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

	LIBRARIES	continuing disintegration but he aware of the si- influence over it. In st
WATER ITEMS AND ISSUES	JAN 18 1991 COLORADO STATE UNIVERSITY	January 1991
Water International, <i>Editorial by Neil S. Grigg</i> Colorado Water Engineering and Management Conference Rocky Mountain Flood and Climate Workshop		
AWRA Meetings - Water Project Development and Financin The Colorado Legislative Agenda and Up Water Conservation Issues	g in the 1990s pecoming	6
University Water News - Includes Request for Preproposals From Cooperative Extension	y Charles W. Howe	
COLORADO WATER INTERNATIONAL - First edition of	of International Newsletter	Centerfold
Water Resources Education Designated Pr Egypt Water Center Project Helps Improv US/Canada Research Seeks Remedy for O Vlachos Organizes International Events, F International Water Activities at Colorado Conferences, Short Courses, CIIM, IICE,	rogram of Excellence by CCHE   ve Ag Production   Chlorinated Solvents in Groundwater   Publications   State   ISWR Programs for 1991	
Drought Update		
COLORADO WAT AND MANAGEMH February See Page 2 for G See Page 3 for 3	TER ENGINEERING ENT CONFERENCE 27-28, 1991 eneral Information Fentative Program	
		Transp



U18400 7536840

aniver aw - available its

# WATER INTERNATIONAL

#### Editorial by Neil S. Grigg

This January, as we watch the Persian Gulf situation and the continuing disintegration of the Soviet Union, we can't help but be aware of the shrinking globe and our diminishing influence over it. In spite of this diminishing influence we still have a leadership responsibility, and improving water resources management is a way that Colorado universities and institutions can help.

If there is any doubt that water is part of the global economy, consider its importance to industry, cities, agriculture, and public health - urgent issues in world development. Our universities can improve their contributions to these issues through education, research and outreach. In particular, Colorado State University seeks to make special contributions in the field of water resources engineering and management.

It is natural that Colorado's land grant university should take leadership in the water resources fields. CSU has made of water resources, and CSU seeks to make more such contributions. Here in Colorado we have faced and overcome the severe water problems of semi-arid environments, and here are located some of the finest water institutions in the world - the Bureau of Reclamation and the Denver Water Department, just to name two.

some landmark contributions to advancement of the science

In this issue of *Colorado Water* we inaugurate a new feature - an international version of the newsletter that readers will find contained as an insert. This international version will be mailed twice yearly to our graduates around the world who work in the water industry and to key water offices that enable many of our students to attend Colorado State Univerity. Through this international version of Colorado Water we hope to improve our communications network among international water managers and to create a forum for increased international understanding of how and why to solve water problems.

# COLORADO WATER ENGINEERING AND MANAGEMENT CONFERENCE Denver Marriott Southeast, February 27-28, 1991

The Colorado Water Resources Research Institute at Colorado State University and the Office of the State Engineer are pleased to present the preliminary program for the Colorado Water Engineering and Management Conference.

**Conference Objective**--The purpose of the Conference is to evaluate technical and management methods necessary to solve water problems in Colorado and the West. It serves as a forum to exchange ideas about technological and management solutions for current state water problems and policies.

**Registration** - There is an advance registration fee of \$175.00 if registration is postmarked and paid by 5:00 p.m., February 6, 1991. The fee for registrations received after that date or on site will be \$200.00. There is a one-day registration fee of \$100.00. Substitution of participants is permitted. The registration package includes one copy of the Conference Proceedings, luncheons, reception, educational displays, refreshments during breaks, and attendance at all sessions.

Accommodations - Block reservations have been made with the Conference Hotel, the Denver Marriott Southeast, Interstate 25 at Hampden Avenue, Denver, CO 80222. For reservations call direct (303-758-7000) or toll-free in the USA (800-228-9290). Please mention the "Colorado Water Conference" to receive a special room rate of \$58.00/night (single/double). This special rate expires February 5, 1991.

**Transportation** - The Hotel is approximately 20 minutes from Denver's Stapleton International Airport via commercial airport limousine service, taxi or rental car.

Educational Displays - We invite your participation in presenting an "Educational Display." This meets one of the

Conference objectives to exchange ideas about technological and management solutions for current state water problems and policies. The displays will provide technology transfer and, therefore, no exhibit fee is associated with the display space. However, the Organizing Committee requires that the Conference registration fee applies to anyone who staffs the display area if they attend the Conference. Please contact Janet Lee Montera (address below) if you are interested in this opportunity. Educational Displays must be finalized by January 31, 1991 on a first come, first serve basis.

#### For general information:

Janet Lee Montera Civil Engineering Department Colorado State University Fort Collins, CO 80523, USA Telephone: 303-491-7425 Fax: 303-491-7727

#### **Cooperating Organizations:**

American Water Resources Association, Colorado Section; Bureau of Reclamation; Colorado Water Conservation Board; League of Women Voters; Natural Resources Law Center, University of Colorado; US Geological Survey, Water Resources Division, Colorado District; and Wyoming Water Research Center, University of Wyoming.

Colorado Colorado State University: Agricultural & Chemical Engineering Department, Agricultural Experiment Station, Civil Engineering Department, Colorado Institute for Irrigation Management, Cooperative Extension, and International School for Water Resources.

2

#### PRELIMINARY PROGRAM COLORADO WATER ENGINEERING AND MANAGEMENT CONFERENCE

8:00 a.m. Wednesday, February 27, 1991 - Registration

#### **Opening Session**

Session 1 (Plenary): Topics: Environmental Concerns in Water Resources - New Developments and Thoughts New Decision Processes Needed for Colorado's Water Resources Water Transfers in the West - Results of Latest Research Global Climate Change Research How the Legislature Views Water Issues and Needs Water Views From the Attorney General's Office Bureau of Reclamation's Water Program - New Directions and Priorities California Water Policies - Will Their Trends Hit Colorado? Western History - How It Impacts Water Resources

Luncheon - "Future of Water Resources Management: 2000 and Beyond": Evan Vlachos

#### CONCURRENT SESSIONS

# Session 2A: Water Policy and Management

"Water Management - Colorado's Oxymoron": A. S. "Andy" Andrews

"The Riparian Doctrine vs. the Appropriation Doctrine - Is Integration the Answer?": Kathleen C. Klein

"Who Can Judge? Real Time Benefits of Reclamation to Colorado": Loretta C. Lohman

"Some Measures of the Economic Impacts of a Large-Scale Rural to Urban Water Transfer": Robert A. Young and R. Garth Taylor

#### Session 2B: Controlling Salinity in the Colorado River System

"The Colorado River Salinity Program: An Overall Perspective": S. W. Gappa "The USDA Colorado River Salinity Control Program": Kenneth A. Pitney "Why and How, Colorado River Salinity Control - A State Perspective": Jack Barnett "Salinity Control - A Feature of the Dolores Project": Errol Jensen and Ken Beck

#### Session 2C: Groundwater Management

"High Water Table Irrigation Management for the Alamosa-La Jara Delivery System of the San Luis Valley, Colorado": Brian G. Leib

"The Role of Tributary Groundwater in Irrigated Crop Production in the South Platte Basin: Results From a Survey": P. K. Bash and R. A. Young

"Simulation of Shallow Groundwater in the Morgan Drainage District to Test Alternative Management and Structural Strategies": Yasuhiro Sakai

"Infiltration Trenches: Lot by Lot": Robert J. Houghtalen

# Session 3A: Water Supply Development

"Leveraging a Scarce Resource by Conjunctive Water Resources Development": Uli Kappus, Steve Boand and Carmine Iadarola "Loveland Water Supply Study: Planning to Meet a City's Future Raw Water Needs": Joe Stibrich, Larry Howard and Jeff Heden

"Groundwater: The Solution to Glendale's Water Supply Problems": Gary Sears and Leo M. Eisel

"Water Issues for Urban Water Supplies": Joe Bergquist, E. June Busse and Curtis A. Thompson

# Session 3B: Water Quality Management

"Eutrophication of Bear Creek Reservoir Affects Basin Wastewater and Non-Point Source Management": Russell N. Clayshulte "Determination of Dispersion Coefficient in Solute Transport": Hubert J. Morel-Seytoux and Mahmood Nachabe "Groundwater Pollution Assessment in the San Luis Valley": D. A. Ellerbroek, K. R. Thompson, D. S. Durnford

and G. S. Davis

"Lake Management Plan for a Reclaimed Water Lake": Laurel S. Saito

#### Session 3C: Groundwater Issues and Possibilities

"Identification of Aquifer Parameters": Hubert J. Morel-Seytoux and Xianiou Guo "Study of Near-Surface Flow Through Soil Macropores": Tissa H. Illangasekare "Phase 1 Aquifer-Test Results From OX-2 Ouray, Colorado": J. M. Kaufman and J. B. Wesley "Water Supply: An Alternative to Dams": Greg Storozuk

# **Reception with Educational Displays**

Thursday, February 28, 1991

#### 7:30 AM Registration

Session 4 (Plenary)

#### CONCURRENT SESSIONS

#### Session 5A: Computer Aided Decision Support I

"Use of Reservoir Simulation in Evaluation of Fryingpan-Arkansas Project": Donald Frevert and Roger Weidelman "Dynamic Programming Model for the Capacity Expansion of an Integrated Treated Water Supply System": Keqiang Mao

and Dennis A. Bode

"Williams Fork Reservoir Inflow Forecasting Using Stepwise Multiple Linear Regression": Robert G. Steger "Forecasting Monthly Flows in the Rio Grande System": Jose D. Salas and Ding-Chin Wang

# Session 5B: Water Resources Engineering

"Small Parshall Flume Rating Correction for Settlement": Steven Abt, Christopher Cook, Kenneth Staker and Richard Belt "Water Management and Conservation: Reclamation's Hydraulic Research": Philip H. Burgi

#### Session 5C: Environmental Concerns in Water Resources

"An Overview of the Global Climate Change Response Program": Ronald J. Schuster

Luncheon: "Water Resources Education Forum" Moderator: Neil S. Grigg Speaker : John Kaliszewski - "Assessing the Public's Knowledge and Perceptions of Colorado Water" Speaker : Tom Cech - "Educating Colorado's Public About Water Resources

Session 6A: Computer Aided Decision Support II

"Visualizing Groundwater Flow Model Results Using Public Domain Scientific Visualization Software": Roland H. Schweitzer and David W. Zachmann

"Development of an Advanced Decision Support System for the Upper South Platte Basin": J. Ernest Flack, David Sieh and Charles Haines

"Development of a Groundwater Model of the Denver Basin with Preliminary Evaluation of the Use of Groundwater in Times of Drought": Sigurd Jaunarajs and Eileen Poeter

"Valuation by Visualization in Water Resources Planning": Lynn E. Johnson

#### Session 6B: Agricultural Water Issues

"Farm Irrigation Performance in the Southern San Luis Valley": Mustafa Baskan

"Conserving Colorado--Water, Energy, and Soils": Peggy J. Plate and Carrol E. Hamon

"Conserving Water Through Management Changes on the Newlands Project": Franklin E. Dimick

"Effects of Irrigation Water Supply Variations on Limited-Resource Farm Operations in Conejos County":

Erda Wang and Jerry B. Eckert

#### Session 6C: Stormwater

"Stormwater Quality Monitoring - One Approach": Cynthia Paulson "Basic Urban Drainage Uncertainties": D. Earl Jones, Jr. and Jonathan E. Jones "NPDES Permitting - Is There Something Missing?": William P. Ruzzo

#### Session 7A: Water Administration and Management

"Drought Management in Southwest Colorado 1990": Daries C. Lile "Water Right Transfers in Northeast Colorado: Changes and Trends": Ari M. Michelsen "Myth No. 3 Revisited, Soil Moisture Carryover Depletion Credits - Larceny by Design or Ignorance?": Ralph T. Toren "Hydrologic and Thermal Analyses of a Ground Water Supply for a Fish Hatchery in Central Washington": Catherine Kraeger-Rovey

#### Session 7B: Groundwater Issues

"Groundwater Recharge for Effective Water Management": Bruce P. Glenn "Denver Basin Aquifers Iron Management": F. Robert McGregor and Kenneth R. Wright "Studies of Surface Ground Water Interactions in Four Arizona Stream Systems": Catherine Kraeger-Rovey "Conjunctive Use Management in Idaho - Past Experiences and Proposed Solutions in the Boise River Basin and the Big Lost River Basin": David R. Tuthill, Jr.

Friday, January 25, 1991

Session 7C: Water Quality Issues

Session to be organized by the Colorado Department of Health

## **ROCKY MOUNTAIN FLOOD AND CLIMATE WORKSHOP**

Climatology and flood hydrology of the Rocky Mountains were the topics of a workshop held in Lakewood, Colorado October 4-5, 1990. Ninety-one people participated in the workshop, which was organized by Robert Jarrett of the U.S. Geological Survey, John Liou of the Federal Emergency Management Agency, and Doug Laiho of the American Society of Civil Engineers.

The workshop focused on some of the recognized complexities in the hydrometeorology of Rocky Mountain floods, caused by the effects of rough mountain terrain on meteorology, snowmelt and rainfall flooding, and limited rainfall and streamflow data. The current theories and methods used to estimate flood flows in the Rocky Mountains, particularly estimation of the probable maximum precipitation (PMP) and the probable maximum flood (PMF), have been questioned by hydrologists and engineers for some time. The purposes of the workshop were to: (1) review the current understanding and ongoing research of floods in the Rocky Mountains, both frequent and extreme floods (including the PMF); (2) bring together scientists, engineers, and flood-plain managers in government, industry, consulting firms, and universities; and (3) provide a mechanism for the exchange of ideas and technology between climatologists, meteorologists, hydrologists, engineers, and managers.

The workshop was organized into four sessions: Rocky Mountain Flood Hydrology Overview; Relations of Climatology and Meteorology to Flood Hydrology; Survey of Conventional Flood Hydrology Study Methods used in Rocky Mountain Areas; and New Ideas Applicable in the Rocky Mountains. Each invited speaker provided an overview of his role in hydrometeorology of floods related to the goals of the workshop. The speakers, in order of presentation and their general topics were:

Stephen Spann, Office of Colorado State Engineer, real versus regulatory hydrology; Marshall Hansen, National Weather Service, recent precipitation studies; Thomas McKee, Colorado State University, climate related to large rainstorms; Chuck Leaf, consulting snow hydrologist, snow hydrology in the Rocky Mountains; Larry Tunnel, National Weather Service, lack of high-elevation rainstorms; Robert Webb, U.S. Geological Survey, hydroclimatic flood-frequency analysis (presented by Vic Baker, University of Arizona); William Cotton, Colorado State University, cloud modeling of flashflood potential; John Henz, Henz Meteorological Services, high-elevation thunderstorms; John Liou, flood-insurance William Stanton, Colorado Water study methods; Conservation Board, regional flood-frequency relations; Doug Clementson, U.S. Army Corps of Engineers, mixedpopulation flood-frequency analysis (presented by John Liou); Dave Sveum, U.S. Bureau of Reclamation, BOR flood studies; Jose Salas, Colorado State University, recent developments in flood-frequency analysis; Mel Schaefer, Washington Office of Dam Safety, extreme storm characteristics and inflow design flood maximization; Vic Baker, applied paleoflood hydrology; and Robert Jarrett, paleohydrology in the Rocky Mountains. The workshop concluded with a 1/2-day field trip in Clear Creek canyon, west of Denver, to discuss paleohydrologic techniques to analyze floods, and to determine how paleoflood hydrology can be used to complement engineering hydrology.

During panel discussions, participants discussed need to: (1) assess the accuracy of reported extreme-value rainfall and flood data; (2) determine the acceptable differences on flood estimates; (3) evaluate nonstationarity of floods related to climate change; (4) evaluate the causes of the upper elevation limit of significant rainfall-produced flooding in the Rocky Mountains; (5) incorporate atmospheric models to improve the understanding of the physics of flood-producing storms; (6) determine if antecedent-moisture conditions have an important role in generating floods; (7) determine the acceptable level of risk for the hydrologic design in dams; (8) determine how to allocate limited resources given the costs of retrofitting dams and designing new spillways for the PMF; (9) determine how paleoflood data can be used in engineering hydrology; and (10) determine additional data and research needs to help resolve the above issues. Conference attendees agreed there is a critical need for additional research and studies to resolve the above issues,

which would decrease the uncertainties in estimating floods in the Rocky Mountains. To obtain more information about the workshop or to order copies of the workshop handout

> AWRA – COLORADO SECTION AND THE COLORADO WATER RESOURCES RESEARCH INSTITUTE

#### PRESENT

#### WATER PROJECT DEVELOPMENT AND FINANCING IN THE 1990s

Friday, February 1, 1991

8:30 am to 4:30 pm Brittany Hill Restaurant 9350 Grant Street, Thornton

This one-day conference will provide a forum to discuss the initial planning, permitting and financing considerations involved in water project development as well as altermatives to new project development. The conference will feature presentations on:

Evolution of the Planning Process Planning for Future Water Supplies Economics of New Project Development Bond Market Outlook Alternative Funding Sources Environmental Permitting Considerations Changing Role of Local, State, and Federal Agencies

Public, Professional & Media Perceptions of Water Development materials contact Robert Jarrett, U.S. Geological Survey, B<sub>0x</sub> 25046, MS 412, Denver, CO 80225-0046 (303-236-6447).

#### AWRA -- COLORADO SECTION

#### PRESENTS

THE COLORADO LEGISLATIVE AGENDA AND UPCOMING WATER CONSERVATION ISSUES

Friday, January 25, 1991

11:30 Lunch 12:15 Presentation

Wyatt's Cafeteria Lakeside Mall 5801 West 44th Avenue, Denver

Judy Kriss, Legislative Liaison of the Colorado Water and Power Authority, will outline the 1991 slate of legislative proposals involving water issues. Kim Hout, Water Conservation Coordinator for the State of Colorado, will discuss water conservation issues facing the legislature and the Department of Natural Resources.

There will be no registration for this program. Lunch to be purchased at your own expense. For more information, call Kate Berry at 320-4400 or Blaine Dwyer at 773-3788.

Please make a reservation for me at the February 1 program titled Water Project Development and Financing in the 1990s.

Name:	S) teteb boolt		
evaluate nonstationanty of floods related to			
Affiliation:	climate chang	Relations of	sounain Plood Hydrology Overview
Address:	Mountaine	Methods used in	Conventional Flood Hwibology Study
Phone:	Amount Enclosed:	ter provided an	
it in generating floods: (7) determine the		hereign aboolt to	everyiew of his role in hydromet.emiopy
The registration fee for this one-day conference	e, including lunch a	nd refreshment brea	aks, is:
Member of AWRA-Colorado Section	\$45	Please mail your	r registration form and check no later than
Non-member	\$50	January 25 to:	Conference
Non-member plus membership in			AWRA-Colorado Section
AWRA-Colorado Section	\$55		P.O. Box 9881
Student	\$30		Denvr, CO 80209

For more information call Kate Berry at 320-4400 or Jerry Kenny at 987-3443.

# UNIVERSITY WATER NEWS

#### **REQUEST FOR PREPROPOSALS**

#### CLOSING DATE: February 15, 1991

Preproposals are invited for the Colorado Water Resources Research Institute FY 1991-92 water research program. CWRRI is especially interested in projects that feature collaboration between university researchers and water management organizations. Demonstrating collaboration in the preproposal stage will enhance the possibility of an award. Highest priority will be given to projects that address Colorado's most critical water problems: water use efficiency, Colorado water law, policies and institutions; water quality; management; enhancing fish and wildlife and recreational opportunities; and improving water supplies for economic development.

Specific technical topics identified as high priority by CWRRI's Research Planning Advisory Committee are:

Conjunctive management of surface and groundwater

Economic value of nonconsumptive water uses Economics of alternative strategies for fishery enhancement Fate of metals in Colorado streams

Technology for new uses of the satellite stream monitoring System

Improvement in drought forecasts

Improvement in runoff forecasts: flood, late season Preservation of wetlands: economic costs and benefits Improvement in urban storm runoff control measures Biological effects of metals on aquatic organisms Streamflow criteria for flow-based discharge permits Reclamation of polluted groundwater Evaluation of impacts of water exports on basin-of-origin Technology for effective groundwater recharge

Project Duration--Awards will be made for one year beginning September 1, 1991.

Funds Available--For 1990-91 CWRRI awarded ten projects with direct costs in the range of \$10-20,000. Awards for 1991-92 will depend on CWRRI's receiving an appropriation from the Colorado Legislature.

<u>Review Procedures</u>--Preproposals will be evaluated by the Technical Advisory Committee (faculty of CU, CSM and CSU) and by the Research Program Advisory Committee (practitioners). Authors of preproposals judged to have a strong chance of final award will be invited to prepare full proposals. Criteria of selection include: (1) relevance of research product to priority Colorado water problems; (2) scientific merit; and (3) performance record of principal investigator.

<u>Eligibility</u>--Open to regular, full-time faculty of Colorado State University, the University of Colorado and the Colorado School of Mines.

For additional information call the CWRRI office at 491-6308.

#### PAPERS AVAILABLE ON CWRRI AGRICULTURE/URBAN WATER TRANSFERS PROJECT

Readers interested in obtaining the papers described in the following abstracts may contact CWRRI at 491-6308. The research described was supported by CWRRI and the Colorado State University Experiment Station. The papers were presented at the Seminar on Water Allocation and Transfer Systems in a Maturing Water Economy, University of New England, Armidale, NSW, Australia, July 4-6, 1990.

#### Drought-Year Options on Agricultural Water Rights for Urban Water Supplies

# Ari M. Michelsen, University of Wyoming Robert A. Young, Colorado State University

Water supply option contracts have been suggested as an alternative to conventional methods of water supply management. A drought-year water supply option contract is an agreement between farmers and an urban water user to transfer water when needed during critical drought periods from agriculture to the urban user. Option contracts may have the potential to provide municipal/industrial drought insurance at lower cost while maintaining the agricultural production base. This paper identifies requirements implementing water option contracts, develops an economic method to evaluate options, and discusses economic, institutional, and hydrologic considerations bearing on the feasibility of water supply option contracts.

#### Some Measures of the Economic Impacts of a Large-Scale Rural to Urban Water Transfer

Robert A. Young, Professor R. Garth Taylor, Post-doctoral Research Associate Colorado State University

Water rights from over 40,000 irrigated acres in Crowley County in southeastern Colorado have been purchased for transfer to growing Colorado Front Range cities. This paper develops some preliminary economic estimates of direct gains and losses. Foregone direct economic benefits in farming are compared with published estimates of economic benefits to urban water users. Estimates of losses on farms and in the local area are compared with employment associated with the urban use of the equivalent water supplies. Costs of mitigating adverse environmental impacts (by planting grasses) on dried-up farm lands are estimated, and expressed in unit water-volume terms.

#### COOPERATIVE EXTENSION SPONSORS WORKSHOP ON WATER QUALITY IN IRRIGATED AGRICULTURE

Topics of interest at this workshop, to be held January 16-17 at Colorado State, include: an explanation of the Agricultural Chemicals and Groundwater Protection Act (SB126) by Lloyd Walker, Extension Agricultural Engineer; a progress report on the NCWCD Water Quality Program by Mark Crookston, NCWCD; and a field evaluation of irrigation to improve water management by Israel Broner, Extension Agricultural Engineer. The program will also feature presentations on pest and nutrient management; use of organic fertilizers; effects of soil compaction, overirrigation, and use of nitrogen; and the movement of solutes through soils. The program also includes a demonstration of Water and Fertilizer Management Programs at CSU's Computer Lab and a tour of the Soil and Water Testing Lab. For information contact Israel Broner at 491-6172.

# INTERN COMPLETES WORK WITH CHAMBER

Guy Ragan, graduate student in the Department of Economics, has completed a year's stay as research assistant for the Fort Collins Chamber of Commerce. Ragan's initial assignment was with the Chamber's Water Resources Committee, where he focused on the economics of water resources. Another project involved Ragan in an Urban Growth Focus Group, organized to discuss issues related to urban growth in Fort Collins. Ragan said the group found that there is a potential for agreement among diverse parties such as environmentalists and real estate developers if only they had the opportunity to talk together. "Economic theory provides a systematic framework in which to view problems associated with urban growth," said Ragan. His work with the Water Committee "...prompted a greater interest in water in particular and resource economics in general," said Ragan. He will now focus on his dissertation research related to consumer costs that result from salinity in residential water distribution systems.

# ENGINEERING GRADS HELP COMPUTERIZE WATER MANAGEMENT

On November 5 CWRRI Director Neil Grigg visited with several CSU graduates employed by the South Florida Management District, Palm Beach, to discuss their work there. A District goal is to have real-time database and system control capabilities which are now in the "experimental" phase. CSU alumni currently with the District are:

Ronald Mierau, with the District since 1973 and Director of the operations division in the O&M Department, who occupies a key position in planning the District's computerbased operation (MS Civil Engineering);

Vinio Floris, O&M Department, involved in developing expert systems technology for the District (MS and Ph.D, Civil Engineering);

Mariano Guardo (MS and Ph.D Civil Engineering) and Nestor Garrido (MS Civil Engineering, Ph.D Agricultural Engineering) Research and Evaluation Department, concerned with inventorying and planning surface water resources;

Jorge Restrepo (MS and Ph.D, Civil Engineering), Research and Evaluation Department, involved mainly with groundwater issues; and

Jayantha Obeysekera (Ph.D in Civil Engineering and former CE faculty member), and Hosung Ahn (MS and Ph.D Civil Engineering) with the District's Planning Department.

#### SOUTH PLATTE RIVER RESOURCE MANAGEMENT CONFERENCE WELL-ATTENDED

On November 13-14, 1990, the South Platte River Resource Management Conference was held in Fort Collins, Colorado, The conference was sponsored by the Colorado Division of Wildlife, Northern Colorado Water Conservancy District, U.S. Fish and Wildlife Service, Colorado State University, and the Denver Water Department. Several hundred attendees represented diverse areas of interest regarding the South Platte River, including biology, wildlife and fisheries, hydrology, and water management. In addition to over 25 presentations on these topics, the conference featured keynote speeches by John Van Der Walker of the Whooping Crane Trust and Neil Grigg of Colorado State University.

It was apparent throughout the conference that many people are intent upon managing the South Platte so that it can continue to be a viable and positive resource, but there is little communication and consequently little cooperation among the different interests. It was suggested that an integration of interests is needed, and there appeared to be a desire for a similar conference next year to see what progress is being made. If you are interested in participating in next year's conference or would like additional information, please contact the CWRRI office at 491-6308.

# LEADVILLE CAMPUS TEACHES RECLAMATION

Colorado Mountain College offers a two-year degree in either land reclamation and water quality or water quality and waste management. Some 30 students are enrolled in the program at the Leadville, Colorado campus, and most are in their late 20s and seeking new careers. According to Peter Jeschofnig, who heads the department's water quality program, the job market for students with a degree from the ET program has become "fantastic." "We could place two to three times the number of students we have here," he says.

The school emphasizes practical skills. Summer internships allow students to work with Amax Mining in Leadville, and Domtar Gypsum in Coaldale, on testing and reclamation projects. The Environmental Protection Agency also uses Colorado Mountain College students to work at California Gulch, a superfund site located on the edge of Leadville.

For information, write to Colorado Mountain College, Admissions Office, Box 10001PB, Glenwood Springs, CO 81602.

Source: High Country News, 9/10/90

# AWTRI RECEIVES BOOST THROUGH \$500,000 APPROPRIATION

Congress has appropriated \$500,000 for development of the Denver Water Reuse Plant as a research facility. The plant, which closed December 1990, recycled a million gallons daily from the Metropolitan Denver Sewage District and returned most of the water to the South Platte River. Operated by the Denver Water Department and initiated as an EPA demonstration project in 1979, the plant successfully demonstrated that treated wastewater can be transformed into a safe drinking water supply. With its close in 1990, Colorado State University, the University of Colorado, and the Denver Water Department sought a way to continue the plant's operation as a research facility. The result was formation of the Advanced Water Treatment Research Institute (AWTRI). Since the plant presently can handle only treated Denver Metro wastewater, the appropriation was provided to develop additional source waters. Part of the funds will be used to enhance the laboratory facility. The appropriation was initiated by Senator Tim Wirth and supported in the House by Representative Patricia Schroeder.

#### COOPERATIVE EXTENSION PROGRAM INCLUDES WATER OUALITY, SALINITY CONTROL EFFORTS

Water Quality--The recently enacted Agricultural Chemicals and Groundwater Protection Act gives Cooperative Extension the leading educational role of informing farmers about best management practices. State funding will provide support for a full-time Extension Water Quality Specialist for this purpose. Extension Specialists and administrators are part of a task force to implement this Act and their 1990 activities, which included a total of 24 programs focusing on water quality, demonstrate Extension's commitment to the program. Program topics included pesticide application and handling, safe drinking water, nonpoint source pollution from agriculture, nitrogen and irrigation management, cropping practices, agricultural chemicals, related health issues, and disposal of household toxic chemicals.

Colorado River Salinity Control Program--Lower Gunnison Units 1 and 2 showed improved irrigation water management on 262 acres of farmland and a salt load reduction of 367 tons. Twenty-three meetings/workshops were held to train farmers on irrigation management for better yield, with a total attendance of 558.

In the Grand Valley area surge demonstration units were provided to 35 farm operators as part of a grant from USBR, and units were also provided for four additional sites. SCS data from four fully-monitored fields, totaling 40.2 acres, indicated surge saved from 2.3 to 7.25 tons of salt per acre during the irrigation season. Assuming an average salt savings of 4.35 tons per acre, the salt savings for all units, totaling 178.8 acres, was 777 tons.

#### WATER OUALITY PROGRESS REPORT **ISSUED BY USDA/SCS**

USDA/Cooperative State Research Service has released a 1990 Groundwater Quality Progress Report for 23 two-year research projects initiated in 1989. Funds provided by USDA/CSRS helped support research on processes involved in degradation of water quality and for the development of soil, water, and crop production practices and management systems. Forty-six research grants were awarded under the program in FY1990, and the agency expects to make approximately the same number of awards in FY1991 under its Special Research Grants Program, Application Procedures for Water Quality. For additional information contact Drs. Charles M. Smith, Berlie L. Schmidt, or George H. Wagner at 202/401-4504.

# FROM COOPERATIVE EXTENSION

# by Lloyd Walker, Extension Agricultural Engineer

The Agriculture Chemicals and Groundwater Protection Act (Senate Bill 90-126)-The Act took effect on July 1, 1990, and concerns the regulation of activities which could result in agricultural chemicals in the groundwater of the state. Such chemicals include pesticides and commercial fertilizers. Three state agencies are responsible for implementing the Act. The Colorado Department of Agriculture has overall responsibility for implementation of the Act. This includes identifying problem areas, developing methods for mitigating the problem, and promulgating rules and regulations as needed. Colorado State University Cooperative Extension provides education and training in methods designed to reduce groundwater contamination for agricultural chemicals. The Colorado Department of Health will conduct a groundwater monitoring program to assist in identification of problem areas.

The Act requires the Commissioner of Agriculture and the Water Quality Control Commission to work cooperatively in assessing the effectiveness of measures employed to prevent or mitigate groundwater pollution. If the measures do not prove effective, the Water Quality Control Commission shall have final authority to promulgate control regulations.

The Act declares that the public policy of Colorado is to Protect groundwater and the environment from impairment or degradation due to the improper use of agricultural chemicals while allowing for their proper and correct use. The Act calls for education and training of agricultural chemical applicators and the general public regarding groundwater protection, agricultural chemical use, and best management practices (BMPs). BMPs are recommended practices established to prevent or remedy the introduction of agricultural chemicals into groundwater to the extent technically and economically practical. BMPs might include: (1) soil testing, (2) split nitrogen applications, (3) use of slow release nitrogen fertilizers, and (4) irrigation management.

The Act also requires creation of rules and regulations for bulk storage facilities and mixing/loading areas where at least 55,000 pounds of finished agricultural chemical product (tank mix) are handled each year. These rules and regulations are designed to prevent spills and leaks from contaminating groundwater. Those covered by the rules and regulations will likely include commercial applicators (both agricultural and urban), public applicators (municipalities, weed districts), some farmers including those applying agricultural chemicals via chemigation, and agricultural chemical dealers. These regulations will be developed through a public hearing process and once adopted will have a three-year phase-in period.

The Act specifies a three-tiered response in addressing potential and actual groundwater pollution due to agricultural chemicals. The first level of response would be considered prevention efforts. These would be coordinated by the Department of Agriculture through the Commissioner's Office and include:

1. Development of rules and regulations for bulk storage facilities and mixing/loading areas where at least 55,000 pounds of finished agricultural chemical product are handled each year;

2. Establishment of BMPs appropriate to local conditions and type of agriculture;

3. Education and training in implementation of BMPs by Colorado Cooperative Extension;

4. Establishment of a state-wide groundwater monitoring program by the Colorado Department of Health. Such a monitoring program is designed to determine the presence of any agricultural chemical in groundwater which meets, exceeds or has a reasonable likelihood of meeting or exceeding drinking water standards as adopted by the Water Quality Control Commission;

5. Designation, by the Commissioner, of Agricultural Management Areas (AMA) in the state. An AMA is a designated geographic area where there is a significant risk of contamination or pollution of groundwater from agricultural activities. An AMA might be designated based on features such as soil type, depth to groundwater, intensity of agriculture, or results of the groundwater monitoring program. An AMA designation would serve to focus the activities of the involved agencies toward prevention or mitigation of the identified problem.

A second level of response would be considered mandated practices. If prevention efforts mentioned above fail to remedy a groundwater pollution problem, the Commissioner of Agriculture can adopt rules and regulations which become an Agricultural Management Plan (AMP). AMPs are any activity, procedure or practice to prevent or remedy the introduction of agricultural chemicals into groundwater to the extent technically and economically practical. AMPs can be designated for an area or a specific chemical. An AMP would likely mandate selected best management practices. If continued monitoring reveals that AMPs are not preventing or mitigating the presence of agricultural chemicals, the third level response of regulation will be employed. At this level of response, the Commissioner of Agriculture and the Water Quality Control Commission will confer and determine the appropriate regulatory response. The first regulatory response would be made by the Commissioner of Agriculture. The Commissioner may promulgate rules and regulations regarding the use of any agricultural chemical which has been identified through monitoring as creating, or likely to create, a pollution problem. If continued monitoring reveals that the rules and regulations are insufficient to correct the problem, the Water Quality Control Commission may promulgate a control regulation. The Water Quality Control Commission has final authority over the content of the control regulation.

In developing a control regulation, substantial weight will be given to recommendations from interested water conservation districts, water conservancy districts and soil conservation districts. The use of the three tiered response must be kept in perspective in order to understand the intent of the Act. The Act ultimately is concerned with protecting Colorado's groundwater from pollution due to agricultural chemical use. However, it favors and stresses voluntary compliance and educational methods to accomplish the goal. Moving from tier of response to another will be done with careful consideration and adequate monitoring data to support such action. The Act states that proper and correct use of agricultural chemicals is also an intent of the Act.

The Act focuses on the handling of agricultural chemicals. Such chemicals are handled by a number of groups including: agricultural producers, commercial applicators, municipalities, and homeowners. All these groups must assume responsibility for groundwater protection, and the intent of the Act is to involve all groups in addressing the issue.

#### **TECHNOLOGY, INSTITUTIONS, AND POLITICS: STILL OUT OF BALANCE** by Charles W. Howe, Environment and Behavior Program Institute of Behavioral Science, University of Colorado

Let me start by reiterating Allen Kneese's message in his guest editorial concerning the excitement of the early days of *Water Resources Research (Kneese, 1990)*. My commitment to the study of water resources began through studies of inland waterway transportation. That led tot he publication of an article in the very first issue of the journal. I then was fortunate to be asked to join Resources for the Future, Incorporated (RFF) in 1965, where I had the privilege of learning from and working with many great scholars in the field, among them Irving Fox, Allen Kneese, John Krutilla, and Walter Langbein. There was close collaboration between RFF and the U.S. Geological Survey at that time, resulting not only in *Water Resources Research* but in productive

collaborative studies such as those by Lof and Hardison (1966) and Davis et al. (1968), and the sequence of economic/hydrologic studies of groundwater management by John Bredehoeft and Robert Young (Bredehoeft and Young, 1970, 1983; Young and Bredehoeft, 1972). Such collaboration carried on the vital interdisciplinary spirit that had been created by innovative programs like the Harvard Water Program (Maass et al., 1962).

This type of collaboration in the mid 1960s was part of a continuum of intellectual development in the water policy field that might be said to have begun with the design and evaluation of multiple-purpose projects in the late 1930s,

10

# **COLORADOWATER**

INTERNATIONAL EDITION - Newsletter of Colorado State University's Water Programs Colorado Water Resources Research Institute Colorado State University, Fort Collins, CO 80523

January 1991

# Welcome to Colorado Water - International

This issue of *Colorado Water - International* begins a new addition to our water newsletter, an international report. It will go twice yearly to key water managers and offices that work with CSU faculty and students involved in water programs. We hope to improve our communications network and create a forum for increased understanding of advances in water resources knowledge to meet human and environmental needs. We invite readers to contact us with news about your activities and to request more information about what we're doing at Colorado State.

Neil S. Grigg, Director

#### WATER RESOURCES EDUCATION PROGRAM AT COLORADO STATE RECEIVES PROGRAM OF EXCELLENCE AWARD

On December 6, The Colorado Commission on Higher Education designated Colorado State University's Water Resources Education Program as a Program of Excellence under the state's "Programs of Excellence" competition. The program will receive \$750,000 over the next three years pending approval by the State Legislature. Albert C. Yates, President of Colorado State, said he is "...extremely pleased that the CCHE has recognized Colorado State's international reputation as a center for water resources."

Neil Grigg, Director of the Colorado Water Resources Research Institute, said Colorado State has been a world leader in water research and development since the late 1800s. In 1883 Colorado State established the country's first irrigation engineering program. The program was started by Elwood Mead, for whom the lake above Hoover Dam is named. In the 1950s, the university achieved preeminence in water resources by establishing the first water management programs in Asia. About 40 Colorado State faculty members are involved in irrigation management projects and education programs in Egypt. The university offers more than 100 water resources courses not found at other universities.

Thirty-three Colorado programs were nominated this year. Other award recipients were: Colorado State's Department of Chemistry, \$225,000; Colorado School of Mines Minority Education Program, \$1 million; the Hazardous Materials Training Program at Front Range Community College, \$555,000; and the Colorado Space Grant Consortium at the University of Colorado-Boulder, \$1 million.

# EGYPT WATER CENTER PROJECT PROVIDES TECHNOLOGICAL, MANAGEMENT TRAINING TO HELP IMPROVE AG PRODUCTION

The Wall Street Journal has described USAID's program of development and technical assistance in Egypt as a model for U.S. aid in the 1990s. A major goal of the assistance program, begun in 1977, was to improve Egypt's crop production. Egypt's Ministry of Irrigation, recognizing that this involved improving the country's *on-farm* irrigation management, delivery systems, and drainage, implemented the Egypt Water Use and Management Project, funded jointly by the Arab Republic of Egypt and USAID. The Consortium for International Development (CID) was the USAID contractor for the project and Colorado State was the lead university.

With the completion of the initial project and with the experience and knowledge it provided, Egypt's Ministry of Agriculture implemented a *National* Irrigation Improvement Program. A \$25-million contract provided funds for Colorado State to help train Egyptian personnel, furnish technical assistance, and help develop a water management policy. The Egyptian personnel come from the Water Research Center, an arm of Egypt's Ministry of Public Works and Water Resources.

The essence of the training program is to strengthen the WRC's capabilities to perform the tasks and research that are needed to establish a water management policy in Egypt. The training program covers a whole range of water issues, with the graduate work at Colorado State related to actual problems that will be encountered in Egypt upon the students' return home. For example, a Ph.D graduate whose program dealt with hydraulics and off-stream storage returned to Egypt and is now working on-site to see if this is a feasible way to provide irrigation water in his country.

Colorado State, continuing its involvement in Egypt's comprehensive effort to increase agricultural production and improve its peoples' social and economic welfare, again was the lead university for the project with CID as the USAID contractor. Dr. E. V. Richardson, the project technical adviser and Civil Engineering Professor at Colorado State, has devoted the past 11 years to improving irrigated agriculture in Egypt. Dr. Daniel K. Sunada, campus coordinator and training specialist, also has served as an advisor to Egypt during the past 11 years.



Finding a process for on-site remediation of chlorinated solvents in groundwater is the ultimate objective of a joint US/Canada research project, now completing its second year of research. The focus is on large-scale field experiments in Canada, and the program's four goals are:

1. To improve the understanding of the subsurface behavior of chlorinated solvents including the vadose (above the water table) zone and the groundwater zones (below the water table), including porous media (sand and gravel) and fractured media (fractured clay and bedrock). Many aspects of the behavior of chlorinated solvents in the vadose and groundwater zones are poorly understood, and this limited knowledge impedes the development of better siteinvestigation and site-remediation methods.

2. To improve technologies/methodologies for investigating sites where contamination by chlorinated solvents occurs. At many sites in North America, cleanup attempts have been unsuccessful primarily because site-investigation methods have not adequately characterized the nature and extent of solvent contamination. This research program is using two main field sites, where conditions are known in detail, for controlled field experiments.

3. To assess known site remediation technologies. Existing methods for site remediation such as vapour extraction, conventional pump and treat, surfactant flushing and heat enhancement methods are being assessed.

4. To develop and assess new site remediation technologies. New methods of in situ remediation, originated at the consortium universities, are being assessed.

The consortium includes the Waterloo Centre for Groundwater Research, University of Waterloo at Waterloo, Ontario; the Department of Civil Engineering, University of Western Ontario, London, Ontario; the Department of Agricultural and Chemical Engineering, Colorado State; and the Oregon Graduate Institute, Department of Environmental Science and Engineering, Beaverton, Oregon.

David McWhorter, Professor of Agricultural and Chemical Engineering, is Colorado State's Principal Investigator for the project. To date it has wholly or partially supported two Ph.D students and two Masters students.

The program has embarked on a program of short courses and seminars targeting regulatory agencies, consultants, and industries. A short course was held in November 1990 at Waterloo, a seminar in June 1990 in Atlanta, Georgia, and a major short course with invited participants in Denver in early December.

Current annual direct funding for the project is \$900,000, provided by Ciba Giegy, General Electric, DOW, Kodak, and two agencies of the Canadian Government.

# VLACHOS ORGANIZES INTERNATIONAL WATER EVENTS AND PUBLICATIONS

During 1990 Evan Vlachos, Professor of Sociology and Civil Engineering at CSU, organized several important water events and publications. These included a project for linking water resources planning and management among the US, Portugal, and Brazil under the sponsorship of the Tinker Foundation.

Together with Neil Grigg, Vlachos organized an international congress in Lisbon during the summer of 1989 through the auspices of the International School for Water Resources at Colorado State. The conference involved water managers and scientists from the three countries and produced action plans for further research into water policy and planning processes.

This activity was followed up by a National Science Foundation project Vlachos headed, which has organized teams of US visitors to Brazil to discuss water policy issues related to drought and natural hazards and other aspects of environmental engineering.

Vlachos, together with Jerome Delli Priscoli of the Army Corps of Engineers'Institute for Water Resources, organized a special volume of *Water International* on "Water, Peace, and Conflict Management." This volume, published in December 1990 by the International Water Resources Association, includes a result from a special session at the VIth World Congress of IWRA in Ottawa. Under funding from the Ford Foundation and previous support from the Vienna Conference on Managing International River Conflicts, Vlachos and Priscoli assembled speakers' papers and additional articles on some of the world's most important water conflicts including those between India and Pakistan, on the Mekong River, the Nile, and the Senegal River.

Most recently, Vlachos and the Greek International Institute for Strategic Studies were funded to conduct a workshop on water in the Middle East and the Balkans. This workshop will be followed by a longer-term program supported by the MacArthur Foundation.

Evan Vlachos is Professor of Sociology at Colorado State University.

**R. K. Sampath Visits India to Give Lectures on Economics of Irrigation Management-**-Professor R. K. Sampath, Department of Agricultural and Resource Economics at Colorado State, has been invited by the Food and Agriculture Organization of the United Nations to present three weeks of lectures at the Central Soil Salinity Research Institute located in Karnal, India. Sampath will develop a research program on economics of irrigation management, provide lectures, and install computer software on pricing and the economic evaluation of irrigation. While in India he will visit irrigation command areas and observe irrigation practices.

J. Leo Cefkin, Jerry Eckert Selected to Go to South Africa--J. Leo Cefkin, Professor Emeritus of Political Science, and Jerry Eckert, Professor in the Department of Agricultural and Resource Economics, were among six US professors selected by the Fulbright Foundation to receive scholarship awards to go to South Africa. They will teach and conduct research during the 1990-91 academic year, helping South Africa to manage its transition to a postapartheid society. Eckert will leave for South Africa January 11 and serve as a visiting professor in the faculty of economics at the University of Cape Town. Cefkin will depart in early April and will lecture at Rhodes University in Grahamstown and also conduct research on the process of political transition to majority rule.

Vujica Yevjevich to Participate in Three International Symposia--Vujica Yevjevich, Professor of Civil Engineering at Colorado State, is an invited speaker at three international symposia in 1991: the European Conference on Advances in Water Resources Technology, Athens, Greece, March 20-23; the International Symposium on Hydrology and Water Resources - Education and Training, Chihuahua, Chih., Mexico, April 15-19; and the International Symposium on Improvement of Karst Water Utilization and Protection, Dubrovnik-Trebinje, Yugoslavia, June 5-8.

Earth Resources Faculty Specialize in International Watershed Management--Faculty member Ellen Wohl specializes in reconstructing Quaternary floods by computerbased flow simulations using paleostage (slackwater deposits) and paleocompetence (coarse sediment) indicators. She has reconstructed late Quaternary floods on several bedrock channels in northerm Australia and related flood characteristics to past climate and to channel morphology.

Lee MacDonald was recently appointed Associate Professor of land use hydrology in the Watershed Science Program at Colorado State. MacDonald's experience includes over five years in setting up research and training programs in developing countries with the United Nations public and private organizations, and several years as a hydrologist with the US Forest Service.

John D. Stednick, Earth Resources faculty member, has completed an assignment with the Food and Agriculture Organization (FAO) of the United Nations to design a water resources monitoring program for the country of Western Samoa. The program was designed to inventory existing water resources and to enable the country's Department of Agriculture, Forestry, and Fisheries to assess the effect of land use practices, mostly shifting agriculture, on non-point source pollution. Water quality sampling and analysis were part of the program design.

An analysis of data for the Indus, Nile and Mississippi Rivers conducted by Professor Stanley Schumm shows that a surprising variability of pattern and behavior exists. His research demonstrated that this can be related to the variation of valley slope, which is controlled by tributary contributions of water and sediment and by geologic controls (faults, folds). In all three cases active deformation of the valley floor appears to be the cause of at least some of the observed morphologic and dynamic variability of these great alluvial rivers.

Advanced Water Treatment Research Institute Receives \$500,000--Congress has appropriated \$500,000 to maintain Denver's world-class water reuse plant, closed in December 1990, as a research facility. The plant's five-year program, funded by EPA, successfully demonstrated that treated wastewater can be transformed into a safe drinking water supply. AWTRI was formed by Colorado State University, the University of Colorado, and the Denver Water Department to keep the plant open as a laboratory to study water treatment processes. David Hendricks, Professor of Civil Engineering at CSU, actively participated in the effort. (See Colorado Water, Jan. 1990.)

Robert Meroney, D.E. Neff Work on Windmill Efficiency-Meroney, Professor of Civil Engineering, and Neff, Research Scientist, have worked during 1989-90 with U.S. Windpower, Livermore, California to develop a "windmill wall" concept to improve the efficiency of windmill farms. These electric generation farms can be used to pump water for irrigation or desalination. An IICE course titled "Wind and Solar Powered Water Pumping" will be offered by Meroney, Jane H. Davidson, Assistant Professor of Civil Engineering, and Deanna Durnford, Assistant Professor of Agricultural and Chemical Engineering, in August 1991.

**Cooperative Extension Program Seeks to Reduce Salinity in Colorado-**-The Colorado River Basin Salinity Control Program was implemented to help decrease the salinity of water delivered to Mexico under the 1944 Colorado River Treaty. This year, in Colorado, improved irrigation water management techniques initiated by Cooperative Extension have resulted in salt load reductions of an estimated 367 tons and 777 tons, respectively, at two Colorado River Salinity Control project sites (see *Colorado Water*, Jan. 1990).

Papers on Agriculture/Urban Water Transfers Presented at Australia Seminar--Research conducted by Robert A. Young, Professor of Political Science and Principal Investigator of a Colorado Water Resources Research Institute (CWRRI) project, was described at the Seminar on Water Allocation and Transfer Systems in a Maturing Water Economy, University of New England, Armidale, NSW, Australia, July 4-6, 1990. The papers were: "Drought-Year Options on Agricultural Water Rights for Urban Water Supplies," by Ari M. Michelsen and Robert A. Young; and "Some Measures of the Economic Impacts of a Large-Scale Rural to Urban Water Transfer," by Robert A. Young and R. Garth Taylor (see Colorado Water, Jan. 1990).

**CWRRI and State Engineer's Office Sponsor Colorado Water Engineering and Management Conference-**-The conference will be held in Denver February 27-28, 1991, to evaluate technical and management methods necessary to solve water problems in Colorado and the West. It serves as a forum to exchange ideas about technological and management solutions for current state water problems and policies. (See *Colorado Water*, Jan 1990 or contact Janet Montera at: Phone (303)491-7425; FAX (303)491-7727; Telex 910 930 9000 ENGR CSU FTCN.)

Design of Water Quality Monitoring Networks--Robert Ward, Jim Loftis (Agricultural and Chemical Engineering), and Tom Sanders (Civil Engineering) have offered a very successful one-week short course on the "Design of Water Quality Monitoring Networks" for the past 11 years. The course is now offered annually in June. The short course presents detailed procedures for designing a water quality monitoring system. For information contact Janet Montera at Phone, FAX or Telex number given above.

#### COLORADO INSTITUTE FOR IRRIGATION MANAGEMENT

The Colorado Institute for Irrigation Management (CIIM) provides interdisciplinary training, technical assistance, and project management services worldwide to organizations involved in all phases of irrigation management. Following are titles of the 1991 courses offered at Colorado State by CIIM.

- Colorado Irrigation Study Tour, June 3-14
- Design and Management of Local Irrigation Organizations, June 17-July 13
- Modern Irrigation System Management, July 8-August 9
- Study Tour of Irrigation Main Systems in the Western United States, August 5-23
- Monitoring, Evaluation, Feedback and Management of Irrigated Agricultural Systems, Sept. 2-27
- Training of Trainers for Irrigation Management, Oct. 7-Nov. 1
- Irrigation Systems Rehabilitation, Nov. 11-Dec. 6

CIIM offers the following courses on request at Colorado State University or in-country.

- Design and Management of Farm Irrigation Systems
- Design and Management of Small Sprinkler and Drip Systems
- Drainage for Irrigated Lands
- Flow Regulation and Measurement in Irrigation Systems

In addition, special courses can be designed to meet specific needs of sponsors and participants.

The Director of CIIM is Dr. Marvin E. Jensen, formerly National Program Leader for USDa'S Water Management Research and Past President of the International Commission on Irrigation and Drainage. For information contact: Colorado Institute for Irrigation Management, 410 University Services Center, Colorado State University, Fort Collins, CO 80523 USA. Phone (303)491-2868; FAX (303)491-2293; Telex 910 9309011 CSU CID FTCN.

#### 1991 SHORT COURSE PROGRAM INTERNATIONAL INSTITUTE FOR CIVIL ENGINEERING DEPARTMENT OF CIVIL ENGINEERING COLORADO STATE UNIVERSITY

The International Institute for Civil Engineering (IICE) comprises a series of short courses offered each year for continuing professional education and academic credit at Colorado State University. IICE was developed to meet the need for current, high-quality instruction on advanced topics in the field of civil engineering. The IICE 1991 Program includes courses in: Geographic Information Systems (GIS); Computer Pipe Networks; Water Treatment; Waste Disposal, Slow Sand Filtration; Damage and Risk Assessment; Irrigation Management; Forecasting and Control; Water Storage; Expansive Soils; Air Pollution and Wind-Tunnel Modeling; Hydrometry; Wind Loads and Damage Mitigation; Wind/Solar Water Pumping; Design of Dams; and Water and Systems Analysis.

For information and a brochure contact: Janet Montera, Manager, Conference Section, Civil Engineering Department, Colorado State University, Fort Collins, CO 80523. Phone: (303)491-7425 or FAX: (303)491-7727.

#### INTERNATIONAL SCHOOL FOR WATER RESOURCES AND ASSOCIATED PROGRAMS

The International School for Water Resources (ISWR) was established at Colorado State University in 1967 to provide advanced education for engineers and managers concerned with water resources engineering and technical management. As a non-degree alternative to traditional graduate education, the School provides a flexible structure for supplemental education and training. In recent years, ISWR has expanded its activities to include international collaboration, service and research conducted through Colorado State's various academic departments. The International School also can plan, organize and conduct short courses, conferences and training programs at other locations in the US and abroad. Programs are designed to meet the specific needs of the sponsoring agency. Dr. Darrell G. Fontane, Associate Professor for Civil Engineering, is Managing Director of ISWR.For information contact: International School for Water Resources and Associated Programs, 213 Weber Building, Colorado State University, Fort Collins, CO 80523. Phone (303)491-5247; FAX (303)491-6787.

culminating in several classics of the field (e.g., Inter-Agency Committee on Water Resources, 1958; Eckstein, 1958; Krutilla and Eckstein, 1958).

A panel of consultants to the Bureau of the Budget produced a highly perceptive report (*Hufschmidt et al.*, 1961) that helped to clarify issues like the discount rate, secondary benefits, and risk, but also introduced issues that would occupy water policy social scientists and operations researchers for the next two decades, namely the valuation of nonmarketed services of water (recreation, fish, and wildlife values) and the need for multiple-objective planning.

Multiple-objective planning and evaluation (MOPE) (e.g, U.S. Water Resources Council, 1973, 1983; Major, 1969; Major and Lenton, 1979) represented another major advance in water planning techniques. It became increasingly clear that benefit-cost analysis, limited to easily monetized items, was being increasingly distorted by the major operating water agencies, partly because they wanted to keep building projects regardless of merit, partly because valid social objectives not included in the benefit-cost calculus were being pursued through water development. Multiple-objective planning and evaluation promised the possibility of objective evaluation of economic, environmental, and social benefits and costs (in noncommensurable terms, if need be), with their weights to be determined by the political process, in the light of good information. While the "Principles and standards" of the U.S. Water Resources Council (1973) were never applied to real projects, they were partially embodied in the National Environmental Policy Act (NEPA) and to some extent carried out through the preparation and use of environmental impact statements.

A more recent advance has been in the application of interactive advances computing technology, computer graphics, and artificial intelligence to water resource systems. The work of Strzepek and Chapra (Center for Advanced Decision Support for Water and Environmental Systems, University of Colorado) has led to the capability of visualizing important dimensions of large geographical information sets (e.g., the contours and contents of a floodplain) and of simulating hydrologic events and their effects. In spite of all of the foregoing advances, a decision environment in which these advances can be effectively applied still does not exist. Such an environment would be one in which the best multiple-objective data and analyses are sought and placed on the table for decision-makers and the public. Public water agencies all too often continue hiding behind the institutions of yesteryear as if values, priorities, and the availability of resources had not changed from those of the 1950s and 1960s.

Too frequently, water agency personnel, politicians who work with them, and the special interest beneficiary groups don't want the objective analyses called for by NEPA and MOPE specifically acknowledge that final decisions are to be taken by elected representatives, i.e., by politicians. Facts and objective analyses have an awkward habit of getting in the way of project "salability," whether the project be the (hopefully) last of the water dinosaurs, Animas-La Plata, or a new airport and baseball stadium for Denver, all projects with inadequately demonstrated technical, economic, and social justification.

Another example is found in Conservancy Districts that control significant portions of the western United States water supply and that continue to be governed by appointed boards that, by and large, voice that needs of irrigated agriculture of 50 years ago and fail to consider the emerging values of water in nonirrigation uses. Western states continue to justify projects using interstate water by invoking simplistic "use it or lose it" arguments rather than constructively addressing the issue of interstate water reallocation.

These pessimistic observations sound much like those of 25 years ago, don't they? It remains true, as it was then, that socially responsible decisions require broad public participation, channeled through appropriate institutions. Institutions must changes in response to changing public values, and institutional change is costly, but vital. Democracy, unfortunately for some, is messy and costly, but we will be better off pursuing the right goals somewhat inefficiently than pursuing the wrong goals efficiently.

Published in WATER RESOURCES RESEARCH, Vol. 26, No. 10, Pages 2249-2250 October 1990. Copyright 1990 by the American Geophysical Union. Paper number 90WR01200.

# "CHIPS" BARRY TO HEAD DENVER WATER DEPARTMENT

The Denver Water Board has named Hamlet J. "Chips" Barry III to succeed the retiring William H. Miller as Manager of the Denver Water Department. Barry left his job as Executive Director of the Colorado Department of Natural Resources in mid-December to assume his new post. Barry, 46, is a fourth-generation Coloradan and an attorney of more than 20 years' experience, most of it in natural resources issues. Before being appointed to head the state Department of Natural Resources by Governor Romer in 1987, Barry had served in a variety of top management positions in the department. Between 1985 and 1987, Barry practiced natural resources law with the Denver firm of Calkins, Kramer, Grimshaw & Harring. In 1975 and 1976 he was the resources attorney for the Western Governors' Regional Policy Office in Denver. He also spent nearly four years as a legal services attorney in Alaska and Micronesia. William H. Miller, 65, hands the reins to Barry after a 20year career with the Water Department, 12 of them as manager. He is a Denver native and attorney with a distinguished career in journalism, public policy and public affairs. Before joining the Water Department in 1970, he served six years as executive officer to Denver's mayor. He also had been a reporter for both the <u>Rocky Mountain News</u> and <u>Denver Post</u>. Miller earned this year's American Water Works Association national award for outstanding service for his overall leadership and his support of water research. He also received the Denver Federal Executive Board's award for furthering intergovernmental cooperation.

Source: Denver Water Department

#### KEN SALAZAR NEW EXECUTIVE DIRECTOR OF DEPARTMENT OF NATURAL RESOURCES

Governor Roy Romer has appointed Ken Salazar to head the Colorado Department of Natural Resources. Salazar, a 35year-old water lawyer and native of the San Luis Valley, assumed his new post on December 15. Salazar holds an undergraduate degree from Colorado College and a law degree from the University of Michigan. He specialized in water-law cases with the Denver law firm of Sherman & Howard before joining Governor Romer's cabinet in 1987. He is a founder and board member of the Hispanic League and a partner in El Rancho Salazar, a farm-ranch operation east of Manassa.

#### Source: Rocky Mountain News 11/27/90

# DAVID WALKER NAMED DIRECTOR OF COLORADO WATER CONSERVATION BOARD

The Colorado Water Conservation Board has announced its appointment of David W. Walker as its new director. Walker has served as the Board's Deputy Director since 1980, and has worked in the areas of water and natural resource planning at the federal level and for the states of New York, Vermont, and Illinois. A resident of Englewood, he also served on the Board of Directors for the South Suburban Park and Recreation District from 1984-90, and as Chairman from 1989-90. Walker replaces Bill McDonald, who is now serving as Assistant Commissioner for the Bureau of Reclamation.

Source: Colorado Water Conservation Board

#### SOUTH PLATTE COALITION RESUMES MEETINGS

The South Platte Basin Water Coalition, which was formed by water users in 1984, has once again begun meeting on a bimonthly basis. The group was formed in order to share information, to try to reduce water litigation, and to improve water management. Bob Walker of Wiggins was elected President of the organization, Steve Treadway of Brush was named Vice-President, Jack Odor of Fort Morgan is Secretary, and Tom Cech of Greeley is Treasurer. Board members include L.E. "Butch" Gerkin of Hudson, Bart Woodward of Snyder, Elmer Stroh of Johnstown, John Caneva of Fort Morgan, Jim Park of Kersey, Neil Grigg of Fort Collins, Vern Peppler of Longmont, Manuel Pineda of Windsor and Elmer Roth of Greeley. The meetings are open to the public.

Source: Central Waterline, Vol. X, No. 2, Fall 1990

#### MEXICAN, US OFFICIALS MEET TO DISCUSS PROJECT

On Friday, October 26, ten Mexican officials and 20 U.S. equipment company representatives met in Los Angeles at the Metropolitan Water District of Southern California to discuss the estimated \$500 million in procurement needs for the construction of the Monterrey IV water supply and treatment project. As a result of the meeting, officials from at least five U.S. companies will visit the Mexican officials in Monterrey, Mexico, to discuss specific equipment needs for the project.

The program was funded by the U.S. Trade & Development Program (TDP) and sponsored by the American Water Foundation (AWF) in cooperation with the American Water Works Association (AWWA). For one week preceding the trade meeting, the ten Mexican officials visited the las Vegas Valley Water District, Hoover Dam, Coachella Valley Water District and the Metropolitan Water District of Southern California.

#### JAMES M. SOUBY NEW DIRECTOR OF WESTERN GOVERNOR'S ASSOCIATION

James M. Souby has been named Executive Director of the Western Governors' Association, with offices in Denver, Colorado. He succeeds Paul Cunningham, who resigned after six years to pursue other professional interests. For the past seven years, Mr. Souby has directed the National Council of Governors' Policy Advisors (CGPA), a senior staff association and policy think-tank in Washington, D.C.

Source: Western States Water, October 26, 1990

# DROUGHT IN THE UNITED STATES: SUMMER 1990 UPDATE AND HISTORICAL PERSPECTIVE

Richard R. Heim, Jr., National Climatic Data Center NOAA, Global Climate Lab, Climate Perspectives Branch, Federal Bldg., Asheville, NC 28801

Little change occurred in the overall drought situation in the contiguous United States during 1990. A fourth of the nation continued to experience severe or extreme long-term drought, while a tenth of the nation experienced severe to extreme wet conditions. Drought ended in the central Plains states and Great Lakes, but severe to extreme long-term drought persisted in the northern Plains and much of the Far West. Severe dryness developed in the summer in the southeastern states.

Spring and summer precipitation rankings for the west region were near the middle of the historical distribution (near normal), but this is the dry season for the region, so there was little recovery from the unusually dry winter. Conditions in the southeast deteriorated as the year progressed, with June-July 1990 ranking as the second driest such period on record (the record begins in 1895). The year so far has been unusually wet in a band from the northeast to the south central states, while year-to-date rankings indicate overall dryness in the southeast, west north central, and west regions. Average precipitation across the nation for the year to date gives 1990 a rank of ninth wettest (eightyeighth driest). The last two years have had above-normal precipitation for this period (January-July), contrasting with the unusual national dryness of the last half of the 1980s and marking a return to the unusual wetness that characterized the 1970s and early 1980s.

Considerable improvement occurred in the 1989-90 water year (October-present) during the last several months in most basins. However, precipitation rankings indicate drier conditions at the end of July than during March for the Lower Mississippi, Tennessee, and South Atlantic-Gulf basins, reflecting the unusual summer dryness in those regions. Precipitation rankings for selected river basins, October-July 1989-90 - Rank of 1 = driest, 95 = wettest, based on the period 1895-1990:

River Basin	Precipitation Rank	% Area Dry	% Area Wet
Missouri Basin	45	28.7	0.0
Pacific Northwest Basin	32	36.3	3.0
California River Basin	8	65.2	0.0
Great Basin	19	67.4	0.0
Upper Colorado Basin	21	100.0	0.0
Lower Colorado Basin	38	56.8	0.0
Rio Grande Basin	49	11.1	3.9
Arkansas-White-			
Red Basin	60	0.0	20.4
Texas Gulf Coast Basin	56	0.0	0.0
Souris-Red-Rainy Basin	22	5.4	0.0
Upper Mississippi Basin	89	0.0	41.1
Lower Mississippi Basin	66	0.0	4.6
Great Lakes Basin	71	0.0	7.1
Ohio River Basin	68	0.0	35.0
Tennessee River Basin	58	0.0	0.0
New England Basin	59	0.0	0.0
Mid-Atlantic Basin	61	0.0	6.0
Basin	54	20.4	14.5
References:			

Solow, A.R. 1987. Testing for climate change: An application of the two-phase regression model. *Journal of climate and Applied Meteorology* 26:1401-1405.

#### WATER QUALITY

NCWCD Working on Water Delivery Plan--The Northern Colorado Water Conservancy District is developing a plan to replace the nitrate-contaminated well water that supplies several area farming towns with clean water delivered from the District's Big Thompson and Windy Gap projects. A project outline is expected early next year. Larry Simpson, General Manager of the District, said municipal bonds would fund the pipeline and revenues from water users would pay off the bonds.

Six Towns Consider Water Authority--Fort Lupton, Hudson, La Salle, Gilcrest, Evans, and Platteville may form Karl, T.R.; and R.R. Heim, Jr. 1990. Are droughts becoming more frequent or severe in the United States? *Geophysical Research Letters*.

Source: Drought Network News, October 1990

# STATE/REGIONAL WATER OUTLOOK

The State Engineer's Office reports that Colorado water supplies are near normal for this time of year, with statewide precipitation averaging 102 percent of normal in November. Late December snowpack measurements by the Soil Conservation Service show snow depths that are 80 percent of normal for this time of year. Colorado's southern mountains are faring much better than the northern mountains, with snowpack measuring seven to 10 times more than in 1989. These measurements come too early to predict summer water shortages, according to Mike Gillespie, SCS, because typically about 40 percent of maximum snowpack accumulates by January 1 and 60 percent falls in the first three months of the new year. There is still time to meet or exceed snow expectations, but Gillespie said that belownormal conditions cause concern even at this time of year.

Regionally, a National Weather Service/SCS report found that conditions are far below normal across the West. Reservoirs in Wyoming, Utah, Nevada, Idaho, Utah, Arizona and California are well below levels needed for irrigation-and utilities in 1991. The agencies' first stream forecast is due January 8.

#### USBR ISSUES DROUGHT REPORT

"The Drought of 1990 in the Western States and Outlook for 1991," summarizes drought-related issues in the 17 Western States for water year 1990. The report's first section illustrates how drought conditions developed, intensified, and, in some cases, eased throughout the wateryear. The second section describes the effects of and responses to drought conditions at selected USBR projects. Wherever possible, the potential water supply outlook for 1991 is also provided. For more information about the report, contact: The Upper Colorado Regional Office, Roland Robison, Regional Director, P.O. Box 11568, Salt Lake City, Utah 84147.

#### WATER NEWS DIGEST

a six-community water authority to make it easier for each to provide quality water for its residents.

Sources: Denver Post 11/16/90, Coloradoan 11/21/90

Mining Operation Approved--District 3 Water Judge Robert W. Osborne has given initial approval to a permit that allows Battle Mountain Gold Company to operate a gold mine near San Luis in Southern Colorado. The ruling would allow the company to change the designation of water rights from agricultural to industrial on two ranches it owns outside San Luis, and to use the ranch water to replace water taken from Rito Seco Creek in its leaching operation. Residents opposing the plan fear that possible contamination of land and water will poison crops and livestock and drive down land values.

Sources: Denver Post 12/4/90, Rocky Mountain News 12/4/90

Don't Drink the Water--The Communicable Disease Center's most recent report on outbreaks of waterborne diseases shows that Colorado accounted for 10 percent of the drinking water illnesses in 1988. Most cases were attributed to backpackers and others drinking from mountain streams, but a few cases have resulted from water systems that failed to screen out the parasite. Dean Brown, a Professor in the School of Occupational Educational Studies at Colorado State University, offers this advice: On short day hikes, bring water from home. If you camp for several days, be sure to heat stream water to a rolling boil to kill Giardia.

Sources: State News Service 12/9/90, Denver Post 12/11/90, Rocky Mountain News 10/17/90

#### WILDERNESS AND RECREATION

Armstrong Amendment Denies Federal Water Right--Just before Congress adjourned in late October, the Senate passed the Arizona Desert Wilderness Act of 1990. The Act designates two sections of Arizona desert lands as wilderness areas. Attached to the bill was an amendment by Colorado Senator Bill Armstrong that denies a federal water right for those areas and upholds state and federal law and interstate compact jurisdiction over the Colorado River and its tributaries. Armstrong said the bill sets a very important precedent for Colorado's own wilderness debate. An aide to Arizona Senator DeConcini said the Armstrong amendment prevents the two refuge areas from claiming Colorado River water, but provides a right to streams within their boundaries.

Sources: Grand Junction Daily Sentinel 10/28/90, Coloradoan 10/30/90, Rocky Mountain News 11/4/90

**Brown-Wirth Meeting--**U.S. Senator Hank Brown will meet with Senator Tim Wirth in an effort to resolve the wilderness bill and other issues. While Brown said he hopes that "we can move quickly," he has three worries about Wirth's current wilderness proposal: dealing fairly with private landowners who hold land inside proposed wilderness areas; the borders of some proposed tracts; and federal water rights in streams flowing through federal wilderness areas. Representative Ben Nighthorse Campbell said he plans to introduce a compromise wilderness bill that he proposed earlier in 1990 but never introduced, but he will omit water rights language.

Sources: Denver Post 11/10/90, 12/24/90

**BuRec to Borrow DWCD Water**--Under an agreement between the Bureau of Reclamation and Dolores Water Conservancy District, USBR will borrow water from the District to keep Dolores River flows up to 31-33 cubic feet per second or higher from June through September. The agreement calls for 30,100 acre-feet to be released from McPhee Reservoir in each of the next three years to help downstream fish habitat. The agreement also calls for the Bureau to conduct hydrologic studies and investigate other alternatives of obtaining additional waters for use downstream.

#### Source: Rocky Mountain News 11/19/90

Balance Sought Between Snowmaking and Trout Instream Needs--Biologists are concerned that taking water from streams for snowmaking may cause stream fluctuations that are harmful to trout. Robert Behnke, CSU fishery biologist, says "...If you divert enough water from the stream, it increases the pressure on the fish." Ski executives note that about 80 percent of the water returns to the streams as snowmelt in the Spring. Colorado Division of Wildlife agreements made with Breckenridge, Keystone, Copper Mountain and Vail in 1986 require the ski areas to guarantee minimum flows in some streams. Wildlife officials say the state has yet to conduct population tests on several streams comparing trout numbers before and after snowmaking.

Source: Durango Herald 12/10/90

#### WATER DEVELOPMENT

**Two Forks Vetoed**--On November 23, EPA Assistant Administrator for Water, LaJuana Wilcher, vetoed the U.S. Army Corps of Engineers decision to grant a Section 404 dredge and fill permit, required under the Clean Water Act, for Colorado's Two Forks dam and reservoir. Governor Roy Romer said of the veto, "This should be a Colorado decision, not a federal decision, not a decision made in the courts." The EPA decision will likely be reviewed in federal court.

Source: Western States Water, Nov. 30, 1990

AWDI Publishes Newsletter--The first issue of *The Valley Independent*, an eight-page paper published by American Water Development Inc., was distributed to San Luis Valley residents in early December. Described by AWDI president Dale Shaffer as a newsletter, it details the activities of Valley Ventures Ltd., a partnership between AWDI and an agricultural cooperative of more than 70 families around Center, a small farm town.

#### Source: Denver Post 12/12/90

San Luis Valley Voters Approve District Loan--By a 98 percent margin, San Luis Valley residents voted to grant the Rio Grande Water Conservation District authority for a \$472,000 loan to continue its legal battle against the controversial AWDI Baca Project. The issue goes to trial in October.

# Source: Denver Post 12/12/90

Aurora Considers Blue Mesa Reservoir Water Purchase-If the City of Aurora can reach agreement with the federal government, it might try to buy 60,000 to 100,000 acre-feet of water yearly from Blue Mesa Reservoir, built by the USBR. Aurora officials consider the purchase an alternative to the city's original plan to construct the \$320 million Collegiate Range water project, which would include two reservoirs - Almont and Pieplant Creek. Gunnison-area residents opposed to the plan are conducting a letter-writing campaign to state and federal officials.

Source: Rocky Mountain News 11/27/90, 11/29/90

Colorado Springs Files for Arkansas Water Rights--City officials of Colorado Springs will file for water storage rights on the upper Arkansas River, upstream of Buena Vista, to protect potential dam sites. The Bureau of Land Management recently began a review to determine whether 120 miles of the Arkansas from Leadville to Canon City should be included in the nation's wild and scenic river system. A recommendation for wild and scenic designation would put a moratorium on dam construction for a five-year period or until Congress resolves the issue.

#### Source: Coloradoan 12/12/90

Agencies May Reach Compromise on Animas-La Plata-The Animas-La Plata dam project could go ahead if the US Fish and Wildlife Service accepts a three-point plan proposed by the Bureau of Reclamation: Point 1--a five-year research project to investigate instream flow needs on the San Juan River; Point 2--design of a recovery program such as the one developed for endangered fish in the Green and Colorado Rivers; and Point 3--allowance for construction of the first three largest portions of Animas-La Plata--the weir, Ridges Basin Reservoir, and the Durango Pumping Plant. The irrigation portions of the project would be delayed until conclusion of the five-year project. A final opinion is expected by next April.

US Water News, Dec. 1990

Broomfield/Boulder Negotiate Water Rights--Broomfield is seeking to buy Boulder's rights to Windy Gap water for about \$22 million. In turn, Boulder would purchase Barker Reservoir near Nederland or explore three other options to ensure a stable water supply.

Source: Rocky Mountain News 11/29/90

Developers Call Water Law "Catch 22"--Colorado's "can and will" law is the subject of considerable legal debate. The 1979 state law requires water developers to show they "can and will" build the project they propose. Without such proof, a court will not grant developers any needed water rights. But without water rights, say developers, they will have a tough time persuading any government agency to allow its property to be used for a new reservoir. And without permission from a government agency, developers can't get water rights. Western Slope interests say the law is doing its job, but Front range farmers and suburbs disagree and are trying to change the law. State Representative David Owen of Greeley said he will propose a bill next year to remove stumbling blocks developers face with the court's current interpretation of "can and will."

Source: Denver Post 12/24/90

"The South Platte River country north of Denver, nestled up to the Rockies, is one of the great environmental laboratories of the nation. It's the birthplace of major irrigated farming 15

in the West...the gate to one of America's best national parks and mountain recreation complexes, and home to educational institutions nationally recognized in the sciences of environmental adjustment. Its network of right-sized communities...is noted for good living...Surely if the legal and political system that has produced this balance between people and the environment cannot sustain that balance...it cannot be sustained anywhere."

Bill Hornby, Senior Editor, Denver Post

# **AGRICULTURE/URBAN WATER TRANSFERS**

Proposed Legislation to Require Mitigation Measures --Colorado lawmakers say they will introduce legislation, initially approved by the Interim Committee on Water, to require cities that divert water from farms to mitigate the damage they cause. The legislation probably will include a requirement that cities maintain and revegetate the land for a certain time after water is removed. It will also require cities to submit an economic and environmental mitigation plan to the water court when they apply for permission to take water away from farmland.

#### Source: Greeley Tribune 11/19/90

Cooperative Water Use Proposed--Northern Front Range cities and agricultural areas are developing a proposal for cooperative water use by cities and farms. The draft proposal, to be released by the Northern Colorado Water Conservancy District, calls for construction of dams west of Fort Collins on the Cache la Poudre River and in Little Thompson Canyon to capture an estimated 90,000 acre-feet of water that now flows out of the state as spring runoff. The proposal provides for a delivery system to the Denver area and for storage in an off-channel reservoir. This could provide enough domestic water for an additional 360,000-400,000 people.

Source: Rocky Mountain News 12/3/90

#### FEDERAL/STATE WATER RIGHTS

Judge Denies Federal Request--In the landmark water trial centered on who has priority water rights in national forests, Weld County District Judge Robert Behrman on December 19 refused a request by the federal government to amend its method of determining stream flow through national forests. Now attorneys will prepare closing briefs, due this Spring and Summer, and then make final arguments. Behrman could issue a ruling by next Fall.

Source: Associated Press 12/22/90

BLM Won't Seek Water Rights--The Bureau of Land Management will not seek federal water rights in its proposal to designate 440,000 acres of BLM land as wilderness. The area includes 6,614 acres in Brown's Canyon, 26,210 acres in Beaver Creek, 4,000 acres in the San Luis Valley, and more than 400,000 acres on the Western Slope.

Source: The Pueblo Chieftain 12/19/90

#### HYDROPOWER LICENSING

Nebraska Seeks State Input--Nebraska's Water Management Board is leading efforts to obtain a negotiated position on federal relicensing of power projects in the state. Original licenses for two projects, owned and operated by the Central Nebraska Public Power and Irrigation District and the Nebraska Public Power District, expired in 1987. The projects include Kingsley Dam and all related power plants. FERC recently held a series of Nebraska meetings to receive input on what should be addressed in the EIS still to be approved.

Source: Nebraska Resources, Fall 1990, No. 47

Vermont Senator Introduces Bill--Senator James Jeffords, Vermont, has sponsored a bill to restore state authority in approving hydroelectric projects. Under the proposed legislation, states could require necessary instream flows in reviewing original hydropower applications or applications for relicensing.

Source: US Water News, Dec. 1990

**USBR Delays Decision**--The Bureau of Reclamation has delayed a final decision on the AB Lateral hydroelectric plant so the National Park Service can study its effect on water levels in the Black Canyon of the Gunnison.

Source: Denver Post 12/12/90

#### WETLANDS

WGA Adopts Wetlands Resolutions--Two separate resolutions regarding wetlands protection were adopted at the Western Governors' Association meeting held November 30 in Las Vegas. The first, a "Governance of Wetlands Protection" policy statement, advocates a "...no net loss of the...remaining wetlands base" and the restoration and creation of wetlands where feasible, particularly in the states with the fewest remaining wetlands. The second, "Consolidation and clarification of the Federal Role in Wetlands Protection," addresses deficiencies in the current federal wetlands regulatory program.

Source: Western States Water 12/7/90

Wetlands Workshop Held in Loveland--A one-day workshop, "Wetlands and Urban Development: Can They Co-Exist?", was held November 9 in Loveland. Ed Moore, chief planner for the City of Loveland, organized the workshop, which attracted city and county planners, engineers, developers, landscape and architectural designers, and parks and recreation planners. Moore, a native Californian, said his motivation for the workshop was that as chief planner he was caught unaware by the wetlands issue. "It took some education for me to realize that a wetland is more than just cattails," he said.

Source: Coloradoan 11/10/90

Wetlands Protection Included in Farm Bill--The 1990 Farm Bill advocates wetlands protection by encouraging farmers to voluntarily retire about one million acres of wetlands to enhance wildlife habitat. It also calls for enrollment of 40-45 million acres of environmentally sensitive land in the Conservation Reserve Program by 1995.

Source: Western States Water, Dec. 7, 1990

# WATER CONSERVATION

**Denver Water Board Increases Conservation \$--**The Water Board will increase spending by 29 percent next year to boost conservation programs and help bring city water to the new airport. No water rate hikes are forecast. Funds will come from monies set aside to pay for Two Forks Dam.

#### Source: Denver Post 12/19/90

**Denver Water Consumption Drops-**-The Denver Water Board reported savings of 4.6 billion gallons through October as the consumption rate fell to 6.7 percent below average.

#### Source: Rocky Mountain News 11/1/90

**Boulder Promotes Water Saving Plan**--A plan proposed by Boulder's Public Works Department and given preliminary approval by the city council may help the city delay construction of a treatment plant for 20 years. The plan would give a cash rebate to public agencies that use less water than expected and encourage a public information campaign for residents on how to xeriscape their homes and cut domestic water use.

Source: Rocky Mountain News 11/23/90

Water Conservation Bill Planned--Representative Pat Grant of Denver said he plans to sponsor a water conservation bill that would create a statewide office to oversee municipal attempts at saving water.

#### Source: Greeley Tribune 11/19/90

Water Board Awards Prizes--A Denver woman and Lakewood woman won top prizes from the Denver Water Board in December for submitting the best water conservation suggestions in the Board's WaterSave91 contest. Barbara Comerford of Denver received a certificate for a topof-the-line ultra-low-volume toilet and its installation for submitting the best indoor water conservation suggestions. Mary Thompson of Lakewood, winner in the best outdoor water conservation idea category, received a certificate awarding her \$1,000 toward a water-efficient lawn irrigation system. Comerford and Thompson are two of the 24 Denver-area individuals and families honored for their contributions to WaterSave91, co-sponsored by the Rocky Mountain News and 9NEWS.

Source: Denver Water Department 12/14/1990

# CALIFORNIA ASKS FOR MORE COLORADO RIVER WATER

California has asked the federal government to declare a water surplus and authorize a one-time request, to cope with drought conditions, for 7.9 million acre-feet of Colorado River water. In the past, Southern California used water

Arizona was given under law but couldn't use, but now that the Central Arizona Project is on line, it is diverting more of Arizona's share of Colorado River water. California faces yet another year of drought unless its mountains receive substantial snowfall in the next three months. Denver's *Channel 4* reported on the January 2 evening news that snow measurements in California show a water content only one-third of normal.

Partial Source: Grand Junction Daily Sentinel 12/9/90

# GRADUATE FELLOWSHIPS/ASSISTANTSHIPS

**OTA Congressional Fellowship Program 1991-92--**The Office of Technology Assessment (OTA) is seeking candidates from academia, business and industry, and the public sector for its Congressional Fellowship Program. Up to six Fellows will be selected for a 1-year appointment in Washington, DC, beginning in September 1991. The program is open to individuals who have demonstrated exceptional ability in such areas as the physical or biological sciences, engineering, law, economics, environmental and social sciences, and public policy. Candidates must have significant experience in technical fields or management or have completed research at the doctoral level.

Applicants for the fellowships are required to submit the following: a resume limited to two pages, including education, experience, area(s) of special interest; and a one page listing of most recent published works; three letters of reference, including telephone numbers, from individuals who know the applicant well enough to write about his or her professional competence (sent directly to address below before the deadline); and a statement of up to 1,000 words that either: evaluates an issue with both technical and public policy content and why it is of interest to you, or summarizes the findings of a piece of public policy related to work you have done. Applications and letters of reference must be postmarked by January 31, 1991. Screening and

selections will be made by committees of OTA staff appointed by the director of OTA. Personal interviews of the finalists will be conducted during the week of March 25-29, 1991. Awards will be announced by April 5. Send applications and letters of reference to: Congressional Fellowships, Personnel Office, Office of Technology Assessment, Congress of the United States, Washington, DC 20510-8025.

Graduate Research Assistantships--Utah Water Research Laboratory, Utah State University, offers research assistantships in Hydraulics, Water Resources and Environmental Engineering for outstanding students with backgrounds in Engineering, as well as in the Mathematical, Physical, Biological and Social Sciences, seeking graduate degrees in Civil and Environmental Engineering. Assistantships are awarded on a competitive basis. Initial awards for each year will be made in April. Applicants should send a letter of interest, transcripts, and resume to: Water Resources/Hydraulics: Dr. David S. Bowles, Utah Water Research Laboratory, Utah State University, Logan, 84322-8200, (801)750-3157. Utah Environmental Engineering: Dr. Ronald C. Sims, Department of Civil and Environmental Engineering, Utah State University, Logan, Utah 84322-4110, (801)750-2925.

# CALLS FOR PAPERS

International Conference on The Physical Causes of Drought and Desertification, December 9-13, 1991, Melbourne University, Australia. Topics include: Drought: Observational aspects of drought; Drought simulations; Statistical and deterministic predictions; Drought mechanisms and precursors (global and regional); Feedback mechanisms: atmosphere, ocean, land: and Desertification: Causes and trends; Feedback mechanisms, Sensitivity studies; Influence of climatic change. Send one-page abstract to: Ms. Val Jemmeson, Conference on Drought and Desertification, C/-CSIRO Division of Atmospheric Research, PMB No. 1, Mordialloc, Vic. 3195., Australia. Deadline: May, 1991.

Eleventh Annual "Hydrology Days" April 1-5, 1991 at Colorado State University, Fort Collins, Colorado. The conference objective is to provide a forum for hydrologists and hydrology students to get acquainted and to share problems, analyses and solutions. Special Keynote Addresses will be given by recognized hydrologists. Besides general hydrology, special sessions currently include: "Watershed Runoff and Streamflow Routing," "Remote Sensing and Advances in Mountains Hydrology," "Estimation of Hydrologic Extremes," "Interfacing Hydrologic and Global Circulations Models," "Groundwater Recharge," "Water Rights and Conjunctive Management," "Organic Contamination of Soils and Aquifers," "Hydrologic Modeling of Solute Transport in the Unsaturated Zone," "Aquifer and Soil Parameter Identification," and "Stochastic Processes, Chaos and Governing Equations in Hydrology."

Hydrology Days is cosponsored by the Hydrology Section and the Front Range Branch of AGU, the Hydraulics and Irrigation and Drainage Divisions of ASCE, the American Water Resources Association, the Colorado Groundwater Association, and the Colorado section of ASCE.

The program will include volunteered papers (mostly), invited papers (a few) and student papers (one full day). Paper presentations should be about 25 minutes (including discussion). Standard audio visual equipment will be provided. A written paper is not mandatory for participation in the program.

Send two copies (original plus one) of abstract, per abstract preparation instructions by January 15, 1991 or contact Dr. H.J. Morel-Seytoux, Mail Abstract to: Dr. H.J. Morel-Seytoux, Hydrology Days, Civil Engineering Department, Colorado State University, Fort Collins, CO 80523, 303-491-6762(W)/303-482-9814(H). There is no abstract fee and all accepted abstracts will be published in EOS after the

Conference, along with a meeting report. Deadline to submit the final written paper for preprinting in the Proceedings is **February 26, 1991.** Guidelines and special paper will be provided on request. Proceedings will be available at the Conference. NOTE: If desired by the authors, a scientific committee will review the submitted paper. As a result of this review, papers may be accepted, accepted subject to revision, or rejected. Authors who wish to have their paper reviewed for publication **must submit** it as **early** as possible in order to meet the publisher's deadline of Feb. 26, 1991.

Awards and prizes will be presented to the best student papers in two categories: M.S. and Ph.D candidates. Criteria for judging: clarity of presentation (30%), originality (30%), relevance to hydrologic practice (30%), quality of written paper (10%) if submitted for the Proceedings.

**Technology Integration Program Project Manager**--The Colorado Center for Environmental Management seeks an experienced, multiple-skilled professional to further develop and manage a major State and U.S. DOE initiative related to the integration of new technologies for environmental restoration. This anticipated 4-5 year demonstration program will use a pilot project to develop a technology integration model for use at sites throughout the country. This project will define a process that more efficiently identifies, screens, evaluates, and transfers remediation technologies from the testing to the implementation phase.

A potential candidate should possess exceptional organizational and management skills and be a consensusbuilder. Must have the ability to work with diverse groups and individuals from government, industry, education and public sectors. Prefer proven ability to maintain credibility with the university and environmental action groups. Familiarity with federally funded research and technology transfer programs preferred. Understanding of and practical experience with environment regulatory process and site remediation or hazardous waste management desireable. Prefer advanced university degree and at least ten years experience as a senior administrator and/or manager.

Interested individuals should contact: Steve Eandi, Director, Colorado Center for Environmental Management, Denver West Office Center, 1536 Cole Boulevard, Building 4, Suite 290, Golden, CO 80401. Telephone: (303)237-7013; FAX: (303)620-4658.

Director, Center For Science, Mathematics and Technology Education--Colorado State University, Colorado's land-grant university, invites nominations and

#### **REGISTRATION FEES/INFORMATION**

Regular:	\$100.00	(By March 22, 1991)
	\$125.00	(After March 22, 1991)

Registration package includes: technical sessions, exhibits, two lunches, refreshment breaks and a copy of the Conference Proceedings.

Students: Free (By March 22, 1991) \$5.00 (After March 22, 1991)

Registration package includes: technical sessions, exhibits and refreshment breaks.

Final registration details will appear in the program advertised in EOS in early February 1991.

# POSITIONS AVAILABLE

applications for the position of Director of the newly formed Center for Science, Mathematics and Technology Education (CSMATE). The Center serves as a focal point for research aimed at improvement and innovations in science, mathematics and technology instruction at all levels-elementary through university. The Director is expected to obtain extramural funding through contracts and grants supporting the initiation and enhancement of programs that will address the needs and aspiration of K-16 science, mathematics and technology students, teachers and administrators.

Interested parties should request a full job description. Applications should include letter of interest, current resume, and the names, addresses and telephone numbers of three references. Closing date for applications is January 31, 1991. Deadline may be extended if a suitable candidate is not found. Position available July 1, 1991 or sooner. Send applications and nominations to: Dr. Thomas A. Gorell, Chair, CSMATE Director Search Committee, College of Natural Sciences, C-138 Clark, Colorado State University, Fort Collins, CO 80523.

Department Head, Civil Engineering, PENNSTATE--The College of Engineering invites applications for the position of Head of the Department of Civil Engineering. Successful candidate must possess academic credentials of the highest quality, including an earned doctorate and an established reputation in civil engineering. Nominations and applications, including curriculum vitae, received by March 1, 1991 will be assured of consideration. Direct inquiries to: Chairperson, Department Head Search Committee, Department of Civil Engineering, Box CEH, 101 Hammond Building, University Park, PA 16802.

# CONFERENCES, MEETINGS, SHORT COURSES

Colorado Water Congress Annual Convention, Holiday Inn Northglenn, January 16-18, 1991--The Thursday, January 17 General Session features Keynote Speaker John B. Mannion, Executive Director, American Water Works Association. The other two speakers are Max H. Dodson, Director, Water Management Division, Region VIII, US Environmental Protection Agency and (Invited) Attorney General Gail Norton. Concurrent workshops will be held in the morning on: water quality developments, financial and management developments, Mutual Ditch Companies, and the COE 404 Regulatory Program. Luncheon Speaker will be William Perry Pendley, President and Chief Legal Officer, Mountain States Legal Foundation.

In the afternoon a three-member panel will address the subject, "Can We Resolve Colorado's Water Wars?" Panelists: Larry MacDonnell, Director, Natural Resources Law Center, University of Colorado-Boulder; Greg Walcher, President, Club 20; and Keith Propst, President, Colorado Farm Bureau. Afternoon concurrent workshops: wetlands, Division of Wildlife developments, Mutual Ditch Companies, and legal developments.

Friday's program includes a legislative breakfast with six legislators addressing the delegates. Morning concurrent workshops will feature: media impact and media relations, Colorado Water Resources Research Institute, FLPMA, and engineering and management developments. The General Session Keynote Speaker will be John Buechner, Chancellor, University of Colorado at Denver. The other two speakers are: Ken Salazar, Executive Director Designate, Colorado Department of Natural Resources, and Bridget O'Grady, Director of Government Relations, National Water Resources Association. The Wayne N. Aspinall Memorial Luncheon will feature presentation of the "Wayne N. Aspinall Water Leader of the Year" Award.

Four States Irrigation Council 1991 Annual Meeting, "40 Years of Service to Irrigation, January 9-11, 1990--The Council's meeting will be held at the University Park Holiday Inn, Fort Collins. Highlights of the program will include a tour of Colorado State's Hydraulics Laboratory, and a discussion of Federal vs. State Rights (Jeff Fassett, Wyoming State Engineer, Larry Simpson, General Manager, Northern Colorado Water Conservancy District - Frank Dragoun, Moderator). Scheduled CSU faculty presentations are: "Cuthroat Flumes," Ramchand Oad, Agricultural and Chemical Engineering; "Computer-Aided Management of Irrigation Water Distribution," Tim Gates, Civil Engineering; and "Surge Irrigation," Israel Broner, Extension Irrigation Specialist. The program features a keynote address by USBR Commissioner Dennis Underwood. Time is also set aside for ditch companies and water districts to meet with Bureau of Reclamation officials.

#### SHORT COURSES

Mountain States Groundwater Expo, March 15-16, Denver. Contact: 1991 Mountain States Expo, 1540 S. Holly, Ste. #5, Denver, CO 80222 (303)759-1756.

CGWA Geochemistry Workshop, April 10-12, Denver. Contact Kelly Carter-Hranac (303)831-8200.

Bureau of Land Management & Forest Service Watershed Rehabilitation II, May 13-17, Fort Collins. Contact: Office of Conference Services, Rockwell Hall, Colorado State University, Fort Collins, CO 80523.

#### CONFERENCES

The Fundamentals of Ground Water Conference, January 24-25, 1991, Houston, TX. Contact: Richard M. Miller, American Ecology Services, Inc., 127 E. 59th Street, New York, NY 10022, (212) 371-1620.

American Association for the Advancement of Science (AAAS) Annual Meeting. February 14-19, 1991, Washington, D.C. Further information can be obtained from the American Association for the Advancement of Science, 1333 H Street, N.W., Washington, D.C. 20005, (202) 326-6400.

Colorado Water Engineering and Management Conference, Feb. 27-28, 1991, Denver, CO. Contact: Janet Lee Montera, Manager, Colorado State University, Department of Civil Engineering, Fort Collins, CO 80523, (303) 491-5048.

Fifth Federal Interagency Sedimentation Conference, March 18-21, 1991. Practical Sediment Mgmt.: Issues and Answers. Las Vegas, NV. Contact: USGS, Office of Water Data Coor., 417 National Ctr., Reston, VA 22092.

Nonpoint Source Pollution: The Unfinished Agenda for the Protection of Out Water Quality, March 20-21, 1991. Tacoma, WA. Contact: Washington Water Resource Center, Washington State Univ., Pullman, WA 99164-3002. (509/335-5531).

Pipeline Crossings (ASCE), March 26-27, 1991. Denver, CO. Contact: Joseph P. Castrovono, Pipeline Crossings Conf. Chm., CH2M Hill, P.O. Box 1647, Gainesville, FL 32601.

Hydrology Days, April 1-5, 1991. Fort Collins, Colorado. Contact: Prof. Morel-Seytoux, Hydrology Days, Civil Engr. Dept., Colorado State Univ., Fort Collins, Co, 80523 (303/491-6762).

Virginia Water Resources Conference, Presented by the Virginia Water Resources Research Center and the Virginia Lakes Association, April 14-16, 1991, in Richmond. Contact: Elizabeth B. Crumbley, virginia Water Resources Research Center, Virginia Polytechnic Institute and State University, 617 North main Street, Blacksburg, Virginia 24060-3397, (703) 231-8038.

15th Annual Conf.-Assoc. of State Floodplain Managers, Inc., June 10-14, 1991. Denver, CO. Contact: Bill Stanton, Colorado Water Conserv. Board, 721 Centennial Bldg., 1313 Sherman St., Denver, CO 80203. (303/866-3441).

American Society of Civil Engineers Third Water Forum Conference, August 3-5, 1992, Baltimore, MD. Contact: Edward A. Kippel, ASCE, 345 E. 47th Street, New York, NY 10017 (212) 705-7496.

28th Annual American Water Resources Assn. Conference and Symposium "Global Change", Nov. 1-5, 1992, Reno, NV. Contact: Michael C. Fink, American Water Resources Assn., 5410 Grosvenor Lane, Suite 220, Bethesda, MD 20814 (301) 493-8600.

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

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

tion," Tim Gauss, Civil Engineering Israel Broner, Extension Irrigation in frequers a keynosa address by

.

Sedimentation Conference, March 18-21, 1991. Practical Sodia , Office of Water Data Core, 417 Halianal Cir., Reston, VA 22



2

RI

n: The Unfinituded Agendia for the Froberhon of Out Water Quality, March 20-21, 1991, 1 Water Researce Conter, Washington State Univ., Pullman, WA 99164-2002, (505/335-5531).

> Morgan Library Documents