

COLORADO WATER

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

WATER ITEMS AND ISSUES . . .

July 1991

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PRELIMINARY CALL FOR PAPERS COLORADO WATER ENGINEERING AND MANAGEMENT CONFERENCE

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**LOOK FOR THE NEXT ISSUE OF
COLORADO WATER IN OCTOBER.
OUR FUTURE PUBLISHING SCHEDULE WILL BE:
FEBRUARY, APRIL, JUNE,
AUGUST, OCTOBER AND DECEMBER.**



OUT-OF-BASIN WATER TRANSFERS

*Editorial
by Neil S. Grigg*

Interbasin transfer, basin of origin, area of origin - whatever it is called, the issue of moving water from one basin to another generates conflict. This is true everywhere in the U.S., even in

the East which in years past was considered to be a "water-rich" area.

I confess to a divided mind about interbasin transfer. On the one hand, making the best use of water is sensible and requires taking water to where the demand is. On the other hand, it seems that something as complex as a river basin ought not to suffer a permanent loss of water.

Most of my argument over the subject of interbasin transfer has been with economists: they point out that water ought to flow to where the net economic benefits are the highest. But there is a lot more to interbasin transfer than economics: there is law, politics, ecology and sociology, just for a start; and engineering is probably the easiest part.

One of our graduate students, Maureen Maxwell, just finished a review of what has been written lately on the subject in Colorado. Her findings: out of basin transfers produce a lot of antagonism; they are expensive and often not the best options

for resolving water needs; and they involve high costs for both water importers and exporters. During her review, she found Frank Milenski's quote: "The biggest shame about the water business is that you have to fight so hard. Without water, the farmer has nothing. But if you're in the water business, you don't have time to farm..."

After reviewing Larry MacDonnell's recent report on water transfers in the West, Maureen became impressed with the cost of the conflict; it is not unusual for a water right change application to spend more than a year and a half in the legal process while all involved wait and pay transaction costs. MacDonnell's study and others have produced suggestions: having all findings of fact be made by the Division Engineer; broadening Colorado law to allow consideration of affected interests; letting cities buy drought insurance from the farmers thus reducing the need for water storage; reducing the cost to move water around; and providing farmers with an alternative to selling out in hard times. The reader will, of course, be aware that there are many complexities involved in implementing these ideas.

After reviewing the subject, Maureen concluded that there is time to solve Colorado's interbasin transfer problems without instituting a "water police state." That's a new term to me: as a concept it might replace having a water czar or water planning as the chief bugaboo in Colorado water policy.

I doubt if citizens of basins-of-origin will ever be convinced about the merits of water transfer. Solutions will hinge on political and financial criteria. Engineering, economic and environmental feasibility will be necessary but not sufficient conditions for transfers to occur.

USGS' NATIONAL WATER QUALITY ASSESSMENT INCLUDES TWO COLORADO RIVER BASINS

The South Platte River Basin and the Rio Grande Valley are two of the 20 units across the nation to be assessed in studies initiated this year as part of the National Water Quality Assessment (NAWQA) by the U.S. Geological Survey. NAWQA's goal is to describe the status and trends in the quality of a large representative part of the nation's surface and groundwater resources and to provide an understanding of the natural and human factors that affect these resources.

Each study-unit investigation has a local liaison committee with representatives who have water resources responsibilities from federal, state and local agencies; universities; and the private sector. Robert Ward, Professor of Agricultural and Chemical Engineering, will represent CSU and CWRRI on the South Platte River Basin Liaison Committee. Deanna Durnford, Assistant Professor of Agricultural and Chemical Engineering, will represent CSU and CWRRI on the Rio

Grande Valley Liaison Committee. Dr. Durnford is researching agricultural practices, groundwater and water quality in the San Luis Valley under the sponsorship of CWRRI and the Agricultural Experiment Station in conjunction with Cooperative Extension. Russell Livingston of USGS/NM Project Chief for the Rio Grande assessment.

Ultimately 60 study units representative of the nation's diverse water resources will be investigated in the context of local water quality issues to form the basic framework of the NAWQA program.

"One obvious goal of this assessment is to provide water managers and users with a more complete snapshot of current water quality conditions and problems in the basin," said USGS hydrologist Keven Dennehy, Project Chief for the South Platte study-unit investigation.

COLORADO WATER ENGINEERING AND MANAGEMENT CONFERENCE

February or March, 1992

PRELIMINARY CALL FOR PAPERS

Conference Objective--The focus of the 1992 Colorado Water Engineering and Management Conference will be on technical and management solutions for state water problems. The conference will be held in cooperation with the American Water Resources Association, Colorado Section. Papers will be coordinated with the technical program of AWRA.

Conference Topics

- * Water Resources Management
- * Water Management by Exchanges, Banking, Conjunctive Use
- * Computing and Telecommunications in Water Management
- * Flood and Stormwater Management
- * Urban Water Supply
- * Drought Planning
- * Wastewater and Water Quality Issues
- * Groundwater Management
- * Climatic Issues
- * Agricultural Water Management

To Submit a Paper for Consideration Send a brief abstract by **November 1, 1991** to:

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CWRRI, DENVER WATER DEPARTMENT AND UNIVERSITY OF CALIFORNIA COLLABORATE ON DROUGHT/URBAN WATER CONSERVATION STUDY

CWRRI will join the University of California, Berkeley and the Denver Water Department in a study of the management of urban drought and water conservation. Principal Investigator William H. Bruvold, of the UC/Berkeley School of Public Health, will compare water conservation and rate structures in California's Bay Area and in the Denver Metropolitan area.

The project will assess the impact of two price and four non-price conservation program elements upon residential consumption in the Bay Area from 1970 to 1991 and in the Denver Metropolitan area from 1980 to 1991. Covering two

decades of cyclical droughts, the project will provide a data base for designing residential conservation programs and for water supply planning.

Dr. Anthony C. Fisher, Professor of Economics at UC/Berkeley, will serve as co-investigator. CWRRI Director Neil S. Grigg will represent CWRRI on the research team. Grigg and Rocky Wiley, Manager of General Planning for the Denver Water Department, will jointly supervise CSU graduate research assistant Max McGowan. The DWD will fund the assistantship for McGowan, who is pursuing a Master of Science degree in Civil Engineering.

PROJECTS SELECTED FOR CWRRI'S 1991-92 WATER RESEARCH PROGRAM

The FY1991-92 research program of the Colorado Water Resources Research Institute includes 12 research projects that concentrate on water policy issues and management problems of high priority in the state, the region, and the nation. The projects were selected after review by the CWRRI Research Planning Advisory Committee (with members from local, state and federal agencies and the private sector), which scrutinizes projects for relevance to priority water problems, and the Technical Advisory Committee (faculty from Colorado State University, the University of Colorado and the Colorado School of Mines), which looks at the projects' technical merit.

DESIGN AND OPERATION OF SMALL LYSIMETERS

This study was generated because of water court cases filed by various municipalities along Colorado's Front Range seeking to quantify and reuse deep percolation from lawn grass irrigation accruing to the stream system. The project will define the relationship between water applied and deep percolation and identify the major factors which influence this relationship. It will develop procedures for the design and operation of small lysimeters that can be utilized to evaluate return flows from lawn watering in an urban environment. This research will be helpful in implementing programs of water conservation, Xeriscape and changes in water use. The research program was designed in consultations with personnel of the State Engineer's Office, which has contributed cost share funds of \$15,000 for the project. *Principal Investigator: Ramchand Oad, Agricultural and Chemical Engineering, CSU*

USE OF A CALIBRATED SOLUTE TRANSPORT MODEL FOR MANAGING AGRICULTURAL CHEMICALS IN THE SAN LUIS VALLEY

Groundwater is the primary drinking water source in the San Luis Valley of South-central Colorado and also a major source of irrigation water. Irrigated agriculture provides the economic base for the valley; however, a shallow water table, sandy soils and extensive use of agricultural chemicals make the groundwater susceptible to pollution. The objectives of this project are to calibrate a vadose zone chemical transport model for conditions in the San Luis Valley of Colorado and determine the usefulness of the model for improving on-farm chemical management practices and reducing adverse impacts on groundwater quality. The project will provide detailed information on chemical transport in the vadose zone for conditions in the valley and determine if, in fact, a chemical transport model can be useful to farmers for evaluating management decisions with respect to water quality impacts. The San Luis Valley has high potential for reducing adverse impacts of agriculture on groundwater quality with effective agricultural management practices. *Principal Investigator: Deanna Durnford, Agricultural and Chemical Engineering, CSU*

THE FATE OF METALS IN COLORADO WATERS AND STREAMS

Many Colorado waters are polluted with heavy metals which enter streams from mine wastes, industrial pollution and

municipal waste disposal. This study focuses on obtaining basic information on the solubilities of heavy metals and the solid phases that control their solubilities in waters and streams. Consideration will also be given to point sources and underground aquifers that are suspected of being polluted by metals. Since metals are often affected by redox relationships, redox measurements and controls will be included. Of particular interest will be the expected increase in metal solubilities in anoxic environments where oxygen is depleted, as may occur in underground water supplies and drainage systems.

This research will provide basic chemical information that will help in understanding how metals are held by sediments and released to streams in Colorado waterways. It will be of benefit to the State of Colorado, the EPA, mining companies, industries, municipalities and other agencies that are attempting to understand metal pollution problems and trying to resolve them. *Principal Investigator: Willard Lindsay, Agronomy, CSU*

INTEGRATION OF GIS AND CONJUNCTIVE STREAM-AQUIFER MANAGEMENT MODELS FOR THE LOWER SOUTH PLATTE BASIN

The Geographic Information System (GIS) has great potential for becoming a powerful engineering tool through linkages with computer models for planning and management of water resource systems. The objective of this research is to integrate (GIS) with stream-aquifer management models (SAMSON and MODSIM) to develop a comprehensive decision support system (DSS) for daily water administration, river flow management, conjunctive use, drought contingency, and long-term water supply planning. The GIS-based DSS will be designed to allow eventual interfacing with water quality models that will aid in evaluating the environmental consequences of various management plans.

The GIS-linked DSS will provide an important tool for drought contingency planning. It can also be used to capitalize on the extensive groundwater storage capacity available in alluvial aquifers and to develop plans for capturing more flows leaving the state, to which Colorado is legally entitled. As a regional scale model it will provide a means for rational resolution of conflicts related to continued encroachment of cities into agricultural water availability and the hydrological impacts of marketing on water rights. The research will involve collaboration with the South Platte Basin Water Management

Committee, the State Engineer's Office and other organizations. *Principal Investigator: John Labadie, Civil Engineering, CSU*

ASSESSMENT OF EFFECTIVENESS OF RECHARGE OPERATIONS FOR AUGMENTATION

The San Miguel River Preserves protect about 6.5 river miles of riparian plant communities. Riparian vegetation, wildlife, fisheries, recreation, and other water-related values depend on instream flows (including floods and related groundwater conditions). Augmentation plans to compensate for stream depletion due to pumping often incorporate artificial recharge from spreading basins or canals. The presence of canals, for example, between the recharge zone and the targeted stream may void completely the effectiveness of the recharge plan. The objectives of this research are: (1) to complete the development of realistic yet simple procedures to predict the effectiveness of a recharge operation when canals or reservoirs may intercept the return flows intended for a depleted stream; and (2) to verify the procedure on field data collected by the Northern Colorado Water Conservancy District.

Preservation and future management of the outstanding riparian resource along the San Miguel River requires the successful basinwide management of surface and groundwater resources. This research will improve the understanding of the relationships between riparian vegetation and the channel hydrology. Such information is essential to allow the orderly development of water diversions and yet maintain riparian vegetation. This inter-institutional effort will be conducted in collaboration with the Colorado Division of Water Resources, the Northern Colorado Water Conservancy District, the National Ecology Laboratory and the Nature Conservancy. *Principal Investigator: James Warner, Civil Engineering, CSU*

THE ECONOMIC IMPACT DUE TO DRAWDOWN ON COLORADO'S RECREATION RESERVOIRS

Tourism is Colorado's number one industry, generating over \$6 billion a year, and water is the focal point. In addition to the ski industry, reservoirs constitute a significant recreation resource both for tourists and for native Coloradans. Yet, there are relatively few reservoirs open to and managed for recreation. The objectives of this project are: to determine the economic value of nonconsumptive recreation water uses at reservoirs experiencing drawdown that are managed by the Colorado Division of Parks and outdoor Recreation (CDPOR); to determine the economic impact of drawdown due to loss of recreation opportunities; and to compare the recreation economic losses caused by drawdown to the cost of water rights purchases that would mitigate these losses.

Water recreation was recently identified as the number one concern of Colorado citizens (Governor's Great Colorado Outdoors Committee). Managers of water-based recreation

sites and policy makers are faced with heavy pressure and tough decisions on the spending of millions of dollars to purchase water rights for recreation. The CDPOR views this problem, especially as it relates to boating, as one of the most critical water recreation issues facing their agency. Results of this research could demonstrate just how much recreation money is being lost due to drawdown and compare it to the cost of water rights purchases or leasing of water needed to meet recreation needs and minimize the recreation economic loss. *Principal Investigator: Robert Aukerman, Recreation Resources, CSU*

PROTOTYPE WATER DATABASE MANAGEMENT SYSTEM FOR THE SOUTH PLATTE RIVER BASIN

The recent veto of Two Forks by federal authorities has exacerbated the water management problems of Colorado's South Platte River Basin (SPRB). Innovative nonstructural water management has become a priority to meet the water demands of the large urban population (about 70 percent of state total) and extensive irrigated agriculture (1.6 million acres) in the basin. This project seeks to capitalize on recent technological developments both within the water industry and the computer information management field to increase nonstructural water management capabilities. The project's objectives are: to design and implement a prototype federated water database management system for a subregion of the basin; and extend the basin's Hydrologic Data Assessment Report. Emphasis will be placed on physical data of the system (flows, stream and aquifer properties, crop and irrigation characteristics, water quality constituents, etc.), although the need to incorporate water rights and economic data will also be considered.

The South Platte is a water-short river system where numerous organizations, both private and public, are attempting to manage their share of the water resource wisely and efficiently. Each organization generally makes use of individual data collection, storage and analysis techniques to support its activities. If an integrated database of water information can be implemented across the basin, the participating organizations could avoid redundancy, better manage their waters based on regional rather than just local management information, and reduce costs of data collection, reduction and analysis. *Principal Investigator: Tim Gates, Civil Engineering, CSU*

AN IRRIGATION COMPANY WATER QUALITY MONITORING AND MANAGEMENT PROGRAM

Maintaining desirable levels of nutrient loading in irrigation company canals and laterals may require organizational adjustments in how river decrees, storage rights, water rental markets and affiliated laterals are currently managed. This research, conducted in cooperation with the New Cache la

Poudre Irrigating Company of Colorado, will investigate: how the association can mix river decree water, internal return flows and storage rights so that desirable levels of canal water quality are maintained with minimal impact on the normal distribution of water shares to company shareholders; and develop accurate measurement and remote reporting procedures that provide continuously updated information on the quality and quantity of water in service area canals over the course of the season.

If the company can successfully incorporate water quality goals into its normal canal management program similar companies will be inclined to adopt such practices, thereby greatly reducing undesirable levels of non-point source pollution throughout a given river basin.

The research product will include: a report on alternative river decree, reservoir storage and rental market management procedures and their scale of acceptance by the shareholders; the probable degree of impact on water quality levels in selected service area canals and laterals; the methodology used to select the water quality monitoring stations; the technologies chosen to be tested for routine usage by the company's management staff; and the method of calibrating these technologies with more sophisticated laboratory analysis.
Principal Investigator: David Freeman, Sociology, CSU

BIOACCUMULATION OF HEAVY METALS BY BROWN TROUT IN THE ARKANSAS RIVER: IMPORTANCE OF FOOD CHAIN TRANSFER

Poor survival of adult brown trout, *Salmo trutta*, in the Arkansas River has been attributed to heavy metal contamination. This project will investigate food chain transfer of heavy metals from benthic invertebrates to brown trout in the Upper Arkansas River, Colorado. The principal objectives of this research are: to document changes in feeding habits of *S. trutta* resulting from altered prey communities at metal-impacted stations downstream from California Gulch, a USEPA Superfund Site at the Arkansas River; to measure concentrations of heavy metals in *S. trutta* and their dominant prey; and to develop a model to estimate the relative importance of food chain transfer of heavy metals from benthic invertebrates to fish in this system.

Information on the relative importance of dietary uptake versus uptake from water is required to evaluate recovery of the Arkansas River. Cleanup operations at the California Gulch Superfund Site are scheduled to begin in 1992. The ultimate goal of this remediation is to restore a productive brown trout fishery to the river with no acute toxicity by 1995. This research will provide important baseline information to evaluate the effectiveness of remediation at California Gulch. Since poor water quality resulting from mining operations is not unique to the Arkansas River, this proposed research will be useful for evaluating the impact of metals in other Colorado streams.

FIELD ASSESSMENT OF STREAM- AQUIFER INTERACTION IN THE DENVER BASIN AND COMPARISON WITH COMPUTER REPRESENTATIONS

As Colorado's population grows and the state develops, problems associated with appropriation of water are encountered. Newcomers and entities with junior water rights look to groundwater supplies to satisfy their needs. It is well-known that the use of groundwater impacts stream discharge, but it is difficult to determine the magnitude of the impact. To effectively use models that simulate stream/aquifer interaction, field knowledge of mechanisms that control stream/aquifer interaction and the hydraulic properties of the important component parts of the system must be known. The objective of this research is to provide a better understanding of the mechanisms that control stream/aquifer interaction, determine hydraulic properties of stream beds and alluvium that influence those interactions, determine transient stream/aquifer seepage rates, and compare field observations with current model representations of the Denver Basin. Field data will be incorporated into the RIVINT Model of the Denver Basin previously developed by the principal investigator.

Given our current knowledge of the hydrologic flow system in the Basin, use of groundwater in times of drought will be acceptable only if surface water is used for recharge during wet periods. This research will advance the understanding of stream/aquifer interaction in the Denver Basin and provide quantitative field measurements of stream/aquifer interaction. Consequently, it will be used both by groups with interest in developing water resources and by environmental groups seeking to protect water resources. *Principal Investigator: Eileen Poeter, Geology and Geological Engineering, CSM*

A DECISION SUPPORT SYSTEM FOR WATER RIGHTS ADMINISTRATION PHASE 2

Water rights administration is an increasingly complex task for the Colorado State Engineer's Office because of the increasing numbers of water exchanges, transfers and augmentation plans on Colorado streams, such as the Upper South Platte. This project was designed to develop a system using advanced decision computer techniques and graphics that will quickly illustrate the stream regime and permit forecasting of flows given alternative operating criteria. Phase I of the project involved the development of a computerized basin map showing all significant water rights locations, return flows, reservoirs, stream gaging stations, and climate data for the Upper South Platte. The graphical display is capable of zooming in to a scale suitable for display of local features significant to water administration. Phase II will extend the prototype to include water rights nodes, with complete identification regarding flow rates, amounts and priorities. The project utilizes a computer work station and advanced decision support software already available at the Center for Advanced Decision Support in Water and Environmental Systems

(CADSWES) to display data on routed water flows, water rights, diversions, storage, etc.

Implementation of the system will greatly ease the tasks of personnel of the State Engineer's Office and permit more optimum management by water users. It will enable water users to see the consequences of various river calls and reservoir releases which the SEO could implement with assurance of no injury. The project receives financial support from six basin water users and developmental oversight is provided by the State Engineer's Office. *Principal Investigator: J. Ernest Flack, CU*

EFFECTS OF FLOW DIVERSIONS IN DOWNSTREAM CHANNEL FORM IN MOUNTAIN STREAMS

Many streams in the Colorado Rocky Mountains have been diverted and the water transported off-site for agricultural, municipal and industrial purposes. Some observed changes

associated with diversion are depleted streamflow, lowering of water tables, encroachment of vegetation along the edge of stream channels, localized channel filling, and degradation of fish and wildlife habitat. This project will evaluate the impacts of flow diversion on several steep channels in the Colorado Rocky Mountains. To assess the impacts on both streamflow regime and channel morphology, investigators will utilize discharge data from field stations, field evaluation of geomorphic and hydraulic characteristics, and air and ground photography to document long-term changes in channel width and riparian vegetation.

This project is a collaborative effort of researchers from the Department of Geography at the University of Colorado, the US Forest Service and the Rocky Mountain Forest and Range Experiment Station. It will provide a clearer understanding of the processes active in high-gradient channels and the role of discharge and sediment transport in stream channel formation. *Principal Investigator: Nelson Caine, Geography, CU*

CWRRI/RMFRES PROJECT SUPPORTS FOREST SERVICE ASSESSMENT OF U.S. WATER SITUATION

CWRRI and the Rocky Mountain Forest and Range Experiment Station, under a cooperative agreement, will work together on an effort to summarize past trends and the current situation for water supply, demand and quality in the U.S. as part of the Forest Service's periodic assessment of the U.S. water situation. The assessment will include:

- * documentation of past and current conditions of reservoir storage and hydroelectric energy production;
- * documentation of past and current conditions of riparian area protection,
- * documentation of past and current conditions of population, irrigated acreage, kWh of thermal energy produced, and water withdrawal in the U.S.;

- * description of past and current interbasin agreements for water transfer, and amount of water transferred under these agreements;
- * a summary of information about the relationship of water quality to water treatment costs; investigation of availability of water treatment cost information; and
- * assistance in river basin simulation studies and graphic display of water resource data.

CSU research assistant Antony Balan Thadicaran, PhD candidate in Civil Engineering, will work on the project under the direction of Neil S. Grigg of CWRRI and Tom Brown of the Rocky Mountain Forest and Range Experiment Station.

UNIVERSITY WATER NEWS

LLOYD HERSHEY DONATES BOOKS TO CWRRI LIBRARY--The Institute thanks Lloyd Hershey of the State Engineer's Office for donating books from his personal collection for our library. The books are available for use by students, faculty and other interested persons. Lloyd's background includes 18 years with the Colorado District of the U.S. Geological Survey as a hydrologist, where he participated in the Lower Cache la Poudre Study - An Evaluation of Groundwater Resources, in 1960. Lloyd was also a hydrologist-consultant in Canyon City and a well site consultant for Tetra Tech in Saudi Arabia. He has been a well

drilling inspector with the State Engineer's office for five years.

WATER RESOURCES PAPERS NOW AVAILABLE--The *Water Resources Papers* are a continuation of the *Hydrology Papers* series that was established by Dr. Vujica Yevjevich at Colorado State University. Subscriptions and correspondence regarding these papers should be addressed to: Hydrology and Water Resources Program, Colorado State University, Engineering Research Center, Fort Collins, CO 80523. Telephone: 303/491-8460; FAX: 303/491-8671.

NEIL GRIGG APPOINTED TO ASCE COMMITTEE-- Neil Grigg has been appointed to the Executive Committee of the American Society of Civil Engineers' Water Resources Planning and Management Division, effective October 1991.

FISHERY & WILDLIFE BIOLOGY PROF RECEIVES FY1991 MATCHING GRANT AWARD--A proposal to study "Structural and Functional Responses of Benthic Communities to Heavy Metals: Variation Along Longitudinal Stream Gradients," by Will Clements, will be funded under the Geological Survey's FY1991 Section 105 (Matching Grant) Water Resources Research Program. Clements will receive \$105,488 in federal funds for the research.

CSU GRAD NAMED RESEARCH MANAGEMENT DIRECTOR--The American Water Works Association has named Debbie Brink Director of its Research Management Division. A graduate of Colorado State University with a B.S. in Civil Engineering and an M.S. in Environmental Engineering, Debbie has been with the AWWA Research Foundation for 4-1/2 years. AWWA is located in Denver at 6666 West Quincy Avenue.

STUDENT ENGINEERS HELP RECLAIM PIT AREA NEAR FORT COLLINS--Civil Engineering seniors at CSU worked with Western Mobile Inc. in a Spring semester project to reclaim a gravel pit area east of Fort Collins. They developed a plan to convert the area into useable open space - and hopefully eventually into a wetland wildlife habitat. The students were asked to resolve the problems of infiltration of Poudre River water into the gravel pits, because they are below the water table, and also evaporation in the area. They developed a plan to dig a trench around the area and fill it with bentonite, a clay that expands to about 12 times its original volume and becomes virtually impervious. To decrease evaporation from the area, the pits will be filled with soil and wetland vegetation to help hold the water.

In developing their plan, the students also had to consider other factors. The area is located near the historic Strauss Cabin about one mile east of Fort Collins and west of Interstate 25; a railroad runs through the property and nearby there is a sewage treatment plant. The site included about 60 acres. Students learned they had to deal with a variety of officials to learn about water rights, zoning and other issues related to land use changes. The students were members of a class conducted by Darrell Fontane of CSU's Civil Engineering Department.

Source: Coloradoan 4/22/91

COOPERATIVE EXTENSION NAMES WATER QUALITY SPECIALIST--Reagan Waskom has been named as the new Extension Water Quality Specialist, and will be responsible for developing and disseminating Best Management

Practices (BMPs) for Colorado chemical applicators and farmers. He is affiliated with the Agronomy Department at Colorado State University as an Extension Specialist. Reagan's immediate focus will be to develop educational materials and programs on specific guidelines to minimize the effects of applied plant nutrients and pesticides on groundwater. To achieve this, he will integrate the existing work of Colorado State University specialists with other state and federal programs.

Reagan was previously a Research Coordinator with the Tissue Culture for Crops Project in the CSU Biology Department, and was responsible for research on salinity and drought tolerance in cereal crops. The work centered on the development and testing of stress-tolerant germplasm for use in developing countries and in the U.S. Salt and drought tolerance research was conducted at numerous international and domestic field sites, as well as under controlled environmental conditions.

Prior to that, Reagan was employed with Rohm and Hass Seeds in the development of hybrid wheat for the Great Plains, with the Texas Agricultural Experiment Station in hybrid sorghum research, and with Servi-Tech as an agricultural consultant. His educational background includes BS and MS degrees in Soil and Crop Sciences from Texas A&M University.

Reagan's office is located in Room C109 Plant Science, CSU, and the phone number is 491-6103. He would appreciate hearing from others working on Best Management Practices and groundwater quality-related issues.

FROM THE WATER SCIENCE AND TECHNOLOGY BOARD, NATIONAL RESEARCH COUNCIL

The Committee of Western Water Management held its final meeting February 28 - March 2 in Irvine, California. The committee was organized to examine the scope and nature of water transfers in the West, with an emphasis on third party effects. It included seven case studies, one of which is the Arkansas River and Colorado Front Range area. Larry MacDonnell, Director of CU's Natural Resources Law Center, is a member of the committee. The committee's report should be available by Fall.

The Committee on Climate Uncertainty and Water Resources Management is now providing oversight to the Bureau of Reclamation's Global Climate Change Response Program (GCCRP). The purpose of GCCRP is to investigate the potential impacts of global climate change on water resources in the 17 western states. The committee met May 2-3 in Boulder for its first review of GCCRP activities.

William M. Lewis of the University of Colorado at Boulder has been appointed as chair of the reorganized Glen Canyon Environmental Studies Committee. The committee will make recommendations to the Bureau of Reclamation on an

overall research strategy and application of science in managing the Colorado River; assist with the development of a long-term monitoring program in the Grand Canyon; recommend criteria for maintaining the best possible riverine ecosystem in the Canyon, and host a symposium to compare results of GCES with other river systems where environmental concerns must be considered alongside hydropower project functions.

Ingrid Burke of Colorado State University was appointed to the recently organized **Committee for the Review of the Environmental Monitoring and Assessment Program**. Burke is Assistant Professor of Forest and Wood Science at Colorado State. Patrick Brezonik, Director of Minnesota's Water Institute, is also a member of the committee. Its task includes an evaluation of the EMAP program's feasibility, cost-effectiveness and potential usefulness. The committee will also make recommendations for the program's design and implementation.

FROM COOPERATIVE EXTENSION

by Lloyd Walker

Extension Agricultural Engineer

Support Provided for County Water-Quality Projects

Cooperative Extension has again received water-quality program support funds from the USDA. Due to the USDA-required focus of these support funds, Colorado will address nutrient management and pesticide education. Both program areas have objectives that include identifying and demonstrating best management practices (BMPs) for a target audience of agricultural chemical users (including ag producers, commercial applicators, ag chemical dealers, homeowners and municipalities).

Also included is educational programming in water testing and water-treatment options. (Note, however, that it does not include paying for water testing.) Educating 4-H youth on water-quality issues is another topic.

Reagan Waskom, recently hired extension water quality specialist, will assist county efforts with BMP-oriented projects. The availability of these support funds and our new water quality specialist provide extension with useful resources for water-quality programming.

The Return of all Ag Engineers

Jim Loftis finally caught a (uno) big trout in New Zealand and decided to come home just as the cold, rainy winter was starting to settle in down there, arriving just in time to catch

CSU AMERICAN WEST PROGRAM SPOTLIGHTS FORMER STATE ENGINEER

The career of Michael Creed Hinderleider, Colorado's State Engineer from 1924-54, was described at CSU on June 18 by James E. Sherow, a historian from Southwest Texas State University, San Marcos. Sherow's talk was titled: *The Evolution of the Water Buffalo: Michael Creed Hinderleider's Early Career as the Colorado State Engineer.* According to Sherow, Hinderleider was an outstanding engineer who followed traditional approaches to water development in his early career but had second thoughts about water development in arid areas later in his life. Much of Hinderleider's efforts focused on getting John Martin Dam and Reservoir approved and built. His power reached its zenith in the 1930's, declining somewhat with the formation of the Colorado Water Conservation Board in 1937; an event that divided the powers of the state's water authorities. Hinderleider died on August 30, 1967.

the cold, rainy weather here. Jim says that the highlights of his work at the Water Quality Centre in Hamilton, New Zealand were the chance to work with a broad spectrum of water scientists including ecologists, chemists and marine biologists; the big success of his short course on water quality statistics (offered twice due to the sellout crowd the first time around); and daily morning and afternoon teas.

Paul Ayers has returned to CSU following his sabbatical where he studied controlled traffic cropping systems with Dr. Jeff Tullberg at the University of Queensland Agricultural Campus in Queensland, Australia. During his stay, he spent time at an Australian Army Maneuvers Site (Wide Bay Training Area) investigating environmental damage resulting from off-road vehicle traffic. Part of the research was chasing M113 armored personnel carriers through the woods monitoring soil surface disturbance.

Paul also spent time at Ayr in northern Queensland working with Dr. Mike Braunack of the Queensland Department of Primary Industries (Similar to the USDA) on controlled traffic/permanent ridge till systems for corn. The permanent wheel lanes were useful after Cyclone Joy hit the coast in December and dumped 14 inches of rain in less than two weeks. Mike was able to easily drive down the permanent wheel lanes, but was continuously mired in the conventional beds. After the recent rains in Colorado, many farmers could use permanent wheel lanes so that they can get into their fields.

HOUSE RECOMMENDS \$2.875 MILLION INCREASE FOR STATE WATER INSTITUTE PROGRAM

On June 25, the House of Representatives passed the Fiscal Year 1992 appropriations bill for the Department of the Interior by a vote of 345 to 76. The bill included "An increase of \$2.875 million...to continue the water resources research institute basic grants at current levels."

USGS TO CEASE PUBLICATION OF SWRA

Because of budgetary constraints and the range of commercial services available to access the Selected Water Resource Abstracts (SWRA) database, USGS has decided to cease publication of the printed version of SWRA after December 1991. The database is available from CSU's Morgan Library on CD-ROM.

WATER RESEARCH AWARDS

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

Colorado State University, Fort Collins, CO 80523

Glen Canyon Ecological Studies: Impacts of Electrofishing on Fish, Robert T. Muth, Fishery & Wildlife Biology
Predator-prey Interactions Between Selected Non-native Fishes of the Colorado River &, Robert T. Muth, Fish & Wildlife Biology

Collection of YOY Fishes from the Colorado River above Grand Valley Diversion, Robert T. Muth, Fishery & Wildlife Biology
Assessment of Drifting Larval Fishes in the Yampa & Green Rivers, Robert T. Muth, Fishery & Wildlife Biology
Competitive Interactions Between Colorado Squawfish & Red Shiner Young Under Laboratory, Robert T. Muth, Fish & Wildlife Biology

Position Paper on Drift of Young Colorado Squawfish, Robert T. Muth, Fishery & Wildlife Biology

Flaming Gorge Studies: Early Biology & Development of Selected Fishes in the Green River....., Robert T. Muth, Fishery & Wildlife Biology

1990 - 1991 Aquatic Studies, David R. Anderson, Coop. Fish & Wildlife Research

Larval Fish Laboratory Involvement in Implementing Recovery Actions for the Endangered...., Robert T. Muth, Fishery & Wildlife Biology

Embankment Overtopping, James F. Ruff, Civil Engineering

Field Tests of Interspecific Competition in Stream Solmonid Guilds in Japan & the U.S., Kurt D. Fausch, Fishery & Wildlife Biology

Gas Phase Transport of Volatile Organic Compounds in the Vadose Zone, David McWhorter, Ag. & Chem. Engineering

Computer Modeling, Software Development and Documentation for Watershed Hydrology, Jose D. Salas, Civil Engineering

Colorado Pesticide Use Survey, Bert L. Bohmont, Plant Pathology & Weed Sciences

1990 - 1991 Catch Per Unit Effort (CPUE) Modeling and Analysis, David R. Anderson, Coop. Fish & Wildlife Research

Effects of Vegetation on Radon Transport Processes in Soil, Thomas B. Borak, Radiological Health Sciences

ARO - Hydrologic Modeling Model Analysis, Daryl B. Simons, Civil Engineering

ARO - Climatic Geomorphology, Stanley A. Schumm, Earth Resources

ARO - Current & Forecast Hydrometeorological Conditions, Thomas H. Vonderhaar, Atmospheric Science

Bureau of Reclamation - Saline Water Research, Dennis W. Lamm, Cooperative Extension

Research in Support of a Microwave Precipitation Retrieval Algorithm for TRMM, Graeme L. Stephens, Atmospheric Science

South Platte River Habitat Investigation, Eric P. Bergersen, Cooperative Fish & Wildlife Biology

Irrigated Agriculture Management Improvement Process, Wayne Clyma, Agricultural & Chemical Engineering

Fluvial Terraces: A Tool for Integrating Geomorphic Processes, Ellen E. Wohl, Earth Resources

Prediction of Soil Moisture, Gary A. Peterson, Agronomy

Effect of Best Management Practice on Groundwater Quality, Deanna S. Durnford, Agricultural & Chemical Engineering

Analytical and Empirical Prediction in Meander Bends, Colin R. Thorne, Civil Engineering

Management Modeling of Aquifer Cleanup Systems, James W. Warner, Civil Engineering

Clouds - Their Prediction and Simulation, William R. Cotton, Atmospheric Science

Laboratory Study of Alternative Methods of Protecting Bridge Piers for Scour, Morris M. Skinner, Civil Engineering

University of Colorado, Boulder, CO 80309

Prediction of Climate Change in the Tropics using Combined Statistical Techniques, Cecile Penland, Cooperative Institute for Research in Environmental Sciences

Development and Trend Analyses of an Arctic TOVS Temperature Sounding Record, Siri-Jodha Khalsa, Cooperative Institute for Research in Environmental Sciences

Han River Control System, Phase II. Addition of Dam Break, Hydrologic Forecasting, and Estuary Crossing Modules to the Han River Control System, Pedro Restrepo, Civil, Environmental & Architectural Engineering

Fracture Mechanics of Concrete Gravity Dams Part III: Dynamic Testing and 3D Analysis, Victor Saouma, Civil, Environmental, and Architectural Engineering

COLORADO WATER SUPPLY CONDITIONS UPDATE

From the Office of the State Engineer

The Colorado snowpack was significantly diminished by spring-like weather conditions during the month of May. Low elevation snowpack is totally depleted leaving snowpack remaining at high elevations on north and east facing drainages. Streamflow forecasts have been downgraded throughout the state. Reservoir storage remains above average. Soil moisture conditions are generally much improved over last year's conditions. Water shortages are likely to occur by late summer in those areas of the states with less than adequate storage. The state snowpack decreased from 93 percent of average on May 1 to only 43 percent of average on June 1.

The National Weather Service forecast above average precipitation in Colorado for the June 1-September 1 period. Going into 1991, 25 percent of the contiguous U.S. was experiencing drought conditions while 10 percent of the U.S. was experiencing extremely wet conditions. Little has occurred during the first half of 1991 to change these statistics. During the severe drought of the 1930s, 1950s, 1977, and

1988, approximately 50 percent of the U.S. experienced drought conditions.

Storage in Lake Powell is 14,600,000 acre-feet. This is 3,100,000 acre-feet than one year ago. Storage in California is now 65 percent of average while storage in Nevada is only 16 percent of average. Conditions in New Mexico are much better where storage is at 212 percent of average.

The Surface Water Supply Index (SWSI) developed by the Office of the State Engineer is used as an indicator of water supply conditions in the state. It is based on reservoir storage, streamflow, and precipitation for the summer period (May 1st through November 30). Weight factors are applied to each of the measured hydrologic factors in computing in each basin except the South Platte where reservoir storage is the primary component. The following SWSI values were computed for each of the seven basins on June 1, 1991 and 1990:

Basin	June 1, 1991					June 1, 1990				
	SWSI Value					SWSI Value				
South Platte					+0.7					+0.3
Arkansas					+0.2					-0.7
Rio Grande					+1.7					-1.7
Gunnison					+1.1					-1.4
Colorado					-0.5					-2.5
Yampa/White					-2.4					-3.8
San Juan/Dolores					+0.4					-2.1
	-4	-3	-2	-1	0	+1	+2	+3	+4	
	Severe Drought			Near Normal			Abundant			

GENERAL WATER OUTLOOK FOR COLORADO

Issued by William (Bill) Richards, Chief, USDA/SCS

Released by Duane L. Johnson, State Conservationist, SCS, Lakewood, Colorado

Snowpack--Data from automated snotel sites show a significant decrease in snowpack totals on June 1. The statewide figures decreased from 94 percent of average on May 1 to only 43 percent on average on June 1. These totals are 87 percent of the snowpack measures on June 1, 1990. Measurements ranging from 70 to 90 percent of average were reported in the Yampa, Roaring Fork, and Arkansas River basins. Sites in the North Platte River basin reported the

highest snowpack in the state at 95 percent of average. Well below average readings have been reported across most the remainder of the state. The lowest snowpack totals remain in the San Juan, Animas, Dolores, San Juan River basins at only 29 percent of average. Other basins reporting much below average snowpack include the Gunnison basin at 36 percent of average, the South Platte basin at 39 percent of average, and Rio Grande basin at 52 percent of average.

Precipitation--Precipitation during May was slightly above average in the Rio Grande, Yampa, White, and North and South Platte River basins. The remainder of the state received below normal totals for the month. The driest conditions occurred in the Arkansas, Gunnison, San Juan, Animas, Dolores, and San Miguel River basins. These basins received less than 60 percent of their average for the month. Statewide precipitation for May using selected National Weather Service stations was only 83 percent of average. Water year totals are near average across most of the state, with the highest totals in the Rio Grande basin at 122 percent of average, and the lowest totals in the South Platte River basins at 84 percent of average.

Reservoir--Reservoir storage in Colorado has been maintained at the above average levels throughout the winter of 1991. Storage on June 1 was 110 percent of average, and is 109 percent of last year's storage. Although slightly above the long-term average, these volumes are only 57 percent of the capacity of the 68 reservoirs. The Gunnison basin continues

to have the highest percentages, at 144 percent of average, and is 30 percent above the last year. The lowest storage amounts are in the Colorado River basin, currently storing only 89 percent of average volumes. Near average storage volumes remain in the South Platte, Arkansas and Rio Grande River basins.

Streamflow--June 1 streamflow forecasts decreased from last month's at nearly all forecast points in the state. Volumes of 70 to 90 percent of average are forecast for much of the state. Less than 70 percent of average flows are forecast for the Little Snake, North Platte, and Lower Gunnison Rivers. Near average streamflows are forecast in the Rio Grande basin and the southern tributaries to the Arkansas River. A few of the smaller southern tributaries to the Rio Grande River have the highest forecasted volumes, with above average volumes expected. With the early loss of nearly all lower elevation snowpack, some streams have already reached their peak flow and have begun to recede.

WATER EXPERT IVAL GOSLIN DIES

Ival Goslin, who served as executive director of the Upper Colorado River Commission for more than two decades and played key roles in western water decisions long past retirement, died on June 15. Political leaders and water resource managers called him one of the most influential water experts in the upper basin of the Colorado. Goslin was born in Pullman, Washington, and earned engineering degrees from the University of Utah. He briefly taught school in Idaho Falls and then joined the U.S. Geological Survey. He also worked for the Aberdeen-Springfield Canal Company in Idaho and served on the compact commissions for the Snake and Columbia Rivers. He became executive director of the Upper Colorado River Commission in 1955 and served until 1979. He was named by then-Governor Dick Lamm to be the first executive director of the Colorado Water and Power Development Authority. Rollie Fischer, secretary-engineer of the Colorado River Water Conservation District, called Goslin's death "the passing of an era."

Source: The Coloradoan, 6/16/91

WATER NEWSMAKERS

USGS Names Jarrett Engineer of the Year

Robert D. Jarrett has been named Engineer of the Year by the U.S. Geological Survey. Jarrett, a resident of Lakewood, Colorado, was among 34 federal-agency engineers who were contenders for the top award, *Federal Engineer of the Year*. As a hydrologist, Jarrett's work focuses on mountain-river hydraulics and paleohydrology, for which he has garnered international recognition. His research on hydraulics of higher-gradient rivers, including flow resistance assessment and

discovery of the S-shaped velocity profile, has led others to increase their research on mountain rivers. The awards program is administered by the National Society of Professional Engineers of Alexandria, Virginia.

Source: ASCE News, 6/91

Ralph Adkins Elected President of SECWCD Board of Directors

Ralph Adkins has been elected President of the Southeastern Colorado Water Conservancy District's board of directors. Adkins succeeds Raymond Nixon of Colorado Springs. Also elected at last week's meeting were Robert Schrader, general manager, Security Water and Sanitation District, vice president; Glenn Everett, a Salida rancher, secretary; Lee Simpson, general manager, St. Charles Mesa Water District, treasurer; and Charles Thompson, general manager of the Southeastern District, assistant secretary treasurer.

John Eckhardt Appointed Assistant State Engineer

John Eckhardt has been appointed Assistant State Engineer for the Technical Services Branch, where he will head the following groups: computer modeling, dam safety, water management and supply, hydrographics and geotechnology. John recently completed requirements for his Ph.D degree in Civil Engineering at Colorado State.

Will Burt Moves to New Position in State Engineer's Office

Will Burt of the State Engineer's Office has been appointed Assistant State Engineer in Charge of Administration.

COLORADO WATER

INTERNATIONAL EDITION - Newsletter of Colorado State University's Water Programs

Colorado Water Resources Research Institute

Colorado State University, Fort Collins, CO 80523

July 1991

WATER RESOURCES PROGRAMS IN CSU SPOTLIGHT

Water Resources Research at Colorado State University has received designation as a University Program of Research and Scholarly Excellence. The designation includes the water resources programs of the Colleges of Engineering and Forestry and Natural Resources. The programs, measured by the number of graduate students and volume of research activity, offer what may be the nation's outstanding graduate program in water resources engineering, said CSU President Albert C. Yates.

The Departments of Civil Engineering, Agricultural and Chemical Engineering and Earth Resources conduct research into issues such as managing water during drought, providing safe drinking water, monitoring hazardous waste, providing adequate water for fisheries and recreation, protecting groundwater, using satellites and radar to measure climate changes, managing irrigation water for food production, and river research.

In the last *COLORADO WATER INTERNATIONAL* we reported that our water resources programs had received the prestigious "Program of Excellence" award from the Colorado Commission on Higher Education. This latest designation by CSU confirms both the outside recognition of the program and CSU's internal recognition of the achievements of the water programs.

Programs of Research and Scholarly Excellence Enhance Quality of Research at CSU

President Albert C. Yates, in announcing the designation of Research and Scholarly Excellence, said it is an important step in the efforts to enhance the quality of research at Colorado State University. Programs for nomination were organized in four categories: biotechnology and biosciences in agricultural

and natural sciences; environmental and ecological sciences; human, health and cultural programs; and physical and engineering sciences and technology.

The following were identified as the University's Programs of Research and Scholarly Excellence:

Biotechnology and Biosciences in Agricultural and Natural Sciences: 1) Animal Reproduction and Biotechnology Laboratory; 2) Program in Biochemistry; 3) Program in Neuronal Growth and Development.

Environmental and Ecological Sciences: 1) Department of Atmospheric Science; 2) Natural Resource Ecology Laboratory.

Human, Health and Cultural Programs: 1) Tri-Ethnic Center for Prevention Research; 2) Radiological Sciences and Cancer Research; 3) Infectious Diseases Program.

Physical and Engineering Sciences and Technology: 1) Department of Chemistry; 2) Optoelectronic Computing Systems Center 3) Water Resources Research.

In the identification of these programs of excellence, each college dean was asked to nominate up to five research programs that: 1) have attained national/international stature; 2) through strategic investment, can attain national/international stature; or 3) are emerging areas in which a program of national/international stature would meet a significant need or opportunity. The nominations were initially reviewed by the Council of Deans, University Distinguished Professors, Faculty Council Committee on Academic Planning and the Agricultural Experiment Station. A committee headed by the Vice President for Research Judson Harper--involving representatives from these four groups as well as the Faculty Council at-large--then placed the nominations in priority order and made recommendations to President Yates.

INTERNATIONAL WATER ACTIVITIES AT COLORADO STATE

Freeman Smith, Professor of Earth Resources, Has Several International Projects Underway--Freeman Smith was a member of a team that traveled to Honduras to develop a collaborative agreement with the Pan American (EPA)

Agricultural School in Zamorano. The agreement is being finalized among CSU, EAP, and the German Institute for Technical Cooperation (GTZ). The objective is to develop a 4th-year curriculum at EAP in integrated natural resource

management that includes watershed management and water supply for irrigation.

Smith developed two training programs in hydrology, GIS and watershed modeling in 1991. He also advised two individuals sent as representatives of their governments for specialized training through the International School of Forestry. Dr. R.K. Batta, Hydrologist from the National Soil Survey and Land Use Planning in Nagpur, India completed his program in May 1991. Dr. Wen Fu Chen, Assistant Professor from Chung Hsing National University, Taichung, Taiwan will complete his program in August 1991.

Smith said perhaps his most interesting international project undertaken in 1990 was the review and evaluation of a natural resources management plan for a tropical forest reserve (wilderness area) in the state of Maranhao, Brazil. The objective was to preserve the water supply and quality above the confluence of the Alpercatas and Itapecuru rivers. The Itapecuru river supplies the principal municipalities in the state, as well as large irrigated areas.

Lee MacDonald Publishes Monitoring Guidelines for Forests and Streams--Lee MacDonald, Associate Professor in the Watershed Science Program, has published a 162-page monograph entitled *Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska*. The guidelines were prepared to assist people in the design of monitoring projects and the selection of monitoring parameters. While the focus of the document is on forestry activities and streams in the Pacific Northwest and Alaska, much of the information is more widely applicable. The parameter selection system developed in the Guidelines also has been developed as a PC-based expert system called PASSSFA (Parameter Selection System for Streams in Forested Areas).

The Guidelines are a joint publication of the U.S. Environmental Protection Agency (EPA) and the Center for Streamside Studies at the University of Washington. Both the Guidelines and PASSSFA are available from U.S. EPA, WD-139, 1200 Sixth Street, Seattle, WA, 98101. Persons requesting a copy of PASSSFA should include a diskette formatted in MS-DOS with at least 225K of available space.

Ted Yang Receives IAHR/IHP Lecturer Award--A prize of \$5,000 and an award certificate will be presented to Ted Yang during the opening ceremonies of the XXIV IAHR Biennial Congress, which will be held in Madrid September 9-13, 1991. Yang received the award for his lectures on the application of minimum energy dissipation rate theory, unit stream power theory and GSTARS computer model to solve the Yellow River flood and sedimentation problems. The lectures were given at the Yellow River Conservancy Commission in Zhengzhou, China. The award was announced by Dr. J. E. Prins, Secretary General of the International Association for Hydraulic Research (IAHR). This was the first time IAHR and UNESCO's International Hydrological Programme (IHP)

jointly sponsored the Lecturer award. Yang also received a United National Development Program (UNDP) grant of \$100,000 to conduct a one-year feasibility study to test his theories on the Yellow River sedimentation problem. The World Bank has indicated its willingness to provide \$500,000 for a more detailed follow-up study later. Yang is International and Special Projects Coordinator for the Bureau of Reclamation in Denver. He received a Ph.D in Civil Engineering at Colorado State in 1968.

Israel Broner, Darrell Fontane and Marvin Jensen attended the 42nd International Executive Council Meeting of the International Commission on the Irrigation and Drainage (ICID) held in Beijing, China, on April, 15-21. ICID is an international professional organization with members from all over the world with the U.S. Committee on Irrigation and Drainage (USCID) as the local organization. A special technical session was held during the meeting in which Israel presented a paper titled, "Water Conservation Practices in Surface Irrigation." He also represented the USA in three working groups on mechanized irrigation, crop water use and a dictionary on irrigation.

Following the meeting, Israel participated in a study tour where modern technology as well as some very primitive agriculture was observed. The group visited a modern village which resembles as Israeli "kibbutz" with large fields cultivated collectively by the members with impressive management and operation. Irrigation is done by hand moved sprinklers and water is pumped from shallow wells. However, many of the villages in the study tour were very poor with small fields--each family has a fraction of an acre. Cultivation is done with water buffalo, and water is pumped manually from earthen ditches.

Following his two weeks in Beijing, he spent a short time in Japan meeting with agricultural engineers at the national Agricultural Research Institute in Tskuba. While in Tskuba, the discussions centered around applications of expert systems in agriculture.

WINGSPREAD WATER CONFERENCE WILL USE DENVER AS CASE STUDY

Water resources managers in the world's urban centers face increasing challenges in the years ahead. Some common water resource concerns are aging and poorly maintained infrastructures, solid waste disposal, contaminated sediments in rivers and lakes, eutrophication, and point source and non-point source pollution. To provide an in-depth discussion of these common problems with colleagues from other nations, the International Activities Committee of the American Society of Civil Engineers is developing a series of three conferences to explore ideas for international information exchange between water managers of large urban area in Europe and North America.

The first Wingspread Conference planned for July 1992, will involve the United States, Canada and Mexico. With the general theme of improved water management, a city was selected as a case study for each of the three countries: for the United States Denver was selected; for Mexico Leon, Guanajuato was selected; and for Canada, Hamilton, Ontario was selected. A case study author who will prepare a report for the conference, will be designated for each city.

Subsequent conferences are planned for North America and West Europe (July 1993) and North America and Europe (late 1991-Early 1994). The location of the conferences will be Wingspread, Racine, Wisconsin.

CSU AND BLM FORM COOPERATIVE UNIT FOR GLOBAL CHANGE

Colorado State University and the Bureau of Land Management have formed a cooperative research unit to conduct global climate research. The offices for the Environmental Science and Technology Center opened in April in Fort Collins. Approximately 10 Colorado State and BLM researchers will operate out of the center. Center objectives include development of more efficient methods for air resource and wildland management. Two major global change projects the center researchers will work on are establishing monitoring sites at 15 to 20 remote locations in North America and a joint research project with the Soviet Union. In the Soviet study, Colorado State, BLM and Soviet scientists will examine the relationship between environmental quality and environmental stresses at four paired sites in the Soviet Union and North America. (See *COLORADO WATER*, May 1991.)

HYDRAULICS LAB RECEIVES FHWA AWARD FOR BRIDGE SCOUR STUDY

The Federal Highway Administration (FHWA) will fund a 42-month project at CSU to investigate the effects of gradation and cohesion on bridge scour for the Nation's 500,000 bridges. Five Ph.D students have begun their research on the various aspects of this challenging study that will have both national and international implications. The principal investigator of the project is Albert Molinas, Professor of Civil Engineering at Colorado State University.

SOCCER TOURNAMENTS HONOR PROFESSORS

Preparations are underway for the "Vlachos Cup" indoor soccer tournament scheduled for four weekends beginning September 21 and ending October 13, 1991. The tournament is held annually to honor a selected CSU faculty member for outstanding contributions to the international community and multi-cultural cooperation and interaction. The chosen honoree for the 1991-92 academic year is Evan Vlachos, Professor of Sociology and Civil Engineering. Sammer S. Hammad,

Tournament Coordinator, said this is an outstanding way to show support for Dr. Vlachos.

Hammad, a committee of 11 students and staff advisor William Hill are organizing the event. Last year's tournament, the first, was the "Albertson Cup" in honor of Civil Engineering Professor Maurice Albertson, and was a great success. An award ceremony was held February 17, 1991 with the first-place team receiving the Albertson Trophy and gold medals, the second-place team silver medals, and the third-place team bronze medals.

Tournament sponsors are the International School for Water Resources, Recreational Sports and the Associated Students of Colorado State University.

CSU GRAD DIRECTS INTERNATIONAL WATER EDUCATION CONFERENCE

The International Symposium on Hydrology and Water Resources Education and Training: Challenges to Meet at the Turn of the 21st Century, was held at Chihuahua, Mexico in April. Dr. Jose A. Raynal, CSU graduate and Professor-in-Charge of the Water Resources Program at the Universidad Autonoma de Chihuahua, organized the conference. Program participants included water professionals from the United States, Mexico, Yugoslavia, Turkey, Germany, South Africa, Ireland, Switzerland, Canada, Italy, Thailand, The Netherlands, India and Zambia.

The symposium included two computer workshops, ten technical sessions in which participants described the status of water resources education and training in their respective countries, and panel discussions. CSU participants were Neil S. Grigg, CWRRI Director, J. R. Nuckols, Professor of Environmental Health, and Vujica Yevjevich, Professor Emeritus of Civil Engineering. Dr. Yevjevich presented Keynote Lecture I, "Education in Water Resources under Continual Evolution in Problems and Society's Attitudes and Demands." J. R. Nuckols described the status of education and training in the hydrological sciences in Jamaica, West Indies. Nuckols and Grigg took part in a panel discussion on "The Role of Professional Organizations as a Conduit for International Technical Information Exchange." Nuckols is preparing a report on the panel discussion for the Director of the Division of Water, International Hydrological Programme, UNESCO, at his request.

CSU POLITICAL SCIENCE PROF COAUTHORS BOOK ON THE EL CHAMIZAL DISPUTE

Between 1852-1873 the Rio Grande River shifted course and under flood conditions cut a new course into Mexico. In the process it left behind several hundred acres of land which had formerly been south of the river in Mexico. Did this land belong to the United States or Mexico? In 1911 the matter was submitted to an international tribunal which decided that

the land in question remained Mexican. The United States rejected the finding and refused to honor it. Not until 52 years later was the issue resolved under the administration of John F. Kennedy. Why did it take so long to settle the Chamizal boundary dispute? In a review of Statecraft, Domestic Politics, and Foreign Policy Making, The El Chamizal Dispute, coauthored by Stephen P. Mumme and Alan C. Lamborn, Albert E. Utton says:

"This book is must reading not only to understand the Chamizal dispute, but also the complex relationships between the State Department, the IBWC (International Boundary Water Commission), and the political power centers of the border states. The authors make a major contribution in putting the Chamizal dispute in context, and documenting not only the interplay between the two countries at the diplomatic level, but also the interplay between the State Department and the IBWC, the IBWC and local interests, and the State Department and those state and local constituencies. As the pressures for resolving groundwater issues grow, it may become necessary for the State Department to lead the negotiations as was the case in the Chamizal."

Stephen P. Mumme is Professor of Political Science at Colorado State University. The reviewer, Albert E. Utton, is Professor of Law, University of New Mexico; Editor, *Natural Resources Journal*; and Director, *International Transboundary Resources*. The review was contained in the Winter 1990 issue of *Transboundary Resources Report*. Statecraft, Domestic Politics, and Foreign Policymaking, The El Chamizal Dispute, is available from Westview Press, 550 Central Avenue, Boulder, CO 80301.

The same issue of *Transboundary Resources Report* contained a paper by Mumme titled, "Complex Interdependence and Hazardous Waste Management Along the U.S.-Mexico Border."

CSU PROFESSORS TAKE INTERNATIONAL SABBATICAL LEAVES

During 1991-92 three water professors will be studying water conditions in other countries. Darrell Fontane, Associate Professor of Civil Engineering, will spend his sabbatical at Chungbuk University in South Korea. There he will concentrate on water management and reservoir control strategies. Pierre Julien, also Associate Professor of Civil Engineering, has begun his sabbatical leave and is at Delft Hydraulics Institute in The Netherlands. Julien has concentrated in recent years on geosciences research including watershed hydrology and river mechanics. Jose Salas will spend his sabbatical in Italy and concentrate on hydrologic research related to streamflow forecasting and climate change. Jim Loftis, Professor of Agricultural and Chemical Engineering, just returned from a sabbatical in New Zealand where he was affiliated with the Water Research Centre. Robert Ward, also Professor of Agricultural and Chemical Engineering, spent his sabbatical at the same institution three

years ago. James Ruff, Professor of Civil Engineering, will complete his sabbatical soon. He split his time between the Delft Hydraulics Institute and the University of Barcelona, Spain.

EGYPT PROJECT EXTENDED

On July 2 Dr. Mahmoud Abu-Zeid, Chairman of the Water Research Center, Cairo, and Mr. G. Flynn Fuller, Agricultural Officer of USAID, Egypt were at CSU to sign an extension of the Water Research Center project. This project involves a long-term relationship between Colorado State University and the Water Research Center to develop education, research and training programs that promote the development of water resources management in Egypt.

1992 COLORADO WATER CONFERENCE

This is an early call for technical papers for the 1992 Water Conference being organized by the Colorado Water Resources Research Institute, the Office of the State Engineer and the American Water Resources Association, Colorado Section. The conference may be coordinated and organized in conjunction with other organizations as well. Deadline for abstracts is tentatively set for November 1, 1992. Tentative conference date is February or March 1992. The focus of the program will be on technical and management solutions for state water problems. The conference will be of interest to water resource engineers, water district managers, utility and municipal officials, agricultural and industrial water managers, public officials and other citizens interested in the engineering and managerial aspects of water management.

Conference topics include: Water Resources Management; Water Management by Exchanges, Banking, Conjunctive Use; Computing and Telecommunications in Water Management; Flood and Stormwater Management; Urban Water Supply, Drought Planning; Wastewater and Water Quality Issues; Groundwater Management; Climatic Issues; Agricultural Water Management.

Papers in the technical sessions will be coordinated with the technical program of AWRA. To submit a paper for consideration send a brief abstract by November 1, 1991 to: Neil S. Grigg, Water Resources Research Institute, Colorado State University, Fort Collins, CO 80523. Telephone: (303)491-6308, FAX: (303)491-2293.

BUREAU OF RECLAMATION WATER PROGRAMS

by J. William McDonald

Assistant Commissioner, Bureau of Reclamation

Presented at the Colorado Water Engineering and Management Conference

February 28, 1991

I appreciate the opportunity to speak on behalf of the Commissioner, Dennis Underwood. Dennis sends his regrets; he is on the Hill today testifying on the President's FY92 budget for the Bureau of Reclamation.

It's particularly a pleasure for me to be here, since in the last fifteen years I have stood at this podium with my state hat on and now have the opportunity to be back with my friends and professional colleagues and wear my federal hat. I will let you judge for yourself if in only six months I've lost my perspective on state's rights and state's prerogatives. According to the Denver Post recently, I have.

In my capacity as the Assistant Commissioner for Resources Management, I oversee Reclamation's planning and environmental compliance activities. These range from substantive acts such as the Fish & Wildlife Coordination Act or the Endangered Species Act to procedural matters such as the National Environmental Policy Act. I also oversee all operating projects of the Bureau of Reclamation. This amounts to some 350 projects including 55 power plants, which makes Reclamation the 11th largest electric utility in the United States. Reclamation serves about 137,000 land holders with irrigation water, irrigating more than 10 million acres. In short, a very interesting job. I'm having a wonderful time with Reclamation, even as I greatly miss the colleagues that I worked with in the state.

After 6 months with the Bureau of Reclamation, I find that certain issues stand out with respect to new directions and new priorities in the Reclamation program. I would like to share with you this morning my perspective on what I think those new priorities and directions will be.

Historically, the Bureau of Reclamation has been a construction agency whose primary task in the last ninety years has been to build projects which develop new increments of water supply throughout the seventeen western states. This is reflected in Reclamation's budget, which has been devoted primarily to construction activities.

But change is upon us in any number of ways, and the first of those is in the very field of construction. The decline of construction dollars has started. Essentially the Bureau is in the process of wrapping up the two major construction jobs, the Central Arizona Project and the Central Utah Project, that consumed the bulk of our construction dollars in recent years. There are smaller projects and, we hope, one major one in the future. That would be the Animas LaPlata Project here in Colorado. But essentially the construction program, as it has been historically known, will come to a conclusion in the next

three to five years.

In contrast, Reclamation's operation and maintenance budget has increased from approximately \$160 million to \$260 million in the past three years. This reflects the fact that we are moving from an emphasis on construction to an emphasis on operation and maintenance. It also reflects the fact that much of the physical plant -- the federal investment which has been made in the past -- is beginning to age and requires substantial maintenance, replacement and rehabilitation. This change in emphasis is inevitable and inexorable. It will continue concurrently with the winding down of construction over the next three to five years.

The second major change in direction is a corollary of the increase in the operation and maintenance budget: Reclamation is becoming a resources management agency. Water is valued for many different uses and benefits, but it is also a finite and relatively scarce resource, even though it is a renewable resource. There are, therefore, substantial conflicts and competition between users and beneficiaries of the West's water resources.

To date, Reclamation's program has emphasized a sub-set of the universe of benefits that are derived from the use of water. That sub-set, of course, has been to develop the West's scarce water resources for beneficial consumptive uses. Reclamation's mission was to implement a social policy, enunciated in 1902 when Reclamation was created, to settle the West and generate economic development. That certainly has been a worthy purpose. But changing societal values, changing economic circumstances, and changing federal budget priorities, require a reexamination of what benefits are to be derived from Reclamation projects in the future.

Let me cite a few examples of interest to Colorado as evidence of the changing times that Reclamation faces. One is the ongoing analysis at Glen Canyon Dam concerning potential changes in power plant operations in order that a better balance of benefits can be achieved. Historically, the Glen Canyon Dam powerplant has been operated as a peaking power facility. That is, the minimum required flow is quite low; the maximum flow is the capacity of the turbines; and the releases are changed very quickly from low flows to high flows and back down so as to track load demands. That is the virtue of a hydroelectric system, of course. On the other hand, there is an environmental price associated with that peaking power operation. From a national perspective, it is a particularly high price because the environment is the Grand Canyon National Park located downstream from Glen Canyon. There inevitably will be changes in power plant operations. It will be less of

a peaking power operation, but exactly how much less we don't know. That will await the outcome of the appropriate studies and policy discussions of the balance to be struck between a reduction in the economic benefits of the power plant and protection of the environmental and recreational resources of the Grand Canyon.

A second example is the Dolores Project, here in Southwest Colorado. This project was explicitly planned and designed with a certain minimum flow requirement and operating regime in recognition of the fact that a coldwater fishery would be created below the dam. That coldwater fishery had been established in the last four or five years, when along came last year's drought in southwest Colorado. There was not enough water to go around among fish, irrigators, and municipalities. Although operations were within the scope of the criteria set out in the definite plan report and in the environmental impact statement for the project, this did not provide enough flows to prevent temperatures from rising to the point that significant harm to the trout population would occur. Not a native population, mind you, but a fishery created because the dam was built and coldwater releases were made. Nonetheless, a segment of society values that trout fishery and the recreational sport that goes with it.

We are now analyzing potential changes in the operation plan for the Dolores Project. There is clearly some opportunity, given the volumes of water that are already required to be released for instream flows, to accommodate the fishery without impairing irrigation or municipal supplies. But there are also those who may urge that municipal and irrigation supplies be reallocated to the fishery if that is what is required to achieve what they view as suitable flows. We face difficult issues in that regard.

The final example that I would give you is a legal requirement that came to pass in 1982 with the enactment of the Reclamation Reform Act, about which I will speak later. One of the provisions in that act requires those who contract for water from a Reclamation project to prepare a water conservation plan that indicates how they will go about improving their efficiency of use. Reclamation has been, frankly, less than enthusiastic about playing a policeman role with respect to water conservation plans. Some of the plans that we have accepted have only been one or two pages and of marginal quality at best. We are subject to criticism, and that criticism recently has been levied in a report by the National Wildlife Federation, which argues that Reclamation has not been serious about encouraging improvements in water efficiency. I believe that it is an indictment that to some large extent is proper. I do not agree with all the particulars of their report, but the bottom line is that Reclamation does need to improve, given our statutory obligation, what we require in the way of water conservation plans.

These are examples of resource management issues that Reclamation faces. We are moving from the day and age of building projects for new supplies into an age in which more

efficient use and a more balanced distribution of benefits is what Reclamation will be all about. Put another way, Reclamation is being called upon to broaden its perspective: to become a resource management agency, not just a developer of irrigation and municipal and industrial water supplies. Indeed, I would submit that all water resources agencies are being called upon to likewise broaden their perspective. This is not just a federal Reclamation program issue; it is essentially a challenge that is being brought to the whole water community in the West. We need to work together to recognize the new realities which we face and the legitimacy of other people's points of view with respect to the balance to be struck. These are difficult issues, but I think they are at same time very challenging issues. And if we solve them, very rewarding issues.

A third area in which Reclamation is going to take new directions is in what I refer to as cost recovery. By law and by policy, some of the costs of Reclamation projects, of the federal investments, are to be repaid to the Federal Government. Reclamation's critics believe that our cost recovery efforts are deficient. With the federal budget situation, those critics will focus attention on any possible source of revenue that can be returned to the federal treasury. Indeed, this has become an issue for which Congressional oversight hearings are likely. They were scheduled last fall and were canceled at the last minute. We have every expectation that oversight hearings will be called this year.

In general, I think that we have accomplished what the law calls for. But if the law has been subject to interpretation, there is no doubt that Reclamation has favored its traditional constituency. I do not find fault with that. That was the policy that was expected of Reclamation at the time. But those policies are now changing. We have room for improvement. Thus, Reclamation is undertaking, through my office, a review of our cost recovery practices. I have no doubt but that it will lead to change. Let me give you just a few examples.

First, operation and maintenance costs are repayable annually by the entity that receives water or power. But we have a tendency to capitalize extraordinary maintenance costs. This is very advantageous to a water user. It takes what would be an annual repayment to the Federal government and turns it into, generally speaking, a 40-year repayment obligation without interest. We are subject to scrutiny in that particular area.

A second example is how the repayment of capital costs is handled. Costs allocable to power and to municipal and industrial water supply purposes bear interest. Costs allocable to irrigation purposes are interest-free. Interest-bearing costs are repaid first. From a Federal Treasury perspective, one should collect the non-interest-bearing capital repayment first, because its present worth is reduced substantially with the passage of time. If we find ourselves in Congressional oversight hearings, this practice will likely be a major issue.

A third example is that Reclamation owns about 8 million acres of lands associated with our reservoirs' rights of way and withdrawn lands for unbuilt projects. We get a whole variety of revenues from those lands. Some have oil and gas leases, some have mineral leases, others have grazing rights. In general, these miscellaneous revenues are to return to the Federal Treasury. It turns out that some of these revenues do not reach the Federal Treasury. Those are the kinds of things that we are going to be called upon to look at and, frankly, tighten down.

Again, my observation with respect to cost recovery is that the status quo is simply not going to prevail. Change is upon us. We must respond to it in a constructive and, I would urge, forthright manner. Any effort to minimize these issues and not be forthright will be viewed by critics of the Reclamation program and western water development, in general, as hiding dirty laundry. It doesn't get you anywhere.

The fourth area in which major changes are occurring concerns the subsidies that are inherent in the Reclamation irrigation program. Even though certain costs are to be recovered, and even assuming we are doing a perfect job of recovering everything required by statute and policy, the Reclamation program still provides, and was intended to provide, subsidies to irrigation users. Reducing or even eliminating some of those subsidies is on the table in Congress as an agenda item for the next several years. The key reform has already been made. It comes in the form of limitations on the acreage upon which one can receive subsidized irrigation water. That happened in the Reclamation Reform Act of 1982.

Interesting things happened to Reclamation with the Reclamation Reform Act of 1982. The act required Reclamation to become a regulatory agency with respect to

acreage limitations. That is not part of Reclamation's institutional culture. Reclamation is used to being an agency that assists water users. Now, we have to go out to water users and tell them to turn in forms, to verify their acreage, to let us look at their tax records. It didn't sell well, to put it mildly.

We have many critics in this regard. Some of that criticism I find to be deserved. We have just sent to Congress a major annual report on our enforcement of acreage limitations. We think we've got a solid program and we make no apologies for it, but there are shortcomings and we laid those out in the annual report. I didn't have any fun last week when I had to go to the Hill and brief the committees of jurisdiction on those shortcomings. But I came away convinced that Reclamation is better off for it, the Reclamation program is better off for it, and you, the water users, are better off for it. By going up there and saying we're not perfect, here's where we fell short, we substantially improve our credibility.

Another aspect of subsidies is the so-called double subsidy issue. There are many instances in which the crops being irrigated with Reclamation project water supplies are also eligible for price supports from the Department of Agriculture. That is viewed as a double subsidy by many. Legislation addressing this issue was introduced last year by Representative Sam Gjedenson. It passed the House; it did not succeed in the Senate. I have every expectation that this issue will surface again in this Congress.

In summary, change is upon us. I think it is incumbent upon the traditional Western water community to work together to deal with that change. We cannot stonewall the future. We must address these issues together.

WATER NEWS DIGEST

WATER CONSERVATION

Acceptance of New Technology Grows

Water conservation technology is increasing in acceptance by the public and in creativity. The composting toilet that operates without water is being installed in more Colorado homes. The toilet uses a large fiberglass tank, and wood chips are added weekly to keep the contents dry. Natural bacteria within the waste "cooks" the contents, a vent system circulates air within the tank, and an exhaust fan carries away the odors. After a few years, several cubic feet of compost matter can be removed. The system has been installed in houses in areas that have curtailed building or require new houses to conform to strict waste-water restrictions. Currently, the Denver metro area uses more water to flush toilets than it uses for drinking, laundry, dishwashing, handwashing, carwashing, toothbrushing, shaving and housecleaning combined. Other technology includes a device that goes inside existing toilet offering two

types of flushes: a short low-water flush or a regular one releasing the whole tank of water. These devices are available in some home improvement and plumbing stores. In addition, "gray water" recycling systems filter water from kitchens, bathrooms, and laundry rooms, then pipe it into yards. Engineers for the new Denver International Airport are exploring using a "gray water" system, according to Liz Inman, Denver Water Department Conservation officer.

Summarizing the new conservationist thinking, Inman said: "It's rude to waste water." The Denver Water Department has led the nation in focussing attention on water conservation, coining the word Xeriscaping--dry landscaping--and promoting conservation through Xeriscaping classes, home demonstrations of water-saving devices, offering free educational materials, and offering an \$80 rebate for homeowners who purchase approved low-volume toilets.

Denver Post 5/19/91, 4/27/91

ET Rates and Lawn Watering Calendar Make Traditional Return

ET rates and the "diamond-square-circle" lawn watering calendar make their traditional return to Denver area's summer landscape on Saturday, June 1. Introduced in 1977, the diamond-square-circle calendar reminds consumers to water lawns no more than every three days. The water department began announcing evapotranspiration rates -- or ET -- in 1981 to help consumers avoid overwatering. Both the diamond-square-circle calendar and ET rates are voluntary water conservation systems now used by most metro area water utilities and special districts. This year, the cities of Fort Collins and Colorado Springs introduced ET rates to their water customers as part of their existing water conservation programs. In addition, cities across the West have adopted or adapted the systems.

The daily watering symbol and ET rate are announced during television newscasts and in daily newspapers. Additional information and help is available from the Denver Water Conservation Hotline at 628-6343 between 8:30 a.m. and 4:30 p.m. weekdays.

UNC Students Call for Water Conservation Measures

Students participating in the senior seminar class in Environmental Studies at the University of Northern Colorado has called for the establishment of a climate-compatible water policy. In a column in the Greeley Tribune, the students detailed the environmental affects of high mountain dams and urged the arresting of further environmental degradation by instituting water conservation measures. Installing more efficient systems can cut domestic use by 35 percent and, the students wrote, using less water could save Greeley as much as \$128,000 a year in sewage treatment costs.

The students cited the 1991 Water Conservation Program survey conducted by the Colorado Water Utility Council, showing Greeley's per capita water consumption to be 121 gallons more than the average use of the 21 cities surveyed. Since Greeley averages only 12-14 inches of precipitation per year, the students made a strong pitch for the expanded use of Xeriscaping, urged the city to make simple changes to landscaping ordinances and the plumbing code, and recommended that the Greeley Water Board change its rate structure to charge more, rather than less, to heavy users.

Greeley Tribune 5/26/91

Development of New Grass Strains Underway

Turf scientists are developing buffalo grass strains that are as thick and green as Kentucky bluegrass and need far less water, mowing and chemicals. The catch is the strains go dormant by late September and stay brown until early May, although turf researchers have come up with promising strains that turn gold,

pink or mauve. The strains have been developed by Terry Riordan at the University of Nebraska and Mel Engelke at Texas A&M with funding from the U.S. Golf Association, and could be available to Colorado homeowners in a year or two.

Rocky Mountain News 5/26/1991

WATER DEVELOPMENT

Arizona's Babbitt Says Water Development Over

The era of surface water development in the West is over and water conservation is the only alternative, according to former Arizona Gov. Bruce Babbitt. Speaking to a water law conference at the University of Colorado, Babbitt named Las Vegas and California as examples of outdated value systems, claimed the Endangered Species Act has rightfully shut down development on many Western rivers, and called for a new approach to management of depleted aquifers.

Coloradoan 6/6/91

Gunnison River Case Begins

Arapahoe County's claim to 153,000 acre-feet of Gunnison River Basin water went to trial June 3. Aurora withdrew from the case a few months ago, but Arapahoe County, former partner with Aurora in the diversion plan, took over the project.

Rocky Mountain News 6/4/91

The National Park Service has formally requested the release of more water from Blue Mesa Reservoir in the spring and a cut back of winter release to guarantee riverflows through the Black Canyon of the Gunnison National Monument. The increased springtime flow would flush out silt and guarantee scenic waterfalls in the 2,000-foot chasm. The change could affect plans by Arapahoe County to build Union Park Reservoir or the AB Lateral hydroelectric project proposed by a Montrose group. The Black Canyon could become a test case for other expected federal water claims.

Associated Press 5/11/91, Denver Post 5/10/91

San Luis Valley in Drought Cycle

The San Luis Valley is in a drought cycle and such cycles can last up to 2,000 years, according to archaeologist Dennis Stanford of the Smithsonian Institution, who spoke to an audience at Sunday's Citizens for San Luis Valley Water lecture series. Stanford and his wife Peggy Jodry, also an archaeologist with the Smithsonian, expressed concern for the effect on archaeological sites in the area of the proposed American Water Development Inc. pumping project. The couple is involved in the only full-scale Folsom dig in the nation's history. While working at the site, which is about

10,800 years old, they began to study the way vegetation and water in the valley have changed during the last 11,000 years.

Pueblo Chieftain 3/6/91

San Luis Valley artists are creating a huge traveling mural depicting their view of life and conflicts in the valley. The group WE CARE, Water and Earth: Concerned Artists for Resources Everywhere, is creating the mural to express their opposition to American Water Development Inc.'s proposal to pump deep groundwater for use along the urban Front Range, and to the Battle Mountain Gold mine near San Luis, Colorado's oldest incorporated town. The mural will be officially unveiled at the state fair in Pueblo this summer, and will eventually return to Alamosa to be hung at a new community center.

Denver Post 5/4/91

Two Forks - Denver/Suburbs Will Sue

Denver and its suburban allies will sue the Environmental Protection Agency, if that's what it takes, to keep the right to develop water on the South Platte River at the site of the vetoed Two Forks Dam. EPA vetoed Two Forks and two scaled-down versions of the project because they were not the least environmentally damaging alternatives. Denver's top water officials believe chances are slim that a federal judge will find EPA's veto so flawed that a permit will be granted for Two Forks, but are concerned that the EPA decision might mean Denver can never develop that water.

Rocky Mountain News June 7, 1991

Marcia Hughes, attorney for suburban backers of the Two Forks Dam, said that the reservoir would cause more environmental damage than other proposed water projects. In a letter to the Metropolitan Water Providers, Hughes wrote that a lawsuit would face several obstacles, including that the New Cheesman Reservoir and the Estabrook Dam are less environmentally damaging than Two Forks.

Denver Post 5/26/91

Dolores/Animas La Plata Costs Rise

Inflation and cost overruns have increased the price tags of the federal Animas-La Plata and Dolores water projects by \$47.8 million, according to officials of the U.S. Bureau of Reclamation. Inflation raised the overall cost of Animas La-Plata by 3.8 percent last year, and inflation and cost overruns combined to increase the cost of the Dolores project by 5.1 percent. Taxpayers and Western electric customers are scheduled to cover the majority of the added costs.

Denver Post 5/28/91

The Four Corners Action Coalition and the taxpayers for the Animas River asked the U.S. Fish and Wildlife Service for further studies of the Animas-La Plata water project's environmental impact statement and the project's effect on wetlands along the Animas River. Project supporters said if construction does not begin this summer, further appropriations for the project could be jeopardized.

Rocky Mountain News 5/20/91, Daily Sentinel 5/20/91

NCWCD/Thornton Case Taken Under Advisement

Chief water Judge Robert Behrman will settle a dispute between the Northern Colorado Water Conservancy District and the City of Thornton. The NCWCD wants water rights for three reservoirs and a possible power facility on the Poudre river northwest of Fort Collins. Thornton claims the district plan will hinder its plans to convert agricultural water rights from Weld and Larimer counties to municipal use. Behrman took the case under advisement June 4 following closing arguments in the 9-day trial.

Coloradoan 6/6/91

Windy Gap

The Loveland Water Board decided not to sell its Windy Gap water and to periodically review all the city's water rights for possible sale or trade. The Board was considering selling some of the water to help pay for the city's raw water program. Recently, two of the original member cities--Greeley and Boulder--have decided to sell their Windy Gap water to Broomfield.

Loveland Report-Herald 5/21/91

WETLANDS

Revision of Definition Considered

The Bush administration is considering a revision of the government's official definition of "wetlands" which would require lands to be wetter deeper and longer to qualify for protection under EPA's permit program. Environmentalists charge the new definition would eliminate protection for millions of acres of vulnerable wildlife habitat.

Denver Post 5/15/91

Arvada Residents Oppose Development

Residents near a 13-acre site containing two ponds and wetlands in Arvada are fighting a developer's proposal to cover the land with \$200,000-\$300,000 homes. Contractors-Developers Services Inc. has an option on the property and touts the location's natural views of the foothills and the nearby wildlife. Area residents want to keep the entire property in its natural state. After initial rejection by the city council,

the developers scaled down their plan, which was then further cut by the Arvada planning commission. Neighbors, however, have formed the Two Ponds Preservation Foundation to fight the scaled-down plan.

Associated Press 5/17/91

RECREATION AND WILDERNESS

Pinyon Canyon Access Planned

Las Animas County commissioners plan to assist the U.S. Forest Service in establishing access to Pinon Canyon's historical and archeological sites and to assist in law enforcement once the canyon is open to the public. The historic sections of the canyon, approximately 16,700 acres, were acquired by the U.S. Army in 1983 as part of the Pinon Canyon Maneuver Site, but were not usable for training purposes. The canyon is the site of a pioneer cemetery and Catholic church, pioneer dwellings, as well as being a breeding ground for several endangered species, including the black-footed ferret and the bald eagle.

Pueblo Chieftain 3/5/91

Brown Introduces Poudre Legislation

U.S. Senator Hank Brown introduced legislation designating the Poudre River basin as Colorado's first National Heritage Area. If approved, the bill would authorize \$1 million to be used over five years by a 15-member, locally nominated and Congressionally appointed commission. The commission would help local governments preserve and interpret the Poudre's contribution to the westward expansion of the United States.

Ft. Collins Coloradoan 5/31/91

A Chronology - Compromise Wilderness Bill

U.S. Senators Tim Wirth and Hank Brown introduced a compromise wilderness bill May 9 designed to meet the interests of water users and environmentalists. The compromise was announced at a news conference in Denver with U.S. Representative Ben Nighthorse Campbell, who will be introducing the compromise in the House of Representatives. The bill would make 22 additions, totaling 642,000 acres, to the Colorado wilderness system, which currently has 2.6 million acres, would prohibit the federal government from obtaining wilderness water rights, and would bar water developers from ever building new dams in proposed wilderness areas. In 1985, U.S. District Judge John Kane ruled that federal agencies were entitled to reserve water rights on Western lands, but that decision was overturned by the 10th Circuit Court of Appeals, which ruled that unless wilderness is actually threatened, no federal reserve right needs to exist.

Pueblo Chieftain 5/11/91, 5/6/91, Denver Post 5/11/91

Colorado Governor Roy Romer announced his support for the bipartisan compromise between Colorado's U.S. senators adding 641,690 acres to wilderness areas in the state. "As a practical matter, the Wirth-Brown proposal achieves the same result as a reserved water right," Romer said in a letter to the senators.

Rocky Mountain News 5/24/91

U.S. Rep. David Skaggs said he will not introduce a federal wilderness bill, but proposed enlarging Rep. Ben Nighthorse Campbell's plan by 429,000 acres. Skaggs' plan also would add 150,100 acres to the proposed wilderness study areas in Campbell's plan.

Ft. Collins Coloradoan 5/7/91

U.S. Rep. Ben Nighthorse Campbell predicted the recently introduced Wirth-Brown Wilderness Bill has a 50-50 chance of passing. Campbell said the bill differs from past wilderness bills in other western states because no federal guarantees are needed, since all the water originates in Colorado and no rivers flow into the state.

Pueblo Chieftain 5/18/91

A coalition of environmental and conservation groups formally announced their opposition to the Wirth-Brown wilderness bill, while the Colorado Farm Bureau announced its support. The opposing groups said the measure jeopardized protection of water flowing through wilderness areas and does not protect areas that the groups call ecologically important. Farm Bureau executive vice president Buford Rice said his organization is pleased with the bill language, which states that there is no federal water right for the wilderness areas included in the legislation. Among the groups announcing their opposition are the Sierra Club, the Wilderness Society, Colorado Wildlife Society, Colorado Wildlife Federation, the LAW Fund, Sheep Mountain Alliance, Trappers Lake Group, Uncompahgre Sierra Club, Colorado Mountain Club and the Colorado Environmental Coalition.

Ft. Collins Coloradoan 5/18/91

The Senate Subcommittee on Public Lands, National Parks and Forests heard testimony from supporters and critics of the compromise wilderness bill introduced by U.S. Senators Tim Wirth and Hank Brown. Environmentalists reiterated their belief that the bill would leave the federal government unable to protect water needs of wilderness lands. Officials of the Colorado Water Conservation Board and several water conservancy districts testified that the wilderness areas' water interests are protected by the bill's prohibition of water projects in the protected areas. Wirth and Brown are expected to meet to discuss proposed boundary changes in their bill and agreed not to propose any changes without mutual agreement.

Denver Post 6/19/91

A bipartisan coalition of Colorado lawmakers testified on behalf of the Wirth-Brown wilderness bill before the House subcommittee that will vote first on the legislation. U.S. Senators Tim Wirth and Hank Brown, and U.S. Representatives Ben Nighthorse Campbell and Joel Hefley appeared before the House Interior Subcommittee on National Parks and Public Lands. Chairman Bruce Vento, (MN) expressed reservations about the unusual language in the bill regarding wilderness water rights. Wirth testified that any substantive changes would cause the bill to unravel.

Ft. Collins Coloradoan 5/24/91, Rocky Mountain News 5/24/91, Denver Post, 5/24/91

HYDROPOWER - THE RELICENSING PROCESS

The relicensing process of Kingsley Dam on the North Platte River in Nebraska could set a precedent for the 165 licenses to operate hydroelectric projects which will expire by 1993. Kingsley Dam's 50-year license expired in 1987 and it has been operated under annual licenses since then as the long-term relicensing process continues. The Federal Energy Regulatory Commission must determine what conditions should be placed on the new license, taking into account environmental laws passed since 1930. Environmental groups want more water to flow at key times of year to maintain the habitat of migratory birds, while power districts and irrigators want adequate water retained in Lake McConaughy to meet irrigation and associated electrical use peaks.

Ft. Collins Coloradoan 5/19/91

BUSH URGED TO DEVELOP NATIONAL WATER POLICY

The heads of two environmental groups have called on President Bush to appoint a commission that would help formulate a national water policy. In a letter to the President dated June 21, George T. Frampton, Jr., President of the Wilderness Society, and Kevin J. Coyle, President of American Rivers, set forth their ten recommendations for a water policy:

- 1) Rationalize economic incentives so that water is allocated sensibly.
- 2) Protect endangered species in the manner required by federal law.
- 3) Manage the federal public lands (26 percent of the U.S. lands) to take greater advantage of the high-quality watersheds they provide, rather than as sites to build dams and dikes.
- 4) Limit the number of rivers dammed to provide hydroelectricity.
- 5) Complete the National Wild and Scenic River System.
- 6) Implement a new strategic plan for the U.S. Bureau of Reclamation.
- 7) Rescind the 1988 opinion by the Interior Department Solicitor that there are no reserved water rights for federal wilderness areas.
- 8) Implement a "no net loss" wetlands policy.

- 9) Actively enforce water quality laws and regulations.
- 10) Coordinate the federal agencies involved in water issues.

The two groups cosponsored a conference on water use and river protection June 20-23 at the Sheraton Denver Tech Center.

Source: American River/The Wilderness Society, 6/21/91

HATFIELD REINTRODUCES WATER BILL

On June 6, Senator Mark Hatfield of Oregon reintroduced the Western Water Policy Review Act that he first introduced in 1989. The bill directs the Secretary of the Interior and an advisory commission to study the institutional framework surrounding federal water policy in the 19 Western states and recommend changes for a more coherent decisionmaking process. "Drought conditions in the Western U.S., particularly California, again serve to underscore the desperate need for a coordinated and comprehensive water policy....," said Hatfield.

Source: Western States Water, 6/28/91

NEW CHAIRMAN FOR HOUSE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS

On May 9, 1991, the U.S. House of Representatives elected Congressman George Miller (D-CA) to serve as the Chairman of the Committee on Interior and Insular Affairs. He replaces former Congressman Morris K. Udall (D-AZ), who served as the Committee's chairman for nearly fourteen years. The Interior Committee oversees a wide array of issues, including nuclear power, Indian affairs, national parks, forest and wilderness lands, Western water projects, mining and offshore drilling. An article in the Congressional Quarterly (4/17/91) says Miller is expected to bring a much more aggressive style to the committee. Miller is "...likely to be much more of an activist trying to charge market values for publicly owned or subsidized resources, including federal water, grazing land, mineral resources and hydroelectric power," says the article.

AMERICAN RIVERS ANNOUNCES MOST ENDANGERED RIVERS OF 1991

American Rivers has announced the most endangered and threatened rivers of the United States for 1991. The most endangered river is the Colorado River in Arizona which is threatened by hydroelectric dam operations that cause enormous damage to wildlife, habitat and recreation opportunities in the canyon. American Rivers also named 15 other highly threatened rivers and their threats. Included were: The Animas River (Colorado) -- proposed irrigation project; and the Arkansas River (Colorado) -- two proposed water projects that would flood an important river stretch.

Source: American Rivers News Release, 4/16/91

NOAA-11 POLAR ORBITING SATELLITE TRACKS DROUGHT CONDITIONS

NOAA/NESDIS has designed a new AVHRR-based vegetation condition index (VCI) that can be used to detect and track drought. The VCI is adjusted for land climate, ecology and weather conditions. Measured on a scale of 0-100, VCI values below 30 are used as an indications of drought. A PC software package was developed to demonstrate satellite-derived droughts during 1985-1990 in the United States and sub-Saharan Africa. The data can be sent on request for comparison with ground information. A PC AT-286 or AT-386 with a VGA graphics board and a 5.25-inch density floppy drive is required. Coverage is being extended to include the entire vegetated area of the world. For information contact Felix Kogan, Satellite Research Laboratory, NESDIS/NOAA, Washington, D.C., 20233.

Source: Drought Network News, June 1991.

ENVIRONMENTAL INSTITUTE APPOINTS WATER DIRECTOR

Veteran Congressional investigator Don Gray has joined the staff of the Environmental and Energy Study Institute (EESI) as Senior Fellow and Water Program Director. Gray recently retired as Chief Investigator of the Environment, Energy and Natural Resources Subcommittees of the House Committee on Government Operations, where he also served as Staff Director. During eight years with the subcommittee, Gray specialized in environmental matters, including groundwater contamination, hazardous and radioactive waste disposal, safe drinking water regulation and water resources development.

The Environmental and Energy Study Institute (EESI) was established in 1984 in cooperation with the leaders of the Congressional Environmental and Energy Study Conference.

SOME BACTERIA FOUND ABLE TO CLEAN URANIUM CONTAMINANTS FROM WATER

Scientists with the U.S. Geological Survey, Department of the Interior, have discovered that at least two types of bacteria can be used to clean uranium, a radioactive and toxic metal, from contaminated water. Discovery of the ability of the microbes to remove uranium from water by changing the metal to an insoluble form was announced by Derek R. Lovley, a microbiologist at the USGS National Center in Reston, Virginia, and three USGS co-authors in the April 4, 1991 issue of *Nature* magazine. This marked the second announcement by Dr. Lovley in less than a year of the discovery of the ability of bacteria to remove contaminants from water. In a lecture May 1, 1990, at the USGS National Center, Lovley disclosed that similar bacteria have the ability to reduce concentrations of some organic contaminants in ground water. None of the bacteria involved in the USGS studies are harmful to humans or animals, Lovley said.

Source: USGS, 4/3/91

ENVIRONMENTAL INSTITUTE STUDIES WATER EFFICIENCY

An EESI Water Efficiency Project seeks to identify key issues and policy options, provide information to national policy makers, and spark further discussion and debate on water efficiency. The project started with workshops to explore key issues. The first workshop, held in Tucson, Arizona in 1990, was on water supply alternatives. The second workshop, held in Denver, Colorado in May 1991, looked at agricultural water conservation and the opportunities and obstacles confronted in providing environmental benefits. EESI now plans a series of briefings on water efficiency to help Congress identify the key issues and examine alternatives for action.

CALLS FOR PAPERS

1992 National Conference on Water Resources Planning and Management A Component of Water Forum '92, August 3-5, 1992, Baltimore, Maryland. Special emphasis is being given to national and international contributions that discuss either newly emerging problem areas, new methodology, or suggested new directions for water resources research. Conference papers will be published in the proceedings. The WRPM Division's committees and the Urban Water Resources Research Council will organize sessions including invited and contributed papers. Three copies of 500-word abstracts (typed double spaced) should be submitted. All participating authors will be required to submit a paper. Send submittals to: Mohammed Karamouz, Civil Engineering, Pratt Institute, 200 Willoughby Avenue, Brooklyn, NY 11205, Tel: (718) 636-3436. Deadline for abstracts is August 1, 1991.

The 1992 Simulation Multiconference - Managing Risk with Computer Simulation, April 6-9, 1992, Orlando, Florida. Sponsored by the Emergency Management Technical Activity of SCS to bring together users, planners, researchers, and managers to learn and exchange ideas about how, when, where, and why computer simulation can be used to avoid, mitigate, and recover from disasters and other emergencies. Deadline: October 15, 1991. Each abstract must include the names of the proposed paper with a short summary, so that it may be properly positioned in the conference; Only papers which have not been previously published should be submitted. Authors must obtain employer, client or governmental releases prior to submissions of the final manuscript. Authors and other participants are expected to register early at a reduced rate, and to attend the Conference and participate at their own expense.

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

November 19-20, 1991

University Park Holiday Inn Fort Collins, Colorado



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

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

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

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

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

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

Target Participants

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

Presentations

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

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

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

Sponsored by:

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

For information about the Conference, contact: Jack Carroll, (519) 666-0092, FAX (519) 661-3515/3292, E-mail (jmc@csd.uwo.ca). Written submissions with a cover letter stating the name, address and phone numbers of each author should be sent to: Emergency Management and Engineering, (EMC 1992), P.O. Box 17900, San Diego, CA 92177, Telephone: (619) 277-3930.

WATER EXPERTS TO DEBATE EFFECTS OF ENVIRONMENTAL REGULATIONS

Wetlands regulations, nonpoint pollution control, instream flows, endangered species protection...an increasing number of regulations, created to protect the environment, are changing the water is managed in the arid West. At the Sixteenth Annual Colorado Water Workshop, more than three hundred people will meet to discuss the progress and problems created by environmental regulations.

"From the Dome to the Ditches: Translating Environmental Legislation into Practice," is the theme of this year's Workshop, scheduled July 21-23 at Western State College in Gunnison. Bennett Raley, legal counsel to Senator Hank Brown, and Melinda Kassen of the Environmental Defense Fund, will open the Workshop with their diverse perspectives on the reauthorization of the Clean Water act and its implications for Colorado. Next on the schedule are Marc Reisner, author of *Cadillac Desert*, and respected water attorney Gregory Hobbs, facing off in a debate on the problem of balancing water development and environmental protection.

Discussions will then shift to Colorado's nonpoint pollution control programs, including a debate on hydrologic modifications, with Larry Simpson of the Northern Colorado Water Conservancy District and Lane Wyatt from the Northwest Colorado Council of Governments. Highlights of July 23 will include an examination of the reevaluation of river-system operations. How can dam operations be modified to improve environmental protection while also serving the needs of power generators and water users? Speakers will include Rick Gold, Assistant Regional Director of the Bureau of Reclamation for the Upper Colorado River; Jim Lochhead, member of the Colorado Water Conservation Board; and Dan Luecke of the Environmental Defense Fund.

Additional discussions will focus on the application of wetlands regulations. Panelists will include biologist David Cooper, Roger Mitchell of the Colorado Farm Bureau, and Eric Kuhn from the Colorado River Water Conservation District.

The Colorado Water Workshop is made possible through the cooperative efforts of private and public sponsors and the Western State College of Colorado. Major sponsors of the 1991 Workshop include: the City of Gunnison, the City of Aurora, the Colorado River Water Conservation District, the Denver Water Department, the Southwestern Water Conservation District, Natural Energy Resources Company, and

the Colorado Division of Wildlife. Western State College offers one undergraduate or graduate credit for the conference. Eighteen Continuing Legal Education (CLE) credits are also available for Colorado attorneys and judges. The registration fee, which includes meals and materials, is \$195 if postmarked by July 10, and \$220 thereafter. A limited number of partial scholarships are available. For more information, call or write: Colorado Water Workshop, Western State College, Aspinall-Wilson Center, Gunnison, CO 81231, (303) 641-2238.

INTERNATIONAL CONFERENCE ON SUB-IRRIGATION AND CONTROLLED DRAINAGE TO BE HELD IN LANSING MICHIGAN AUGUST 12-14, 1991

An International Conference on Subirrigation and Controlled Drainage will be held in Lansing, Michigan August 12-14, 1991. The conference will bring together water table management researchers and practitioners to exchange views on the design, operations, economic and environmental impacts of subirrigation and controlled drainage systems. During the first two days, twenty-five technical papers authored by experts from the USA, Canada, China, Netherlands, New Zealand, Italy, Finland and the United Kingdom will be presented. Table top exhibits (posters, computer software, etc.) will be available for viewing. The third day will be devoted to touring subirrigation research sites, production subirrigation systems, and research facilities at Michigan State University.

The registration fee for the conference is \$195 before July 14 and includes a Sunday reception; breakfast, lunch and banquet Monday; breakfast and lunch Tuesday; all refreshment breaks; and the conference proceedings. The charge for the tour is \$650 and includes a continental breakfast and lunch. Contact Barbara Brochu, Agricultural Engineering, 217 Farrall Hall, Michigan State University, East Lansing, MI 48824; (517)355-3477; FAX (517)353-8982 for information.

Climate and Water Resources Management, Albuquerque, New Mexico, November 5-7, 1991. Sponsored by the Bureau of Reclamation, Army Corps of Engineers, Environmental Protection Agency, National Oceanic and Atmospheric Administration, and the U.S. Geological Survey, the conference will present water resources managers, planners, and policy makers with the newest thinking on the potential sensitivity of water resources to climate change and shifts in climate variability and start a dialogue on how those might affect water management systems and resources. Additional information is available from Mr. Joel Smith, EPA. Telephone: (202)475-9655; FAX: (202)479-1009 or Mr. Tom Ballentine (Corps of Engineers) Telephone (703)355-2072; FAX: (703)355-3171.

POSITIONS AVAILABLE

Assistant/Associate Professor in Agricultural Engineering--
Nature of position: To provide leadership, direction and technical support for Extension programs in water quality,

environmental protection and pollution control. Require Ph.D in Agricultural Engineering of equivalent degree in a closely related field. Effective oral and written communication skills required. PE or PE eligibility preferred. Interest in and knowledge of American agriculture is desirable. Salary is open and competitive, depending on experience and qualifications. Job will be filled by October 1, 1991 or as soon thereafter as a suitable candidate can be found. Application must be received by **July 15, 1991**. Submit a letter of application, statement of professional goals, a resume, transcripts and three letters of reference to: Dr. Michael D. Smolen, Agricultural Engineering Dept., Oklahoma State University, Stillwater, OK 74078-0497.

Extension Agent (Irrigation)--Colorado River Salinity Control Program. Two positions are available located in Cortez and Montrose (Please indicate preference on the application materials). Applications (organizational application form required) and transcripts of college course work must be received or postmarked no later than **July 19, 1991**.

The individual will work as a member of a team of professionals, and is a local representative of Colorado State University. Primary duties include, but are not limited to: Implementing an Extension information and education program to create an awareness of the Colorado River Salinity Control Program; implementing an Extension program in irrigation management with emphasis on local crop production; coordinating research and Extension activities with other

professionals working in this area; cooperating with other agencies and organizations, both public and private, where appropriate; and providing leadership and assistance with other activities as assigned.

The organizational annual, minimum base salary for this EA-3 position is \$18,700 (BS) or \$21,700 (MS). Starting salary for the successful applicant beyond this base will be determined by adding to the base for additional relevant professional experience and formal training beyond the masters to a level comparable to current extension staff in this grade. Completed BS, MS is preferred.

Application forms and additional information may be obtained by writing to: Milan A. Rewerts, personnel Director, Cooperative Extension, 229 Aylesworth Hall, NW, Colorado State University, Fort Collins, CO 80523. Tele: 491-6421.

Research Hydrologist (GS-9/12)--The USEPA's Environmental Research Laboratory in Athens, Georgia seeks applicants in the area of the interaction of global climate change and the hydrologic cycle. The successful applicant will be responsible for systematic studies of the impact of global climate change on water resources and feedback processes from the hydrologic cycle to climate through radiatively important trace gas emissions. For further information contact: Personnel Officer, Environmental Research Laboratory, USEPA, College Station Road, Athens, GA 30613-7799. Phone: (404)546-3517/

MEETINGS

- July 21-23 **Sixteenth Annual Colorado Water Workshop, "From the Dome to the Ditches, Translating Environmental Legislation into Practice**, Gunnison, CO. Contact: Lucy High or Dale A. Skoff, Aspinall-Wilson Center, Western State College, Gunnison, CO 81231. Telephone: (303)641-2238 or (303)943-3232.
- July 25-26 **High Altitude Revegetation Committee 1991 Summer Field Tour** - a tour of the central Colorado Rocky Mountains on both sides of the Continental Divide, including: the Alice Mine, the URAD Mine, the Pennsylvania Mine, the Colorado Yule Marble Quarry, and the Eagle Mine. Contact: Larry Brown, HAR Chairman, L.F. Brown & Associates, Inc., P.O. Box 698, Idaho Springs, CO 80452, (303)674-9813; Gary Thor, HAR Secretary, Colorado State University, Department of Agronomy, Ft. Collins, CO 80523, (303)491-7296; or Bruce Humphries, HAR, Colorado Mined Land Reclamation Division, Room 215, 1313 Sherman St., Denver, CO 80203, (303)866-3567.
- July 30-Aug. 2 **UCOWR Annual Meeting, Water Rights East and West: Environmental and Allocation Issues**, Albuquerque, NM. Contact: UCOWR Executive Director's Office, 4543 Faner Hall, Southern Illinois University, Carbondale, IL 62901. Phone: (618)536-7571.
- Aug. 12-14 **International Conference on Subirrigation and Controlled Drainage**, Lansing, MI. Contact: Barbara Brochu, Agricultural Engineering, 217 Farrall Hall, Michigan State University, East Lansing, MI 48824-1323. Telephone: (517)355-3477 or FAX: (517)353-8982.
- Aug. 22-23 **Sixteenth Annual Membership Forum and Water Workshop**, Breckenridge, CO. Contact: Dick MacRavey, Colorado Water Congress, 1390 Logan St., Suite 312, Denver, CO 80203. Telephone: (303)837-0812.
- Sept. 5-6 **Colorado Water Law Seminar**, Denver, CO. Contact: Dick MacRavey, Colorado Water Congress, 1390 Logan St., Suite 312, Denver, CO. Telephone: (303)837-0812.

Sept. 19-21

A Symposium on the Settlement of Indian Reserved Water Rights Claims, Albuquerque, NM. Contact Western States Water Council or Native American Rights Fund.

Nov. 11-16

Nalms 11th International Symposium - Lake, Reservoir and Watershed Management in a Changing Environment, Denver, CO. Contact: Jim LaBounty, Bureau of Reclamation, D-3742, P.O. Box 25007, Denver, CO 80225, (303)236-6002; or Bob Schroeder, Denver Water Department, 1600 West 12th Ave., Denver, CO 80254, (303)628-6382.

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MEETINGS

**Colorado Water Resources
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