

COLORADO WATER

12

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

WATER ITEMS AND ISSUES . . .

December 1991

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MEETINGS

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COLORADO WATER CONGRESS ANNUAL CONVENTION

January 23-24, 1992

COLORADO WATER ENGINEERING AND MANAGEMENT CONFERENCE

March 2-3, 1992

10TH HIGH ALTITUDE REVEGETATION WORKSHOP

March 4-5, 1992

1992 WESTERN REGIONAL INSTREAM FLOW CONFERENCE II

October 2-3, 1992



A BEND IN THE ROAD

by
Neil S. Grigg

This Fall I changed jobs at CSU, becoming Head of the Civil Engineering Department. This department is a world leader in water resources education, and I look forward to continuing to work with Colorado's water leadership and

with CWRRI in this role. We're fortunate that Robert Ward has been selected to head CWRRI. Robert has a lot of experience in water and a deep interest in education and research. Also, Jud Harper, CSU's Vice President for Research, is taking an active role in developing CWRRI and CSU's water programs. Shirley Miller will continue as the key staff person at CWRRI. I feel that our team is stronger than ever; and this is especially important for Colorado's economic development and environmental protection for the future.

So, this is not goodbye; it's just a bend in the road. I look forward to working with you in the future on Colorado water issues and research.

COMMENTS BY THE DIRECTOR -- AN INTRODUCTION

by Robert C. Ward

As the new Director of the Colorado Water Resources Research Institute (CWRRI), I feel it is important that I introduce myself to the Colorado water community. Such an introduction will provide insight into how I hope to navigate CWRRI in the future.

First, I want to acknowledge the contribution of Neil Grigg to CWRRI over the past three years. Neil has been untiring in his efforts to connect the water research and education needs of Colorado to the expertise of the research universities in the state. I greatly admire what he has been able to accomplish in the relatively short time he led CWRRI. I plan to continue in the directions Neil has charted for CWRRI. We all are very fortunate that Neil is going to continue to play an active role in the Colorado water scene.

My connection with water resources and Water Resources Research Institutes began during my graduate studies at North Carolina State University in the late '60s. While pursuing my Ph.D in Agricultural Engineering, I participated in a water resources "minor" program operated by the North Carolina Water Resources Research Institute under the direction of David Howells. This program, among its many features, permitted me to take graduate courses at the University of North Carolina at Chapel Hill in areas in which they specialized, even though I was a student at North Carolina State University. This program taught me the value of cooperative building on strengths as well as much about water resources.

Upon completing my Ph.D, I had job offers from several universities. As students often do, I asked for advice from David Howells regarding which offer, professionally, I should accept. He said that if I wanted to work in water resources, I



had no choice! Colorado State University was a premiere institution in the broad field of water resources.

After 21 very rewarding years on the faculty of Colorado State University, working mainly in the field of water quality management, I know the advice I received from David Howells was excellent. I have benefitted greatly from working with colleagues who are world renowned in their fields. I have been challenged by the high-quality students who are attracted to our graduate programs. I have enjoyed interacting with professionals working in Colorado's water "industry."

As Director of CWRRI I hope to repay the Colorado water community for many of the benefits I have received over the years. In particular, I welcome the opportunity to increase my interaction with the water professionals in Colorado and help them bring their research and education needs to the higher education community in the state. Also, I look forward to assisting faculty in their efforts to connect with the water research and education needs facing Colorado.

Water management in Colorado is an evolutionary process. CWRRI can play a vital role in the research necessary to facilitate this process. As Neil has articulated a number of times over the past three years, CWRRI programs are designed to:

- * Identify and prioritize water problems for research;
- * Plan and manage water research projects;
- * Transfer new information and technology to users; and

- * Provide liaison between state and federal research funding agencies and act as an advocate for Colorado water research needs.

These tasks imply that Colorado's water users and the state's institutions of higher education are working closely to address water research and education needs. The Director of CWRRI cannot perform these tasks alone. It takes the cooperation of both water users and faculty. I will work to have both groups

see water resources research and education as a win-win proposition. While I have a number of propositions I want to explore, I welcome suggestions as to how we can create additional win-win situations.

I look forward to meeting and working with many of you as I move into the role of Director of CWRRI. Please feel free to contact me about any aspect of CWRRI - I welcome input.

RESEARCH OPPORTUNITIES

CWRRI WATER RESEARCH PROGRAM REQUEST FOR PREPROPOSALS CLOSING DATE: January 31, 1992

Preproposals are invited for the Colorado Water Resources Research Institute FY1992-93 water research program. CWRRI is especially interested in projects that feature collaboration between university researchers and water management organizations. Demonstrating collaboration in the preproposal stage will enhance the possibility of an award. Highest priority will be given to projects that address Colorado's most critical water problems: water use efficiency, Colorado water law, policies and institutions; water quality; management; enhancing fish and wildlife and recreational opportunities; and improving water supplies for economic development.

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

- Conjunctive management of surface and groundwater
- Economic value of nonconsumptive water uses
- Economics of alternative strategies for fishery enhancement
- Fate of metals in Colorado streams
- Technology for new uses of the satellite stream monitoring system
- Improvement in drought forecasts
- Improvement in runoff forecasts: flood, late season
- Preservation of wetlands; economic costs and benefits
- Biological effects of metals on aquatic organisms
- Streamflow criteria for flow-based discharge permits
- Reclamation of polluted groundwater
- Evaluation of impacts of water exports on basin-of-origin
- Regulation of groundwater recharge
- Urban runoff management
- Water reuse management
- Water-based recreation: economic costs and benefits

Project Duration--Awards will be made for one year beginning September 1, 1992.

Funds Available--For 1991-92 CWRRI awarded 10 projects with direct costs in the range of \$10,000-20,000. Awards for 1992-93 will depend on CWRRI's receiving an appropriation

from the Colorado Legislature.

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

Eligibility--Open to regular, full-time faculty of Colorado State University, the University of Colorado and the Colorado School of Mines. For additional information call the CWRRI office at 491-6308.

USGS ANNOUNCES APPROPRIATION FOR 1992-93 PROGRAMS

On November 13, 1991, the President signed the bill providing Fiscal Year 1992 appropriations for the Department of the Interior and Related Agencies. The House and Senate conference committee agreed to an amendment providing for a 1.411 percent reduction in all accounts, programs and projects covered by the Act. In addition, the competitive matching grants program (Section 105) was reduced. John E. Schefter, Chief, Office of External Research, Geological Survey, announced the following appropriations for its water research program.

Section 104, State Water Institute Program--The FY1992 appropriation for the State Water Resources Research Institute Program is \$5,576,000, or \$101,381 per Institute.

Section 105, Competitive Grant Program--The appropriation for the U.S. Geological Survey's Water Resources Research Competitive Grant Program was reduced to \$1.8 million in FY1992 from the \$4.4 million appropriated in recent years. As a consequence, this highly competitive program, which has in the past funded less than 15 percent of the proposals received, is likely to be even more competitive in FY1992. Applicants for these grants should be aware, however, that the proposals submitted this year also may be considered for funding early

in FY1993 if the program receives an appropriation in that year.

CSRS INVITES APPLICATIONS FOR WATER QUALITY PROGRAM GRANTS

The Cooperative State Research Service (CSRS) of the U.S. Department of Agriculture invites applications for the competitive grant awards under the Water Quality Program for FY1992. To be considered for funding, proposals must be postmarked by January 21, 1992. A total of approximately \$6 million will be available for this program. Maximum total

funding will be \$135,000 for a single institution/organization proposal, and \$225,000 for a multi-institution/organization proposal, for a maximum funding period of up to three years. The research emphasis in FY1992 is on water quality with particular attention to groundwater. Surface water quality problems are eligible, where they are shown in the proposal to be potential sources of groundwater contamination.

For further information contact the Office of Sponsored Programs at Colorado State University. Faculty at other universities should contact their contracts and grants office.

EDITOR'S IN-BASKET

D. EARL JONES, JR. - WATER STATESMAN PASSES AWAY

D. Earl Jones, Jr., a Boulder resident, passed away on July 24, 1991. Friends of his son, Jonathan E. Jones, and Wright Water Engineers, are familiar with Earl's achievements, but readers of *COLORADO WATER* may not be aware of his many achievements in water resources.

Earl had a long and successful career culminating with his assignment as Chief Engineer for the U.S. Department of Housing and Urban Development in Washington, DC. This followed a career that began in Texas and included assignments with the Texas Highway Department, consulting firms and assignments as a city engineer.

Earl's major contributions were in the area of urban hydrology. He published an article "Urban Hydrology - A Redirection" in civil engineering magazine in 1967 and pioneered the ideas of preserving and enhancing natural drainage systems that set the stage for city beautification and storm water management improvements for the next twenty years.

Earl was one of the founders of the ASCE Urban Water Resources Research Council. His influence on this highly successful volunteer organization was enormous. The Council's program, directed by Murray McPherson, published over 100 influential technical memoranda on the subject of Urban Water Resources. Earl was an expert on natural hazards. He was a co-founder of ASCE's Expansive Soils Research Council and was one of the originators of the National Flood Insurance Program, located within HUD.

As a personal testimony, I would like to say that Earl was one of the most dedicated and inspirational engineer that I have known and his influence on our profession has been profound. We'll miss him.

Neil S. Grigg, Head
Department of Civil Engineering
Colorado State University

CHESLEY J. POSEY, FORMER RMHL DIRECTOR, DIES IN IOWA

Chesley J. Posey died Friday, August 30, 1991, in Cedar Rapids, Iowa. Posey was a founding trustee of the Rocky Mountain Hydraulic Laboratory in Allenspark, Colorado and was director of the laboratory from 1946 to 1984. Posey was a Professor of Engineering at both the University of Iowa and the University of Connecticut. He published many scientific papers and was co-author of a text on flow in open channels which was widely used, particularly in Japan. In 1958 he was awarded the James Laurie prize by the American Association of Civil Engineers for a paper on flood erosion protection.

ASSISTANT STATE ENGINEER RETIRES

Robert ("Bob") Longenbaugh retired this year after 11 years as Assistant State Engineer in the Colorado Division of Water Resources. Bob supervised the administration of Colorado's groundwater resources and also had litigation and enforcement responsibilities for the agency.

Bob's 30-year career in water resources had its beginnings on his father's farm northwest of Cortez, Colorado. As a teenager, responsibility for the farm's irrigation gave him an early appreciation of how important water is in the semiarid West.

In 1957 Bob enrolled at Colorado State University where he received a B.S. in Agricultural Engineering. After a tour of duty with the U.S. Air Force, where he served as a meteorologist, he resumed his engineering career at CSU that spanned a period of 19 years. From 1967 to 1970 he was at the University of California, Davis, on sabbatical leave, where he studied for a Ph.D and conducted research on the optimum conjunctive use of ground and surface water.

Bob's research on artificial recharge included studies in Prospect Valley, the Cope recharge study in the High Plains, the South Platte Canal study near Merino, and San Luis Valley studies. He conducted groundwater investigations in the

Kiowa-Bijou, South Platte, Arkansas and Rio Grande Drainages.

Bob is a registered professional engineer in Colorado and a member of numerous professional societies including the American Society of Civil Engineers, the American Geophysical Union, the American Water Resources Association, Sigma Xi, the International Commission for Irrigation, Drainage and Flood Control, and the Colorado Water Well Contractors Association.

OFFICE OF WATER CONSERVATION ANNOUNCES GRANT PROGRAM

The state's Office of Water Conservation has established a grant program to encourage Colorado communities and other water-providing entities to develop innovative water conservation projects. Grants of up to \$50,000 will be awarded based on guidelines adopted last week by the Colorado Water Conservation Board (CWCB). Grant program information and applications are being sent to more than 300 cities and other water providers. Any public agency in Colorado may apply for a grant. The application deadline is February 1, 1992 for the current funding cycle.

Information about the grant program and other Office of Water Conservation services are available from the Office of Water Conservation, 1313 Sherman Street, Room 721, Denver, CO 80203, or by calling (303)866-3441.

EPA NAMES BROOMFIELD WASTEWATER TREATMENT PLANT BEST IN NATION

Congratulations to the City of Broomfield - its wastewater treatment plant has received the U.S. Environmental Protection Agency (EPA) National Award for Outstanding Operations and Maintenance. In a letter to Plant Superintendent H. Thomas Huston, EPA Chief William K. Reilly said, "Your selection is the result of extensive national competition and reflects commitment by your community and your wastewater treatment plant personnel to exceptional facility management and compliance. The selection panel evaluated compliance history, sludge management, financial management and other key factors in reaching its decision."

The award was presented to Plant Manager Thomas Huston and to City Public Works Director Marvin Thurber on October 7, 1991, at the 64th Annual Water Pollution Control Federation Conference. The design engineer on the project was Henry Benjies, of HDR Engineering Inc. of Denver. The contractor was Summit Constructors, Inc., also of Denver. Plant Superintendent Huston said the EPA award is one of many that has been given to the environmentally conscious, trend-setting facility. "We don't think of it as a sewage treatment facility," said Huston, "we are a bug farm. We raise bugs." At the facility the bugs - or microorganisms - devour a daily diet of sludge and help turn out two by-products: clean water and

natural fertilizer that is distributed to farmers in the area. There is a waiting list, says Huston, for the fertilizer.

At nighttime, a computer named Otto is in charge of the facility, but during the daytime, the staff run the operations out of passive solar facilities. Heat is also provided for the buildings from hot water distributed by the boilers. The boilers, in turn, are fired by excess methane gas produced in the sludge digestion process. When the hot water from the buildings returns back to the digester complex to be reheated, it is diverted through heat exchangers for sludge heating.

Such careful energy efficiency planning is found factored into most equipment in the treatment plant as well. For instance, energy-efficient enclosed screw pumps were installed to lift the water 23 feet. And all primary sludge pumps located in the basement of the headworks building were installed at an elevation below that of the primary clarifier so that positive head pressure - to reduce friction loss - is against the pumping process at all times.

A biotower was added to remove organic shock loads from industrial dischargers into the wastewater treatment facility, and a new, more efficient fine bubble diffusion system for aeration and mixing was added to the process. The system effectively serves four aeration basins with a 150 horsepower motor. In comparison, the old system relied on two 40 hp. mechanical mixers plus a 100 hp. and served only two basins. For solids handling, a volatile solids reduction of more than 55 percent was achieved in each of the digesters. This effectively increased the total sludge digestion capacity of the plant from 7,000 gallons/day to over 15,400 gallons/day.

The result for the City of Broomfield is not only a state-of-the-art Wastewater Facility, but one that saves the city both energy and money. There has been a decrease of over 23 percent in power consumption to run it, the lowest annual figure, says its report to the EPA, since 1980, and an average reduction in the power bill of 21 percent.

DAVID J. LYSTROM SELECTED USGS COLORADO DISTRICT CHIEF

David J. Lystrom has been selected as the Colorado District Chief for the U.S. Geological Survey (USGS), Water Resources Division, U.S. Department of the Interior. As Colorado District Chief, Dave Lystrom will direct USGS Water Resources Division activities in Colorado, including offices in Lakewood, Pueblo, Grand Junction, Meeker, and Durango that have a combined staff of 160 employees. He replaces C.A. (Jerry) Pascale who has been appointed Assistant Regional Hydrologist, Central Region, and who is responsible for Water Resources Division programs in Colorado, Montana, and Wyoming. Pascale's duty station will remain in Lakewood.

"Dave's strong technical and program-management experience, coupled with his in-depth knowledge of Colorado water-

resources issues, are among the reasons Dave was selected as Colorado District Chief," Jerry Pascale said. "Dave has demonstrated superb technical skills during his 27-year career with the Survey's water-resources program in Colorado during the past 10 years."

Dave Lystrom started his career with the USGS in the Oregon Branch of Surface Water. His educational background includes a BS degree in Civil Engineering at North Dakota State University. During his tenure in Portland, Oregon, he worked in data and in interpretive projects and became registered as a Professional Engineer. He transferred to the Colorado District in 1981. His interpretive-studies experience includes streamflow water-quality statistics, surface-water hydrology, and urban-rainfall-runoff modeling. His supervisory and management experience includes positions as Chief of the Portland, Oregon, Subdistrict; Program Coordinator of the Survey's Urban Hydrology Program; and, more recently, as Associate District Chief and Chief of the Hydrologic Studies Section in the Colorado District.

SUSTAINABLE AGRICULTURE PROJECT EXAMINES WELD COUNTY PRACTICES

by Jim Loftis

Agricultural producers in the United States have come under increasing public scrutiny regarding use of agricultural chemicals. The producers themselves are asking questions about past practices and the environmental impacts of those practices. The concept of bringing agricultural production in harmony with the environment, primarily by reducing inputs of fossil fuels, irrigation and tilling, is often referred to as "sustainable agriculture." Reducing inputs, however, is only part of the sustainable agriculture equation. For a farm or ranch operation to be truly sustainable, it must use economically viable systems that are compatible with the environment and public health while ensuring adequate food and fiber for present and future generations.

The Sustainable Agriculture Project in Weld County is examining environmental effects and economic ramifications of various agricultural practices and identifying those that appear sustainable. This pollution prevention-oriented study emphasizes on-farm applied research and demonstration of sustainable agricultural practices. The project, which has received first-year funding of \$220,000 from the EPA and

AGENCIES UNITE FOR WATERSHED PROJECT AT BADGER CREEK

Trout Unlimited has joined with 17 federal, state and local agencies in a watershed project to control runoff on both public and private lands draining into Badger Creek. The creek is a perennial, Rocky Mountain/southern Colorado stream in the Arkansas River drainage. It begins in the southwest corner of Park County and travels south through Fremont County until it enters the Arkansas River, approximately seven miles east of Salida. Studies indicate that Badger Creek is a prime spawning ground for brown trout

BuRec, is being coordinated by the Central Colorado Water Conservancy District. Among the agencies involved in the study, which began in April 1991, are: Agricultural Soil Conservation Service, Soil Conservation Service, Colorado State University, the University of Northern Colorado, and the Colorado Departments of Agriculture and Health. Project participants anticipate that a more sustained approach to agricultural practices will result in the following:

- improved profitability
- reduced off-farm purchased inputs such as pesticides, fertilizers and fossil fuels
- reduced ecological and public health risks
- improved water quality, irrigation and conservation management
- protected wetlands and wildlife habitat
- reduced soil losses
- reduced need for pesticide regulation

For more information on the Sustainable Agriculture Project in Weld County, contact Fred EchoHawk, Project Director, Central Colorado Water Conservancy District, Greeley, CO, (303)330-4540.

DAVID W. MOODY ELECTED 1992 AWRA PRESIDENT

David W. Moody has been elected President of the American Water Resources Association for 1992. Moody is Assistant Chief Hydrologist for Water Assessment and Data Coordination, U.S. Geological Survey, Reston, Virginia. His work includes the development of policy and programs related to the coordination of water-data acquisition activities by the federal government and the preparation of the National Water Summary series of reports. The following persons were also elected to take office beginning January 1, 1992: President-Elect--Charles D. Mosher, U.S. General Accounting Office, Seattle, Washington; Vice President--Nancy C. Lopez, Chief of the Office of Water Data Coordination, USGS, Reston, Virginia; Secretary--Stephan J. Nix, Associate Professor, Department of Civil and Environmental Engineering, Syracuse University, Syracuse, New York; and Treasurer--Kenneth J. Lanfear, Assistant Branch Chief, National Water Summary Branch, USGS, Reston, Virginia. Donald F. Potts, Professor of Watershed Management at the University of Montana, was elected Mountain District Director.

from the Arkansas River with the capability of producing up to 300 pounds of fish per acre.

The limiting factor in maintaining this fishery is the periodic flushing of the streambed by snowmelt and rainfall runoff. The watershed consists of 135,000 acres of pinyon-juniper, Douglas fir, and high mountain parks. The land is primarily used as a summer livestock grazing area. Ownership and management is almost evenly divided between four groups:

Private.....31,320 acres
 State of Colorado.....33,760 acres
 U.S. Forest Service (FS/USDA).....29,200 acres
 Bureau of Land Management (BLM/USDOJ)..40,760 acres

These groups have not been noted for cooperating in the past, but in Badger Creek where they share a watershed and the need for enlightened and environmentally sound grazing-land management, they are working together. In order to treat a watershed of this size and adequately address the needs of individual users, land owners and governmental agencies, the four groups of owners and managers have signed off on a formal memorandum of understanding. This unique agreement was developed in the last years of the 1980s under the leadership of the Sangre de Cristo Resource Conservation and Development Area (RC&D) and BLM.

The memorandum, among other things, calls for the development of a four-year program that prioritizes zones within the total watershed area (regardless of ownership/management) and identifies site-specific data for costing out implementation projects. The project looks at the watershed environment holistically. Its purpose is to protect and improve the fisheries, wildlife habitat, range resources, recreation, and water quality of the Badger Creek watershed. Treatment will also reduce sediment discharge into the Pueblo Reservoir and downstream water treatment plants and thereby improve the quality of Arkansas River water.

The agreement sets up a six-person coordinating team with the Sangre de Cristo RC&D as project leader. Other members are: BLM Royal Gorge Area Manager; USFS Salida District Ranger; State Land Board; State Division of Wildlife (DOW) Salida Area Wildlife Supervisor, and the Canon City Soil Conservation Service (SCS) District Conservationist. Participating federal land management agencies have used their funds to undertake treatment projects on their own land while EPA Region VIII, through the state of Colorado, has provided 319 (nonpoint source management) funds. In the Memorandum of understanding, BLM agreed to continue its watershed precipitation monitoring.

The Badger Creek project is finishing its second year of a four year-planned program. As of September 1991, the project has undertaken three workshops for project participants and three team building meetings, both led by the Sangre de Cristo RC&D. In addition, EPA Region VIII led a Holistic Resource Management Workshop for private ranchers, Trout Unlimited, Nature Conservancy, FS, SCS, BLM and DOW personnel. The workshop was developed using EPA education funds.

Extensive treatment projects have been undertaken on the ground by the cooperating agencies. On a non-cost shared basis, 43,478 acres of planned grazing systems have been installed. The systems rely on the amount of time cattle are in a pasture rather than the numbers of cattle in a pasture. In addition, two acres of willow were planted on private land.

BLM has been testing intensive grazing in riparian areas to demonstrate that time-controlled grazing can assist in streambank stabilization. Additionally, BLM has constructed erosion control dams, erected precipitation monitoring stations, and, with USGS, has installed automated measuring devices.

SCS has concentrated on riparian planting, with black willows, buffalo berry and cottonwood planted in BLM riparian areas to determine survivability of wood species in the upper watershed along Badger Creek.

The Forest Service has built erosion control dams and installed 200 cubic yards of rock riprap on its lands.

EPA's 319 funding has been essential in the building of 19.5 miles of cross fencing, 3 miles of pipeline for water distribution, seven water supply tanks -- 30 foot diameter, three erosion control dams on private land, two spring development projects, and two solar systems.

The Water Quality Control Division of the Colorado Health Department (with the cooperation of the State Forest Service and the State DOW) has been concerned with the monitoring of fish habitat, including streambank analysis, fish counts, and existing food sources for fish population.

The Memorandum of Understanding has a five-year term, renewable at the option of the signatories. Signatories to the agreement are:

State of Colorado--Department of Natural Resources, Division of Wildlife, State Land Board, State Forest Service, State Soil Conservation Board, State Conservationist, SCS

U.S. Department of Agriculture--Forest Service, Pike-San Isabel National Forest, Soil Conservation Service
 Agricultural Stabilization and Conservation Service

U.S. Department of the Interior--Bureau of Reclamation

Soil Conservation Districts--Sangre de Cristo Resource Conservation and Development Area, Upper Arkansas Soil Conservation District, Fremont Soil Conservation District, Teller-Park Soil Conservation District

Local and Areawide Governments--Upper Arkansas Area Council of Governments, Fremont County, Board of County Commissioners, Park County, Board of County Commissioners, Southeastern Colorado Water Conservancy District

Public Interest Groups--Colorado Trout Unlimited

In summing up his views on the history and outlook of the project, John Valentine, Coordinator, Sangre de Cristo RC&D, observed:

It was felt that the most effective approach to watershed

rehabilitation and stabilization, and to management of grazing and other impacts, would be to expend efforts in the upper reaches of the watershed where land treatment practices would have the most immediate impacts. This conclusion was reached after having completed an action plan in 1982 that assigned work to the various agencies to collect data on the watershed. Soils, range conditions, forestry, wildlife, fisheries, and hydrologic data were gathered, compiled and analyzed. The federal land agencies, the Forest Service and the Bureau of Land Management, are accelerating their conservation treatment programs. Private and state lands that can be quickly impacted by working in the upper range of the watershed are being assisted with 319 nonpoint source funds as well as Colorado State Land Board funds. We are all working together to achieve common, and agreed to, environmental goals for the watershed.

For more information contact: John Valentine, Coordinator, Sangre de Cristo RC&D, 821 Desert Flower Blvd., Pueblo, CO 81001. Phone: (719)543-8385.

EPA News-Notes, Oct-Nov, 1991

USDA AND EPA COOPERATE IN PRIVATE WELL PROTECTION PROJECT

The U.S. Department of Agriculture and the Environmental Protection Agency will soon announce an inter-agency agreement to support a private rural well protection project called Farm-A-Syst. The agreement will support an expansion of the Farmstead Assessment System, piloted initially in Minnesota and Wisconsin, for use nationally. The system, designed by the Wisconsin and Minnesota Cooperative Extension Services and EPA Region 5, provides a series of 12 fact and work sheets to help farm owners assess how effectively their farmstead practices protect drinking water supplies. Farmers are given information on identifying, prioritizing, and reducing risks to their private wells.

For more information contact: John Reeder, Office of Groundwater and Drinking Water (WH-550). U.S. EPA, 401 M Street, SW, Washington, DC 20460. Phone (202) 260-5512.

EPA News-Notes, Oct-Nov 1991

COLORADO WATER SUPPLY CONDITIONS UPDATE

From the Office of the State Engineer

Surface water supplies declined throughout the state during October. Except for the South Platte River basin which showed above normal supplies, the entire state showed below normal supplies. Generally, however, supplies have been adequate to meet demands. Statewide precipitation for the month of October was 83% of average ranging from a low of 58% of average in the San Juan/Dolores/Animas basin to a high of 117% of average in the Colorado River basin. The statewide reservoir storage was 110% of average on November 1. The San Juan/Dolores/Animas basin has the highest storage rate at 125% of average while the Rio Grande basin has the lowest storage rate at 88% of average.

The National Weather Service 30-day forecast (October 15 through November 15) statewide is for above normal

precipitation and below normal temperatures. The 90-day forecast (starting October 1) is also for above normal precipitation and below normal temperatures statewide.

The Surface Water Supply Index (SWSI) developed by this office is used as an indicator of water supply conditions in the state. It is based on stream flow, reservoir storage and precipitation for the summer period (May 1st through October 31). Weight factors are applied to each of the measured hydrologic factors in computing the SWSI values for each basin. During the summer period, streamflow is the primary component in each basin except the South Platte where reservoir storage is the primary component. The following SWSI values were computed for each of the seven basins on November 1, 1991 and 1990:

Basin	November 1, 1991 SWSI Value	Change From Previous Month	November 1, 1990 SWSI Value
South Platte	+1.9	-0.2	+1.8
Arkansas	-0.4	-0.1	+2.6
Rio Grande	-1.0	-3.6	+2.8
Gunnison	-1.4	-0.1	-1.3
Colorado	-0.7	-2.0	-0.6
Yampa/White	-2.2	-1.5	-1.8
San Juan/Dolores	-1.5	-4.7	+2.7

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

UNIVERSITY WATER NEWS

KIRVIN KNOX APPOINTED TO HEAD CSU'S AGRICULTURE AND OUTREACH PROGRAMS

Kirvin Knox has been named Colorado State's Associate Academic Vice President for Agriculture and Outreach Programs and Dean of the College of Agriculture. President Albert Yates announced the appointment in November. Knox, who will assume his new duties in February, will be the principal spokesman for the broadly defined area of agriculture. This includes intercollege, Cooperative Extension and Agricultural Experiment Station programs, and programs specific to the College of Agricultural Sciences. Both urban and rural programs are included.

Knox was a professor in the Department of Animal Sciences and Director of the Metabolic Research Laboratory at Colorado State from 1964-72. He also served as visiting scientist with the World Health Organization in Geneva, Switzerland; an NIH Pre-doctoral Fellow; and member of the Davis Tracer Team for Metabolic Research.

Knox now is Professor of Nutritional Sciences and Dean and Director of the College of Agriculture and Natural Resources at the University of Connecticut. He also serves as director of the Storrs Agricultural Experiment Station and Director of the Cooperative Extension System there. He received a bachelor's degree in agriculture from California State University-Fresno, a master's in nutrition from Colorado State and a doctorate in nutrition from the University of California-Davis.

Source: CSU Comment 11/21/91

JAMES HEANEY NAMED DEPARTMENT CHAIR AT CU

James Patrick Heaney, former Director of the Florida Water Resources Research Center, was recently named Chairman of the Department of Civil, Environmental and Architectural Engineering at the University of Colorado, Boulder. Heaney, born in Chicago, Illinois, received his BSCE from the Illinois Institute of Technology (structural engineering) and his MSCE and Ph.D from Northwestern University (environmental engineering and water resources engineering and operations research).

After receiving his degree, Heaney worked for the Metropolitan Sanitary District of Chicago, the U.S. Public Health Service on the Colorado River Basin Project, as a consultant for the American Public Works Association, and as a senior research engineer for Battelle-Northwest, Richland, Washington. In 1968 he moved to Florida, accepting a joint appointment at the University of Florida, Gainesville in Industrial and Systems Engineering and Civil Engineering. Heaney became director of the Florida Water Resources

Research Center in 1979. He is a registered Professional Engineer in Florida, and is a member of numerous professional societies. He has been associate editor of the Water Resources Bulletin since 1990. He served on the Water Resources Committee for the National Association of Universities and Land Grant Colleges for two years (1984-86), was President of the Executive Board, Universities Council on Water Resources (1983-84), and is currently a member of the Water Science and Technology Board, Panel on Sources, Wastewater Management in Coastal Areas.

Heaney's consulting activities since 1980 have included the Environmental Protection Agency, the Office of Technology Assessment, the National Science Foundation, the Pecos River Commission, the National Oceanic and Atmospheric Administration, and the South Florida Water Management District. In 1988 he participated in the development of a water plan for the State of Sao Paulo, Brazil and in 1989 was consultant to the University of Tunis on urban water resources.

SUMMARY OF WATER QUALITY DATA MANAGEMENT SURVEY NOW AVAILABLE

The *Summary of 1991 Water Quality Data Management Survey* is currently available to interested agencies or individuals through the Colorado Water Resources Research Institute. The report contains a brief summary of survey responses from 200 agencies that collect, use, or manage water quality data. The two-page questionnaire solicited responses on data management systems, water quality activities, types of data used, sources of data, and interagency activities. The report presents numerical results of the survey, with minimal interpretation of results. Interpretation and elaboration of the results will be included in the master's thesis of the survey preparer, Laurel Saito, a graduate student at Colorado State University. This thesis should be completed in the spring of 1992, and also will be available on request.

CSU STUDENT AWARDED USCOLD FELLOWSHIP

Debby Miller has received a \$10,000 graduate research fellowship from the United States Committee on Large Dams (USCOLD). Debby, an instructor in the Civil Engineering Department, is working on her Ph.D. With her fellowship funds Debby will continue her basic studies related to the mechanics of unsaturated soils and their effect on dam performance. Debby's advisor is John Nelson, Professor of Civil Engineering.

Larry Stephens, representing USCOLD, presented Debby with a scholarship check at an October 22 award ceremony in CSU's University Club. The U.S. Committee on Large Dams is a nationwide professional organization dedicated to advancing the technology of dam design, construction,

operation and maintenance, and to promoting awareness of the role of dams in the beneficial development of the nation's water resources. It is the United States member of the International Commission on Large Dams (ICOLD), an international organization composed of nearly 80 countries.

COOPERATIVE EXTENSION'S WATER QUALITY INITIATIVE

Cooperative Extension is a partnership of Colorado State University, Colorado Counties, and the United States Department of Agriculture. As an integral part of CSU, it is the university's major off-campus educational arm with a mission:

"To provide information and education, and encourage the application of research-based knowledge in response to local, state, and national issues affecting individuals, youth, families, agricultural enterprises, and communities of Colorado."

Water quality has been identified as a high priority initiative for Cooperative Extension. Significant accomplishments of Extension's water quality initiative were recently reported as follows:

- Patterson Hollow Hydrologic Unit Area and the San Luis Valley Demonstration Project identify and adopt best management practices that alleviate ground water contamination.
- Youth from ten counties along the Platte River develop basic water testing skills while investigating the environmental impact of man and nature on the watershed.
- Demonstration project studies irrigation water management in corn, alfalfa, and grains to reduce leaching of agricultural chemicals into groundwater.
- An integrated crop management project in Mesa County monitors nitrate.
- Leaching and crop yields applied through surge irrigation techniques--increased crop yields resulted even when chemical application was reduced by 50%
- Logan County water testing; 150 samples for lead, coliform bacteria, and nitrates; heightened awareness of the issues surrounding water quality.

WYOMING INSTITUTE FUNDS 20 RESEARCH PROJECTS FOR FY1992

Twenty research projects were approved for fiscal 1992 support made available through the Wyoming Water Research Center (WWRC) at the University of Wyoming. The projects, selected from among 31 proposals, include 11 new one-year

projects, six projects continuing from FY1991 supported by state grant-in-aid funding and three projects funded by a matching block grant from the U.S. Geological Survey (USGS). State grant-in-aid funding is awarded for research on water resource issues of particular interest to Wyoming. New projects include:

Research on improved irrigating structure design, pesticide monitoring for groundwater protection, a study of the hydrology and geochemistry of the New Fork Tongue of the Wasatch Formation, an assessment of the "whole effluent" toxicity testing method, alternatives for severe drought water management in the upper Green River Basin, a study of flushing flow requirements of large rivers to maintain fishery and channel values, an investigation of surface and groundwater dynamics critical to maintenance of subalpine riparian wetlands, an evaluation of possible small water storage projects to enhance late-season irrigation flows, an assessment of the impact of reduced surface stream flows on groundwater recharge and spring discharge in the Little Snake drainage basin, and education and technology transfer for water use efficiency and conservation.

Wyoming Hydrogram, Sept. 1991

FACULTY

David Hendricks, Civil Engineering Department, CSU, participated in a study tour of Iraq to assess war damage to water and wastewater treatment systems. The study team visit was under the auspices of the "Commission on Civilian Casualties" Harvard Human Rights Program. Hendricks kept a diary while on the tour and excerpts will be published in the next issue of *COLORADO WATER*, International Newsletter section.

George Radosevich, Department of Agricultural and Resource Economics, participated in the October 18 Colloquium on the Law of International Watercourses organized by the University of Colorado, School of Law, American Bar Association International Environmental Law Committee, and American Society of International Law. This conference reviewed the recently released draft of the U.N. International Law Commission's report on Non-Navigable Uses of International Watercourses. He served as commentator to Article 26-18 and 30-32 regarding implementation: Joint Institutional Management and Remedies in Domestic Tribunals. His commentary will be published in the forthcoming *Natural Resources Law Journal*, CU.

Raymond Herrmann, Water Resources, Cooperative Park Studies Unit, CSU, has received the American Water Resources Association Fellow Award. The presentation was made at the Association's 27th Annual Conference and Symposium awards luncheon. The conference was held September 8-13, 1991 at New Orleans, Louisiana.

WATER RESEARCH**A W A R D S**

- Landscape Elements Controlling Acid Mine Drainage in Upper Arkansas River, John Stednick, Earth Resources, CSU
- Inter-Site Climate Database for Agricultural and Ecological Research, Thomas B. Kirchner, Natural Resources Ecology Lab, CSU
- Geologic Controls on Groundwater Hydrology at the Rocky Flats Plant, Eric A. Erslev, Earth Resources, CSU
- Methodologies for Design of Soil Covers of Waste Disposal Sites, Steven B. Abt, Civil Engineering, CSU
- Particle Size of Bed Sediments Along the Atchafalaya River, 1991, Carl F. Nordin, Civil Engineering, CSU
- Fluid Management Requirements in a Plant Growth Chamber, Willy Z. Sadeh, Civil Engineering, CSU
- Development of a Rainfall-Driven Water Delivery Formula for the Taylor Slough Basin, Duane C. Boes, CSU
- Fish Habitat Structural Diversity Indices and Reconstruction of Lake Basins at RMA, Eric P. Bergersen, Fishery & Wildlife Biol., CSU
- Lower Gunnison Basin Surge Irrigation Research, USBR, Dennis W. Lamm, Cooperative Extension, CSU
- Development of an Optimal Predictive Supervisory Control Scheme for a Canal System with Multiple Local Automatic Controllers, David Clough, Civil, Environmental and Architectural Engineering, CU
- A National Survey of Bromide Ion Concentrations in Drinking Water Sources and Related Studies, Gary Amy, Civil Engineering, CU
- Arctic System Science Ocean/Atmosphere/Ice Interactions: A Data Management Pilot Study, Claire Hanson, Cooperative Institute for Research in Environmental Sciences (CIRES)
- The Nature of Eolian Activity During the Holocene on the Northern High Plains, USA: A Geomorphic Analog for Landscape Response to Future Atmospheric Warming, Alexander Goetz, CIRES, CU
- Scaling Theories of Hydrology, Hydraulics and Geometry of River Networks, V. K. Gupta, CIRES, CU
- Mapping Atmospheric Water Vapor and its Motions with SSM/I Data and the Consequences for Moisture Flux from the Ocean to the Atmosphere, William Emery, Aero-Colorado Center for Astrodynamic Research, (ACAR), CU
- Study of Ozone Response to Solar UV Variation Over 27 Days Using a 2D Chemical-Radiative-Dynamical Model, Julius London, Astrophysical, Planetary and Atmospheric Sciences, (ACAR), CU
- Monitoring Atmospheric Moisture and Global Wind Patterns with SSM/I Data: A Component of the WETNET Science Program, Susan Avery, ACAR, CU
- An Integrated Ozone-Bioreactor System vs. Membrane Separation of DBP Precursors, Joann Silverstein, Civil Engineering, CU
- Innovative Approaches for Valuing Perceived Environmental Quality, William Schulze, Institute of Cognitive Science
- Han River Control System, Phase II. Addition of Dam Break, Hydrologic Forecasting, and Estuary Crossing Modules to the Han River Control System, Pedro Restrepo, Civil, Engineering, CU
- Nearly Coincident Water Vapor Corrections for Geosat Altimetry Derived from SSM/I, William Emery, ACAR, CU
- A Retrospective Analysis of Geosat Altimeter Data in the Bering Sea, Robert Leben, ACAR, CU
- Methane Emission Rate Measurements for the Floodplain Orinoco River, Venezuela, William Lewis, Environmental, Population and Organismic Biology, CU

WATER PUBLICATIONS, VIDEOS**Regulations Handbook for
Very Small Communities**

The EPA's Region VIII Small Community Work Group has completed an 82 page handbook titled Everything You Wanted To Know About Environmental Regulations ... But Were Afraid To Ask. This handbook was prepared for use by officials of very small communities, with populations of 1000 or less, as a quick guide to environmental issues that typically face their constituencies: pollution prevention, public-private partnerships, emergency planning/community right-to-know, asbestos, indoor radon, air, RCRA hazardous waste, municipal solid waste, underground storage tanks, wetlands, drinking water, wellhead protection, and wastewater (NPDES, sewage sludge, industrial pretreatment, and storm water). Superfund issues were not addressed because very small towns typically do not become involved in the Superfund program. The handbook contains a resource matrix of Region VIII EPA/State contacts. The Small Community Work Group is mailing the

handbook to the mayors of all of the very small communities within Region VIII (approximately 1500 towns). Copies of the handbook can be obtained from Pauline Afsher, EPA's handbook coordinator, at (303) 294-1169.

**Sustainable Agriculture for California:
A Guide to Information**

Edited by Steve Mitchell and David Bainbridge. This publication lists a wide variety of resources addressing the economic viability of farming and the effect of farm practices on the natural environment. Specific topics include cover crops, ley farming, agroforestry, range management, biological and cultural control of weeds and pests, new and specialty crops, gardening, on-farm research, soil conservation, new tillage methods, microclimates, windbreaks, agricultural engineering, crop rotations, water management, farm worker safety, and human health and social impacts of agriculture. The guide also explains how to determine which libraries have

an agricultural focus and contain sustainable agriculture material. It provides valuable information on the use of electronic databases, including AGRICOLA, the National Agricultural Library database in Beltsville, MD. Available from ANR Publications, Univ. of California, 6701 San Pablo Ave., Oakland, CA 94608-1239.

Water Efficiency for Your Home

The updated version of the Rocky Mountain Institute Water Program's guide to water efficiency is now available. This 23-page pamphlet explains how homeowners can save water, energy and money. It costs \$1, or \$0.50 in quantities of 10 or more. Contact the Rocky Mountain Institute, 1739 Snowmass Creek Road, Snowmass, CO 81654-9199.

Social, Economic, and Institutional Issues in Third World Irrigation Management

Co-edited by R. K. Sampath and Robert A. Young. The contributors to this volume examine problems of irrigation management and propose strategies for improving irrigation efficiency and equity in the developing world. A series of detailed case studies of project successes and failures provides an interdisciplinary analysis of irrigation management in a variety of Third World settings. R. K. Sampath and Robert A. Young are both professors in the Department of Agricultural and Resource Economics at Colorado State University. Available from Westview Press, Customer Service Dept., 5500 Central Ave., Boulder, CO 80301-2847. Phone: (303)444-3541. FAX: (303)449-3356.

Monitoring the Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska

This document provides *Guidelines* for designing water quality monitoring projects and selecting monitoring parameters. These guidelines were developed through an EPA grant with the Center for Streamside Studies (CSS); at the University of Washington in Seattle. Authors of the *Guidelines* included Lee MacDonald (CSS), Alan Smart (USDA-FS) and Robert Wissmar (CSS). Two companion resources to the *Guidelines* are also available. The first is a PC-based expert system that incorporates the parameter selection process outlined in the *Guidelines*. The second is a booklet entitled "Forest Manager's Guide to Water Quality Monitoring. Contact Elbert Moore, Chief, Nonpoint Source Section, EPA, Region 10, Mail Stop WD-139, Seattle, WA 98101. Phone: (206)553-4181. Lee MacDonald is a Professor of Earth Resources at Colorado State University.

New EPA Video Available on Sustainable Agriculture

David Wann of EPA's Region VIII and Yasukuni Christopher Tribble of Versatile Video Products have produced a new video on sustainable agriculture. Featuring on-farm

photography, music from Paul Winter and the Nitty Gritty Dirt Band, and narrated by Raymond Burr, the video is designed to promote educational awareness of sustainable agriculture.

The video contains the testimonials of many farmers from around the country who are implementing alternative agricultural practices that are sustainable, more protective of the environment, and more cost effective. It contains the testimonials of many farmers from around the country who are implementing alternative agricultural practices that are sustainable, more protective of the environment, and more cost effective. They speak of a better understanding of biological systems so that inputs can be applied in smaller quantities precisely where and when they are needed.

Some farmers are using methods such as biological pest control (natural predators and diseases) and mechanical cultivation to replace some or all of the pesticides and herbicides. They use crop rotations; growing different crops on a given piece of land over a several-season cycle to limit pest buildup and increase soil fertility. Including a legume in the rotation reduces the need for fertilizer, as legumes "fix" nitrogen from the air and store it in their root structure, which remains to feed the next crop. Some farmers are using strip cropping, which involves planting narrow strips of different crops together to take advantage of their different abilities to use resources such as sunlight, soil, and water, and to prevent pest buildup.

The lesson these farmers have learned is good management, which comes from understanding the natural system. People need to learn to live more harmoniously with nature if nature is going to continue to sustain people. As consumers, we should learn to accept less "picture perfect" fruits and vegetables, if that perfection comes at the cost of an unstable and unhealthy agricultural system. As the video says, "the recurring theme is that the solution to a given challenge can usually be found within the system itself--a system that includes human ingenuity. One farmer calls it "just damn good farming."

For information on how to obtain a copy of the video call David Wann, EPA Region VIII, at (303)293-1621.

EPA Region VIII Waste Watchers, Aug/Sept 1991

Water Transfer Report

Moving Western Water-At Whose Cost? is a publication of the National Conference of State Legislatures (NCSL), by Larry Morandi. The report looks at water transfers in Arizona, Colorado and New Mexico in the context of the public interest. It addresses legislative policy options for defining and applying the public interest, mitigating the impacts of water transfers, and creating incentives to conserve water. For copies, contact NCSL, 1560 Broadway, Suite 700, Denver, CO 80202; (303) 830-2200.

FEATURES**NITROGEN AND WATER MANAGEMENT USING AN EXPERT SYSTEM**

by

*Paul D. Ayers, Israel Broner, Jim C. Loftis and Lloyd R. Walker
Extension Agricultural Engineers*

"Expert systems" are software packages that simulate human decision-making. Such systems are now being developed for many applications in agriculture. A barley management expert system has been developed by the Department of Agricultural and Chemical Engineering in cooperation with the College of Agricultural Sciences and the Coors Brewing Company. The barley management expert system is designed to produce water and fertilizer recommendations to maximize yield (subject to the strict quality requirements of the Coors Brewing Company).

The expert system makes recommendations using a combination of arithmetic calculations, such as crop consumptive use and soil water balance calculations, and rules, such as proper timing of fertilizer application. The set of rules used in the system was developed through extensive questionnaire interviews of barley production experts. If it performed correctly, such a system could be used by barley producers to obtain recommendations similar to those provided by Coors own agronomists without the need for actual visits and consultations by those experts.

During the 1990-91 growing seasons, the barley expert system was tested and verified under field conditions at Center, Colorado, and Burley, Idaho. The tests included a comparison of recommendations given by a human expert and the recommendations of the expert system. Plots using each set of recommendations are produced; and yields, along with water and fertilizer inputs, are compared to determine which set of

recommendations results in better crop performance. The test results from the two locations are shown in the table below. At both locations, the human expert recommended higher applications of nitrogen. Since both locations have light, shallow soils, over-irrigation leaches fertilizer below the root zone. Consequently, a common practice is recommending higher applications of nitrogen to be "on the safe side" and compensate for leaching. This is economically attractive, even for a very small yield increase, since the cost of fertilizer is low. However, the field trials reveal that nearly the same yield and net return can be obtained by applying approximately one-half of the normal application of nitrogen.

Although there was a small penalty in net returns from using the expert system recommendations, there were two important benefits. First the brewing qualities of the barley were improved in terms of protein content. (Lower protein is better for beer.) In some cases a better price per bushel for high quality barley may offset slightly lower yields. The second advantage, greatly reduced potential for nitrate contamination of groundwater, may become extremely important as environmental concerns and regulations increase.

Overall, the expert system performed very well compared to its human counterpart. This study provides another piece in the growing list of evidence that such software can be a valuable tool for helping farmers manage crop production systems at the high level required to maintain farm profitability and environmental quality.

	Applied nitrogen (lb/a)	No. of irrigations	Yield bu/a	Protein content %	Yield price \$/100 lb	Net return \$/a
Center, Colorado						
Human expert	120	20	155	13.2	7.14	510
Expert system	60	18	132	12.0	7.39	461
Burley, Idaho						
Human expert	110	6	99	11.6	7.54	344
Expert system	68	5	92	10.8	7.59	338

CHAUTAUQUANS DEBATE MYTHICAL COYOTE FLATS DAM

by Maureen Maxwell

In a mock Congressional field hearing reminiscent of the Two Forks Dam debate, proponents, opponents, and experts of every stripe testified on the mythical Coyote Flats, a proposed dam in the arid, mountainous and fictitious state of Lincoln. The hearing was watched and commented upon by prominent ghosts-of-Western-water-past **John Wesley Powell**, **Mary Hallock Foote**, **William Mulholland**, **Sarah Winnemucca**, and **John Muir**, impersonated by present day scholars. The cast of characters is listed at the end.

The Third Annual American West Symposium, **WESTERN RIVERS FROM GRAND WASH TO COYOTE FLATS: CONFLICT AND COMMUNITY**, was sponsored by the Center for the American West and held September 27 and 28 at the University of Colorado at Boulder. The chautauqua examined the lessons of history and questions of the future of water and the West. It featured speeches by key figures in the development of water in the West, portrayed by scholars who have studied their lives and writing. The remainder of the conference was devoted to the mock hearing, the historical figures providing commentary, later followed by commentary from the scholars themselves.

Opening the conference to the strains of "Cool Waters" by Sons of the Pioneers, CU Professors Charles F. Wilkinson and Patricia Nelson Limerick, Co-Chairs of the Center for the American West Advisory Board, welcomed the participants to the chautauqua.

Director of the Center for the American West Gary H. Holthaus read from the poem "The Ancient Ones: Water," by Janet Lewis, repeating her question:

The earth and sun were constant,
but water,
How could they name it with one word?"

He announced the recipient of the Center for the American West's annual Wallace Stegner Award, author and visual artist N. Scott Momaday. His works include The Ancient Child, House Made of Dawn, and Angle of Geese and Other Poems. The award is given for "...faithfully and evocatively depicting the spirit of the American West." Momaday was unable to attend the conference but sent expression of his deep appreciation for the award.

John Wesley Powell then took the stage in suspended dungarees, boots, one sleeve pinned across his shirt, and a flowing beard. His main message, said Powell, was that the West is fundamentally different from the East. He told his life story and described his Civil War years, where at the Battle of Shiloh in 1862 a nearly spent ball shattered his wrist and went up his arm. It was amputated two days later. He said he still

could do pretty much what he wanted, and the loss of the arm helped him avoid portage on his Colorado River trips.

Powell plunged into a detailed description of the preparations for his Great Adventure down the Colorado River, recounting his efforts to obtain financing and put together a crew. The expedition left Green River at 1:00 P.M. on May 24, 1869. They departed with provisions for ten months, expecting to winter on the River. Three months later the remnants of the expedition emerged at Grand Wash Cliffs, half starved, diminished by four men and two boats. He had heard the Grand Canyon would be the worst, he said, and it was.



John Wesley Powell describes his travels down the Colorado River.

Acting as M.C., Major John Wesley Powell introduced each of the other historical characters. The first was **Mary Hallock Foote**, writer and illustrator of Western regional literature in the late 1800s and early 1900s, and wife of engineer Arthur Foote. Mrs. Foote accompanied her husband from project to project, and sometimes her income as a writer and illustrator was all that supported the family. Throughout her speech, she returned to her ambiguity about the West and the Easternization of it, and the building over and remaking of its waterways. In spite of her concerns for the open spaces, her writing often romanticized the West and perhaps helped bring more people to it.

From left, Professor Charles F. Wilkinson, Center of the American West Director Gary H. Holthaus, Major John Wesley Powell, and Professor Patricia Nelson Limerick listen to William Mulholland.



Major Powell next introduced Los Angeles engineer **William Mulholland**, who took the stage dressed in suspended overalls tucked into sturdy boots, with a hat on his head: he was dressed for overseeing the building of major water projects. Mulholland immediately pointed out that his job was to bring water to the people of Los Angeles and he did what

he was told to do. Mulholland was portrayed as a very focused engineer, the do-er to move the water, with little patience for any view other than to bring the water to the largest concentration of people who could use it. The public interest, in Mulholland's lexicon, is defined as the needs of the greatest number, and a special interest is when a small number profit from the public interest. When asked if environmental preservation was a concern when he was developing his water transfer plans, he looked stunned and demanded, "Through the desert? There wasn't anything there."



William Mulholland describes his major water projects.

Mulholland was followed by Sarah Winnemucca, who became a spokesperson for the Paiute Indians during the white expansion west, working to coexist with the whites and to prevent her people from being left with no livelihood and no education. Born in 1844 near Humboldt Lake in

Northern Nevada, she was always torn between two societies. Her maternal grandfather, Captain Truckee, believed that it was important to live side by side with the whites, because he believed the coming of the whites was the fulfillment of the Paiute creation story of the separation of God's children, red and white, and that the story came full circle to reunion when the whites moved West. Sarah's father was more skeptical: he had a vision that the Paiute would suffer at the hands of Captain Truckee's white brothers and he was therefore much more cautious in his dealings with him.

Because Sarah spent part of her childhood among the whites in California and because she spoke English and several Native American languages, she became a spokesperson for the Paiute. She attempted to convince the whites to follow through with their promises of land, tents, and food, losing the trust of her own people because she would tell them of these promises that later went unfulfilled. "I find it strange that our Indian ways are not good any more and we are not allowed to live that way, yet are expected to live in the white world without the training to do so."

There are moderates and absolutists, said Major Powell, and John Muir was the most lyrical absolutist of the American West. Much of his life was spent waging a battle to preserve Nature as Nature had designed itself and to put man in his proper perspective. Muir was a remarkable hiker, covering thousands of miles of the North American continent - the Sierras, the glaciers of Alaska, and discovering the Petrified Forest in Arizona. In 1871, he started taking people on tours and began to write articles for Eastern newspapers. He cited such successes as the creation of the Sierra Club to promote Wilderness and the publication in 1894 of his first book The Mountains of California; and some failures, such as his fight against the damming of the Hetch Hetchee. "I never saw anything created by the hand of man to match the temple of God," he said.



Sarah Winnemucca, center, and Mary Hallock Foote, right, talk with a conference participant. William Mulholland, far left, catches up on the news.

Chautauqua: among the few adult education institutions indigenous to the United States. One of the first was founded on the shores of Chautauqua Lake, New York, combining education, recreation and religion. By 1878 a Chautauqua Literary and Scientific Circle gave year-round service to local study groups, and in 1882 a correspondence school was added. The project's success inspired imitation and by 1886 at least 50 chautauquas were scattered across the country. The movement inspired traveling chautauquas, the first appearing about 1904. These commercial ventures gave programs in circus tents in small towns and villages, emphasizing popular lectures, music, and dramatic entertainment. The original chautauqua, now the Chautauqua Institution, still attracts many to its annual summer meetings.

Hearing Begins; Interest Groups Testify

Howard Berkes of National Public Radio set the stage for the public hearing on the mythical proposed Coyote Flats Dam. Co-chairs of the hearing were U.S. Representative Charles Wilkinson and U.S. Senator Patricia Limerick. Berkes pointed out that Rep. Wilkinson, a Democrat, was a supporter of the Coyote Flats project, while Senator Limerick had voted both

for and against the project. The site for the \$600 million dam, just over the mountains, said Berkes, would create a 14-mile lake, holding a supply of one year's water for four million people. Asking if the project were the Holy Grail or the Temple of Doom, Berkes listed the various interests expected to be represented at the hearing: downstream towns, recreation

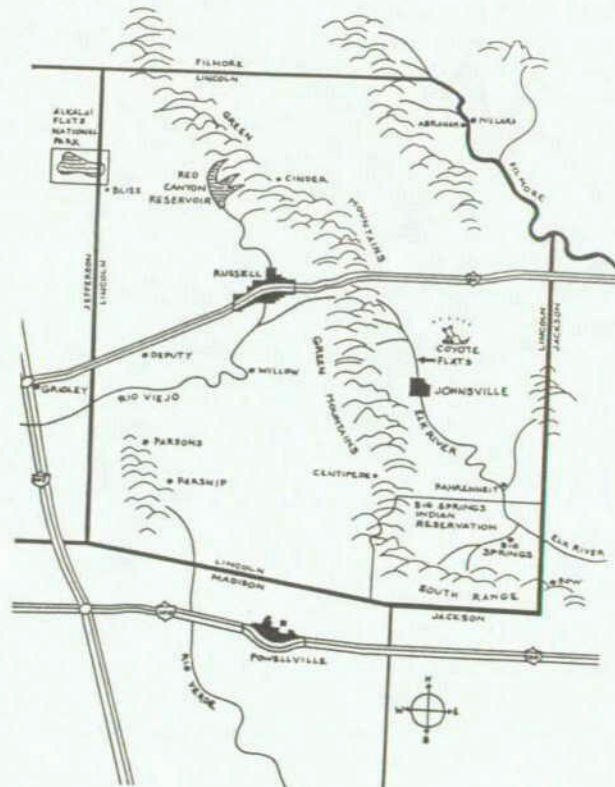
interests, Native Americans, water-importing cities, conservationists, agricultural interests. Just as the gavel was to open the hearing, two crowds of protesters took the stage, pro-dam and anti-dam forces vying for space and the attention of the Senator and Representative. After marshals removed them, the hearing began in earnest.

Lead witness **Neils Griggs**, an economist-hydrologist, explained the interbasin proposal and discussed the level of urban conservation that would be needed in lieu of the project. He discussed the complexity of agricultural water conservation and the difference between urban consumptive water use and agricultural use by diversion. He described the water marketing concept, pointing out that it might forestall the need for some projects but would not preclude them altogether.

The hearing then proceeded through its list of witnesses beginning with the mayors of the Russell, the water-importing city and Johnsville, the first city downstream of the proposed project; a representative of the Big Springs Tribe, some of whose land would be inundated by the Coyote Flats reservoir; **Walter Holyfield**, representing Friends of Coyote Flats; **Royle Dunn**, Trout Unlimited; **Jane Worker**, AFL-CIO; **Bill Goodfellow**, social worker; **James Rising Sun**, a dissident tribal member; **Jeremiah Geophilus**, Friends of Red Canyon; **Mark Trail**, U.S. Forest Service Supervisor; **Ricardo Remuda**, farmer; and **Sharon Weatherby**, rancher.

The testimony highlighted the many facets of the different issues surrounding such a project. The Mayor of Russell, the large water-seeking city, testified that even with the city's newly developed water use plan Russell would need more water. The Mayor of Johnsville, the first town downstream of the proposed project, expressed her awe of the big city hub (with a slight tone of sarcasm), but suggested that the mayor of Russell should come to the table with a clean slate, not with a fully developed project plan. She said that the issue was not an environmental or economic question but a lifestyle question: who decides what in their own area.

The Chair of the Big Springs Tribe supported the project, part of a recently Congressionally-approved agreement with the tribe. Her tribe's support was not to water lawns or provide recreation, she said, but was for the survival of her people. She said that if the water rights were litigated, the Big Spring Tribe could establish rights to most or all of the water, but they were not interested in taking water from rivers. She also testified that, contrary to press reports, no sacred sites would be inundated by the project. James Rising Sun, another member of the Big Springs Tribe, later testified that the project would adversely impact access to a sacred site near Johnsville. In addition, he raised questions about how Indian graves that might be found at the project site during construction would be handled, referring to a recent protest by Indian students at a nearby university where Indian remains had been brought after exhumation.



Walter Holyfield, Friends of Coyote Flats, cited a friend who said that in the East people take water for granted -in the West, they take it from each other. He said the public interest is not the rule of the majority, but taking the long view: if we do not have a strong clean environment, then we are goners. "All we ask," he said, "is that you leave wonderful, magical, spiritual Coyote Flats alone." Representative Wilkinson interjected that it is just plain land and that this was not a big spiritual issue.

Royle Dunn, a professional engineer representing Trout Unlimited, testified that the dam was necessary to provide water for the trout. He said most blue ribbon water associated with trout in the West is associated with dams.

When the hearing resumed the next day, **Jane Worker** of the AFL-CIO compared the conditions of building a dam to those of building the Alaska pipeline, citing the heavy work schedule and frequent separation of families, since the workers must stay in camps at the work site. She raised the question of funding for services to alleviate these stresses. Social worker **Bill Goodfellow** said that his job would become harder if Coyote Flats were built. When the project is completed, he pointed out, the problems of the workers will remain. Goodfellow recommended \$400,000 for additional social workers, child care, and doctors.

Friends of Red Canyon representative **Jeremiah Geophilus** began his testimony by pointing out that his name means "lover of the earth." He delineated the "ecosystem devastation" caused by the Red Canyon Reservoir, located elsewhere in the state, and warned that similar damage would result from the Coyote Flats project.



Sarah Winnemucca, left, waits with audience for next witness.

Marc Trail of the Forest Service gave a dry recitation of various laws applicable to the building

of dams and presented the Forest Services as being a good scientific manager of timber. "Good silvaculture imitates nature but simply on a different time schedule," said the ranger. Rep. Wilkinson asked his advice on the project, pointing out that it was under the jurisdiction of the Bureau of Reclamation, so the Forest Service was not involved in the planning and Trail could objectively comment. Trail reiterated that the Forest Service promotes scientific practices and added that its staff viewed environmentalists as biologists view creationists.

Farmer **Ricardo Remuda** supported the dam because he felt it would keep the City of Russell from pursuing Rio Viejo water rights. He testified that the Rio Viejo farms downstream

of the project site and the 300-year-old Rio Viejo community would be destroyed if they did not have water from the dam. He said developers were offering to buy water rights and officials had threatened to raise taxes if farmers didn't sell. Some had held out, Remuda reported, but it was a water quality problem: if some sold their rights, it decreased the quality of water remaining. He asked if we could really put a price on the living standards of the people.

Final testimony came from rancher **Sharon Weatherby**, owner of the site of the proposed dam and reservoir. She promised to make it difficult to take her land. When asked how she found out that her land was the site of the not-yet-authorized dam, she said by reading the newspaper - she had not been contacted by any of the planners. A member of the audience asked if any surveyors or geologists had been to her property, or the water tested for chemical content. She said no, but Rep. Wilkinson countered the questioner's accusation that the project plan was not based on scientific data collected from the site saying that there were feasibility studies, but not entry on Weatherby's land.

The hearing was then opened to questions from the audience, some of whom portrayed members of the public who might appear at an authentic congressional hearing on a proposed water project. A professor from the neighboring state of Jefferson said he found a misplaced decimal point in the studies of the Coyote Flats project: evaporation was listed to be 1.5% of the flow of the river and should have been listed at 15% of the flow. This would almost completely eliminate any gain in net water yield from the dam. Representative Wilkinson said he would look into it. Senator Limerick expressed her annoyance at 60s-style outside agitators. A resident of Russell urged the implementation of a serious water conservation project, listing such measures as metering, regulating lawn watering, and using tertiary treatment plants. The biggest problem, she said, is our own state of mind.

The chautauqua scholars commented on the proceedings and on how their characters would have responded to such a hearing. Frederick Krebs, who portrayed Mulholland, said that the engineer spoke for many people then and now with his belief in the power of technology and progress. Krebs said that it comes down to the question of defining progress. He said that Mulholland pointed out to us the importance of scientists and engineers having a clear understanding of society's sense of values and philosophy behind the project. The Iroquois, Krebs stated, believed that policy should be made with respect to seven generations into the future--we are more here and now.

Philip Supina, who portrayed John Muir, said that the Jeremiah figure, the Francis of Assisi comes through in Muir's outlook, and that in our heart of hearts we like him, or at least recognize the need for people like him.

Benay Blend, still in her character as Mary Hallock Foote, pointed out that when we try to transform the arid landscape

into an oasis, we are in danger of losing important values associated with the arid wilderness. Considering this point of view, Blend expressed her discomfort with Foote's having romanticized the West for her Eastern audience.

Alexandra Voorhees, who portrayed Sarah Winnemucca, pointed out that 100 years after her death, treaties that had been entered into in her lifetime were still not being fulfilled. She said that she had the same problem as Winnemucca in that she is both white and Paiute. We need to take care of Mother Earth, she said; being the keeper is both a right and a privilege we often overlook.

Howard Berkes of NPR pointed out that Western states have a higher percentage of urban dwellers than Eastern states. During the hearing he had heard a lot of human agonizing but still had not resolved how to get beyond that to a sustainable economy in the American West. Freedom equals license, he said, and we haven't taken seriously that part of freedom: if you don't want others to restrain you, you had better restrain yourself.

Clay Jenkinson, Major Powell's impersonator, closed the conference, beginning with his observation that the history of

the United States is the history of maiming. He cited William Cotton, who argued that humans went wrong when they started to consume calories not their own. Oil and coal are ancient calories, not contemporary. The essential misunderstanding was when Columbus came (Jenkinson said he was using Columbus as a symbol to make this point): they came and saw empty continents, but one could argue that the continents were already environmentally and ecologically full.



Outgoing CWRR Director Neil S. Grigg and new Director Robert C. Ward take a break at chautauqua.

Cast

Howard Berkes, *himself*, is a Salt Lake City-based correspondent for National Public Radio.

Benay Blend, *Mary Hallock Foote*, teaches African-American history at Louisiana School, and has published several articles on Western history.

Bunny Brock, *Jane Worker*, is earning a Master's Degree in Political Science and Indian Policy.

Steve Brock, *Bill Goodfellow*, is earning his Master's Degree in Political Science and Water Policy.

Deedee Decker, *Sharon Weatherby*, is a Western Colorado rancher, and has been a trustee with the Environmental Defense Fund.

Roger Echo-Hawk, *James Rising-Sun*, is a student of Pawnee Tribal History, a consultant on Indian history, and archaeological monitor for the City and County of Denver.

Roger Flynn, *Walter Holyfield*, is a Rocky Mountain Water Fellow at the Environmental Defense Fund and author of *A Citizen's Guide to Mining in Colorado*.

Barbara Greene, *Deborah Bucynam*, Mayor of Johnsville, is a Denver attorney and member of the Groundwater Commission.

Neil Grigg, *Neils Griggs*, is Head of Civil Engineering Department at Colorado State University, and former Director of the Colorado Water Resources Research Institute.

Warren Hern, *Jeremiah Geophilus*, is a physician and epidemiologist, and Chair of the Holy Cross Wilderness Defense Fund.

Carmine Iadarola, *Randall Heartleak*, Mayor of Russell, President of AquaSan Network, a multi-disciplinary water and environmental firm.

Clay Straus Jenkinson, *John Wesley Powell*, is a Rhodes Scholar working on his Ph.D. in Classical Studies, and is director of the Great Plains Chautauqua, a traveling humanities tent show. He also portrays Thomas Jefferson.

Uli Kappus, *Royle Dunn*, is a Principal in AquaSan Network, and is an ardent fisherman and hunter.

Frederick Krebs, *William Mulholland*, is a Distinguished Status Instructor at Johnson County Community College and an experienced chautauquan with ten different presentations, including Benjamin Franklin and William Allen White.

Patricia Nelson Limerick, *Senator Limerick*, is a Professor of History at CU-Boulder, specializing in history of the American West. She is author of *The Legacy of Conquest* and *Desert Passages*, and is Co-Chair of the Center of the American West Advisory Board.

Kenneth Orona, *Ricardo Remuda*, is earning a Master's Degree in history, with an emphasis on history of the American West.

Steve Sturgeon, *Marc Trail*, is earning a Master's Degree in History, specializing in history of the American West.

Phillip Supina, *John Muir*, teaches history and political science at Mercyhurst College in Pennsylvania. He has also portrayed Aldo Leopold and James Madison.

Alexandra Voorhees, *Sarah Winnemucca*, co-ordinates Youth, Multicultural and Interfaith for the National Conference of Christians and Jews, and serves on the Mayor's Youth Advisory Committee in Reno, Nevada. Of Paiute ancestry, she was recently chosen to go to Nicaragua and Guatemala with a Native American delegation for Witness for Peace.

Jeanne S. Whiteing, *Rayanne Redfeather*, Chair of the Big Springs Tribe, a member of the Blackfeet Tribe, is a partner in Whiteing & Thompson, which practices Indian Law exclusively. She recently concluded a water rights settlement on behalf of the Northern Cheyenne Tribe in Montana which is now pending in Congress.

Charles F. Wilkinson, *Representative Wilkinson*, is Moses Lasky Professor of Law at CU-Boulder and Co-Chair of the Center for the American West Advisory Board. His books include *American Indians, Time and the Law*, *The American West: A Critical Bibliography and a Study in Regionalism*, and *The Eagle Bird: Searching for an Ethic of Place*.

WATER NEWS DIGEST

WATER CONSERVATION

Denver Water Department Begins New Water Conservation Study at Airport

In our last issue, we reported that the Denver Water Department and U.S. Environmental Protection Agency are cooperating in a test of low-volume 3.5 gallons-per-flush (gpf) toilets at Denver's Stapleton Airport. The toilets actually use a much more water-conservative 1.5 gpf. Our apologies for the inaccuracy and thanks to John Wilder, Special Assistant in Operations and Management with the Board of Water Commissioners, for the correction and for additional information on the study.

On November 21 the Denver Water Department and EPA began their study of the efficiency and public acceptability of 1.5 gallons-per-flush wall-hung toilets. The toilets were installed in two public restrooms, one men's and one women's room, at Stapleton Airport. Data will be collected over the next four months and evaluated against a baseline of the 3.5 gpf toilets.

The number of 1.5 gpf toilets being tested are as follows: 10 in the women's restroom and five in the men's restroom. In addition, each toilet is individually recorded as to the number of flushes and time of flush to record incidence of double flushing. Computers will be used to collect and process data that give information on average water use per flush, total water use per restroom area, use of water in each stall, and frequency of double flushing. Public response will be measured by non-scheduled interviews.

In addition, wastewater flow from the test restrooms is further restricted by self-canceling lavatory faucets on all lavatories and gpf urinals in the men's restroom. Thus the restrooms will be tested using complete conservation devices in order that a comprehensive evaluation may be made with respect to the 1.5 gpf toilets.

Additionally, the wall-hung toilets that use high water consumption blow-out flush valves to overcome the lack of gravity found in floor-mount toilets have been used in the past in high traffic areas of public use and are preferred by architects, engineers, and building owners, due to their ease of maintenance and cleanliness advantages over the floor-set gravity toilets.

Denver will use results of the study to determine whether to install the 1.5 gpf wall-hung toilets in the New Denver Airport public restrooms as well as requiring very-low-flow toilets in new construction as called for in a recently passed city ordinance. Implementation of the ordinance is being delayed pending the findings of this research program as well as scientific studies in progress elsewhere in the U.S.

The Denver Water Department is supervising the study, which is being conducted by the Stevens Institute of Technology, a New Jersey engineering school. The study will be monitored by the Denver Building Code's Revision Committee on Plumbing, composed of practicing consulting engineers specializing in the field of plumbing and mechanical engineering; plumbing contractors;

Plumbers' Union Local No. 3; representatives of the Denver Waste Water Department's engineering staff; the city's Chief Plumbing Inspector; the Chief Mechanical/Plumbing Plan Review Engineer for the City; and Denver Health Department Environmental Health Division staff. The committee is chaired by a representative of the Denver Water Department.

In addition, there will be close coordination of the study with representatives of the American Association of Plumbing Engineers (A.S.P.E.) and the Region VIII Office of the Environmental Protection Agency.

Denver Water Department Praises Consumer Conservation

Denver water use decreased 7.6 million gallons during the wet summer of 1991 and half the credit goes to the consumer, not the weather, according to the Denver Water Department. Water use from May through September in Denver and several suburbs was 19 percent less than a typical 1980s season. Water use is down about 8.5 percent for the entire year. The Denver Water Department employs three full-time residential auditors who will give homeowners free water use audits, and make recommendations and assist in the installation of water conservation equipment.

Source: Rocky Mountain News 10/4/91

Castle Rock Saves Buckets of Water and Cash

Castle Rock, Colorado, population 8700, conserved 10 million gallons of water in 1990, a 30 percent reduction from previous years. The town also saved \$65,000 in water costs and pumping expenses. Parks and public lands within the town limits were xeriscaped in 1990. Devices were installed that turn off the town's sprinkler systems during rainstorms, and town-owned land is watered only once every three days. In addition, the town delivered free water-saving kits to every water customer in town. The kits, costing Castle Rock under a dollar apiece, contained a displacement bag for a toilet tank, flow restrictors for showers and faucets, and dye tablets to detect water leaks. Castle Rock homes water lawns one day out of three.

Source: U.S. Water News 10/91

Water Conservation Poll Results Mixed

Two out of three Americans surveyed gave themselves a "B" for water conservation but a "D" or "F" for their recent efforts to clean up local water resources. In a recent Yankelovich Clancy Shulman/Coors Pure Water 2000 survey, nearly 60 percent of respondents said they would favor tax breaks for individuals who take the initiative to clean up local water supplies. Twenty-two percent would be willing to pay additional taxes to establish more water protection programs, but only 19 percent said they had actually volunteered to participate in local water cleanup efforts.

Source: U.S. Water News 10/91

AWARDS

CO Water Division IV announces annual awards

State Engineer Jeris Danielson and Division Engineer Keith Kepler presented Division IV annual awards at the Division's annual fall meeting Oct. 9. Steve Tuck was named "Water Commissioner of the Year" for Division IV. He is Deputy Water Commissioner on Tongue Creek and George Creek and parts of Kaiser and Wrad Creeks near Cedaredge. He was commended for his dedication to proper delivery of the available water supply and his excellent records, and for his communications with his water users.

The Colorado Co-operative Company was named "Division IV Water Manager of the Year." The Company operated the Highline Canal serving the area around Nucla. Bob Nylund and Zene Weimer accepted the award. The Company has put much effort into improving their system: installing a new diversion dam in the San Miguel River, replacing flumes with siphons over several canyons, and improving the canal out of Norwood Canyon to the irrigated area.

Colorado Water Division IV consists of the entire Gurnison River basin plus the San Miguel River and lower end of the Dolores River basins.

Source: Montrose Daily Press 11/4/91

Environmental Award Goes to Boulder Lawyer

Boulder Lawyer David L. Harrison received the national Sol Feinstone Environmental Award in September for his volunteer work on land and water conservation. He served two years as national chairman of the Nature Conservancy, an international conservation organization with 600,000 members. The Feinstone award is given by the State University of New York.

Source: Denver Post 10/11/91

USGS Hydrologist Receives USDI Award

Richard O. Hawkinson, Hydrologist and Chief of the Branch of Analytical Services of the USGS Water Resources Division, Lakewood, Colorado, has received the U.S. Interior Department's Superior Service Award, the third highest honor given by the Department. Hawkinson was cited for his outstanding technical and management contributions to the USGS water resources program.

Source: Hydate Nov. 1991

LEGISLATION

Amendment Proposes Local Vote on Water Transfers

A proposed state constitutional amendment would allow voters in river drainages to vote before their water is diverted to other areas. A non-profit corporation, WATER Inc., is planned to organize a petition drive to get the initiative on the general election ballot in 1992. It is called the WATER amendment--Willingness and Appropriateness in the Transfers and Exports of Rivers.

Source: Montrose Daily Press 11/14/91

Senate Approves Cabinet-Level EPA

The U.S. Senate approved S. 533, the Department of the Environment Act, by voice vote on October 1. The legislation, introduced by Senator John Glenn, D-Ohio, would elevate the Environmental Protection Agency to cabinet level. The bill also creates a Bureau of Environmental Statistics (but without the resources to gather or power to require the submission of statistical information) and a new advisory Presidential Commission on Improving Environmental Protection.

Source: Western States Water 10/4/91

Senate Considers Review of Western Water Resources

The Senate Committee on Energy and Natural Resources held a hearing September 19 on S. 1228, the Western Water Policy Review Act. The legislation would initiate a comprehensive 5-year, \$18 million review of federal water resources activities in 19 Western states. The Secretary of the Interior, in consultation with an advisory commission, would oversee the study and be required to submit a report to the President, with recommendations for action. Bill sponsor Senator Mark O. Hatfield (R-Ore.) pointed out that there are at least 13 congressional committees, 8 Cabinet-level departments, 6 independent agencies, and 2 White House offices with responsibility relating to national water management policy. Senator Malcolm Wallop (R-Wyo.) expressed concern that S. 1228 would intrude on state control over resources.

Source: Western States Water 9/27/91, Eos 10/15/91

WATER QUALITY

Deadline Set for 22 States to Adopt Water Quality Standards

Twenty-two states and territories must adopt water quality standards for toxic pollutants by February 19, 1992, or the EPA will establish numeric standards for them. It would be the largest water enforcement action ever contemplated by the agency. The requirements were part of the 1987 amendments to the Clean Water Act. Affected states and territories are Alaska, Arizona, Arkansas, California, Colorado, Connecticut, the District of Columbia, Florida, Hawaii, Idaho, Kansas, Louisiana, Michigan, New Hampshire, New Jersey, Nevada, the Northern Mariana Islands, Puerto Rico, Rhode Island, Vermont, Virginia and Washington. EPA Administrator William Reilly said he expects only Colorado and New Hampshire to have standards in place for all 105 of the toxic pollutants involved by the deadline.

Source: Denver Post 11/22/91, Rocky Mountain News 11/7/91, Western States Water 11/8/91

New Leak: New Curbs

The Colorado Department of Health has confirmed another cyanide leak from Summitville Consolidated Mining Co. near Wolf Creek Pass, and announced imposition of further restrictions on the discharge of wastewaters from the mine. Summitville officials deny that discharges from the mine are responsible for increased toxicity in the Alamosa River. They have 30 days to consider the proposed new limits on mine discharges prompted by the November 11 incident.

Summitville was fined \$100,000 earlier this year after officials blamed a cyanide spill for killing all the aquatic life in 17 miles of the Alamosa River and the Terrace Reservoir.

Source: Denver Post 11/20/91, 11/11/91

Bill Introduced to Renew UMTRA

Legislation to reauthorize the U.S. Department of Energy's UMTRA program for the cleanup of uranium mill tailings was introduced in November. Without reauthorization it will end in 1994, and projects on the waiting list will not be completed. Senator Hank Brown (R-CO) introduced the legislation. Senator Tim Wirth (D-CO) supports reauthorization but has called for specific time limits for completing the cleanup projects.

Source: Grand Junction Daily Sentinel 11/9/91

DOE Says Rumor of Delay Not True

U.S. Department of Energy officials assured Rifle and Garfield County officials that cleanup of Rifle's uranium mill tailings will start in April 1992 as planned. Assurance was sought after a report was leaked that said the cleanup start would be delayed until 1994.

Source: Grand Junction Daily Sentinel 11/1/91

Toxin Detected in New Location at Arsenal

An extremely toxic rocket-fuel agent has been detected in a groundwater test well close to the north boundary of the Rocky Mountain Arsenal and environmental officials are trying to learn more about it before it seeps into nearby residential wells. Laboratory tests by the Army show that none of the N-nitrosodium-methylamine, called NDMA, has been found in 17 test wells that monitor groundwater quality in Adams County communities near the arsenal's boundary. But NDMA has now been discovered in a groundwater test well near the arsenal's north boundary, and the groundwater there flows north and northwest towards Commerce City, Adams City, Dupont and Henderson.

NDMA is a chemical compound that forms as the rocket propellant hydrazine breaks down in the environment. The Army blended hydrazine at the Arsenal from 1959 to 1982 and disposed of the fuel and its ingredients in the post's liquid-waste basins. It is extremely toxic but there is no indication that it is off-post, according to Connally Mears, who monitors the Arsenal for the EPA.

In a separate incident, a backup protection system contained a spill, discovered November 7, of about 250 to 300 gallons of water that leaked from a tank at the Arsenal. The leak was caused by a faulty valve, but all the pollution was trapped by a special berm outside the tank before it reached any groundwater, according to the Army. The fluid was water used 20 years ago to rinse out industrial tanks in which the rocket fuel was blended.

Source: Rocky Mountain News 10/5/91, Denver Post 11/9/91

Mining Cleanup Plans Outlined

The U.S. Environmental Protection Agency and the Colorado

Department of Health have outlined plans for cleaning up a 400-square-mile area contaminated by mining operations in Gilpin and Clear Creek counties. Daily discharge into Clear Creek of an estimated 1200 pounds of heavy metals from the Argo Tunnel will be handled at a water treatment plant. Dangerous levels of lead, arsenic, copper, zinc and manganese have been found in the water.

Burleigh Tunnel discharges will be treated with biological instead of chemical methods. Chemicals will be filtered through manmade wetlands. No remedy is proposed for discharges from the McClelland and Rockford Tunnels, and officials will issue a waiver of water quality regulations governing the Big Five Tunnel discharge until other cleanup options are evaluated. Discharge from Quartz Hill, National Tunnels, and the Gregory Incline will be collected and piped to a site below the Black Hawk/Central City wastewater treatment plant, where the state health department will conduct routine tests of area groundwater wells. Residents whose wells are contaminated will be given an alternative source of drinking water.

Owners of mine waste piles will have one year to remove or process the waste before they will be required to put in soil caps. Active mill sites will be required to have runoff barriers.

Source: Denver Post 10/1/91

New Groundwater Standards Approved

The Colorado Water Quality Control Commission has approved groundwater standards for South Platte River aquifers that should limit further contamination. The standards, effective October 30, will not allow groundwater quality along the river and in four other state aquifers to deteriorate further unless it is better than the drinking-water standard. Groundwater better than the current standard may not fall below the standard.

Source: Denver Post 9/15/91

Gas Company Sued Over Leaking Tanks

The city of Brighton has filed a lawsuit against Petroleum Wholesale of Texas Inc. to stop the underground migration of gasoline from a service station owned by the firm onto adjacent property owned by the city. Geotechnical and hydrological consultants determined that the petroleum in the soil was migrating toward two wells that are part of Brighton's water supply, but the wells had not been contaminated yet. Brighton changed its construction process on the site to handle the problem. An "historic survey" conducted around the service station determined that the contamination could not have come from a source other than the station. The city has not been able to get assistance from the company to remedy the problem and has not been able to investigate the station's underground storage tanks to determine definitively that they are the source.

Source: Denver Post 11/9/91

Battery Acid Spill Contained

Cleanup crews worked to prevent hazardous chemicals from contaminating Gore Creek near Vail after a truck carrying electrical storage batteries overturned on Interstate 70 September 29. The

acid from the shattered batteries posed a threat to fish and other aquatic life but did not reach the creek, according to officials of Chemical Handling Corp. The company planned to remove approximately 2,700 cubic yards of dirt and place it and the bagged batteries in lined drums for transport to an out-of-state site.

Source: Rocky Mountain News 9/30/91

Tiger Team to Study Claims of Los Alamos Contamination

A 150-member panel from the U.S. Department of Energy has gathered at Los Alamos National Laboratory to investigate whether radioactive material from the lab has contaminated the community. The so-called Tiger Team will review monitoring records and other data to see whether the nuclear bomb complex allowed deadly plutonium and other contaminants to reach the Rio Grande and other water courses. At the same time, the Energy Department is financing a \$400,000 epidemiological study to determine whether the large number of brain tumors in the area is statistically significant and whether it can be attributed to one cause. The study is separate from that of the Tiger Team.

Source: Denver Post 9/29/91

State Fines Coors for Polluting

The Colorado Department of Health has fined Coors Brewing Co. \$211,000 for discharges into Clear Creek. Coors was fined \$175,000 for repeatedly discharging mercury, lead, copper, and silver into the creek, and \$36,000 for a 150,000-gallon beer spill last May that killed an estimated 13,000 fish in Clear Creek. Because of its water quality problems, Coors began operating a new \$3 million treatment plant in April, which it said enabled the brewery to meet state pollution limits for the past five months, exclusive of the May beer spill.

In addition, Coors agreed to pay a \$700,000 penalty levied by the Denver regional EPA office for violating federal hazardous-waste laws. Coors agreed to the penalty without admitting or denying any liability. EPA officials said Coors knew it illegally discharged at least two industrial solvents into the groundwater from 1981 to 1984, but failed to report it to the agency until 1990. The pollution was traced to leaky pipes beneath the company's container plant. Coors has replaced the pipes, but an estimated 1,300 pounds of the solvents TCA and PCE remain in the soil beneath the plant. Coors plans to clean up the contamination by 1994.

Source: Denver Post 10/3/91, 10/4/91; Rocky Mountain News 10/3/91

WETLANDS

Groundwater Trust Awarded Wetlands Grant

The American Ground Water Trust, in cooperation with the Audubon Society of New Hampshire, has received a grant from the U.S. Environmental Protection Agency to produce a booklet describing the hydrological relationships between wetlands and groundwater in the United States. Case studies of wetlands throughout the nation will illustrate these relationships in different geological and geomorphological settings and climatic conditions. The dynamic nature of the hydrological system and the effects of

annual climatic variability on wetlands and ground water will be emphasized. Any suggestions concerning case studies or perspectives which could be included in "Ground Water and Wetlands in the United States," may be sent to the Trust's offices. The booklet is scheduled for completion by mid-1992.

Source: POINTS, Fall 1991

Experts Say Wetlands Definition Unscientific; Study Suppressed

Government experts involved in regulating wetlands have described the Bush administration's proposed redefinition of the term "wetlands" as unworkable and scientifically unsound, based on a nationwide field test. The documents summarizing the test program and containing the criticism have been barred from release by the White House but were obtained by the Associated Press. The sharpest criticism was leveled at a proposed requirement that an area must be saturated for 21 consecutive days or inundated with water for 15 consecutive days to qualify as a wetland. These requirements, along with a new definition of a growing season and criteria on wetland vegetation, would leave thousand of acres of legitimate wetlands unprotected, the experts said. Test results from around the country indicate that the new definition would reduce wetlands acreage. In some regions, from 30 percent to 80 percent of acreage currently classified as wetlands would lose its protection.

The analyses include views from experts at the Army Corps of Engineers, the EPA, and the Fish and Wildlife Service. Members of a wetlands task force on the White House Domestic Policy Council, which played a key role in crafting the new definition, have argued that only the raw data documents, not the analyses, should be available to the public.

The period for public comment on the proposed new guidelines ends December 15.

Source: Denver Post 11/22/91 & 11/17/91, Ft. Collins Coloradoan 11/24/91, Rocky Mountain News 11/24/91

Western States Examine Proposed Redefinition

Controversy over the effect of the Bush Administration's proposed redefinition of wetlands is sweeping several states. In Colorado, the redefinition would remove about 50 percent of the wetlands currently so classified, according to Gene Reetz of the EPA and wetlands scientist David Cooper of Colorado State University. But Ray Christensen of the Colorado Farm Bureau said it is unfair for farmers to pay property taxes on land that becomes economically worthless as soon as it is federally defined as a wetland. Steve Dougherty, a consultant for ERO Resources of Denver, which has represented some of the state's wetlands developers, argued that a proper wetlands policy should have two parts. The first part would create a scientific definition of wetlands and the second part would require politicians to decide when protection should be applied to those defined areas.

In Nebraska, the redefinition could remove protection of more than one million acres of wetland, according to Jim Ducey, the director of Preserve Our Water Resources. Among areas removed would be 85 percent of wetlands in the Sandhills, the largest sand dune area in the Western Hemisphere and one of the largest grass-stabilized dune regions in the world. The hills make up one-quarter of

Nebraska, and they sustain almost half of the state's cattle. Dick Gersib, a state Game and Parks Commission wetlands specialist who participated in the federal field studies in Nebraska, said that a high percentage of temporary and seasonal wetlands would fall out of jurisdiction under the proposed policy.

Source: Montrose Daily Press 11/11/91, Ft. Collins Coloradoan 10/13/91, Denver Post 11/10/91

Arvada Council Rejects Plan to Buy Wetlands

The Arvada City council voted against a plan to buy the 13-acre Two Ponds Wetlands to prevent it from becoming a 20-home development. The resolution to buy the land for \$375,000 failed 4 to 3. The property is held by the Resolution Trust Corporation.

Source: Rocky Mountain News 11/1/91

Compact States Reject California Request for More Water

Most of the Colorado River Basin States have rejected California's effort to obtain a larger share of Colorado River water. Colorado Governor Roy Romer didn't rule out the idea, but listed six problems that would have to be solved before talks could begin on a water bank. Romer has suggested an "escrow account" plan, under which the upper-basin states would assure California of extra Colorado River water over the next 20 years, while California takes action to conserve water. The escrow levels would gradually drop over the 20 years, whether California meets conservation goals or not. Arizona and New Mexico have both rejected this proposal, citing lack of assurances for their future water supplies and the need for California to reduce its use to Compact levels.

Source: Grand Junction Daily Sentinel 10/25/91, 11/5/91

Native Americans Gain Seat at Colorado River Planning Table

Seven Native American tribes from the Colorado River Basin sent their lawyers to the November meeting of basin states and secured a seat at the table. The meeting was part of a five-year planning process under way between the seven Colorado River Basin states and the U.S. Bureau of Reclamation. Native Americans were not included in the talks leading up to the 1922 Colorado River compact but hold water rights that date back to the mid-1800s.

Source: Grand Junction Daily Sentinel 11/16/91, 10/24/91

WATER DEVELOPMENT

Judge Rules Arapahoe to Get Fraction of Water Sought

Robert Brown, a Gunnison water court judge has ruled that there is only 20,000 acre-feet of water available for Arapahoe County's Union Park project. Arapahoe County had claimed that there were 97,000 to 156,000 acre-feet of water available. The county was seeking permission to build diversion on the East and Taylor rivers and to collect the water in a reservoir to be constructed at Union Park, then piped to Denver suburbs.

Source: Rocky Mountain News 10/22/91, Montrose Daily Press 10/22/91

Ground Broken at Animas-La Plata Site

Assistant Interior Secretary John Sayre detonated a symbolic explosion October 26 at the planned site of the Animas-La Plata water project. The ground-breaking was originally scheduled last year but was cancelled when the Fish and Wildlife Service said that water depletions from the project would endanger the Colorado squawfish and razorback sucker in the San Juan River system. In a compromise, the FWS agreed that a portion of the project could be built while scientists study the needs of the fish. The federal government will build a smaller first stage than originally planned, with one reservoir, pumping plant and pipeline. Federal officials plan to compensate for environmental damage caused by Animas-La Plata by releasing extra water for the fish from an existing dam at Navajo Reservoir. The project honors Native American water rights promised more than 100 years ago in frontier peace treaties. The Sierra Club Legal Defense Fund and five other environmental groups have told the Bureau of Reclamation that they will sue if construction begins without a new environmental study.

Source: Denver Post 10/26/91, Ft. Collins Coloradoan 10/27/91, Grand Junction Daily Sentinel 10/16/91

Homestake II Land-use Permit Rejection Affirmed

Eagle County commissioners reaffirmed a decision denying Aurora and Colorado Springs a land-use permit to develop water resources in the Holy Cross Wilderness Area near Vail, Colorado. District Judge William Jones ordered the re-evaluation in July after a two-year court battle over the criteria used to reject the permit. Opponents of the Homestake II Project fear it will destroy wilderness wetlands.

Source: Rocky Mountain News 11/26/91

Denver Decides Not to Sue Over Two Forks

The Denver Water Board decided not to sue the federal government for its rejection of permits for the Two Forks dam project when EPA clarified that its veto was for the three projects proposed at the Two Forks site, not for the site itself. Denver plans to sell surplus water supplies to the suburbs. Eight suburbs have filed suit against EPA in an attempt to overturn the veto. The suburbs are Platte Canyon, Southwest Metropolitan, Alameda, Bear Creek, Bennett, Bear Creek Farms, Consolidated Mutual, Meadowbrook and Willowbrook.

Source: Rocky Mountain News 11/23/91, Denver Post 11/22/91, AWWA Main Stream 10/91

Water Judge Rules Against San Luis Valley Project

Water court Judge Robert W. Ogburn ruled that the groundwater sought by AWDI for its proposed San Luis Valley project did not meet the definition of non-tributary groundwater. AWDI wants to sink 92 wells on its Baca Grant Ranch and pump 200,000 acre-feet of water from the San Luis Valley aquifer to sell to Front Range cities. AWDI plans to pursue the case to the Colorado Supreme Court while considering filing for surface-water rights.

Source: Rocky Mountain News 11/25/91, 11/23/91

POSITIONS AVAILABLE

SABBATICAL LEAVE - POST DOCTORAL OPPORTUNITIES

The Center for Water Resources and Quality Management at Chung Buk National University, South Korea, is seeking applicants for its 1992 Visiting Scholar Research Program. The Center is conducting research on the development of Decision Support Systems for Water Quantity and Quality Management in South Korea. General fields of interest are water quantity and quality simulation and optimization modeling, systems analysis, geographical information systems, remote sensing, real-time system control and database systems. For 1992, they are particularly interested in applicants with expertise in reservoir and river water quality modeling and remote sensing, analysis and management of water quality data. Two types of positions are available: Visiting Associate Professors and Post-Doctoral Research Appointments.

Applicants for the Visiting Associate Professor Positions should be Associate Professors between 35 and 42 years of age and

actively involved in independent research efforts. Appointments from 3 to 9 months will be considered beginning in the summer of 1992. The primary focus of the appointment is research; however, teaching of a graduate course might be desirable and this will be discussed with the applicant.

Applicants for the Post-Doctoral Research Position should have received their Ph.D degree no more than 2 years prior to their date of application. Appointments from 6 to 12 months will be considered.

For additional information contact Professor Soon Bo Shim, Director of the Center, by FAX at 82-431-62-3643. Applicants should include their MOST CURRENT RESUME, ADDRESS and WORK AND HOME PHONE NUMBERS and a FAX NUMBER where they can be reached.

JOB ANNOUNCEMENT

Chemonics International, a large consulting firm located in Washington, D.C., is looking for the following personnel for a current proposal:

Position: Engineer/Hydrologist or Hydrogeologist
Location: Near East
Date to begin: February, 1992
Duration: 12 months
Project: Evaluation and development of groundwater recharge projects.

Expertise/Experience Required: Registered engineer or hydrologist; degrees in civil engineering, geology or hydrology. Over 3 years working experience with engineering issues related to hydrology and aquifers in semiarid and arid environments in the Near-East/Middle-East region or in the western U.S. Technical expertise in most of the following: groundwater recharge programs, hydrologic data monitoring and analysis, coastal aquifers, groundwater quality, stormwater management.

Contact: Marc Van den Bossche
 Technical Personnel Coordinator
 Chemonics International
 Suite 200, 2000 M St., N.W.
 Washington, D.C. 20036
 Tel: (202)466-5340 FAX: (202)331-8202

GRADUATE RESEARCH ASSISTANTSHIPS

Colorado State University--Three Graduate Research Assistantships are available through the Civil Engineering Department at CSU to support qualified students in research related to the development of a resource management support system for irrigated agriculture. Two M.S. Assistantships, at \$950/mo.

stipend and paid tuition, are available. One Ph.D Assistantship is available at \$1,050/mo. stipend and paid tuition. Funded by: The National Science Foundation; The Navajo Agricultural Products Industry, Farmington, NM; Colorado State University; Fort Lewis College, Durango; and the University of Southern Colorado, Pueblo. The research is financed in part by the Career Access Program for Women, Minorities and the Disabled of the National Science Foundation. Applications from underrepresented groups, such as Native Americans or other minorities, are especially encouraged. Apply by December 15 1991 to: Dr. Omnia El-Hakim, Dept. of Engr. and Physics, Fort Lewis College, Durango, CO 81301-3999, Phone: (303)247-7160; or Dr. Timothy K. Gates, Civil Engineering Dept., Colorado State University, Fort Collins, CO 80523, Phone: (303)491-5247.

GRADUATE FELLOWSHIPS

Michigan State University--Graduate stipends of \$17,000 per annum will be awarded to Fellows appointed through the USDA National Needs in Water Sciences Training Program. Three Fellowships will be awarded to outstanding first-year doctoral students in the 1992-93 academic year. Program information and applications can be obtained from: Dr. Frank M. D'Itri, Co-Director, Institute of Water Research and Department of Fisheries and Wildlife, 334 Natural Resources, MSU, East Lansing, MI 48824. Phone: (517)353-3742. Deadline: December 31, 1991

Oklahoma State University--The Departments of Agricultural Engineering, Agronomy and Forestry invite applications for two Ph.D Fellowships in Water Sciences funded through the USDA National Needs Program. Each fellow will be awarded a graduate stipend of \$17,000 per annum for three years. Applications will be accepted until suitable candidates are chosen. Contact: Dr. C. T. Haan, Agricultural Engineering Department, Oklahoma State University, Stillwater, OK 74078-0497. Tel. (405)744-8398.

SEMINAR SERIES**SPRING 1992-SEMINAR SERIES
CU-BOULDER WATER RESOURCES AND ENVIRONMENTAL ENGINEERING**

Friday Afternoons at 3:00 p.m.-Engineering Center Rm CE 0-1
Refreshments are served

- January 24 THE PRIVATE PRACTICE OF ENGINEERS, Mr. Kenneth Wright, President, Wright Water Engineers
- January 31 BIOGEOCHEMISTRY OF THE ORINOCO RIVER, Dr. William M. Lewis, Professor, Dept. of Environmental, Population and Organismic Biology, CU Boulder
- February 7 INTERACTION OF SURFACE WATER WITH GROUNDWATER, WITH AN EMPHASIS ON SMALL SYSTEMS, Dr. Thomas Winter, Hydrologist, U.S. Geological Survey
- February 14 A SPATIAL DECISION SUPPORT SYSTEM FOR REAL-TIME WATER ALLOCATION ON THE UPPER SOUTH PLATTE, David Sieh, Professional Research Assistant, CADWES, CU Boulder, Gil Barth, Graduate Student, Dept. of Civil Engineering, CU Boulder, and Dr. John Eckhardt, Assistant State Engineer, State of Colorado
- February 21 OPTIMAL REAL-TIME POLLUTION CONTROL FOR COMBINED SEWER SYSTEMS, Dr. John Labadie, Professor, Dept. of Civil Engineering, Colorado State University
- February 28 RELIABILITY-BASED DESIGN IN ENVIRONMENTAL & WATER RESOURCES ENGINEERING, Dr. James P. Heaney, Professor and Chairman, Civil, Environmental & Architectural Engineering, CU Boulder
- March 6 BIOGEOCHEMISTRY OF HUMIC SUBSTANCES IN LAKES AND STREAMS, Dr. Dave McKnight, Hydrologist, Water Resources Division, U.S. Geological Survey
- March 13 RISK REDUCTION FOR HYDROLOGIC FORECASTING DECISION SUPPORT SYSTEMS DESIGN AND IMPLEMENTATION, Dr. Lynn Johnson, Professor, University of Colorado, Denver
- April 3 SCALING EXPONENTS IN HYDROLOGY: FROM OBSERVATION TO THEORY, Dr. Vijay Gupta, Professor, Geological Sciences, CU Boulder
- April 10 COLORADO WATER-RIGHTS ADMINISTRATION: LEGAL AND TECHNICAL ASPECTS, Dr. John Eckhardt, Assistant State Engineer, State of Colorado
- April 17 BIOREMEDIATION OF SOILS USING VARIOUS TECHNOLOGIES, Dr. Thomas Simkin, Process Engineer, C H 2 M Hill Consulting Engineers
- April 24 THE ART OF MAKING MODELS FOR MANAGERS: SOME OBSERVATIONS, EXPERIENCES AND RESEARCH NEEDS, Dr. Peter Loucks, Professor, Civil and Environmental Engineering, Cornell University, Distinguished Visiting Professor, Dept. of Civil, Environmental and Architectural Engineering, CU Boulder
- May 1 THE HYDROGEOCHEMISTRY OF SOIL INTERSTITIAL WATERS AT THE ROCKY FLATS PLANT, Dr. Iggy Litaor, EG&G, Environmental Restoration Division, Rocky Flats Plant

CALLS FOR PAPERS

28th Annual Conference & Symposia
"Managing Water Resources During Global Change"
Reno, NV - Nov. 1-5, 1992

Abstracts for conference or symposia--For information contact General Chairman Raymond Herrmann, Water Resources, Cooperative Park Studies Unit, 233 Natural Resources, Colorado State University, Fort Collins, CO 80523. Phone: (303)491-7825. Deadline: Jan. 15, 1992. AWRA Short Course--The American Water Resources Association is currently accepting proposals for its 1992 short course program to be offered in conjunction with

AWRA's 28th Annual Conference and Symposium. Contact: Michael C. Fink, Director of Meetings, AWRA, 5410 Grosvenor Lane, Suite 220, Bethesda, MD 20814-2192. Phone: (301)493-8600; FAX: (301)493-5844. Deadline: Dec. 20, 1991.

Geographic Information Systems and Water Resources
Mobile, AL - Mar. 14-18, 1993

All are expected to pay registration fee. For information contact: John M. Harlin, Dept. of Geography, No. Illinois Univ., DeKalb, IL 60114. Phone: (815)753-6826. Deadline: May 29, 1992.

CALL FOR PAPERS

CONFERENCE AND WORKSHOPS

WATER RESOURCES AND ENVIRONMENT: EDUCATION, TRAINING AND RESEARCH

July 13 - 17, 1992

Colorado State University, Fort Collins, Colorado

Organized and Sponsored by:

Department of Civil Engineering and
Colorado Water Resources Research Institute

OBJECTIVE--The Colorado Commission on Higher Education in 1990 and Colorado State University (CSU) in 1991 designated CSU's water resources engineering programs as a "Program of Excellence." Building on this designation, Colorado State University plans to work with other universities, agencies and water industry groups to organize a conference to include workshops on education, training and research issues in the fields of water resources and environment. The conference and workshops will feature opportunities to describe curriculum and programs; to assess educational needs; to evaluate disciplinary issues; to identify program development opportunities, and to evaluate water and environmental education policy issues.

WHO SHOULD ATTEND--The conference and workshops will be of interest to educators; educational administrators; higher education and water policy officials; water agency officials; international training organizations; legislators, and other elected officials. Specialty workshops on program and curriculum development will be of focused interest to educators. The Ford Foundation has provided support for a Minority Institutions Collaboration Program in water and environmental resources. This program will be combined with the conference and workshops and special sessions of interest to minority institution educators will be included.

- TOPICS**
- Water and Environmental Issues: Technology, Science, Policy, Finance, Economics, Politics
 - University Curriculum Issues
 - Water Agency Training Needs and Programs
 - Scientific Information and Publication Systems
 - On-Line Databases
 - Accreditation and Certification
 - Continuing Education and Distance Learning
 - Computers in Education
 - Laboratory Issues
 - International/Global Issues in Education and Training

SUBMIT ABSTRACT BY February 14, 1992 TO:

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

Abstracts must be one page, single spaced with full names and mailing addresses of all authors following the title of the paper. Notification of acceptance of abstracts will be made by March 13, 1992. Five-page papers for preprinting in the Conference/Workshops Proceedings will be due May 18, 1992. [Papers received after this date will not appear in the Proceedings.] The Proceedings will be available at the time of the Conference. There is an early discount registration fee of \$325.00/person. Authors are expected to pay the registration fee.

COSPONSORSHIP SOUGHT--Organizations desiring to cosponsor are invited to contact the conference and workshops organizers (see General Information).

GENERAL INFORMATION--For all information concerning this conference and workshops, please contact Neil Grigg or Janet Montera, Civil Engineering Department, Colorado State University, Fort Collins, CO 80523 USA, Telephone 303-491-7425 and Fax 303-491-7727.

MEETINGS

COLORADO WATER ENGINEERING AND MANAGEMENT CONFERENCE
Including AWRA,
COLORADO SECTION SYMPOSIUM
 March 2-3, 1992 - Aurora, Colorado

Preliminary Program

March 2, 1992

Plenary Session: Environmental Issues
 Wetlands
 Wilderness
 Climate Changes
 Environmental Issues in Colorado

Breakout Sessions: Surface Water
 Climate Issues
 Groundwater
 Probable Maximum Precipitation
 Decision Support Systems
 Computing in Water Management

Reception with Educational Displays

March 3, 1992

Plenary Session: AWRA Meeting and Water Quality Symposium

Breakout Sessions: Economic Issues
 Conflicts in Water Management
 Hydraulics and River System Management
 Environmental Issues

COLORADO WATER CONGRESS ANNUAL CONVENTION
 Holiday Inn, Northglenn
 January 23-24, 1992

The Thursday, January 23 General Session features Keynote Speaker Hubert J. Farbes, Jr., President of the Denver Water Board. The other two speakers are (Invited) Attorney General Gail Norton; and Tom Donnelly, Executive Vice President, National Water Resources Association, Washington, D.C. Concurrent workshops will be held in the morning on environmental issues, hazardous waste, engineering and management developments, and wetlands. Luncheon Speaker will be John Sayre, Assistant Secretary of Interior for Water and Science, Washington, D.C.

In the afternoon a panel, moderated by Ken Salazar, will address the subject of "DNR's Priorities in Water." Salazar is Executive Director, Colorado Department of Natural Resources. Four concurrent workshops are scheduled in the afternoon on water conservation, legal ethics, engineering and management developments, and status of the Clean Water Act.

Friday's program includes a legislative breakfast with six legislators addressing the delegates. Morning concurrent workshops will feature the Colorado Water Resources Research Institute,

wilderness, financial developments, water quality issues, and legal developments and issues. The General Session will feature three speakers addressing Lower Basin Issues. The Wayne N. Aspinall Memorial Luncheon will feature presentation of the "Wayne N. Aspinall Water Leader of the Year" Award.

10TH HIGH ALTITUDE REVEGETATION WORKSHOP

DATES: Wednesday and Thursday, March 4 and 5, 1992 (Friday, March 6 - Optional tour of Rocky Mountain Arsenal)

LOCATION: University Park Holiday Inn, 425 W. Prospect, Fort Collins, Colorado (303-482-2626)

REGISTRATION: A brochure with the full agenda and complete registration information will be mailed to you in January

COST: \$130 regular registration (includes meals) or \$25 students

INFORMATION; (303) 491-7296, Gary L. Thor, HAR Committee Secretary, Department of Agronomy, Colorado State University, Ft. Collins, CO 80523

This year's conference will have an excellent group of speakers who will give updates on wetlands and riparian projects, erosion control products and techniques, industrial issues and ecological aspects of reclamation. A panel discussion will address issues involved in SMCRA bond release. The conference keynote address dealing with national park issues, some controversial, will be given by Lorraine Mintzmyer, the National Park Service's Mid-Atlantic Regional Director. This year's workshop will also include poster papers. To volunteer a poster exhibit contact Jeff Pecka, Systems Planning Group, 5973 E. Irwin Place, Englewood, CO 80112 (303-770-07476), or John Lawson, Wharf Resources, HC 30 Box 811, Lead SD 57754 (605-584-1441).

The workshop will have educational and exhibitor displays of reclamation products, equipment and services. To reserve an exhibit space please contact Marc Theisen, Synthetic Industries, 4019 Industry Dr., Chattanooga, TN 37416 (800-621-0444), or Mark Schuster, Grubb and Ellis, 5445 DTC Parkway, Englewood, CO 80111 (303-770-9900).

1992 WESTERN REGIONAL INSTREAM FLOW CONFERENCE II

Trout Unlimited and the Bureau of Reclamation have announced their recent signing of a cooperative agreement to cosponsor the 1992 Western Regional Instream Flow Conference II. The theme of the conference will be "Tools and Strategies for the Enhancement and Maintenance of Instream Flow." The two-day conference will be held in Jackson Hole, Wyoming on October 2-3, 1992. Further conference details will be announced later.

- Jan. 8-10 FOUR STATES IRRIGATION COUNCIL 1992 ANNUAL CONVENTION, Fort Collins, CO. Contact: Four States Annual Convention, P.O. Box 163, Loveland, CO 80539. Brian Werner (303)667-2437.
- Jan. 15-16 CONFERENCE ON WESTERN WATER RESOURCE ISSUES, Las Vegas, NV. Contact: Nate Cooper, Nevada Water Resources Association c/o Desert Research Institute, 2505 Chandler Ave., Las Vegas, NV 89120. Phone: (702)798-0560.
- Feb. 10-11 AGU 1992 FRONT RANGE MEETING, Boulder, CO. Contact: Rush Services Technical Communications, 3300 Arapahoe Ave., Suite 217, Boulder, CO 80303. Phone: (303)443-8489.
- Mar. 2-3 COLORADO WATER ENGINEERING AND MANAGEMENT CONFERENCE, Aurora, CO. Contact: Janet Lee Montera, Civil Engr. Dept., Colorado State University, Fort Collins, CO 80523. Phone: (303)491-7425. FAX: (303)491-7727.
- Mar. 4-5 10TH HIGH ALTITUDE REVEGETATION WORKSHOP, Fort Collins, CO. Contact: Gary L. Thor, HAR Committee Secretary, Dept. of Agronomy, Colorado State University, Fort Collins, CO 80523. Phone: (303)491-7296.
- Apr. 12-15 AWRA SYMPOSIUM ON FUTURE AVAILABILITY OF GROUNDWATER RESOURCES, Raleigh, NC. Contact: AWRA, 5410 Grosvenor Lane, Suite 220, Bethesda, MD 20814-2192. Phone: (301)493-8600.
- Aug. 19-22 CONGRESS ON CRITICAL RENEWABLE NATURAL RESOURCES ISSUES FOR THE 21ST CENTURY, Vail, CO. Contact: Debora R. Lebow, Prog. Dir., RNRF, 5430 Grosvenor Lane, Bethesda, MD 20814-2192. Phone: (301)493-9101.

SHORT COURSES

- Jan. 22-24 WATER SURFACE PROFILE COMPUTATION USING HEC-2, Colorado State University, Fort Collins, CO. Sponsored by ASCE. For information or to register by phone, call: 1-800-548-2723 or (212)705-7668.
- Feb. 24-28 STATISTICAL METHODS IN GROUNDWATER POLLUTION, Colorado School of Mines, Golden, CO. Contact: International Ground Water Modeling Center, Institute for Ground-Water Research and Education, CSM, Golden, CO 80401-1887. Phone: (303)273-3103. FAX: (303)273-3278.

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

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David Walker, Exec. Director
Colorado Water Conservation Board
1313 Sherman St., #823
Denver, CO 80203