

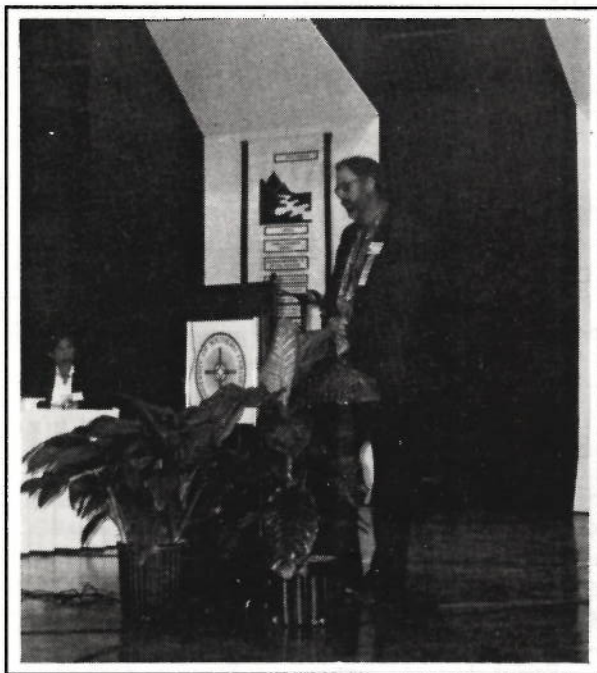
Colorado Water

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

WATER ITEMS AND ISSUES . . .

February 1995

EASIER ACCESS! – Editorial by Robert C. Ward	2
Water Research	3
University Water News	7
Editor's In-Basket	9
Water Publications, Databases	12
Water Supply	13
Water News Digest	14
"A River of Dreams and Realities"	18
Water-Related Seminars and Short Courses	19
Calls for Papers	25
Meetings	26
Calendar	27



Jack Garner, Area Manager, Eastern Colorado Area,
U.S. Bureau of Reclamation at Arkansas River Basin
Water Forum

"A RIVER OF DREAMS AND REALITIES"
The Arkansas River Basin Water Forum
For highlights see page 18

HENRY DARCY LECTURE SERIES PRESENTS

Dr. Paul Hsieh, U.S. Geological Survey
Monday, February 20, 1995 -- 12:00 Noon
Green Center - Petroleum Hall
Colorado School of Mines, Golden CO

**"A Multidisciplinary, Multiscale Investigation of Fluid
Flow and Solute Transport in Fractured Crystalline Rocks:
Findings From the Mirror Lake Site, New Hampshire"**

Sponsored by: The Association of Groundwater Scientists and
Engineers, A Division of the National Ground Water Association.
For information contact Eileen Poeter, 303/273-3829.

EASIER ACCESS!

by Robert C. Ward



For several years now, CWRRRI has been examining ways to provide easier and faster access to its research results. For the past 30 years, the general method for making CWRRRI's research results available was to publish research results, proceedings of meetings and other miscellaneous information in one of four publication series (Completion Reports, Information Series, Technical Reports, and general).

These reports were then distributed to libraries around Colorado and made available for purchase by any interested person through the Cooperative Extension Resource Center at Colorado State University (formerly the Bulletin Room).

With the advent of the information super highway and increasing capabilities of the Internet to store and allow access to large volumes of information, such as water research publications, CWRRRI is watching developments closely. The thought has always been to switch from paper publication to electronic publication as soon as we could be assured that everyone could gain access.

With the 20 percent federal budget cut that CWRRRI must absorb in FY1995, we are moving into a more streamlined publication policy perhaps a little faster than we would like. The means to publish CWRRRI's water research results electronically, in such a way that they are readily available in libraries across Colorado, is not available yet. However, the budget cut is forcing us to move in that direction. Beginning in 1995, CWRRRI will no longer publish paper copies of all its reports to be available for purchase through the Cooperative Extension Resource Center. We will be much more selective in deciding which reports to publish in the regular Completion Report series and which to put into a new category - Open File Reports.

Open File Reports will be those that are large (and expensive to publish) or which are of interest to a limited number of Colorado water users and managers. Open File Reports will be numbered and will be available in CWRRRI files. Copies, either on computer disk or on paper, will be available through CWRRRI. We will charge what the duplication costs us.

To ensure that reports are available around the state, we will continue to publish enough copies of the Open File Reports to place one in each Colorado library that receives copies from the State Publications Depository. The reports will be labeled as Open File, however, implying that they are not generally published but are on file at CWRRRI and will be duplicated for those interested. Eventually, we hope to cease even the publication for libraries as soon as we can provide them electronically. The estimated time for this ability is two years.

How will the decision be made to publish research results as a regular Completion Report or as an Open File Report? It will be a subjective decision made at CWRRRI based on the interest of Colorado water users and managers in the topic. A report that addresses a "hot topic" or that provides a major new insight into an ongoing water management problem will be published as a Completion Report. A report that addresses a water problem of interest to a limited number of water users/managers or a report that is extremely large will be published as an Open File Report.

To further enhance ready access to water research results that are of interest to large numbers of Colorado water users and managers, CWRRRI has created a new publication series entitled "Water in the Balance". The goal is to describe the results of water research in ways that relate more directly to the water user, manager or citizen. This more popular presentation of CWRRRI water research results will begin to appear over the next year.

I hope this new CWRRRI publication policy will result in the same, or even better, access to water research results and will do

COLORADO WATER

Vol.12, No. 1

Date: Feb. 1995

Editor:

Shirley Miller

Writers:

Cindy Brady, Julie Eyre, Jill Marsh, Kathleen Klein, David Williams

COLORADO WATER is a publication of the Colorado Water Resources Research Institute. The scope of the newsletter is devoted to enhancing communication between Colorado water users and managers and faculty at the research universities in the state.

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

Published by the Colorado Water Resources Research Institute, Colorado State University, Fort Collins, CO 80523. Phone: (303) 491-6308

Robert C. Ward, Director

it at less cost. The goal is to make maximum use of electronic publishing capabilities while at the same time getting the research results into the hands of those Colorado water users/managers who can benefit by the findings.

As we move into this new mode of distributing our research results, please let us know of any problems you encounter (and any improvements you note -- both views are necessary to ensure the new arrangements are working).

CSU BULLETIN ROOM CHANGES NAME AND LOCATION

The Colorado State University Bulletin Room, a distribution center for Cooperative Extension information, Agricultural Experiment Station information, and CWRI reports for many years, has a new name and location. It is now known as

The Cooperative Extension Resource Center

and is located at the

General Services Center
Colorado State University
Fort Collins, CO 80523
Phone: 303/491-6198
FAX: 303/491-2961

Manager: Gail McKee

For additional information about the Center or for a catalog contact Gail McKee at the number above.

WATER RESEARCH

DEVELOPING A BIOTIC INDEX FOR COLORADO STREAM QUALITY

by
Scott A. Grotheer

On July 30, 1994, the front page headline of the Fort Collins Coloradoan read, "Water Compromise Reached." The article announced that the Forest Service had struck a compromise with water owners in the Cache la Poudre River basin. The compromise was to increase the water available to inhabitants of the Cache la Poudre River from near the top of Cameron Pass to the mouth of the canyon. This compromise should improve the aquatic habitat in the canyon during the winter months when the flow has traditionally been quite low and has adversely impacted the stream community. The fact that environmental conditions have an impact on organisms has been known for quite some time; however, awareness of the information that

those organisms can provide to investigators on environmental conditions is still in its infancy.

For more than 20 years Kodak Colorado Division and Colorado State University have sponsored a project that monitors both the water quality and the population dynamics of the aquatic organisms in the Cache la Poudre River. Data collection continues at ten sites along the river; site 1 is near Martinez Park in Fort Collins, Colorado, and Site 10 is located just upstream from Weld Count Road 31 near Greeley, Colorado. The study reach is about 50 kilometers long and spans an elevation of 85 meters.

Drs. N. J. Voelz and J. V. Ward compiled an unpublished report for Kodak Colorado Division and the City of Fort Collins that outlined population dynamics for the organisms within the river. They examined population dynamics both on a longitudinal scale (from site 1 to site 10) and on a temporal scale (from 1970 to 1991). Identification of organisms was typically to the generic level. Total abundance, taxonomic abundance, evenness, diversity, and detrended correspondence analysis (DCA) were among the measures that they examined in their report. The majority of the significant changes that they found occurred between site 1 and site 2. Most taxa were considered rare and many of the common taxa preferred waters of high oxygen content, low to moderate nutrient concentrations, and low to moderate organic enrichment.

RBD Engineering also compiled an unpublished report for Kodak Colorado Division that analyzed trends and areas of concern in the physicochemical conditions within the study reach. The report highlighted all significant trends in the physicochemical parameters and highlighted parameters considered as "areas of concern." RBD Engineering highlighted dissolved oxygen, unionized ammonia nitrogen, and dissolved lead as areas of concern. Dissolved oxygen is essential to the survival of stream organisms and fell below 5 mg/l (the minimum standard) twice at site 4. Unionized ammonia-nitrogen typically has its source in treated wastewater effluents, so elevations in this parameter could possibly be corrected and definitely need to be monitored. The elevated dissolved lead values were believed to have their source in a leaded gasoline spill that occurred near site 1.

Until recently, with the proposal for the development of a biotic index for the Cache la Poudre River basin, these two data sets were analyzed only in isolation from one another. Biotic indexes strive to extract information about environmental conditions indirectly, using the population dynamics of the organisms rather than directly measuring the characteristics of the environment. They rely on correlations between population dynamics of organisms within the reach and the physicochemical conditions present at the time of collection. Large, long-term data sets need to be used in determining the environmental requirements or tolerances of the organisms. The long-term database collected from the Cache la Poudre River provided an excellent opportunity for the development of such an index.

Rather than using the database to determine the tolerances of organisms to a general level of organic pollution, it was decided to use the organism to determine trends in the actual chemical parameters themselves. This was accomplished by using a commonly accepted principle that organisms will be found in greatest abundance along an environmental gradient at their preferred value for existence. Their abundance will decrease as the level of the parameter(s) within the gradient(s) either begin to increase beyond acceptable limits or begin to decrease beyond minimum requirements. These "preferred values" were calculated for the organisms collected within the reach using the chemical data that were collected from 1981 to 1991. The preferred values were then used to determine the chemical conditions of the reach as defined by the previously determined preferred values for each of the organisms found within the reach.

Downstream and longitudinal trends in the actual chemical condition of the plains segment of the Cache la Poudre River initially appear to correspond quite well to the conditions defined by the preferred values for the organisms within the reach. It is important to realize however, that only the presence of organisms can provide information to the investigator; if an organism is absent from a sample, the investigator should not assume that the site is polluted. A biotic index of this nature will not provide the investigator with exact values for the physicochemical parameters. It can only provide an indication of what the organisms are "telling him" about the condition of the reach. Although biotic indexes can provide ecologists and resource managers with much valuable information about the state of the systems being investigated, in their current state they should be used with caution and supplemented with more traditional direct assessment approaches.

This article is a summary of CWRRI Completion Report No. 187, **Developing a Biotic Index for Colorado Stream Quality**, by Scott A. Grotheer, J.M. Chudd, Sen-Her Shieh, N.J. Voelz and J.V. Ward. The report is available from the CE Resource Center, General Services Building, Colorado State University, Fort Collins, CO 80523 (see **PUBLICATIONS**, page 12).

WATER SUPPLY UPDATE -- Feb. 3, 1995. Front Range water officials are concerned because snowpack in the South Platte River Basin stands at just 55 percent of average. Statewide, snowpack is 89 percent of average, topped by the Rio Grande Basin in southcentral Colorado with 114 percent of average. In southwest Colorado, snowpack in the San Juan, Dolores and Animas basins was 111 percent of average. The Gunnison River basin was 105 percent. Snowpack in other major Colorado river basins: North Platte, 75 percent of average. Arkansas, 80 percent of average, and White, 88 percent of average. (Source: *The Coloradoan*, 2/3/95).

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

- Assessment of Erosion & Sedimentation in the Rio Puerco Watershed, New Mexico, Robert G. Woodmansee, Rangeland Ecosystem Science.**
Sponsor: U.S. Geological Survey (USGS).
- Defining & Delineating Ecoregional Patterns in Alaska, Roger M. Hoffer, Forest Sciences.** Sponsor: USGS.
- *Ecological Effects Of Reservoir Operations on Blue Mesa Reservoir, Brett M. Johnson, Fishery & Wildlife Biology.** Sponsor: Bureau of Reclamation (USBR).
- Application of Century Model to Evaluate the Ecological Effects of Climate Change, William J Parton and Dennis Ojima, Natural Resources Ecology Lab.** Sponsor: USDA/U.S. Forest Service.
- Integrative Riparian Ecosystem Modeling Along the Yampa River, Colorado, Ellen E. Wohl, Earth Resources.** Sponsor: Mellon Foundation.
- *Effects of Gradation & Cohesion on Scour, Albert Molinas, Civil Engineering.** Sponsor: Federal Highway Administration.
- *Water and Climate, David A. Randall, Atmospheric Science.** Sponsor: NASA-Goddard.
- Removal of Biological Particles by Rapid Filtration, David W. Hendricks, Civil Engineering.** Sponsor: American Water Works Assn.
- *Evaluation of Water Rights Planning Models, Neil S. Grigg, Civil Engineering.** Sponsor: Riverside Technology, Inc.
- *Toxicological Evaluation of Flood Plain "Slickens" Along the Clark Fork River, A. William Alldredge, Fishery & Wildlife Biology.**
Sponsor: National Park Service (NPS).
- *Describe Snowfall Characteristics & Observational Techniques, Thomas B. McKee, Atmospheric Science.** Sponsor: USBR.
- *The Impact of Wildlife Related Recreation on the Alaskan Economy, Edward W. Sparling, Agricultural & Resource Economics.** Sponsor: USDA/U.S. Forest Service, Rocky Mtn. Experiment Station.
- Ecological Monitoring in Lake Mead National Recreation Area, Charles D. Bonham, Rangeland Ecosystem Science.** Sponsor: NPS.
- Middle East Water: Efficiency & Use in the Agricultural Sector, Evan C. Vlachos, Civil Engineering.** Sponsor: Office of Resources, Trade & Technology.
- Field to Farm to Ecosystem Scale Decision Support Models, Jose D. Salas, Civil Engineering.** Sponsor: USDA-Agricultural Research Service.
- *The Creation of Wetlands at the Rocky Mountain Arsenal: Monitoring the Patterns..., David J. Copper, Cooperative Fish & Wildlife Research.** Sponsor: Fish & Wildlife Service.
- Transient Responses of Grasslands & Forests to Climate Change, William K. Lauenroth, Natural Resource Ecology Lab.** Sponsor: Electric Power Research Institute.
- Geomorphology of the Little Snake River, Ellen E. Wohl, Fishery & Wildlife Biology.** Sponsor: NPS.
- Development of a Watershed-Based Methodology for Screening-Level Assessment of Nonpoint Source Pollution from Inactive and Abandoned Hardrock Mines, Jim C. Loftis, Agricultural & Chemical Engineering.** Sponsor: Environmental Protection Agency (EPA).
- Analysis of Water Resource Issues in Yosemite National Park, Lee H. MacDonald, Earth Resources.** Sponsor: NPS.
- Flood Hazards Associated with Glacier - Lakes in the Eastern Himalaya Mountains, Ellen E. Wohl, Earth Resources.** Sponsor: Engineering Grant.
- *Studies of the Influences of Land Use & Watershed Processes on Erosion & Stream Sediment..., Lee H. MacDonald, Earth Resources.**
Sponsor: NPS.
- *Quantification of Federal Reserved Water Rights for National Park Purposes, Thomas G. Sanders, Civil Engineering.** Sponsor: NPS.
- *Establishment of Baseline Water Quality Conditions in the National Park Service, John D. Stednick, Earth Resources.** Sponsor: NPS.
- *Distribution & Dynamics of Radionuclides in Ecosystems of the Savannah River Site, Floyd W. Whicker, Radiological Health Sciences.**
Sponsor: University of Georgia.
- Mitigation in Agriculture: IRCC Assessment, Edward T. Elliott, Natural Resources Ecology Lab.** Sponsor: Soil Conservation Service.
- *Continued Investigation of the Influence of Landscape on Weather and Climate, Roger A. Pielke, Atmospheric Science.** Sponsor: NSF.
- *Spatial Trends in Surface Water Quality, Noatak National Preserve, Daniel E. Binkley, Forest Sciences.** Sponsor: USFS/
- *Population Modeling, Gary C. White, Fishery & Wildlife Biology.** Sponsor: Colo. Div. of Wildlife (CDOW).
- Community-level Tolerance to Heavy Metals, William H. Clements, Fishery & Wildlife Biology.** Sponsor: CDOW.
- Rocky Flats Plant Ecological Monitoring Program, Edward T. Elliott, Natural Resource Ecology Lab.** Sponsor: EG&G Rocky Flats, Inc.
- Impact Assessment Schemes for Studies of Regional Climate Change, Jorge A. Ramirez, Civil Engr.** Sponsor: Tulane University.
- Population Genetics of Fish in Colorado, Robert P. Ellis, Microbiology.** Sponsor: CDOW.
- Larval Colorado Squawfish Investigation, Colorado and Gunnison Rivers, Robert T. Muth, Fishery & Wildlife Biology.** Sponsor: CDOW.
- Ecology and Status of Rio Grande Sucker in Colorado, Brett M. Johnson, Fishery & Wildlife Biology.** Sponsor: CDOW.
- *Instream Flow Rights and Needs in the Western U.S., Lee H. MacDonald, Earth Resources.** Sponsor: USDA/USFS-Rocky Mtn. Exp. Sta.
- *Ecological Effects of Reservoir Operations on Blue Mesa Reservoir, Brett M. Johnson, Fishery & Wildlife Biology.** Sponsor: USBR.
- *Hydrological Forecasting System Evaluation, Lynn Johnson, CIRA Admin. Unit.** Sponsor: National Oceanic and Atmospheric Administration.
- Status and Trends of the Rockies, Thomas Stohlgren, Natural Resources Ecology Lab.** Sponsor: National Biological Survey.

University of Colorado, Boulder, CO 80309

- ***Bridge Management Systems**, George Hearn, Civil, Environmental & Architectural Engineering. Sponsor: State of Colorado.
- Biodenitrification in Sequencing Batch Reactors**, Joann Silverstein, Civil, Environmental & Architectural Engineering. Sponsor: Los Alamos National Laboratory.
- ***Effects of Climate Change in the Colorado Alpine: Ecosystem Response to Altered Snowpack & Rainfall Regimes**, Timothy Seastedt, Institute of Arctic and Alpine Research Environmental, Population & Organismic Biology. Sponsor: NSF.
- Automatic Construction of Accurate Models of Physical Systems**, Elizabeth Bradley, Computer Science. Sponsor: NSF.
- Nutrient Modelling of South Platte River**, William Lewis, Environmental, Population and Organismic Biology. Sponsor: USGS.
- ***Development and Experimental Verification of Theories for Up-Scaling of Water Flow & Solute Transport in Saturated Porous Media**, Tissa Illangasekare, Civil, Environmental & Architectural Engineering. Sponsor: Dept. of the Army.
- Hydrology, Hydrochemical Modeling and Remote Sensing of Seasonally Snowcovered Areas**, Mark Williams, Institute of Arctic and Alpine Research. Sponsor: University of California at Santa Barbara.
- ***Conceptual Planning For Integrated Analysis (Integral) of Water Resource Systems and Power Operations**, David Sieh, Civil Environmental & Architectural Engineering. Sponsor: Tennessee Valley Authority.
- ***Nitrogen Dynamics: Interactions Between Snowmelt and Runoff**, Mark Williams, Institute of Arctic and Alpine Research. Sponsor: NPS.
- Generating an Assessment of Nesting Success of Neotropical Birds on the South Fork, Snake River, Idaho**, Carl Bock, Environmental, Population & Organismic Biology. Sponsor: Bureau of Land Management.
- Study Stream & Riparian Restoration by Beaver**, Carol Wessman, Cooperative Institute for Research in Environmental Sciences. Sponsor: USDA/U.S. Forest Service.
- Quantifying the Spatial Statics of Snow Meltwater Flow Using Lysimeter**, Mark Williams, Institute of Arctic and Alpine Research. Sponsor: USDA/U.S. Forest Service.
- Potential Impacts of Global Climate Change on Western River Basins**, Carol Marra, Civil Engineering. Sponsor: USBR.
- ***Conceptual Planning for Integrated Analyses (Integral) of Water Resource Systems and Power Operations**, Edith Zagona, Civil Engineering (CADSWES). Sponsor: Tennessee Valley Authority.

Colorado School of Mines, Golden, CO 80401

- Biochemistry and Optimization of a Wet Substrate Passive Mine Drainage Treatment System for Circum-neutral Water of the Mary Murphy Mine at Chalk Creek, Colorado**, Ronald R. Cohen and Ronald W. Klusman, Environmental Science/Chemistry. Sponsor: EPA.
- A Detailed Examination of the Chemical, Hydrologic, and Geologic Properties Influencing the Mobility of ²²²Rn and Parent Radionuclides in Ground Water**, Eileen Poeter and Bruce Honeyman, Geology/ Environmental Science. Sponsor: Department of Energy.
- Review Geological and Geotechnical Data Relative to Rockmill Excavation for Safety of Dams -- Modification of Twin Buttes Dam**, Russell J. Miller, Excavation Engineering & Earth Mechanics Institute, Sponsor: Bureau of Reclamation.
- A Study Determining Water Infiltration Routes From Structures Located Above Carlsbad Cavern, Carlsbad Caverns National Park, New Mexico**, Kenneth E. Kolm, Paul van der Heijde and Helen Dawson, Geology /Environmental Science / International Ground Water Modeling Center. Sponsor: U.S. National Park Service
- Characterization of Iron Transport Between An Alluvial Aquifer and a Natural Wetland Impacted by Acid Mine Drainage, Tennessee Park, Leadville, Colorado**, Wendy J. Harrison and Donald Macalady, Geology/ Chemistry. Sponsor: Colorado State University (USGS).
- Study of Mechanisms of Methane Movement in Ground Water in the Los Pinos River Area North of Bayfield, Colorado**, Paul van der Heijde, International Ground Water Modeling Center. Sponsor: AMOCO.
- Geostatistical Evaluation of Geological and Hydrological Conditions for Site Assessment and Remediation**, Eileen Poeter and Kadri Dagdelen, Excavation Engineering/Earth Mechanics Institute/Geology/Mining. Sponsor: Sandia National Laboratories (DOE).
- Subsurface Conceptualization for Assessment of Affects of Heterogeneity on Natural and Remedial Processes**, Eileen Poeter, Institute for Resource and Environmental Geoscience/Geology. Sponsor: U.S. Army.
- ***Modeling for Design and Testing of Treatment and Remediation Technologies for Aquifers Contaminated with Organic Wastes**, Tissa Illangasekare, Civil Engineering. Sponsor: Kansas State University.
- ***Arsenic Occurrence in Drinking Water Sources, National Cost of Compliance, and Analysis of Arsenic Removal in Drinking Water Sources**, Marc Edwards, Civil Engineering. Sponsor: American Water Works Association.

*Supplement to existing award.

UNIVERSITY WATER NEWS

FALL SEMESTER PROGRESS REPORT: CCHE WATER RESOURCES PROGRAM OF EXCELLENCE SCHOLARSHIP PROGRAM

The fall semester undergraduate scholarship program of the Colorado Commission on Higher Education's (CCHE) Water Resources Program of Excellence was recently completed by the 12 engineering undergraduate scholarship recipients. The students participated in three seminars throughout the semester and wrote a paper on a water resources topic. The first seminar introduced the students to current water resources issues, while the second seminar featured the *Denver Metro Water Game*, a computerized gaming simulation of the Denver metro area water supply developed by the University of Colorado at Denver. The students selected an on-campus seminar of their choice as their third seminar.

As in previous years, the students submitted outstanding papers on a wide variety of water resources topics. Senior **Stephanie Brock**, an Environmental Engineering major, wrote about the effects of industrial pollution on the water quality environment through oxygen depletion, eutrophication and human health issues.

Agricultural Engineering senior **Kevin Filkkema** wrote an interesting paper about current issues surrounding Noranda Minerals, Inc.'s proposal to start a gold mine on Henderson Mountain at the northwest corner of Yellowstone National Park, Montana. Kevin pointed out similarities between water issues surrounding the Noranda mine proposal and the Summitville Mine in Colorado, in which poor installation of the mine's leach pad led to the contamination of the Alamosa River and reclamation costs of up to \$100 million.

Kyle Hamilton, a senior Civil Engineering major, researched issues regarding the controversial Two Forks Dam project. Kyle concluded that while "the Two Forks project would supply Denver and the surrounding communities with enough water until the early to mid 2000's," there would still be water supply issues beyond that time. The project failed because people are learning that "there is a finite amount of water produced on this planet per year. We must not take water for granted and [we must] learn how to stretch our current supplies so that they are sufficient."

Junior **Suzanne Hyde**, a Chemical Engineering major, chronicled the history of the City of Thornton's controversial purchase of northern Colorado water rights for its Northern Project. While recent decisions by the state water court have enabled Thornton to proceed with the construction of facilities to deliver water allocated by the water rights purchase, Suzanne explained that other issues concerning a reduction by 10,000 acre-feet of Thornton's allocated water and operational limitations still remain to be resolved.

Another Chemical Engineering major, junior **Becky Karst**, discussed drinking water quality issues regarding parameters such as lead, nitrates, radon, arsenic and trichloroethylene (TCE). Becky concluded her paper with a sobering observation: "As if the amount of water available is not enough for people to be concerned about, now they must think about the quality of the drinking water they have, and I am not sure which thought is worse: not having enough water to drink, or having to drink water that is extremely dangerous and quite possibly lethal."

Civil Engineering sophomore **Benjamin Madrill** summarized the Roan Creek Project in Garfield County, Colorado. This project will address many different water resources issues, including recreation, fish and wildlife enhancement, interstate leasing of water to Nevada, and oil shale development in Colorado. Benjamin discussed opposition to the Roan Creek Project by people comparing it to another water transfer proposal called the Galloway Proposal, pointing out that the two projects should be judged independently because there are many fundamental differences between them.

Timothy Martinez, another Civil Engineering sophomore, discussed aspects of California's water supply. After highlighting a number of ecological problems related to the water supply, Timothy focussed on an innovative solution that has been proposed involving shifting icebergs.

Senior **Thom Rutledge**, a Civil Engineering major, wrote a comprehensive paper on the Colorado-Big Thompson Project. He included a history of the region and the project and a summary of project components and uses. Thom also discussed transmountain diversions, benefit and cost analyses of the project, and environmental concerns, noting that "as we learn more about the world around us, we also learn that we cannot neglect our effect on it."

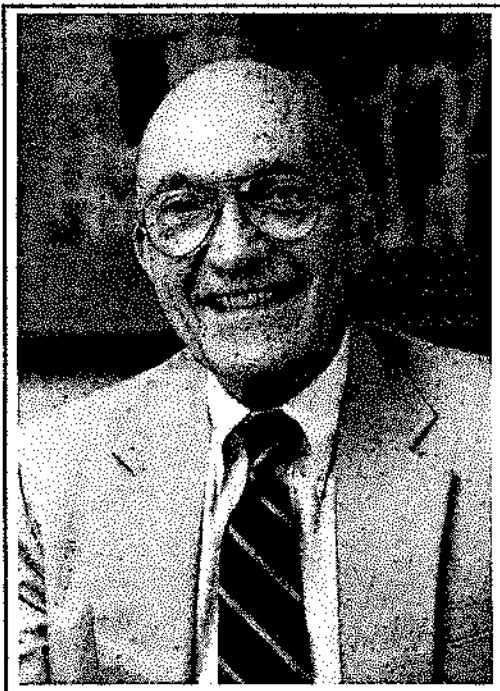
Carlos Sanchez, also a senior Civil Engineering major, discussed the lesser-known issue of water spreading and how it is being addressed by the U.S. Bureau of Reclamation (USBR). To the USBR, water spreading involves "the application of USBR project water to ineligible lands or purposes," and Carlos stated that "approximately 132,000 to 154,000 acres received water illegally from...projects [in eight western states] as a result of water spreading practices...[and] from 1984 to 1992, 370,000 to 429,000 acre-feet of water was applied to this acreage." Carlos discussed implications of increased consumptive use of project water due to water spreading, views of environmentalists and irrigators on the issue, and the USBR's enforcement

efforts. He concluded his paper by noting several interesting issues which need to be addressed to resolve the problem of water spreading, including how "saved" water should be reallocated, administered and regulated, if the water can be reallocated for instream flows, and if farmers will be required to give up their water rights on conserved water and be compensated for those rights.

Civil Engineering senior Yusuf Siddiqui wrote an excellent paper documenting the plight of the Aral Sea in Central Asia. Yusuf included a history of the semi-arid region, describing the calculated development of irrigated agriculture that has resulted in a 70 percent reduction of the volume of the Aral Sea and corresponding ecological, climatic and health concerns. Yusuf noted that restoration of the sea relies upon the coordinated effort of Central Asian governments, which may not be possible. In this event, he said, the Aral Sea may "impose its own ecological] solution."

Junior Juancarlos Simbana, an Engineering Science major, discussed methods of desalinization of sea water, including distillation, reverse osmosis, electrodialysis, ion exchange and freeze distillation. Juancarlos observed that the costs of these procedures are currently very high, "but with time and research we may be able to tap into that vast resource, the ocean. In the meantime, we should look more closely at our water use habits...in light of the fact that we use three times as much water a day as the Europeans, and that over 1000 million people around the world are without a safe water supply."

The American Water Development, Inc. (AWDI) attempts to sell groundwater from the San Luis Valley to urban areas of Colorado was the topic of junior Chemical Engineering major Jennifer Tonso's paper entitled *A Fight Over Water Hits Too Close to Home*. Jennifer documented the series of events that have occurred over this issue and how it has affected her family and other residents of the San Luis Valley.



Charles W. Howe

CHARLES W. HOWE RECEIVES AWRA AWARD FOR ACHIEVEMENTS IN WATER RESOURCES

Dr. Charles W. Howe has received the 1994 Icko Iben award from the American Water Resources Association for his outstanding contributions to the promotion of communications among the various disciplines of water resources. Howe's accomplishments in water resources include teaching, academic administration, research, and international work. He authored a major text book on natural resources economics and coauthored seven others, as well as numerous articles, book chapters, reports and editorials in the field of water resources.

With a B.S. and M.S. from Stanford University and a Ph.D in Economics from Rice, Howe began his teaching career in 1956 at Stanford University, later moving on to become Associate Professor of Economics at Purdue University. In 1965 he was named Director of the Water Resources program at Resources for the Future, where he applied his experience in water resource planning and policy in other countries, ranging from the poorest developing countries to the richest industrialized ones.

In 1970 Howe went to the University of Colorado where he has been since. He served as Chairman of the Economics Department for five years, and in 1986 became Director of the Environment and Behavior Program, Institute of Behavioral Science, where he combines administrative duties with a strong program of research and teaching. He also has taken an active role with the Natural Hazard Research Center at the University of Colorado.

Howe served as editor (for economic and policy sciences) of the journal *Water Resources Research* for seven years, and since 1980 as general editor of Westview Press's Monograph series on *Water Policy and Management*. He served on the National Panel for the Evaluation of the 54 State Water Resources Research Institute Programs in 1993-94. His research interests include the areas of water marketing, area-of-origin issues related to interbasin water transfers, and water banking. He has also served as a consultant to New Mexico's State Engineer and the Attorney General of Texas.

An associate wrote of Howe, "Chuck is one of those special human beings who makes friends wherever he goes. He is truly an ambassador of good will for the general academic community and within the water resources community...As a scholar, a teacher, and a human being, Chuck is truly outstanding."

AWRA created the Icko Iben Award in 1971 in honor of the late Icko Iben, one of the organization's co-founders. The award was presented at the annual award ceremony during AWRA's 30th Annual Conference in November.

EDITOR'S IN-BASKET

EPA ANNOUNCES WATER AGENDA

The Environmental Protection Agency (EPA) water program will increase its focus on implementation of existing initiatives in 1995 -- including a shift to ecosystem approaches to pollution problems. Robert Perciasepe, EPA Assistant Administrator for Water, has outlined national water program goals and identified reforms to the drinking water regulatory program and the control of-polluted wet weather runoff as top 1995 priorities.

Perciasepe defined several steps his office will take to increase its focus on specific areas:

- development of a multi-year plan to deploy 10 percent of water program staff in the field and/or states to do "place-based" work;
- Creation of new memoranda of understanding with other federal agencies involved in watershed protection;
- development of two proposals in each EPA regional office to use geographic areas as a basis for achieving regulatory flexibilities;
- a 10 to 20 percent increase in the number of watershed protection projects in each state; and
- targeting some grant programs for possible reform to promote ecosystem protection.

Perciasepe has called for the reform of programs administered under the Safe Drinking Water Act and indicated that EPA would produce a report by the end of January on the condition of drinking water in the United States. According to Perciasepe, increased emphasis will be placed on source water protection as a means of preventing contamination.

Source: Eddie G. Gouge, NASULGC, e-mail 1/23/95

In Colorado -- EPA Region VIII, Denver, has announced it will move toward a new organizational structure based primarily upon strategic themes, priorities and functions. The reorganization includes divisions for:

- pollution prevention and state and tribal programs;
- ecosystem management and remediation;
- enforcement, compliance assurance and environmental justice that will include all enforcement attorneys;
- technical services and management;
- external affairs; and
- legal counsel.

Region VIII will also retain the Montana operations office. The EPA Design Team hopes to have the final organization structure detailed by March 31, 1995.

Source: *Waste Watchers*, Nov. 1994

EPA Approves Colorado Wellhead Protection Plan -- In an early October letter to Governor Romer, EPA formally approved Colorado's Wellhead Protection Program. Kathleen Reilly, Colorado Department of Health, says public education will begin in earnest this winter through the joint efforts of the state Water Quality Control Division and the Colorado Groundwater Association. Reilly says the state continues to offer incentives to public groundwater systems willing to commit to developing a wellhead protection plan. For more information contact Kathleen Reilly, Administrator, Wellhead Protection, Colorado Department of Health at 303/692-3573.

Source: *Colorado Rural Water*, 3rd Ed., 1994

WEATHER SERVICE MODERNIZES

In response to the Weather Service Modernization Act (P.L. 102-567), the National Weather Service (NWS) has announced the reorganization of the National Meteorological Center (NMC). The modernized structure provides for specialized centers around the country that will transmit digital information generated from numerical models and other tools to NWS Weather Forecast Offices, where local forecasters can use them to prepare specialized products. The old NMC's functions will be absorbed by the National Centers for Environmental Prediction (NCEP), six science-based, service-oriented centers and two support offices.

Hydrometeorological Prediction Center, Washington, D.C. area, will prepare guidance for quantitative

precipitation forecasts based on digital data from mesoscale and global models and other sources.

Storm Prediction Center, Norman Oklahoma, will study short-term hazardous mesoscale weather such as severe convective storms, heavy rain, flash flooding, and ice and snow storms.

Aviation Weather Center, Kansas City, Missouri, will analyze and forecast potential weather hazards for domestic aviation.

Tropical Prediction Center/National Hurricane Center, Miami, Florida.

Marine Prediction Center, Monterey, California. Will be administered jointly by NWS and the National Ocean Service, and be responsible for forecasts of hazardous weather, winds and waves for waters within 100 miles of the U.S. Coast.

Climate Prediction Center, Washington, D.C. Will predict climate variations from a few weeks to several seasons in advance.

All the research and development needed for NCEP's ocean-land-atmosphere modeling will be concentrated at the **Environmental Modeling Center** near Washington, D.C. NCEP operations, including the central computing facility and related administrative support, will also be located at that site.

Source: *Natural Hazards Observer*, Nov. 1994

COLORADO WATER EDUCATION FOUNDATION REORGANIZES

by David Williams

The mission of the Colorado Water Education Foundation (CWEF) is to educate the Colorado citizens, from a non-advocacy position, of the importance of water to the state. The foundation has recently received financial support in the form of a grant from El Pomar Foundation, which trains people to operate non-profit organizations. The grant will fund an executive director, Tyler Stevens, for two years. Tyler has finances and support, and now he plans to work on organization.

The executive board of CWEF was historically comprised of 33 members, representing different water interests and geographic locations. The board is being scaled down, however, to between 13 and 15 members, who will focus on raising funds to help operate the foundation. An advisory board, which will represent different geographic locations, is also being formed. Its purpose

will be to make sure information CWEF disseminates is objective and accurate, helping to minimize misconceptions about water and promote good decisions.

The first project of the newly organized foundation is funded by a grant from the Colorado Historical Society. CWEF will compile a history of water in Colorado, producing a frameable map of water quality in historical sites. *Colorado Water Maps* are also available from CWEF. Several school districts buy the maps for their classrooms, and this serves as an additional source of funds for the foundation.

For more information about the Colorado Water Education Foundation, contact Tyler Stevens at El Pomar (719) 577-7005, or Carmine Iadarola at Aquasan Network (303) 932-6910.

THE ARKANSAS RIVER SHINER: ENDANGERED?

The U.S. Fish and Wildlife Service (USFWS) is considering a proposal to list a two-inch minnow, known as the Arkansas River shiner, as an endangered species in the Canadian River which crosses the Texas High Plains. The USFWS says that the shiner, once abundant in the western portions of the Arkansas River Basin in Kansas, New Mexico, Oklahoma and Texas, has disappeared from over 80 percent of its historic range. The agency says the shiner is now almost entirely restricted to the Canadian (South Canadian) River in Oklahoma, Texas and New Mexico.

According to the USFWS, reservoirs constructed within the Arkansas River Basin have altered considerable sections of river habitat. Another USFWS concern is pumping of groundwater from the Ogallala Aquifer. Because operation of Lake Meredith could be affected if USFWS requires increased streamflows as part of a recovery plan, Texas legislators have asked the USFWS to conduct public hearings on plans to designate the shiner as an endangered species. The legislators questioned the listing of the Arkansas River shiner as an endangered species since this exact species flourishes in the Pecos River of New Mexico. The USFWS did not include that population in its endangered species proposal.

Source: *The Cross Section*

REPORT SUMMARIZES PROGRESS ON NATURAL HAZARDS MITIGATION

by Jill Marsh

As the population of Colorado continues to grow, the likelihood that many of the state's communities will become more vulnerable to natural disasters has increased as pressures mount to build in areas previously considered unsafe or too costly to develop. As a result, natural hazard mitigation and the Colorado Natural Hazards Mitigation Council become increasingly important.

The Colorado Natural Hazards Mitigation Council (CNHMC) was created in March, 1989 by Governor Romer to coordinate statewide efforts to reduce the physical and financial impacts of natural hazards such as floods, landslides, wildfires, avalanches, earthquakes, and drought. The council meets twice a year and focuses on natural hazard mitigation issues of both immediate and long-term concern. CNHMC, the first such council in the country, provides the state with an unprecedented opportunity to identify and correct hazardous situations within an institutional mitigation framework before disasters can occur. The coalition of local, state, and federal governments and members of Colorado businesses and universities, works closely together to reduce future hazard losses.

In the Council's latest Annual Report, the Flood Hazard

Mitigation Committee discussed the three types of flooding that occurred in Colorado during the 1993 flood year: snowmelt flooding, a result of heavy snowpack combined with hot weather; rain on snowmelt flooding, occurring most often during the month of May; and thunderstorm-induced flooding. Due to the higher than normal snowpack in 1993, there was concern about possible flood problems from spring runoff. However, the Committee reported that the 1993 snowmelt runoff flood season did not reach the magnitude of the 1984 Western Slope flooding, the last abnormally high snowpack year. Spring weather cycles produced warm/cool, warm/cool patterns in 1993 to help the state sidestep potentially widespread flood problems. Additionally, post-flood mitigation measures that were implemented as a result of the 1984 flood helped to prevent more serious problems in many areas.

Varying degrees of flood damage did occur, however, in southern mountain areas, mountain valleys of the Western Slope, and in the San Luis Valley. In response to the flood problems experienced on the Western Slope in 1993, a state pilot program was developed to instruct state residents in flood hazard

mitigation techniques. The Colorado Water Conservation Board Flood Control and Floodplain Management Section recommended a number of strategies for reducing future flood losses in the state, including development of a Colorado Snowmelt Runoff Model to improve flood prediction forecasts, development of a local-state-federal flood emergency response plan, development of a policy or standard for restoring and reclaiming original stream channels, and implementation of a multi-objective river management planning process.

The Flood Hazard Mitigation Committee also identified a number of issues that should be addressed by state and local decision makers if progress is to be made in reducing the state's flood hazards. Included was designating locations and alignments of natural stream channels, mandating flood insurance coverage for development projects using state resources, and authorizing the State Engineer to divert flood waters and change reservoir storage levels during flood events.

Source: 1993 Annual Report, Colorado Natural Hazards Mitigation Council.

CULTURAL DIVERSITY SCHOLARSHIP

Colorado Division of Wildlife
Department of Natural Resources

To encourage students of diverse racial, ethnic, and gender backgrounds to obtain college degrees in all fields of study applicable to employment with the Colorado Division of Wildlife, the Division announces the third annual "Cultural Diversity Recruitment Scholarship Program." Scholarships ranging up to \$2,000 will be awarded to students seeking baccalaureate or advanced degrees from any two-year or four-year Colorado college or university.

To obtain Rules and Eligibility Requirements and Application Instructions contact:

Rita Laitres
Human Resources Diversity Specialist
Colorado Division of Wildlife
6060 Broadway
Denver, CO 80216
Phone 291/7485

**Deadline: Must be postmarked by
March 1, 1995**

Semi-finalists will be selected on the quality of material submitted. All semi-finalists will be contacted and scheduled for a personal interview by April 3, 1995. Final scholarship selection will be based on need and merit.

NSF DOCTORAL TRAINEESHIPS: GROUNDWATER CHEMISTRY & HYDROLOGY

Maryland Water Resources Research Center-- Support is available for interdisciplinary doctoral research and training in the departments of Agricultural Engineering, Agronomy, Civil Engineering, Chemistry, and Geology. Trainees will receive a stipend of \$14,000/year, full tuition and medical insurance. Traineeships will be renewable in subsequent years, subject to satisfactory progress toward a degree. Contact Dr. George Helz, Water Resources Research Center, University of Maryland, College Park, MD 20724 (301) 405-6928 or e-mail gh17@umail.umd.edu. Trainees must have at least a bachelor's degree in a related discipline and must be U.S. citizens.

PRESIDENTIAL FELLOWSHIPS

Oklahoma State University Environmental Institute announces 1995-1996 Presidential Fellowships for Water, Energy, and the Environment for advanced study and research. Fellowship competition is limited to U.S. citizens. Applicant must be a doctoral student in residence at Oklahoma State University or must have applied for admission. Recipients will receive stipends of \$1,600 per month and may begin research July 1, 1995. Fellowships are renewable each July 1, and may be continued up to three years, provided satisfactory progress is demonstrated. Reapplication is required for each year of support. For information contact: Olen Paul Matthews, Director, Environmental Institute, 003 Life Sciences East, Oklahoma State University, Stillwater, OK 74078-0281. Phone: 405/744-9994.

WATER PUBLICATIONS, DATABASES

NEW CWRRI REPORTS

To order CWRRI reports contact the Cooperative Extension Resource Center, General Services Building, Colorado State University, Fort Collins, CO 80523. Phone 303/491-6198; FAX 303/491-2961.

Completion Report No. 185, Field Assessment of Stream/Aquifer Interaction Under Semi-Arid Conditions and Problems with Computer Representation, by Lisa L. Bissett and Eileen P. Poeter. Price: \$5.00 plus postage.

Completion Report No. 186, An Integrated Economic Hydrologic-Model for Groundwater Basin Management, by Islam M. Faisal, Robert A. Young and James W. Warner. Price: \$6.00 plus postage.

Completion Report No. 187, Developing a Biotic Index for Colorado Stream Quality, by Scott A. Grotheer, J.M. Chudd, Sen-Her Shieh, N.J. Voelz and J.V. Ward. Price: \$7.00 plus postage.

Technical Report No. 61, Windy Gap: Transmountain Water Diversion and the Environmental Movement, by Gregory M. Silkensen. Price: \$10.00 plus postage.

Technical Report No. 62, Technology Effectiveness Assessment of Soil Vapor Extraction, by David Barnes, David McWhorter, and Robert Ward. Free.

NATIONAL WETLAND MITIGATION BANKING STUDY

Wetland Mitigation Banking: Resource Document, IWR Report 94-WMB-2. Presents banking case study information and an annotated bibliography.

An Examination of Wetlands Programs: Opportunities for Compensatory Mitigation, IWR Report 94-WMB-5. Identifies and discusses programs that could potentially accommodate compensatory mitigation arrangements.

Wetland Mitigation Banking, IWR Report 94-WMB-6. Discusses institutional, economic and environmental aspects of mitigation.

To order contact Institute for Water Resources, Casey Bldg., 7701 Telegraph Rd., Alexandria, VA 22315-3868. Phone 703/355-3042.

High Plains States Groundwater Demonstration Program, Interim Report, October 1994--In its 6th Annual Report to Congress, the Bureau of Reclamation documents progress of

Phase II of the High Plains States Groundwater Demonstration Program. The project is conducted in cooperation with U.S. Geological Survey, the Environmental Protection Agency, and 13 states that have ongoing projects: Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, Oklahoma, Oregon, South Dakota, Texas, Utah and Washington. Available from U.S. Government Printing Office, Superintendent of Documents, Washington D.C. 20402. Phone 202/783-3238. 1995-841-391.

PROCEEDINGS

Proceedings, 4th National Pesticide Conference: New Directions in Pesticide Research, Development, Management and Policy -- Contact Publication Services, Virginia Water Resources Research Center, 617 N. Main St., Blacksburg, VA 24060-3397. Phone 703/231-8036; FAX 703/231-6673.

Proceedings, Drought Management in a Changing West: New Directions for Water Policy -- Contact International Drought Information Center, 241 L.W. Chase Hall, Univ. of Nebraska, P.O. Box 830728, Lincoln, NE 668583-0728. Phone 402/472-6707; FAX 402/472-6614.

U.S. GEOLOGICAL SURVEY REPORTS

USGS Water-Resources Activities in Colorado--Fiscal Years 1992-93--A summary report for fiscal years 1992-93 (October 1, 1991, to September 30, 1993). A listing of reports published or approved for publication during part of fiscal years 1989-91 and during fiscal years 1992-93 (and where they can be obtained) also is given. Water-resources data are collected, and interpretive hydrologic investigations are completed in Colorado under the direction of the Colorado District Chief, David J. Lystrom. Results of these investigations and the data collected are published or released either by the U.S. Geological Survey or by cooperating agencies. Seventy Federal, State, and local agencies are listed that cooperated with the U.S. Geological Survey during fiscal years 1992-93. *For costs of the paper copy and microfiche versions of the report, please contact the U.S. Geological Survey, Earth Science Information Center, Open-File Reports Section, Box 25286, Mail Stop 517, Denver Federal Center, Denver, CO 80225 or call (303) 236-7476.*

Use of Frequency Analysis and the Extended Streamflow Prediction Procedure to Estimate Evacuation Dates for the Join -Use Pool of Pueblo Reservoir, Colorado, USGS Water Resources Investigations Report 94-4054. Prepared in cooperation with the Southeastern Colorado Water Conservancy District. *For costs of the paper copy and microfiche versions of the report, please contact the U.S. Geological Survey, Earth Science Information Center, Open-File Reports Section, Box 25286, Mail Stop 517, Denver Federal Center, Denver, CO 80225 or call (303) 236-7476.*

WATER AND THE WORLD WIDE WEB, WORKING TOGETHER
by Julie Eyre

The Colorado Water Resources Research Institute, in cooperation with the National Institute for Water Resources, has made information about water accessible through the World Wide Web (WWW). Included are: a listing of CWRRI publications with abstracts, a listing of water-related courses available at Colorado universities, and a listing of expertise in Water at universities in Colorado. Soon our newsletter will also be available through the WWW.

WWW is a portion of the Internet, which links thousands of computers around the world and makes an abundance of information available to users of the Internet. Many companies offer public access to Internet services. These services include access to the WWW and also to electronic mail and news groups. Files can be downloaded from the WWW to the user's personal computer. There are many different, user-friendly graphical applications to help the user maneuver around the WWW. One of the most popular is Mosaic, and most companies that provide Internet services have Mosaic available. To access these services the user pays a monthly service fee and sometimes a one-time hookup fee.

A few companies that are available to Colorado users (some nationwide) are listed below with phone numbers. You can call and receive information on the services that each company provides and prices.

- NetCom 800/353-6600
- Rocky Mountain Internet Initiative 719/576-6845 or (800)900-RMII
- Colorado SuperNet (303)296-8202
- FortNet (primarily Fort Collins area) 303/224-6105

If you have access to the Internet you can find our WWW Page at <http://www.colostate.edu/Depts/CWRRI/>. The National Institute for Water Resources has a WWW Page available at <http://wrri.eng.clemson.edu>.

DEER

Another interesting service available on the network is the Department of Energy Environmental Restoration (DEER) Gopher Service. It includes: Business Opportunities in Environmental Restoration; Technology for Sample Analysis; Technologies Needed for Environmental Restoration; Recycling Hazardous and Radioactive Waste; and a suggestion box -- users can enter suggestions for improving the DEER Gopher Server.

DEER can be accessed one of two ways. If you have access to the Internet and you have a gopher client on your computer, type: `gopher doe-wrc.ott.ohio-state.edu`.

or for x windows
`xgopher doe-wrc.ott.ohio-state.edu`.

If you don't have a gopher client on your computer you can use telnet by typing the following

`telnet doe-wrc.ott.ohio-state.edu`

Once the login prompt is obtained, use lower case letters and enter `ottogopher` as the user id and `ottogopher.1` as the password.

WATER SUPPLY

The Surface Water Supply Index (SWSI) developed by the State Engineer's Office and the USDA/SCS is used as an indicator of mountain-based water supply conditions in the major river basins of the state. It is based on snow pack, reservoir storage, and precipitation for the winter period (Nov.-April). During the winter period snow pack is

the primary component in all basins except the South Platte, where reservoir storage is given the most weight. The following SWSI values were computed for each of the seven basins on January 1, 1995 and reflect conditions during the month of December.

<u>Basin</u>	<u>1, 1995 SWSI Value</u>	<u>Change From Previous Mo.</u>	<u>Change From Previous Yr.</u>
South Platte	-0.6	-0.6	-2.4
Arkansas	-0.7	-2.8	-0.7
Rio Grande	+2.0	-1.1	+3.2
Gunnison	+1.7	-0.6	+2.6
Colorado	-0.8	-1.7	-2.1
Yampa/White	-0.9	-1.7	-0.9
San Juan/Dolores	+1.6	-1.4	+3.4

SCALE									
-4	-3	-2	-1	0	+1	+2	+3	+4	
Severe Drought	Moderate Drought	Near Normal Supply			Above Normal Supply		Abundant Supply		

WATER NEWS DIGEST

NATIVE AMERICAN WATER RIGHTS

Three Colorado Congresspeople Support Animas-La Plata

The Animas-La Plata water project, a \$687.9 million dam and irrigation plan authorized by Congress in 1968 along with the Central Arizona Project, recently gained the backing of three Colorado lawmakers: Senators Ben Nighthorse Campbell and Hank Brown and Representative Scott McInnis. A \$45,000 study, undertaken by Bookman-Edmonston Engineering, Inc. and financed by the Southern Ute Indian Tribe, the Ute Mountain Ute Indian Tribe, and the Southwestern Water-Conservation District, says that the project will generate money for every dollar spent on it. The study contradicts last year's study by the Inspector General of the U.S. Interior Department, which concluded that the project was economically infeasible. The Bureau of Reclamation, which is responsible for the construction of the project and whose records show that Animas-La Plata irrigators would be charged \$20.4 million for \$513.5 million of government irrigation improvements, is to release another economic study in March or April. In 1988, Congress ordered construction of the project as part of a mandate to restore 130-year Native American water rights on seven regional rivers. The project's construction would settle a legal dispute with the two Ute tribes of southern Colorado. If the project is not under construction by the year 2000, the tribes can take their case back to federal court.

Denver Post 12/30/94, 1/1/95, 1/18/95; *Grand Junction Daily Sentinel* 12/31/94, 1/17/95; *Greeley Tribune* 1/18/95; *Montrose Daily Press* 12/28/94, 1/18/95; *Pueblo Chieftain* 1/18/95, 1/23/95

LITIGATION

U.S. Supreme Court Refuses to Review AWDI Ruling

On November 28, 1994, the U.S. Supreme Court declined to hear arguments on American Water Development Inc.'s (AWDI) appeal for water rights in the San Luis Valley. AWDI was formed by Maurice Strong in 1985 after he bought the 110,000-acre Baca Ranch, which sits on top of one of the largest aquifers in the West. AWDI filed for water rights in the San Luis Valley on December 31, 1986. The company planned to drill about 100 wells into a large aquifer and pipe up to 200,000 acre-feet of water each year to cities. AWDI asserted four claims to the water, including the 1848 Treaty of Guadalupe Hidalgo between the United States and Mexico. An eight-year court battle followed, with Division 3 Water Judge Robert Ogburn denying the claim in November 1991. He ordered AWDI to pay court opponents \$2.7 million plus interest (which now puts the amount over \$3 million) in expenses and court costs.

AWDI appealed, arguing that surface flows would not be affected by pumping, and that because the Baca Ranch was originally part of a land grant, rights to all water beneath the ranch should supersede U.S. law. The Colorado Supreme Court in May of 1994, however, supported Ogburn's decision, denying AWDI's claim. In September, AWDI appealed that decision to the U.S. Supreme

Court, stating dollar amounts among the issues. The court, refused to review the case, ending AWDI's development plans.

Denver Post 11/29/94, 12/4/94; *Greeley Tribune* 11/29/94; *Pueblo Chieftain* 11/29/94, 11/30/94, 12/6/94

GROUNDWATER

Attorney General Probes Water Rights Deal at Lowry

State hydrologists have discovered 3 million acre-feet of water in deep rock formations under the old Lowry Bombing Range. This is enough water to supply 30,000 homes for 100 years. Under a proposed agreement between the state land board, Rangeview Metropolitan District, a local water development group, and a Canadian company, International Nickel, the state would get royalties from selling water under the range, just east of Aurora Reservoir. Colorado law allows developers to tap nonrenewable underground water, but state leaders are debating whether Colorado should rely on finite groundwater supplies to sustain future development. The developers would remove 30,000 acre-feet of water a year — the most allowed by law. In addition to supplying new homes, officials at Rangeview Metropolitan and International Nickel plan to sell 10,000 acre-feet a year to water users elsewhere. Colorado Attorney General Gail Norton, however, is investigating conflicts of interest and financial errors involved in the land deal, handled by the state land board. Norton's team is making the case that interlocking relationships between water developers and investors were unfair. Norton's response is due Jan. 30.

Denver Post 12/9/94, 12/13/94, 1/13/95, 1/20/95, 1/21/95; *Greeley Tribune* 12/10/94, 1/14/95; *Montrose Daily Press* 12/12/94

WATER ALLOCATION

Judge's Ruling Gives Park Right to Water

Judge Robert A. Behrman, District Court, Water Division No. 1 in Greeley, has issued a decree giving Rocky Mountain National Park the right to all surface and groundwater not appropriated by 1915. The ruling applies only to water that is in parts of the park east of the Continental Divide. The water will be used to preserve water-related features of the park.

Fort Collins Coloradoan 12/3/94

WATER PROJECTS

Greeley Granted Easement for two Reservoirs

The U.S. Forest Service has granted the city of Greeley a 50-year easement to operate two mountain reservoirs. The granting of the easement ends a three-year battle with the federal government over the renewal of 20-year permits for Peterson Lake and Barnes Meadow reservoirs. The cost for Peterson Lake will be \$49,000 to be paid over 25 years. Barnes Meadow should cost \$10,000 and be paid over 10 years. The Forest Service also agreed to drop a

requirement for \$10 million in liability insurance on the city dams to protect the government from accident claims. The city is self-insured, and the federal government accepted the state law which limits Greeley's liability to \$600,000 for each occurrence.

Greeley Tribune 11/30/94; *Fort Collins Coloradoan* 12/22/94; *Montrose Daily Press* 12/22/94

Colorado River Flood Delayed Indefinitely

For a week, a stretch of the Colorado River was supposed to roar with a spring flood like those in the days of Major John Wesley Powell. The torrent, 10 feet deep and more, would be artificial, released through the turbines and jet tubes of Glen Canyon Dam on the Arizona-Utah line 16 miles above Grand Canyon National Park. The purpose would be to lift sand from the river bottom and partly restore a chain of sandy beaches along the river. The restoration could also help preserve the remains along the river of stone dwellings, hunting camps, and roasting pits used by the Anasazi Indians. Restored beaches could also serve as spawning grounds for the endangered humpback chub and other native fish. The flood has been delayed, however, by the Bureau of Reclamation, because officials there say they need time to determine how the experiment would affect the environment and the dam.

Colorado Springs Gazette Telegraph 1/7/95; *Denver Post* 1/6/95; *Fort Collins Coloradoan* 1/6/95

WATER QUALITY

Proposal Deals with Abandoned Operations on Federal Lands

Interior Secretary Bruce Babbitt and Agriculture Secretary Mike Espy have issued a draft proposal to Carol Browner, Administrator of the Environmental Protection Agency (EPA), to deal with threats to water quality from abandoned operations (mining, oil and gas, and landfills) on federal lands. Estimated numbers of these abandoned sites range from tens to hundreds of thousands, however EPA estimates that less than one percent have severe impacts on water quality. The proposal suggests identifying specific water bodies currently not meeting state water quality standards as a consequence of discharges from abandoned mines on federal lands, prioritizing these water bodies within each state, and developing a remediation plan. A single NPDES permit will be issued to each land management agency for each state to allow for priority setting among watersheds and sites. The initiative is being overseen by Debra Knopman, Interior Department Deputy Assistant Secretary for Water and Science, (202) 208-4811, and Adela Backiel, Agriculture Department Deputy Assistant Secretary for Natural Resources and the Environment, (202) 720-5166.

Western States Water 1/13/95

Conference Panel Sees Little Advancement in Groundwater Quality Protection

Congressional committee staff on a panel at a conference on "Protecting Groundwater: Promoting Understanding, Accepting Responsibility, and Taking Action," held December 11-13 in Washington, D.C. think any new federal programs to enhance groundwater protection are unlikely in the new Congress. Speakers represented the Senate Environment Committee, the House Public

Works Committee, and the former Merchant Marine and Fisheries Committee.

Western States Water 12/23/94

EPA Expands Chemicals List

The Environmental Protection Agency (EPA) is expanding the requirement for companies to report toxic chemical releases into the environment, nearly doubling the number of chemicals that must be disclosed. To the 368 chemicals already covered by the reporting rule would be added 286 chemicals, bringing the total to 654. Chemical and other industrial plants must report the amounts of these chemicals that are released annually into the air, ground, and water. EPA also made it easier for dischargers of small amounts (500 pounds or less) to comply, allowing them to use a shorter, less time-consuming reporting form.

Montrose Daily Press 11/29/94

Boulder Neighborhood Could be Named a Superfund Site

Residents in the neighborhood of Crestview, located in Boulder's city limits, learned in 1992 that their well water was contaminated with toxic chemicals, including DCE, which is used in plastics production. A six-member task force, comprised of city, county, and state leaders, will have to come up with a solution by March 15 to avoid Superfund designation. Centerline Circuits Inc., a company located near the site, was identified by EPA as a major contributor to the water contamination. EPA officials want to learn how far underground pollutants have spread and what other contaminants might be present at the site. Long-term exposure to DCE can cause damage to the liver, kidney, heart, and lungs.

Grand Junction Daily Sentinel 1/8/95

Acidity in Snow a Record

Snow in the federally protected Mount Zirkel Wilderness Area above Steamboat Springs is polluted with the most acidity and sulfates ever found in the West, leading the U.S. Forest Service to threaten a ban on any new major pollution sources in northwest Colorado. Suspected sources are coal-fired power plants along the Yampa River in Hayden and Craig. Forest Service researchers have been tracking the source of the Mount Zirkel pollution since 1984. In July 1993, the agency told Governor Roy Romer that the two power plants were believed responsible for visibility and pollution problems in the 140,000-acre wilderness area, which is visited by 75,000 hikers, anglers, and hunters each year. Biologists are worried about acid snow because acidity is a slow killer of trees and trout, and, though there have been no proven biological die-offs from acidity in the Zirkel area, scientists say its snowmelt-fed lakes are highly vulnerable to subtle chemical changes.

Denver Post 1/28/94; *Grand Junction Daily Sentinel* 1/29/95; *Greeley Tribune* 1/29/95; *Pueblo Chieftain* 1/29/95

Lowry Pollution Testing Begins

Drilling began in December of 10 holes in neighborhoods north of the former Lowry Air Force Base to find out how far underground pollution has spread. Chemical pollution from past base activities

has seeped north of the facility. Nobody depends on wells for water within 2 miles of Lowry, but pollution could delay conversion of the 1,866-acre former base for civilian use. Any property that has contamination cannot be released for transfer by deed. The chemical contaminants include trichloroethene, a potential carcinogen found in cleaning solvents. Previous tests off base found trichloroethene concentrations as high as 300 parts per billion, 60 times the federal drinking water standard (5ppb). On base, the concentrations were as high as 4,000 parts per billion.

Denver Post 11/29/94

Salinity Control Program Receives Funding

Salinity control projects on the Western Slope will receive \$2.5 million of a \$4.5 million federal allocation for the Colorado River Salinity Control Program. The allocation for 1995 is short of the \$7.5 million program units Montrose, Delta, and Montezuma counties received in 1994. The \$4.5 million Congress appropriated for the national salinity control program, is much less than the \$13.8 million given to the program in 1994. Funding changes and the recent reorganization of the U.S. Department of Agriculture persuaded officials to shift most of the salinity control program responsibility to the USDA's Natural Resources Conservation Service (NRCS, formerly the Soil Conservation Service). NRCS will continue to offer technical assistance to farmers and ranchers under contract with the program; however, the program's cost-share, which paid 70 percent of a participant's cost for implementing better irrigation practices, will be reduced or possibly eliminated. The West Slope allocation will be only for people already involved with the program.

Montrose Daily Press 11/22/94

USDA to Market Soil Test

The Department of Agriculture will market a new lab test that more quickly checks soil for two conditions that can hamper crop yields. The USDA's Agricultural Research Service signed a cooperative agreement with Hach Company of Loveland to devise the new test, which detects saline or sodic presence in soil, using electrical measurements that monitor conductivity. The Agriculture Department expects it to replace the time-consuming chemical test used to evaluate salt and sodicity, a combination of high sodium, low salinity, and high pH levels.

Montrose Daily Press 11/29/94

PEOPLE

Bill Klapwyk Retires After 45 Years in Irrigation

Bill Klapwyk has spent 45 years involved in irrigation -- as a ditch rider, water master, and assistant manager and manager of the Grand Valley Water Users Association, the group that manages Highline Canal. As Klapwyk steps down, Dick Proctor, who was hired by the water users board as assistant manager, takes over the position of manager. Proctor farmed for 21 years in Delta County, and was a member of the board of the Uncompahgre Valley Water Users Association.

Grand Junction Daily Sentinel 12/27/94

National Water Resources Association Elects New President

Effective January 1, Fred N. Pfeiffer of San Antonio, Texas became the new President of the National Water Resources Association. He will serve a two-year term. Pfeiffer is the General Manager of the San Antonio River Authority and has formally served as NWRA Vice-President. Also elected were Wayne P. Cunningham as incoming Vice-President and Dewitt Moss as Treasurer.

Western States Water 1/20/95

WATER EDUCATION

River Watch Teaches Students About Water Quality/Quantity

Three students in Fowler, east of Pueblo, are engaged in the River Watch program, sponsored by the Division of Wildlife (DOW). The program trains students throughout the state on how to report on water quality in the state's rivers and streams. The Fowler students, with a participating teacher, travel to sites along the Huerfano, Apishapa, and Arkansas rivers to take samples for a variety of water quality tests including alkalinity, hardness, acidity, and dissolved oxygen content. The students also calculate the amount of water flowing in each channel. The results are sent to DOW, and the students have the satisfaction of knowing that DOW is using their data. DOW provides waders and all the test equipment.

Pueblo Chieftain 1/26/94

PUBLIC LANDS

State Searches for Water for Proposed Great Plains Park

Governor Roy Romer formed the Arkansas River Coordinating Committee to look at how Colorado will handle, among other things, getting water for the proposed Great Plains State Park, near Eads. The committee is made up of representatives from a number of state water agencies, valley county commissioners, well owners groups, and irrigation ditch boards. The Division of Wildlife (DOW) announced recently that the state could buy water needed for the park from local farmers in such a way that it would continue to make Payment In Lieu of Taxes, or PILT, payments to affected counties. The state needs thousands of acre-feet of water for the park, which is to be located at the Great Plains Reservoir system near Eads. The project has been criticized, because seepage losses in the canals that feed it require almost twice as much water to be acquired as the amount that makes it to the lakes. DOW officials have said, however, that this would not be a loss to wildlife, because it would allow more trees and bushes to grow.

Pueblo Chieftain 12/16/94, 1/20/95

LEGISLATION

Water Sought as Collateral in Mexico Bailout

Congressman Scott McInnis plans to introduce an amendment to legislation bailing out Mexico to make Colorado River water rights collateral for a \$40 billion loan guarantee. The amendment would require Mexico to forfeit rights it has for 1.5 million acre-feet of water a year from the Colorado and other rivers if it defaults on

repaying money owed the U.S. McInnis said approval of his amendment would not guarantee his support for the bailout if there are other problems in the proposal.

Grand Junction *Daily Sentinel* 1/21/95; *Montrose Daily Press* 1/23/95

Skaggs Bill to Protect North Saint Vrain Creek

A bill to protect North Saint Vrain Creek along the largest roadless canyon remaining on Colorado's Front Range has been introduced by U.S. Representative David Skaggs. The bill would prevent construction of dams on the upper portion of the creek and on several of its tributaries and clear up public land ownership along the creek. The bill was approved by the House last year, but Congress adjourned before the Senate could act on it. Prohibition on new dams would be on the part of the creek from its headwaters in Rocky Mountain National Park to a point above Button Rock Reservoir. The bill would also facilitate ongoing land negotiations between federal agencies and the city of Longmont by directing the Park Service to acquire land near Copeland Lake and reaffirming the Forest Services's authority to acquire Coulson Gulch.

Greeley *Tribune* 1/21/95

Endangered Species Act MOA Signed

Fourteen federal agencies have signed an MOA (Memorandum of Agreement) to improve cooperation and ESA (Endangered Species Act) implementation on federal lands. It was signed by the Departments of Agriculture, Commerce, Defense, Interior, and Transportation, as well as the Army and the Environmental Protection Agency (EPA), among others. Federal lands host 905 animal and plant species listed as endangered or threatened. The MOA establishes interagency working groups that will involve the public, states, tribes, and local governments. By giving more attention to species in decline, the agencies hope to avoid many listings. For a copy call (703) 358-2171.

Western *States Water* 12/23/94

WATER RATES

Denver Water Rates Hikes Set

Denver water customers face a 14 percent rate hike in January and another rate hike in 1996, but they still have lower water bills than anyone in the suburbs. The average Denver residential customer will pay \$16.13 a month compared to an average suburban residential bill of \$25.71 a month, which are going up an average of 1.3 percent. The city charter requires that suburban rates be higher than Denver rates. The rate hikes are meant to offset operating costs. The Denver Water Board plans to eliminate 45 positions as part of its streamlining.

Denver *Post* 12/7/94, 12/8/94; *Montrose Daily Press* 12/9/94

Colorado Springs Seeks Water Rate Hike

The average monthly water bill for a residential customer in Colorado Springs could rise by 86 cents as early as March, based on a rate-increase proposal to be considered in February. City

officials say the increase is needed to help pay off more than \$27 million in construction costs to complete two major projects. The biggest chunk, \$16.8 million, will be spent on the McCullough Water Treatment Plant northwest of the city. Another \$10.5 million will be spent building pipelines to deliver water to the southwest portion of the city. Overall, officials have proposed a 3.4 percent increase. The city will consider the rate increase at a public hearing Feb. 22. For more information call Dennis Senger, at (719) 636-5496.

Colorado Springs *Gazette Telegraph* 1/11/95

RECREATION

Great Outdoors Colorado Grants Given to State Parks

The State Board of Great Outdoors Colorado announced on Jan. 11 the awarding of \$3.5 million in grants. A new portion of the Colorado River Trail will be built with a \$350,000 grant to the Colorado River State Park. The money, with a \$350,000 match from other entities, will be used to build two miles of trail from an area on the north side of Corn Lake to 30 Road. It will also buy lots needed to make the connection with the existing riverfront trail in downtown Grand Junction. Boyd Lake State Park received \$235,000 in grants for purchasing land on the south side of the park, buying water for the lake, and trail construction.

Fort Collins *Coloradoan* 1/12/95; Grand Junction *Daily Sentinel* 1/12/95

GROWTH

Governor Romer Holds Colorado Leadership Summit on Smart Growth and Development

Governor Roy Romer launched his two-day state growth summit on Jan. 25 by calling for a "new growth ethic" that would fit local decision making into broader state objectives. However, Senate President Tom Norton of Greeley said state government should stay out of growth management and development. Romer proposed to link awarding of park-and recreation grants, financed by the state lottery, to a city or county's willingness to adopt long-range growth plans. Communities that approve development plans, he said, should get priority for \$860 million of lottery proceeds expected in the next 20 years.

Romer also called for a major change in Colorado water law to dramatically slow the pumping of deep groundwater reserves. Romer wants to cut the allowed water use rate by about two-thirds, and he challenged water officials to help get the idea turned into law. The summit ended with elected officials, home builders, environmentalists, and community planners trying to set up 10 regional growth summits across the state. The dates and meeting sites have not been set yet in many places, though all are expected to be held in March or April.

Denver *Post* 1/26/94, 1/27/94; *Montrose Daily Press* 1/27/95

"A RIVER OF DREAMS AND REALITIES" -- THE ARKANSAS RIVER BASIN WATER FORUM
January 17-18, 1995, University of Southern Colorado Campus

by Kathleen Klein



A lot of people are interested in the "River of Dreams and Realities"!

This year's Arkansas River Basin Water Forum, held January 17 and 18, attracted approximately 200 interested participants. Attendees included water users, recreational interests, local, state, and federal agency staff, business interests and members of the general public. After months of organizational effort, the planning committee realized their goal of pulling together diverse interests to address the basin's complex water resource management issues.

Overriding the positive atmosphere of information exchange, however, was the sense of loss because Charles L. "Tommy" Thomson was not there to participate. The Forum was dedicated to Tommy, who was program chairman at the time of his death. The culmination of his efforts (and those of many others) was an excellent event.

Although the full list is too lengthy to print here, other program organizers included: Jim Valliant, CSU Cooperative Extension; Robert Appel, Southeast Colorado RC&D; Leon Bright, Arkansas Valley Audubon Society; Marie Del Toro, Colorado Springs Utilities Department; Jeff Keidel, Upper Arkansas Valley Watershed Association; Joe Kelly, City of La Junta; Sid Lloyd, ASARCO, Inc. and many more.

The Arkansas River is truly a "river of dreams and realities." Issues that transcend jurisdictional boundaries within the basin include resolution of the Kansas v. Colorado litigation, meeting increasing recreational and municipal demands for water, and coping with the spectre of agricultural to urban water transfers. The broad array of speakers addressed these questions and others throughout the two-day event. Speakers included:

James Lochhead, Executive Director of the Colorado Department of Natural Resources;

Tom Kourlis, Commissioner of the Colorado Department of Agriculture;

Colorado Senator Don Ament, Chairman of the Colorado Senate Committee on Agriculture, Natural Resources and Energy;

Hal Simpson, Colorado State Engineer; and many others.

Issues highlighted by the speakers included improving groundwater management strategies, high demand for water-



David L. Harrison, Moses, Wittemyer, Harrison and Woodruff, P.C., Boulder, Colorado

based recreation, and municipal efforts to meet burgeoning demands.

Water attorney David Harrison noted that increased cooperation among the basin's three groundwater management associations could help reduce compact compliance burdens and litigation costs.

Steve Reese, Arkansas River Headwaters Recreation Area Head, noted that the Arkansas River is the nation's top destination for rafting enthusiasts.

Gary Bostrom, Manager of Water Resources and Planning for the Colorado Springs Utilities Department, discussed the ongoing efforts of Colorado Springs to develop new water supplies in response to growing population pressures.



Hal Simpson, Colorado State Engineer

Overlying these basin-wide water competition issues lies the uncertainty created by the ongoing Kansas v. Colorado case. Hal Simpson, Colorado State Engineer, noted that his office has started issuing orders to irrigation well permit holders in response to the Special Master's ruling in the case.

Although the final outcome of the ruling remains to be seen, what is certain is the need to adjust previous pumping practices. The State Engineer for Kansas, David Pope, was on hand to remind the group that the quantity and quality of Arkansas River water delivered to his state are of great concern.

Addressing the complex water issues facing the Arkansas River Basin will continue to be an exercise in cooperation and compromise. The Forum was an excellent step in the direction of improving management of this critical resource.

A proceedings of the Forum will be published by CWRRI. Individual recordings of the presentations can be purchased by contacting Jim Valliant, Cooperative Extension, 411 N. 10th Street, P.O. Box 190, Rocky Ford, CO, 81067, (719)254-7609.

WATER-RELATED SEMINARS AND SHORT COURSES

SPRING 1995 LUNCH TIME SEMINAR SERIES DEPARTMENT OF ENVIRONMENTAL HEALTH COLORADO STATE UNIVERSITY

Mondays 12:10 to 1:00, 110 Microbiology A108

<u>Date</u>	<u>Topic</u>	<u>Speaker</u>
Feb. 20	Insecticides -- User Friendly?	Richard Johnsen, Entomology Dept., CSU
Mar. 20	To Be Announced (Environmental Toxicology and Risk Assessment)	Elizabeth Caldwell, ENSR
Mar. 27	Evaluation of Hepatocellular Proliferation and Regulatory Growth Factors Following Long-term, Low-level Exposure to a Mixture of Groundwater Contaminants in F344 Rats	Alex Constan, Environmental Health
Apr. 17	American Public Health Association: Influencing Public Health Policy	Katherine McCarter, APHA

**SPRING 1995 LUNCH TIME SEMINAR SERIES
NATURAL RESOURCE AND AGRICULTURAL ECONOMICS
COLORADO STATE UNIVERSITY**

Wednesdays 12:10 to 1:10, 110 Animal Science Building

<u>Date</u>	<u>Topic</u>	<u>Speaker</u>
Feb. 15	Conservation Policy and Sustainability Considerations in the 1995 Farm Bill	Dana Hoag, CSU
Feb. 22	Reevaluating Water Demand Elasticities in Irrigated Agriculture: Implications for Ag Water Conservation	Susanne Scheirring, CSU
March 29	Comparison of Visitor and Residents Value for Ranch Open Space in the Steamboat Springs Resort Area	Richard Walsh, CSU Randy Rosenberger
April 5	Incorporating Zero WTP in Dichotomous Choice CVM Responses for Dam Removal Using a Spike Model	Dave Harpman, USBR John Loomis, CSU
April 19	Treatment of Uncertainty in Dichotomous Choice CVM Responses and Calibration to Actual WTP: The Grand Canyon Revisited	Patricia Champ, U.S. Forest Service

**SPRING 1995 SPEAKERS PROGRAM
DEPARTMENT OF EARTH RESOURCES
COLORADO STATE UNIVERSITY**

All talks are at 12:00 noon in Room 316 Natural Resources Building.

<u>Date</u>	<u>Topic</u>	<u>Speaker</u>
Feb. 23	Alkalic Rocks at Two Buttes, Colorado	Linda Davis, Earth Resources, CSU
Mar. 9	Travels in South America (tentative title)	Tommy B. Thompson, Earth Resources, CSU
Apr. 13	Debris Flows from Breached Moraine-Dammed Lakes in the Central Oregon Cascade Range	Jim O'Connor, U.S. Forest Service

For additional information contact:

*F. G. Ethridge
Phone: 303/491-6195
FAX: 303/491-6307
E-mail: fredpet@picea.cnr.colostate.*

**SPRING 1995 SEMINAR SCHEDULE
WATER RESOURCES SCIENCE AND ENGINEERING
COLORADO STATE UNIVERSITY**

LOCATION: Room 208 Lory Student Center unless indicated otherwise (LSC208).

<u>Date</u>	<u>Topic</u>	<u>Speaker</u>
Feb. 16 12:10 pm	Water Issues for the Nature Conservancy in Colorado	Robert Wigington, The Nature Conservancy
Feb. 22 7:00 pm	Rangeland Riparian Management by Objectives (LOCATION TBA)	Sherman Swanson, Univ. of Nevada, Reno
Feb. 23 12:10 pm	Some Riparian Vegetation Influences on Stream Morphology	Sherman Swanson, Univ. of Nevada, Reno
Mar 2 12:10 pm	Stochastic Simulation of the Great Lakes System	Jose Salas, C.H. Saada, Civil Engr., CSU
Mar. 9 12:10 pm	Management of Reservoir Sedimentation in China	Darrell Fontane and Carl Nordin, Civil Engr., CSU
Mar. 23 12:10 pm	Decision Support System for Stochastic Groundwater Modelling of Rocky Mountain Arsenal	Abdel Abdel Raliman, Civil Engr., CSU
Mar. 23 4:00 pm	Opportunities and Challenges for Improving Western Water Management (LOCATION TBA)	Julla Doermann, Water Policy Analyst, Western Gov. Ass'n.
Apr. 13 12:10 pm	Historic Uses of Water in Colorado: Examining the Water Compact	Daniel Tyler, History, CSU
Apr. 27 12:10 pm	Innovative Ecological Reclamation of Sand and Gravel Mines	Doug Gladwin National Biological Service
May 4 12:10 pm	A Watershed Approach to Stormwater Quality Management (LOCATION TBA)	Kevin McBride, PE Stormwater Quality Coord. City of Ft. Collins

Sponsored by: Hydrologic Science and Engineering Program, Civil Engineering Department; AWRA Student Chapter, Colorado State University; Water Resources Planning and Management Program, Civil Engineering Department; Groundwater Program, Civil Engineering Department; and Watershed Sciences Program, Earth Resources Department. For information contact: Professor Jose D. Salas, Hydrologic Science and Engineering Program, Phone 303/491-8460 or 5048; or David Graf, Earth Resources Department, Phone 303/491-5861.

**HOT TOPICS IN NATURAL RESOURCES
A Luncheon Program Series – 12:00 Noon**

LOCATION: HERSHNER ROOM, NORWEST BANK CENTER, 17th Ave. and Lincoln, Denver. Box lunches provided, cost \$13 until three business days before lunch, \$16 thereafter, with an additional \$5 to register CLE credits if desired. Preregistration and prepayment are required. One Hour of Continuing Legal Education (applied for). For information call Kathy Taylor at the Natural Resources Law Center 303/492-1288; FAX 303/492-1297.

Monday, March 13

IMPLICATIONS OF FERC ORDER NO. 636 FOR THE NATURAL GAS INDUSTRY

Elisabeth Pendley, KN Energy
and NRLC 1995 El Paso Natural Gas Law Fellow

Thursday, April 27

WHOOING CRANES & RISING PLOVERS: WATERSHED PROBLEM SOLVING ON THE PLATTE

Elizabeth Rieke, Assistant Secretary for Water & Science, Department of the Interior
The Federal Perspective

Gordon (Jeff) Fassett, Wyoming State Engineer and
J. Michael (Mike) Jess, Nebraska Director of Water Resources
State Concerns

Moderator: Jim Lochhead, Colorado Department of Natural Resources

**SPRING 1995 SEMINAR SERIES
ENVIRONMENTAL ENGINEERING
UNIVERSITY OF COLORADO**

*Fridays 3:30 to 4:30 p.m.
Room CR2-06*

<u>Date</u>	<u>Topic</u>	<u>Speaker</u>
Feb. 24	Research on Membranes for Environmental Applications	Paul Todd, CU
Mar. 3	Environmental Application of Colloid and Particle Size Separation Techniques	Jim Ranville, CU
Mar. 10	Chemical, Biological and Physical Assessment of Salt Creek, Nebraska	Cynthia Paulson, Brown & Caldwell
Mar. 31	Arsenic Occurrence Patterns in United States Source Waters	Michelle Frey, CU
Apr. 7	Lead and Arsenic Speciation in Contaminated Soils	John Drexler, CU
Apr. 14	Humic Substances - The Ultimate Mixture	Patrick MacCarthy, CSM
Apr. 28	Biosorption of Organic Compounds	Gary Carlson, CU

**GROUND-WATER MODELING SHORT COURSE 1995 (TENTATIVE SCHEDULE)
COLORADO SCHOOL OF MINES**

- Jan 30-Feb 2:** Practical Modeling of Three-Dimensional Contaminant Transport and Remedial Action Designs Using MODFLOW and MT3D. Instructors: Zheng (Un. Alabama). Neville (Papadopoulos, Inc.). Software: MODFLOW/MT3D (Method of Characteristics).
- Feb 20-24:** Statistical Methods in Ground-Water Pollution. Instructors: Helsel, Gilroy (USGS). Software: MINITAB (student edition).
- March 21-24:** Introduction to the MODFLOW Ground-Water Flow Modeling System. Instructors: Anderson, Greenwald (GeoTrans, Inc.). Software: MODFLOW, MODPATH.
- April 10-13:** Application of SESOIL and RISKPRO.
- May 8-12:** Principles and Applications of Chemical Reaction Modeling in Ground Water. Instructors: Parkhurst, Plummer, Glenn (USGS). Software: PHREEQE, PHREEQEM, BALANCE, NETPATH.
- June 5-9:** Characterization, Information Management and Modeling for Ground-Water Systems. Instructors: Kolm (Colo. School of Mines), Karanjac (UN consultant). Software: IDRISI, UN/GW, GWIS/GWW.
- June 19-22:** Practical Modeling of Three-Dimensional Contaminant Transport and Remedial Action Designs Using MODFLOW and MT3D. Instructors: Zheng (Un. Alabama), Neville (Papadopoulos, Inc.). Software: MODFLOW/MT3D (Method of Characteristics).
- July 4-7:** Advanced Principles and Applications of the MODFLOW Ground-Water Flow Modeling System. Instructors: Andersen, Greenwald (GeoTrans, Inc.). Software: MODFLOW, MODPATH, MODFLOW add-on modules.
- July 14-26:** Simulation of Saturated/Unsaturated Zone Flow and Contaminant Transport. Instructors: Bear (Technion), Yeh (Penn. State Un.). Software: 3DFEMWATER, 3DLEWASTE, FEWA, LEWA, FEMWATER, LEWASTE.
- Aug 8-11:** Application of Geostatistics and Kriging to Spatial Estimation Problems in Ground-Water. Instructors: Hoeksema (Calvin Coll.) and Magdalen (CSM). Software: GEO-EAS, GEOPACK.
- Aug 21-25:** Application of HELP.
- Sept 18-22:** Parameter Identification for MODFLOW. Instructors: Hill, Cooley, Yager (USGS). Software: MODFLOWP.
- Oct 17-21:** Introduction to the MODFLOW Ground-Water Flow Modeling System. Instructors: Andersen, Greenwald (GeoTrans, Inc.). Software: MODFLOW, MODPATH.
- Nov 7-10:** 3D Saturated Zone Solute Transport Modeling. Instructors: Konikow, Goode (USGS). Software: USGS 3D-MOC/MODFLOW.

For information contact Paul van der Heijde, IGWMC Director, at 303/273-3105.

SPECIAL COURSES

- June 13-16** **TRANSPORT AND FATE OF ORGANIC CHEMICALS IN SOILS AND GROUNDWATER.** This course addresses the environmental behavior of organic chemicals in soils and groundwater. The course describes the fundamental physical, chemical, and biological factors governing the transport and fate of organic chemicals in subsurface systems. Steady and unsteady state analytical spreadsheet models are developed and applied to sites contaminated with organic chemicals. *Fee: \$945. Dr. Helen Dawson, Assistant Professor, Department of Environmental Science and Engineering, Colorado School of Mines, 303/273-3402.*

- June 19-23 **INTRODUCTION TO FINITE ELEMENT ANALYSIS.** This course is designed to be a "hands-on" introduction to Finite Element Analysis, using the popular FEM package Algor. Students will learn how to build models and analyze them using beam, truss, plane stress, plain strain axis symmetric plate, and 3D bricks. Topics of engineering judgement and verification will be included. *Fee: \$650. John Steele, Assistant Professor, Department of Engineering, 303/273-3663; Michael McGrath, Professor, Department of Engineering, Colorado School of Mines, 303/273-3434.*
- June 27-29 **RECYCLING HEAVY METALS IN SOLID WASTE.** This course uses case studies to illustrate process technologies for converting solid wastes into byproducts. Focus is on proven technologies, specifically those associated with heavy metals. A primary objective is to familiarize the participants with up-to-date practices and issues important to managers having process responsibility for waste minimization and recycling. *Fee: \$895. Paul Queneau, Principal Metallurgical Engineer, Hazen Research, Inc. 303/279-4501, FAX 303/278-1528; Erik Spiller, VP, Hazen Research, 303/279-4501; Barry Hasan, VP, Hazen Research, Inc., 303/279-4501; Rob Staton, Environmental Engineer, Rayovac Corp., 608/275-4846; Fred Koch, Foundry Supervisor, Cambridge Brass, 519/621-5520.*
- Summer 1996 **VAPOR DEPOSITION PROCESSES.** This is a first course on vapor deposition processes, and will be an overview of vapor deposition techniques -- PVD, CVD, ion implantation, process control and thin film morphology, characterization of thin films, and comparison of processes, structures and properties. *Fee: TBA. John J. Moore, Professor, Metallurgical and Materials Engineering Department, 303/273-3770; Gerald P. Martins, Professor, Metallurgical and Materials Engineering Department, 303/273-3798; A.J. Perry, Director/Research Technology, ISM Technologies, Inc.*

MESA COUNTY WATER ASSOCIATION
 Second Annual Offering -- The Water Course

- THIS YEAR'S TOPIC:** The Grand Valley Water Supply: Where it Comes From and Who Else Wants It.
 "Structures and Structures."
- WHAT:** Two Seminars and an Informal Speaker's Meeting Regarding Water Issues Affecting Grand Valley Water Supplies.
- WHEN AND WHERE:** Tuesdays, March 7, 14 & 21, 1995, 7:00 - 9:00 p.m., County Commissioners Meeting Room, 750 Main Street, Grand Junction, Colorado

Course Content

- Introduction and Overview of Colorado Water Law
 - What is a Water Right, Legally and Physically
- Videos and Explanation of the Major Rights in the Grand Valley for:
 - Irrigation, Household Use
- State and Federal Issues Affecting Grand Valley Water
 - Upstream Users on the Colorado and Gunnison Rivers: Front Range and Ski Area
 - Competition for Grand Valley Water
- The Endangered Species Act -- Discussion of the Pros and Cons Affecting the Grand Valley
- Major Water Court Cases Involving Grand Valley Water Supplies
- Speakers Night and Informal Discussion in Conjunction With Short Regular Meeting of the Mesa County Water Association

Contact: Mesa County Water Ass'n., Box 572, Fruita, CO 81521 or call Ruth Hutchins (858-7363) or Marjorie Miller (242-7490).

CALLS FOR PAPERS

Society for Conservation Biology

June 7-11, 1995, Fort Collins, CO. Symposia include: Habitat Conservation Planning, Theory and Design of Nature Reserves, The Wildlands Project: Underlying Ecological Principles, and Sustainability and Conservation Biology: Common Ground or Points of Departure? Contact: Rick Knight, Dept. of Fishery & Wildlife Biology, Colorado State Univ., Fort Collins, CO 80523, Phone 303/491-6714.

1995 ASDSO Annual Conference

September 17-20, 1995. Atlanta, GA. Association of State Dam Safety Officials. For entry form for abstracts contact: ASDSO, 450 Old East Vine St., 2nd Floor, Lexington, KY 40507. Phone 606/247-5140; FAX 606/323-1958. Deadline: March 1, 1995.

CONSERV 96 Conference and Exposition

January 4-8, 1996, Orlando, FL. The only large-scale program dealing exclusively with water conservation. For abstract forms or general information contact Rick Harmon, American Water Works Association, 303/347-6195. Deadline: March 31, 1995.

Water Quality International '96

June 23-28, 1996, Singapore. For abstract instructions contact: International Association on Water Quality (IAWQ), 1 Quenn Anne's Gate, London SW1H 9BT, England. Tel: 44-171-222-3848; FAX 44-171-233-1197; Tlx 9188518 WATAD G. Presenters must pay registration fee and own expenses. Deadline: July 1, 1995.

WHOSE THIRST IS FIRST? A NEW PARADIGM FOR WATER MANAGEMENT?

THE UNIVERSITIES COUNCIL ON WATER RESOURCES ANNUAL MEETING PORTLAND, MAINE, August 1-4, 1995

"Integrated Resource Protection" -- "Integrated Watershed Management" -- "Ecosystem Management" -- There are many expressions being used to describe a more holistic approach to water management within a total watershed/ecosystem framework. To some, these words elicit a sigh of, "Here we go again!" To others, the words reflect a major paradigm shift in water management. To still others, the terms imply a threat to "take" water from existing uses and give it to other uses. What

is really happening? UCOWR's 1995 annual meeting will examine the nature of changes taking place in society's efforts to manage water and reflect on the impacts these changes may have upon the water education, research and outreach efforts of higher education. This meeting is a must for those trying to understand the changes taking place in water management during the 1990s, and, in particular, those trying to determine higher education's role in these new initiatives.

Paper and poster presentation proposals are solicited on the following topics:

- Integrated watershed management: A better approach to water management or more unfunded mandates?
- Ecological integrity - a better water management goal or an excuse for "takings"?
- Economic and social integrity - competing objectives?
- Urban stormwater management vs. urban riparian ecosystems!
- Ecosystem restoration - how?
- Case studies describing "Integrated watershed management"
- Integrated education for watershed management - current status?
- Coastal Zone Management - An effective NPS strategy?

Send three copies of each proposal to the Technical Program Chair, Robert Ward, Colorado Water Resources Research Institute, Colorado State University, Fort Collins, Colorado 80523. Phone: 303/91-6308; FAX: 303/491-2293. Proposals should be limited to 1000 words and must include affiliation and position of the author(s), address(s), and daytime telephone and FAX numbers. Speakers are expected to register for the conference. Participants will receive a copy of the Proceedings. Deadline: March 1, 1995. Authors will be notified of acceptance by April 1, 1995.

Conference Site: The conference will be held at the Holiday Inn by the Bay in Portland, Maine. The conference hotel offers rooms with breathtaking views of Casco Bay or the White Mountains of New Hampshire. Sailing, golfing, salt water fishing, walks through historic Old Port or along Portland's beaches, and excellent seafood are offered along with outstanding conversations about evolving water management strategies!

MEETINGS**PROBLEMS AND TOOLS IN MANAGING GROWTH**

March 3, 1995

CU Law School, Boulder, Colorado

Often the burden of new development falls on local government, whose regulatory tools include the use of zoning powers, incentive-based approaches, and special designations of areas as "historical districts," "land preservation units," or "wetlands." Governor Romer has been invited to talk about his nine-point plan for managing growth in Colorado, and a separate panel following the Governor will examine the state's role in greater depth.

Other speakers include Attorney General Gale Norton (invited); former State Representative Ruth Wright; Weld County Planning Director Chuck Cunliffe; Denver attorney Skip Spensely; State Representative Ken Gordon; Boulder County Attorney Larry Hoyt; Blaise Rastello from Routt County; and Any Hammano, attorney with the Nature Conservancy in Boulder. For information call Kathy Taylor at the Natural Resources Law Center, 303/492-1288; FAX 492-1297.

PARADIGMS IN TRANSITION: NATURAL RESOURCES MANAGEMENT IN THE NEW CENTURY

April 11, 1995

*Cherokee Park Room of the Lory Student Center, Colorado State University
Admission is free and the public is welcome to attend.*

Featuring:

Curt Meine, Susan Jacobson, Robert Costanza, Steward Pickett, Mark Brunson, and Patricia Nelson-Limerick

This forum will serve as a stage where historians, economists, ecologists, sociologists, and educators critically appraise the history and reasons for the present-day changes, and attempt a look into the future. How did we get here, what factors initiated this tumultuous period of change, and future forecasts will be the topics of speakers chosen to present hard-hitting and incisive

summaries. Sponsored by the Environment and Natural Resources Policy Institute at Colorado State University, and the Colorado State University Chapter of the Society for Conservation Biology. For further information contact Richard Knight at 303-491-6714, Joyce Berry at 303-492-5405, or Dan Binkley at 303-491-6519.

YOUTH AND THE ENVIRONMENTAL INDUSTRY**Partnerships for Education and Employment**

March 30-31, 1995

Executive Towers Hotel, Denver, Colorado

Conference Concept -- Integrated efforts and partnerships are needed where government, industry, education and non-governmental and volunteer organizations work together on youth and environmental programs, especially those concerned with at-risk youth. This conference will focus on how partnerships can be used to coordinate and integrate separate program efforts such as jobs and internships, counseling for careers and academic, curriculum development, mentoring, recruitment and retention, and teacher development.

Conference plan -- The first day will feature presentation of papers and abstracts. On the second day, workshops will focus on special topics and summaries. Adjourn by 3 pm.

For information contact: Neil S. Grigg or Janet Montera, Department of Civil Engineering, Colorado State University, Fort Collins, CO 80523. Tel: 303-491-7425 Fax: 303-491-7727.

15TH ANNUAL HYDROLOGY DAYS

April 3-7, 1995

Fort Collins, Colorado

The five-day program will include volunteered papers (mostly), invited papers (a few), and student papers (one full day at least). A written paper is not mandatory for participation in the program. Awards and prizes will be presented for the best student papers as oral or poster presentation in two or three categories: B.S. and/or M.S. and Ph.D. candidates. Registration

Fees/Information -- Regular: \$140.00 by March 10, 1995; \$170.00 after March 10, 1995. Students: Free by March 10, 1995; \$10.00 after March 10, 1995. For registration and general information, contact: Janet Montera, Hydrology Days, Civil Engineering Department, Colorado State University, Fort Collins, CO 80523. Tel (303) 491-7425, FAX (303) 491-7727.

UPPER ARKANSAS RIVER RESEARCHERS WORKSHOP

April 17-18, 1995

The Upper Arkansas Basin of Colorado is a hot-spot for water-related research. Numerous state, federal, academic and private organizations have been active in the basin for the past several years. Who is studying what? What have they learned? What else needs to be learned? These questions will be discussed at the Upper Arkansas River Researchers Workshop, April 17-18, at the Canon Inn, Canon City, Colorado. Workshop sessions on Riparian and Wetland Vegetation; Water and Sediment

Chemistry; Fish, Macroinvertebrates, and Toxicity; Databases; and Computer Modeling have been designed to provide a complete look at research in the basin. Facilitated discussions will also allow participants to identify future needs. A document compiling all the research activities in the watershed will be completed. *For more information contact Jeff Keidel, P.O. Box 938, Buena Vista, CO 81211 or call 719/395-6035.*

RMSAWWA MONTHLY LUNCHEON MEETINGS IN DENVER AREA

RMSAWWA (Rocky Mountain Section, American Water Works Association) will host a series of monthly luncheon meetings at:

Ramada Hotel
8773 Yates Drive
Westminster, Colorado
Boulder Turnpike and Sheridan Blvd.

11:30 am - 1:00 pm

\$10 includes buffet, beverage, tax, tip

March 16	April 20
May 18	June 15
July 13	August 17
Sept. 21	October 19
November 19	December 14

For program information and reservations contact:

EMPLOYMENT OPPORTUNITIES

CH2M Hill--Full time Entry-Level Hydrogeologist/Groundwater Hydrologist. Contact: Ms. Kathy Metzger, CH2M Hill, 2485 Natomas Park Drive, Suite 600, Sacramento, CA 95833. Phone 916/920-0300; FAX 916/920-8463; Internet: gvogt@rdd.ms.ch2m.com.

University of New Mexico--Postdoctoral Position in Hydrology. Contact: Dr. Michael E. Campana, Dept. of Earth and Planetary Sciences, Univ. of New Mexico, Albuquerque, NM 87131-116. Phone 505/227-3269; FAX 505/277-8843; e-mail: aquadoc@unm.edu). Deadline: March 1, 1995.

University of Illinois--Invites applications for four regular, full-time tenure track faculty appointments at Assistant Professor rank or higher. Contact: Prof. Neil M. Hawkins, Head, Dept. of Civil Engr., Univ. of Illinois at Urbana-Champaign, 114 Newmark Civil Engr. Lab., 205 No. Mathews Ave., Urbana IL 61801. Phone 217/333-3814. Deadline: April 28, 1995.

CALENDAR

1995

- Feb.28-
Mar. 1 **PLATTE RIVER BASIN ECOSYSTEM SYMPOSIUM**, Kearney, NE. Contact: Micke Eckert, Platte Watershed Program Coordinator, 221 L.W. Chase Hall, University of Nebraska, Lincoln, NE 68583-0726. Phone 402/472-0891; FAX 402/472-6338.
- Mar. 5-8 **CLEAN WATER-CLEAN ENVIRONMENT-21ST CENTURY**, Kansas City, MO. Contact: ASAE Meetings & Conferences, Phone 616/429-0300; FAX 616/429-3852.
- Mar. 9-10 **WESTERN WATER LAW**, Denver, CO. Contact: CLE International, 1541 Race St., Suite 100, Denver, CO 80206. Phone (800)873-7130; FAX 303/321-6320.
- April 2-5 **5TH MULTIDISCIPLINARY CONFERENCE ON SINKHOLES AND THE ENGINEERING AND ENVIRONMENTAL IMPACTS OF KARST**, Gatlinburg, TN. Contact: Barry F. Beck, P.O. Box 4412, Oak Ridge, TN 37831-4412. Phone 615/483-7483.

- April 2-6 MICROIRRIGATION FOR A CHANGING WORLD: CONSERVING RESOURCES/PRESERVING THE ENVIRONMENT, Orlando, FL. Contact: ASAE, 2950 Niles Rd., St. Joseph MI 49085-9650
- April 17-18 UPPER ARKANSAS RIVER RESEARCHERS WORKSHOP, Canon City, CO. Contact: Jeff Keidel, P.O. Box 938, Buena Vista, CO 81211 or call 719/395-6035.
- April 20 RMWPCA MID-YEAR CONFERENCE, Northglenn, CO. Contact: Jose Velazquez, Camp Dresser & McKee, Inc., 1331 17th St., Suite 1200, Denver, CO 80202. Voice 303/298-1311; FAX 303/293-8236.
- Apr. 23-26 WATER IN THE 21ST CENTURY; CONSERVATION, DEMAND & SUPPLY, Salt Lake City, UT. Contact American Water Resources Association, Phone 703/904-1225; FAX 703/904-1228.
- May 14-18 WATER RESOURCES AT RISK, Denver, CO. Contact: Helen Klose, Amer. Inst. of Hydrology, 3416 Univ. Ave., SE, Minneapolis, MN 55404, Phone 612/379-1030.
- May 23-25 WORKSHOP ON COMPUTER APPLICATIONS IN WATER MANAGEMENT, Fort Collins, CO. Contact L.R. Ahuja, USDA-ARS, Phone 303/490-8300; fax 303/490-8310.
- June 9-11 1ST CONFERENCE, ASSOCIATION FOR THE STUDY OF LITERATURE AND ENVIRONMENT, Fort Collins, CO. Contact: Office of Conference Services, Colorado State University, Phone 303/491-6222 or e-mail at asleconf@vines.colostate.edu.
- June 25-28 WATER RESOURCES & ENVIRONMENTAL HAZARDS: EMPHASIS ON HYDROLOGIC & CULTURAL INSIGHT IN THE PACIFIC RIM, Honolulu, Oahu, Hawaii. Contact American Water Resources Association, Phone 703/904-1225; FAX 703/904-1228.
- July 2-14 INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS, Boulder, CO. Contact IUGG XXI General Assembly, c/o American Geophysical Union, Phone 202/462-6900, FAX 202/328-0566, e-mail iugg_xxiga@kosmos.agu.org.
- Sept. 18-20 VERSATILITY OF WETLANDS IN THE AGRICULTURAL LANDSCAPE, Tampa, FL. Contact American Water Resources Association, Phone 703/904-1225; FAX 703/904-1228.
- Oct. 21-25 WATER ENVIRONMENT FEDERATION 68TH ANNUAL CONFERENCE & EXPOSITION, Miami Beach, FL. Contact: Water Environment Federation, 601 Wythe Street, Alexandria, VA 22314-1994. Phone 800/444-2933.
- Nov. 5-9 1995 NATIONAL CONFERENCE OF THE AMERICAN WATER RESOURCES ASSOCIATION, Houston, Texas and Reconvened Conference Nov. 10-12, 1995, Cancun, Mexico, General Chairperson, Bechtel, 3000 Post Oak, Houston, TX 77252-2166, Phone 713/235-4921.
-