Colorado Water

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

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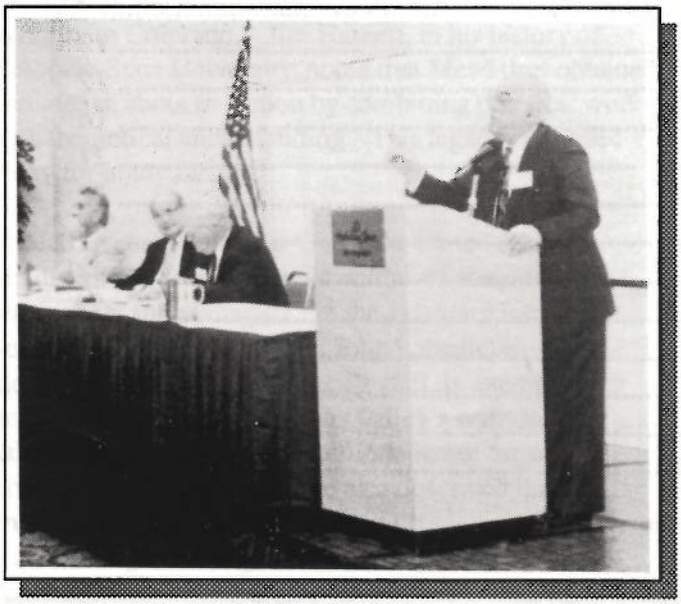

Evan Vlachos addresses the annual meeting of the Colorado Water Congress (see page 21)

ARTICLES

MEETINGS AND CALLS FOR PAPERS

Come and hear Ed Marston, Publisher of High Country News, discuss the Animas La Plata Project. His presentation will be Wednesday, April 9, 7:30 p.m., in the Cherokee Park Room, Lory Student Center, Colorado State University. It will be followed by a reception at the University Club.

Environmental Hydraulics of Mountain and Plains Watersheds and Rivers – **52ND ANNUAL MEETING, ROCKY MOUNTAIN HYDROLOGIC RESEARCH CENTER, September 5-6, 1997** **Page 31**

WATER PARNERSHIPS: Can Competing Users Cooperate to Manage a Vital Resource…And Live Happily Ever After? **COLORADO WATER WORKSHOP – July 30-August 1, 1997** **Page 32**

Colorado State University

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COLORADO WATER

Vol. 13, No. 2 April 1997

Editor: Shirley Miller Writers: Liz Rewey and Laurie Schmidt

COLORADO WATER is a publication of the Colorado Water Resources Research Institute. The scope of the newsletter is devoted to enhancing communication between Colorado water users and managers and faculty at the research universities in the state. This newsletter is financed in part by the U.S. Department of the Interior, Geological Survey, through the Colorado Water Resources Research Institute. The contents of this publication do not necessarily reflect the views and policies of the U.S. Department of the Interior, nor does mention of trade names or commercial products constitute their endorsement by the United States Government.

Colorado Water Resources Research Institute Phone: 970/491-6308
Colorado State University, Fort Collins, CO 80523. FAX: 970/491-2293
E-mail: cwis31@yuma/ACNS.ColoState.Edu
Internet: http://www.ColoState.EDU/Depts/CWRRI

Robert C. Ward, Director

BRINGING PRACTICE AND THEORY TOGETHER

Editorial by Robert C. Ward, Director

Higher education faculty in Colorado have a long history of working shoulder-to-shoulder with water users and managers in Colorado. Elwood Mead, after joining the CSU faculty in 1883, spent his summers working for State Engineer E.S. Nettleton. In describing his work with the State Engineer, Mead recalled that he "tramped the streams and measured the capacity of all the ditches in northern Colorado." Jim Hansen, in his history of Colorado State University, noted that Mead thus obtained knowledge about irrigation by combining practical work with theoretical understanding. This legacy continues today for many faculty.

In each issue of Colorado Water, we try to highlight faculty efforts as they work shoulder-to-shoulder with water users and managers. In the February issue we described how CSU engineer John Labadie, working closely with the State Engineer's staff, is attempting to better understand the Arkansas Valley's waterlogging and salinity changes via computer modeling of the processes involved. The February issue also described how CSU engineer Luis Garcia is working with several South Platte water management organizations to coordinate data development and evaluate analysis tools that can be used to develop management options.

In this issue of Colorado Water, we describe the efforts of Evan Vlachos, CSU sociologist and engineer, to help water organizations examine the future of water management in Colorado. We also note the endeavors of Dan Smith, CSU plant scientist, who is working with Colorado water managers to define the complex subject of irrigation water conservation.

There are many similar faculty efforts. At the University of Colorado, engineer Jim Heaney is working closely with a number of local and national water organizations to determine how water is used within the home. The goal is to obtain better information for future urban water conservation efforts. Professors Bob Siegrist, an engineer at the Colorado School of Mines, and Bill Lewis, a biologist from the University of Colorado, serve on a task force of the Denver Regional Council of Governments that is trying to better understand collective water quality impacts of septic tank systems in the Foothills. Jim Valliant, CSU Extension Irrigation Specialist, is organizing a technical group in the Arkansas Valley to coordinate agency efforts to help farmers with waterlogging and salinity problems in the valley.

Mark Fiege, CSU historian, is collaborating with Colorado drought managers to describe past drought management efforts. John Wilkens-Wells, CSU sociologist, is working with irrigation ditch companies in the West to explore development of secondary supply markets that will maintain their economic vitality in the face of urbanization. John Stednick, CSU watershed scientist, helped organize a statewide meeting on non-point source pollution last Fall and a national meeting on water education that will be held in Keystone this Summer. Marshall Frasier, CSU economist, is working with water managers and users in the San Luis Valley to determine the effects of a severe, sustained drought in the Rio Grande. Jessica Davis, CSU soil and crop scientist, is helping irrigators address the controversial topic of animal waste impacts on groundwater quality.

There are over 180 faculty in Colorado's colleges and universities who apply their disciplines, in one way or another, to water. The above list only scratches the surface of those working closely with Colorado water users and managers, but it does illustrate the many faculty efforts to combine practical work with theoretical understanding. When such combinations occur, Colorado water users, managers, faculty, and students all win.

Faculty integration of on-campus theoretical work with off-campus practical applications is not always easy. Practical problems have many dimensions, while theoretical developments are often along narrow disciplinary lines. To fully understand the practical applications of their work, faculty must not only keep up-to-date in their own discipline, but also be knowledgeable about water management policy, management program implementa-

tion, and day-to-day operations. For those faculty who can keep up with both the theoretical and practical dimensions of their work, the rewards are great.

How do faculty find time to keep up both in the theoretical and practical worlds? On the theoretical side, they do this by teaching at the cutting edge of their disciplines and by seeking contracts and grants to support theoretical research. On the practical side, they can work for local and state agencies during the summers as Professor Mead did in the 1880s. Some faculty perform consulting work as a way to keep up with the practical implementation of their science. Others seek contracts and grants with water management organizations to support working directly with the practical application of their science. Many get involved with the practical application of their discipline via service with local river groups, watershed councils, local water boards, ditch company boards, and community service organizations.

In summary, it is important that faculty understand the practical implications of their disciplinary research. Obtaining this understanding requires extra effort — effort that can be greatly enhanced by close working relationships with water users and managers in Colorado. Such relationships can provide water users and managers with a better understanding of the theoretical aspects of their problems, while faculty benefit from a better understanding of the practical implications of their discipline's theory. CWRRI seeks to facilitate the formation of such close working relationships between faculty and Colorado water users and managers.

WATER RESEARCH

CONDITION ASSESSMENT OF PARSHALL FLUMES IN COLORADO

by Steven R. Abt, Bryan C. Ruth, Cara M. Mitchell, and Chad M. Lipscomb

Introduction — The increasing demand for water resources has forced water suppliers, ditch and irrigation companies, and water districts to accurately allocate and distribute water to users. Accurate water measurement through conveyance and distributing systems is a vital component of water resource management throughout the arid and semi-arid western United States, and particularly in Colorado. The allocation and monitoring of water flow have become dependent upon flume measurements to maintain accuracy. One of the most critical flow measurement applications occurs where water is diverted to individual users, particularly for agricultural applications. Thousands of flumes throughout the west serve as the basis to volumetrically monitor water resource distribution. It was observed that many flumes have been in place for several decades and have become severely damaged, are poorly maintained, and/or are subjected to field practices that may result in questionable discharge measurements.

The Parshall flume was developed at Colorado State University to measure open channel discharge and is the most common instrument used in the agricultural community of Colorado. When the Parshall flume is properly installed, the flume is accurate to plus or minus 3 percent, which has become the industry standard for acceptable flow measurement. Flumes are usually constructed of concrete or metal, the weight of which cause long-term consolidation of the foundation soil and potential settlement of the flume. Resulting low-gradient channels or improper flume installations often create submerged flow conditions, where submergence is the ratio of the downstream depth of flow to the upstream depth of flow exceeding 0.7. In addition, the flume is routinely subjected to many cycles of wetting and drying, freezing and thawing, and heating and cooling. These and other factors affect subsequent flume accuracy.

A two-year pilot study was conducted by the CSU Agricultural Experiment Station to assess the condition of Parshall flumes used for flow measurement throughout the Colorado agricultural community. The study objective was to provide agricultural water users a snapshot of the current conditions of the water measurement and monitoring system infrastructure, the results of which are contained in the full study.

Conclusions and Recommendations — The results of the

conditions assessment are derived from a small sample of Parshall flumes surveyed in seven regions of the state, but are indicative of the status of the flow measurement and monitoring systems throughout Colorado. These results can be extrapolated to similar systems throughout the arid and semi-arid western United States. It is apparent that the water measurement infrastructure is aging. The deterioration of the infrastructure demonstrated the need to focus attention toward maintenance and/or replacement of the flow measurement instruments. The potential flow measurement discrepancies of nearly 27.5 percent of the flumes assessed portray a false sense of water accounting accuracy to water users and water resource managers. These results also indicated that many water users receive more than their allotted appropriation.

It is recommended that water users and managers perform a condition assessment of the comprehensive water distribution and measurement system(s). Strategies can be developed for upgrading the infrastructure and restoring confidence in the water measurement, monitoring, and management system. The flow measurement infrastructure must be upgraded if a relatively accurate accounting of water delivery and use is desired.

Acknowledgements — This study was supported by the Colorado Agricultural Experiment Station, Project No. 1-57151, The authors wish to acknowledge and thank the flume owners, as well as those individuals who located and coordinated access to the flumes for the CSU staff. The primary field contacts were: Mr. Bill Wittwer of Alamosa, Mr. Dick Bartholomay of Grand Junction, Mr. Walt Bland of Lamar, Mr. Mike Wish of Wellington, Mr. Brice Boesch of Rocky Ford, Mr. Gary Lancaster of Julesburg, and Mr. Bob Schott of Sterling.

For more information, contact Dr. Steven R. Abt, Civil Engineering Department, Colorado State University, Fort Collins, CO 80523. Phone at (970) 491-8203, fax at (970) 491-7727, or email at [abt@lance.colostate.edu].

WATER RESEARCH AWARDS

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

Colorado State University, Fort Collins, CO 80523

Sustainability of Colorado State Parks, Glenn E. Haas, Natural Resource Recreation & Tourism. Sponsor: Colorado Div. of Parks & Outdoor Rec.

Influence of the Tropical Western Pacific on Climate Dynamics, Wayne H. Schubert, Atmospheric Science. Sponsor: National Oceanic & Atmospheric Administration.

Simulations of the Interaction Between Deep Convection & the Ocean Mixed Layer..., William R. Cotton, Atmospheric Science. Sponsor: National Oceanic & Atmospheric Administration.

Long-Term Ecological Measurements in Loch Vale Watershed, Rocky Mountain National Park, Jill S. Baron, Natural Resource Ecology Lab. Sponsor: U.S. Geological Survey.

*Snow Distribution & Runoff Forecasting, Kings River Basin, California, Kevin J. Elder, Earth Resources. Sponsor: Corps of Engineers.

Integrating Condition Indices, Performance Measures, & Quadrant Decision Processes, Steven R. Abt, Civil Engineering. Sponsor: Corps of Engineers.

*DEC Monitoring Sites 1996-1998, Chester C. Watson, Civil Engineering. Sponsor: Corps of Engineers.

*Ecological Effects of Reservoir Operations on Blue Mesa Reservoir, Brett M. Johnson, Fishery & Wildlife Biology. Sponsor: Bureau of Reclamation.

*Quantification of Federal Reserved Water Rights for National Park Purposes, Thomas G. Sanders, Civil Engineering. Sponsor: National Park Service.

*Hurricane Dynamics, Wayne H. Schubert, Atmospheric Science. Sponsor: National Science Foundation.

*Continued Investigation of the Influence of Landscape on Weather & Climate, Roger A. Pielke, Atmospheric Science. Sponsor: National Science Foundation.

*Mixed Layer Processes & Parameterization in High Resolution Ocean Models, David A. Randall, Atmospheric Science. Sponsor: US Department of Energy.

*Irrigation Enterprise Management Study, John R. Wilkins-Wells, Sociology. Sponsor: Bureau of Reclamation.

Detection of Lower Tropospheric Aerosols & Cloud Parameters from GLI Sensor Data, Thomas H. Vonderhaar, CIRA. Sponsor: NASDA-Nat. Space Dev. Agency of Japan.

A Physical Approach to Derive Integrated Water Vapor & Cloud Liquid Water from AMSR...Thomas H. Vonderhaar, CIRA. Sponsor: NASDA-Nat. Space Dev. Agency of Japan.

*Opportunities & Obstacles for Sustainable Development, Douglas L. Murray, Sociology. Sponsor: MacArthur Foundation.

*Avian Diversity & Predator Assemblages in Lowland Riparian Areas, John A. Wiens, Biology. Sponsor: City of Boulder

Turkey/Watershed Management Estimation Techniques of Sediment Yield, Transport..., Freeman M. Smith, Earth Resources. Sponsor: Consortium for International Development.

Turkey East Anatolia Watershed Training Project, Merle H. Niehaus, International Research & Development. Sponsor: Consortium for Inter. Development.

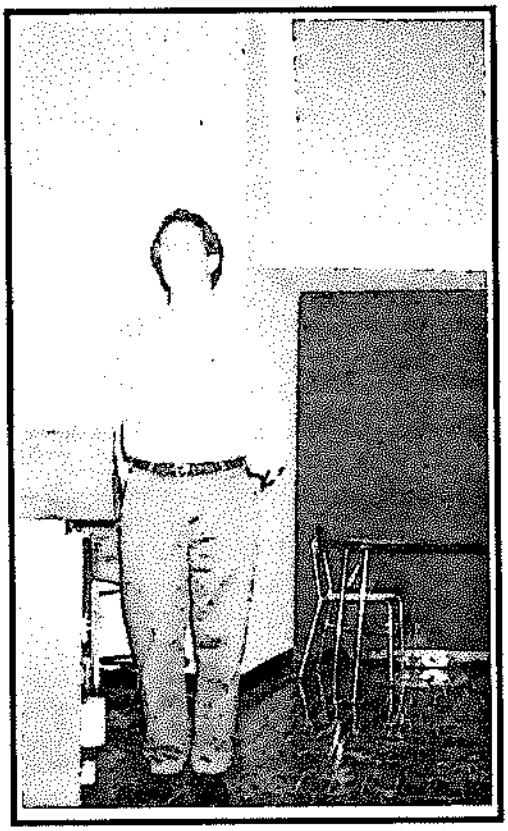
Turkey/Watershed Management & Plant Materials for Erosion Control Training, Larry R. Rittenhouse, Rangeland Ecosystem Science. Sponsor: Consortium for Inter. Development.

RENOWNED LECTURER ROBERT NAIMAN COMES TO CSU

by Liz Rewey

On January 31, 1997, Dr. Robert Naiman addressed several contemporary issues related to water resources. His presentation, entitled "Fresh Water and Freshwater Resources in a Changing World," questioned whether today's version of Integrated Watershed Management is science or myth. Because it lacks realistic, applicable interpretation, argued Dr. Naiman, Integrated Watershed Management is currently more of a myth.

According to Dr. Naiman, Integrated Watershed Management can be transformed into sound application and practice once we consider the following: water as a strategic resource; the abilities and limits of fresh water supplies; the channeling, or isolation of rivers; and multiple aspects of changing land use.



Robert Naiman addresses today's version of Integrated Watershed Management

Dr. Naiman illustrated four major aspects of land use change as potential areas of application. First, he cited impending demographic changes such as the likely doubling of the world's population in the next 50 years, 90 percent of which will be in developing countries currently lacking sufficient water supply to meet such demand. Next, Dr. Naiman encouraged a consideration of resource consumption and waste. A third land use change is the threat to freshwater biodiversity resulting from alteration of physical habitat. Lastly, Dr. Naiman emphasized the need for social and institutional organizations to collaborate on longer, more accurate studies before creating policies.

On a more affirmative note, Dr. Naiman cited advancements in both intellectual and practical applications of watershed management. By studying "freshwater fingerprints," theorists are better able to understand the make-up and fate of rivers.

Dr. Naiman also sees a growing synthesis among various disciplines related to water management. These interfaces, he explained, are necessary to approach water management decisions with total certainty. Finally, Dr. Naiman emphasized improvements in practical applications of Integrated Water Management, such as improved management and extraction of resources and more frequent cycles of feedback between researchers and the public.

CHALLENGES FACING WATER SUPPLIES IN COLORADO

by Chuck Lile, Director
Colorado Water Conservation Board
at the Arkansas River Basin Water Forum, Jan. 22-23, 1997

I appreciate the opportunity to address this forum and want to compliment the planning committee for their efforts in organizing this conference. This is our third year, and there is a need to provide an opportunity for a review of concerns and issues surrounding the vital resource of water in the Arkansas River Basin. I would like to provide a brief overview of major statewide water issues that impact water management in Colorado. I will then focus in more detail on issues concerning the Arkansas River.

Our state is changing, and those changes are taking our water uses beyond the traditional/historical pattern. Traditionally, water in Colorado has played a significant role in the development of our state, and it will continue that role in the future. The historic use of water started with mining and then evolved into agricultural use within a few years. The miners used the water for hydraulic mining and power production. This was not an extensive consumptive use of water; it was a diversion from the stream, with the amount of return to the stream nearly equal to the diversion. The depletion of the resource was not significant in terms of quantity.

...our position as an upstream state experiencing rapid growth places us in a unique situation. There are increasing downstream needs, and we need additional supplies, but we do not have anyone upstream to look towards. Our only option is to look internally within our existing supplies to meet the future needs of Coloradans.

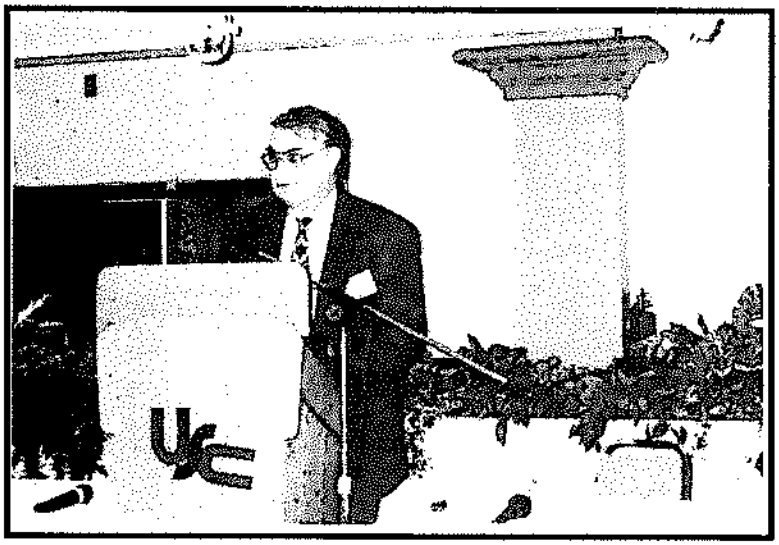
As our state developed, agriculture began to use water, and there were diversions from our streams for irrigation. These diversions changed the amount of water returning to the streams and modified the timing of return flows, depending upon the amount of diversion, type of crops being grown, and distance from the stream. Irrigation changed the pattern of stream flows in our state. There is a recharge or enhancement of groundwater and a delay in the time of return flows. These return flows are then diverted, and patterns of use and reuse have developed throughout our stream systems. By storing water in groundwater aquifers, the water supply is extended. Rather than having the heavy snowmelt and thunderstorms wash water out of our state, we retain these flows in the groundwater and also in the reservoirs that have been built. This pattern of water use has been in place for a century, but as our state becomes urbanized, there are demands being placed on our use patterns.

The growth of our population is resulting in the need for more water for municipal and domestic use, as well as for water-based recreation and environmental needs. Not only is there competition to change use patterns, but we are also faced with challenges from downstream states and the influence of national laws and changing perspectives. This forum touches on these issues, and there will be several speakers in the next two days who will expand further on the competing demands for water in the Arkansas.

Colorado is at the headwaters of four major rivers in the West: the Colorado, the Platte, the Arkansas, and the Rio Grande. We have seven contiguous states, plus several non-contiguous states, including Nevada, California, and Texas, who rely on Colorado for water. Additionally, there is an international obligation to Mexico. All of our downstream neighbors have finite supplies of water and are faced with the need for additional water. Consequently, our position as an upstream state experiencing rapid growth places us in a unique situation. There are increasing downstream needs, and we need additional supplies, but we do not have anyone upstream to look towards. Our only option is to look internally within our existing supplies to meet the future needs of Coloradans.

The crux of our problem is, how do we meet our interstate obligations, provide water to meet the changing demands, and protect the historical uses? We have available to us surface water, tributary groundwater, confined aquifers, and non-tributary groundwater supplies. It is within the limits of these supplies that we must chart our future.

I would like to briefly discuss how we are trying to manage these issues on the South Platte River. Presently, the Front Range is one of the fastest growing regions in the United States. The primary source of water for this region is the South Platte River and trans-mountain imports from the Western slopes. There is also reliance on non-tributary groundwater. We are faced with interstate litigation between Nebraska and Wyoming on the North Platte River that may impact the South Platte, and there are attempts to limit our water use through the Endangered Species Act and the federal permit requirements regarding infrastructure on forest lands.



Chuck Lile at the Arkansas River Basin Water Forum

To address Front Range water supply issues, the Colorado Water Conservation Board (CWCB) requested funding from the state legislature in 1993 for a Metro Water Supply Study. Governor Romer convened a formal process in the Fall of 1993 utilizing an Advisory Board with broad representation of water users. Through that process, a technical committee of consultants and staff from those entities was established to guide the study. We are pleased that the study is nearing completion, and we have identified some solutions for enhancing municipal supplies. Conjunctive use of groundwater, integration of existing physical infrastructure, and reuse of existing supplies have been identified as potential options. Although the formal process is being completed, we have agreed to continue to facilitate technical meetings between Front Range water providers. The willingness of the metro providers to seek cooperative solutions is the most significant development.

Perhaps one of our most promising methods for extending the non-tributary aquifers of the Denver Basin which are being used for the supplies, primarily south of Denver, is the conjunctive use of surface and groundwater. During times of surplus surface water supplies, they can be banked in the Denver Basin aquifers, either by not pumping groundwater and exchanging the amount with surface providers, or by direct recharge of the aquifers with excess water. During dry periods, this water can be recovered. Certainly, it will be necessary to store surface water supplies in reservoirs and to facilitate injection at a rate that the aquifers can accommodate.

While working on the metro supply studies, we have also funded projects in the Lower South Platte to re-regulate and manage state line flows through the Tamarack groundwater recharge project which, in essence, diverts surplus flows from the South Platte into recharge ponds that allow for the recharge of the groundwater table. Thus, there is a delay in the timing of return flows from the groundwater aquifer, which enables us to deliver water to Nebraska at a time which is helpful to stream flows that enhance flows in critical reaches of the Platte River.

A three state MOU between Nebraska, Wyoming, Colorado, and the U.S. Fish and Wildlife Services has been negotiated for the purpose of developing a recovery plan for the endangered species in Nebraska. While a formal recovery program has not yet been agreed upon, progress is being made.

This process will also aid in resolving issues in the Nebraska vs. Wyoming U.S. Supreme Court litigation, since Nebraska has asserted a claim for water to improve wildlife habitat along the Platte River. Last year the state legislation passed SB96-74, which directed myself and the State Engineer to collect data concerning existing uses of surface and groundwater in the South Platte basin and

prepare a report for an interim legislative committee for their review by June 1, 1997. We are conducting studies of the economic life of the Denver Basin aquifers, evaluating the effects of the pumping of these basins on the system, collecting present use data, and conducting public meetings throughout the basin. Prior to submitting our report, there will be opportunities for peer and public review.

Turning to the Colorado River drainage, we are faced with increasing use by the Lower Basin states which are diverting water in excess of the basic apportionments of 7.5 maf. Flows to recover the four endangered fish, the need for additional development of water supplies for growing communities in Colorado, and settlement of the Ute Indian claims in Southwest Colorado regarding the construction of the Animas-La Plata project are all issues to be dealt with.

We are often criticized for working to resolve the issues surrounding the ESA. However, it is our judgment that this approach which seeks solutions through cooperative partnerships is more productive than the uncertainty of litigation. With litigation through the federal courts, there are clearly uncertainties and we do not wish to have a court set precedent using the ESA, which may impose greater restrictions on our water apportionment than exist already through interstate compacts. In order to avoid the uncertainties of litigation, and to assure that we have input into the recovery programs which allow Colorado to develop its water resources while meeting the obligation of protecting endangered species, we have worked to develop collaborative solutions.

We are, of course, very involved in the operation of the Colorado River system from the headwaters to the Gulf of California. The law of the river — which includes the Colorado River Compact, the Upper Basin Colorado River Compact, the U.S. Supreme Court decision in Arizona v. California, and the federal laws surrounding the operations of federal reservoirs, including Lake Mead, Lake Powell, Navajo Reservoir, Flaming Gorge, and Blue Mesa Reservoir — requires constant vigilance to ensure that there is adequate storage and operation of the River to preclude downstream demands in excess of compact obligations.

There are two recovery programs in place for endangered fish. One is for the Upper Colorado River Basin, which includes a partnership between the States of Colorado, Wyoming, and Utah and the U.S. Fish and Wildlife Service, the U.S. Bureau of Reclamation, various water users, and environmentalists. The other program is for the San Juan River system, which is a partnership between the States of Colorado and New Mexico, the U.S. Fish and Wildlife Service. Ute tribes, water users, and environmental interest groups. Both of these programs are designed to allow for efforts to recover the four endangered species of fish while protecting existing water uses and providing the opportunity for the development of our compact apportionments.

I would like to explain why we are working on the recovery programs. The Endangered Species Act (ESA), which passed in 1972, gives the U.S. Fish and Wildlife Service very broad enforcement capabilities. The Service has the authority to review any federal action that may impact an endangered species, or the species' habitat, to ensure that there are no adverse consequences to the species. The Service can preclude the action, or they can develop a plan that allows for the action or activity to occur if there are provisions which prevent adverse impacts to the species and provide reasonable and prudent alternatives for the protection and recovery of the species. Since almost any activity involving water development will have a federal nexus (i.e. required compliance to federal laws such as the Clean Water Act or the Federal Land Planning Management Act), developments will face the need to address the ESA.

We are often criticized for working to resolve the issues surrounding the ESA. However, it is our judgment that this approach which seeks solutions through cooperative partnerships is more productive than the uncertainty of litigation. With litigation through the federal courts, there are uncertainties and we do not wish to have a court set precedent using the ESA, which may impose greater restrictions on our water apportionment than exist already through interstate compacts. In order to avoid the uncertainties of litigation, and to assure that we have input into the recovery programs which allow Colorado to develop its water resources while meeting the

obligation of protecting endangered species, we have worked to develop collaborative solutions.

On the Colorado River, we are making efforts to manage the water which we are required to deliver downstream by interstate compact to facilitate recovery of the fish. It is our goal to avoid sending any greater amounts of water downstream than we are required by interstate compacts. We can vary the timing of deliveries through reservoir re-operation, which is beneficial to the habitat of endangered fish, and receive credit for it as compact deliveries without increasing our obligation to downstream states.

One of the key tools we are using is the Colorado River Decision Support System (CRDSS), which began development in 1993 through the efforts of our agency and the State Engineer's office. The CRDSS was originally a response to lessons that we learned as a result of the Arkansas litigation. One of the tools we are developing is river modeling, which can aid us in scheduling releases of reservoir water and enhance the reservoir use timing.

During the preparation of trial before the U.S. Supreme Court or the Arkansas River, we found that the records of water use in Colorado were not adequate to aid in evaluating the use of the River. Maintaining good, quality records of water use is an essential part of managing all the rivers in our state. Consequently, the CWCB has started with the development of better data for the Colorado River, and we plan to expand the CRDSS to all of our rivers. Simply put, the best defense to challenges from downstream states is a good offense, which is documentation of our existing uses of water within Colorado.

Annual use in the Lower Basin states (California, Nevada, and Arizona) is in excess of 7.5 maf, as allocated under the Colorado River Compact. Although California is allocated 4.4 maf, its present annual use is 5.2 maf. This was not a problem prior to 1996, when Nevada and Arizona were not using their total allocations. Now, however, the Central Arizona project is rapidly increasing that state's usage to 2.8 maf, and Nevada is growing rapidly as well. This past year, the Secretary of the Interior declared a surplus on the system, which allowed for the delivery of additional supplies from Lake Mead. Lake Mead is currently at a level which may require evacuation of stored water to

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avoid flood spills. It is my understanding that releases may begin as early as this week, after an evaluation of projected runoff for 1997 is completed. The present amount of water in storage supports the Secretary's decision for this year and next year. However, the day will come when storage is not sufficient to justify a surplus declaration.

The problem facing California is that during dry cycles, surplus water will not be available, and they cannot rely on these surplus declarations to meet their long-term needs. The other six Basin states are encouraging them to develop options to reduce their reliance on surplus supplies. This is possible through conservation, reduction of agricultural use in dry years, fallowing of presently irrigated lands, and the importation of additional supplies from Northern California. The other Basin states have expressed a willingness to cooperate in developing short-term solutions as long as California establishes a plan to bring their use within the 4.4 maf apportionment.

Similar issues are also evolving on the Rio Grande. Recently, the State Engineer and his staff found that use patterns in Texas were changing from traditional agricultural to municipal. This has altered the delivery timing from Elephant Butte Reservoir, which can cause severe consequences in Colorado. Traditionally, the demands for use from the reservoir were for irrigation, which is a seasonal use. However, municipal and domestic uses represent year-round demands. The timing of releases affect whether or not there will be a spill and when it will occur. Colorado is not required to curtail uses on the Colorado River. If water is released sooner than has been done in the past, then a spill will not occur, and Colorado will be forced to curtail uses.

The CWCB has provided funding to the water users in the Rio Grande Basin to evaluate the operations of the Rio Grande in New Mexico and Texas to further understand

how re-operations vs. historical operations may impact Colorado water users. Also, there are endangered species in the Rio Grande in New Mexico which are being closely monitored for potential threats to Colorado water users.

I would like to point out another problem facing us. I have discussed the recovery programs, but I have left out an important issue: the COST of these programs. On the Colorado River, it is estimated that it will cost $80 million; on the Platte River, $75 million; and on the San Juan River, $20 million. Colorado is faced with sharing the cost on all of the basins. Where the money will come from is an essential question. As part of the SB-74 study, the legislature charged us with seeking public input on this key question. The source of funding is a statewide issue, and we welcome suggestions on how to best fund these obligations.

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In each and every basin of our state, we are facing major challenges, and the Arkansas River is no exception. Previous meetings of the forum have focused on the Kansas vs. Colorado litigation, and today you will be hearing more about it. I don't intend to spend a lot of time detailing the case; however, I would like to update everyone on activities which have occurred since we last met.

As a result of the efforts of the Arkansas River Coordinating Committee, legislation was drafted and passed during 1996. We refer to the law as the ***Arkansas River Compact Protection Act***. It provides for additional staff for the State Engineer, the enforcement of groundwater pumping regulations, the collection of electronic records to calculate groundwater pumping, loans for the purchase of augmentation water, grants for computer technology to aid the augmentation groups, and funding for studies to improve the conveyance channel of the Arkansas River below John Martin Reservoir.

The CWCB has also approved a grant to the Southeastern Conservancy District to complete a needs assessment of future water demands in the basin. The grant is for $75,000, and we are working with Southeastern's manager, Steve Arveschoug, to develop a partnership with water users who will participate in the study to ensure that water needs are addressed on a regional basis.

The Arkansas River is the driest river in our state. The water users, however, are facing the same issues as the rest of the state: urban growth, recreational demands for water, and the need to fund adequate augmentation water for the pumping of groundwater for agricultural purposes. Consequently, I believe that the needs assessment study is very important at this time, and I encourage the water users to participate in the process.

It is easy to manage water during wet cycles, but without the ability to carry supplies over to the dry periods, either through reservoir storage, groundwater The manner in which Arkansas River water users address the competing demands in this basin will guide the future of the basin's quality of life and economic well-being. I believe that we need to look for innovative methods to manage limited water resources, not only in the Arkansas River Basin, but in our entire state.

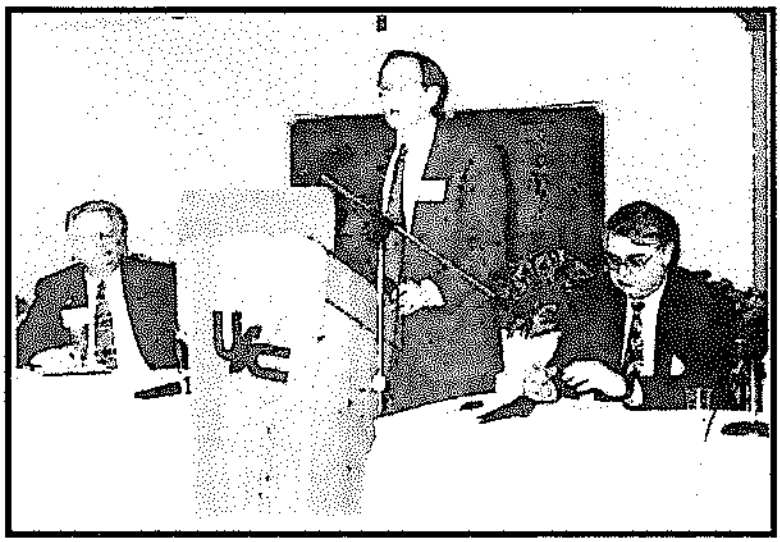
In conclusion, let me discuss the role of the CWCB. The Board was established to assist in the development and protection of our compacted apportionments, and that is still our primary charge. We have been given tools by the state legislation to further that goal. These tools include a Board with representation from each basin, a staff with diverse expertise, a revolving construction loan program, a conservation grant and education program, a flood management plan, and instream management. We serve on interstate compact commissions and on national water policy organizations, such as the Western States Water Council, and we can propose federal and state legislation in the interest of our state.

We are not a regulatory agency, but an agency whose role is to support the citizens of Colorado to ensure that we have adequate water supplies to meet the changing demands of the future. We view our job as a partnership with Coloradans. Thank you for the opportunity to address you today.

UPDATE – KANSAS V. COLORADO

Presented by Dennis Montgomery
Hill & Robbins, P.C.
at the Arkansas River Basin Water Forum

Chuck Lile has worked for the State of Colorado for 30 years, and Colorado is lucky to have a man of such broad experience as director of the Colorado Water Conservation Board. In his opening remarks, Chuck brought to our attention a wide range of issues facing water users in the State of Colorado and in the Arkansas River Basin. The Arkansas River Basin is probably the most water-short basin in Colorado, and water supply has always been a major issue. Now, in addition, there are endangered species issues and environmental issues that water users did not have to face in the past.



Dennis Montgomery updates participants at the Arkansas River Basin Water Forum, Jan. 22-23, 1997

For the past three years, the focus of many water users in the Arkansas River basin has been on a program to bring post-compact well pumping in Colorado into compliance with the Arkansas River Compact. The focus of that effort revolved around amended rules and regulations which the State Engineer adopted in September of 1995. Let me give you a brief history of what has occurred in the past three years.

In February 1994, a Special Master appointed by the U.S. Supreme Court issued a draft report indicating that he would recommend to the U.S. Supreme Court that post-compact well pumping in Colorado had caused material depletions to usable Stateline flows in violation of the Compact. He allowed the states to submit further arguments; then issued his final report in July 1994. He did not change any of his recommendations in any significant way.

In August 1994, the Governor appointed the Arkansas River Basin Coordinating Committee. The committee was comprised of a wide variety of interests in the basin, including ditch owners, well users, representatives from the Arkansas River Compact Administration, state officials, including Chuck Lile and Hal Simpson, the State Engineer, representatives from the Cities of Colorado Springs and Pueblo, and from the Southeastern Colorado Water Conservancy District. Committee members met for months and discussed possible programs to bring post-compact well pumping into compliance with the Compact. In the meantime, both Colorado and Kansas filed exceptions to the Special Master's report. Those were argued to the U.S. Supreme Court in March 1995, and on May 15, 1995, the U.S. Supreme Court issued an opinion overruling all exceptions, affirming the report of the Special Master, and returning the case to him for further proceedings.

The Arkansas River Coordinating Committee then became the forum to hammer out a set of amended rules and regulations that the State Engineer could adopt to bring post-compact well pumping into compliance with the Compact. Water users in this basin are to be commended for the effort that was made. Ditch owners indicated at that time that in order to get their support, the rules and regulations would have to address the impact of well pumping on senior surface rights in Colorado. The well owners, to their credit, agreed that the rules and regulations should do that.

Finally, in September 1995 the State Engineer adopted amended rules and regulations. Protests were filed and some well owners in the basin challenged the amended rules, but these were only a handful. Many water users – well owners and surface users alike – supported the amended rules and regulations. Rather than spending money to challenge the amended rules and regulations, most well owners applied their energies to developing plans that would comply with the amended rules.

At the end of April [the Special Master] entered an order approving the amended rules, to become effective June 1 of last year. By July 5 the State Engineer had approved 12 plans submitted by well owners to comply with the amended rules and regulations.

Last April Judge Anderson, the water judge for Water Division 2, held an eight-day trial in Canon City on protests to the amended rules. At the end of April he entered an order approving the amended rules, to become effective June 1 of last year. By July 5 the State Engineer had approved 12 plans submitted by well owners to comply with the amended rules and regulations. The plans included those submitted by the three major well organizations in the Arkansas River basin – the Colorado Water Protective and Development Association (CWPDA), the Arkansas Groundwater Users Association (AGUA), and the Lower Arkansas Water Management Association (LAWMA).

I don't mean to suggest that well owners had a choice about complying with the Compact — they did not. But certainly if they had resisted the adoption of the amended rules and regulations, it would have made it more difficult for the State of Colorado to come into compliance with the Compact. Ultimately, the U.S. Supreme Court would have forced Colorado to bring post-compact well pumping into compliance with the Compact. The Supreme Court, for example, could have issued an injunction to prohibit any pumping in Colorado over the 15,000 acre-foot pre-compact pumping allowance permitted under the Compact. If there were depletions caused by post-compact pumping in Colorado, the Supreme Court could have taken other actions that would have been very painful to the State of Colorado. For example, it could have limited storage in Pueblo Reservoir, John Martin Reservoir, or Trinidad Reservoir, all federal reservoirs operated by federal agencies, to assure that Kansas would get the water to which it is entitled under the Compact. Such actions would have severely impacted surface users in the basin who pay to use those reservoirs, and would have pitted surface users against well users in the basin.

The accomplishments of the last three years are truly remarkable, but we are not out of the woods yet.

The Colorado Legislature is also to be commended. The Special Master was somewhat critical of Colorado's administration of groundwater in the Arkansas River basin. The Legislature adopted Senate Bill 96-124 that included fines for violation of rules and regulations. It included funding for the state and the division engineer's office for additional employees to administer groundwater and to enforce rules and regulations that have been adopted. It also included funding of low-interest loans from the Colorado Water Conservation Board's construction fund to purchase water rights for the Lower Arkansas Water Management Association to replace depletions caused by well pumping.

The accomplishments of the last three years are truly remarkable, but we are not out of the woods yet. Kansas does not like every aspect of our plans to comply with the Compact, but I think even Kansas has shown its grudging respect for the accomplishments in Colorado over the last 18 months since the U.S. Supreme Court issued its opinion finding that Colorado had violated the Compact.

Now, let me bring you up-to-date on what has happened in Kansas vs. Colorado. On December 20 we completed the last scheduled trial segment and we are awaiting a second report by the Special Master to the U.S. Supreme Court. For those of you not familiar with the case, let me give you a little background.

In December 1985 the State of Kansas filed a motion with the U.S. Supreme Court for leave to file a complaint against the State of Colorado alleging violations of the Arkansas River Compact. Some of you might wonder why Kansas chose to file in the U.S. Supreme Court. The answer is that the U.S. Supreme Court has original and exclusive jurisdiction over cases between two or more states. It is the only forum for one state to sue another

state. The reason Kansas filed a motion for leave to file a complaint instead of simply filing a complaint (which is what a plaintiff could do in most other courts) is that the U.S. Supreme Court is very protective of its original jurisdiction. It does not have time to hold trials in cases any longer. Most of its time is taken up with hearing appeals on questions of federal law. Therefore, the Supreme Court rules require filing a motion for leave to file a complaint to give the Court an opportunity to decide if the case truly merits a hearing before the Supreme Court.

In March 1986 the U.S. Supreme Court granted the motion and later appointed Arthur L. Littleworth of Riverside, California, as a Special Master to take evidence and submit a report to the Court with his recommendations. That is the typical procedure in original actions between states. The U.S. Supreme Court does not have time to sit as a trial court. It appoints a Special Master with authority to take such evidence as he deems necessary and then prepare a report with his recommendations and submit that to the Court.

Prior to the commencement of trial in Kansas vs. Colorado, the Special Master granted a Kansas motion to bifurcate the trial into liability and remedy phases. The Special Master decided he would first determine if there had been any violations of the Compact and then he would hear evidence to determine what remedy was appropriate if there had been any violations. In July 1994 Mr. Littleworth submitted his report to the Supreme Court on the liability issues. The Special Master recommended that the Supreme Court find that post-compact well pumping in Colorado had caused material depletions of the Arkansas River at the Stateline in violation of the Arkansas River Compact.

In June 1995, about a month after the Supreme Court decision, Kansas filed a motion for an injunction with the Special Master and requested an expedited hearing. The Kansas motion requested that Colorado be enjoined from pumping more than 15,000 acre-feet per year until such time and only to the extent that Colorado had guaranteed the delivery of flows to offset depletions to Stateline flows caused by post-compact well pumping.

Colorado responded ...that there was no accepted method which the Special Master had approved by which depletions could be determined, nor was there any method by which Colorado could demonstrate the adequacy of a plan to replace those depletions.

On that claim, the Special Master concluded that post-compact well pumping in Colorado had depleted state-line flows in violation of the compact.

Both states filed exceptions to the Special Master's report. The exceptions were argued before the Supreme Court on March 21, 1995. On May 15, 1995, in an opinion by Chief Justice Rehnquist, the U.S. Supreme Court overruled all exceptions of both states and remanded the case back to the Special Master for determination of the unresolved issues. These issues included quantification of past shortages or depletions that had occurred to Stateline flow and determination of a remedy (including whether injunctive relief to ensure future compliance with the compact was necessary and a remedy for past depletions to state-line flow).

In June 1995, about a month after the Supreme Court decision, Kansas filed a motion for an injunction with the Special Master and requested an expedited hearing. The Kansas motion requested that Colorado be enjoined from pumping more than 15,000 acre-feet per year until such time and only to the extent that Colorado had guaranteed the delivery of flows to offset depletions to Stateline flows caused by post-compact well pumping. The motion was based on the grounds that, according to Kansas, the Supreme Court had determined that post-compact pumping in amounts greater than 15,000 acre-feet per year violated Article IV-D of the Compact, and that requiring immediate compliance with the Compact was appropriate even though the Special Master had yet to determine the amount of the past depletions or a procedure to calculate those depletions to Stateline flows in the future.

Colorado responded to the motion by pointing out that there was no accepted method which the Special Master had

approved by which depletions could be determined, nor was there any method by which Colorado could demonstrate the adequacy of a plan to replace those depletions. Colorado then outlined the actions that were being taken to bring post-compact well pumping into compliance with the Compact, including the consideration of amended rules and regulations which were being discussed at that time by the Coordinating Committee. In September 1995 the Special Master entered an order denying the motion for an injunction. The Special Master pointed out that the Supreme Court did not find, and that he did not recommend, that any pumping over 15,000 acre-feet per year in Colorado was unlawful under the Compact. He pointed out that the impacts of additional pumping above the 15,000 acre-feet per year permitted under the Compact could be offset by other changes in Colorado, including return flows from transmountain water that is imported into the basin.

The Special Master pointed out in his order that experts from both states had testified that the only way to isolate depletions caused by post-compact well pumping was through the use of hydrologic modeling, and that the evidence at that point was now more than ten years old. He pointed out that no methodology had yet been established to determine depletions and that the evidence on depletions needed to be brought up-to-date. The Special Master noted that denying the Kansas motion at that time did not preclude appropriate relief in the future. He said the means are not now available to him to determine the impact of current pumping. He noted that Kansas had expressed understandable concern over the possibility of delays in bringing Colorado into current compliance with the Compact, but noted that Colorado was proceeding through its own statutory and administrative procedures to develop controls on pumping and programs to offset depletions. He pointed out that he could impose standards on Colorado if Colorado failed to do so through its own processes.

Following a status conference in July 1996, the Special Master established a trial schedule to present evidence. One item was to quantify depletions to Stateline flows for the period 1950-1985 consistent with his prior report. Then he scheduled hearings to quantify depletions for the period 1986-1984. The states eventually agreed to use the model that had been developed by Kansas experts to quantify depletions. In October 1995, Colorado and Kansas entered into a stipulation to quantify the depletions that occurred between 1950-1985. Using the Kansas hydrologic model, those depletions were 328,505 acre-feet for that period. That works out to about 9,125 acre-feet per year for that 36-year period. The Special Master also set up a schedule for the State Engineer to report to Kansas on Colorado's efforts to comply with the Compact and scheduled a series of hearings for Hal Simpson, the Colorado State Engineer, to report on what Colorado was doing to comply with the Compact.

We held a series of meetings with Kansas experts to agree on basic data that is needed in the model to quantify depletions for the period 1986-1994, which includes streamflow, precipitation data, irrigated acreage, and pumping data. Eventually we agreed on all of the basic data; however, the Kansas experts announced that they had discovered a problem or an error in the Kansas model that needed to be corrected. The Colorado experts said they had pointed out this error four years earlier, but they also thought there were other deficiencies in the model that balanced this error. They thought the model was appropriate to use for quantifying depletions and did not agree with Kansas experts that one error should be corrected selectively.

In March 1996 the Special Master held a hearing to address Stateline depletions for the period 1986 to 1994. Colorado experts, using the same model that Kansas experts had developed for the 1950-1985 period, updated it and determined that depletions to usable Stateline flows for the nine-year period were roughly 30,000 acre-feet or about 3,300 acre-feet per year. Kansas experts, using their version of the model, determined that depletions for that nine-year period were 90,000 acre-feet, or about 10,000 acre-feet per year. At the conclusion of the March trial segment, the Special Master said that all of the experts had agreed that there was a problem with the model. Colorado experts said that it was unfair to correct that one problem selectively without addressing other problems in the model. The Special Master said that he would like to see the states develop the best model possible and that he wanted to hear additional evidence from the Colorado experts on what the results would be if they were to correct the other problems in the model. He then scheduled additional trial segments that were held in September, October, and November of this year, with a final day of testimony on December 20.

Colorado experts then corrected other problems to the model, in addition to the problem that the Kansas experts had pointed out, and reran the model. They calculated depletions of about 18,000 acre-feet for the nine-year

period. This amount was smaller than the depletions calculated without any changes to the model. So, evidence at the present time is that depletions to usable Stateline flows for the 1986-1994 period are somewhere between 18,000 and 90,000 acre-feet. The Special Master has indicated that he will issue another report to the Supreme Court early this year, deciding which version of the model he thinks is appropriate to quantify depletions. This is important to Colorado, because knowing which version of the model the Special Master will approve for determining depletions through 1994 will provide a tool to determine compliance in the future. Currently, well users are put in the unenviable position of not knowing how to calculate depletions to Stateline flows and feeling, with some justification, that they are shooting at a moving target. Hopefully, this year we will get some direction from the Special Master.

The Master... will address two...legal issues in the report he will issue early this year. One will be the measure of damages, and the other will be whether the 11th amendment to the U.S. Constitution bars Kansas from claiming damages to individual water users.

The Special Master will also address legal issues related to a remedy for past depletions. Early last year, he asked Kansas to file a statement of its position with regard to a remedy for past depletions. Kansas indicated in its statement that it wanted a remedy in the form of money only. Kansas also said that the measure of those damages should be the loss to Kansas, or the benefit to Colorado, of having additional water during this 45-year period, whichever was highest. Kansas also said that it was entitled to prejudgment interest on damages. You don't need to be an economist to realize that prejudgment interest would be significant on damages that go back to 1950. Kansas also said that it was entitled to recover losses that had been suffered by individual farmers from not having water that had been depleted by well pumping in Colorado. Those damages might take the form of increased pumping costs or crop losses.

In its response, Colorado suggested that water might be a simpler and more equitable remedy. It certainly would take substantially less time for the Special Master to fashion a remedy if he were to order repayment of past depletions in water rather than in money damages. Colorado also argued that the measure of damages should be the traditional measure of damages for contract breaches, which is the loss to the plaintiff (the State of Kansas). Colorado also argued that the 11th amendment to the U.S. Constitution bars a state from claiming damages that occurred to its citizens and that it is limited to asserting damages that occurred to the State of Kansas.

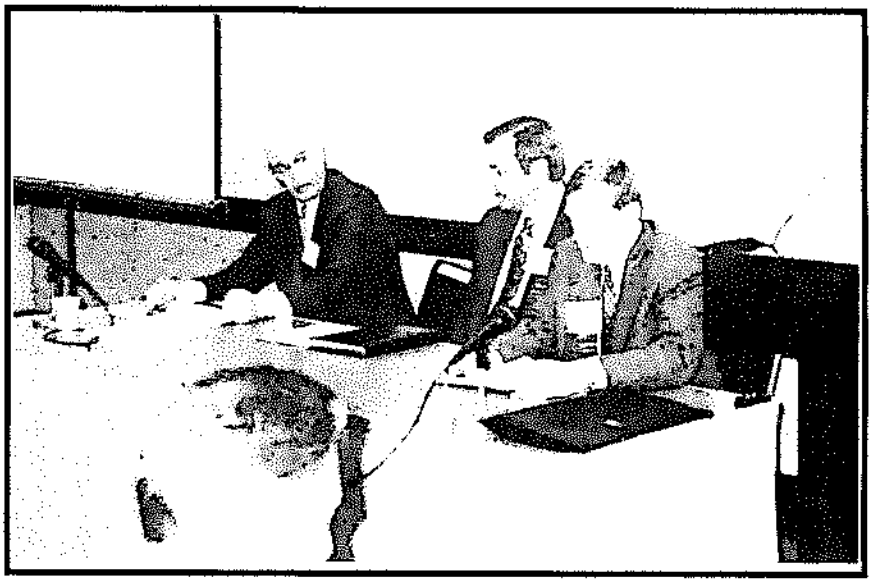
The Master has indicated he will address two of those legal issues in the report he will issue early this year. One will be the measure of damages, and the other will be whether the 11th amendment to the U.S. Constitution bars Kansas from claiming damages to individual water users. The Special Master is also expected to comment on Colorado's compliance efforts. Colorado has made substantial, good faith efforts to comply with the Compact. Kansas has criticized some aspects of our plans, but has grudgingly admitted that at least some of the plans that have been adopted by water users appear reasonable. We do not expect the Special Master to determine in his report whether the form of the remedy should be in money damages or water. He has indicated that he wants to take further evidence before he makes a recommendation on the form of the remedy. He wants to know whether there is economic data available to quantify damages. He also wants to know whether repayment in water would be practicable. He has also indicated that he won't decide the prejudgment interest issue either.

What do we expect over the coming year or two? The focus of the hearings before the Special Master will shift from quantifying past depletions to a remedy for past depletions. That may take a substantial period of time, particularly if it requires testimony by economists to quantify economic damages. We also expect the Special Master to hold additional hearings to determine whether Colorado is complying with the Compact and how well the plans that were approved last year did in bringing Colorado into compliance with the Compact. We are not finished with the case by a long shot, but we certainly are a substantial way there.

GOVERNOR'S AGRICULTURAL FORUM OUTLOOK

by Laurie Schmidt

Dan Smith, Professor of Soil and Crop Science at Colorado State University, chaired a breakout session at the sixth annual Colorado Governor's Agricultural Outlook Forum held at the Colorado Convention Center on February 20, 1997. Dr. Smith was joined by Eric Wilkinson, Manager of the Northern Colorado Water Conservancy District, and Ralph Curtis, General Manager of the Rio Grande Conservation District in presenting a session entitled "Irrigation Water Conservation: Opportunities and Limitations in Colorado."



Ralph Curtis, Eric Wilkinson and Dan Smith at Governor's Agricultural Outlook Forum

The purpose of the session was to present the results of a CWRRI project that was summarized in a recent issue of ***Colorado Water.*** The speakers focused their presentation on explaining how the concept of irrigation water conservation is developing in Colorado, giving special attention to how the theory takes on various meanings in different river basins, depending upon the geohydrology of the valley. They also discussed the variety of different conservation measures that are being used in Colorado today, including the following:

- Irrigation scheduling
- Gated pipe and surge irrigation systems
- Center pivot and side roller sprinklers
- Tail water or pump back systems
- Drip or trickle irrigation on high cash crops

Finally, they concluded the session by outlining some of the incentives that are encouraging irrigators to adopt conservation strategies. These incentives, which vary regionally, include decreased pumping costs, labor savings, higher crop yields, water shortages, and restrictions on aquifer depletion rates.

The Governor's Agricultural Outlook Forum provided farmers, ranchers, educators, business leaders, and public officials with an occasion to meet and exchange ideas. Since many representatives of the agricultural community were in attendance, the presentation by Dr. Smith provided a unique opportunity for the academic community to share its research findings with industry members who can most benefit from them.

For information on the results of this project, please refer to the December 1996 issue of ***Colorado Water.***

PROPOSITION 204: CALIFORNIA VOTERS SEND A STRONG MESSAGE ABOUT SOLVING WATER PROBLEMS

by Laurie Schmidt

Last November, California voters proved what can happen when various interest groups come together to support a crucial water issue. After more than two years of negotiations, Proposition 204, also known as the Safe, Clean, Reliable Water Supply Act, passed by an unprecedented margin in California's November election. The bill provides for a $995 million bond to restore California's water supplies, and was endorsed by an assortment of groups that usually find themselves engaged in intense conflicts over water issues. Agricultural groups, environmental organizations, civic and community groups, major businesses, labor organizations, and elected officials from both major parties all came together to support the bill. In addition, the bill garnered editorial support from an array of major and regional newspapers.

85 percent of Californians consider a safe water supply to be a very important issue to California - second only to the quality of education. Additionally, nine out of ten Californians surveyed said that a sufficient, reliable, and affordable water supply is essential to maintaining a strong state economy.

Proposition 204 was originally introduced as Senate Bill 900 by California Senator Jim Costa (D-Fresno). On January 31, Senator Costa addressed the annual meeting of the Colorado Water Congress in Denver. He briefly discussed the process that led to the bill's passage, explaining that there were three key activities that went on simultaneously from 1994-1996:

- Developing a coalition and grassroots support system to support the legislation
- Campaigning to promote voter support
- The CAL-FED process

The measure was supported by 77 percent of San Francisco voters and by 59 percent of Southern California voters. This isn't surprising, considering the findings of a public opinion poll that was conducted in July, 1996, four months before the election. The results of the poll indicated that 85 percent of Californians consider a safe water supply to be a very important issue to California - second only to the quality of education. Additionally, nine out of ten Californians surveyed said that a sufficient, reliable, and affordable water supply is essential to maintaining a strong state economy.

Like in several other Western states, California's water supply system has been unable to keep pace with the needs of a fast growing population. The California Department of Water Resources has warned that California is facing significant and growing water supply shortages that could have a devastating effect on the state's economy and environmental resources. According to projections, California could face annual water shortages of between 3.7 and 5.7 million acre-feet (maf) during average rainfall years, and between 7 and 9 maf during drought years.

Proposition 204 promises to be beneficial to both the state's economy and its environment. Provisions of the bill include the following:

- Ensuring safe drinking water by preventing pollution in source water supplies
- Increasing water supplies by planning for new reservoirs and delivery systems that can capture water in wet years for use during droughts
- Providing for the cleanup of contaminated waterways
- Protecting against floods by completing long-overdue flood control projects

Professor Evan Vlachos, California Senator Jim Costa, and former Colorado Springs Mayor Robert Isaac discuss vision, financing, and leadership at the annual meeting of the Colorado Water Congress

- Protecting against earthquake damage by completing necessary repairs and improvements to critical levees to help prevent failure during catastrophes
- Encouraging water conservation and recycling by funding local projects
- Protecting critical fisheries, wildlife, wetlands, and other natural habitats
- Helping the economy by protecting existing jobs and encouraging new business opportunities

By far, the most widely publicized provision of Proposition 204 is the allocation of funds for the cleanup and restoration of the San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta). The Bay-Delta is the major drinking water source for 22 million Southern California residents. It is home to 120 species of fish and wildlife, including several endangered species, and provides a corridor through which 80% of the state's commercial fishery species migrate. In addition, it is the source of irrigation water for 45 percent of the state's fruit and vegetable crops. But the health of this vital water resource has declined rapidly in recent times. The Bay-Delta has been adversely impacted by agriculture and industries that have extensively pumped water from the delta. Pollution has contributed to the deterioration of water quality and the decline of fish and wildlife populations, and delta levees and flood control facilities are in dire need of repairs and overhauls.

About $600 million of Proposition 204's total funds have been allocated to projects designed to fix the Bay-Delta. Many of these projects emerged from the 1994 San Francisco Bay-San Joaquin Delta accords. This agreement, which was reached after decades of fighting among various interest groups, governs the fragile estuary located at the confluence of the San Francisco Bay and the San Joaquin River. The CAL-FED program, which represents the state and federal agencies concerned with solving the Bay-Delta problems, builds on the 1994 agreement and complements Proposition 204.

Proposition 204 provides for the following allocations (in $ millions) of funds:

Bay-Delta improvements	$ 193
CAL-FED Bay-Delta ecosystem restoration	390
Clean water and water recycling	235
Water supply reliability	117
Local flood control and prevention	60
TOTAL	$995

A portion of the funds allocated to clean water and water recycling (see allocation above) will go towards the rehabilitation of the Lake Tahoe watershed ($10 million), and the restoration of the Los Angeles River ($27 million).

Proposition 204 is a general obligation (G.O.) bond. G.O. bonds have been a traditional method of financing long-term capital projects in California, such as water, schools, prisons, and parks. The bonds are backed by the state, which means that the state is required to pay the principal and interest costs on the bonds. The principal and interest on the $995 million will be paid over a 25-year period by the California State General Fund. General Fund revenues are generated primarily by state personal and corporate income taxes and sales tax. Many of the water programs funded by Proposition 204 will generate matching federal funds. In total, it is estimated that an additional $1.3 - $2.1 billion in federal funding will be made available by the bill's passage.

Proposition 204 is an example of the progress that can be made when various factions are willing to acknowledge that none of their interests can be met unless they are willing to work together to resolve an issue. The bill's success can be attributed largely to the broad-based coalition that sanctioned the measure. Among its major supporters were the California Chamber of Commerce, the California Farm Bureau Federation, the California Building Industry Association, the California Labor Federation, the Environmental Defense Fund, and the League of Women Voters of California.

However, the bill was not without opponents. The Libertarian Party filed a ballot argument against the measure, saying "What water crisis?" Opponents also questioned the assertion that the bill would not raise taxes, claiming that bond financing nearly doubles the cost of any government project, and that taxpayers can't afford Proposition 204.

Senator Costa defended the bill saying, "We are making an investment that will benefit the entire state of California." According to Costa, there are valuable lessons to be learned from the process. First, the fact that Proposition 204 ended decades of "water wars" by bringing together members of environmental, agricultural, and business groups to resolve critical water issues makes the bill a "model in consensus building." Second, the process made it clear that not only do you have to bring everyone to the negotiating table, but you have to work continually to keep them there.

"Proposition 204 is significant for California's future growth and economic development because it puts the state's master water development plan back on track by providing a substantial down payment to a long-term solution," said Costa.

Video copies of Senator Costa's address are available for purchase from the Colorado Water Congress. If interested, please contact:

Carolyn Simon
Colorado Water Congress
1390 Logan, Suite 312
Denver, CO 80203
(303) 837-0812
(303) 837-1607 (FAX)

COLORADO'S WETLANDS: Colorado's diverse physiography results in diverse hydrologic settings for wetland formation. Wetlands cover only about 1.5 percent of Colorado but are ecologically and economically valuable to the state. In most of Colorado, evaporation exceeds precipitation annually, and, except in mountainous areas, there is a net statewide annual moisture deficit that inhibits wetland formation. Ground-water discharge from springs, shallow water tables, or both maintain wetlands in many areas of Colorado. The results of a study of wetlands in a river basin in the eastern plains indicated that most wetlands were along springfed streams that have perennial flow in reaches 1-2 miles in length. In the intermountain basins, ground water is an important determinant of wetland location. Wetlands in the San Luis Valley, an intermountain basin, are hydrologically supported by springs or ground-water mounds that form during spring and summer runoff.

Abstracted from National Water Summary on Wetland Resources
U.S. Geological Survey Water-Supply Paper 2425

PROFESSOR EVAN VLACHOS PROMOTES COMMUNICATION BETWEEN WATER USERS AND HIGHER EDUCATION

by Laurie Schmidt

CWRRI's legal mission includes not only funding and coordinating water research deemed critical to Colorado water users and managers, but also furthering the connection between higher education and the water community. This critical link is often advanced at water conferences and meetings in Colorado where academic researchers have the opportunity to present their most recent findings.

Professor Evan Vlachos, of the Departments of Sociology and Civil Engineering at Colorado State University, is one academic water expert who has been in demand for high profile speaking engagements in recent months. On January 28, he addressed a meeting of the Consulting Engineers' Council of Colorado. On January 30, he presented the keynote address at the Annual Meeting of the Colorado Water Congress in Denver. In late February; he was the invited speaker for the Colorado Engineers Council.

One common theme that runs through many of Vlachos' presentations is that of futurism as it relates to water resources planning. In his address to the Colorado Water Congress in January, Vlachos focused on the uncertainty that the field of water resources is facing. "The planning of the future must accommodate surprises," he said. "The environment is becoming more globalized and interdependent, and the water scene is imbued with continuous challenges."

According to Vlachos, the "surprises" that the future holds will be triggered by five major crises that the field of water resources is facing:

- An engineering crisis
- An ecological crisis
- A geopolitical crisis
- An organizational crisis
- A data crisis

Coping with these crises will involve a 3-part transformation process:

- Envisioning - goals and objectives for the future
- Empowerment - public participation in the decision-making process
- Enactment - implementation of policies

In 1993, Vlachos was the recipient of the Icko Iben Award, an award presented by the American Water Resources Association, for his outstanding contributions in promoting communication among the various disciplines concerned with water resources issues. He has the unique ability to address a wide variety of audiences in the fields of engineering, sociology, agriculture, and natural resources, and leave them with a clearer understanding of the interface among these disciplines.

During his tenure at Colorado State University, Vlachos has developed several original courses in technology assessment and social impact assessment. These courses have been popular with both water resources students and students from the policy disciplines. This is yet another example of Vlachos' effort to bridge the gap between sociology, technology, and policy.

Vlachos' hallmark is his ability to successfully combine sociology and engineering agendas in his approach to water resources education and research. He is an exceptional example of the water expertise that is available to Colorado water users through the academic community.

THE COLORADO SECTION OF THE AMERICAN WATER RESOURCES ASSOCIATION (AWRA) HOLDS ITS ANNUAL MEETING ON MARCH 14, 1997

by Laurie Schmidt

The Colorado State Section of the AWRA held its annual meeting on March 14 at the Brittany Hill Restaurant in Thornton. The annual symposium highlighted the theme of Watershed Planning and Management.

Eric Kuhn, Secretary-Engineer of the Colorado River Water Conservation District (CRWCD), presented the keynote address. The topic of Kuhn's speech was interstate watershed issues, and he discussed problems related to the Platte, Arkansas, Rio Grande, and Colorado Rivers, focusing on the role that the CRWCD plays in resolving these issues. He also discussed Lower Basin State issues, such as the crisis that California is facing due to diminishing surpluses from Arizona and Nevada.

Senator Don Ament and Rick McLoud, Centennial Water & Sanitation District, at the recent AWRA Colorado Section Meeting

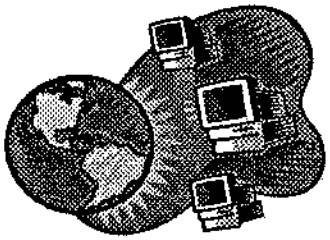
More than 20 presentations took place during six sessions held throughout the day. Topics included water quality monitoring, integrated watershed modeling, cooperative watershed planning, mine-impacted watersheds, water rights, conjunctive use systems, ground water development, and watershed management tools.

In addition, Dale Book presented a status update on the Kansas v. Colorado litigation, including a discussion of additional issues which have arisen as a result of the U.S. Supreme Court's finding that alluvial well pumping in the Arkansas River Basin has caused violations of the Arkansas River Compact by Colorado.

The first full-day symposium devoted to watershed management was held in 1996 and drew the attendance of 86 people, including 26 presenters. This year's symposium was designed to further examine and discuss various approaches to water resources planning and management.

COLORADO WETLANDS: The average annual precipitation in Colorado ranges from about 7 inches in the San Luis Valley to about 60 inches in some mountainous areas. The timing and volume of runoff affect the establishment and function of riparian wetlands.

Abstracted from National Water Summary on Wetland Resources
U.S. Geological Survey Water-Supply Paper 2425



WET SPOTS ON THE WEB

Find-Water Related Information Quickly and Easily!

by Liz Rewey

Description	WWW Address
"Colorado's Flood Information On-Line" can be found on the Colorado Department of Natural Resources home page at:	http://www.dnr.state.co.us or directly at: http://www.dnr.state.co.us/water/floodwatch
Information about the Western States Water Council is available at:	http://www.westgov.org/wswc
National Library for the Environment – over 200 short non-technical reports produced by the Library of Congress	http://www.cnie.org/nle
Western Governors' Association — Available at this site is the **Drought Response Action Plan**, WGA, Nov. 1996. Scroll to "Lands and Waters" section and click on link for drought plan.	http://www.westgov.org
Institute for Water Resources, Corps of Engineers, **Water Supply Handbook** (IWR Report 96-PS-4).	http://www.wrc-ndc.usace.mil/iwr/index.htm
U.S. Geological Survey, **Understanding the Earth**, 1995.	http://yearbook.usgs.gov
USDA Forest Service Welcome Page – access information on land management, research, and state, private and international forestry activities focusing on America's forested lands.	http://www.fs.fed.us/fs/welcome.html
Water Treatment Path for Kids – Children of all ages can follow a drop of water from its source through the treatment process.	http://www.epa.gov/OW/OGWDW/kids/treat.html
EPA Office of Wetlands, Oceans and Watersheds	http://www.epa.gov/OWOWWTRL/general
Surf Your Watershed – EPA's Office of Wetlands, Oceans and Watersheds	http://www.epa.gov/surf/
Science Advisory Board (SAB) – Browse SAB's 1995 and 1996 reports.	http://www.epa.gov/science1/
River Network Online – Provides tools to help organize, protect and restore rivers and watersheds.	http://www.rivernetwork.org/-rivernet
Educating Young People About Water – Provides materials, searchable by grade level or subject, that can help users develop water education programs while forming key community partnerships.	http://www.uwex.edu/erc/ywc/
U.S. Geological Survey, National Water-Quality Assessment (NAWQA) Program, South Platte River Basin	http://webserver.cr.usgs.gov/nawqa/splt/splt_home

WATER SUPPLY

The SWSI indicator and snowpack figures continued to hold well above average through February. Statewide the snowpack is 142 percent of average as reported by the Natural Resources Conseration Service. The Gunnison River basin has the highest snowpack at 154 percent of average, and the South Platte River basin has the lowest at 134 percent of average.

As the snowpack continues to hold above normal through late winter prospects increase for an above average runoff. Spring weather significantly affects the duration and peak flow rates of runoff. Temperature affects rate of snowmelt, wind affects rate of melt and the amount of runoff vs evaporation, and rainfall directly adds to stream flow and can increase the rate of snow melt.

The Surface Water Supply Index (SWSI) developed by the State Engineer's Office and the USDA/SCS is used as an indicator of mountain-based water supply conditions in the major river basins of the state. It is based on streamflow, reservoir storage, and precipitation for the summer period (May-October). During the summer period streamflow is the primary component in all basins except the South Platte, where reservoir storage is given the most weight. The following SWSI values were computed for each of the seven basins for January 1, 1997 and reflect conditions during the month of February.

Basin	Mar. 1, 1997 SWSI Value	Change From Previous Mo	Change From Previous Yr.
South Platte	3.2	+0.2	-0.6
Arkansas	3.3	0.0	+0.9
Rio Grande	3.5	+0.4	+6.2
Gunnison	3.9	+0.1	+2.2
Colorado	3.5	+0.2	+1.6
Yampa/White	3.8	-0.1	+1.1
San Juan/Dolores	3.5	+0.1	+6.2

SCALE

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

WATER PUBLICATIONS

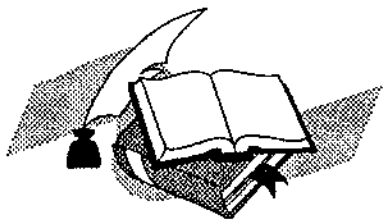
U.S. GEOLOGICAL SURVEY REPORTS

Contact the U.S. Geological Survey, Earth Science Information Center, Open-File Reports Section, Box 25286, Mail Stop 517, Denver Federal Center, Denver, CO 80225 or call 303/236-7476 unless another source is provided.

National Water Summary on Wetland Resources. Water-Supply Paper 2425.

This summary is the eighth in a series of reports that describes the conditions, trends, availability, quality and use of the water resources of the United States. Focusing on wetlands, it gives a broad overview of wetland resources and includes discussions of the scientific basis for understanding wetland functions and values; legislation that regulates the uses of wetlands; wetland research, inventory and evaluation; and issues related to the restoration, creation and recovery of wetlands. The summary provides specific information — types and distribution, hydrologic setting, trends, and conservation – on the wetland resources of each state, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and several Pacific islands over which the United States has jurisdiction.

This publication is for sale by the U.S. Government Printing Office, Superintendent of Documents, M.S. SSOP, Washington, D.C. 20402-9328.



New Publications of the U.S. Geological Survey, August-December 1995. Available from the office above and also at the USGS WWW Home Page: http://www.usgs/gov.

Geohydrology of the North Park Area, Jackson County, Colorado, 1996, by S.G. Robson, USGS, with a section on Water Law by Glenn Graham, Colorado Division of Water Resources. Water-Resources Investigations Report 96-4166.

Summary of Biological and Contaminant Investigations Related to Stream Water Quality and Environmental Setting in the Upper Colorado River Basin, 1938-95, 1996. Water-Resources Investigations Report 96-4172.

Understanding the Earth, 1995. Available from the office above and also at the web site http://yearbook.usgs.gov.

OTHER WATER REPORTS

Water Supply Handbook, IWR Report 96-PS-4, Department of the Army, Corps of Engineers, Water Resources Support Center, Institute for Water Resources, 7701 Telegraph Road, Alexandria, VA 22315-3868.

This is the first published half of the document, which is intended to serve as a comprehensive desk-top reference on water supply topics that are spread throughout the body of COE regulations, manuals, technical letters and memoranda. The information is intended for easy access and reference purposes only, and is not intended to serve as a substitute for COE policy or implementation guidance. The document is also available at the following website: http://www.wrc-ndc.usace.mil/iwr/index.htm.

WATER NEWS DIGEST

Compiled by Liz Rewey and Laurie Schmidt

WATER ALLOCATION

Impact of San Luis Valley Water Diversion Challenged
Plans to pump 100,000 acre-feet of water from beneath the Baca Grant Ranch north-east of Pueblo would drop the water table two feet within 10 years, not the next 300, according to a water engineer. This finding is particularly vital in light of proposed projects for SLV water. Foremost among these proposals is that of Stockman's Water Company, which wants to pump water to Colorado Front Range cities. Stockman's needs water contracts to apply to the Water Court for use of the water.

The Pueblo Chieftain, 12/22/97

Water Plan Doesn't Make Many Waves
A water project making big waves in the San Luis Valley is still a faint ripple along the Front Range. Potential customers for Stockman's Water Company's plan to export SLAV ground water are looking at numerous other options for satisfying long-term water needs. However, the Parker Water and Sanitation District is negotiating with Stockman's Water Co. for up to 20,000 acre-feet of SLV water. Parker is looking for renewable resources to lessen its dependence upon groundwater supplies.

The Pueblo Chieftain, 1/27/97, 1/30/97

Panel OKs Bill Entangling SLV Water-export Plan
In early February, Rep. Lewis Entz won committee approval for a bill to make it harder for Stockman's Water Co. to pump its water for export out of the San Luis Valley. Specifically restricted to Water Division 3 in the San Luis Valley, the bill would require court approval of an augmentation plan to replace every drop of underground water that decreases the hydro-static pressure in an aquifer. Entz said San Luis Valley groups are as dead-set against the Stockman's plan as they were AWDI (American Water Development, Inc.). By the first of March, Rep. Entz won a 7-3 vote from the House Appropriations Committee to move his HB1214 to the Colorado House floor for debate. Under the bill,

the San Luis Valley would have a four-year moratorium on new wells. The new-well moratorium would apply only until July 1, 2001, when State Engineer Hal Simpson completes a $3 million study of the entire San Luis Valley water system. Entz's motivation is to make it more difficult for Stockman's Water Co. to drill new wells and pump up to 100,000 acre-feet of water annually for export out of the valley.

In reaction, Gov. Roy Romer expressed his concern and his tendency to oppose the Stockman project, especially if it is like AWDI. Romer also said he supports the moratorium on new SLV wells.

Chieftain Denver Bureau, 2/6/97, 3/1/97, 3/21/97

John Martin Reservoir Will Be Key to Kansas' Future Water
Because of a 1994 Supreme Court decision in favor of Kansas in the lawsuit over the Arkansas River Compact, the concerned parties have to decide how to award compensation to Kansas. Colorado wants to repay water, which amounts to between 346,000 and 400,000 acre-feet over the past 47 years. The states are still at odds on the exact amount. Additionally, water stored in John Martin Reservoir could offset future losses to Kansas caused by wells in Colorado. The plan, called an offset account, is being considered by the Arkansas River Compact Administration. Pueblo's Division water engineer said the replacement water would be the primary source used to create a pool of 20,000 acre-feet in the reservoir. Currently, Kansas is entitled to 40 percent of John Martin Reservoir's 335,000 acre-feet of water. The Supreme Court has not decided how Colorado must repay damages, which could amount to as much as $100 million or 400,000 acre-feet of water.

The Pueblo Chieftain, 1/23/97, 2/6/97

WATER QUALITY

Dams Have Improved Arkansas River Water Quality
The construction of Pueblo Reservoir and changes in the management of John Martin Reservoir have boosted water quality in many parts of the Arkansas River, a recent study conducted by the U.S. Geological Survey shows. Water tested below Lake Pueblo after the dam was built showed that large quantities of better-quality snow melt water mixed with the saltier river water of low-flow periods. However, the river still has a lot of dissolved solids. According to hydrologist Michael Lewis, the salty water of Fountain Creek and the salt-loading from agriculture and reuse of water makes the river below Pueblo saltier than allowed by federal standards. Water quality improvements below John Martin Reservoir are likely the result of better water reaching the dam and a 1980 change in how the reservoir is operated. Another component of the study failed to turn up evidence of 97 percent of the pesticides researchers were looking for. Only one chemical, the herbicide called 2-4D, was found consistently, but levels did not violate federal standards.

The Pueblo Chieftain, 2/22/97

Southwest Coloradans Upset about Contaminated Wells
About 35 La Plata County residents are suing Amoco and other gas producers, claiming that their water wells have been contaminated. One landowner claims that testing showed explosive levels of methane in her water. But the companies, which are tapping methane gas trapped underground, say there is no proof they are responsible for the contamination. On Feb. 20, a federal jury in Albuquerque, N.M. found Amoco liable for contaminating the water supplies of six families in San Juan County, N.M. - just across the state line from La Plata County - as a result of methane drilling. La Plata County residents with similar complaints are waiting their day in court, but have been sidetracked by jurisdictional disputes.

The Pueblo Chieftain (Associated Press), 3/10/97

Private Tests of Wells Show Woodland Park Water to be Safe
Teller County residents who were told last Fall that their well water contained a cancer-causing chemical said that tests done by independent laboratories they hired found no trace of the chemical. The Colorado Department of Health and Environment had reported dangerous levels of ethylene dibromide in well water. Water district customers were then switched to city water, which caused their water bills to double. Some residents don't think the entire water system should be shut down based on the results of a single test, and are concerned about the higher water rates. The U.S. Forest Service, the Environmental Protection Agency, and the state are all conducting tests to locate the source of the contamination.

The Denver Post, 2/11/97

Lower Pollution Standards Eyed for Alamosa River
The Colorado Water Quality Control Commission is considering lowering pollution standards for stretches of the Alamosa River that have been contaminated by the Summitville gold mine. Acidic water flowing from the mine killed all the fish in the Alamosa and the Torrance Reservoir in one of the worst environmental disasters in Colorado history. Not only have the fish died, but the contamination also took away a cottonwood-lined river that has been an oasis for generations of San Luis Valley residents. The new standards being considered would allow acid and metal levels that are lethal to fish on some sections of the river. The EPA is still trying to recover cleanup costs from former officials with Canadian-based Galactic Resources, Ltd., which operated the mine before declaring bankruptcy in 1992.

Ft. Collins Coloradoan (Associated Press), 2/24/97

Bill Targets Hog Ranches
The Senate Agriculture Committee is scheduled to vote on Senate Bill 70, by Senator Joan Johnson (D-Adams County), which tightens water quality protection requirements for the increasing number of hog farms in Colorado. Johnson's bill requires large hog operations - with 2,500 or more swine weighing 55 pounds or more - to obtain a permit from the state Department of Health and Environment that would determine where they could be located.

The bill also requires annual inspections and bond-posting by large operations to ensure payment for cleanup if any contamination occurs. The bill is pitting environmentalists against ranchers and pork producers who don't want tough regulations on the livestock industry.

Ft. Collins Coloradoan (Associated Press), 2/2/97

Computer Model May Bring Arkansas Monitoring into Non-political Age
A computer model may be able to predict consequences of disturbing the balance between water quality and quantity along the Arkansas River Valley. Colorado State University Professor John Labadie and other CSU researchers spent the last three years designing a computer model of the Arkansas River to show how changes in water use could affect water quality and quantity. The project integrates water supply with measurements of salinity, metals, and other harmful substances. Labadie said that, although the model is not perfect, its design would accommodate water users, rather than just engineers or academics.

The Pueblo Chieftain, 1/24/97

New Restrictions on Reservoir Water Quality
Reservoir managers want to ease some tough, new restrictions on water quality - proposed rules that could force their beaches to close this summer if high bacteria levels are detected again. At the same time, though, reservoir directors said they will track any health complaints they get this summer from people who claim they got sick because they took a dip in a public lake.

The changes proposed by the state health department would cause all swimming at public beaches to be banned if a test sample shows that the reservoir contains more than 126 E. coli organisms per 100 milliliters of water. Some reservoir operators called that number overly stringent and far too conservative. They want a limit of 235 organisms per 100 milliliters. The difference in the two proposed E. coli levels are microscopic, and some forms of E. coli are incredibly virulent. The state board of health is expected to lay down restrictions on E. coli in area reservoirs - as well as a tougher, new limit on fecal coliform bacteria - before the swim season opens this summer.

The Denver Post 2/27/97

WETLANDS

Wetlands Rules Change
The rules relating to the use of wetlands have changed under the U.S. Army Corps of Engineers. Jim Townsend, Chief of the Southern Colorado Project Office, U.S. Army Corps of Engineers, Albuquerque District, said the corps' mission is changing quite a bit, and regulations are becoming more oriented toward environmental conservation. One big change will involve a reduction in the amount of land to be covered by a corps permit. That amount will probably be reduced to about one-third of the current limit. Also, all land under permit will have to meet the conservation compliance regulations administered by the Natural Resources Conservation Service.

The Pueblo Chieftain, 2/25/97

Green Groups Challenge Telski Wetlands Settlement
Colorado environmental groups are hoping that a federal judge will increase the approximately $3.6 million in proposed penalties against the Telluride Ski & Golf Company for development-related illegal wetlands destruction. The penalties include a $1.1 million fine and a requirement to restore, at an estimated cost of $2.5 million, 17 of the 60 cares of wetlands Telski allegedly destroyed while developing its ski and golf resort and associated real estate. They came as part of a yet-to-be-approved negotiated settlement between the company, The U.S. Environmental Protection Agency (EPA), and the Department of Justice. Despite the fine's reported precedence as the largest-ever levied in a wetlands destruction case in the six-state Rocky Mountain region, the green groups, including the Rocky Mountain chapter of the Sierra Club and Telluride's Sheep Mountain Alliance, say it is too low.

The most serious challenge, however, came from the Denver-based Colorado Environmental Coalition (CEC), which is seeking to hold the EPA to its 1990 policy which mandates that penalties levied in wetlands destruction cases must remove any profit companies make as a result of illegal wetlands fills. The CEC wants the court to order Telski to do environmental restoration work above and beyond that which it negotiated with federal authorities. Telski has argued that it realized no economic benefit from its unpermitted development in wetlands areas. In 1995 the company commissioned a study which concluded that the same development could have occurred without disturbing wetlands and, therefore, that choosing to develop there did not bring profits otherwise unobtainable. Whether the settlement will be amended to address the CEC's arguments is unknown until the court's ruling is known. But the EPA's Regional Wetland Enforcement Division in Denver believes that the settlement is "pretty close to the best we could do under the circumstances."

Telluride Daily Planet 1/28/97

PEOPLE

Former Water Panel Operations Chief Dies
Carl E.C. Carlson, longtime director of operations for the Denver Water Board, died of a heart attack at age 76. During his 37 years of service, Carlson oversaw projects such as the construction of Dillon Dam, Foothills Water Treatment Plant, and the completion of the Roberts Tunnel. He was responsible for about 85 percent of the budget and personnel at the Water Board. Carlson retired in 1986 to pursue his passion for history and trains.

The Denver Post, 2/24/97

Fruita Water Activist Dies
Ruth Hutchins, a Fruita farmer and outspoken citizen activist on Western Slope water issues, died on Feb. 3 at her home of complications from lymphatic cancer. Hutchins was a founding member of the Mesa County Water Association, and worked tirelessly to make water law and issues understandable to the public. Greg Trainor, Grand Junction Utilities director, said Hutchins was a true citizen of water in the state of Colorado.

Grand Junction Daily Sentinel 2/5/97

Water District Wins Conservation Award
Early this year, the Northern Colorado Water Conservancy District received the 1996 Bureau of Reclamation Water Conservation Award. The award honors the water district for its 10-year program of working with area farmers to implement more efficient irrigation methods. The district also started an irrigation conservation program in 1993 for area golf courses and businesses.

The Coloradoan 1/24/97

WATER ALLOCATION

Thornton Water Plan Sketchy
The city of Thornton has the go-ahead to use Northern Colorado water it acquired more than a decade ago, but it could be another three decades before the city actually starts using the water. The Colorado Supreme Court ruled in October that Thornton could proceed with its plans. As of February, no date had been set for the start of construction on any if the pipelines to be used to get the water to the north-Denver suburb. Thornton water engineers are working to see if there is a way to use some of the water before the pipeline is built. In April 1986, Thornton purchased about 100 farms and the water rights on those farms in northern Larimer and Weld counties. It filed three water-right applications for new conditional water rights from the Poudre and South Platte rivers. However, Thornton does not have a right to any of the Colorado-Big Thompson Project water.

The Coloradoan (Associated Press), 2/2/97

Water Districts Want Control over Reservoirs
The Ute and Collbran water conservancy districts are making another try at winning congressional approval to transfer the Collbran water project into their hands. They seek control of Vega and 15 other reservoirs on the north side of the Grand Mesa, irrigation canals and the upper and lower Molina power plants. The Ute Manager and a representative of the Collbran district are seeking endorsements from the state's water, wildlife, and parks agencies. They have already won approval from many fronts, including the Colorado Wildlife Commission, the Plateau Valley Chamber of Commerce, and the Colorado River Water Conservation District.

Grand Junction Daily Sentinel, 1/24/97

Alamosa Ranch Buy to Increase Water Supply
In late February, Alamosa's City Council spent $1 million to buy the 1,350-acre North Thomas Ranch along the Rio Grande, virtually doubling the size of the city should it decide to annex the property. Additionally, the property of a late La Jara physician also has water rights totaling more than 3,000 acre-feet. The extra water should take care of the city's needs for 50 years.

The Pueblo Chieftain, 2/21/97

Four Corners Expects Hard Battle over Water
As a result of a soggy winter, relieved ranchers and farmers in the Durango area are anticipating an abundant supply of irrigation water this summer. After the initial relief, however, battles over water will begin again. Still unresolved are the decades-old arguments over the Animas-La Plata project, community tensions between growth and limited water sources, and coal-bed methane drilling through deep aquifers by the oil and gas industries, which could be to blame for contamination of residential water supplies.

The Denver Post, 3/9/97

WATER PROJECTS

Plan Would Expand Reservoir
After years of planning, the Loveland water board has recommended expanding the 600 acre-foot Green Ridge Glade Reservoir to 6,000 acre-feet. The city wants to complete the project in order to improve water management, increase emergency storage, and protect against drought. Critics have argued that the expansion is intended to prepare for growth.

The Coloradoan (The Associate Press), 2/14/97

Wetlands Devouring Waste in New Mexico
One of several new projects completed in the area, a wetland has been constructed behind an Albuquerque school. A few rectangular pits contain several species of wetland vegetation, which in turn support waste-consuming microbes. The school

is using their new constructed wetland to process sewage before it trickles into ground water supplies. Wetlands have long been recognized for their ability to filter contaminants out of water. Such systems are improved by pumping air into the underground sewage, in a process called aeration. Aeration changes nitrates, one of sewage's most dangerous components, into nitrogen gas.

The Coloradoan (The Albuquerque Tribune, 2/9/97

Aquaculture Growing in San Luis Valley
Aquaculture— raising everything from fish to alligators— is a growing industry in the San Luis Valley and the state, with Colorado ranking third among Western states in fish production. Colorado's commercial trout farms have increased from 27 farms in 1994 to 36 farms last year, with total sales climbing from $2.2 million to $2.4 million in the same period. About 90 percent of Colorado's fish farms raise trout for recreational use. Other branches of aquaculture in Colorado are alligator farming, hydroponics, fish export to Asia, and educational programs.

The Coloradoan (The Associated Press), 2/10/97 and *The Denver Post*, 2/9/97

Corps Considers Destroying Dams on the Snake to Save Salmon Stocks
For years, dams have killed salmon populations in the Snake River. Four huge hydroelectric dams were built on the lower Snake River between 1957 and 1975. But the same federal agency that used $1 billion to raise the big dams may have to spend hundreds of millions to pull them down. The reason: Snake River Salmon are disappearing. In the mid-1800s, millions of salmon swam up the Snake to spawn each year. The number of Chinook salmon had dropped to 100,500 by 1969. And the 1996 Snake River total for sockeye salmon returning: one. The relatively few Snake River salmon that are left now swim under the protection of the Endangered Species Act. Now the U.S. Army Corps of Engineers is studying - with reluctance - ways to dismantle the dams and restore the Snake to something resembling its natural state. No one disputes that dams kill salmon, but there is deep disagreement over how many die. Ultimately, Congress or federal courts may make the decision on the lower Snake. The Corps has until the end of 1999 to produce its recommendations on the best way to save the salmon.

The Denver Post 3/13/97

ENVIRONMENT

Rocky Flats Waste Plains-Bound?
The cleanup contractor at the former Rocky Flats nuclear weapons plant is advertising for someone to take 50,000 cubic meters of lightly radioactive waste and dump it somewhere in eastern Colorado. Colorado's only hazardous-waste disposal site, Highway 36 Development Co. in remote Adams County, began considering the offer in late February.

The Denver Post, 2/27/97

Rocky Flats Impact Study Dumped
The U.S. Department of Energy is canceling plans for a "site-wide" environmental impact study of the former Rocky Flats nuclear weapons plant. The agency has concluded that such a study has no value and is meaningless now because the Jefferson County facility's mission has changed dramatically since work began on the statement in 1991. In 1993, the federal government decided to quit making nuclear weaponry at Rocky Flats. Since then, it has developed multibillion-dollar plans for decommissioning the site and cleaning up extensive nuclear pollution there.

The Denver Post 2/26/97

Runoff May Destroy Gains Made in Grand Canyon
With an unusually heavy snowpack building up in the Rocky Mountains, Glen Canyon Dam's operators began releasing large volumes of water in mid-February. The water, released into Lake Powell, could wipe out many of the environmental gains achieved from last spring's man-made flood. Potentially at risk, say scientists, are the beaches and backwater habitats partly restored by the man-made flood. These areas are critical to endangered fish and other wildlife that evolved over millennia to depend upon the periodic scouring of the Grand Canyon by a naturally running Colorado River. Bureau of Reclamation officials now estimate the Colorado River basin's snowpack and runoff will be 171 percent of normal; enough to send 13.2 million acre-feet of water into Lake Powell. That inflow, on top of what is already in the reservoir, would easily exceed the lake's capacity and overflow the dam unless large releases are continued.

The Washington Post, 2/17/97

Kansas Cloud-Seeding Plan Worries Some Coloradans
Kansas officials want permission to fly cloud-seeding missions on the Colorado side of the state line this summer. The 22-year old Kansas program seeds clouds with several chemicals to make rain or reduce harmful hail. The hail-reduction portion of the program has been the most used in recent years. But some Southeast Colorado farmers feel that cloud-seeding produces more hail for border-area fields. Program officials at the Kansas Weather Modification Program feel that Coloradans shouldn't be worried about the plan, and would like to fly the planes as far as 10 miles inside Colorado to seed storms before they roll over into Kansas. The seeding process takes time and the storms usually move from Colorado into west Kansas. To be permitted to come into Colorado, the program would need an official entity to sponsor the flights.

The Pueblo Chieftain 3/1/97

Stream Consciousness Raised as Whirling Disease Ravages Colorado Trout

Streams trampled by outdoor enthusiasts and grazing cattle appear to be creating breeding grounds for the parasite that is attacking the state's trout population. The parasite - myxobolus cerebralis - has a complex life cycle that relies on fish and a "sewer" worm called tubifex. According to the Colorado Division of Wildlife, the worms are abundant in high mountain streams where there has been a lot of human activity.

However, a new genetic test developed in California and being tested at Colorado State University could help wildlife managers make faster and cheaper identifications of the whirling disease parasite, minimizing damage and revealing ways to exorcise it from the state's rivers and streams. The genetic test has a multitude of applications, the broadest of which would be to characterize the progress of the disease. Although the parasite's cycle is generally understood, the test would allow scientists to confirm that they have it right and discover more detail. Whirling disease not only threatens the state's reputation as a destination for world-class trout fishing; it also could infect the native greenback cutthroat trout population.

The Boulder Daily Camera 2/6/97

LEGISLATION

Groups to Revise Wyoming State Water Planning Process

Under the direction of Mike Besson, Director of the Wyoming Water Development Commission and State Engineer Jeff Fassett, groups have been formed to recommend a new state water planning process. One group, called the working group, consists of staff and faculty from the WWDC, State Engineer's Office, the Wyoming Water Resource Center, and the University of Wyoming. This group will design a needs assessment public survey and the development of a public outreach and input process for the Level I water planning effort. In the scoping group are faculty and staff from the same agencies and institutions.

Wyoming Water Flow, March 1997

Groups Ready to Drop Out of Platte Talks

As of early March, conservation groups began bailing out of tri-state talks with the federal government over sending more water down the Platte River to help endangered wildlife species. The original plan had been to negotiate a boost in Platte River flows to aid downstream habitats of rare bird species, including the whooping crane. At the heart of the dissent lies management of Nebraska's Kingsley Dam, which was built for irrigation and hydropower. By mid-March, Wyoming and Colorado officials consented to a Platte River agreement contingent upon Nebraska's actions regarding its environmental claims lawsuits against Wyoming.

The Denver Post, 3/4/97 and The Coloradoan 3/19/97

Senators Back Bill to Kill Animas-La Plata Funding

US Senators Russ Feingold, D-Wis., and Sam Brownback, R-Kan. have introduced a bill to rescind federal funding for the $710 million Animas-La Plata dam. Opponents to the bill call the action an attempt to evade treaty obligations to the Southern Ute and Ute Mountain Ute Indian tribes. Congress first authorized the plan in 1968, but the project has languished as foes have raised economic and environmental concerns.

Ft. Collins Coloradoan, (Associated Press) 3/15/97

Water-basin Diversion Bill Dies

State Rep. Matt Smith's attempt to require water diverters to compensate basins from which water is taken was killed by the House Appropriations Committee, just as Smith predicted. The Committee voted 10-1 to postpone indefinitely consideration of the bill. House Bill 1286, which was approved 7-6 by the House Agriculture Committee, would have required water diverters to compensate basins from which water is taken. Unlike other basin-of-origin bills, this one would have broken the state into its five primary river basins. The bill also would have required using 60-year-old mitigation measures, set up by the Colorado Water Conservation Board, when inter-basin transfers are recommended. Previous efforts to get some sort of legislation passed to require entities diverting water to compensate the basin of origin have also been unsuccessful.

Grand Junction Daily Sentinel 2/27/97, 2/28/97

VIDEOCONFERENCE

The University of Wisconsin Cooperative Extension presents
COMMUNITY WATER EDUCATION FOR YOUTH:
FOCUS ON WATERSHEDS

A live, satellite videoconference on May 1, 1997. 12:45-3 pm CDT. A professional development opportunity to strengthen your ability to design and deliver youth water education programs that can make a difference in your community.

If you are interested in this event and having a local conference location, please call Chris Bridges at the Colorado Office of Water Conservation at 866-3441. If there is enough interest, they may sponsor a Denver/Boulder conference site.

1997 Short Course Program
International Ground Water Modeling Center
Colorado School of Mines

Dates	*Course*
May 12-16	Using the USGS MODFLOW Ground-Water Modeling System
June 2-6	Applied Contaminant Transport Modeling and Remediation Assessment Using MODFLOW and MT3D
June 16-20	Principles and Applications of Chemical Reaction Modeling In Ground Water
June 30-July 1	Analytical Modeling of Contamination
July 14-18	Parameter Identification for Modflow

For more information contact:
International Ground Water Modeling Center
Phone: 303/273-3104
E-Mail: igwmc@mines.edu
or
Office of Special Programs and Continuing Education
Phone: 303/273-3321 FAX: 303/273-3314 E-Mail: space@mines.edu

CALLS FOR PAPERS

ROCKY MOUNTAIN HYDROLOGIC RESEARCH CENTER
52ND ANNUAL MEETING
ENVIRONMENTAL HYDRAULICS OF MOUNTAIN AND PLAINS WATERSHEDS AND RIVERS

September 5-6, 1997 at the YMCA Camp of the Rockies

This meeting will encourage interdisciplinary communication among a variety of professionals representing hydrology, engineering, environmental science and other related professionals in the Rocky Mountain Region. The meeting includes a tour of the Rocky Mountain Hydraulic Lab along the North St. Vrain Creek. Topics for the meeting are:

- Emerging water quality issues in western mountain watersheds
- Watershed and river basin management
- Stream and riparian vegetation management
- Hydraulics, sediment transport and geomorphology
- Paleohydrology and paleoclimatology
- Water rights and water supply
- General hydrology
- Other topics of hydrologic, engineering, ecological or environmental interest

Submit one-page abstract by July 10, 1997 to: Robert T. Milhous
Midcontinent Ecological Research Center
Biological Resources Division
U.S. Geological Survey
4512 McMurry Avenue
Fort Collins, CO 80525-3400
Phone 970/226-9233 FAX 970/226-9230 E-Mail robert_milhous@nbs.gov

Robin Helken, Director of the Colorado Water Workshop, at the Loveland "Topic Input Session" on February 26, 1997

MEETINGS

The 1997 Colorado Water Workshop will be held on the campus of Western State College July 30, 31 and August 1. Robin Helken, Workshop Director, conducted five "Topic Input Sessions" to gather ideas for the 1997 workshop theme. Meetings were held in Gunnison, Grand Junction, Loveland, Denver and Colorado Springs. Mark your calendar for this traditional Colorado water meeting.

22nd Annual Colorado Water Workshop
July 30-August 1, 1997

Western State College, Gunnison, Colorado State University

WATER PARTNERSHIPS

Can Competing Users Cooperate to Manage a Vital Resource ... and Live Happily Ever After?

Cooperative efforts to manage limited water resources are viewed by many as an absolute necessity if we are to cover ever-expanding needs with our limited water supplies. But do water partnerships work? How?

At the 22nd Annual Colorado Water Workshop, we'll explore the impacts, problems and opportunities of partnering in management of western water resources. Can partnerships effectively ease tensions over water rights and responsibilities among diverse user groups – and provide water where needed at the least cost? Can we create partnerships without compromising the rights and water needs of our agricultural, recreational and municipal users? What steps are required of water partners to ensure recreational and municipal users? What steps are required of water partners to ensure compliance with state and federal legal requirements? And will cooperative efforts better address environmental concerns and growing conflicts over water quality and quantity?

Join us on the Western State College campus – in the heart of one of Colorado's premier recreational destinations – for a provocative, interactive forum with some of the country's most far-sighted water professionals, users and political leaders, including the front-runners in the water partnering efforts of other western states. We'll welcome your active participation as we look closely at new tools for balancing our approach to water management amid rapid growth and increasing demands on the West's most vital and valuable resource.

For information contact: Robin Helken, Director, Colorado Water Workshop

Via mail: Post Office Box 97, Cimarron, CO 81220
Via phone: Arrowhead Ranch 970/249-3034
Via FAX: 970/240-4884
Via E-Mail: arrowhd@rmi.net

AWRA/UCOWR ANNUAL SYMPOSIUM
WATER RESOURCES EDUCATION, TRAINING AND PRACTICE:
OPPORTUNITIES FOR THE NEXT CENTURY
June 29-July 3, 1997 -- Keystone, Colorado

The American Water Resources Association (AWRA), in conjunction with the Universities Council on Water Resources (UCOWR), will present a symposium June 29 - July 3 at the Keystone Resort in Summit County, Colorado. The joint symposium, ***Crossing the Stream to the 21st Century***, will integrate water resources education and practice with an eye on the future. More than 200 leading water resources educators and practitioners will make presentations that attempt to answer two fundamental, and yet related, questions:

- Is today's educational system providing the curriculum and experiences needed in water resources for the next century?
- What lessons can we learn from current projects dealing with the complexities of integrated watershed management?

Beyond simply defining the current state-of-the practice, the symposium is designed to foster new ideas and initiatives by creating an environment that promotes cross-fertilization between educators and practitioners. Attendees should leave the symposium with a better understanding of what constitutes successful water resources management and of the tools with which to more effectively educate people of all ages about this vitally important resource.

Aside from the purely technical, a variety of extracranial (fun) activities are also planned to enhance the overall symposium experience. An afternoon field trip on Thursday, July 3, to Lake Dillon Reservoir is a natural extension of a morning technical session and a great way to end the thought-provoking symposium. A 5K run/walk/crawl at over 9000 feet elevation is sure to be both humbling and entertaining. In addition, a special session featuring hands-on water resources educational activities will be featured. Keystone Resort is located in one of the most scenic valleys in the Rocky Mountains, and breaks and social activities will take maximum advantage of these beautiful surroundings. The symposium schedule abuts a long "vacation" weekend, and families can take advantage of the summer outdoor activities available in the area, including boating, sailing, fly fishing, river rafting, scenic gondola rides, mountain biking, horseback riding, llama trekking, golf, tennis and swimming.

On the first evening of the symposium, on June 29, the Warren A. Hall Medal will also be presented. This memorial award, which was established by friends and family of Dr. Warren A. Hall, one of the founders of UCOWR, recognizes unusual accomplishments of an individual in the water resources field. The Medal is awarded annually to an educator devoted to the advancement of knowledge in water resources through teaching, research, and/or public service, and with a strong commitment to the education and welfare of his or her students.

Like at all AWRA meetings, it will be the degree of personal/professional interaction and sense of camaraderie that will make this symposium truly memorable.

All persons attending the AWRA/UCOWR Symposium, including presenters and moderators, must register for the meeting. Registrations received on or before May 23, 1997, qualify for the "Early-Bird Registration" rate. The registration fee entitles each attendee to a copy of the Symposium Proceedings, which will be available on site. To register, or to purchase copies of the Proceedings after the meeting, write or phone AWRA Headquarters at:

AWRA
950 Herndon Pkwy., Suite 300
Herndon, VA 20170 - 5531
(703) 904-1225/Fax (703) 904-1228

COLORADO WATER LAW

Live Program – Friday, May 2, 1997

The Hyatt Regency Hotel
1750 Welton Street
Denver, Colorado State University

Video Replay – Friday, May 23, 1997

CLECI Classroom
1900 Grant Street
Third Floor
Denver, Colorado

Featuring timely information and discussion of current issues facing water law practitioners:

- Water Augmentation Plans and Water Rights: Successful Prosecution Strategies, Technical Considerations and Administrative Review
- Recent Challenges Facing Colorado Water Users – Endangered Species and Compact Demands
- Administering the Waters of Colorado Rivers
- Cooperative Water Sharing Plans

Everything You Ever Wanted to Learn About Colorado Water Rights

The morning portion of the program is designed to help you successfully navigate the administrative and judicial requirements of water augmentation plans and substitute supplies. The Honorable Rebecca Kourlis of the Colorado Supreme Court will be the luncheon speaker, followed by a mystery guest who will induct new members into the order or the Water Buffalo. Colorado State Engineer Hal Simpson and Peter Evans (acting director of the Colorado Water Conservation Board) will highlight the afternoon with discussions of compact and administration issues regarding Colorado rivers. The program will conclude with a panel on cooperative water-sharing plans.

For information contact: Continuing Legal Education in Colorado, Inc. (CLE) at 303/860-0608.

Cosponsored by the Water Law Section of the Colorado Bar Association.

MARK YOUR CALENDAR!

October 22-23, 1997

The Water Center and six departments at Colorado State University will sponsor a Water Symposium that will feature undergraduate and graduate research related to water resources. Poster and oral presentations will be included. The symposium will be designed to give students experience in presenting their work and to expose them to the interdisciplinary nature of water resources. For more information, contact Laurel Saito at lsaito@engr.colostate.edu.

RICH HERBERT MEMORIAL SCHOLARSHIP
Offered by the
COLORADO SECTION, AMERICAN WATER RESOURCES ASSOCIATION

GOAL – To further interest and research in the water resources of Colorado.

QUALIFIED APPLICANTS – To be considered for the scholarship, the applicant must meet the following criteria:

Enrollment as a student in a degree program at any accredited Colorado public or private college or university.

Involvement in research or independent study pertaining to hydrology, engineering, hydrogeology, geomorphology, aquatic biology, water law, water-resources policy or planning, environmental science or other topics concerning water resources in Colorado.

STIPEND Scholarships are awarded for one academic year. The amount is determined by the AWRA-Colorado Section Board of Directors. Previous awards have ranged from $750 to $1500.

APPLICATIONS – must include: Resume, Abstract of current research, and a letter of recommendation from a faculty advisor

Completed applications should be sent to:

Chairman, Scholarship Committee, AWRA – Colorado Section
P.O. Box 9881
Denver, CO 80209-0881

CALENDAR

May 7-9 COMMUNITIES WORKING FOR WETLANDS, Alexandria, VA. Contact: Terrene Institute, 4 Herbert Street, Alexandria, VA 22305, Phone 800/726-4853 or 703/548-5473, FAX 703/548-6299, E-mail terrene@gnn.com.

May 28-31 IAIA '97 - REFLECTIONS ON WATER: LEARNING FROM HISTORY AND ASSESSING THE FUTURE, New Orleans, LA. Contact: International Association for Impact Assessment, NDSU-IBID, Hastings Hall, PO Box 5256, Fargo, ND 58015-5256, FAX 701/231-1007.

June 2-4 DAMS: WATER AND POWER IN THE NEW WEST, Boulder, CO. Contact: Natural Resources Law Center, University Of Colorado, Boulder, CO 80309, Phone 303/492-1293, FAX 303/492-1297.

June 2-4 8TH BIENNIAL SYMPOSIUM ON ARTIFICIAL RECHARGE OF GROUNDWATER, Tempe, AZ. Contact: Doug Bartlett c/o Dames & Moore, 7500 N. Dreamy Draw Dr., #145, Phoenix, AZ 85020, FAX 602/861-7431, E-Mail phxrdb@dames.com.

June 9-13 CHANGING WATER REGIMES IN DRYLANDS, Lake Tahoe, CA. Contact: Jack Gillies, Desert Research Institute, P.O. Box 60220, Reno, NV 89506. E-Mail: jackg@sage.dri.edu.

June 29-July 3 AWRA/UCOWR ANNUAL SYMPOSIUM, WATER RESOURCES EDUCATION, TRAINING AND PRACTICE: OPPORTUNITIES FOR THE NEXT CENTURY, Keystone, CO. Contact: John Stednick, General Chairperson, AWRA , Phone 970/491-7248, E-mail jds@cnr.colostate.edu; or Robert Ward, General Chairperson, UCOWR, Phone 970/491-6308, E-mail rward@vines.colostate.edu.

July 14-15 1997 ROCKY MOUNTAIN SYMPOSIUM ON ENVIRONMENTAL ISSUES IN OIL AND GAS OPERATION, Golden, CO. Contact: Continuing Education, Colorado School of Mines, Phone 303/273-3321; FAX 303/273-3314; E-mail space@mines.edu.

Aug. 5-8 HYDROPOWER: NEW CHALLENGES, OPPORTUNITIES AND PARTNERSHIPS, Atlanta, GA. For information contact: American Society of Civil Engineers at Direct Line 703/295-6000, Exhibits 703/295-6009, FAX 703/295-6144, Website: www.asce.org.

Sept. 7-10 DAM SAFETY '97, Pittsburgh, PA. Contact: ASDSO, 450 Old East Vine St., 2nd Fl., Lexington, KY 40507, Phone 606/257-5140, FAX 606/323-1958.

Sept. 22-24 COLORADO ASSOCIATION OF STORMWATER AND FLOODPLAIN MANAGERS (CASFM), Vail, CO. Contact Cindy Edwards, Program Chair, Arapahoe County Dept. of Engineering, 5332 S. Prince St., Littleton, CO 80166-0001, Phone 303/795-4640.

Oct. 18-22 WEFTEC '97, Chicago, IL. Contact: Water Environment Federation, Phone 800/666-0206; FAX 703/684-2471; E-mail confinfo@wef.org.

Nov. 3-6 EVAPOTRANSPIRATION AND IRRIGATION SCHEDULIING, San Antonio, TX. Contact: American Society of Agricultural Engineers, 2950 Niles Rd., St. Joseph, MI 49085-9569, Phone 616/429-0300, FAX 616/429-3852, E-Mail hq@asae.org.

Nov. 16-19 INTERNATIONAL CONFERENCE ON ADVANCES IN GROUNDWATER HYDROLOGY -- A DECADE OF PROGRESS, Tampa, FL. Contact: Andy Smith, So. Florida Water Mgmt. Dist., 2379 Broad St., Brookville, FL 34609, Phone 352/796-7211, ext 4235.