COLORADO WATER

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

WATER ITEMS AND ISSUES . . . *June 1992*

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Colorado State University

EDITORIAL

by Robert C. Ward

The Colorado Water Resources Research Institute (CWRRI) operates a modest research program each year. CWRRI utilizes two advisory committees in operating its research program: (1) the Research Planning Advisory Committee (RPAC) comprised of 30 representatives of water users, managers and professionals from around the state; and (2) the Technical Advisory Committee (TAC) comprised of 13 faculty from institutions of higher education.

The RPAC assists in identifying water-related research needs. Once the needs are defined, a call for proposals is announced to faculty, primarily through this newsletter and on-campus mailings. Thirty-two proposals were submitted this past January for 1992/93 funding. The RPAC evaluated the proposals for relevance to Colorado's water management needs and the TAC evaluated the proposals for scientific merit. With the evaluations, CWRRI was able to fund the top 12 proposals for 1992/93.

In this issue of *Colorado Water* the 12 proposals selected for funding are briefly summarized (see page 3). Each proposal is funded at a "seed money" level of $10,000 to $15,000. Several of the projects have additional matching money from Colorado water organizations. Readers interested in the research projects are encouraged to contact the principal investigators for more information. The more dialogue the researchers have with Colorado water users, the stronger will be the connection between CWRRI's research program and the users of the research results.

The knowledge gained through these research projects also helps the faculty keep their water-related courses current. Course titles of water-related subjects offered at the senior and graduate levels at CSU are listed on page 17. This listing of courses is by current topic area rather than academic discipline. It is interesting to note the variety of disciplines addressing the different topic areas. Listings of water courses for the University of Colorado at Boulder and the Colorado School of Mines are currently being prepared and will be published in future issues of *Colorado Water*.

The interplay between research and education is a major goal of a research university and the listing of CWRRI research projects and CSU water-oriented courses serves to illustrate this close connection in the water area.

RESEARCH OPPORTUNITIES

The Denver office of the Bureau of Reclamation invites proposals for water conservation innovative technology research for agricultural and urban irrigation water. The Bureau anticipates awarding two or three cooperative agreements from FY1992 funds. The minimum funding available for this program is $250,000, and funding of at least that amount is anticipated for FY1993 through FY1995; however, the amount available for each year will be contingent upon funds available from Congressional appropriations. The period of performance is two years and applicant must provide 25 percent cost share.

Applications must be received by 4:00 p.m. on Friday, June 30, 1992. Contact your contracts and grants office or Ann Fleckenstein, Contract Specialist, Bureau of Reclamation, at telephone number (303)236-8041.

COLORADO WATER

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Editor
Shirley Miller

Writers
Maureen Maxwell
Jennifer Roberts
Laurel Saito
Greg Silkensen
Craig Woodring

Writer-Librarian - Mary DeMartini

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WATER RESEARCH

RESEARCH PROJECTS SELECTED FOR 1992-93 CWRRI PROGRAM

Thirty-two faculty members at Colorado State University, the University of Colorado and the School of Mines responded to CWRRI's request for preproposals for its 1992-93 water research program. The preproposals were reviewed and rated by CWRRI's Research Planning Advisory Committee (water professionals) and Technical Advisory Committee (faculty members from CSU, CU and CSM).

The combined ratings resulted in selection of the following 12 projects for next year's program, pending approval by the U.S. Geological Survey, CWRRI's federal sponsor.

Impact of Irrigation Water Use on Water Quality in the Central Colorado Water Conservancy District

An environmental concern for Colorado agriculture is that return flows from irrigated agriculture are a source of groundwater pollution. This research will evaluate irrigation water use as a function of different crops, soils and management practices. The goal will be to reduce adverse effects on groundwater quality by better irrigation management. Water use efficiency will also be considered. The project will provide the Central Colorado Water Conservancy District with a better understanding of how groundwater quality in the South Platte Basin is impacted by irrigation. *Principal Investigator: Jim Loftis, Department of Agricultural and Chemical Engineering, Colorado State University.*

Design and Operation of Small Lysimeters for Estimating Return Flows for Urban Lawn Water Use

This project, which continues research currently underway, is investigating the accuracy of small lysimeters by comparing them to a standard lysimeter located at the Agricultural Engineering Research Center at Colorado State University. Second-year research will (1) assess the effect of different watering patterns on the resulting deep percolation; and (2) investigate the relationship between deep percolation and return flow in urban lawn water use (the effect of water use by trees, shrubs and other vegetation surrounding urban lawns. The project has received additional funding from the State Engineer's Office and the City of Colorado Springs. *Principal Investigators: Ramchand Oad and Terry Podmore, Department of Agricultural and Chemical Engineering, Colorado State University.*

Development of Reference Evapotranspiration Maps for Colorado

The State of Colorado is lagging behind in standardizing the computation of agricultural crop water requirements. To estimate evapotranspiration (ET) and water demand, Reference Crop Evapotranspiration (ETo) values are first determined for a given location and then crop coefficients are applied. At the present time Colorado does not have a standard set of mean ETo values. This project will develop a set of isoline (constant ET value) maps that can be adopted as a standard by the State Engineer's Office to compute agricultural crop water requirements. The maps can also be used in computing water demand and planning and managing the state's water resources. *Principal Investigator: Luis Garcia, Department of Agricultural and Chemical Engineering, Colorado State University.*

Cooperative Regional Water Management Through a Federated-Distributed Database

This is the final year of a three-year effort to develop a cooperative data-sharing program among water organizations in the South Platte Basin. This year the implementation - or on-site operation and management of the federated database at participating organizations - will be completed. Investigators plan to use several existing models to demonstrate usefulness of the system. For example, the SAMSON model will be used to address implementation issues such as linkage to model-base systems for use in the formulation and analysis of water management alternatives. Following prototype evaluation and documentation, key participants will be gathered to decide on future directions for the database. *Principal Investigator: Tim Gates, Civil Engineering, Colorado State University.*

Spatial Distribution of Nitrate Leaching "Hot Spots" and Nitrate Contributions to the South Platte River Basin Aquifers

This project will address the issue of groundwater quality in the South Platte River Basin Aquifer due to nitrate contamination. Additional critical issues addressed will be conjunctive management of surface and groundwater, reclamation of polluted groundwater, and regulation of groundwater recharge through control of deep percolation water quality. Project objectives are to: (1) develop crop use

maps from multitemporal Landsat TM images; (2) incorporate crop use, aquifer characteristics, soils, climate and other geographic data layers within a geographic information system (GIS) to provide data inputs for nitrate leaching estimation via NLEAP; and (3) produce maps showing the spatial distribution of Nitrate Leached (NL) and Annual Leaching Risk Potential (ALRP) indices for specified areas within the South Platte Basin. This will allow the identification of the geographical extent and spatial distribution of nitrate leaching "hot spots." *Principal Investigator: Roger M. Hoffer, Forest Sciences Department, Colorado State University.*

Improved Conjunctive Ground and Surface Water management in the South Platte Basin: Economics, Institutions and Policies

The South Platte aquifer, which contains an estimated eight million acre-feet, is an extremely important renewable resource for northeastern Colorado. The aquifer has been proposed as a potential source of water for urban areas during long-term, water-short periods. Water could then be replenished during a higher-flow precipitation cycle. The South Platte stream-aquifer simulation model (HELM) will be refined and used to propose alternative institutional and policy changes that would augment economic returns to the South Platte stream-aquifer system and to test these proposals. *Principal Investigator: S. Lee Gray, Department of Agricultural and Resource Economics, Colorado State University.*

Agricultural to Urban Water Transfers in Colorado: An Assessment of the issues and Options

There is currently considerable concern about the possible adverse effects of water transfers on rural agricultural areas. Under existing law, transfers may not occur if they will result in injury to other water rights. Possible harm such as loss of economic activity and reduction of the tax base in the area of the original water use generally are not considered. This project will: (1) assess recent water rights transfers from agricultural to urban use and the issues associated with these transfers; (2) quantify the extent and nature of this activity; (3) set forth existing Colorado law and procedure regarding water rights transfers; and (4) describe and analyze additional approaches including water banks, water leasing, dry-year options, water conservation, and options for mitigating third-party effects.Included will be a case study of water transfers in the lower Arkansas Valley. *Principal Investigator: Larry MacDonnell, Natural Resources Law Center, University of Colorado.*

Water Transfer Effects on Vegetation and Riparian Systems in a High-Altitude Mountain Meadow

Transfers of water rights from agricultural uses to municipal and industrial uses have been particularly significant in the South Park region of Colorado. Approximately 50,000 acres were irrigated prior to the beginning of large-scale transfers initiated in the late '60s. Only a small fraction of this acreage is currently being irrigated, and as a result, much of the riparian land formerly devoted to hay production is now used for livestock grazing during the summer. The potential effects of this change are unknown, but some suggest that the biological consequences of this transition may be negative. This project will: (1) determine the changes in species composition and productivity of vegetation in meadows that result from water transfers; and (2) determine the effects of livestock grazing on mountain meadows. *Principal Investigator: Dan Smith, Department of Agronomy, Colorado State University.*

Heavy Metal Removal From Waters by Mountain Meadow Bogs

Since mountain meadow bogs intercept mine drainage water in many Colorado mining areas, it is important to understand how to manage these critical areas. If bogs are maintained, they may provide a method for removing heavy metals. When drained, however, the bogs may become a major contributor to heavy metal contamination. This project will examine two bogs having similar soil, water and geologic properties near the mining area of Leadville, Colorado. The only difference between the two is that one bog was contaminated with heavy metals from the California Gulch source between the years 1874 to 1920. Water and sediment samples from the bogs will be subjected to experiments to determine heavy metal inputs into the Arkansas river. *Principal Investigator: Willard Lindsay, Department of Agronomy.*

Integration of Water Quantity and Quality in River Basin Network Flow Modeling

Of particular importance to Colorado is the need to integrate water quality management within the context of institutional and legal structures that govern water storage, diversion and use. This project will develop a flexible approach for the model MODSIM that will allow its linkage with a variety of surface stream, impoundment, and groundwater quality models. This will update all water quality coefficients as flow calculations are modified by MODSIM. A prototype version of the new water quantity/quality version, MODSIMQ, will be evaluated and tested on a portion of the South Platte River Basin through cooperation with the ongoing National Water Quality Assessment Program being conducted on the Basin by the U.S. Geological Survey. *Principal Investigators: Darrell Fontane and John Labadie, Department of Civil Engineering, Colorado State University.*

Improvements in the Colorado Ammonia Model by Simultaneous Computation of Extremes in Flow and Water Chemistry

The Colorado Ammonia Model is used by the Colorado Department of Health in estimating the maximum allowable concentrations of total ammonia for point source dischargers

to the surface water of Colorado. Total ammonia limits dictate treatment requirements for wastewater effluent, and simultaneously allow for full protection of the surface waters of Colorado within the standards set by the Water Quality Control Commission. Currently, the model treats extremes of water chemistry and hydrology separately. This project will add a component to the model allowing it to treat these two variables simultaneously. The simultaneous treatment of extremes in flow and water quality would improve the sophistication and realism of the model, and provide for optimal use of site-specific stream flow and chemistry data in the preparation of flow-based discharge permits. Both the Colorado Department of Health and the US Environmental Protection Agency supported development of the model and have agreed to collaborate in developing the improvement outlined in the proposal. *Principal Investigators: William M. Lewis, Jr. and James F. Saunders, III, Department of Environmental, Population, and Organismic Biology, University of Colorado.*

Field Assessment of Recharge and Stream-Aquifer Interaction in Arid Western Basins and Comparison With Computer Representations

As Colorado's population grows and the state develops, appropriators of water will encounter problems, and many will look to groundwater supplies to satisfy their needs. Use of groundwater affects stream discharge, but it is difficult to determine the magnitude of the impact. Building on previous work funded by CWRRI, this project will improve technology for field characterization of recharge and stream-aquifer interaction, the two most critical and least known parameters required for modeling arid western basins. The technology will be applied in an integrated approach by modeling a natural water system to obtain more realistic evaluations for the purpose of making better decisions regarding the management of groundwater and surface water. *Principal Investigator: Eileen Poeter, Dept. of Geology and Geological Engineering, Colorado School of Mines.*

DU PROF RECEIVES NSF GRANT

Thomas E. Drabek of the University of Denver has received a $307,878 award from the National Science Foundation to study "Disaster Evacuation Behavior Among Transient Populations." The project will document the social processes that affect disaster evacuation behavior among four types of transient populations: tourists, business travelers, migrant workers, and people in the process of relocating (including the homeless). Drabek is a member of the Department of Sociology at the University of Denver.

Source: Natural Hazards Observer, May 1992

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

Impacts of Water Management on the Fishery Resources of the Wind River on the Wind..., Eric P. Bergersen, Cooperative Fish & Wildlife Research

Monitoring the Response of the Uppertroposphere/Lower Stratosphere to a Greenhouse Gas..., Stephen K. Cox, Atmospheric Science

National Forest User Perceptions & the Role of Interpretation on Grazing Allotments, George N. Wallace, Recreation Resources

Ecological Risk Assessment of the Aberdeen & Yuma Proving Grounds, Patricia L. Kennedy, Fishery & Wildlife Biology

Integrated Research on Hazardous Chemical Mixtures/Environmental Biotechnology, Kenneth F. Reardon, Agricultural & Chemical Engineering

Colorado Squawfish & Razorback Sucker Chemoreception Imprinting & Propagation, Robert T. Muth, Fishery & Wildlife Biology

Flaming Gorge Studies: Non-Native Fish Management, Robert T. Muth, Fishery & Wildlife Biology

Conservation Tillage in a Furrow--Irrigated Arid Environment of Western U.S.A., Calvin H. Pearson, Western Slope--Fruita

Flaming Gorge Studies: Larval--Adult Colorado Squawfish Recruiting & Link, Robert T. Muth and John A. Hawkins, Fishery & Wildlife Biology

Larval Collection Maintenance, 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

Flaming Gorge Studies: Assessment of Drifting Larval Fishes in the Yampa River, Robert T. Muth, Fishery & Wildlife Biology

Climate Change Effects on Soil Carbon Balances, William H. Hunt, Natural Resource Ecology Lab

Independent Review & Evaluation Services for EG&G--Rocky Flats, Ralph E. Smith, Assoc. Vice President for Research

Colorado Department of Highways--STAND, William L. Peterson, Extension Service

Inter-Decadal Variations of Atlantic Tropical Cyclones & the West African Monsoon, William M. Gray, CIRA Admin. Unit

Fish Species Identification on the Methow River, Robert J. Behnke, Fishery & Wildlife Biology

Spatial Trends in Surface Water Quality, Noatak National Preserve, Daniel E. Binkley, Forest Sciences

The Creation of Wetlands at the Rocky Mountain Arsenal: Monitoring the Patterns & Processes, David J. Copper, Cooperative Fish & Wildlife Research

U.S. - Turkey Workshop & Meetings on Pollution Control Projects in Turkey, David W. Hendricks, Civil Engineering
Embankment Overtopping, James R. Ruff, and Steven R. Abt, Civil Engineering
Climatic Change in the Colorado Rocky Mountains: Bounding Projected Changes in Region..., Timothy G. F. Kittel, CIRA Admin Unit
Interdisciplinary Science Investigation of Clouds & the Earth's Radiant Energy System, David A. Randall, Atmospheric Science
Experimental Study of Deep-Sea Fan Evolution and Sedimentology, Frank Ethridge, Earth Resources
Acute Toxicity Testing for Rio Grande Aquatic Species, Daniel Beyers, Fishery & Wildlife Biology
Projecting Climate and Vegetation Change for the Central Grasslands Region, Roger A. Pielke, Atmospheric Science
Range-Watershed Training for Native Americans, Ellsworth T. Bartlett, Range Science
Larval Fish Laboratory Involvement in Implementing Recovery Actions for the Endangered Species, Robert T. Muth, Fishery & Wildlife Biology
Development of a Procedure for Determining Groundwater Pollution Potential Due to Agriculture, Jim Loftis, Agricultural and Chemical Engineering

University of Colorado, Boulder, CO 80309

Global Surface--Based Cloud Observations For ISCCP, Julius London, Astrophysical, Planetary and Atmospheric Sciences
Effect of Glacial and Polar Ice on Space Geodetic, John Wahr, Physics
Sea Ice Motion in the Central Arctic Pack Ice as Inferred from AVHRR Imagery, William Emery, Aerospace Engineering
Application of Atmospherically Corrected Images And Reflectance Spectra From HIRIS to the Identification and Mapping of Stabilized Eolian Deposits as Potential Indicators of Global Change, Alexander Goetz, Geological Sciences
Prediction of Climate Change in the Tropics Using Combined Statistical Techniques, Cecile Penland, CIRES
An Integrated Detection System for the Measurement of Carbon Species in the Atmosphere, James Roberts, CIRES
Project ARRCC: Analysis of Rapid and Recent Climatic Change, Jonathan Overpeck, Institute of Arctic and Alpine Research
Paleoclimate in Southern South America and Its Relation to Antarctic Paleoclimates, Vera Markgraf, Geological Sciences
High-Resolution Holocene Climatic Reconstructions From the Eastern Canadian Arctic, Jonathan Overpeck, Institute of Arctic and Alpine Research
***Fracture Mechanics of Concrete Gravity Dams Part III: Dynamic Testing and 3D Analysis**, Victor Saouma, Civil Engineering
***Fracture Mechanics of Concrete Gravity Dams Part I: Static Loading**, Victor Saouma, Civil Engineering
***Comparative Lithological Mapping Using Multipolarization, Multifrequency Imaging Radar and Multispectral Official Remote Sensing**, Alexander Goetz, CIRES
***Distribution and Recovery of Refinery Waste Products in Groundwater Aquifers: Experimental Study and Model Evaluation**, Tissa Illangasekare, Civil Engineering
***Effect of Boundary Conditions on the Strength and Deformability of Natural Fractures in Welded Tuff**, Stein Sture, Civil Engineering

1992 STUDENT PAPER COMPETITION

American Water Resources Association (AWRA)
Universities Council on Water Resources (UCOWR)
Hydrolab Corporation

Three awards will be given: one sponsored by Hydrolab Corporation of Austin, Texas, and the other two by the Am erican Water Resources Association (AWRA) and the Universities Council on Water Resources (UCOWR).

AWARDS: AWARD #1 - Given by Hydrolab Corporation for the Best Student Paper Presentation at the Annual AWRA meeting Nov. 1-5, 1992 in Reno, Nevada.

- **Cash price of $250.00**
- **One year's membership in AWRA**

This award will be presented at the Annual Meeting

AWARD #2 - Two awards given by UCOWR and AWRA to the students who submit the best technical paper. One award is given for the best undergraduate paper and one award is given for the best graduate paper.

- **Cash prize of $250 for each award**
- **One year's membership in AWRA for each award**
- **Publication in the *Water Resources Bulletin* for each award**
- **Travel expense stipend to attend the Annual Conference for each award**

APPLICATION FORMS ARE AVAILABLE FROM CWRRI OR CONTACT PETER E. BLACK AT (315)470-6571.

FEATURES

THE NATION NEEDS A COMPREHENSIVE WATER POLICY

by Senator Mark O. Hatfield (R, Oregon)

In an age of growing demand for resources, Americans are beginning to realize the responsibility we have to conserve and coordinate the use of our water supply. The recent war in the Middle East has confirmed my theory that war over access to raw materials is a reality, but while countries around the world can diversify their fuel resources, there is no substitute for water.

Water resources security must originate from the conservation and wise distribution of existing resources. But unfortunately, water policy at the federal level is fragmented and haphazard at best. Presently we have at least 13 congressional committees that deal with water resource issues. In addition, there are eight cabinet level departments, six independent agencies, and two White House offices with responsibilities related to water policy.

Despite this incredible maze of bureaucracy, we have no coherent policy directing the use, conservation, and our future need for water in this country.

Meanwhile, Congress continues to fund water impoundment projects and storage systems, set safe drinking water standards, and approve waste treatment facilities. And, as it is written now, a bill to reauthorize the Clean Water Act will shift the focus of the Environmental Protection Agency from pollution control to stream quality management, a shift that would have significant implications on traditional concepts of federal - state water relations in water management.

Throughout this country, we are faced with increasing conflicts over the use of our natural resources. And yet there has been no systematic examination of the role of states in the water picture, no examination of interstate and inter-basin water policies, no comprehensive understanding of out water needs, no analysis of overlapping jurisdictions at the federal level. In short, the water crisis affecting the western states today is only a small part of a larger, more complicated picture.

In an attempt to address these policy shortcomings, I have introduced legislation that would establish a Western Water Policy Commission. Although drafted to focus on water policies and problems in the western United States, the concept clearly needs to be expanded to include a national perspective. Indeed, recent testimony on the legislation at a hearing in Washington D.C. urged that the scope of the Commission include water policies throughout the United States.

The Western Water Policy Review Act, as it is called, would establish a 14-member Water Commission to undertake a comprehensive review of western water resource problems and programs and provide recommendations for action to the President of the United States. The Commission would be charged with reviewing current problems, identifying future requirements, and developing potential alternatives. It would be required to look at all federal programs and agencies, decide whether they should be continued, and if so, how they should be managed. Furthermore, the Commission would be required to review the effectiveness of historical arrangements and decide whether additional storage projects are needed. A comprehensive review of all water laws and the respective roles of the Federal government and the states would be mandated. The legislation calls for the Commission to remain constituted for a five year period and provide interim and final reports to the Congress and the President. Governors would be invited to designate representatives to work with the Commission, and the Commission would be authorized to utilize the service of any of the Federal water resource agencies.

Membership of the Commission would include the ranking majority and minority member from the Senate Committees on Energy and Natural Resources and Appropriations, and the ranking majority and minority members from the House of Representatives Committees on Appropriations and Interior and Insular Affairs, along with six persons to be appointed by the President. In addition, the Commission would have the discretion to invite public and private interest group representatives to join in the process.

Drought conditions in the western United States, particularly California, serve to underscore the desperate need for this comprehensive approach to water policies and programs.

Earlier this year the Central Valley Water Project in California had to reduce its water allocations by 75 percent following a 50 percent cutback in 1990. Many fear that the drought could cost California farmers $624 million in direct crop revenues, thereby increasing consumer food costs by as much as $207 million. The Colorado River Basin, which serves 21 million people and 2 million acres of farm land in 7 states, is being tapped at a yearly consumption rate that exceeds supply by 5 percent.

Even in Oregon, a state recognized around the world as synonymous with rainfall, there is a shortage of water. Ironically, Oregon is tied with Nevada as the second lowest in water availability in the West, and six of 36 counties in the state have recently filed for emergency drought status.

But the concern that Western States have traditionally had with federal legislation affecting water allocations may soon become a problem for Eastern States as they try to deal with drought, population, and declining water quality.

Today the role of the states remains critical. Indeed, I have noted with some interest the recent trend to resort to federal

solutions to regional issues rather than using interstate compacts or regional commissions. Regardless, states must be an integral part of the water review process. The goal is simple: we must strive continuously toward a doctrine of conservation and wide use of our finite water resources. Coordination and interrelation of competing water uses and needs such as agriculture, urban consumption industry, recreation, and fish and wildlife is the primary goal of the Western Water Policy Review Act. I am confident that we can undertake this review and eventually remove the bureaucratic impediments to a coordinated water policy.

Source: WSTB Newsletter, April 1992

CALIFORNIA GOVERNOR FRAMES WATER PLAN

by Maureen Maxwell

In a speech in April, California Governor Pete Wilson laid out his framework for the development of a state water policy. He drew together previous and new proposals and current activities, and called for consensus among urban, agricultural and environmental water users. Wilson listed his objectives for each user group to achieve successful water management through the year 2010:

1. Safe, reliable water supplies for domestic, municipal and industrial uses,

2. Adequate long-term water supplies for agriculture, at a reasonable cost, with dry-year groundwater reserves where feasible,

3. Restoration and protection of fish and wildlife resources and aquatic habitat; and protection of threatened and endangered species.

Wilson warned that all major water user groups must move step by step together, that no one sector can be allowed to get ahead of the others in meeting its needs. He cited the December, 1990, meetings of representatives of the three major water user groups, at which it was agreed that a phased approach, linking simultaneous benefits for all, is critical for progress.

Wilson listed his priorities and proposals, beginning with the Delta area. He called the Delta the centerpiece of California's most intractable water problem, and warned that because natural flows are at historic lows, saltwater intrusion threatens the Delta and the quality of drinking water for many Californians. The governor plans to initiate an investigation under the California Environmental Quality Act and the National Environmental Policy Act of specific solutions to fix the Delta, and has set a three year time-table to complete the process. He will appoint an Oversight Council to define objectives and evaluate criteria to be used.

In addition, he called for immediate interim actions in the South Delta, including construction of flow control barriers, enlargement of some channels, and shifting of pumping to winter months through use of the four new pumps, and linking South Delta facilities to improved interim standards for protection of fish and wildlife. He is charging CAL-EPA and the State Water Resources Control Board to continue working closely with the U.S. Environmental Protection Agency (EPA) to develop these standards by the end of the year.

In addition, Wilson stressed the need to increase water supply by construction of more off-stream storage reservoirs, calling them more environmentally acceptable than conventional dams on flowing streams. He supports three off-stream reservoirs. He emphasized his support for the current process to develop Efficient Water Management Practices for agricultural water use, and called for ensuring that new developments in water-short areas make maximum use of recycled water.

He proposed bond revenues for public reclamation facilities. Furthermore, he has directed the Department of Health Services and State Water Resources Control Board to work with U.S. EPA to remove obstacles to reclamation activities, while emphasizing that the reclamation program must set strong health standards and create a streamlined process for the construction and operation of both public and private reclamation faculties.

Wilson pointed out the importance of groundwater recharge, citing current development of a large groundwater storage program, the Kern Water Bank, to provide dry year resources for contract agencies of the State Water Project. He called for cooperation between state and local entities to develop long-term plans for maximum sustained-yield groundwater management.

Wilson listed his criteria for accepting legislation regarding water transfers:

1. Water transfers must be voluntary, real and not just on paper, and the water rights of sellers must not be impaired;

2. Water transfers must not harm fish and wildlife resources and their habitats;

3. Transfers must not cause overdraft or degradation of groundwater basins;

4. Entities receiving transferred water should be required to show that they are making efficient use of existing water supplies;

5. Both those transferring water and those receiving transferred water should have a role in transfer decisions.

The governor congratulated those who worked out the Memorandum of Understanding that was signed by the state and more then 100 water agencies to agree to a set of Best Management Practices. He also highlighted the long record of

conservation practices by California farmers, mentioning drip irrigation, micro-sprinklers, and laser land leveling.

Wilson stated that California should have control of the Central Valley Project and said he had appointed a negotiating team to work out a transfer plan over six months. First meetings with U.S. Dept. of Interior staff took place in April.

Wilson also called for applying the State Water Bank concept regionally to develop an Interstate Water Bank, the goal being to fully utilize the capacity of the Colorado River aqueduct, so that in any year 1.2 million acre-feet of water is available to the Metropolitan Water District.

Governor Wilson called for both a free market for water and for the ability of the state to ease hardship or to satisfy emergency needs. He has made permanent the Water Policy Task Force, composed of members of his administration who have advised him during California's drought. He emphasized that California's water wars have been wars without winners and that no one sector or type of user can jump ahead of the others and threaten the progress made over the last few years.

ARIZONA'S ALLOCATION THREATENED BY UNDERUTILIZATION OF CAP WATER

by Maureen Maxwell

The $3.5 billion Central Arizona Project (CAP) is nearing completion, but concern is growing in Arizona over whether the state will be able to use its full CAP allocation of Colorado River water. This article summarizes some of the dilemmas faced by Arizonans as reported in *Arizona Water Resource* from the Arizona Water Resources Research Center.

Arizona's use of CAP water declined from 745,000 acre-feet in 1990 to 421,000 acre-feet in 1991, due mostly to wet weather and idled farmland. California is interested in increasing its Colorado River allocation on an interim basis, but many Arizonans are reluctant to contract surplus CAP water to California, even on a temporary basis, fearing that temporary use could become long term or permanent.

Arizona water planners anticipated that agricultural districts would use the bulk of the state's CAP entitlement in the early decades of the project, and expected a transition to municipal and industrial (M&I) use as the state's urban population grew. However, low farm profits and the relatively high cost of CAP agricultural water ($52 per acre-foot) have led some farmers to reduce the number of irrigated acres, nor has M&I and Native American demand risen as rapidly as expected. According to Dave Iwanski of the Agri-Business Council of Arizona, the Bureau of Reclamation conducted its economic feasibility studies for the CAP Irrigation Districts in the late 1970s and early 1980s when commodity prices were higher than today. The Bureau used a modest inflation rate for the commodity prices estimates, assumed revenues would keep pace with costs over the early repayment period, and assumed more acres would be planted in higher-valued citrus and vegetables than has been the case.

However, commodity prices fell drastically. Reduced agricultural profits have reduced the ability to pay property taxes and assessments. Assessments are fees that irrigation districts levy on member farmers to pay for CAP Distribution System loans, among other things. The loans are for construction of facilities to receive and distribute CAP water on farms. Nine irrigation districts have received $230 million from these loans, and three are delinquent. Unless there is a sudden economic upturn, bankruptcy threatens some of the irrigation districts. Bankruptcy coupled with a default on federal loans would be particularly untimely since Arizona is seeking additional congressional appropriations to complete the CAP. In addition, fixed operating costs that cannot be paid by agriculture must be picked up by municipal users.

One proposed solution is for municipal and industrial rate payers to subsidize agriculture. Municipalities are unwilling, however, since most are already implementing large rate increases to cover the costs of conservation programs, water treatment facilities and augmentation measures.

Some irrigation districts have proposed selling future CAP resources to M&I entities for money that could be used now to pay off agricultural debt. Arizona Department of Water Resources (ADWR) officials question the availability of future supplies: of the 435,000 acre-feet of CAP water currently going to these districts, an estimated 240,000 acre-feet may become part of the settlement of tribal water claims. In addition, one acre-foot per acre of CAP water is to remain with the land when it is retired from agriculture to support future M&I uses. There are about 200,000 acres of potentially retired agricultural land involved, which would leave no agricultural CAP water available in the future.

Mike Brophy, a native Arizonan and water attorney, said the fundamental question is should Arizona keep the water and pay what it takes to do so, or attempt to sell it and risk not getting it back. Brophy said that many Arizonans are unaware of the debate about CAP, but the issue must be decided by all Arizonans.

Presenting a different viewpoint, Mark Myers, a small businessman and third generation Arizonan active in water and environmental issues, described the current concern over declining use of Arizona's CAP water as a panic, and therefore in danger of leading to poor public policy. He argues that agriculture already receives subsidies through other government programs and should receive no more subsidy from Arizona taxpayers. He places settlement of Indian water rights claims at the top of his priority list, for reasons of simple justice and for the economic future of the state. Finally, he supports consideration of transferring some portion of Arizona's Colorado River allocation to California by sale or long-term lease, figuring that the proceeds from the sale would be adequate to pay off CAP debts, fund some recharge projects throughout

central Arizona, and offset the reduction in the farm economy. A task force chaired by ADWR Director Betsy Reike has been organized to propose a strategy for Arizona to maintain its Colorado River entitlement.

Arizona Water Resource March 1992, May 1992

OGILVIE RECEIVES PRESTIGIOUS ALUMNI AWARD

by Kathy Hayes, ALUMNUS Editor

James L. Ogilvie

One of the most serious issues facing our world today revolves around one of our main life sources: water. Water quality, irrigation efficiency, and water reserves are just a few of the issues high on our list of concerns for today and the future.

Colorado State alumnus James L. Ogilvie has dedicated over 50 years of his life to water management in Colorado. In May, Ogilvie was honored by the Alumni Association with the prestigious honor alumni award. The award recognizes individuals for bringing honor to Colorado State University and themselves by means of their distinguished service to the University, State or Nation.

This honor is awarded each year to a graduate from each of the University's eight colleges.

Ogilvie graduated in 1933 with a degree in Civil and Irrigation Engineering. A retired civil and irrigation engineer from the Denver Board of Water Commissioners, Ogilvie has been recognized throughout the years for his excellent leadership and engineering skills, including his leadership in water development projects designed to supply the Denver metro area with a dependable water supply.

Ogilvie has been recognized nationally with the United States Department of Interior Honor Award for Distinguished Service as well as the John V. Christensen Memorial Award for Extraordinary Contributions to Local Government and Regionalism. Engineering News-Record cited him for "serving the best interests of the construction industry."

Currently, Ogilvie serves on the Dean's Council Board of Directors for the College of Engineering and is also the chairman of the awards subcommittee. He and his wife Freda reside in Denver. They have two sons.

Year of the River PLANNING MOVES AHEAD

by Maureen Maxwell

President Bush has declared 1992, the twentieth anniversary of the Clean Water Act, the *Year of Clean Water* and October 1992 *Clean Water Month.*

Fort Collins Mayor Susan Kirkpatrick declared 1992 the *Year of the River*, in conjunction with the national *Year of Clean Water.* This designation is intended as a theme around which community organizations, schools, and businesses can plan activities. Listed below are some of the activities:

* Fort Collins is seeking to have the Cache la Poudre watershed designated as National Heritage Area. Legislation sponsored by U.S. Senators Hank Brown (R-CO) and Tim Wirth (D-CO) and U.S. Representative Wayne Allard (R-CO) is pending in Congress. The federal designation would help with conservation of natural and cultural resources and provide a framework for education about water management.

* Designs have been made to link the Poudre River Trail by an underpass at College Avenue, to be completed in 1994. Another underpass will link the trail at Prospect Avenue this summer and a trail extension from Taft and Drake out to the Pine Ridge property will be completed this fall.

* The City/CSU River Landscape Opportunities Study will attempt to clarify a vision for the long-range future (2 to 10 decades) of the river, particularly in the vicinity of the CSU-Northern Colorado Environmental Learning Center. Phase One, data collection analysis, will be completed in June, and will be followed by a public open house.

* The Fort Collins City Council recently adopted Resolution 92-63, which specifies 12 action steps the City can take to conserve its own water use, including a leak detection program for the water distribution system, an audit of indoor water use and installation of more efficient fixtures

where needed, training of City staff and contractors on efficient landscape watering practices. The City Water Department is also continuing its regular public education program, which includes presentations to large groups, articles about water conservation practices in the local newspapers, and answering questions from water users.

* The City's Streets and Parks Department recently completed a surface clean up of the old Lee Martinez tree dump and has graded and reseeded the site for public use. Other clean up projects are being planned for Fall.

* The City Storm Drainage Department has begun a study to identify flood hazard areas along the Poudre River, and design alternatives for mitigation of flood hazards and stream stability problems. The study will be completed by the end of 1993.

* The Gustav Swanson Nature Areas is a pilot project for a barrier free nature park next to the downtown area. Much native vegetation has been restored and Phase Two work is beginning now. Cooperating local interest groups include the Native Plant Society, the Poudre River Trust, and the Audubon Society.

* An interdepartmental City staff team is assessing priorities and opportunities to enhance the existing open space system. Of particular focus are reclaimed gravel pits along the river.

* Limited edition commemorative posters are available for $5.00 plus tax. They are for sale at the Building Permits counter at 281 N. College Ave.

City planners would like to hear from groups or individuals about their river activities. More information is available from Kari V. Henderson, Senior City planner, at 221-6756.

Local efforts to preserve and improve water resources are essential to the nation's clean water efforts. Before enactment of the Clean Water Act in 1972, less than half of America's rivers supported fish and shellfish or provided wildlife habitat. Fishing and swimming were restricted in many areas and drinking water supplies were menaced. Today, nearly three-fourths of America's waters support these uses, and the quality of others has been improved. Technological advances have improved detection and quantification of pollution problems. At the same time, pressure to already limited water supplies from increasing population, and pollution from non-point sources, such as farm and city street runoff, are problems that have yet to be solved. The efforts of every individual and every community will be needed to preserve clean water and to protect the nation's rivers, lakes and shores.

COLORADO WATER SUPPLY CONDITIONS UPDATE

From the State Engineer's Office, May 1--Statewide snowpack was 59 percent of average on May 1. The Colorado River basin has the highest amount at 65 percent of average while the Gunnison River Basin has the lowest amount at 49 percent of average. As a result of the low snowpack, the Soil Conservation Service is forecasting substantially below normal stream flows this Spring and Summer. The runoff may occur early and be short.

Statewide reservoir storage was 111 percent of average on May 1. The Gunnison River basin has the highest storage rate at 144 percent of average, while the Colorado basin has the lowest storage rate at 97 percent of average. The near average to above average reservoir storage situation may contain the only bright spot in this season's water supply. Water users with storage will likely be drawing on their supplies this Summer.

The National Weather Service 30-day forecast (May 1) is for near to above normal precipitation for the southern quarter of the state, and near to below normal precipitation for the northern three quarters of the state. Thirty-day temperatures are forecast to be above normal statewide. The 90-day precipitation forecast (May 1) is the same as the 30-day forecast. The 90-day temperature forecast (May 1) is for near to below normal temperatures for the southern quarter of the state and above normal temperatures for the northern three quarters of the state.

SOUTH PLATTE RIVER ECOLOGICAL HISTORY

Greg Silkensen, a graduate student of history at Colorado State, is currently studying the ecological history of the South Platte River Basin as a student intern for CWRRI. More specifically, he hopes to describe the ecosystem of the South Platte before 1859 (when irrigated agriculture was initiated) and describe how the river's ecosystem evolved with the increased irrigation since then. There were many conflicting observations written during the 1800s, and Greg hopes to further clarify the ecological conditions and changes that took place in the South Platte during the 1800s.

Greg is particularly interested in reading journals or personal accounts of pioneers, gold seekers, and others who traveled up the South Platte River Valley and may have recorded ecological and physical descriptions of the South Platte. If you have any information that will help Greg in his research, please contact him at the Institute (491-6308).

Greg's results will be used as background for the 1992 South Platte Conference, which will attempt to define the concept of "ecological integrity." The conference announcement and call for papers is found on page 25 of this issue of *Colorado Water*.

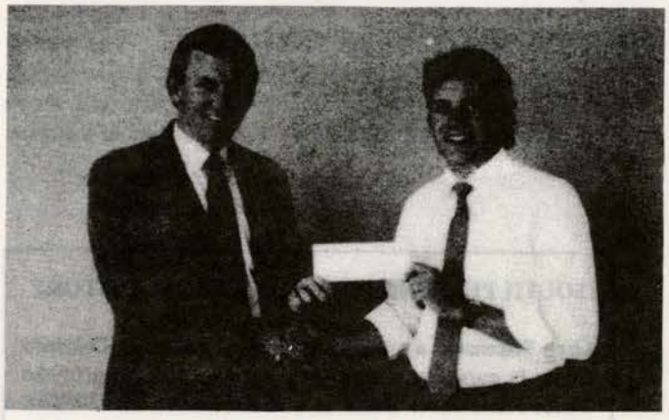
UNIVERSITY WATER NEWS

JAMES B. WARNER SCHOLARSHIP AWARDED

by David Engels, Wyoming Trustee

The Rocky Mountain Section of the American Water Works Association's James B. Warner Scholarship is a partial educational funding that can be used to lessen the financial burden of tuition, books or other fees for college or university students. The amount of the scholarship is at least $1,000 and is awarded on May 1 of each year. Trustees of the RMSAWWA study each candidate's application and make the award.

When the RMSAWWA Trustees volunteered to select the recipient of the James B. Warner Scholarship they were looking for the glory. They never visualized the emotional gut-wrenching required to select the awardee from such a deserving slate of candidates. After careful consideration, thought and debate, the Trustees selected Glenn B. Hamilton to receive the first James B. Warner Scholarship.



RMSAWWA Past Chair Lloyd Gronning presents a check in the amount of $1,000 to Glenn Hamilton

Glen is currently a graduate student in hydraulics and a teaching assistant at Colorado State University. Glenn received his bachelor's degree in civil engineering in 1990 from CSU. In obtaining his bachelor's degree, he compiled a 3.66 grade point average and in his senior year was selected by the American Society of Civil Engineers as CSU's most outstanding civil engineering student. Also while at CSU, he was active in Chi Epsilon, Tau Beta Pi and ASCE.

In addition to Glenn's academic achievements, he has received invaluable practical experience while being employed in various engineering technician capacities during the summer months of the past five years. Glen has passed his FE exam, and after graduation his goal is to secure employment with a firm specializing in hydraulic and water resources.

RMSAWWA Trustees had four applications for the first James B. Warner Scholarship. All four applicants were deserving of the scholarship. The selection process was a very difficult one. Criteria to receive the scholarship is simple; all you have to do to qualify is: (1) be a RMSAWWA member or a dependent of a RMSAWWA member; (2) be enrolled as at least a junior in an accredited institution of higher learning; or (3) be studying toward a bachelor, or higher, degree in a water-related field.

Source: *RUMBLES*, May 1992

NATURAL HAZARDS CENTER DIRECTOR STEPS DOWN

William E. Riebsame, director of the Natural Hazards Center at Boulder for the past eight years, will move to the Department of Geography at the University of Colorado. There, Riebsame will pursue his research interests in global climate change and sustainable land use. The Center's interim director is Gilbert F. White, 303/492-6315. Riebsame's new address is: Department of Geography, Campus Box 260, University of Colorado, Boulder, CO 80309-0260; Phone 303/492-6312.

CONCRETE CANOE FINALS SET FOR FORT COLLINS IN JUNE

by Laurel Saito

Colorado State University will host the national concrete canoe finals on June 19-21. The 20 winners of the regional runoffs held around the country this spring that will be racing at City Park Lake on June 20 include:

City College - New York
Iowa State University
Michigan State University
New Mexico State University
Northern Arizona University
Ohio State University
Oklahoma State University
South Dakota School of Mines
SUNY - Buffalo
University of Alabama - Huntsville
University of California - Berkeley
University of Houston
University of Illinois - Urbana
University of Maine
University of Maryland
University of New Orleans
University of North Carolina - Charlotte
University of Pennsylvania
Virginia Polytechnic and State University
Washington State University

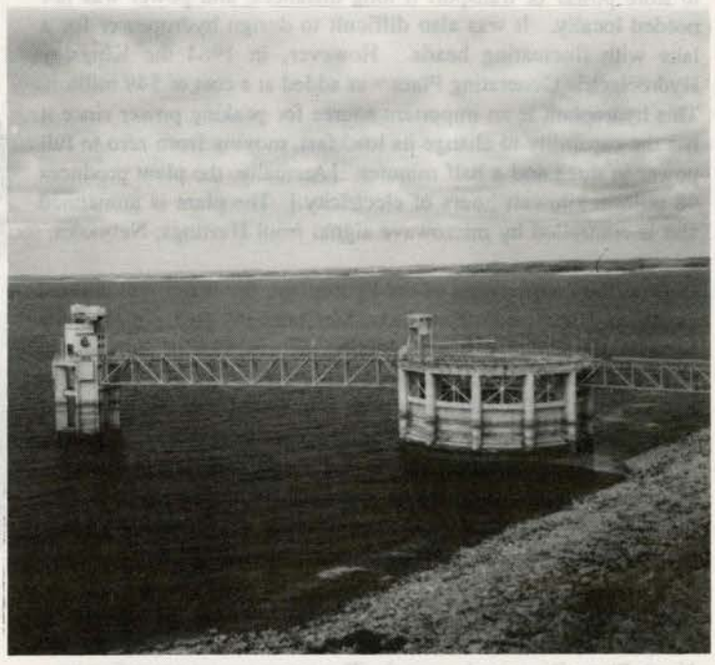
The competition, sponsored by the American Society of Civil Engineers and Master Builders, includes a total of $9,000 in scholarship money to the top three schools. The day-long event is open to the public. For more information contact Laurel Saito at 491-6308.

OH NEBRASKA! WHAT A DAY!

by Mary DeMartini and Laurel Saito

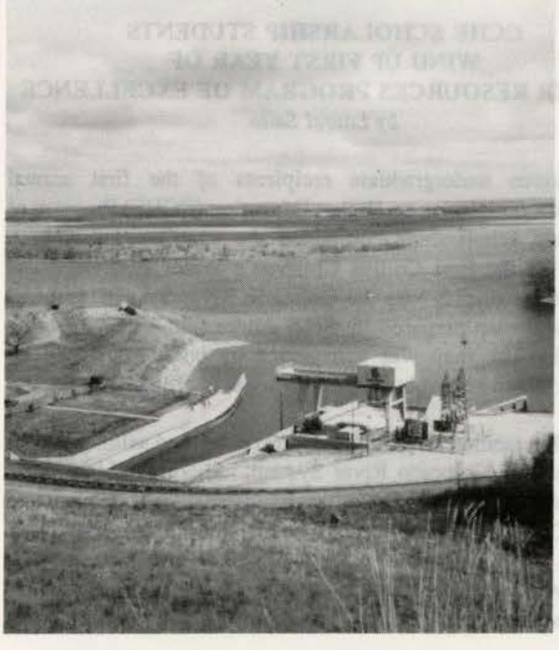
March 6, 1992: Field Trip Day for engineering students at Colorado State University (CSU). This is the day students look forward to when they get the rare opportunity to venture from their books and see engineering in action. One group of twenty-five students ventured as far away from CSU as one can get in a day -- Nebraska! Led by Dr. Morris Skinner, a CSU civil engineering professor, the students took guided tours of Kingsley Dam, its hydroelectric plant, an inverted siphon, and a coal-fired steam generating plant.

Dr. Skinner, an enthusiastic native of Nebraska, stopped the bus about an hour before the Nebraska border to point out a vast body of water. The students looked around puzzled at the typical landscape of scattered farms and fields until Dr. Skinner explained that beneath them lay an alluvial-filled aquifer containing 25 million acre-feet of water. This aquifer was formed by a river that previously flowed where the South Platte River now flows. Its erosion trench was later filled, and the South Platte now feeds the aquifer as it flows above. Dr. Skinner then pointed out the edge of the Ogallala aquifer, which lay over the next hill, noting that this enormous partially confined aquifer extends from South Dakota to Texas.



Outlet tower and "Morning Glory" carry water from Lake McConaughy to hydroelectric plant

A couple of hours later the students reached Kingsley Dam, the second-largest hydraulic fill dam in the world. Built during the Depression (1936-1941), the dam reflected the realization of Nebraskans that water storage was needed for irrigation.



Kingsley Hydroelectric Generating Plant

Repetitive droughts dispelled the "rain follows the plow" myth, and over 1500 people were employed in the 1930's by the Public Works Administration in the establishment of the Central Nebraska Public Power and Irrigation District. The completion of the $43 million Kingsley Dam Project resulted in the construction of a diversion dam, supply canal, three hydroelectric power plants, irrigation systems, and the Kingsley Dam itself, behind which the waters of Lake McConaughy are stored.The dam is 3.5 miles long, 162 feet high, and 1100 feet wide at its base. The hydraulic fill process used to form the dam consisted of hydraulically dredging Lake Ogallala, a lake which lies directly east of the dam. Dredged sand was placed on the dam and allowed to settle, forming an economical and efficient dam. With a clay core reinforced with sheet piling, the dam's total seepage is a mere 10 cfs through the toe drains. However, because of seismic instability, this process of dam construction is no longer used in the United States.

Kingsley Dam forms vast Lake McConaughy, which has the appearance of an ocean in the desert because of the surrounding sand hills. The lake, 22 miles long, 3.5 miles wide, and 142 feet deep when full, lies in an area that historically was the end of many cattle drives from Texas. The Platte River supplies the lake with water that is used at least six times for hydropower and cooling before being returned to the river. Although Lake McConaughy was only half full and relatively calm, Mr. Glen Bevard related incidents of wave damage due to high winds when the lake was full. Waves have been observed with eight foot peaks, and Mr. Bevard admitted that boats have been lost in strong winds. In 1972, three days of winds of 65 miles per hour over the full lake caused waves to overtop the dam and expose its clay core. People were evacuated downstream, and all available trucks were employed to haul rock for protection. Although the dam held, the maximum elevation of the lake has since been lowered five feet.

A hydropower facility at the dam was not included in the system originally because the technology was not available in the 1940's to store power or transport it long distances, and power was not needed locally. It was also difficult to design hydropower for a lake with fluctuating heads. However, in 1984 the Kingsley Hydroelectric Generating Plant was added at a cost of $49 million. This hydroplant is an important source for peaking power since it has the capability to change its load fast, moving from zero to full power in three and a half minutes. [Annually, the plant produces 98 million kilowatt hours of electricity.] The plant is unmanned and is controlled by microwave signal from Hastings, Nebraska.

Prior to the construction of the hydroplant, the water was aerated as it was transported from Lake McConaughy to Lake Ogallala because of a siphon effect created by the exposure of the water to air at both ends of the discharge pipe. With the addition of the hydroplant, the discharge pipe was submerged and the water was pulled from a much deeper and colder part of the reservoir, greatly reducing the oxygenation of the water and resulting in fishkills. In order to comply with state water quality standards, it is now necessary to use a separate discharge valve which adds oxygen to the water by releasing turbulent water through the air.

After leaving Kingsley Dam, Dr. Skinner showed the students a computer-operated diversion dam that divides water between the North Platte River and a canal. The gates are set according to the level of the reservoir as it fluctuates with the surges of the hydroplant.

At Paxton, Mr. Vern Staller showed the students an inverted siphon that was built in 1934. Although this siphon has operated since with very few problems, maintenance work is done every five years when it is inspected. In the 1950s an 8-foot wall and sand traps were installed to reduce scour. The inverted siphon brings water of Wyoming origin through a 14 foot diameter pipe 7000 feet under Highway 30 and the South Platte River to Seminole Reservoir. Mr. Staller noted that the siphon poses a safety hazard because it takes the water about 22 minutes to travel from one end to the other and no one can hold their breath that long!

Next, Mr. Tom Kennedy gave the students a tour of Gerald Gentleman Station, a coal-fired steam generating plant. The plant is unique because it does not use cooling towers, which are notorious for consuming large quantities of water due to evaporation. Instead, the plant uses a once-through system, circulating canal waters through the plant and then cooling them in ponds before returning them to the river. Environmental regulations require that the water be returned within four degrees of the temperature it is received. The plant uses four large circulating pumps that each have a 132,000 gallons-per-minute capacity. Six foot conduits lead to the plant and are capable of diverting half of the canal's water.

A "trip," or plant malfunction that requires modification of operations, can cost $250,000 if cool-down occurs and the plant has to start up again. In the past, tumbleweeds have caused "trips", so a tumbleweed-removing device has been installed.

Inverted siphon at Paxton carries water to Seminole Reservoir

The trip home involved much conversation about the day's activities. Although it had been a long day, the students were impressed with what they had seen and returned with heightened aspirations to complete their studies and enter the world of water and engineering.

CCHE SCHOLARSHIP STUDENTS WIND UP FIRST YEAR OF WATER RESOURCES PROGRAM OF EXCELLENCE

by Laurel Saito

The thirteen undergraduate recipients of the first annual Colorado Commission on Higher Education (CCHE) Program of Excellence scholarships completed the year by preparing a display for the Fort Collins Children's Water Festival. The theme of the display was the Colorado River System, featured in a central map prepared by Scott Andre (junior, Engineering Science). The map was surrounded by boards designed by students which highlighted different aspects of the river system.

Trudy Olin (senior, Civil Engineering) described salinity and its effects on the Colorado River System. She grew bean plants using water with varying salinities representative of levels found in the Colorado River from its headwaters to Imperial Dam. Richard Pringle (senior, Civil Engineering) focused on hydropower. Jennifer Roberts (sophomore, Engineering Science) discussed the Central Arizona Project with a colorful map of the project.

In addition to preparing the Colorado River Basin map, Scott Andre defined groundwater and used pictures along the Yampa River to illustrate groundwater seepage in canyons. Lisa Poppenga (senior, Civil Engineering) described water rights and

Jennifer Roberts points out Colorado River Facts to the kids at the Children's Water Festival

illustrated the allocation of Colorado River water using a map and proportioned water drops. Kirsten Close (sophomore, Agricultural Engineering) highlighted aspects of the Colorado River which affect Mexico.

Todd Lewis (senior, Civil Engineering) discussed the adventures of John Wesley Powell, while Mary DeMartini (junior, Civil Engineering) described the environmental impacts of the operation of Glen Canyon Dam. Carlos Sanchez (sophomore, Civil Engineering) featured recreational aspects of the Colorado River with pictures. Heath Stein (senior, Civil Engineering) defined water transfers and illustrated the size of the Alva B. Adams tunnel by drawing a pipe with a jeep inside of it.

Brian Foy (junior, Civil Engineering) described the plight of the Colorado squawfish by organizing his text in the shape of a fish, while Samara Iodice (senior, Civil Engineering) featured other wildlife of the Colorado River Basin with pictures. Heather Trantham (senior, Civil Engineering) defined an acre-foot as the amount of water that would fill 6,500 bathtubs!

A fact from each of the student's displays was chosen to be included in the "Colorado River Facts Game." This game was given to each of the fourth and fifth grade students that stopped by the display during the Children's Water Festival, and the students were given prizes for answering questions correctly. CCHE scholarship students Scott Andre, Mary DeMartini, and Jennifer Roberts helped CCHE Coordinator Laurel Saito organize the game for the grade school students.

FORT COLLINS CHILDREN'S WATER FESTIVAL A *FUN* SUCCESS

by Laurel Saito

Approximately 1100 elementary school students attended the first Fort Collins Children's Water Festival, which was highlighted by excitement, energy, and lots of fun and laughter. Held at Colorado State University on May 19, the event featured classroom activities as well as hands-on displays put on by various agencies, educators, and other organizations.

Gold Panning at Children's Water Festival

The Division 1 Water Court in Greeley conducted "Order in the Court" in the Senate Chambers of the Lory Student Center, while other classroom activities featured river sedimentation, the creation of acid rain, and the sources of drinking water in Fort Collins. A favorite outdoor activity was the "Wheel of Misfortune," presented by Kevin McBride of the City of Fort Collins Stormwater Utility. Students dressed in raingear poised in the shower stall assembled with seven shower heads, waiting for the storm which would be "spun" by a fellow classmate. The "wheel" resembled a roulette wheel with 1-, 5-, 10- and 100-year storm frequencies instead of numbers. With this display, students learned about the significance of storm frequencies.

Water Wheel of Misfortune

In addition to the classroom activities, the Main Ballroom of the Lory Student Center was filled with hands-on exhibits which occupied the students' curiosity and piqued their interest in water. Norman Blake and "Choppo" Fetterhoff of Black Hawk gave students a taste of gold panning, while the Fort Collins Water and Wastewater Utility enclosed students and teachers in giant soap bubbles. The State Engineer's Office helped students transmit messages via satellite, and the CCHE Water Resources Program of Excellence Scholarship students used an interactive game to teach students facts about the Colorado River Basin.

The event was sponsored by Colorado State University, the City of Fort Collins Water and Wastewater Utility, the Northern Colorado Water Conservancy District and Poudre R-1 Science.

Dr. H.J. Morel-Seytoux presents award in undergraduate category to Susan Firor

STUDENTS HONORED AT HYDROLOGY DAYS

Three students received "Best Student Presentation Awards" at the recent AGU Twelfth Annual Hydrology Days, held at Colorado State University March 31-April 2, 1992. In the undergraduate category, Susan Firor, from Humboldt State University in Arcada, California, was honored for her presentation of "Disaggregation Modeling of Temperature and Precipitation Using Synthetic Streamflow Generation Techniques."

Masters Student Mike Grimm accepts award from Dr. Morel-Seytoux

In the Masters category, Mike Grimm, from Colorado State University, was recognized for his presentation "Comparison of Four Methods to Estimate Peak Discharge of the June 1, 1991 Flood at Stonewall Creek near Livermore, Colorado." William L. Wingle, Colorado School of Mines, was recognized in the Ph.D category for his presentation "Evaluation of Uncertainty Associated with Contaminant Migration in Groundwater: a Technically Feasible Approach." Professor Hubert J. Morel Seytoux, organizer of Hydrology Days, presented the awards.

STUDENT COMPLETES FIRST YEAR OF REUSE STUDY IN ITALY

Former CWRRI student intern Joseph Pollara has concluded the first year's participation in a two-year experiment being conducted in Sicily to determine if wastewater reuse can provide a safe source of irrigation water for the island's crops. The region is confronted with water resource shortages similar to those in many arid and semi-arid countries throughout the world. Joe's work was done at the Carini Experimental Station, located 20 km west of Palermo, Sicily.

The first crop grown at the station was cowpeas (*Vigna ungiuculata L. Walp*) in a 112-day growing season between May and September. The preliminary results of the study revealed that water safe for irrigation can be produced from municipal wastewater using a standard treatment plant consisting of a biological system and filtration and UV disinfection. In addition, it was found that nutrient levels, namely potassium and phosphate, in the soils of the two fields studied were excessive due to historical fertilization practices. This led to high crop yields of dubious quality. An interim crop of barley was planted to reduce the high nutrient concentrations before the start of the 1992 growing season. Preliminary results were presented in a poster session at the IAWPRC 16th Biennial Conference being held in Washington, DC between May 25-29, 1992.

Susan Poulsom, who received her Masters in Civil Engineering from Colorado State University, has replaced Joe at the Carini Experimental Station, and is now conducting research in the project's second year. In a letter to Susan before she embarked on her trip overseas, Joe recommended, "If you have a diet, leave it behind."

IDS HOSTS OPEN HOUSE

Last month IDS opened its doors to show how powerful computers with graphical interface programs can assist water resource managers. The Integrated Decision Support Group (IDS), part of the Center for Water Resources Engineering and Science (CWRES), is an interdisciplinary group formed in January 1992 to build decision support systems (DSS). Using graphical interfaces to help manipulate large amounts of spatial data,a DSS can assist water resource managers to make optimal water resource management decisions. Some of the programs highlighted at the open house were:

> A Natural Resource Workstation; An Integrated River Basin Environmental Management Program; The Optimal Spatial Planning of Habitat Development; Development of Reference Evapotranspiration Maps for Colorado; and A GIS Approach to Estimation of Irrigation Demand in Irrigation Systems Network

IDS would like to thank all of the open house guests for their attendance. Organizations represented at the Open House included the US Bureau of Reclamation, Northern Colorado Water Conservancy District, US Fish and Wildlife Service, IBM, US Soil Conservation Service, USDA Agricultural Research Service, Ecology Center, Colorado State Engineer's Office and Colorado State University Engineering and Earth Resources.
For more information on any of the projects IDS is working on contact: Dr. Luis Garcia, CWRES-IDS Group, 410 University Services Center, Colorado State University, Fort Collins, CO, 80523. Phone: (303) 491-5144 Fax: (303) 491-2293.

COLORADO STATE UNIVERSITY WATER COURSES AT THE SENIOR/GRADUATE LEVEL - 1991/92

The following courses offered at the senior level and above have been identified as being particularly relevant to water (eg water quantity, water quality, and the causes and management of both). Course letters refer to the department or college in which the course is taught:

A	Agric. Sciences (College office)	F	Forest Sciences
AE, CH and AC	Agric. and Chemical Engr.	FW	Fishery and Wildlife Biology
AG	Agronomy	NR	Forestry and Natural Resources (College off.)
AT	Atmospheric Science	MB	Microbiology
B,Z	Biology	PL	Philosophy
CE	Civil Engineering	PO	Political Science
EA	Agric. and Resource Economics	RR	Recreation Resources
EH	Environmental Health	RS	Range Science
EN	Entomology	S	Sociology
ER	Earth Resources		

Course No. (Credits)	Title
Climatological Processes	
AT 440(2)	Meteorology
AT 606(3)	Climatology
AT 620(3)	Thermodynamics and Cloud Physics
AT 621(2)	Atmospheric Chemistry
AT 712(3)	Dynamics of Clouds
AT 724(2)	Cloud Microphysics
AT 752(3)	Weather Modification
AT 753(3)	Atmospheric Water Resources
AT 755(3)	Theoretical and Applied Climatology
ER 422(3)	Plant Canopy Meteorology
ER 424(3)	Bioclimatology
AG 580(3)	Environmental Biophysics
Economics	
EA 540(3)	Economics of Natural Resources
EA 541(3)	Environmental Economics
EA 542(3)	Economics of Water Resources Planning
EA 662(3)	Planning for Development (ME 610)
Groundwater	
AE 538(3)	Groundwater Hydrology
AE 539(3)	Experimental Methods in Groundwater
AE 638(3)	Groundwater Quality and Cont. Transport
AE 733(3)	Flow in Porous Media
CE 423(3)	Groundwater Engineering
CE 631(3)	Solutions to Groundwater Problems
CE 633(3)	Groundwater Cont. Transport Modeling
CE 635(3)	Quantitative Hydrogeology
ER 446(3)	Environmental Geology
ER 542(3)	Hydrogeology
ER 552(2)	Advanced Topics in Hydrogeology
Hydraulics	
CE 502(4)	Introduction to Fluid Mechanics
CE 510(3)	Operation of Hydraulic Systems
CE 514(3)	Hydraulic Structures/Systems
CE 515(3)	Hydropower
CE 605(3)	Experimental Fluid Mech. and Hydraulics
CE 607(3)	Computational Fluid Dynamics
CE 612(4)	Open Channel Flow
CE 614(3)	Hydraulics of Closed Conduits
CE 700(3)	Aero- and Hydrodynamics
CE 701(3)	Advanced Mechanics of Viscous Fluids
CE 702(3)	Turbulence
CE 714(3)	Hydromachinery
Hydrology	
CE 422(3)	Basic Hydrology
CE 520(3)	Physical Hydrology
CE 521(3)	Hydrometry
CE 522(3)	Engineering Hydrology
CE 524(3)	Modeling Watershed Hydrology (ER 524)
CE 622(3)	Risk Analysis in Water Resources
CE 624(3)	Control of Floods and Drought
CE 720(3)	Theoretical Physical Hydrology
CE 721(3)	Stochastic Analysis in Water Resources
ER 406(3)	Seasonal Snow Environments
ER 416(3)	Land Use Hydrology
ER 440(3)	Watershed Problem Analysis
ER 520(3)	Evapotranspiration
ER 574(3)	Snow Hydrology
ER 712(3)	Watershed Systems
Irrigation and Drainage	
AE 430(4)	Soil-Water Engineering
AE 505(3)	Irrigation Scheduling
AE 531(2)	Irrigation and Drainage Pumping Systems
AE 532(3)	Drainage Engineering
AE 533(3)	Hydraulic Design for Farm Irrigation
AE 535(3)	Surface Irrigation Systems
AE 536(3)	Sprinkler and Trickle Irrigation Systems
AE 537(1)	Surface Irrigation Laboratory
AE 567(3)	Monitoring and Eval. of Irrig. Systems
AE 568(3)	Irrigation System Management
AE 610(2)	Irrigation Field Trip
AE 767(3)	Advanced Irrigation Topics
AG 415(3)	Crop Response to Environment

Course No. (Credits)	Title
AG 470(3)	Soil Physics
AG 471(1)	Soil Physics Laboratory
AG 715(2)	Physiology of Crop Yield Development
AG 770(4)	Advanced Soil Physics
B 640(2)	Mechanisms in Plant-Water Relations

Law, Institutions, Policy

AE 462(3)	Environmental Law
EA 575(3)	Water Law
PL 545(3)	Concept of Natural Value
PL 565(3)	Seminar in Environmental Philosophy
PO 670(3)	Politics of Growth and the Environment
PO 709(3)	Environmental Politics in the U.S.
PO 739(3)	International Environmental Politics
PO 749(3)	Comparative Environmental Politics
PO 759(3)	Environmental Policy and Administration
S 421(3)	Sociology of Natural Resource Utilization
S 460(3)	Technology, Culture and Society
S 763(3)	Social Conflict and Development
NR 521(2)	Natural Resource Administration
RR 450(3)	Wilderness Philosophy and Ethic Dev.

Management and Planning

CE 544(3)	Water Resources Planning
CE 546(3)	Water Resource Systems Analysis
CE 577(3)	Urban Water Management
CE 578(3)	Infrastructure Engineering and Management
ER 510(2)	Watershed Management in Developing Countries
NR 400(3)	Public Relations in Natural Resources
NR 622(3)	Analysis of Environmental Impact
RR 454(3)	Wilderness Management Planning
RS 472(4)	Range Ecosystem Planning
RR 604(3)	Water Resources and Recreation

Models/Computer Data Management and Presentation

CE 645(3)	Computer-Aided Water Management and Control
NR 510(3)	Geographic Information Systems
NR 621(3)	Design of Geographic Information Systems
NR 793(1)	Seminar in Geographic Information Systems

Non-point Source Pollution Control

A 468(3)	Management and Control of Turfgrass Pests
AC 405(3)	Non-point Source Pollution
AG 455(3)	Soil Microbiology
AG 467(3)	Soil Chemistry
AG 500(2)	Environmental Agronomy
AG 560(3)	Chemical Equilibria in Soils
AG 564(3)	Chemical Analysis
AG 666(3)	Salinity and Soil-Water Management

Course No. (Credits)	Title
AG 755(3)	Advanced Soil Microbiology
AG 760(3)	Soil Chemistry and Plant Nutrition
RS 400(2)	Rangeland Improvements
RS 478(3)	Surface Mining Rehabilitation
RS 578(3)	Ecology of Disturbed Lands

Sediment Transport

CE 413(3)	Environmental River Mechanics
CE 716(3)	Erosion and Sedimentation
CE 717(3)	River Mechanics
ER 652(3)	Fluvial Geomorphology

Stream and Riparian Zone Biology

B 450(4)	Plant Ecology
B 551(3)	Plant Geography
EN 445(4)	Aquatic Insects
FW 400(3)	Fish Ecology
FW 401(3)	Fishery Science
FW 451(3)	Urban Fish and Wildlife Management
FW 540(3)	Stream Fish Ecology and Management
FW 560(3)	Management of Fish in Ponds and Reservoirs
MB 432(4)	Aquatic Microbiology
Z 440(4)	Freshwater Biology
Z 441(3)	Stream Biology
Z 443(3)	Limnology

Toxicology

EH 446(3)	Environmental Toxicology
EH 500(4)	Toxicology
EH 648(3)	Environmental Health Risk Assessment
FW 544(3)	Ecotoxicology

Water Quality Management

AE 548(3)	Water Quality Management (CE 548)
AE 549(3)	Design Water Quality Monitoring Systems (CE 549)
ER 418(3)	Land Use and Water Quality
ER 419(2)	Water Quality Laboratory for Wildland Managers
ER 714(3)	Water Quality for Wildland Managers
FW 420(2)	Water Quality for Fish and Wildlife

Water and Wastewater Treatment/Environmental Engineering

CE 438(4)	Water Supply and Wastewater Removal
CE 537(3)	Residuals Management
CE 538(3)	Aqueous Chemistry
CE 539(3)	Water and Wastewater Analysis
CE 540(3)	Unit Operations of Environ. Engr.
CE 541(4)	Unit Processes of Environmental Engineering
CE 543(3)	Industrial Wastes Management
CH 560(3)	Environmental Biotechnology

EDITOR'S IN-BASKET

WQCD STUDIES UPPER ANIMAS RIVER BASIN

The Water Quality Control Division of the Colorado Department of Health has begun a major effort to study the Upper Animas River Basin, one of the most intensively mined regions of Colorado. Most of the basin's rivers and streams carry very high concentrations of heavy metals such as zinc, cadmium, copper, aluminum, iron, manganese and lead. Study leaders hope that information collected will help predict the feasibility of rehabilitation of the basin to support aquatic life. For more information contact Jim Harvey or Greg Parsons at the Colorado Department of Health 303/331-8333.

Colorado Conservator, Feb. 1992

GOVERNOR MAKES APPOINTMENTS TO WQCC, CWCB

The Governor has appointed and the Senate has confirmed six members to the Water Quality Control Commission and three to the Colorado Water Conservation Board. The appointments and reppointments are:

Water Quality Control Commission - For terms expiring February 15, 1995: **Shirley P. Ela** of Grand Junction, reappointed; **Connie H. King** of Colorado Springs, appointed; Hon. Dr. **Florine P. Raitano** of Dillon, reappointed. For terms expiring February 15, 1994: **Laura L. Davis** of Fort Collins, appointed; **Mary J. Gearhart** of Denver, reappointed; **Roger Bill Mitchell** of Monte Vista, appointed.

Colorado Water Conservation Board - **Leo M. Eisel** of Denver; **James S. Lochhead** of Glenwood Springs; and **David H. Smith** of Meeker.

Source: Water Legislative Report, Colorado Water Congress, 3/31/92.

MESA COUNTY WATER ASSOCIATION MODEL EVALUATES SALINITY CONDITIONS IN COLORADO RIVER BASIN

Gregg Trainor of the City of Grand Junction has informed CWRRI that the Mesa County Water Association has just completed development of a water quality model for the Upper Colorado River Basin. The model, named +Mesa+, is designed to evaluate the effect of changes to the hydrologic regime of the basin - changes that affect the amount of water, the quality of water, or the timing of historic flows within the Upper Colorado River system. The hydrologic information developed by the model for either a historic profile or a hydrologic modification includes monthly streamflow, dissolved solids (DS) loads, and average DS concentrations at ten points along the river system for the years 1951 through 1990.

Trainor said the model is available for use by municipalities, water districts, public interest groups, irrigation districts, research institutes and others at no charge. Commercial use is restricted and by permission only. For further information contact: Greg Trainor, City of Grand Junction, 250 N. 5th St., Grand Junction, CO 81501. Phone: 303/244-1564.

+Mesa+ was developed for the Association by AquaSan Network, Inc. It was described by Uli Kappus of AquaSan at the Colorado Water Engineering and Management Conference held in Denver in early March.

MIKE LONG NAMED MINED LAND DIRECTOR

Michael B. Long has been appointed director of the Colorado Mined Land Reclamation Division. Long began his career with the Colorado Department of Natural Resources in 1981 and was Coal Program Supervisor until July 1990, when he accepted the position of Deputy Director of the Indiana Department of Natural Resources, where he managed reclamation, oil and gas, and geological survey activities. The Mined Land Reclamation Division operates the Coal Program, the Minerals Program and the Inactive Mine Reclamation Program.

Source: DNR News, April 1992

NEWS FROM THE WATER SCIENCE AND TECHNOLOGY BOARD

Committee on Western Water Management--The committee report, "Water Transfers in the West: Efficiency, Equity, and the Environment," was released March 9. Included in the report's seven case studies are the Arkansas River and Colorado Front Range area. The WSTB plans three workshops to encourage discussion of the report. The Denver workshop will be held July 14 with participation by invitation only. Contact Chris Elfring at (202)334-3422 to be included.

Committee on Climate Change and Water Resources Management--The committee, charged to provide guidance to the USGS Global Climate Change Response Program, met March 19-20 in Denver to conduct a mid-course evaluation of the program. Proceedings of a colloquium hosted by the committee, "Managing Water Resources in the West Under Conditions of Climate Uncertainty," are available either from the WSTB or the National Academy Press. (202)334-3313.

Assessment of Groundwater Modeling Technology as Applied to U.S. Army Installations--In response to a request from the Army Corps of Engineers Waterways Experiment Station (WES), the WSTB will help strengthen WES' groundwater science and modeling needs. As many as 1,800 military installations throughout the US have been identified by the US Department of Defense as contaminated groundwater sites, with an estimated $8 to $20 billion for cleanup costs.

While the Corps has been involved with the characterization of DOD sites where contaminated water is present, its efforts have focused on detection and monitoring. It would like to increase its role in groundwater modeling and contaminant transport. As part of the WSTB effort, a workshop is scheduled for July 1 in conjunction with the Board's meeting in Washington, D.C. The workshop will be hosted by WSTB members including Don Runnells, faculty member at the University of Colorado.

LEWIS AND CLARK EXPEDITION 1992 BEGINS MAY 31

Lewis and Clark set forth from St. Louis in 1804 searching, like Columbus, for water routes to the Orient--188 years later, the 4,000 mile "Lewis and Clark Expedition 1992" departs from St. Louis on May 31, goes through 11 states, and concludes at the mouth of the Columbia River in early August. The Expedition will use motorized boat, canoe one-fourth of the time, and bicycles over the Bitterroots. The modern explorers are Dr. Tom Warren of Oklahoma and John Hilton, a photographer and videographer from Missouri. American Rivers, sponsor of the expedition, scheduled a news conference for June 1 to mark the departure. For more information, contact Randy Showstack, American Rivers, 801 Pennsylvania Ave. SE, Suite 400, Washington, DC 20003; 202/547-6900.

Congratulations to....

Daniel Luecke, named by **American Rivers** an outstanding American river conservationist. Luecke, Senior Scientist with the Environmental Defense Fund in Boulder, was cited for "tireless leadership in protecting the South Platte River."

1992 elected officers of the American Water Resources Association, Colorado Section: President Elect - **Dave Merritt**; Vice President - **Keith Little** and **Dave Rau** (tie), Secretary - **Marie Del Toro**, Director-at-large - **Bruce Lytle**, and Treasurer - **Jim Kunkel**.

Robert L. Wubbena, named vice president elect of the American Water Works Association (AWWA). Wubbena will assume his duties in June 1992 and serve as AWWA president for the 1994-95 term. Wubbena is founder and president of Economic and Engineering Services of Olympia, Washington. He has been a member of AWWA for 24 years.

Kenneth D. Reid, promoted to Executive Vice President of the American Water Resources Association. The announcement was made by Dr. David W. Moody, AWRA president.

The following Colorado State University water faculty who received professional recognition and awards in 1991:

R. Hunter Follett, Agronomy--recipient of Commendation Award for professional achievements and service, Soil and Water Conservation Society.

Lewis Grant, Atmospheric Science--recipient of Vincent J. Schaefer Award which recognizes excellence in scientific and technological discoveries, Weather Modification Association, 1991.

Neil Grigg, Civil Engineering--elected to Executive Committee, Water Resources Planning and Management Division, American Society of Civil Engineers; and elected president, Fort Collins Water Board.

Hsien Wen Shen, former CSU faculty member (now professor at the University of California, Berkeley), recipient of the Joan Hodges Queneau Award for his outstanding engineering work in environmental engineering over the past decade. The award, given each year by the American Association of Engineering Societies, was presented in an early April ceremony in Washington, DC.

Evan Vlachos, Sociology--named associate editor, *Water International*, and member, advisory board, *The Encyclopedia of the Environment.*

J. V. Ward, Biology--appointed member, International Advisory Board, Study of the Mississippi River Drainage; and editor, *Regulated Rivers.*

SOUTH PLATTE MANAGEMENT PROGRAM INVITES PARTICIPATION AND SUPPORT

The Colorado Water Resources Research Institute (CWRRI), the University of Colorado (CU), and its Center for Advanced Decision Support for Water and Environmental Systems (CADSWES), and a group of South Platte water users have been working with the SEO over the past two years to develop an advanced computer information system to improve the efficiency of information handling and management decision making in administration of water rights in the South Platte River basin.

Metro-area water users (consisting of the cities of Aurora, Denver, Thornton, Englewood and Lakewood, the Centennial Water and Sanitation District, the Farmers Reservoir and Irrigation Company and Consolidated Ditches) and CWRRI, CU and CADSWES have contributed over $150,000 in services and funding to development of this advanced computer information system.

The result of these efforts has been the creation of a prototype water rights administration computer information system called the "South Platte Management Program". The computer information system consists of a graphical representation of the upper South Platte River basin (GIS) combined with real-time stream flow data from the State Satellite Monitoring Network, the SEO water rights tabulation database and two years of historical diversion data for this reach of the river. This system will allow the Water Commissioners instant access to a variety of information that currently requires hours of research from several sources.

Currently, initial programming and computer software for the prototype system are nearly complete. The next critical objective is to install the prototype Program on a SEO computer for testing and actual use, if possible. However, the SEO has been unable to obtain the approximately $40,000 required to purchase the necessary computer hardware to utilize this comprehensive software. The current supporters of this research are exploring additional sources of funding and/or additional sponsors to continue the work into an implementation phase. If you are interested in participating in the project (with or without funding contribution) please contact Doug Kemper at the City of Aurora (303)695-7386.

WATER PUBLICATIONS, VIDEOS

"FUTURES" Videos Available--PBS has released a series of educational videos hosted by Jaime Escalante, the celebrated Los Angeles teacher who was profiled in the film *Stand and Deliver*. FUTURES demonstrates the relevance and excitement of mathematics and math-related subjects to junior high and high school students. Each program in the 12-part series takes students into the high-tech world of a different profession. Students are introduced to agricultural engineers who demonstrate recent innovations in aquaculture, hydroponics, and agricultural brokerage. Despite the difficulties involved in feeding a burgeoning world population, the tone of the program is optimistic - about the future in general, and about student-viewers' futures in particular.

According to Keith Geiger, president of the National Education Association, "FUTURES is a gift from Jaime Escalante and PBS that's bound to inspire the vid-kid generation to go in hot pursuit of math and science careers." The series has already been the recipient of over a dozen national awards.

The FUTURES series consists of six 30-minute cassettes, each of which contains two 15-minute programs. The cassettes can be purchased individually or *in toto*. Besides agricultural engineering, FUTURES also takes students into the worlds of aircraft design, architecture and structural engineering, automotive design, cartography, fashion, water engineering, optics, space travel, sound engineering, statistics, and athletic equipment design. FUTURES will release in the Fall, through PBS, a water engineering feature with Jaime Escalante and John Cameron. For more information or to order, call ASAE headquarters, 616/429-0300.

Source: *Within ASAE*, Apr. 1992

Series host Jaime Escalante and actor Jimmy Smits

Water Efficiency--Did you know that "if your water use is anywhere near the national average, you can probably save a third or more of the water you now use at home?" *Water Efficiency for Your Home*, by John C. Woodwell of the Rocky Mountain Institute, is a brochure to "help individuals improve the water and energy efficiency of their own homes and save money in the process." Also available from RMI are the following publications: Water Efficiency - A Resource for Utility Managers, Community Planners, and Other Decisionmakers (Through Cooperative Agreement with the USEPA Office of Water, Office of Wastewater Enforcement and Compliance); and Water-Efficient Technologies - A Catalog for the Residential/Light Commercial Sector. Contact: Jim Dyer, Director, Water Program, Rocky Mountain Institute, 1739 Snowmass Creek Rd., Snowmass, CO 81654-9199. Phone 303/927-3851; FAX 303/927-4178.

Newsletters Provide Water Information for Small Communities--In March the National Drinking Water Clearinghouse (NDWC) initiated a new quarterly publication called *On Tap*, designed to keep readers informed about drinking water assistance programs, regulations, products, technologies, and health, finance and management issues relevant to small communities. NDWC was established in 1991 with funds from the Farmers Home Administration. Another newsletter, designed to provide wastewater treatment information for small communities, is *Small Flows*, published by the National Small Flows Clearinghouse (NSFC). The NDWC, NSFC, and the National Environmental Training Center for Small Communities are under the Environmental Services and Training Division of the National Research Center for Coal and Energy. The location is West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064. Phone 1-800-624-8301.

Cooperative Weather Observing Program Celebrates Centennial--*Cooperative Weather Observations in Colorado*, by Nolan J. Doesken, Thomas B. McKee and Joyce Hersh, was reprinted in November 1991 and is available from the Colorado Climate Center. The publication was produced by the Colorado Centennial Cooperative Weather Station Program Committee to commemorate the June 7-8, 1991 celebration of a century of cooperative weather observations. Contact the Colorado Climate Center, Atmospheric Science Department, Colorado State University, Fort Collins, CO 80523; 303/491-8545.

Report Available on FY90-94 Water Quality Demonstration Projects--The major purpose of the Department of Agriculture's Water Quality Demonstration Projects is to accelerate producer adoption of agricultural practices that can reduce loadings of agricultural contaminants to ground and surface water. This report describes the challenges and successes of the first eight demonstration projects of the USDA Water Quality Initiative. "Organization and Implementation Assessment of the FY90-94 Water Quality Demonstration Projects - Summary," is available from Kay Rockwell, Cooperative Extension, University of Nebraska, Lincoln, 68583-0703.

League of Women Voters Updates Water Publication--COLORADO WATER, a best seller since 1975, has undergone a major revision and the addition of four more pages in the new 5th edition. New features are: Groundwater Regulation and Administration; Surface Water Regulation and Administration; Other Players in Colorado Water Decisions; New Trends in Water Management; Rewritten Conflicts and Choices; and More Comprehensive Water Supply Section. This comprehensive water publication has been used as a valuable resource by teachers, planners, water managers, civic leaders, elected officials, citizens and the media.

Price $5.00 per copy; quantity discounts available. Contact LWVCO, 1410 Grant St., B-204, Denver, CO 80203. Phone: (303)863-0437.

POSITIONS AVAILABLE

Assistant Director/State Program Leader of Community, Natural Resource and Economic Development (CNRED): Cooperative Extension, University of Wisconsin-Extension. Has overall programmatic responsibility for organization, content, delivery process and overall effectiveness of CNRED program in Wisconsin. The AD/SPL must interrelate the efforts of roughly 60 county/area-based faculty/staff and 65 collaborative faculty/staff on UW campuses or statewide UWEX unites. Candidate should possess a Ph.D., experience in outreach education programming at county or state levels and in educational administration, demonstrated leadership in program development, effective communication skills, and qualifications acceptable for a tenured faculty appointment within the University of Wisconsin System. Salary is commensurate with qualifications. An excellent benefits package is available. Applications must be received no later than July 31, 1992. Submit a letter of application with resume, and names, addresses and phone numbers of three references to:

Cooperative Extension Personnel, 619 Extension, 432 North Lake Street, Madison, WI 53706.

Water/Environmental Fields--Georgia. Any person interested in working in water and/or environmental fields in Georgia can file resumes with The Georgia Department of Natural Resources, "DNR", Environmental Protection Division, "EPD", 205 Butler Street S.E., Atlanta, GE 30334 Attention: Mr. Bruce Osborne, Personnel Coordinator Suite 1152 - Floyd Towers, East. Positions include Hazardous Waste Technicians, Water Resource Engineers and others.

For the following positions send resume and cover letter by June 22 to Waldron & Company, 101 Stewart, Suite 101, Seattle, WA 98101.

Water Resources Manager - Surface Water Management Division--King County Seattle, WA. Salary range $49,392-$62,184 DOQ. Requires undergraduate degree plus a minimum of five years experience supervising water resource management programs. Master's degree in natural science and/or water resource planning of related skills preferred. The ideal candidate must show an outstanding and innovative track record of achievement in the areas of staff development, development and implementation of plans, programs and policies as well as superior supervisory and leadership skills.

Supervising Engineer, Basin Planning - Surface Water Management Division--King County Seattle, WA. Salary range $46,860-$59,808 DOQ. Requires degree in civil engineering or related field and five years of progressively responsible experience. An advanced degree and/or PE is preferred. The ideal candidate will manage his/her own staff while serving on multi-disciplinary project teams division-wide to resolve watershed protection issues including flooding, erosion, sedimentation, aquatic resource degradation and water quality degradation of constructed and natural (streams, wetlands, lakes) drainage systems. Ability to communicate effectively with technical staff, elected officials and citizens groups.

Surface Water Management Project Engineer--Federal Way, WA. Salary range $46,272-$57,120 DOQ. Requires bachelor's degree in civil engineering or closely related field, and at least five years of large scale project management experience in surface- stormwater engineering. Registration as a professional engineer also required. Ideal candidate should have ability to manage large capital projects in surface water engineering, experience selecting and supervising consultants, ability to communicate effectively to diverse groups, and knowledge of various state and federal regulations.

Supervising Environmental Scientist - Surface Water Management Division--King County Seattle, WA. Salary range $41,700-$53,076. Requires degree in the natural sciences, water resources or environmental engineering and 3-5 years experience supervising in a similar environment. Strong communication negotiation skills required. Responsibilities include assisting SWM Division to be proactive in developing stream and wetland projects that protect plant, fish and animal life. He/She will be the focal point for all environmental review regarding new construction and will direct policy development and technical work in geology, aquatic ecology and water quality.

Utility Engineering Supervisor--Renton, WA. Salary range $48,510-&59,106 DOQ. Requires bachelor's degree in relatedfield or PE and four years of utility related experience including at least two years of experience in a lead capacity and at least two years of experience in surface water engineering and/or planning capacity. Reports to the Utility Systems Director and is responsible for participating in the planning, design, construction and operation of municipal water utilities and public works facilities; training, supervising and evaluating the performance of assigned personnel.

MEETINGS, CALLS FOR PAPERS

WATER RESOURCES AND THE ENVIRONMENT: Education, Training and Research

This conference will focus on using educational programs to solve water and environmental management problems. Topics will include the status and needs of water resources education and environmental education, educating minority citizens, international water/education issues, research trends in water and environment, and outreach - connecting education and action. Organized and sponsored by CSU's Department of Civil Engineering and CWRRI, it is scheduled for July 13-17, 1992. For further information contact: Janet Lee Montera, Civil Engineering Department, Colorado State University, Fort Collins, CO 80523. Phone 303/491-7425; FAX 303/491-7727.

A WORKSHOP ON ENVIRONMENTAL ASSESSMENT OF MOUNTAIN STREAMS
September 15-18, 1992
Wild Basin Lodge, Allenspark, Colorado

The workshop focuses on the need for a holistic view and interdisciplinary approach to environmental assessments. Approximately half of the time will be in the field on the North St. Vrain Creek. Contact Janet Lee Montera at address previously given. *Sponsored by Rocky Mountain Hydrologic Research Center and organized by CSU's Civil Engineering Department and CWRRI.*

COLORADO WATER WORKSHOP

Showdown on the Colorado River is the theme for the 17th Annual Colorado Water Workshop, scheduled for July 22-24 at the Western State College in Gunnison. Panelists will explore whether the existing compacts and management strategies in the Colorado River basin can satisfy the demands of a growing urban population, environmental requirements, and Native American rights. The inviolability of interstate compacts will be debated. New management solutions will be discussed. Will water transfers from agriculture provide the solution? Speakers from Colorado include John Carlson, Lori Potter of the Sierra Club, Jim Lochhead, Jeris Danielson, Jim Dyer of the Rocky Mountain Institute, and Janice Sheftel of the Colorado Water Conservation Board. Interstate Compact discussions will include Gerald Zimmerman of California, Tom Cahill of Nevada, and Betsy Rieke of Arizona. Duane Georgeson of Southern California's Metropolitan Water District and Greg James, from the Owens Valley, will share their perspectives on California's continuing search for urban water supplies. Native Americans from the river basin will discuss the relationship between their water rights, state entitlements, and other water users in the basin.

Western State College will offer undergraduate or graduate credit for the three-day conference; 18 CLE credits will also be available. The registration fee, which includes meals, is $200. A limited number of scholarships will be available. Also, inexpensive dorm rooms will be available at the college. The conference schedule and registration information will be mailed in late May. Printed proceedings will be available for $30. For information, contact Lucy High at (303) 641-2238 or -2239.

WATER QUALITY/BEST MANAGEMENT PRACTICES FIELD DAYS SCHEDULED
by Reagan Waskom

Nitrogen is an essential and relatively inexpensive input that farmers occasionally over-apply to "ensure" that N deficiencies do not limit crop production. Unfortunately, this practice can lead to groundwater contamination with nitrates. Current N fertilizer recommendations in Colorado are based on soil samples taken in the fall or in the early Spring before planting. However, the majority of N uptake by corn occurs in mid-summer. Mineralization of N from manure or other organic matter, and No_3 leaching, can significantly change soil N status during this time. The pre-sidedress nitrate test (PSNT), developed in Vermont by Magdoff (1984), may improve N recommendation accuracy and help to minimize the use of "insurance" N fertilizer in Colorado. By complementing preplant soil testing with PSNT, it may be possible to improve N fertilizer requirement preduction accuracy, resulting in reduced leaching of NO_3 to groundwater.

The current PSNT is based on NO_3 concentration in the top foot of soil when corn is about 12 inches tall. Sampling at this stage of growth is a compromise between being early enough to allow sidedress applications of N fertilizer before the corn gets too tall to allow equipment entry, and late enough to evaluate the influence of spring weather conditions and early irrigation on N availability for the remainder of the season. Quick soil test kits for NO_3 have been developed that allow "field testing," thereby alleviating the problem of slow turn-around time in commercial soil testing laboratories.

A five-county study was initiated by the CSU Agronomy Department and Cooperative Extension Agents in Adams,

Boulder, Larimer, Morgan, and Weld counties to investigate and demonstrate the use of PSNT for irrigated corn. Eight nitrogen fertilizer rates will be used on replicated field plots to obtain a range of soil nitrate levels and yield responses. Extension irrigation specialists and the Northern Colorado Water Conservancy District agronomists are cooperating to measure how irrigation efficiency influences the use of PSNT.

Field days will be held June 30-July 1, 1992 to introduce this methodology to all interested persons and agency staff who are addressing nutrient management issues. They are scheduled:

June 30, 1992, 10:00 a.m.--Boulder County, Cooperator - Mike Laber, 7042 N. 107th Ave., Longmont (Hwy. 287 south of Longmont). For information contact Larry Benner 776-4865.

June 30, 1992, 2:00 p.m.--Weld County, Cooperator - Dennis Hoshiko, West side of Hwy. 34, SE of Old Monfort Feedlot, Greeley. For information contact Jerry Alldredge 356-4000.

July 1, 1992, 10:00 a.m.--Adams County, Cooperator - Ron Sack, 160 (State Hwy. 7) and York St., Brighton, CO. For information contact Ron Jepson 659-4150.

July 1, 1992, 2:00 p.m.--Morgan County, Cooperators - Bob Zadel and Stan Linker, 1/4 mile west of Hillrose to Morgan Co. Rd. 33, north 1.6 miles. For information contact Bruce Bosley 867-2493.

HIGH ALTITUDE REVEGETATION 1992 SUMMER FIELD TOUR July 30-31, 1992

The tour will take place at the Trapper Mine in Northwest Colorado and at the Rocky Mountain National Park. Trapper Mine is 6-1/5 miles southwest of Craig on Highway 13. Revegetation work there includes wildlife management, steep slopes, topsoiling, soil and stream channel erosion control. The bus tour of Rocky Mountain National Park will include Harbison Meadows reclaimed gravel borrow pit, Trail Ridge Road to view pre-cast retaining walls to stabilize steep road cuts, and the Hidden Valley ski area to view restoration and erosion control seedings from 1987. For information contact: Gary Thor, Department of Agronomy, Colorado State University, Fort Collins, CO 80523; Phone 303/491-7296 or Wendell Hassell at (303)969-2172.

MONITORING WORKSHOPS SCHEDULED

The Environmental Protection Agency's Region VIII office in Denver has scheduled two training workshops that will focus on the conceptual basis and design of monitoring projects with special reference to non-point sources in forested areas. The workshops will be led by Dr. Lee MacDonald of Colorado State University, the principal author of a recent EPA publication ("Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska") that is now being widely distributed. MacDonald has conducted similar workshops in Washington, Oregon, Idaho, Alaska and Montana.

Workshop topics will include: legal basis for monitoring; types of monitoring; design of monitoring projects; statistical considerations; parameter selection (including use of an expert system developed by MacDonald); crystal-ball gazing; and practical lessons for monitoring. In both workshops the afternoon of the second day will be devoted to cumulative watershed effects. The workshop format will include individual exercises, case studies, group exercises and oral presentations.

The first workshop is scheduled in Fort Collins on August 20-21, and the second workshop will be held in Salt Lake City on August 24-25. Registration fee will be approximately $20. For information on the Forst Collins workshop contact Chuck Harnish (303)293-1237 or Greg Parson (303)331-2675; for information on the Salt Lake City workshop contact Roy Gunnell (801)538-6146.

ESA SYMPOSIUM SCHEDULED IN HONOLULU

The Society for Range Management will cosponsor a symposium at the 1992 Ecological Society of America Meeting scheduled in Honolulu, Hawaii August 19-13, 1992, titled "Livestock Influences on Western Riparian Ecosystems." Colorado participants include M.J. Trlica (Range Science Department, CSU), who will make introductory remarks; Wayne C. Leininger (Range Science Department, CSU), who will discuss "Livestock Impacts on Riparian Soils and Vegetation;" and Fritz L. Knopf (National Ecology Research Center, Fish & Wildlife Service, Fort Collins) whose presentation will be "Livestock Impacts on Riparian Avifaunas." For additional information contact Joe Trlica at (303)491-5655.

GROUNDWATER LAW, HYDROLOGY AND POLICY TO BE FOCUS OF JUNE CONFERENCE

The Natural Resources Law Center at the University of Colorado School of Law will hold its annual water conference in conjunction with the Rocky Mountain Groundwater Conference, organized by the Colorado Groundwater Association.

"Uncovering the Hidden Resource: Groundwater Law, Hydrology, and Policy in the 1990s" is scheduled for June 15-17, 1992 in Boulder, Colorado. Joint sessions will address groundwater hydrology and related legal principles, groundwater quality protection and clean-up, and international groundwater management issues. In a session on legal and engineering practice issues, an experienced water attorney and groundwater expert will demonstrate an expert witness examination, followed by personal observations from a Colorado water judge. In separate sessions, participants in the NRLC conference will hear about groundwater development in Nevada and in Colorado's San Luis Valley; groundwater management in Arizona, Southern California's water basins, and the Edwards Aquifer in Texas; and groundwater contamination and clean-up in California's San Gabriel Valley and Colorado's Rocky Mountain Arsenal. Participants in the Rocky Mountain Groundwater Conference will focus in their separate sessions on groundwater modeling and development and presentation of technical evidence.

The conference will be held at the University of Colorado in Boulder. Continuing Legal Education credits will be available. For registration materials or further information, contact Kathy Taylor, Coordinator, Natural Resources Law Center, (303)492-1288.

SOUTH PLATTE RESEARCH CONFERENCE
Defining Ecological and Sociological Integrity for the South Platte River Basin

Conference participants are invited to discuss the past and present ecology of the South Platte Basin and define the implications of a new term that has been brought to water management - ecological integrity - as it will apply to the basin. Submit one-page abstract by **July 15, 1992** to: Craig Woodring, CWRRI, 410 University Services Bldg., Colorado State University, Fort Collins, CO. Phone 303/491-6308; FAX 303/491-2293. *Sponsored by Colorado Division of Wildlife, US Fish and Wildlife Service, CWRRI, Denver Water Department, and Northern Colorado Water Conservancy District.*

ASCE CONFERENCE CALL FOR PAPERS

"Management of Irrigation and Drainage Systems: Integrated Perspectives," is the theme of the 1993 National Conference on Irrigation and Drainage Engineering, American Society of Civil Engineers. It will give special focus to the integration of irrigation and drainage system management with the environment and other water uses. Major session topics will include water conflicts and resolution, water quality issues, climate change, groundwater, computer utilization and water requirements. The conference, scheduled for July 21-23, 1993, will be held in Park City Utah. Prospective authors are invited to submit three (3) copies of an abstract to the technical Program Committee by **July 30, 1992**. For information contact Richard G. Allen, Dept. of Biological and Irrigation Engineering, Utah State University, Logan, UT 84322-4105; Phone (801)750-2798; FAX (801)750-1248.

CULTURAL AND ECOLOGICAL INSTITUTE ON WATER - DENVER MUSEUM OF NATURAL HISTORY
July 9-11, 1992

This year's conference focuses on the natural history and contemporary issues surrounding river systems worldwide with an emphasis on Western rivers. This conference will offer participants an exciting and diverse immersion into the ecology, water law policy, resource management, anthropology, geology, and history of rivers. Distinguished scientists, historians, anthropologists, attorneys and conservationists will present timely lectures and panel discussions on a variety of topics: "The Historic and Cultural Uses of Water," "History of Western U.S.; Exploration and Expansion;" "Water in a Changing West," "Western Water: Toward a Sustainable Future;" and "Endangered Rivers of the World." Panel and workshop topics include: "Infusing Water Education in Interdisciplinary Curricula;" "Water Issues and Indian Nations;" "Environmental Perspectives on Western Water;" "Urban/Rural Water Management Issues in Colorado;" "Colorado's Water: For Sale?;" "Contemporary Water Management Issues Across the Nation;" and "Responding to Future Issues and Changing Public Values."

Thursday evening's keynote address will be presented by Marc Reisner, author of Cadillac Desert, at 7:00 p.m. Lectures and panel discussions will be held from 8:00 am - 5:00 pm Friday and Saturday.

For information contact: Joe Wiggins, Denver Museum of Natural History, 2001 Colorado Blvd., Denver, CO 80205; Phone (303)370-8299; FAX (303)331-6492.

WATER NEWS DIGEST

GROUNDWATER

LWV and EPA in Groundwater Campaign

The League of Women Voters and the U.S. Environmental Protection Agency (EPA) are sponsoring a three-year campaign to educate the public about the need to protect groundwater. The League and the EPA have awarded grants of $4,500 to 18 localities across the country to develop grassroots protection strategies. The LWV has produced a groundwater protection poster, "Look Out Below...Protect Your Groundwater," which offers four simple ways for citizens to get involved in protecting groundwater. Copies are available for $4.99, plus $1.00 shipping and handling, from the League of Women Voters of the United States, 1730 M Street, NW, Washington, DC 20036.

U.S.Water News 5/1992

RECREATION

Legislature Authorizes Water Rights Purchase

The Colorado General Assembly has authorized the purchase by the state of water rights for a Great Plains State Park south of Eads. The legislation allows the State Division of Wildlife to spend $2 million. The Colorado Department of Natural Resources has made a verbal commitment for another $5 million in fiscal 1993-94. The funds will be used to begin creating a permanent pool of water for boating, swimming, fishing and other recreation needed to designate Great Plains Reservoirs as a state park. The new park would encompass six lakes--Nee Grande, Nee Noshee, Sweetwater, Jet and upper and lower Queens--that often dry up in summer.

Pueblo Chieftain 5/7/92

SUMMER EVENTS IN COLORADO WILL CELEBRATE THE YEAR OF CLEAN WATER

COLORADO SPLASH
CLEAN WATER FESTIVAL

Presented by

U.S. Environmental Protection Agency,
Water Management Division
and
Colorado Department of Health
Water Quality Division

The Clean Water Act, passed in 1972, was one of the first programs assigned to the newly created Environmental Protection Agency. To commemorate the 20th anniversary of the Act, the U.S. Clean Water Foundation has proclaimed 1992 as *The Year of Clean Water*. In Colorado, the U.S. Environmental Protection Agency and the Colorado Department of Health, Water Quality Division, have joined together to celebrate *The Year of Clean Water* with a summertime water festival called **COLORADO SPLASH.**

Friday, July 24, 7:00 p.m. - 11:00 p.m.

Concert in the Park (City Park, Denver) - The opening event of **COLORADO SPLASH** will include a celebrity speaker and short speeches by Colorado Governor Roy Romer and representatives of Denver Mayor Webb's office and the EPA, followed by a concert given by an entertainer who is dedicated to the environment. The concert will be free.

Saturday, July 25, all day

Chatfield Reservoir - This day will center around water-related educational booths, participatory sports, entertainment, and food/beverages.

- Booths and displays will educate the public about clean water, water conservancy and water issues.
- Entertainment will include another well-known entertainer.
- Sports will include a sailing regatta, paddleboat/raft polo, canoe races, beach ball games, carnival games, fly-fishing demonstrations, sample water testing

EPA and CDOH hope to involve as many organizations and companies as possible in **COLORADO SPLASH.** For more information contact: The Wharton Group, 730 - 17th St., Ste 840, Denver, CO 80202, 303/537-1433.

COLORADO CLEAN WATER AWARDS

Governor Romer has proclaimed 1992 *The Year of Clean Water* in Colorado. As a part of the celebration, the Colorado Water Quality Control Commission will present **Colorado Clean Water Awards** to recognize Colorado individuals and groups who have undertaken activities to protect, maintain and improve the quality of Colorado's water resources. Activities may include clean-up projects, educational efforts, innovative treatment initiatives, or any other actions constituting an exceptional contribution to clean water in Colorado.

Five Awards Categories:

- **School or Youth Groups:** Organizations for persons 18 years or younger, and groups associated with elementary, middle and high schools, colleges and universities.
- **Local Government:** Local governments or agencies of local government.
- **Businesses and corporations:** For-profit companies.
- **Citizen and Constituent Organizations:** Professional, trade, public interest or public service groups.
- **Individuals** - Persons demonstrating an outstanding individual commitment or accomplishment.

Entry Procedures: Complete a Colorado Clean Water Awards application (available from Water Quality Control Commission - Phone 320-833; copy can also be obtained from CWRRI) and submit to the Commission Office by August 20, 1992. Submit a separate, summary statement of the activity. This statement should not exceed 500 words and should include:

- a description of the activity's objectives and results, including how the activity has contributed to protecting, maintaining, and improving the quality of Colorado's water resources; and
- a statement of whether the activity is ongoing, occasional, periodic or a one-time event.

Supplemental material is not required, but if provided should include no more than 10 pages. Materials should be placed in a clearly labelled folder or binder, with each page labelled with the activity name. There is no entry fee. All materials become the property of the awards program and will not be returned. Awards are expected to be announced and presented in October 1992. Specific information will be provided later.

Senate Committee Rejects Bill Limiting Rafters' Liability

The Colorado Senate Judiciary Committee defeated H.B. 1179, which would have granted partial legal immunity for river outfitters, after hearing from the parents of a woman drowned in a Royal Gorge rafting accident last June. The legislation would have prevented recovery for injuries occurring from inherent dangers and capped awards at $400,000.

Montrose *Daily Press* 3/17/91, *Pueblo Chieftain* 3/18/92

State Recommends Usual Arkansas Flow

The state is recommending few changes in releasing water from mountain lakes for rafting and fishing along the Arkansas River, according to Department of Natural Resources representative Steve Norris. The department's recommendations were given to the board of directors of the Southeastern Colorado Water Conservancy District, which will be working with the Division of Wildlife to develop a water-release plan for the summer.

Pueblo Chieftain 4/17/92

Sediment Reduction Plan Gets Underway

State and local officials signed documents for the Trinidad Lake North Watershed Project to start a soil conservation plan aimed at reducing erosion in the Trinidad Lake watershed. The project targets the drainage of four canyons northwest of Trinidad which make up 20 percent of the watershed but deliver approximately 40 percent of the sediment that goes into the lake. Sediment from a 1981 flood has already reduced the estimated life span of the lake, built in the 1970s, from 75 to 40 years. Further sedimentation at the current rate will reduce the life span. The 10-year project is estimated to reduce water storage losses from sedimentation by 97 acre feet annually.

Pueblo Chieftain 3/26/92

Public Opinion Sought on New Regulations

The Colorado Division of Wildlife is inviting individual fishermen and spokesmen for various fishing groups to discuss potential changes in the state's fishing regulations. A new three-year cycle for regulations begins in 1993 and the Colorado Wildlife Commission has accepted a number of issues to be addressed in the regulations-making process.

Colorado Springs *Gazette Telegraph* 4/5/92

WATER RATES

Water Rates Rise in Colorado Springs, But Not as Much as Requested

Water rates in Colorado Springs rose 4.58 percent in early May, adding $1.08 to the average monthly bill of residential customers. This is not as high as the 6.78 percent rate increase requested by the Water Department and rejected by the City Council in February.

Colorado Springs *Gazette Telegraph* 4/15/92

LEGISLATION

Hearing Held on Federal Recreation Legislation

Legislation allowing the federal government to help repair recreation facilities at federal dam sites in the West was considered by the Interior Subcommittee on Water and Power Resources of the U.S. House of Representatives. Current law does not allow the federal owners of reservoir sites to share in costs of renovation, expansion or operation. The bill, sponsored by Rep. Ben Nighthorse Campbell (D-CO), would allow a 50-50 cost share. Many of the non-federal managers of these recreation sites, such as state or county parks and recreation departments, find it difficult to maintain these facilities without help from the federal government, which operates the dams. Twenty one recreation sites have been returned to the Bureau of Reclamation, and the Bureau has been unable to find sponsors for another 31. Many areas are more than 30 years old and do not meet today's use levels, health and safety standards, handicapped access requirements, and other public needs.

Montrose Daily Press 3/13/92, 2/21/92

Revegetation Bill Becomes Law

S.B. 92 has been signed into law by Colorado Governor Roy Romer. The bill codifies the ability of water judges to require revegetation of formerly irrigated farmland when water rights are sold. The bill does not require the judges to order revegetation.

Pueblo Chieftain 4/22/92

Panel Hears Pro and Con on Black Canyon Proposal

The first congressional hearing on a bill to change the Black Canyon of Gunnison National Monument into a national park was held by the U.S. House of Representative Interior and Insular Affairs Subcommittee on National Parks and Public Lands. Rep. Ben Nighthorse Campbell (D-CO) testified in favor of his bill which would designate 20,700 acres of the canyon as a national park and another 64,100 acres as a National Conservation Area. The U.S. Department of Interior opposes the designation, saying the area doesn't have enough diversity for classification as a national park. Some environmental groups, including the Wilderness Society, the Sierra Club and American Rivers Inc., criticized the bill because it has no federal reserved water rights.

Denver Post 4/1/92

Gloomy Prediction Given on Colorado Wilderness Bill

U.S. Rep. Ben Nighthorse Campbell (D-CO) gave a gloomy forecast for legislation to set aside about 640,000 acres of

Colorado as wilderness. Opposition to the bill's treatment of water rights is the main reason, according to Campbell. Rep. George Miller (D-CA), Chairman of the House Interior and Insular Affairs Committee, and Rep. Bruce Vento (D-MN), Chairman of the Subcommittee on National Parks and Public Lands, have objected to the bill's water-rights language. National environmental groups want stream flows in wilderness areas protected from upstream dam-builders. The Senate approved a compromise bill sponsored by Colorado's senators, Tim Wirth, a Democrat, and Hank Brown, a Republican. Supporters of this compromise say that the majority of acreage to be designated as wilderness includes the headwaters of streams and that upstream interference is not possible. Wirth and Brown are still optimistic Congress will pass some legislation this year.

Denver Post 4/1/92

LITIGATION

Recreation Water Users Win Major Victory

A recent decision by the Colorado Supreme Court gives Fort Collins a water appropriation based on recreational use, unusual under Colorado water law. The ruling could make it difficult for the city of Thornton, which has major claims in Northern Colorado, to claim water in the area. The Fort Collins application asked that the city be allowed to build dams that include a boat chute and a fish ladder. The dams would rechannel water to the original stream bed.

Fort Collins *Coloradoan* 5/16/92

Grand Junction Not Ready to Sign Water Settlement

The city of Grand Junction is refusing to sign the settlement of a 4-year-old water court case that would allow Denver to exchange and divert more Western Slope water. Linda White, special water attorney for Grand Junction, said that the deal as written now doesn't guarantee complete protection for current and future Western Slope water users.

The settlement would allow the Denver Water Board to buy water, by exchange, from the Colorado River Water Conservation District's proposed Wolford Mountain reservoir near Kremmling. Denver would divert water from Dillon reservoir on the Blue River, then the river district would release an equal amount into the Colorado River from the new reservoir 40 miles downstream. In between lies Green Mountain Reservoir, which since 1943 has provided guaranteed flows in the Colorado River for Western Slope water users. A portion of those guaranteed flows will be moved downstream to the newer Wolford Mountain Reservoir, and White worries that Wolford's lower-priority rights could be at risk if there is ever a Colorado River Compact call from California.

In addition, the settlement calls for Denver's transmountain diversions to be "'shuffled into the deck'" for Green Mountain water along with Western Slope users. White said the settlement would give Denver a new position that might limit the exchange rights of Western Slope water users to call for Green Mountain water. In addition, ski resort officials contend that Denver's added diversion high in the basin will make their water shortage problems worse and replacing the flows at Kremmling won't help.

Grand Junction *Daily Sentinel* 2/2/92

PEOPLE

Danielsen to Join Water Marketing Firm

Former State Engineer Jeris Danielson has joined the Stockmen's Water Co. and will serve as vice-president and general manager. The company was formed in early May as an alternative way to market San Luis Valley water. Gary Boyce, president of the company and a Crestone rancher, plans to work with other valley ranchers as a way to increase the value of their water. Stockmen's Water Co. will not seek new water rights but will allow ranchers to market a portion of their existing rights.

Pueblo Chieftain 5/24/92

Colorado Springs to Get New Utilities Director

Phil Tollefson will take over as director of Colorado Springs' four utilities departments on June 1. A 10-year employee with the city, Tollefson will replace the retiring Utilities Director Jim Phillips. He will supervise 1,500 employees and 75 percent of the city budget.

Colorado Springs *Gazette Telegraph* 5/17/92

CONSERVATION

Gypsum Blocks Could Help Save Ogallala Aquifer

Buried gypsum block monitoring of soil moisture is a technique farmers in eastern Colorado have found reduces water needs and energy costs and may help prevent depletion of the Ogallala Aquifer. The gypsum blocks were introduced in 1986 by the Ogallala team of the U.S. Soil Conservation Service. The 1 1/4 inch gypsum block is buried in the crop root zone with two insulating wires drawn to the surface for testing with an impedance meter. Farmers install one or two monitoring sites on each circle of land irrigated by a center pivot sprinkler, the region's most common irrigation technology. The yearly costs of the monitoring equipment and labor is less than 50 cents per acre and helps reduce a year's pump-energy bills by $2,000 or more per field.

U.S. Water News 4/92

WETLANDS

Agriculture Department Proposal Would Permit Draining of Wetlands

A draft proposal from the U.S. Department of Agriculture would exempt farmers from the Mississippi Delta to the Great Plains

from a 1990 law barring federal subsidies to producers who drain or otherwise alter wetlands in "bad faith." Clark Williams, wetlands specialist for the National Audubon Society, charged that the plan would authorize use of taxpayer subsidies to agriculture for the destruction of important wetlands resources. Galen Bridge, associate chief of the Agriculture Department's Soil Conservation Service, said the proposal is just one of many working papers under consideration.

The proposal must be approved by Agriculture Secretary Edward Madigan and is in line with other efforts by the Bush administration to ease what the president has described as an undue regulatory burden on business. However, due to the volume of letters written in opposition to the administration's proposed changes in the definition of wetlands, that proposal has been sent back to the drawing board.

Rocky Mountain News 5/23/92, *Montrose Daily Press* 4/1/92

WILDLIFE

Rio Grande Minnow Could Affect River Management All the Way to Headwaters

A U.S. Fish and Wildlife Service proposal to declare the Rio Grande silvery minnow threatened or endangered in New Mexico would modify water releases and in-channel maintenance all the way up to the headwaters. At the same time, Colorado and New Mexico have announced record deliveries of water to Elephant Butte Reservoir in southern New Mexico. This year Colorado will send downstream about 17.3 billion gallons more water than required, which could insulate the state for now from effects of protecting the silvery minnow.

Denver Post 4/13/92

Two Suits Filed Over Endangered Species Act

Two suits have been filed against federal agencies charging violations of the Endangered Species Act, which is meant to keep rare animals from going extinct. Seven national and Rocky Mountain conservation groups filed a lawsuit in U.S. District Court in Denver claiming that the U.S. Fish and Wildlife Service has dragged its feet over protecting habitat for the razorback sucker, a rare fish native to the Colorado River Basin. Three groups and several individuals filed suit in the U.S. District Court in Washington, D.C., against the U.S. Agriculture Department's Animal Damage Control program. The suit seeks to halt predator killing campaigns in known endangered species habitat in the Western United States.

Denver Post 5/8/92

Dam Repair Killing Fish

Attempts to repair a sink hole in the dam at the Sanchez Reservoir is killing fish, according to Jerry Apker, San Luis Valley area supervisor for the Colorado Division of Wildlife (DOW). The amount of lime in the grout is too toxic for the brown trout in Culebra Creek. However, DOW is willing to accept the loss of fish to protect the dam, planing to replace the fish later.

Pueblo *Chieftain* 5/6/92

IRRIGATION

Sale of Agricultural Land Setting Trend

Applications for the sale of agricultural land and proposed developments have recently flooded the Larimer County planning office. Although the recent trend does not match that of the boom of the late 1970s and early 1980s, it is still considered significant. This most recent surge began during the summer of 1991, and will likely continue at least through the end of the year. According to the planning office, there were 67 applications for developments during the first quarter of this year. If this trend continues through the end of 1992, it will surpass the 1986 peak. Most of the proposals are for minor residential developments (MRDs) on flatlands in Larimer County southwest of Berthoud, west of Loveland, east of Interstate 25, and near the southwest corner of Fort Collins. Difficulties with the increasing number of MRDs include planning for utility services such as telephone, water, and sewer lines, and police and fire protection.

Fort Collins *Coloradoan* 5/25/92

Farm Debt Re-examined

The Farmers Home Administration (FmHA) has begun notifying over 30,000 delinquent farm borrowers that their loans will soon be restructured, forgiven, or foreclosed, depending on which option will cost the federal government the least. FmHA ceased restructuring delinquent farm loans in late 1990. At that time Congress passed reforms in response to criticism that the Department of Agriculture was pressuring delinquent small farmers but not large farm operators. As of May 1992 FmHA had 37,311 delinquent farm borrowers, which made up over 26 percent of the agency's active direct loan program. Small farm activists believe nearly 10 percent of these delinquent borrowers could be forced into foreclosure.

Fort Collins *Coloradoan* 5/17/92

Farms Losing Local Significance

As early as the 1870s, agriculture in Larimer County became big business with the digging of large-scale irrigation canals, and 25 years ago agriculture was the foundation of the local economy. But with the surge of urban growth and emergence of companies such as NCR, Budweiser, Teledyne Water Pik, and Hewlett-Packard, agriculture has lost some of its local significance. Since 1959 the amount of land in the county devoted to farming has dropped nearly 30 percent. Some local farmers complain of the indifference shown to farming by both city dwellers and city government and point out that municipalities are often quick to

provide tax breaks or build roads for new industry, but have not provided farming with similar treatment. Agriculture often cannot compete economically with urban use of land.

Fort Collins *Coloradoan* 5/25/92

New Interest in Dormant Evaluation of Irrigated Land Use

Approximately 10 years ago the city of Fort Collins explored the issue of farmland preservation with the formation of a task force which established criteria to evaluate the quality of agricultural land as part of the city's planning process. This was an attempt to highlight the importance of agricultural lands and promote their preservation. This effort lost momentum when Anheuser-Busch announced plans to locate a brewery on prime irrigated land near Fort Collins. Now this effort is gaining interest once again as irrigated land is continuing to be lost to development. According to Don Jones, a farm management specialist for Agricola Realty and Management, "The marginal ground can be developed into housing and industrial use, [but] the best drained, best irrigated land should be left for ag production."

Fort Collins *Coloradoan* 5/25/92

WATER ALLOCATION

Trinidad Dam Fees in Dispute

On April 29, The Bureau of Reclamation shut off water deliveries from Trinidad Dam to the Purgatoire River Water Conservancy District after four ditch companies refused to pay their annual share of the operation and maintenance fees. The dam is operated by the Bureau of Reclamation and the Army Corps of Engineers, while annual fees from ditch companies are collected each April by the Conservancy District under an agreement with the federal government. The District decided to pay the delinquent fees itself after water was shut off to seven other ditch companies which had made the required payment. A negotiation meeting on May 8 between all parties failed to settle the matter, and no further negotiation was expected prior to a preliminary hearing in Las Animas District Court later in May.

Pueblo Chieftain 5/5/92, 5/16/92

Adams County and Denver Compromise on Water Dispute

An agreement between the Denver Water Board and the Adams County Commission calls for Denver to provide water taps for future Aurora city development on a square mile of land called Section 11 along the southern border of the new Denver airport site. In return, Denver will be allowed to construct a water pump plant at East 64th Ave. and Picadilly Road in Adams County which will be used to supply water to the new airport. Adams County had refused to approve zoning for the water treatment plant until Denver resolved the water tap issue.

Denver Post 4/16/92

WATER PROJECTS

Roberts Tunnel Inspected

The Harold D. Roberts Tunnel, which carries water from Dillon Reservoir beneath the Continental Divide to the South Platte River and the Denver area, was recently inspected by the Denver Water Department for the first time in 26 years. The inspection team found the 23-mile-long tunnel in good shape. The tunnel undergoes a routine check every few years, but this was the first detailed look in more than a quarter-century. The Roberts Tunnel was once regarded as the longest underground water tunnel in the world, and at one point, is located 4,465 feet beneath the surface.

Grand Junction *Daily Sentinel* 5/13/92

Animas-La Plata Archaeological Study Planned

A contract for an archaeological study of the Animas-La Plata water project in southwestern Colorado will be awarded in June 1992, according to Roland Robinson, regional director for the Bureau of Reclamation. The study is a necessary preliminary step before construction of the delayed project can begin. Ute Indian Tribes and water districts in southwestern Colorado that will be served by the project threatened to go to court if the construction schedule outlined in a 1988 agreement with the Bureau of Reclamation was not maintained. Drew Caputo, a lawyer for the Sierra Club Legal Defense Fund in Denver, has indicated he will seek an emergency federal court order to bar the start of the archaeological work.

Grand Junction *Daily Sentinel* 5/13/92, 5/21/92

Homestake II Decision Ruled OK

The 10th U.S. Circuit Court of Appeals recently ruled that the U.S. Forest Service and the Army Corps of Engineers did not violate the law when they approved the building of the Homestake II water project. The Sierra Club had appealed an earlier decision, claiming that the two federal agencies had issued permits for the project before required environmental studies were complete. The Forest Service and the Corps granted the permits with the condition that a plan be developed to prevent wetland losses.

Colorado Springs *Gazette Telegraph* 4/6/92

Central City Water Shortage

Further development of casinos and gambling in Central City may cease unless the city can meet numerous government regulations required to build two new reservoirs for winter water needs. The reservoirs are needed for the winter months when water runoff is inadequate due to recent casino development. The largest hurdles seem to be mitigating the depletion of water in the South Platte basin that the reservoirs will cause, and complying with stringent water standards imposed by the federal

government regarding western Nebraska habitats for endangered species of whooping cranes, plovers, and terns along the Platte River system.

Denver Post 4/16/92

WATER TRANSFER

Colorado Springs Utilities Challenges Ballot Wording

Colorado Springs Utilities has challenged the wording of a proposed statewide ballot initiative which would restrict the city's future attempts to transfer water from other parts of the state. The Colorado Supreme Court has been asked to return the ballot initiative to the panel that originally approved the wording of the proposal. Colorado Springs Utilities charges that the wording of the initiative fails to describe the impacts of the proposal.

Colorado Springs *Gazette Telegraph* 5/15/92

WATER QUALITY

Study Shows Adams County Safe

A federally financed study of nearly 500 Adams County residents conducted by state researchers found that although some residents have slightly elevated levels of arsenic and mercury, those levels are not health threatening. The study was conducted to see if the Rocky Mountain Arsenal was a danger to the health of nearby residents. Arsenic and mercury are two of eight chemicals being analyzed by the researchers. Test results involving human exposure to the six other chemicals will be released after further analysis this fall.

Denver Post 5/8/92

ENVIRONMENT

Telluride/Ouray Mine Sites To Be Cleaned Up

The Idarado Mining Company and the state of Colorado have reached an agreement over the cleanup of inactive mine sites in Telluride and Ouray. Colorado first filed suit in 1983 over damages to natural resources by Idarado mining operations. The cleanup plan calls for a phased approach requiring that performance objectives be met for revegetation of mine waste and for water quality improvement, and focuses on reclamation of numerous tailings piles, mine waste rock, and portal discharges in the San Miguel River and Red Mountain Creek drainages. An earlier cleanup effort begun in 1987 was disruptive to the environment and the affected communities, and resulted in this latest effort at negotiation to find a less intrusive, alternate plan. This phased approach will allow cleanup efforts to be monitored, and altered if again found disruptive.

Montrose Daily Press 5/22/92

Enviro-Gro Spreads Sludge

Enviro-Gro Technologies Inc. began applying New York City sludge to wheat fields in southeastern Colorado without difficulty in April, despite opposition from residents of the town of Holly who threatened a protest. Concern was voiced over the safety of the sludge, including environmental pollution and human health, but advocates of the program say the sludge will be safer for the environment than more common anhydrous ammonia fertilizer. Samples of the sludge were taken to be tested for heavy metals and other substances by the Colorado Health Department and the EPA. After application, the sludge was plowed into the fields. The ground treated with sludge will be planted with wheat next September.

Pueblo Chieftain 4/19/92, 4/23/92

Two Colorado Rivers On List

Two Colorado rivers have been listed by a Washington D.C. river conservation group as "threatened" by water development projects. The Gunnison River faces the proposed A-B Lateral project which would remove water from the river above the Black Canyon for hydropower. The project would affect a portion of the river which includes a gold medal trout fishery and 26 miles proposed for wild and scenic river designation. The Animas River made the list because of the proposed Animas-La Plata water project backed by the Bureau of Reclamation to provide irrigation water for both farmers, local communities, and Ute Indians in southwestern Colorado. The South Platte River had been on the group's "endangered" list before a veto of the Two Forks Dam project by the EPA. The most endangered river system on the list is the Columbia/Snake in the northwest U.S., where hundreds of fish species are threatened by dams and development.

Pueblo Chieftain 4/10/92, Colorado Springs *Gazette Telegraph* 4/10/92

WILDERNESS

Water Plan For Piedra Thrown Out

The U.S. Forest Service has thrown out a streamflow plan for the Piedra River in the proposed Piedra Wilderness Area of southwestern Colorado. The plan was viewed skeptically by both environmentalists and state water interests. It calls for virtually all of the Piedra River's flow to remain instream during wet years, while during normal or dry years up to 15 percent of spring runoff would be available for diversion and development. State water interests dislike the idea of federal wilderness making a "water grab," and environmentalists feel that the state will not fairly manage flows for a wilderness stream. This state control issue is the central feature of the Piedra legislation, and is also the central issue of the wilderness bill sponsored by Rep. Ben Nighthorse Campbell, D-Colo. being debated in the U.S. House of Representatives.

U.S. Water News 4/1992

CONFERENCES

July 15 and 17 **WASTEWATER TREATMENT WORKSHOP - LAGOON MICROBIOLOGY AND IDENTIFICATION OF FILAMENTOUS ORGANISMS IN ACTIVATED SLUDGE,** Lakewood, CO. Contact: Colorado Environmental Training Center, Red Rocks Community College, 13300 West 6th Ave., Lakewood, CO 80401-5398; 303/980-9165.

Aug. 2-7 **5TH ANNUAL COLORADO WATER AND WASTEWATER TRAINING CONFERENCE,** Leadville, CO. Contact: Colorado Mountain College, Timberline Campus, Leadville, CO 80461, (719)486-2015.

Aug. 27-28 **COLORADO WATER CONGRESS 17TH ANNUAL MEMBERSHIP FORUM AND WATER WORKSHOP,** Colorado Springs. For more information contact the CWC office in Denver (303)837-0812.

Sept. 13-16 **THE ASSOCIATION OF STATE DAM SAFETY OFFICIALS (ASDSO) 1992 ANNUAL CONFERENCE,** Baltimore, MD. Contact: ASDSO, P.O. Box 55270, Lexington, KY 40555, (606)257-5146; FAX 258-1958.

Sept. 13-17 **THE NATIONAL RCWP SYMPOSIUM, 10 YEARS OF CONTROLLING AGRICULTURAL NONPOINT SOURCE POLLUTION; THE RCWP EXPERIENCE, Orlando, FL.** Contact: The National RCWP Symposium, c/o The Terrene Institute, 1000 Connecticut Ave., NW, Suite 802, Washington DC 20036. FAX 202/466-8554.

Oct. 6 **COLORADO WATER CONGRESS WORKSHOP ON WETLANDS,** Northglenn. For more information contact the CWC office in Denver. (303)837-0812.

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Colorado Water Resources Research Institute
410 University Services Center
Colorado State University
Fort Collins, CO 80523

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