuals who took the survey had the perception, or misperception, that 55 percent or more of the water consumed in the State of Colorado is consumed by the Denver Metropolitan Area.

40 different water entities involved, and believe me, just getting 40 entities in Colorado to work together on anything is difficult. We conducted a survey at the State Fair's Water

Resources Exhibit, and asked about 25 questions to identify what the public knows about water and how it prioritizes water issues. We had about 7,400 ballot responses, so I think it's probably the largest water resources education survey that has ever been carried out in the State of Colorado. We actually surveyed about 10,000 people out of 140,000 people that went through the Water Resources Exhibit, and pared that down to about 7,400 valid responses. Of the 7,400 responses 83 percent were from Colorado and 17 percent were from outside Colorado; in fact, I believe that someone from every state in the union

took this survey except for the State of Hawaii. Basically, the survey represents opinions of Coloradans who live on the Front Range.

Let's look at the question, "What percent of water consumed in Colorado is consumed by the Denver Metropolitan Area?" As you can see, we had answers that ranged from 3 percent to 55 percent. The correct answer is about 3 percent. In fact, it's somewhere between two to three percent of the water consumed in the State of Colorado. Nearly 30 percent of the individuals who took the survey had the perception, or misperception, that 55 percent or more of the water consumed in the State of Colorado is consumed by the Denver Metropolitan Area. Almost 60 percent believe that it's 35 percent or more. Try to relate this to Two Forks, if that high a percentage of the people in the Denver Metropolitan Area believe that 35 percent or more of all the water consumed in the state is consumed by the Denver Metro Area. You might draw the conclusion that they felt Denver was already using far more water than it already needed. That is a typical example of misperception or misinformation.

We look at the next question: "What percent of water consumed in Colorado is consumed by agriculture?" Obviously, this is a flip of the previous question. The correct answer is about 88 percent. Only about 15 percent of the people who took the test got that question correct. The fact that 57 percent of the respondents believe that agriculture consumes 40 percent or less of the water consumed in Colorado indicates that the public is not even sure who the largest consumer of water is in the State of Colorado. This says to the agricultural community, as the public becomes more knowledgeable about who is using the highest percentage of water in the state, that it should be prepared to explain why it's necessary to use those large amounts. I'm obviously not against agriculture using that amount of water, but I think they should be prepared to explain and show why it's essential that agriculture have access to that much water in Colorado.

We cross-referenced all of the questions and answers by age, by where people live and by occupation; it's interesting that basically it made no difference at all. Of the respondents identifying their occupations as farmers, only 21 percent provided the correct answer relative to agricultural water use as compared to the survey-wide answer average of 15 percent. Of those with college degrees, 32 percent believed that the Denver-Metro Area consumes 55 percent or more of the water consumed in Colorado as compared to the survey average of 29 percent. Evidently the more educated you are, the less you know about water. That's really scary.

Another question dealt with the number of years it takes to develop a major water project. The participants did better on that, perhaps because of all the coverage on Two Forks, with the correct answer being 25 to 30 years; 49 percent got that correct. However, 51 percent of the respondents believed that a major water project could be developed in ten years or less.

Respondents were also asked how many dollars water-based recreation provides to the Colorado economy. The answer is about three billion dollars, including skiing. The bottom line is that the majority of the responses were just basically guesses: anywhere from \$480 million to \$3 billion, but the figure of \$3 billion was answered by the fewest number of people -- only 20 percent of the respondents.

Answering a water use question, "How many gallons of water does the average urban household use each year?", 29 percent were correct: 325,000 gallons a year. I actually thought that more people would have the correct answer because of all the information provided by the Denver Water Department and other municipalities in the Denver-Metro Area.

The second part of the survey addressed how respondents would prioritize various issues. First, we dealt with a broad range of issues: having enough water for Colorado's needs; reducing crime; maintaining drinking water quality; improving education; developing Colorado's economy; and providing water for recreation. All of these were ranked very high. Having enough water for Colorado's needs actually ranked the highest. Of course, there is some bias here, in that probably half of these people had just gone through the water exhibit and had water on their minds. The temperature also was about 105 degrees outside.

In a second question, respondents ranked the importance of selected environmental issues including drinking-water quality, hazardous waste, groundwater contamination, air pollution, waste disposal/landfills, and wildlife habitat. Not surprisingly, they ranked all of those high, with water issues basically as high as other environmental issues.

"Where does the public get its information on water?" Sixty-eight percent of the survey respondents said they rely on the news media for information on water. Only 7 percent indicated that their schools were a primary source. Even more interesting, of the respondents under the age of 18, whom you would expect to be in school, only 19 percent listed school as their primary source of information on water. This strongly suggests that schools are not meeting much of the need in the area of water resources education.

Asked if the public is adequately informed on water and water-related issues and has enough knowledge to understand state water issues, 51 percent said no. Twenty-six percent didn't know if they knew enough or not, and that's probably true for a relatively significant portion of the population. They don't know what they need to know about water. Only 23 percent said yes to that particular question. To a follow-up question, "Shall we put water resources education into the school curriculum?", a majority said yes. The 8 percent who voted against that were school-age kids who decided they had enough to study already. Adults in the State of Colorado didn't say we shouldn't incorporate it into the school curriculum.

The questionnaire identified that we have a problem, and now what steps do we begin to take? There are a number of different approaches we can use, including incorporating water resources education into the school curriculum and utilizing newsletters, exhibits, seminars and the media. Incorporating water education into the school curriculum would certainly appear to be the most effective approach. I believe it would address long-term needs and ensure that factual and scientific information is utilized. It would also give us an opportunity to reach those younger students, K through 6, and give them a basic background in the hydrologic system and Colorado's hydrologic resources. Once they are in high school we can begin to approach water issues, which is the real key to having an educated public that can help us resolve water resource problems in the future.

Newsletters. They have their place, especially in keeping people up to date; however, you can't reach everyone with a newsletter. It would be very expensive and time-consuming to put together. Basically, to really have an impact on people you have to be able to deal at their particular level, and that would require writing a number of different newsletters that are digestible by a particular group.

Exhibits. The exhibit that we held at the State Fair had a certain impact; it got people's attention, and we came in contact with about 140,000 people. It was also extremely expensive. The exhibit took about \$400,000 in manpower and capital resources, so it is not something that we will do every year. I do like, however, the idea of developing some type of permanent water exhibit that could be tied to a working water resources center.

Seminars. The Front Range Community College held a series of one-day seminars across the state entitled Colorado Water: The Next Hundred Years, which were fairly well-attended. The problem with any type of conference or seminar is that you generally get individuals who pretty much are already educated and already have an opinion on certain issues.

The Media. This can be very effective, especially when two-thirds of the public says that it relies on the news media for information on water. This is one area where the water community has done a very poor job. It has only been in the last year and a half that our office has tried to develop better contacts with the media. It will take a lot more effort in this particular area. One thing that we are looking at is a set of workshops for the media in all of the seven major drainage basins in Colorado: to find out what they know and what they don't know, and to develop a format for information that the public can digest. Most of us have a tendency to be far too technical for the general public.

The Department of Natural Resources, under its new director Ken Salazar, has put together a water resources education committee. Ken, who worked in the Governor's Office on educational issues before coming over to the DNR, has a very special interest in water resources education. He insists that

the DNR is going to be a flagship agency in this direction. I'm waiting to see just what we really can accomplish in the next year or two. One idea is to bring more summer internships into the DNR, starting with high school students 15 or 16 years of age, and try to get them excited about a career in natural resources.

One of the problems we have in educating the public at any time is what we want to teach them. What are the facts? It's very difficult to get a consensus within the water community of what those water facts are and how to break down issues so that we can make them digestible by the general public. When I was working on the water exhibit, I was continually confronted with "that issue is too technical" or "that issue is too political." I agreed with the technical aspects; we stepped back and adjusted the exhibit to about an eighth-grade level. But it came to the point that I said, "Write down all of the issues that aren't political when it comes to Colorado water." We couldn't come up with any, so we went ahead and decided to approach them all.

What is the real key to a state-wide water resources program? It's getting the water community off dead-center and moving ahead and hoping that somebody within the water community will take a major leadership role. It will also, because of all the broad diversity within the water community, require that we have a state-wide effort. Again, someone needs to step forward and address how we can put together a state-wide effort rather than having all of the various entities do their own thing, addressing their own special interests relative to water resources education.

The overwhelming majority of the Colorado public is either uninformed or misinformed about Colorado water, resulting in serious misperceptions.

The public has demonstrated an inability to comprehend Colorado water issues. Both logic and evidence support the premise that an informed public is an essential component in the future planning and development of Colorado water resources. The Colorado community has to get on the bandwagon and actively support a continuing state-wide water resources education program. Education needs to be a two-way street.

The Colorado water community must also strive to understand what priorities the public has and what value it places on the future development and uses of Colorado water. Someone within the water community needs to stand up and take a leadership role in this particular area. This is going to be a very difficult task, but it's something we need to address right now.

(Transcribed and edited at CWRRI)

The South Platte River Basin: Uses, Values, Research, and Management — Current and Future

November 19-20, 1991

University Park Holiday Inn Fort Collins, Colorado



The settlers crossing the South Platte River, from 'California Crossing' by William Henry Jackson

Rivers, especially those with sections near populated areas, are increasing in value and demand. Their basin resources provide a great variety of uses: both existing and potential. Such is the South Platte.

Managing and planning these uses requires good information on hydrology, water quality, fisheries, and many other aspects of the river system. Last year the first conference on the South Platte brought together some of this information and a diverse group of people concerned about basin resources. Over 110 people attended and 31 presentations were made. Many participants suggested the conference become an annual event.

The 1991 South Platte Research conference will be held November 19-20 at the University Park Holiday Inn in Fort Collins. The 1991 focus is as follows:

- *What is the nature and extent of present and future uses of the river and its tributaries*
- *What research or management information is currently available and what research should be emphasized in the future.*

Topics of interest include crop irrigation, livestock grazing and water supply, domestic water, swimming and water sports, industrial water, fishing, boating, greenways, conservation, water storage, river history, interstate compacts, wildlife habitat, water quality, riparian vegetation, tourism, education, aquatic life, riverside recreation, flood control, and ground-surface water conjunctive use.

Target Participants

Water management organizations, citizen's groups, agricultural interests, outdoor recreationists, conservation organizations, resource consultants, local community government, university students and researchers, and federal resource agencies

Presentations

The conference will consist of presentations (less than 15 minutes), panel discussions, and posters or audiovisuals. Abstracts should provide the river reach, relationship to the South Platte River, and use or subject of discussion. Also it can include the extent and quality of existing information, any limitations to full development of use, direction for the future of the use in the basin, and any proposed plans for the use in the future.

Please submit a one-page abstract of the planned presentation to the organizing committee by July 31, 1991. The preferred format is on disk (Word Perfect or ASCII format), along with one printed copy. Submitted abstracts will be printed in the proceedings. Send materials to:

Craig Woodring
Colorado Water Resources Research Institute
410 University Services Bldg., CSU
Fort Collins, CO 80521
phone: (303) 491-6308
fax: (303) 491-2293

Sponsored by:

Colorado Division of Wildlife
Colorado Water Resources Research Institute
US Fish and Wildlife Service
Northern Colorado Water Conservancy District
Denver Water Department
US Environmental Protection Agency

SHORT COURSES

Design of Water Quality Monitoring--June 10-14, 1991, Colorado State University, Fort Collins, Colorado. Will present detailed procedures for designing a water quality monitoring system. Design procedures apply to the design of any monitoring system, regardless of the location of the water in the hydrologic cycle. The information goals covered include ambient conditions, trends, and excursions beyond a limit. Following a review of basic statistics, the Short Course will address the use of statistics in the analysis of water quality data and the ramifications of such analysis on the design of the entire monitoring system. These ramifications involve sampling frequency, measurement techniques, data reporting formats, data storage and retrieval methods, and sampling locations. Analyzing and redesigning an existing monitoring network will be emphasized citing case studies.

The Short Course is directed to persons actively involved with the design, operation, and/or management of a water quality monitoring network for both surface and subsurface monitoring. The Short Course assumes that attendees will have little or no background in statistics. Each attendee will be furnished with a text which includes the majority of the material presented written by the Course instructors and a copy of our software SQ Stat III. Attendees should bring a calculator as it will be needed during problem sessions.

Activated Sludge Process--June 24-28, 1991, Colorado State University, Fort Collins, Colorado. Will present the methodologies and laboratory techniques to generate process control parameters for operating an activated sludge process. The course will be valuable to any engineer who designs, operates, or manages activated sludge treatment processes.

Hazardous Materials/Waste Manager Training Course--June 18-20, 1991, Marriott Hotel, Fort Collins, Colorado. This course is designed to integrate the HSMW sections of the applicable federal regulations and help minimize liability from HSMW handling. This is one of the most intensive courses you will ever take. It will prepare you to take the Certified Hazardous Materials Manager's Exam which will be given on the last day of the course.

For additional information on these courses please contact: Thomas C. Sanders, Program Leader, Environmental Engineering, Department of Civil Engineering, Colorado State University, Fort Collins, CO 80523, FAX: (303)491-7727, Telephone: (303)491-6222.

CALLS FOR PAPERS

The Availability of Groundwater Resources, Raleigh, NC, April 12-16, 1992. The Symposium will address (1) factors affecting the availability of this resource with respect to water quality and quantity, (2) recent progress in technologies to

evaluate the resource, and (3) the management, regulations, and decision making processes used to protect the resource. New advances and emerging technologies in groundwater resource evaluation will be stressed. Case histories are welcome. **Deadline: July 12, 1991.** For information contact: Dr. Robert C. Borden, Dept. of Civil Engr., No. Carolina State Univ., P.O. Box 7908, Raleigh, NC 27895. (919)737-7665.

1992 National Conference on Irrigation and Drainage Engineering, A Component of Water Forum '92, Baltimore, MD. The paper proposal form is available from CWRRI at 491-6308. **Deadline: August 1, 1991.**

1991 WATER WORKSHOP TO EXAMINE ENVIRONMENTAL LEGISLATION

Planning is underway for the 1991 Colorado Water Workshop at Western State College, scheduled for July 21-23. **From the Dome to the Ditches: Translating Environmental Legislation into Practice** is the title of this summer's program. Workshop Director, Lucy High, is currently organizing discussions focusing on Colorado's non-point pollution control program, instream flows and water quality protection, the Department of Natural Resources' upcoming wetlands report, and conflicts between endangered species protection and water development. The Western State College campus will be inundated with more than three hundred water experts, environmental leaders, government officials and interested citizens as they gather at this summer's conference to debate the impacts of recent legislation on water management and environmental protection in the West.

Congressional staff members, lobbyists and federal administrators will update conference participants on the impending reauthorization of the Clean Water Act, which is the source of wetlands regulations, water quality standards, and non-point pollution control programs. Water engineers, biologists, ranchers and others will discuss their experiences with the application of environmental regulations in the field. The effect of water projects on downstream water quality will also be addressed. In conjunction with the Workshop, the Colorado Water Conservation Board will be meeting on the campus on July 23 and 24.

Western State College will offer one academic credit for the Water Workshop. Eighteen Continuing Legal Education credits will also be available. The registration fee, which includes meals, is \$195. A limited number of scholarships will be available. The Water Workshop schedule of speakers and registration information will be distributed in late May. For more information or to offer suggestions for this year's program, call Lucy High at 641-2238.

15TH ANNUAL FLOODPLAIN MANAGERS CONFERENCE TO BE HELD IN DENVER

Inspiration: Come to the Headwaters--June 10-14, 1991 the Association of State Floodplain Managers (ASFPM) will hold

their 15th annual conference in Denver, the first time it has been held in the central Rocky Mountain Region. Over 400 people from across the nation are expected to attend, according to Conference Director Bill Stanton of the Colorado Water Conservation Board.

The technical part of the conference will officially open on Tuesday morning at a general plenary session followed by concurrent breakout sessions. Over 100 individual presentations are scheduled in four such sessions during the conference by Program Chair Eve Gruntfest of the UCCS. Wednesday opens with six concurrent roundtable breakfasts followed by a general plenary session, then six concurrent breakout sessions and the Awards Luncheon. Wednesday afternoon will feature additional concurrent breakout sessions followed by a general session. Thursday will open with six concurrent breakout breakfasts and a general plenary meeting. Five workshops will follow, and then the technical field trips with box lunches (see below). The traditional BBQ dinner will be held at the Jefferson County Conference and Nature Center on Lookout Mountain. Friday offers three optional after-conference extended excursions and an ASFPM committee chair meeting.

Exhibits--About 35 exhibit spaces are planned for the 1991 conference according to Dan Accurti, Exhibits Chair. Corporations or groups interested in obtaining exhibit space should contact Dan at (717)787-5177. The exhibitor fee is \$625 for ASFPM members and \$725 for nonmembers. The fee includes one 6'x10' booth with table and one free conference registration.

Technical Field Trips--Four technical field trips have been planned for Thursday afternoon by Field Trip Coordinator Bill DeGroot of the Urban Drainage and Flood Control District. Trip 1: a visit to Boulder Creek. Trip 2: a visit to the Corps project in the South Platte River corridor. Trip 3: emphasizes local flood control and stormwater management projects in the Denver area. Trip 4: concentrates on flood warning systems in the Urban Drainage and Flood Control District.

For additional information about the conference, including registration packet, extended excursions and spouse tours, contact Bill Stanton at 866-3441. Registration fee includes a conference notebook, participation in most activities at the hotel, two luncheons, and a copy of the conference proceedings. Registration fees are listed below. Even if you missed the May 1 deadline, the sooner you register the lower the rate.

Class	5/1	5/15	6/1
Non-ASFPM	\$205	\$235	\$265
ASFPM members	190	215	240
CASFPM members	105	125	145
Students	85	85	85

NRLC SCHEDULES WESTERN WATER LAW CONFERENCE

The Natural Resources Law Center will present a three-day conference, **Innovation in Western Water Law and Management**, June 5-7, 1991 at the University Memorial Center in Boulder. The program has been granted 20 CLE credits by the Colorado Board of continuing Legal and Judicial Education. The conference will look at innovation in the following areas--water planning, tribal water rights, conjunctive use of ground and surface water, and public values in water decision making. Speakers with regional and national prominence will come from 15 states and Washington, D.C. to discuss innovations in their states.

Cost of the program is \$550 through May 24 and \$600 thereafter, with discounts available for government, public interest groups, and academics. For more information about the conference call Kathy Taylor, NRLC Coordinator, at 492-1288.

WATER CHAUTAQUA AND HEARING PLANNED

The Center of the American West plans a Water Chautauqua and Hearing for late September 1991. Tentative plans are to reenact significant water events through historical characters and to give attention to contemporary western water issues through a hearing about a proposed project. Mark your calendars for a fascinating time at this unusual water event. You will find more details about this in the July newsletter.

AG WATER CONSERVATION WORKSHOP TO BE HELD IN DENVER

The Environmental and Energy Study Institute (EESI) will sponsor a workshop on **Agricultural Water Conservation for Environmental Benefits** in Denver on May 22-23, 1991. The objective of the workshop is to encourage and facilitate cooperation between and among federal, state, and local agencies; irrigation districts and farming interests in promoting agricultural water conservation for environmental purposes. A resource fair and information exchange will be part of the workshop. Participants are encouraged to bring information on water conservation practices and approaches to disseminate to the group. The workshop will be held at the Hotel Denver Downtown on May 22-23, 1991. Cosponsors of the workshop are the Environmental Protection Agency, the Bureau of Reclamation, the Soil Conservation Service and the Extension Service. Contact: Environmental and Energy Study Institute at (202)628-1400.

CCEM PLANS ENVIRONMENTAL WORKSHOP

The Colorado Center for Environmental Management announces a workshop on **Working Together for a Cleaner Colorado!** The workshop will be held at the Phipps Conference Center, 3400 Belcaro Drive, in Denver on May 22, 1991. The purpose of the workshop is to bring together the

leaders in Colorado's environmental programs to discuss specific problems and the resources available for dealing with them. CCEM, an initiative of Governor Roy Romer, is a multidisciplinary consortium of environmental leaders from government, industry, academic institutions and citizen groups, brought together to address specific hazardous waste and environmental restoration issues. Contact: SPACE, Colorado School of Mines at (303)273-3321.

STEAMBOAT SPRINGS IS SITE OF THIRD INTERMOUNTAIN MEADOW SYMPOSIUM

Colorado State University and the University of Wyoming will present the **Third Intermountain Meadow Symposium** July 1-3, 1991 at the Sheraton Steamboat Resort and Conference Center in Steamboat Springs. The symposium will explore the issues associated with irrigated meadows including agriculture, ranching, agribusiness, wetlands, water quality, wildlife habitat, and aesthetics. Reports will be made by scientists and others from 11 states, Canada and Washington, D.C. The symposium is designed to benefit Extension and Soil Conservation Service personnel, forage producers and utilizers, agricultural researchers, agricultural industry suppliers, and agricultural lenders. It will also be of value to range managers, environmental scientists and water engineers. The meeting features poster presentations and a field tour. For information contact: Gene Siemer, Mountain Meadow Research Center, P.O. Box 598, Gunnison, CO 81230, Phone (303)641-2515; or Dr. Dave Koch, Plant Science Division, University of Wyoming, P.O. Box 3354, Laramie WY 82071, Phone (307)766-3242. Other conference sponsors are Crop Science Society of America, Colorado Chapter of Soil and Water Conservation Society, USDA/CSRS, Foundation for Agronomic Research, COMINCO, and Allied Signals, Inc.

UNDERGRADUATE SCHOLARSHIPS

Office of Environmental Restoration and Waste Management (EMCORE Program), Sponsored by the US Dept of Energy, Office of Environmental Restoration and Waste Disposal. The scholarship is administered by Associated Western Universities, Inc. The purpose of the scholarship is to expand the cadre of scientists and engineers qualified to address the nation's environmental problems by encouraging study and research in the science and technology of environmental restoration and waste management (ER/WM).

Completion of sophomore year; minimum GPA of 3.0 expected; enrollment at a US college or university in one of the ER/WM-related science or engineering disciplines listed below; commitment to a career in ER/WM; US citizenship or for certain laboratories, permanent resident status.

Academic Disciplines in: **Engineering:** Agricultural, Biotechnical, Ceramic, Chemical, Civil, Electrical, Environmental, Industrial, Materials, Mechanical, Metallurgical, Nuclear, Petroleum, Sanitary, or related; **Sciences:** Applied Mathematics, Applied Physics,

Biochemistry, Biology, Cell Biology, Chemistry, Ecology (plant/animal), Environmental Sciences, Epidemiology, Genetics, Geology, Health Physics, Hydrology, Industrial Hygiene, Materials Sciences, Microbiology, Molecular Biology, Physiology (plant/animal), Radiochemistry, Radioecology, Soil Sciences, Toxicology, other related disciplines.

Selection will be based on academic program and performance, recommendations, career plan, and compatibility of applicant's ER/WM interests with those of the host laboratory. Preference will be given to applications from faculty/student teams. The program will be on campus during the academic year. In summer, participation in ER/WM research and development will be at a DOE lab (A list of labs and their locations is provided in the application guidelines.)

The initial duration will be one year, renewable second year for juniors with satisfactory performance; graduating seniors may qualify for graduate support. All EMCORE Scholars must spend ten summer weeks at a DOE laboratory and take part in the Program Review. The Stipend will be \$500/mo (9 months) during academic year and \$1,000/mo (2.5 months) during the summer. Other benefits include tuition and fees of \$2,000/yr; research assistance - \$1,000/yr. Round trip travel to laboratory and Program Review - \$1,000/yr. and a summer housing allowance of \$200/mo; \$380/mo in California.

The application deadline is **June 1, 1991** for Fall Term 1991 start. For additional information and application materials, contact: Associated Western University, Inc., 4190 S. Highland Dr., Suite 211, Salt Lake City, UT 84124, Tel: (801) 278-0799.

POSITIONS AVAILABLE

Secretary-Manager, North Sterling Irrigation District--The District may require in the near future a full-time Secretary-Manager. The person selected will also work for the Pruett Reservoir Company. Duties include general administration of all district business and operational aspects of the water systems. Some construction oversight and management may be required. A construction background would be useful. The person selected should be articulate but firm. He/She will be expected to participate in water policy at the local and state levels. The District seeks a younger, capable person who may or may not be an engineer. It will be desirable for the person to live in the Sterling area so that he or she can be in attendance at the office every day. Contact: Jim Aranci, Route 1, Crook, CO 80726. Phone: 886-2261.

State Extension Agent in Water Resources, University of Nevada, Reno--Provide statewide leadership and coordination to assess needs, establish priorities and clarify issues regarding the quality of Nevada's surface and ground water. Assist Area Specialists located throughout the State in the planning, development and implementation of educational programs to address the identified priority issues. Conduct research that will be of sufficient quality and importance to be published in scientific journals. Coordinate and assist Area faculty in

securing extramural funding at the State and Area levels. A Ph.D is required with academic preparation concentrated in water chemistry. Additional appropriate areas of expertise would include surface and ground water hydrology, aquatic ecology, environmental engineering and/or agriculture engineering. Experience must include educational program development, delivery and evaluation of effectiveness. Application deadline is **May 17, 1991**. Forward letters of introduction, current resume, summary of research interests and abilities, three letters of reference and official transcripts to: Elwood L. Miller (222), Nevada Cooperative Extension, University of Nevada-Reno, Reno, Nevada 89557-0004.

Faculty Position-Utah State University- The Utah Water Research Laboratory and the Dept. of Civil and Environmental Engineering, CEE, at Utah State University invite applications for a tenure track position at Assistant or Associate Professor level. Individual must have a strong background in fluid dynamics in porous media. Responsibilities will include development of research programs in theoretical, experimental and/or computational groundwater and flow in porous media. The individual may teach graduate-level courses in advanced fluid mechanics, finite elements, flow in porous media, contaminant transport, or groundwater hydrology. A Ph.D in Civil Engineering or a closely related field is required. Salary is competitive. Appointment can begin July 1991. Applicants should submit a complete resume with names, and/or letters of recommendation from at least three references to: Chairman, Faculty Search Committee, Utah Water Research Laboratory, Utah State University, Logan, UT 84322-8200.

Openings for Irrigation and Drainage Engineers--Contact: Natural Resources Consulting Engineers, 1250 Addison, Suite 204, Berkeley, CA 94702. Ask for Dr. Mesghinna or Ms. Nemariam.

Summer employment, Bureau of Land Management--The BLM seeks a seasonal hydrologic technician for the summer,

1991. The position is 12 weeks in duration and is located in Lewistown, Montana. Successful applicant may work any 12-week period between June 2 and September 20, 1991. The 12 weeks must be consecutive. The position is grade GS-05 and pays approximately \$8.13 per hour. In addition, the employee will receive \$18 per day food allowance for time spent overnight in the field. Overnight trips will require the employee stay in tents, trailers or motels depending on the location of the duty assignment.

The job description calls for a rugged, outdoors-oriented person willing to forego TV, curling irons and Big Macs. However, he/she will experience the Upper Missouri National Wild and Scenic River with stretches virtually unchanged since the days of Lewis and Clark. To receive an application packet call Montana Job Service at (406)538-8701. To receive consideration for this position your application materials packet must be returned to the Lewistown Job Service Center postmarked no later than May 15, 1991.

Temporary Employment, Biological Technician (Water Quality), National Park Service, GS-0404-05--Position involves working with the Resource Management Specialist and the Biologist to monitor the water quality of streams, springs, and waterpockets within Capitol Reef National Park, Torrey, Utah. Involves collecting water samples, properly preserving them, and analyzing them for various water quality parameters (pH, turbidity, conductivity, dissolved oxygen, organic matter, fecal coliform bacteria, nutrients, etc) using field and laboratory instruments. For more complete information contact CWRRI at 491-6308 or the Departments of Civil Engineering, Agricultural and Chemical Engineering, Earth Resources or Biology at Colorado State University; or Capitol Reef National Park, HC 70, Box 15, Torrey, UT 84775-9602. Phone: 801-425-3791. FAX: 801-425-3794.

MEETINGS

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|-----------|--|
| May 13-16 | 5th National Outdoor Action Conference on Aquifer Restoration, Ground Water Monitoring, and Geophysical Methods , Las Vegas, NV. Contact: NWWA, 6375 Riverside Dr., Dublin, OH 43017. (614)761-1711. |
| May 24 | Total Environmental Management--A Team Approach , Northglenn, CO. Sponsored by the Rocky Mountain Water Pollution Control Association, Inc. Contact: Tim Shangraw at (303)825-8100. |
| May 29-31 | Toxic Waste Management and Environmental Remediation in the 1990s , Vail, CO. Contact: Rocky Mountain Assn. of Environmental Professionals, P.O. Box 46171, Denver, CO 80201. |
| May 29-31 | 5th Biennial Symposium on Artificial Recharge of Groundwater , Tucson, AZ. Contact: Susanna Eden, Water Resources Research Center, University of Arizona, 350 North Campbell, Tucson, AZ 85721. (602)792-9591. |
| June 2-6 | 27th Annual AWRA Conference "Water Management of River Systems" and Symposium "Resource Development of the Lower Mississippi River" - General Chairman: C. Russell Wagner, USGS, Bldg. 2101, Stennis Space Center, MS 39529. (601)688-1580. |

- June 2-6 **Symposium on Water Supply and Water Reuse: 1991 & Beyond**, San Diego, CA. Contact: AWRA, 5410 Grosvenor Lane, Ste 220, Bethesda, MD 20814-2192. (301-493-8600); General Chairman: Steve Pearson, Woodward-Clyde Consultants, 1550 Hotel Circle N, San Diego, CA 92108.
- June 3-6 **WATERMATEX '91, Second International Conference on Systems Analysis in Water Quality Management**, Durham, NH. Contact: New England Center, Univ. of New Hampshire, 15 Strafford Ave., Durham, NH 03824. (603)862-1900.
- June 10-14 **15th Annual Conference, Association of State Floodplain Managers**, Denver, CO. Contact: Bill Stanton, Colorado Water Conservation Board, 721 Centennial Bldg., 1313 Sherman St., Denver, CO 80203. (303)866-3441.
- June 20-23 **The Wilderness Society and American Rivers Conference**, Denver, CO. Contact: The Wilderness Society and American Rivers Conference, 6535 S. Dayton St., Suite 2000, Englewood, CO 80111.
- July 8-11 **BEYOND THIRST -Water for Another 4 Billion Years, 10th Annual Conservation Education Workshop**, Western State College, Gunnison, CO. Contact: CASCE, 3000 Youngfield St., #163, Lakewood, CO 80215. (303) 232-6242.
- July 30-Aug. 2 **UCOWR Annual Meeting, Water Rights East and West: Environmental and Allocation Issues**, Albuquerque, NM. Contact: UCOWR Executive Director's Office, 4543 Faner Hall, Southern Illinois University, Carbondale, IL 62901. Phone: (618)536-7571.

This newsletter was financed in part by the Department of the Interior, U.S. Geological Survey. The contents of this publication do not necessarily reflect the views and policies of the Department of the Interior, nor does mention of trade names or commercial products constitute their endorsement by the United States Government.

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