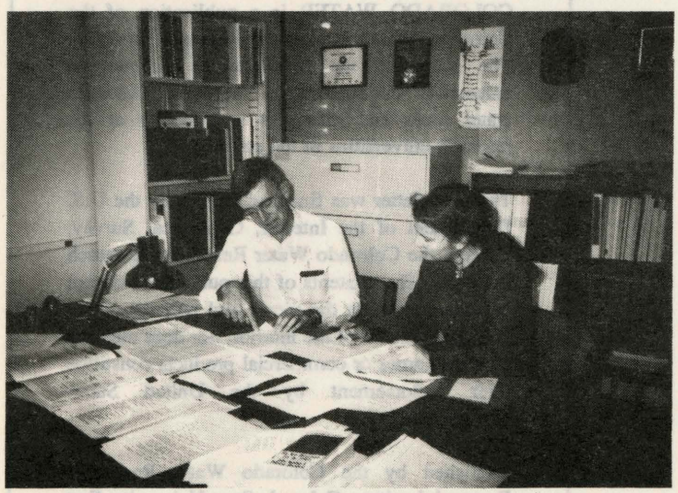
Colorado Water

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

WATER ITEMS AND ISSUES . . . *February 1993*



CWRRI Director Robert Ward and Research Associate Maureen Maxwell review scoping study for water transfers

Water Transfers is a Hot Topic!
Approximately 600 attend
CWCB WATER CONVENTION

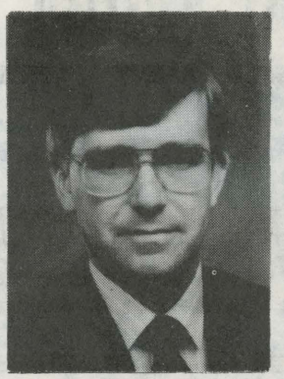
see page 4

REMINDER

AWRA-Colorado Section Symposium
BASIN PLANNING & MANAGEMENT:
WATER QUANTITY AND QUALITY
Friday, March 5, 1993, Brittany Hill Restaurant

Contact Dave Mueller 303/236-4882
or Jerry Kenny 303/987-3443

Colorado State University



WHO NEEDS TO KNOW?

Editorial by
Robert C. Ward

Colorado's professional water managers and consultants are the stewards of the state's water resources. They have created a water infrastructure that supports an active economy. This infrastructure includes a safe public water supply, a sustainable irrigation water supply, water quality protection, protection from flooding, water to support industrial activities, and water for recreation and aesthetics.

Public concern over the status of our environment has led to increased scrutiny of the way water is managed in Colorado. Professional water managers and consultants now have citizens looking over their shoulders expressing considerable interest in their work and decision making procedures.

This public scrutiny bothers some water managers and consultants, while it is readily welcomed by others. A lament often heard is, "How can the public possibly understand all the issues that I have to balance in making my water management decisions?" The answer is, they can't, the way water information is currently made available to them.

Participants in the recent Colorado Water Convention highlighted the above observation by ranking better access and distribution of water information as one of their highest priorities (as ascertained during the breakout workshops held as part of the Convention).

All water management professionals and consultants need to carefully examine how they can make their water information more available to an eager public. *Colorado Water*, a newsletter that attempts to enhance the communication between higher education's researchers and Colorado's water users, constantly is examining how it can translate water research findings into useful information for decision makers. It is not an easy job, nor is the answer obvious. I've almost reached the conclusion that there is a need to actually research methods of how water data can be converted into information the public can readily understand and use. Where do we begin? Do we really understand the breadth of data available and how it can impact decisionmaking?

When the Federal Government seeks additional water for fish habitat, often at the expense of a Colorado water right holder, how is such a request related to the science of the situation? How can the water right holder understand the request? Likewise, when a municipality seeks additional water to support a planned population expansion, how is the need justified to the public? When an environmental group opposes a water project, how are their objections presented to the professional water community? When an industry appeals an effluent discharge permit limit, is the appeal presented in a way the public can understand? When a spill occurs, how can the public understand its relevance to them? Is the word "SPILL" simply spread across the headlines in a very frightening manner?

The list of questions regarding mutual understanding of water issues could go on and on. The point is, we all need to carefully examine the water data and information that crosses our desks daily and determine how this data and information can be better communicated to other water professionals and the public. Water, as it has always been in the West, is a very important natural resource, and everyone is interested and concerned about its management. Furthermore, today the public is more than willing to get involved in water decisions! To participate in the debate on water decisions in a meaningful manner, however, the public needs access to more of the data and information we "professionals" have used for years.

(continued on page 3)

COLORADO WATER

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Robert C. Ward, Director

The results of last November's election regarding the spring bear hunt initiative should be a wake-up call for us. If we don't begin to provide the public with water data and information in a manner they can readily understand, they will act on the basis of the information and understanding they currently possess - and that understanding may be a long way from where the professional water manager sits. We need to actively search for ways to explain, interpret, and communicate our water data and information to each other and the public. Only through better communication all around can we effectively and efficiently address the evolving water management concerns of all Coloradans.

CWCB ANNOUNCES GRANT PROGRAM FOR PILOT PROJECTS ON AGRICULTURAL WATER CONSERVATION AND WATER USE EFFICIENCY

The Colorado Legislature, in Senate Bill 87, authorized a one-time expenditure of up to $500,000 by the Colorado Water Conservation Board for pilot demonstration projects that address agricultural and multipurpose water system water conservation and water use efficiency. The purpose of the grant program is twofold:

- to provide seed money for agricultural and multipurpose water system managers and users throughout Colorado to demonstrate water conservation and water use efficiency measures; and

- to stimulate the development of creative and innovative approaches to water conservation and water use efficiency that will help management achieve savings in operational costs.

The Colorado Water Conservation Board (CWCB) has developed the following criteria for its agricultural water conservation and water use efficiency grants program. A maximum of $100,000 will be awarded for any individual project. Projects must not exceed 30 months from date of contract to submittal of a final report.

GRANT ELIGIBILITY--Any agency or political subdivision of the State, user group or management group of an agricultural water system or multipurpose water system operating in the State, or individuals or groups of individuals may apply for grant awards. Projects must be carried out in the State of Colorado. Grant applicants with limited resources and innovative proposals showing promise for water conservation or water use efficiency will be given special consideration.

PROJECT ELIGIBILITY--Possible categories for grants include but are not limited to:

- Technology Inventory and Assessment - develop a data base identifying relevant state-of-the-art technology and practices
- Programs Inventory and Assessment - develop a clearing house relative to R&D activities and operational programs.
- Agricultural Water Conservation - projects might include water salvage, reductions in diversions, reducing crop consumption through genetic improvements, the development of cooperative operating agreements, and identifying scenarios where various conservation measures can be effective in Colorado under the institutional and legal restraints in place.
- Agricultural Water Use Efficiency - irrigation application technology demonstration, irrigation scheduling practice and technology and operating cost efficiencies.
- Multipurpose Water Systems - water conservation and use efficiency measures involving stream diversions, storage, water conveyance, water use and application practices, operating agreements and potential operating cost savings.
- Water Quality - operational practices that effectively reduce salinity loading, reduce nitrate/nitrite loading, and potential costs savings from such operating modifications.
- Water Reuse and Reclamation - projects might include studies, system enhancement and municipal-agricultural operating agreements.

MATCHING FUNDS REQUIREMENTS--Applications must provide for and identify matching funds to satisfy a 50 percent cost-sharing basis, as stipulated in SB 87. Matching funds may include in-kind services.

APPLICATION PERIOD--The application period for this grant series will remain open until July 1, 1993.

APPLICATION REVIEW AND AWARD CYCLES--Applications will be reviewed and evaluated by CWCB staff and an Advisory Committee. Recommended grant applications will be presented to the CWCB at the next scheduled Board meeting for award approval. Contract awards will be made approximately 45 days after application approval.

For additional information contact the Grants Program Administrator, John Kaliszewski, Water Resource Specialist, Colorado Water Conservation Board, 1313 Sherman St., Room 721, Denver, CO 80203. Phone: 303/866-3441; FAX 303/866-4474.

WATER CONSERVATION OFFICE OFFERS PUBLIC GRANTS

Applications for grants of up to $50,000 are now available to help Colorado communities and other water-providing entities develop innovative water conservation demonstration projects. Any public agency in Colorado can apply for a grant.

The grant program is administered by the Office of Water Conservation (OWC) based on guidelines adopted by the Colorado Water Conservation Board (CWCB). Funding for the grants comes from a one-time allocation of $500,000 from the CWCB's Construction Fund. Grants will be awarded to public agencies until the funds are exhausted.

This is the second year of the grant program, and last year's grants included:

- $32,000 to the City of Castle Rock for a project to transform three homes into state-of-the-art water conserving households.
- $ 8,000 to the Arvada Parks Department for a statewide training program for park managers and others who are responsible for maintaining large turfgrass areas.
- $19,000 to Steamboat Springs to partially fund construction of a high-altitude Xeriscape demonstration area at a local park and to publish a handbook, "Guide to Water Efficient Landscapes in Colorado Mountain Communities."

In all, $204,000 in grants were awarded to 14 water conservation projects in the first cycle.

For information about the existing grants, the grant application process or other water conservation services, contact Chris Bridges, Office of Water Conservation, 1313 Sherman St., Room 721, Denver, CO 80203; Phone 866-3441.

WATER TRANSFER ISSUE DRAWS PARTICIPANTS TO CWCB JANUARY CONVENTION

Approximately 600 persons attended the Colorado Water Convention, held January 4 and 5, 1993 in Denver to focus attention on interbasin and intrabasin water transfers. The meeting allowed the Colorado Water Conservation Board, members of the public, and various water interests from around the state to meet and discuss the issues and conflict surrounding water transfers. Particular emphasis was given to interbasin water transfers and the transfer of agricultural water to urban use.

Last year's Senate bill 87, the Colorado Water Conservation Board construction fund bill, called on the Board to consult with CWRRI about interbasin transfer of water. The consultation took the form of a special scoping study conducted by CSU Research Associate Maureen Maxwell, working closely with the staff of CWCB in the Department of Natural Resources. Results of the scoping study were presented at the convention.

The Convention's first day was devoted to Front Range water supply alternatives. Speakers included Colorado Governor Roy Romer, city mayors, and representatives of Colorado universities, municipalities, irrigation districts, and conservation districts.

On the convention's second day, members of the Colorado Legislature discussed its role in addressing water transfer issues and described potential legislation in the upcoming session. Jud Harper (Vice President for Research, CSU) Robert Ward (CWRRI Director) and Maureen Maxwell (CSU Research Associate) presented results of a scoping analysis of the issues arising from water transfers. The need for statutory changes was discussed, as well as ways to do so, by speakers representing a wide perspective on water policy. Small group workshops gave the participants the opportunity to discuss strategies that would be most successful to help assure adequate water supplies for the Front Range and to define the state's role in the process.

The Convention's most important goal was to gather public input to assist the Governor, the Department of Natural Resources, the Colorado Water Conservation Board and the Colorado Legislature in their deliberations on water policy. Toward that end, public input received at the Convention will be given priority in the conference proceedings. The speeches presented at the conference will be summarized and supplemented with verbatim lists of questions that participants submitted in response to the speeches. Introductory speeches and convention wrap-up speeches will be printed in their entirety. In addition, the proceedings will summarize results of the small-group sessions.

The Department of Natural Resources and CWRRI are collaborating in the preparation of the conference proceedings. CWRRI hopes to have the proceedings available for distribution shortly after March 1.

The conference was sponsored and organized by Governor Roy Romer, the Department of Natural Resources, the Colorado Water Conservation Board, the State Engineer and the Colorado Division of Water Resources.

THE ROLE FOR THE STATE OF COLORADO ON FRONT RANGE WATER CHALLENGES

Presented by Governor Roy Romer
1993 Colorado Water Convention
Denver, Colorado - January 4-5, 1993

Good morning. Thank you for joining with us as we seek to find solutions to some of the key water resource issues of our time. For the last six years, my administration has focused on jobs, the environment and education. In the arid West, water obviously is a key ingredient in that agenda. Colorado's economy depends upon the vitality of our agricultural economy and the attractiveness of our recreation and tourism opportunities. Water is essential to the economic prosperity of the Front Range metropolitan communities and is important in maintaining the environmental quality that makes Colorado the most beautiful and attractive state in this country.

I know that some of you have recognized that this Convention has been called on short notice, and some of you are probably waiting now to identify some hidden theme or veiled agenda in my remarks. Well, there is no hidden agenda. These are the same issues we have been discussing for years. We all recognize that we can do a better job, and that we need to cooperate more, conserve more, and plan better.

I want to be very candid in telling you why we are here today. In the last 5 to 10 years, we have invested many millions of dollars in highly publicized and polarized fights over Two Forks, AWDI, Union Park, the Collegiate Range project, the transfer of Rocky Ford Ditch rights, the proposed Poudre River transfers and many other proposals. This polarization cannot continue if we expect to assure that adequate water supplies will be available for our future needs. Nor can we expect to resolve our water-based economic or environmental concerns if we are not talking to one another and sharing our ideas.

Although our institutions and our leaders are strong, we need to blow the whistle on what has become an unacceptable level of administrative gridlock, litigation, expense and delay whenever water development or transfers are proposed. Many of you probably saw the headline in Saturday's *Rocky Mountain News*, concerning the state study indicating that the metro area has enough water. To be sure, many communities do have a surplus of water, while others are at risk of a shortage. My purpose here today is not to embrace the conclusion of this study -- it may be accurate, and it may not. But I think it ought to be part of the mix of information we consider.

I want you to know that I do not have the solutions for these problems. But I do know that solutions exist and can be found by those in this room. I have three significant expectations of this Convention:

- I hope that we can share information and compare opportunities for assuring future Front Range water supplies in the post-Two Forks era.

- I also hope we can review several proposals intended to address the economic and environmental effects of transferring water from one area of the state to another. As we evaluate these proposals, we must keep in mind our responsibility to assure that adequate water supplies will be available for future needs throughout Colorado.

- Finally, I hope we can clarify the role we may want state government to play in addressing both the Front Range water supply and area-of-origin issues.

THE CURRENT SITUATION, AFTER TWO FORKS

The Denver Metropolitan area is expected to grow by more than 30 percent within 20 years. The Two Forks EIS in 1988 projected a water supply shortfall of approximately 98,000 acre-feet by the year 2010, and a shortfall of approximately 163,000 acre-feet by the year 2035. Although these projections may change over time, we have every reason to believe that additional water supplies will be needed.

Since the EPA veto of Two Forks, water supply planning efforts for the metro Front Range communities have proceeded in a piecemeal fashion, with little direction or momentum. This is unfortunate because it will require more cooperation, not less, to assure that adequate water supplies are maintained through other alternatives. The Denver Water Board has decided it will no longer play the lead role in securing water supplies for the Metropolitan area. Some of the suburban water agencies have formed the Metropolitan Denver Water Authority; others have formed the Front Range Water Authority. Still others are independently pursuing new water sources to enhance existing supplies.

In addition to these efforts by government, many controversial efforts by private entrepreneurs have been launched: American Water Development in the San Luis Valley; Union Park in the Gunnison; the Colorado Water Supply Company proposal in the Lower Arkansas River; and several others. Tens of millions of dollars have been spent on legal and engineering fees. And, in the final analysis, very little has been accomplished to meet the needs of the Front Range.

Our water wars have focused attention on the potential economic and environmental impacts associated with the transfer of water from one area of the state to another. Some have even proposed legislation or constitutional amendments to restrict such transfers. But we must ask ourselves whether the real solution to these "area of origin" concerns might be found in addressing the way we plan for and develop future water supplies along the Front Range.

SOME ISSUES OF STATEWIDE CONCERN

Waste of Public and Private Funds: It is clear that our independent efforts to secure individual water supplies is wasteful and counterproductive. The institutional independence of water supplies throughout the Denver Metropolitan Area causes isolated surplus and shortage of water and a premature need for additional water supplies. This was demonstrated in the Two Forks EIS and became a part of the permitting controversy. Furthermore, our individual approaches have magnified the complexity and expense of

competition for our water resources, assuring that every new appropriation or "change of use" will be challenged by many other parties.

What did we spend for Two Forks? -- $40 million?

What about AWDI? -- $30 million?

And another $15 million or so on Gunnison?

We are approaching $100 million in expenditures on water planning and not a drop to show for it.

Dry Up of Agricultural Lands: A second issue of statewide concern which has intensified these confrontations is the potential dry-up of some of our most productive agricultural lands. Over the years, thousands of acres of agricultural land have been dried up as irrigation rights are sold and transferred to municipal water use. Rural economics have been hurt. The local property tax base in rural communities has contracted. Financing for schools, fire protection, libraries, trash disposal, and many other community services have suffered.

As agricultural production in a community is reduced, many related businesses also suffer - from retailers to seed suppliers to clothing and hardware stores, restaurants and movie theaters. In the long run, this may threaten the integrity of Colorado's rural communities and agricultural economy. And these impacts may be contrary to the desires of most Coloradans. CSU conducted a poll last summer which suggested that 73% of Coloradans would give highest priority to water uses that sustain agriculture. Only 10% would give highest priority to growing cities.

Environmental Consequences: Environmental consequences are also often associated with water transfers, and federal and state law precludes us from ignoring these consequences. These concerns were not anticipated a century ago when we set out to "fully develop" our water resources. Now, however, these concerns impose new challenges on our ability to use Colorado's water where it is most needed. Unfortunately, environmental consequences are very difficult to measure or predict, and that makes them very easy to fight over in the government bureaucracies and in the courts.

Extensive Lead Time Needed to Produce New Supplies: Also, it takes a long time to deliver new or transferred water supplies to meet our future needs. The time and expense of engineering studies, environmental studies, and public participation make the decision process so complicated that the development or transfer of new water supplies must be initiated long before the need for them actually arises. Without a crystal ball or a better way of making these decisions, we may be forced to prepare for major shortages and to entrust our future to luck and litigation.

Impact on Future Development in Other Parts of the State: Finally, extensive transfers of water from any given area may preclude future growth in that area. We have seen this happen in parts of the Fraser River basin. The recent agreement between Denver, the Colorado River Water Conservation District and others appears to have solved that particular problem, and I applaud such efforts, but we know that this risk is a real one.

NEW DIRECTIONS AND ALTERNATIVES

I know we can find solutions to these issues. There are many options available to us as we seek effective and cooperative ways to assure adequate water supplies, and protect our agricultural communities, our environment, and our economy. As we look at some alternative strategies for resolving these concerns, I don't think we are talking about a fundamental change in our water rights system -- and I understand that there may be some nervousness about that in this room. We don't need to introduce fundamental change into our water rights system, but we should not be afraid to explore a more productive and less divisive approach to problem solving.

And as we examine these approaches, perhaps it is time for the State to play an enhanced role in these matters. I say this with some reluctance, because clearly, the people of Colorado are demanding smaller, less expensive government. But it is equally clear that the divisiveness, lack of cooperative planning and endless litigation we have experienced carries its own price tag. We have many options to consider:

A Regional Water Coordinating Organization: We may want the State to organize the many independent water providers along the Front Range into an association which could soften the institutional boundaries that currently isolate and divide our Front Range communities. By doing so, we may be able to reduce or eliminate existing water supply shortages, reduce competition and increase support for new sources of supply, and develop a cohesive regional plan which assures adequate water supplies throughout the Front Range.

State Incentives: We may also want to use state resources such as money from our Construction Fund or Water and Power Authority as incentives to promote more coordinated and comprehensive planning and management of our water resources. This might be accomplished by attaching conditions to state assistance for the construction or enhancement of water infrastructure.

State Water Project: Some have suggested that state government play a more active role in facilitating the development of our compact entitlements as the need for larger water supplies for the Front Range materializes. Some have even suggested that Colorado develop a "State Water Project," as was built in California. I don't know if this is a viable idea, but we should not be afraid of discussing ideas like this.

Cooperation with Agricultural Water Users: We may also want to explore ways to minimize impacts to rural Colorado as Front Range municipalities purchase or appropriate water resources for trans-basin diversion. For example, in response to the proposal to transfer water from the Fort Lyon Canal in the Arkansas River Valley, I asked the Water Conservation Board to take a hard look at the dry-year lease or interruptible supply arrangements. I am fully supportive of their careful examination of these options, since we want to minimize adverse impacts to our agricultural economy and communities. A similar alternative might be for the state to promote an experimental land fallowing program similar to the one Southern California is undertaking.

At noon, you will hear about this program which will allow California farmers using irrigation water to set aside up to 25

percent of their productive lands in order to make additional water resources available from the Colorado River for municipal and industrial uses in Los Angeles. Perhaps a short-term experiment of this nature would be worthwhile in Colorado as well.

Enhanced Information System: We might also consider increasing the ability of our state agencies to coordinate water resources data, information management systems, and decision support systems. This might facilitate the analysis of a wide variety of proposed actions and their impacts on water rights, compact obligations, instream flows, and the environment. Assuming these systems would be available to all interested parties, the engineering and legal costs related to water resource projects could be reduced substantially. Also, access to better information might help us develop consensus for those projects that optimize the use of water and have the least impact on the environment.

CONCLUSION

At my request the Departments of Natural Resources and Local Affairs have contracted for a study on options for Front Range water supplies. That draft study will be described for you in just a few hours. Essentially, it proposes a more detailed investigation of a comprehensive system for water resource management throughout the Front Range urban corridor. If we decide that this alternative is the wisest way to proceed, it could be organized in several different ways, but the support of Front Range communities, rural communities, the environmental community, and other interests throughout the state would be essential. I think you all agree that the expense and frustration of doing business as usual cannot continue. As you absorb the information presented over the next two days, I ask you to consider whether it would be helpful to establish a more active state role in moving forward on these issues.

While several legislative and administrative options are available to us, I am also quite aware that many Coloradans want a smaller and less expensive government. I also know that we should not and cannot force any resolution of these issues that does not work reasonably well for all of us. As I look at this audience, it is clear to me that you have sufficient knowledge, wisdom and leadership to address these questions and I am anxious to hear your views.

> *"As I was driving down from Greeley and listening to the radio, a reporter was explaining the situation in Somalia. He said a map of that country looked like a piece of shattered glass, and wondered why the warlords had carved out such strange areas for themselves. In investigating, he found that those lines that the various warlords had used to carve out areas for themselves were lines that went around the waterholes of the country. Somalians were a nomad nation and the only thing of primary importance to them was the water, so they fought their battles based on that."*
>
> Senator Tom Norton, 1993 Colorado Water Convention, January 4-5, 1993.

WATER RESEARCH

RECOMMENDED WATER QUALITY CRITERIA FOR AGRICULTURAL DIVERSIONS IN COLORADO

Summary of a report by T.K. Gates, T.G. Sanders and T.H. Podmore
Project Technical Report 1, Colorado Agricultural Experiment Station, Project No. 1372-647
January 1993

Recent years have seen increasing competition between urban-industrial areas and irrigated agriculture for the limited water resources of the western United States. One attempt to ease this tension in Colorado has been through the utilization of agricultural water decrees for urban purposes through augmentation, transfer and exchange agreements. A key requirement of these arrangements under Colorado water law is that water returned to the stream must be of "acceptable quality" relative to historic use. However, there is growing concern among agricultural water users regarding this interpretation of what constitutes "acceptable quality."

Effects of Water Quality in Agriculture--One man's waste being another's supply is not a new concept; the practice of recirculating and reusing wastewaters is an inherent aspect of the hydrologic cycle. What is new, however, is the complexity and degree of efforts that presently occur from water pollution. Research to establish pollution guidelines and standards has been driven primarily by concern about direct effects on public health. However, a previously neglected issue has drawn increasing attention in Colorado in recent years: the extent to which return flows and wastewater effluent from municipalities impair the quality of water for downstream use by irrigated agriculture.

Poor water quality can affect agriculture in several ways. First, and usually of primary concern, is the health of users exposed to direct contact. Secondly, the production system of soils, crops, and livestock also can be degraded or destroyed through polluting elements in agricultural waters. For example, a major problem in the western U.S. and around the world is the destruction of prime agricultural land through irrigation-induced

salinization. Finally, an important factor to consider is the impact that the quality of waters coming onto the farm will have on the resulting quality of agricultural return flows.

Current Surface Water Quality in Colorado--Several major river systems originate in Colorado: the Arkansas, the Colorado, the Platte, the Rio Grande and the Republican. These rivers have major tributaries like the Green, the San Juan, the Cache la Poudre, the North Platte and the South Platte. All of these river systems support some part of Colorado's vast irrigated agriculture--a total of 3 million acres statewide. The status of surface water quality in some of the more intensively irrigated basins is briefly described in the report.

Toward a Water Quality Criteria for Colorado Agriculture--The first guidelines for agricultural water quality in the United States were recommended by the Federal Water Pollution Control Administration (1968). They were succeeded by agricultural guidelines in the Environmental Protection Agency's (EPA) *Water Quality Criteria - 1972* developed by the National Academy of Sciences (1973) and EPA's *Quality Criteria for Water* (EPA 1976). Perhaps the most comprehensive study on agricultural water quality was reported in 1985 for the Food and Agriculture Organization (FAO) of the United Nations (Ayers and Westcot 1985).

Current Colorado standards for contaminants in agricultural waters (Code of Colorado Regs. 12CR9, 9-89) are based on the EPA's 1972 and 1976 water quality criteria standards. Colorado has no microbial guidelines (i.e. bacteria, protozoa, helminths and viruses) for agricultural use of raw water as well as recycled wastewater in sprinkler or surface irrigation of food crops (Task Force for Water Reuse 1989). Also, no standards currently exist for pH, total dissolved solids and several ions and trace elements. Several water quality constituents of interest to Colorado agriculture are discussed in the complete report, and recommendations for amendments to current state standards, based on recent research and practice, are presented.

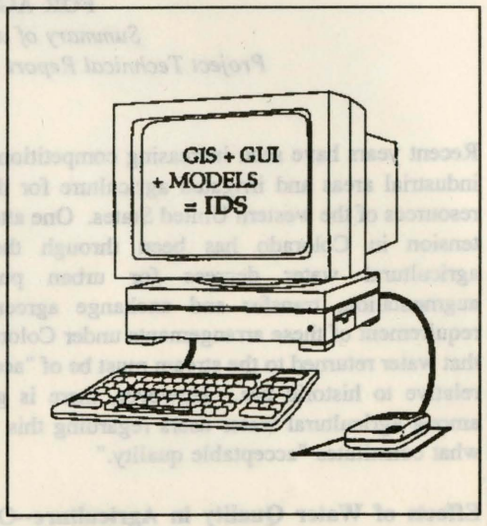
Conclusion and Recommendations--Competition between urban and agricultural interests for the limited water resources of Colorado's appropriated streams can be reduced through the use of transfer and exchange agreements. Such arrangements result in the replacement of higher quality water diverted for urban and industrial use with treated municipal wastewater effluent. Sewage effluent-contaminated streams contain concentrations of constituents that can significantly impair the soil-plant-animal systems of irrigated agriculture. Management to minimize or prevent such impairment requires the adoption of water quality criteria.

This report provides a scientific review of the latest research findings and policies regarding water quality criteria for irrigated agriculture. Major constituents of interest to Colorado are addressed and associated criteria are presented. Difficult questions regarding the implementation of the recommended criteria within regulatory and management contexts must be addressed. The tension such issues create, particularly between competing economic interests, can be discomforting. Nevertheless, in the long-term interest of sustaining Colorado agriculture and its benefits to the public, we put forward these recommendations for consideration.

For more information about the report contact: Dr. Tim K. Gates, Department of Civil Engineering, Wagar Building, Colorado State University, Fort Collins, CO 80523. Telephone: 303/491-5247.

IDS DEVELOPS INNOVATIVE DECISION SUPPORT SYSTEMS FOR NATURAL RESOURCES MANAGEMENT

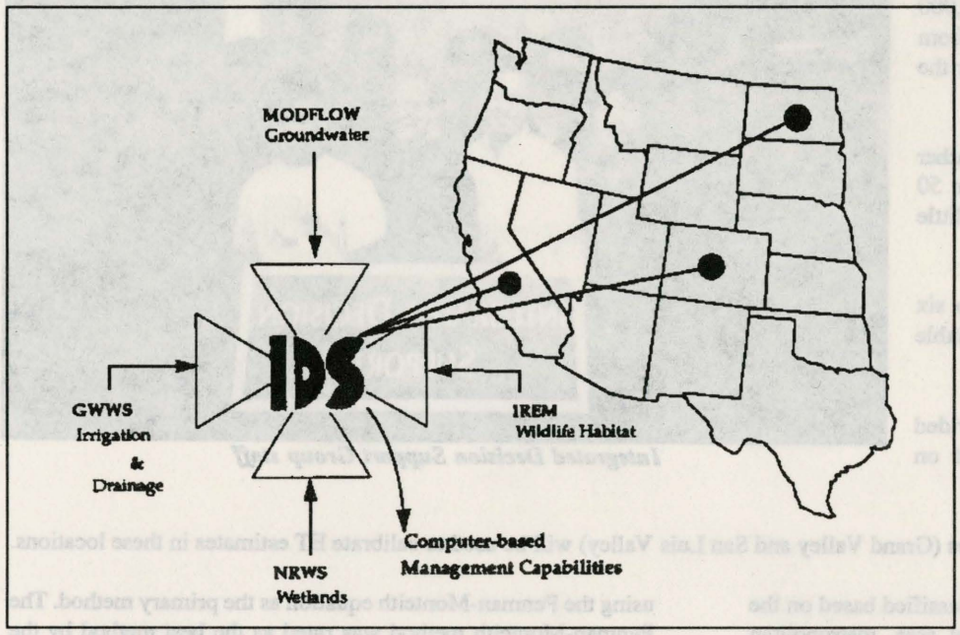
The Integrated Decision Support Group (IDS) is an interdisciplinary group formed in January 1992 to develop decision support systems for applications related to water resource management. By combining advanced modeling techniques with software engineering, IDS has developed a series of innovative Decision Support Systems (DSS). A DSS provides the computer environment for optimal planning by facilitating and automating the modeling process.



The water resource manager can accurately model surface water, groundwater, wetlands and wildlife habitat. When the attributes of one of the components is changed, the effect on the other components in the system can be analyzed. A DSS combines advanced modeling, complex data, geographical information systems and graphical-user interfaces into a single system. The DSS concept can be custom-designed for a particular area and used to analyze and/or optimize resources while developing management scenarios.

Accurate Modeling--A DSS must first model the existing characteristics of an area and then model its potential state based on possible management scenarios. In these scenarios habitat changes, due to changes in water quantity and quality, are elements of the evaluation process. Simulation and optimization modules combined with a graphical user interface permit efficient and convenient study of various resource management scenarios. Maps, graphs, and bar charts can be used to provide an interactive graphical interface of the DSS which can be smooth, intuitive, and useful. DSS provides the ability

to simulate the natural environment quickly and easily, and can store all information required for post-processing analysis and display. Exploring various scenarios through the use of DSS will lead to well-examined solutions and, hopefully, better use of land and water resources.



DSS Applied--Examples of DSS include the Natural Resource Workstation (NRWS), the Integrated River Basin Environmental Management interface (IREM) and the MODFLOW DSS. These Decision Support Systems use Geographic Information Systems (GIS), particularly the Geographic Resource Analysis Simulation System (GRASS), to manipulate spatial information. The necessary modeling tools are presented in a graphical user interface that was developed using X, OSF/Motif and written in the C programming language. Models incorporated into the DSS maintain the developer's model integrity and allow for interactive updates.

The Interdisciplinary Approach--The first step in the development process is to establish what each discipline requires from the system. Continued cooperation is also important to the development of a resource management system that is shared by technical personnel representing many disciplines. This interdisciplinary approach will permit modeling solutions that are realistic and feasible for real world environmental constraints.

Summary--The IDS Group represents the diversity in needs of the end user by an interdisciplinary approach. IDS team members include individuals trained in civil engineering, agricultural engineering, computer science and technical journalism. This interdisciplinary approach permits modeling solutions that are realistic and feasible by combining comprehensive modeling with state-of-the-art software engineering.

IDS is located at Colorado State University and is part of the Center for Water Resources Engineering and Science (CWRES). CWRES was formed in 1990 to provide an umbrella organization for water programs contained within the College of Engineering at Colorado State. Included are programs in hydraulics, hydrologic science, hydrologic engineering, groundwater modeling, environmental engineering, fluid mechanics, water resources management, irrigation engineering, and drainage engineering.

IDS has joint projects with the Colorado Water Resources Research Institute (CWRRI) and the Bureau of Reclamation (USBR), and works closely with other university organizations in the areas of GIS, Remote Sensing, Natural Resource Management, Agricultural Engineering and Civil Engineering.

IDS/CWRRI Project to Compile Reference Evapotranspiration Maps for Colorado

The accurate estimation of water demand in an irrigation system is critical in optimizing the delivery and use of water. The state-of-the-art procedure for estimating evapotranspiration (ET) and water demand is to first determine Reference Crop Evapotranspiration (ETo) values for a given location and then apply crop coefficients. At the present time the state of Colorado does not have a standard set of mean ETo values to use in water transfer decisions and water resource planning and management.

Because the ETo values are calculated for specific locations and are dependent on climate, when dealing with a large areas it is recommended that the ETo values be presented in the form of isoline maps. The lack of a set of isoline maps for the state of Colorado results in a lack of consistency in the estimation of crop water requirements for use in project planning, design and operation.

The Integrated Decision Support Group (IDS) is combining a Graphical Users Interface, a Geographical Information System and Weather Data to creating a set of isoline maps for the Colorado River Basin, the results of this study could be adopted by the State Engineer's Office as a standard set of ETo maps for the state of Colorado.

A concerted effort is underway to contact, collect and screen meteorological data from any groups that gather weather and ET data and to consolidate the data in one system. Weather data have been identified and/or purchased from these sources:

- COAGMET - Colorado agricultural Meteorological Network. Three years of data from four stations have been provided over the network at no cost.

- o JCEM - Joint Center for Energy Management. At a cost of over 5,000 dollars for less than five years of data from four weather stations, this data is by far the most expensive.

- o RAMS - Remote Automatic Weather Stations. Seven years of data for over 50 weather stations was provides for a little more than 100 dollars a year.

- o UCC - Utah Climate Center. Three to six years of data for five stations was available for 300 dollars.

- o NWS - National Weather Service. Provided data from 75 weather stations stored on CD-ROM.

Integrated Decision Support Group staff

- o Five years of data for two lysimeter sites (Grand Valley and San Luis Valley) will be used to calibrate ET estimates in these locations.

The meteorological data is collected and classified based on the location of sampling (pasture, agricultural area, metropolitan area, etc.). An attempt will be made to adjust the meteorological values to convert them to a pre-specified type of location (i.e. agricultural area). The adjusted meteorological parameters can then be used to compute the ETo from the locations containing all the information.

It is expected that all the weather stations will not contain a complete data set and only certain parameters will be available at some locations (minimum and maximum temperature, wind run, relative humidity, etc.). Because not all meteorological parameters will be available at each of the weather stations, some will need to be interpolated between the stations that do have the parameters.

Because of the spatial nature of the meteorological data, a Geographic Information System (GIS) is used in the manipulation of the information. All the weather station locations are being put into a GIS with the existing data. The GIS can then be used to develop isoline maps for each of the meteorological parameters. From these isoline maps the values for each of the parameters missing at any weather station can be obtained.

After a complete meteorological data set is developed for each of the weather stations, estimates for ETo will be computed using the Penman-Monteith equation as the primary method. The Penman-Monteith method was rated as the best method by the American Society of Civil Engineers. The Food and Agriculture Organization (FAO) of the United Nations during a special conference in 1990 decided to use the Penman-Monteith method as the basic equation in the revision of the FAO Irrigation and Drainage paper No. 24. These ET values will be used in the GIS to develop a set of ETo maps for the area under study. The ETo map locations where lysimeter data or very detailed water budget studies are available will be used to validate the calculated ETo values.

Project Funding--The project is funded through the State Water Institute Program (CWRRI) and the State Engineer's Office.

For more information please contact:
Dr. Luis Garcia
CWRES-IDS Group
410 University Services Center
Colorado State University
Fort Collins, CO 80523
Phone: (303) 491-5144
Fax: (303) 491-2293
E-mail: garcia@Longs.LANCE.ColoState.EDU

REPORT DETAILS FIELD ASSESSMENT OF STREAM-AQUIFER INTERACTION

In an attempt to quantify the impacts that groundwater use has on stream discharge, recent research at the Colorado School of Mines has allowed the successful prediction of streamflow loss or gain based on field measurements of the groundwater system. The field area, located several mines southwest of the Colorado School of Mines in Golden, Colorado, was chosen due to the intermittent nature of the small stream allowing an innovative yet inexpensive monitoring program.

While a number of mechanisms have been known to control the interaction of groundwater with surface water, this study concentrated on monitoring temporal and spatial changes in head gradient and hydraulic conductivity in the shallow subsurface. During the course of the study, observed gradients changed

appreciably in magnitude over a long period of time, suggesting that the response time of the groundwater system is buffered.

Measured conductivities of the porous media vary over several orders of magnitude, but a distinct two-layer system was observed and used as a model to predict streamflows. Using this two-layered system as a model in conjunction with the shallow gradients, the predicted streamflow loss or gain compares favorably with observed streamflows.

The approach taken in this research serves as a guide for potential users who wish to obtain a quick and inexpensive overview of site-specific interactions between surface and groundwaters.

The project was sponsored by CWRRI under the USGS State Water Institute Program, and the completion report is available. See page 19, CWRRI Publications, for ordering information.

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

MYSIS/ZOOPLANKTON STUDIES, Eric Bergersen, Fishery and Wildlife Biology
EVALUATION OF INJURIES CAUSED BY ELECTROFISHING, Eric Bergersen, Fishery and Wildlife Biology
GLOBAL OPTIMIZATION FOR GEOPHYSICAL APPLICATIONS USING GENETIC ALGORITHMS, Darrell Whitley, Computer Sciences
EXPERT SYSTEM DEVELOPMENT FOR DAM SAFETY, Thomas Siller, Civil Engineering
A DESCRIPTION OF NON-GAME TAX CHECKOFF DONORS IN COLORADO, Michael Manfredo, Recreation Resources
SUBSTRATE SAMPLING TECHNIQUES, Steve Abt, Civil Engineering
PRESENT AND FUTURE RIVER BASIN IRRIGATION WATER DEMAND REDUCTION..., Terry Podmore, Agricultural and Chemical Engineering
COLORADO WATER CONSERVATION BOARD SCOPING STUDY ON WATER TRANSFERS, Robert C. Ward, CWRRI
MONITORING OF 35 DEC SITES, Chester C. Watson, Civil Engineering
MODIFICATION AND APPLICATION OF RAMS COMPUTER CODE, Thomas B. McKee, Atmospheric Science

University of Colorado, Boulder, CO 80309

THE SOLID FORMS OF LEAD IN MINING, MILLING AND SMELTING WASTES, LEADVILLE, COLORADO WITH APPLICATIONS TO AQUEOUS LEACHABILITY..., Donald Runnells, Geological Sciences
SENSITIVITY OF TROPICAL OCEANS TO FRESHWATER FLUX AND THE USE OF TRMM PRECIPITATION DATA IN OCEAN MODELING, Richard Gosnell, Atmospheric and Oceanic Sciences
ACCELERATED DEVELOPMENT OF AN SSM/I EARTH GRID AS A CANDIDATE FOR THE SSM/I PATHFINDER BENCHMARK GRIDDED PRODUCTS, Richard Armstrong, Cooperative Institute for Research in Environmental Sciences (CIRES)
EFFECTS OF CLIMATE CHANGE IN THE COLORADO ALPINE: ECOSYSTEM RESPONSE TO ALTERED SNOWPACK AND RAINFALL REGIMES, Timothy Seastedt, Institute of Arctic and Alpine Research (IAAR)
BIOLOGICAL HYSTERESIS IN CLIMATE CHANGE MODELS FOR GRASSLANDS: IMPLICATIONS OF PLANT COMMUNITY DYNAMICS ON BIOGEOCHEMICAL FEEDBACKS, Timothy Seastedt, IAAR
COMPARATIVE LITHOLOGICAL MAPPING USING MULTIPOLARIZATION, MULTIFREQUENCY IMAGING RADAR AND MULTISPECTRAL OFFICIAL REMOTE SENSING, Fred Kruse, CIRES
INVESTIGATIONS OF NATURAL GROUNDWATER HAZARDS AT THE PROPOSED YUCCA MOUNTAIN HIGH LEVEL NUCLEAR WASTE REPOSITORY, Charles Archambeau, Physics
APPLICATION OF THE INFLUENCE DIAGRAMMING TECHNIQUE TO DOE ENVIRONMENTAL RESTORATION PROJECTS, James Kiekmann, Civil, Environmental and Architectural Engineering
OPPORTUNITIES FOR INCREASED ENVIRONMENTAL BENEFITS, Lawrence MacDonnell, Natural Resources Law Center

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FEATURES

WATER EXPERTS MEET TO FRAME IDEAS FOR CLINTON ADMINISTRATION

A group of 30 water policy experts from across the country gathered in early December at Allenspark, Colorado to focus on critical water policy issues and opportunities for action by the Clinton-Gore Administration. The group was assembled by the

University of Colorado's Natural Resources Law Center. In its report, the group calls for the reform of national policy to achieve the following objectives for sustainable water use:

water use efficiency and conservation;
ecological integrity and restoration;
clean water; and
equity and participation in decisionmaking.

Several themes emerged from the report's detailed recommendations:

that watersheds be viewed as the fundamental unit of water management;

that human communities interested in and dependent upon water are broader than current policies recognize;

that the federal government should take a leading role in promoting more efficient use of water; and

that the federal government should take immediate action to protect Indian water rights and to prevent inequitable impacts on ethnic and low-income communities.

The report includes recommendations for the Administration's first 100 days and other recommendations for implementation throughout President Clinton's first term. A condensed version of the group's recommendations to President Clinton for the first 100 days of his Administration follows.

(1) Seek congressional approval of the Environental Protection Agency (EPA) as a cabinet-level agency.

Water Use Efficiency and Conservation

(2) Endorse market-based transfers of federally developed water.

(3) The Secretary of the Interior should assign a high priority to implementing Title 34 of P.L. 102-575 relating to the Central Valley Project.

(4) The EPA Administrator should allow use of state wastewater treatment revolving funds for loans to utilities to assist water conservation efforts.

(5) Direct EPA, the Corps of Engineers and the Department of the Interior to: identify best management practices for urban water conservation to be used as baseline measures for evaluating applications for federal permits and identify integrated resource planning procedures to be used by applicants for federal financial assistance.

Amend and strengthen existing Executive Order on Energy Efficiency in Federal Facilities.

(6) Suspend all work on the proposed transfer of the Central Valley Project to the State of California until rules are promulgated that require recoupment of CVP federal construction, operation and maintenance subsidies and ensure that all environmental obligations are met by any such CVP transfer.

(7) Aggressively implement Title XVI of P.L. 102-575 (Reclamation, Wastewater and Groundwater Studies).

(8) Ensure that federal land transfers intended for residential and commercial development have adequate long-term water supplies to sustain the development.

Ecological Integrity and Restoration

(9) Support reauthorization of the Endangered Species Act with provisions to promote ecosystem protection.

(10) Support a substantial expansion of the National Wild and Scenic River system during the next four years.

(11) Issue an Executive Order establishing a policy of watershed-level aquatic ecosystem protection and restoration.

(12) Withdraw the August 1991 Wetlands Delineation Manual and appoint an interagency scientific task force to revise the 1987-89 manuals to address regional variations and concerns; support funding the Wetlands Reserve Program; and announce support for the Clean Water Act Section 404 (wetlands protection) permit program.

(13) Appoint FERC commissioners and power marketing administrators who are sensitive to ecological and non-power interests for hydropower licensing and marketing.

Clean Water

(14) Support annual investments of $2 billion over the next four years to assist communities in complying with the Safe Drinking Water Act.

(15) Form a federal-state task force to identify, prioritize and develop action plans for problem watersheds and pursue funding under the nonpoint source program and the Farm Bill water quality provisions.

Equity and Participation in Decisionmaking

(16) Recommit the United States to protect Indian water rights.

(17) Ensure that federal programs are administered to avoid inequitable and disproportionate effects on identifiable ethnic and low-income communities by: fulfilling needs of traditional Hispanic water management organizations; preventing siting of waste facilities and sewage plants

predominantly in low-income areas; and modifying programs of the Soil Conservation Service and other programs for water management and control in coastal Louisiana that result in denying access to local fishermen.

The complete report, *America's Waters: A New Era of Sustainability,"* is available from the Natural Resources Law Center, University of Colorado, Campus Box 401, Boulder, Colorado 80309-0401. Phone: 303/492-1286; FAX 303/.492-1297.

Participants attended the meeting as individuals, not as representatives of their agencies or organizations, and the report may not reflect the views of their employers.

Colorado members included Bruce Driver, Attorney and Consultant; John E. Ecohawk, Native American Rights Fund; David H. Getches and Charles F. Wilkinson, University of Colorado School of Law; and Sarah F. Bates, Lawrence J. MacDonnell and Teresa A. Rice of the Natural Resources Law Center.

A DECLARATION OF H_2O INDEPENDENCE

Summary of an article by Kevin McLaughlin for ***Aqueduct****, published by the Metropolitan Water District of Southern California, Vol. 58, November 2, 1992.*

by Jennifer Roberts

There are critics who declare that water marketing will not work; however, in Colorado there is evidence to suggest otherwise. The Colorado Big Thompson (CBT) Project may be the most workable model available for providing basic clues to understanding the water transfer enigma.

The largest Colorado transmountain diversion project completed, the CBT was designed to stabilize fluctuating runoff from the Upper Colorado River Basin by diverting water through the continental divide to northeast Colorado. The CBT delivers up to 310,000 acre-feet of water annually into the St. Vrain, Little and Big Thompson, and Poudre rivers for agricultural, municipal and industrial users.

In the early 1950's, founders of the Northern Colorado Water Conservancy District (NCWCD) set a new course by permitting any municipal water organization, irrigation district or farmer within its boundaries to buy or sell water rights from each other.

The district's water resources have shifted from 95 percent agricultural usage in 1956 to 74 percent in 1991, but despite the overall transition from agricultural to municipal use, northern Colorado remains a rich agricultural area -- thanks, in part, to the cities which readily rent surplus water to the farmers. The Census of Agriculture cites Weld County as being the fourth richest agricultural-producing county in the U.S. with $864 million in agricultural products sold in 1988. These interbasin transfers take place without applying to Colorado's water courts to change points of diversion, places of use or purposes of use.

Each month the NCWCD board of directors reviews all permanent transfer requests. Assuming both parties are within district boundaries, there is a demonstrated beneficial use, and all the paperwork is in order, the process is virtually a slam dunk--seven days after its approval the transaction is closed. Almost 70 percent of the CBT water supply changed hands in 1991. The historical average is closer to 50 percent.

What explains this peaceful, efficient transfer of water? Buyers know exactly what they are going to get for their money. Due to a system known as the "April Quota," the water rights are systematically and readily quantified. They are simple and well defined. And they are perpetual.

What is the lesson to be learned? A fair market water policy works. Municipal and agricultural interests alike make necessary water purchases and both thrive.

Metropolitan Water District of Southern California's general manager Carl Boronkay cites the success of the CBT as an example of how supplies can be stretched through water marketing. "We firmly believe in a free enterprise solution that is fair and efficient, and, though the Colorado project transfers are contained within a single district and structured more loosely than the proposal we support for California, their program does show one way that marketing is working."

Kevin McLaughlin is a writer for ***Aqueduct***, published by Metropolitan Water District of Southern California.

Editorial Comment: While this article extols Colorado's CBT Project, at the 1993 Colorado Water Convention, held January 4-5, Duane Georgeson of Metropolitan Water District of Southern California was invited to share California's successes in water transfer. As you can see, the dialogue works both ways.

CALIFORNIA LEGALIZES RESIDENTIAL GRAYWATER REUSE

Summary of an article appearing in
***Small Flows,** Volume 6, Number 4, October 1992,*
by Nancy Gover, staff writer

California will soon become the first state to legalize reuse of residential graywater. The new graywater legislation will go into effect July 1, 1993, under standards due to be finalized by that date. Under the new law, Californians can reuse wastewater from showers, bathtubs, bathroom washbasins, clothes washers, and laundry tubs to irrigate the landscape by means of subsurface distribution systems. To reduce the possibility of the water containing organic grease or pathogens, the law does not permit reuse of wastewater from kitchen sinks or dishwashers.

Larry Farwell, program manager for California's Department of Water Resources, says that the most immediate benefit of the graywater law will be its effect on water bills. He estimates that one-half to three-fourths of the water used inside a typical household can be reused, reducing daily water consumption by 24 to 40 gallons per person per day, so water bills will drop accordingly. According to Farwell, the new legislation was the result of a great deal of public pressure from Californians who are bearing the burden of increasingly limited water supplies and rising water costs. He says that prior to the new legislation's approval, six California counties, encompassing more than 12 million people, had already approved graywater reuse at the county level.

Farwell points out another benefit of graywater reuse - it lowers the cost of treating wastewater. He cites as an example a wastewater treatment plant taking in 10 million gallons per day (mgd). If its flow is reduced by only 20 percent, to eight mgd, he explains, the resultant reduced flow requires less pumping, fewer chemicals, and less holding time. California's Department of Water Resources and the California Department of Health Services will be drafting the final criteria that will accompany the new law. Many of these standards are already set forth in Appendix W of the Uniform Plumbing Code (UPC). *For further information about California's new graywater law, contact Larry Farwell at (916) 653-6261.*

TV Star Getting In On the Graywater Act

Melanie Chartoff, who plays high school principal Grace Musson on Fox's Sunday night sitcom "Parker Lewis," has a patent pending on her new "graywater valve" that diverts wastewater from sink, bath, and shower drains to a holding tank for toilet flushing. She developed the device shortly after buying a 69-year-old home in Rancho Park near Beverly Hills. "I was wearing myself and my boyfriend out, carrying buckets of water to the garden and the toilet, as a way to save water," noted Chartoff.

Chartoff has patents pending in the U.S. and abroad for the gray water valve, and she is currently seeking a manufacturer. All the system requires, Chartoff said, "is one more pipe, a pump, and a holding tank." She estimates that the price of the system would be about $600, but the savings would on an average water bill would run from 35 to 50 percent.

Partial Source: *U.S. Water News,* December 1992

So How Much Water Are We Using, Anyway?

1984 estimates by the Colorado River Water Conservation District and the Colorado River Water Users Association are:

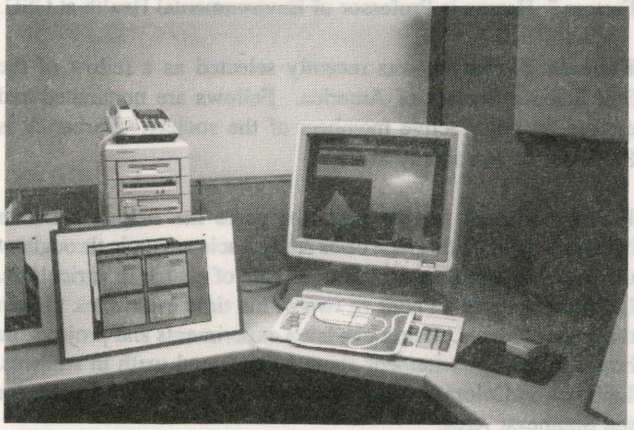
.....	**5-9**	gallons of water per minute for a shower
.....	**3-7**	gallons of water to flush a toilet
.....	**25**	gallons of water to wash one load of dishes by machine
.....	**30**	gallons of water to wash one load of laundry
.....	**548**	gallons of water per year to meet the food and drink supply for a family of four

UNIVERSITY WATER NEWS

TERRA LABORATORY HOLDS OPEN HOUSE

On December 11, 1992 the Terrestrial Ecosystem Regional Research and Analysis (TERRA) Laboratory held an open house to acquaint people with the agency's responsibilities and goals.

TERRA's mission is to help integrate broad, multidisciplinary research being conducted on terrestrial ecosystems within the U.S. Global Climate Change Research Program. Supported by the Department of Agriculture and the Department of the Interior, it serves as an integration point for the Agricultural Research Service, the Forest Service Rocky Mountain and Intermountain Stations, the Soil Conservation Service and the Geological Survey's National Mapping Division.



TERRA supports these agencies in the areas of **water allocation, vegetation utilization** (cropping, grazing, logging), and **land use restrictions** (wilderness, T&E Species, and environmental regulations). Lab personnel are developing procedures that will enable people from a wide variety of disciplines to share their expertise. Powerful computer workstations run software that simplifies loading, linking, visualizing and applying ecosystem component simulation models.

TERRA is designing a decision-making methodology (DAM) with the capability to study the cumulative regional effects of local decisions. The **TERRA DAM** will be based on a broad library of available ecosystem component models, accessible remotely sensed and ground-based data bases, and a geographic information system all integrated by an interface architecture of logic, expert opinion and quality assurance.

Ultimately, TERRA hopes to be to natural resource managers what the spreadsheet is to financial advisors.

POLL SHOWS COLORADANS SUPPORT SUSTAINING AGRICULTURE

by Jennifer Roberts

Passage of Amendment 8 in the November Colorado election and a poll conducted by CSU's College of Natural Resources suggest that Coloradans actively support environmental issues. Pollsters spoke by telephone in early August with 395 residents and questions were posed concerning the upcoming election -- including questions about the GO Colorado Ballot Initiative, Spring Bear Hunt Initiative, State Land Board Access, and the Endangered Species Act.

One question pertained specifically to water uses in Colorado.

> *As populations in urban areas increase, the need for water also increases. One way cities meet their water needs is to purchase agricultural water rights. However, this decreases the amount of water available for farms and agricultural businesses. Given the increasing scarcity of water resources, which of the following do you give the highest priority to for water use: growth of cities or sustaining agriculture?*

The response showed substantial support for sustaining agriculture.

Growth of cities	10%
Sustaining agriculture	73%
Undecided/Don't know	17%

A greater percentage of women (77%) compared to men (67%) support prioritizing use of water for sustaining agriculture.

The poll was conducted by the Human Dimensions in Natural Resources Unit of the College of Natural Resources at CSU. Michael J. Manfredo is the Unit Leader. He said the goal of the survey was to "help provide decision makers with the public's wishes. We are trying to provide some baseline information on where the public stands on the critical issues of the day," he said.

CSU ADMINISTRATORS VISIT EGYPT WATER CENTER

CSU President Albert Yates and Jud Harper, Vice President for Research, traveled to Egypt in late January to tour the university's largest overseas project. They were in Egypt until February 4 meeting with Egyptian and international aid officials at the Nile 2002 conference called by the United Nations and development agencies. CSU is the lead university on the $26 million Egyptian Water Research Center project, which looks at ways to improve the efficiency of water delivery along the Egyptian portion of the Nile River, the agricultural lifeline of 54 million people.

Yates and Harper were invited by Egypt's Minister of Public Works and Water Resources. Funding for the trip is split between CSU and private money from the CSU Foundation.

PEOPLE IN THE NEWS

Jose Salas is working with US Bureau of Reclamation personnel to review USBR's existing stochastic simulation package and develop a new package for the PC and workstation computing environments. The new package will incorporate state-of-the-art methods and modeling strategies for analyzing, modeling and simulating water resources time series such as annual and monthly streamflow. The project is funded by USBR under an interagency participating agreement. Two graduate students are working on the project. Salas is Professor of Civil Engineering at CSU.

Willy Sadeh was one of two people to receive the 1992 International Astronautical Federation's Frank J. Malina Astronautics Medal in September. The medal honors engineers and scientists for achievements in education, teaching, research, publication and outreach in space engineering and sciences. Sadeh is Professor of Space Engineering at CSU.

William Marlatt, Professor Emeritus of Earth Sciences at CSU, received an award November 13 for his service in the development of ecological science in Kabadino-Balkarian, a republic in Russia. Marlatt received the honorary title of "Honored Scientist of Kabadino-Balkarian Republic." This award, presented by the republic's vice president, is the highest award given by the republic and the first ever given to a foreigner. Marlatt also was awarded an honorary doctorate of science from the Russian High Mountain Geophysical Institute. Marlatt helped establish an ecological monitoring program to study global warming as part of a joint project between CSU, the Bureau of Land Management and the former Soviet Union's branch of the World Laboratories. He has since consulted for the government of the Commonwealth of Independent States - the former Soviet Union - in developing programs in Global ecological monitoring and water and air sampling in industrial regions. He also serves as a technical adviser to the Russian Ministry of Science. (*From an article by Lyn Schrotberger, CSU Comment, Dec. 10, 1992.)*

A paper by **Robin Herron** was selected as the best paper at the 1992 Hewlett-Packard Software Engineering Productivity Conference in California. The paper was titled "Limiters to Software Engineering Productivity: The Effect of Environmental Factors." Herron is Professor of Environmental Health at CSU.

Kenneth Barbarick was recently selected as a fellow of the Soil Science Society of America. Fellows are nominated and elected by other active members of the society. Barbarick is Professor of Agronomy at CSU.

Frank Leibrock for the past two years has helped a Lamar Middle School sixth-grade class study a science topic throughout the year. One project explored the role of sludge in agriculture. Leibrock donates an hour or two of his time each week to help teach the students. Using hands-on experiments and projects, he hopes to instill excitement about science and math in students. Leibrock is Colorado State Cooperative Extension Director for the Southeast Area.

The Colorado Groundwater Association has awarded two Harlan Erker Schòlarships for the coming year. Nine applications were received from students at CSU, CSM, CU, Fort Lewis and Denver University. **Amy D. Johnson**, Graduate Student at CSM, will use the geostatistical software package, UNCERT to determine the possible geometrics of the unconfined aquifer at the Rocky Mountain Arsenal. The software package is under development at CSM. **Kelly Archer**, a student at the College of Law, University of Denver, will prepare a comparative analysis of nontributary groundwater law in the US. A comparison to Colorado law will be used to draw conclusions on how to effectively manage Colorado's nontributary groundwater resource. Archer is a law clerk at the Denver Water Department.

EDITOR'S IN-BASKET

A. IVAN JOHNSON RECEIVES AWARDS

A. Ivan Johnson has received the John Wesley Powell Award, the Royce J. Tipton Award, and was elected to the grade of Honorary Membership of the American Society of Civil Engineers in the class of 1992. The U.S. Geological Survey gave the John Wesley Powell Award to Johnson for his expertise and volunteer support for over 45 years "in the establishment of standards for earth sciences terminology, measurements, test methods and practices." The award was presented recently at a ceremony at the U.S. National Center in Reston, Virginia. The 1992 Royce J. Tipton Award was

presented to Johnson for his contributions to the advancement of irrigation and drainage engineering and for his leadership roles in ASCE and other professional organizations. Johnson, retired from USGS since 1979, is a consulting engineer in Arvada, Colorado. He is internationally recognized for his expertise in groundwater hydrology and geotechnical engineering. (Source: *Hydata*, Nov. 1992)

UCOWR ANNOUNCES 1993 DISSERTATION/THESIS COMPETITION

The Universities Council on Water Resources has distributed announcements seeking nominations for the 1993 Dissertation/Thesis Award and for the 1993 Education and Public Service award. The awards are given for student and professional excellence. The awards will be given at the UCOWR annual meeting scheduled August 3-6 in San Francisco, California. The deadline for nominations is March 31. Nomination announcements are available from CWRRI (491-6308).

AMERICAN RIVERS FORMS SCIENTIFIC AND TECHNICAL ADVISORY COMMITTEE

American Rivers has formed a new Scientific and Advisory Committee (STAC) to obtain expertise in many areas vital to implementing the organization's new five year strategic plan. The committee includes 14 leading scientists and technical experts. The group will meet yearly, starting in the spring of 1993, to assure that American Rivers proposes national river policy based on the best scientific and technical thinking available. The committee will advise American Rivers' staff and board of directors on the most critical environmental issues facing rivers. It includes one person from Colorado: Dr. David Getches, Professor of Law, the University of Colorado, whose area of expertise is water law.

KODAK DONATES WATER FOR BOYD LAKE

Kodak Colorado Division has received a letter of appreciation from Doug Will, manager of Boyd Lake State Park, for water it donated. The reservoir is used primarily for agricultural water storage, and demand in the late summer sometimes curtails recreational use of the park. Kodak's donation of 297 acre-feet helps mitigate the late year fluctuations in the lake's water level and extends the recreational use season.

FEMA SEEKS HELP WITH FLOODPROOFING MANUAL

The Federal Emergency Management Agency (FEMA) has contracted with the engineering consulting firm of Dewberry & Davis to develop a *Manual of Technical and Engineering Standards for Residential Floodproofing*. FEMA wishes to identify new and innovative floodproofing alternatives and requests that interested parties send such information to Jim Murphy, Dewberry & Davis, 8401 Arlington Blvd., Fairfax, VA 22031, (703)849-0362.

DROUGHT - WHAT IS IT AND WHAT CAUSES IT?

The January 25, 1993 *Closed Circuit*, newsletter of the Western Area Power Administration, features a comprehensive and informative special issue on drought. Articles include "Power Generation Suffers During Drought, "Water shortage Challenges Western Finances," "Drought Intensifies Competition Among Water Users," "Competition in the Missouri River Basin," "Competition for Central Valley Project Water," and "Competition on the Colorado River Basin." For information contact Western Area Power Administration, P.O. Box 3402 A0100, Golden, CO 80401-0098, Phone 303/231-7025.

FRONT RANGE COMMUNITY COLLEGE TO OFFER TWO-YEAR DEGREE IN WATER/WASTEWATER TECHNOLOGY

Front Range Community College/Larimer Campus will offer a two-year Associate of Applied Science Degree in Water-Wastewater Technology. For information contact Herb Waite, BioTechnology Department, Front Range Community College, Larimer County Center, 4616 So. Shields, Fort Collins Co 80522; Phone 303/226-2500, FAX 303/825-6819.

FOREST SERVICE SIGNS AGREEMENT WITH VENEZUELA

Venezuela and the U.S. Forest Service have signed an international cooperative agreement to help the Venezuelan Ministry of Agriculture and Livestock reclaim tropical rain forests in the Guayana region. The five-year agreement calls for the reclamation of areas disturbed by small mining operations, including a major reduction in sedimentation and mercury contamination in streams and rivers. The Orinoco River, a major South American watershed, flows through the Guayana region of Venezuela, and enters the Atlantic Ocean near Trinidad. (*Experiment Station Letter 2152*, Dec. 18, 1992)

MORE WOMEN AND MINORITIES RECEIVING ENGINEERING DEGREES

Engineering Manpower Bulletin #118, Women in Engineering, reports that the percentage of female engineering students reached all-time highs in 1991: 18.3% of first year engineering students, 17% of full-time undergraduate students, and 14.2% of graduate students were women. *Engineering Manpower Bulletin #119*, Minorities in Engineering, finds that the participation of ethnic minorities in engineering also reached all-time highs in 1992. Ethnic minorities made up just over 25% of the number of first year undergraduates and 23% of the total full-time undergraduates in 1991. The bulletins are available from the American Association of Engineering Societies Publications Department, Telephone 202/296-2237.

February 14-20 is National Engineers Week

WATER SUPPLY

COLORADO WATER SUPPLY CONDITIONS UPDATE

USDA Soil Conservation Service, Michael A. Gillespie--The new year begins with near normal snowpack accumulations, reservoir storage, and good soil moisture across most of the state. Only a few areas of northern Colorado have early season snowpack deficits, with ample opportunity for improvement before spring.

SNOWPACK--Data collected from SNOTEL sites across Colorado on January 1 indicate that the state's snowpack is 101% of average. These figures are 100% of the last year's snowpack. Also, similar to last year, the higher snowpack percentages occur in the basins of southern Colorado, while portions of the northern basins and the Front Range show the lowest percentages. During the last week of December several strong storms crossed southern Colorado and sharply boosted the snowpack in the Rio Grande, San Juan, Animas and Dolores basins. Totals in these basins are now near to slightly above normal. The snowpack in the southern Sangre de Cristo mountain range is currently the highest in the state, at 135% to 165% of average. This has helped keep the Arkansas Basin's overall figures the highest in the state, 131% of average.

Below normal snowpacks were measured in the Little Snake, Cache la Poudre and Laramie River basins across northern Colorado. Additionally, Boulder Creek, Clear Creek, and the Upper South Platte basins along the Front Range also show readings of 75% to 85% of normal. Most of the remainder of the state has near to above average totals, with figures of 90% to 120% of the January 1 average.

PRECIPITATION--November has been the best month for precipitation thus far in the 1993 water year. October's 1992 statewide precipitation was only about 65% of average. November's heavy storms boosted the precipitation totals to 35% above average for the month, while statewide precipitation was back down to 89% of average for December. To date, the 1993 water year's precipitation is 94% of average statewide. Most basins have received about 85% to 95% of their average precipitation for the water year. The only exceptions are the South Platte and the Colorado basins, which are both reporting 101% of average totals for the water year.

RESERVOIR--Water volume stored in the state's 68 major reservoirs is currently 103% of average. These levels are 100% of last year's statewide statistics. Only the Colorado and Arkansas basins are reporting below normal storage levels at 92% and 97% of average, respectively. The highest storage percentages are reported in the combined Animas and Dolores basins, at 120% of average. These basins are followed by the Gunnison Basin at 112% of average.

STREAMFLOW--Streamflows across much of Colorado during the 1993 runoff season are expected to be near normal. However, below normal volumes are expected in the Yampa, White, North Platte and Cache la Poudre basins of northern Colorado. The forecasted volumes in these basins range from 75% to 90% of average. Other basins which are expecting below normal volumes include the headwaters of the South Platte, Rio Grande, Gunnison and San Miguel rivers. Above normal streamflows are forecast on the North Fork of the Gunnison River, while the Culebra and Trinchera creeks of the Rio Grande basin are forecast to produce volumes of 152% and 137% of average, respectively.

From the State Engineer's Office--The Surface Water Supply Index (SWSI) developed by this office and the USDA-Soil Conservation Service is used as an indicator of water supply conditions in the major river basins of the state. It is based on snowpack, reservoir storage, and precipitation for the winter period (November-April). During the winter period snowpack is the primary component in all basins except the South Platte basin where reservoir storage is given the most weight. Inclusion of snowpack in winter computations results in an emphasis on present snow storage which may be available for next spring's runoff. The following SWSI values were computed for each of the seven basins on January 1, 1993 and reflect conditions during the month of December.

Basin	Jan. 1, 1993 SWSI Value	Change From Previous Mo.	Change From Previous Yr.
South Platte	0.0	-0.1	-0.5
Arkansas	+0.1	-0.6	-2.0
Rio Grande	+0.7	+1.6	-1.1
Gunnison	+0.9	-1.1	-0.4
Colorado	+0.3	-1.2	+0.2
Yampa/White	0.0	-2.6	+1.0
San Juan/ Dolores	+0.1	-0.1	-1.5

SCALE

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

WATER EDUCATION

CCWCD SCHEDULES 1993 CHILDREN'S WATER FESTIVAL

The Central Colorado Water Conservancy District will hold its annual Children's Water Festival on March 30, 1993 at Aims Community College, Greeley, Colorado. Approximately 1,500 4th and 5th graders from the Greeley area will attend the Festival. The goal is to educate and entertain the students on the importance of water to our area. The Festival will run from 9:00 a.m. to 3:00 p.m. in the Ed Beaty Hall, Horizon Hall and Westview Hall.

PROJECT WET TAKES OFF IN 1993

by Jennifer Roberts

The Colorado Department of Natural Resources will establish Project WET (Water Education for Teachers) in Colorado. John Kaliszewski will direct Project WET and Chris Bridges will serve as Operations Coordinator. Both are from the Colorado Water Conservation Board. Project WET has been successfully established in North Dakota, Montana, Arizona, Idaho and Hawaii with water education grants available through the U.S. Bureau of Reclamation. The goal is to establish Project WET programs in every state by 1995. National Project WET is operated out of Montana State University in Bozeman, Montana.

Project WET Colorado will be a collaborative effort of DNR divisions with water resources interests and the Colorado water and environmental communities. Its goal is to establish a sustainable youth water education program in Colorado. The primary component of the program for 1993-1994 will be ten teacher workshops held at various geographic locations. The first-year effort will train a projected 200-250 teachers of grades 6-8 and reach an estimated 20,000-25,000 students.

Water education in Colorado represents an opportunity to develop partnerships in the water community working toward a common goal. As Colorado's most important natural resource, water must be understood and valued by the public to ensure that it is protected and developed for the long-term economic vitality and overall quality-of-life of the state.

Project WET emphasizes teaching students how to think, not what to think. WET addresses a wide variety of water-related topics including atmospheric water, surface water, groundwater, and contemporary water management issues. Project WET Colorado will strive to facilitate and promote awareness, appreciation and knowledge of Colorado's water resources. Special emphasis is given to strengthening students' understanding of the importance of water to all users (e.g. farmers, ranchers, recreationists, cities, wildlife, power, industry) and to the belief that wise water management is essential to Colorado's future social and economic prosperity.

WATER PUBLICATIONS

CWRRI PUBLICATIONS

Contact the Bulletin Room, Aylesworth Hall, Colorado State University, Fort Collins, CO 80523 - Phone 303/491-6198.

Estimation of Groundwater Recharge Using Neutron Probe Moisture Readings Near Golden, Colorado, Nicholas J. Kiusalaas and Eileen P. Poeter, Completion Report No. 165. To better understand recharge processes under natural conditions in the Denver Basin, a vadose zone monitoring study was conducted from September 1991 through September 1992 at a site near Golden, Colorado. Six access tubes were monitored with a neutron probe to a depth of 8.75 feet to determine moisture profiles several times a month. Moisture characteristic curves were developed for soil samples which were extracted during access tube installation. The van Genuchten function was fitted to experimental moisture characteristic curve data and combined with saturated hydraulic conductivity from laboratory analysis to estimate unsaturated hydraulic conductivity. Numerical analysis based on moisture profiles and hydraulic properties was used to estimate vertical flux.

Mutual Irrigation Company Monitoring Of Main Canal Nitrogen Levels, John Wilkins-Wells, David Freeman, Completion Report No. 166. Presents the results of a focused social survey and weekly water quality sampling conducted during the irrigation seasons of 1991 and 1992 in the Mutual Irrigation Company (ditch company) service area. The company is located in northeastern Colorado. The potential future role of such organizations in water quality monitoring and agricultural non-point source pollution management is discussed. Data on main canal nitrate loading during one irrigation season are provided.

Bioaccumulation of Heavy Metals by Brown Trout (Salmo Trutta) in the Arkansas River: Importance of Food Chain Transfer, W. H. Clements, Completion Report No.167. Poor survival of adult brown trout, Salmo trutta, in the Arkansas River has been attributed to heavy metal contamination. This project investigated food chain transfer of heavy metals from benthic invertebrates to brown trout in the Upper Arkansas River and developed a model to estimate the relative importance of food chain transfer of heavy metals from benthic invertebrates to fish in the system. The research provides important baseline information to evaluate remediation effectiveness at California Gulch. The ultimate goal is to restore a productive brown trout fishery to the river with no acute toxicity by 1995.

Fate of Heavy Metals In Colorado Waters and Rivers, E. W. Brennan and W. L. Lindsay, Completion Report No. 168-- This project obtained basic information about the solubilities of heavy metals and the solid phases that control their solubilities in waters and streams. Consideration was also given to point sources and underground aquifers that are suspected of being polluted by metals. Since metals are often affected by redox relationships, redox measurements and controls were included. Research results will be beneficial in the attempt to understand metal pollution problems and trying to resolve them.

OTHER PUBLICATIONS

Intergovernmental Decisionmaking for Environmental Protection and Public Works. A-122. Contact ACIR, 800 K

Street, South Building, Suite 450, Washington, D.C. 20575; (202) 653-5536.

Section 319 of the Clean Water Act: An Evaluation of Program Implementation in Region X; EPA Report. Contact Elbert Moore, Watershed Section Chief, U.S. EPA Region X, WD-139, 1200 Sixth Ave., Seattle, WA 98101.

U.S. General Accounting Office Report -- DRINKING WATER: Projects That May Damage Sole Source Aquifers Are Not Always Identified. The first copy of each GAO report and testimony is free. Additional copies are $2.00 each. Orders should be sent to the following address, accompanied by a check or money order made out to the Superintendent of Documents, when necessary: U.S. GAO, P.O. Box 6015, Gaithersburg, MD 20877; (202) 275-6241.

Water Publication Digest. This is a new, 11 issue-per-year review that abstracts and summarizes information appearing in approximately 12 leading water periodicals. It is available for $59/year from Water Publications Digest, Lakeview Publications, P.O. Box 6866, Charlottesville, VA 22906-6866; (804) 973-5111. A sample issue is available for $2 through the same address.

The Cooperative Institute for Research in the Atmosphere (CIRA) FY1991/92 Annual Report. Contact Thomas H. Vonder Haar, Director, or Joanne C. DiVico, Editor,at CIRA, Foothills Campus, CSU, Fort Collins, CO 80523.

AWRA Symposium Proceedings: Managing Water Resources During Global Change, edited by Raymond Herrmann, 1992. Available for $60 (AWRA Member), $75.00 (non-member) from American Water Resources Association, 5410 Grosvenor Lane, Suite 220, Bethesda, MD 20814-2192; (301) 493-8600.

How to Get Information from the US Dept. of Agriculture. Copies are limited. For single copy write to Denver Browning, USDA, Office of Public Affair, Room 536-A, Washington, DC 20250. Phone 202/720-2058.

Proper Well Abandonment Techniques: How to Fill and Seal a Well. 20-minute video, intended for urban and rural homeowners. Copies are available for $15 from the Golden Sands Resource Conservation & Development Council, UW Stevens Point, Nelson Hall, Stevens Point, WI 54481; Phone 715/346-3161.

Groundwater Education in America's Schools, a catalog of groundwater resource materials for elementary and secondary education professionals. Contact The American Ground Water Trust, 6375 Riverside Drive, Dublin, OH 43017; phone 614/761-2215.

Sealing Abandoned Water Wells: A Campaign Primer. Contact the Energy and Natural Resources Clearinghouse at Telephone 217/785-0310.

POSITIONS AVAILABLE

The Water and Energy Research Institute (WERI), University of Guam --Applications invited for tenure track faculty position in groundwater hydrology. Begins Fall, 1993 at Assistant Professor to Associate Professor level. Must have a Ph.D. in geology (emphasis hydrogeology and modeling), civil engineering (emphasis groundwater and modeling), or a comparable degree program; established record of successful research; and be either U.S. citizen or have permanent resident status. For application forms and information contact UOG Personnel Services Division, University of Guam, UOG Station, Mangilao, Guam 96923. Deadline: April 15, 1993.

Water Resources Engineer, Gronning Engineering Company- Applicants should possess an MS in civil or agricultural engineering and 2-3 years experience in technical water rights evaluation in Colorado. For a detailed position announcement and application instructions, call GRONNING ENGINEERING COMPANY in Denver, 303-450-0100. Complete applications are due before March 1, 1993.

Imperial Irrigation District, California--Two engineering positions are available within the Water Resources Unit. Positions require a general background in Civil Engineering/Water Resources. Experience in one or more of the following areas is preferred:

- development of water conservation project plans for an open channel irrigation canal system
- groundwater modeling
- hydraulic modeling in open channel systems
- statistical hydrology

Excellent writing skills are required. Entry level commensurate with education, experience, and registration:

Assistant Engineer - $3286 to $4193 per month
Engineer - $3803 to $4853 per month

(The Engineer title requires registration as a Professional Engineer in the State of California.)

Send resume and college transcript(s) to: Imperial Irrigation District, Personnel Department, 1284 Main Street, El Centro, California 92243.

Graduate Programs, Utah State University--The Water Division, part of the Civil and Environmental Engineering Department and the Utah Water Research Laboratory, offers advanced study and research programs that lead to MS, Professional, and PhD degrees. Four academic programs are available: Fluid Mechanics and Hydraulics, Groundwater,

Hydrology and Water Resources. Graduate research assistantships are available on a competitive basis. For more information, contact: Dr. J.P. Tullis, Head, Water Division, Utah Water Research Laboratory, Utah State University, Logan, UT 84322-8200; (801) 750-3174.

Graduate Programs, Utah State University--The Division of Environmental Engineering, part of the Civil and Environmental Engineering Department and the Utah Water Research Laboratory, offers advanced study and research leading to MS and PhD degrees. The following special-emphasis programs are available: Toxic and Hazardous Waste Management, Natural Systems Engineering, and Geo-Environmental Engineering. For more information, contact: Dr. R.C. Sims, Head, Environmental Engineering Division, Utah State University, Logan, UT 84322-4110; (801) 750-2926.

SEMINAR SERIES AND CONFERENCES - *COLORADO STATE UNIVERSITY*

RIVER RESTORATION AND MANAGEMENT IN THE WEST

Seminars will be held from 12:10 to 1:00 pm. Everyone is welcome. Light refreshments will be served, feel free to bring your lunch. For more information call Jill Minter at 484-2342 or Dr. Ellen Wohl at 491-5298. Sponsored by the Departments of Earth Resources and Fishery and Wildlife Biology, and the Watershed Club.

Date	Topic	Speaker
Feb. 11	Trout Population Response to Habitat Enhancement Using Log Structures in Rocky Mountain Streams	Kurt Fausch, Dept. of Fishery & Wildlife Biology Room 220, Lory Student Center
Feb. 25	Monitoring: The Essential Ingredient	Lee MacDonald, Dept. of Earth Resources Room 220, Lory Student Center
Mar. 11	The Need for an Ecological Wall Street Journal--Getting Information to the People	Robert Ward, Director, Colo. Water Resources Research Inst. Room 220, Lory Student Center
March 25	Using Water Naturally	Dr. Holmes Ralston, Dept. of Philosophy Room To Be Announced
April 8	The River as an Ecosystem	James Ward, Dept. of Biology Room To Be Announced
April 16	Rivers - Perceptions and Predictions	Stanley Schumm, Dept. of Earth Resources Room 208, Lory Student Center
April 21	Western Water Law and River Restoration	George Radosevich, Dept. of Agric. and Resource Economics Room 210, Lory Student Center
April 29	The Use of Benthic Invertebrate Communities to Assess Ecological Integrity in Streams	Will Clements, Dept. of Fishery and Wildlife biology Room 208, Lory Student Center

INTERNATIONAL CONNECTIONS

Noon Brown-Bag Lunch Program, Spring 1993

Held in Room 166, Lory Student Center, 12:10 p.m. Room 166 is located near the Atrium; go north and west through the Food Court dining area.

Date	Topic	Speaker
Mar. 23	Irrigation Traditions from South-East Spain	John Wilkens-Wells

ENVIRONMENTAL ENGINEERING SEMINAR SERIES, SPRING 1993 - Department of Civil Engineering

Seminars are held in Room 180, Lory Student Center from Noon to 1:00. Everyone is welcome - bring a lunch. Location of the March 26 lecture TBA. Direct questions to Dennis Bagenstos at (303)482-3164. Note: April 12 through May 3 meetings to be announced.

Date	Topic	Speaker
Mar. 1	**Material Recovery Facilities and the Larimer County Facility**	Frank Lancaster, Larimer County
Mar. 8	**Reclamation of a Uranium Mill: A Case Study**	Lyle Davis and Clint Strachan, Water, Waste and Land, Inc.
Mar. 15	SEMESTER BREAK	
Mar. 22	**TBA**	
Mar. 26 **FRIDAY, 4 PM**	**Historical Perspective of Industrial Pollution Control in Japan**	Dr. Saburo Matsui, AEEP Distinguished Lecturer
Mar. 29	**Remediation of Leaking Underground Storage Tanks**	Curt Palin, Terracon Environmental, Inc.
Apr. 5	**Topic TBA**	Sonia Kreidenweis, Atmospheric Sciences Professor

SEMINAR SERIES ON WATER RESOURCES SCIENCE AND ENGINEERING - Spring Semester

Seminars are held in the Lory Student Center from Noon to 1:00. Everyone is welcome and free to bring a lunch. Sponsored by the Hydrologic Science and Engineering, Groundwater, and Water Planning and Management Programs of the Department of Civil Engineering; and the Watershed Sciences Program, Department of Earth Resources. For information contact Jose D. Salas at 303/491-8460.

Date & Room No.	Topic	Speaker
Feb. 25, Room 208	**Regional Flood Frequency Analysis by Partial Duration Series**	Jean R. Rousselle, Professor of Civil Engineering, Ecole Polytechnique, Montreal, Canada
Mar. 4, Room 205	**Experience with Flood Detection and Response Systems**	Eve Gruntfest, University of Colorado, Colorado Springs
Mar. 11, Room 208	**The Effect of the Southern Oscillation Index on Daily Precipitation in the SW United States**	David Woolhiser, Affiliate Professor of Civil Engr., CSU
Mar. 25, Room 208	**Flood Routing Through Channel Networks**	Albert Molinas, Asst. Professor of Hydraulics, CSU
Apr. 1 --	**Hydrology Days**	
Apr. 8, Room 208	**On the Fluctuations of the Great Lakes Water Levels**	Frank H. Quinn, Head, Physical Sciences Division Great Lakes Environmental Research Lab, NOAA
Apr. 15, Room 224	**Data Analysis Protocol for Groundwater Monitoring**	Robert Ward, Director, CWRRI
Apr. 22, Room 208	**Temporal Variability and Grain Size Distribution of Bed-Load Transport: Theory and Experiments from Squaw Creek, Montana**	Kristin Bunte, Research Associate, Dept. of Earth Resources, CSU
Apr. 29, Room 208	**Stochastic Modeling of Open Channel Flow: Rationale and Data Analysis**	Tim Gates, Dept. of Civil Engineering, CSU

SEMINAR SCHEDULE - WATER TOPICS, SPRING 1993
Department of Environmental Health

Meetings are held Mondays at Noon in Room A108 Microbiology Building, Colorado State University.

Date	Topic	Speaker
Mar. 8	**Quantifying the Effects of Water Resource Projects on Aquatic Organisms and Their Habitats**	Andrew Miller, US Army Corps of Engineers, Waterways Experiment Station, Vicksburg, MS
Mar. 15	SPRING BREAK	
Mar. 22	**Rapid Bioassessment Techniques for Non-Point Source Contaminant Impacts on Wetlands**	Roy Irwin, Water Operations Branch, Water Resources Division, U.S. National Park Service, Fort Collins

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SEMINAR SERIES - THE UNIVERSITY OF COLORADO

Department of Civil, Environmental and Architectural Engineering - Spring 1993

Watershed Management--Boulder Creek--The Boulder Creek Watershed is an excellent prototype to use as a case study for teaching and research related to watershed management. Its headwaters are west of the City of Boulder and the runoff descends from the mountains into the valley. Boulder Creek has been manipulated by man since gold was discovered at Gold Hill in 1859. This watershed has a very interesting and well-documented history of water supply, flood control, water quality, recreation, and related development. Guest speakers will describe various aspects of the water resources of Boulder Creek and present an overview of selected techniques and management strategies. For senior water resources engineering students, interested faculty and interested citizens.

All seminars are from 2 to 3 p.m. The meeting room is ECCR 0 - 38, in the College of Engineering and Applied Science. Please call Professor Jim Heaney at 492-3276 for more information.

WATER RESOURCES OF BOULDER CREEK WATERSHED

Date	Topic	Speaker
Feb 10	**Floodplain Management**	Gilbert White, CU Boulder
Feb 17	**Water Distribution Systems**	Bob Harberg, City of Boulder
Feb 24	**Stormwater Management on East Campus**	David Love, Love and Associates
Mar 3	**Real Time Control-Campus Irrigation**	Jason Gessner, Landscape Irrigation Design Jim Johnson, L. L. Johnson Company
Mar 10	**Flood Control**	Terry Rogers, City of Boulder
Mar 17	**Water Demand Management**	Paul Lander, City of Boulder
Mar 24	SPRING BREAK	
Mar 31	**Water Rights Simulation Model**	Lee Rozaklis, Hydrosphere
Apr 7	**Stormwater Models**	James Guo, CU Denver
Apr 14	**Effect of Wastewater on Water Quality**	Steve Chapra, CU Boulder
Apr 21	**Stream Channel Restoration**	Chris Rudkin, City of Boulder
Apr 28	**City of Denver Water Game**	Marcos Brandao, CU Boulder

HOT TOPICS IN NATURAL RESOURCES
Natural Resources Law Center

All meetings held at noon, Hershner Room, One Norwest Bank Center, Denver. Charge for lunch and registration

Friday, Feb. 26 **Municipal Water Suppliers**--a joint workshop with Boulder County Bar Association

Thursday, Mar. 18 **Communities Neighboring Public Lands: How Much Local Control?** Speakers - Karen Budd, Attorney, Cheyenne; and Tom Lustig, National Wildlife Federation, Boulder.

Thursday, Apr. 22 **The Endangered Species Act Reauthorization: Are Changes in Order?** Speakers - Janice Sheftel, Attorney, Durango; and Bob Irvin, National Wildlife Federation, Washington, DC.

For information contact:
Katherine Taylor, Conference Coordinator, Natural Resources Law Center
Campus Box 401, University of Colorado, Boulder CO 80309-0401
Phone: 303/492-1288; FAX 303/492-1297

SHORT COURSES AND CONFERENCES - COLORADO SCHOOL OF MINES

THE INTERNATIONAL GROUNDWATER MODELING CENTER

Courses described below will be held on the Colorado School of Mines campus, Golden, Colorado and are sponsored by the International Ground Water Modeling Center (IGWMC). For course content information contact IGWMC Research Associate Suzanne Paschke; for logistical information contact Program Assistant Mary Pigman at the IGWMC, Phone 303/273-3103; FAX 303/273-3278.

Principles and Applications of MODFLOW and Accompanying Models
March 23-26, 1993

This new IGWMC course will deal exclusively with the USGS Modular Three-Dimensional Finite-Difference Ground-Water Flow Model MODFLOW and its accompanying programs. Course content will include a brief math refresher followed by detailed discussions of the MODFLOW structure, input parameters, optional packages, and case studies. Interpretations of MODFLOW results will be presented using MODPATH and other post-processing programs. Computer sessions will consist of example problems which allow the participants to prepare input data sets (using IGWMC pre-processor PREMOD), run MODFLOW, and interpret results (using MODPATH and the IGWMC postprocessor POSTMOD). Instructor: Peter F. Anderson (GeoTrans, Inc.)

Applied Ground-Water Flow Modeling
March 23-26, 1993

This four-day course is designed to familiarize participants with the application of ground-water flow modeling principles to regional and site specific problems through the use of the U.S. Geological Survey Modular Three-Dimensional Finite-Difference Ground-Water Flow Model MODFLOW and its accompanying programs. Lectures will be complemented by extensive hands-on computer sessions. Participants will conceptualize flow problems, prepare data for input to MODFLOW, execute the model, and interpret results.

1993 Groundwater Modeling Conference - June 9-11, 1993

The 1993 conference, organized by the International Ground Water Modeling Center in cooperation with the Office of Special Programs and Continuing Education of the Colorado School of Mines, and the Environmental Education Enterprises Institute, Columbus, Ohio, will feature keynote addresses by prominent ground water hydrologists who are experts in modeling, presentation of applied modeling work, poster sessions, poster sessions with computer demonstrations, commercial software demonstrations, and informal discussions.

Keynote Speakers include: **Linda Abriola**, University of Michigan; **Carl Enfield**, R.S. Kerr Environmental Research Lab, USEPA; **Dan Jaynes**, U.S. Dept. of Agriculture-ARS; **Michael McDonald**, McDonald-Morrissey; **Leslie Smith**, University of British Columbia; **Mary Anderson**, University of Wisconsin; **Leonard Konikow**, U.S. Geological Survey Associates, **James Mercer**, GeoTrans, Inc.; **Jack Parker**, Virginia Polytechnic Institute; **William Woessner**, University of Montana; and **Peter Wierenga**, University of Arizona.

For information about the conference contact Paul K.M. van der Heijde, Center Director or Mary Pigman, Program Assistant, International Ground Water Modeling Center, Colorado School of Mines, Golden, CO 80401-1887; phone 303/273-3103; FAX 303/273-3278; e.mail igwmc@mines.bitnet.

SHORT COURSES - *RED ROCKS COMMUNITY COLLEGE*

Date	Topic	Presented by:
Mar. 22-26	**Modeling Groundwater Flow and Contaminant Transport on a PC**	Roger Stillwater James Tindall

Presented in cooperation with Groundwater Resources and TERRA VAC

Apr. 12-16	**Groundwater Remediation Techniques and Legal Issues**	Roger Stillwater Robert Hiller Jim Rouse and William Bond

Presented in cooperation with Groundwater Resources and Environmental Compliance Technology
For information on either course call Dr. Roger Stillwater at 303/278-3892.

WATER NEWS DIGEST

WATER ALLOCATION

Forest Service Grants Permit Extension

The U.S. Forest Service will extend special-use permits until Jan. 31, 1994 for water users who operate dams and other water diversion structures on agency property in the Arapaho-Roosevelt National Forest. Water users involved include the cities of Fort Collins, Loveland, Greeley, Boulder, the Public Service Co., and the Water Supply and Storage Co. Water users asked for a 20-year permit extension, but USFS has hesitated because it is evaluating environmental effects of the dams. Low water levels in streams may pose a threat to aquatic life, and USFS may require permit holders to release more water into rivers and streams. Permit holders say this requirement may be a violation of Colorado water law. Fort Collins officials say if a release is required to protect wildlife, the USFS should pay the city for its water rights. USFS has asked the U.S. Fish and Wildlife Service to conduct a study of endangered species that might be affected by stream flows.

Greeley Tribune 1/16/93

WATER PROJECTS

GAO Reviewing Animas-La Plata

The U.S. General Accounting Office is reviewing the controversial Animas-La Plata water project. The GAO will issue a report at the request of Sen. J. Bennett Johnston, D-La., before Congress votes on project appropriations this fall. The U.S. Bureau of Reclamation (USBR) plans to ask Congress for $20 million in construction funding for FY 1994. State officials have agreed to discuss alternatives with opponents of the project, including conservation, development of groundwater, different use of water rights and existing projects and sale of Indian water to meet project goals.

Montrose Daily Press 1/7/93

Water Diversion Project Set for South Platte River

A $180 million project that would divert water from the South Platte River east of Greeley to a reservoir near Nunn is being planned by the Northern Colorado Water Conservancy District (NCWCD). The NCWCD will file court documents seeking rights to about 100,000 acre-feet of unappropriated South Platte River water annually. The project would take water out of the South Platte via a pumping station just east of the confluence of the Cache la Poudre River east of Greeley. The water would then be pumped north along a pipeline about 20 miles to McGrew Reservoir, located seven miles east of Nunn. McGrew Reservoir was built in the early 1900's as part of a water project that would have brought water from Wyoming to Colorado. That project never materialized and McGrew was abandoned.

Grand Junction *Daily Sentinel* 12/24/92

WATER TRANSFER

Rio Grande Water Diversion is Contested

The Rio Grand Water Users' Association has gone to court to fight a rancher's request to divert water from the Rio Grande. The owner of the 280-acre Tres Rios Ranch in Conejos County has asked the Division 3 Water Court to allow him to divert 12 cubic feet per second from the river for irrigation to develop grassland and wildlife habitat for recreation and commercial purposes. The Association maintains that the Rio Grande and its tributaries are over-appropriated, and that there isn't enough water to supply the demand for water rights pre-dating those sought by Whitehead. The trial is scheduled for March 31 before Judge Robert Ogburn.

Pueblo Chieftain 12/3/92

Plans Taking Shape for Central Valley Project Transfer

As a first step in its quest for state control of the federal Central

Valley Project (CVP), California has negotiated a draft memorandum of agreement with the Department of the Interior. The department and the state have agreed that transfer of the CVP title best meets the goals of both parties and that impacts should be evaluated through the processes set out by the National Environmental Policy Act and the California Environmental Quality Act. The CVP was originally authorized and conceived by California, but economic setbacks of the Great Depression caused the state to turn the project over to Congress, which authorized the Bureau of Reclamation to begin construction in the 1930's. California, which built the State Water Project in the Central Valley in the 1960's, now wants the title of the CVP so it can integrate the management and control of the two massive projects. The agreement schedule calls for a decision in October 1995. Authorizing legislation will be necessary before title can be transferred to the state.

U.S. Water News 12/1992

ENVIRONMENT

Watershed Anti-Erosion Plan Ends its First Year

A plan aimed at reducing erosion in the Trinidad Lake watershed and the flow of sediment into the lake has completed its first year. The project is a joint effort between the U.S. Department of Agriculture Soil Conservation Service and six local conservation districts and agencies. It targets the drainage in four canyons northwest of Trinidad: Reilly, Burro, Sarcillo, and Wet canyons. The area, only 20 percent of the watershed, delivers 40 percent of the sediment that goes into Trinidad Lake, an estimated 235,000 tons a year. SCS estimates that more than 204,000 tons of sediment per year can be stopped upstream before it enters the lake. The 10-year project has a $1.5 million budget for technical assistance and cost-share programs with landowners. Nine contract management plans were signed with individual landowners this year, who paid a total of $166,000.

Pueblo Chieftain 12/22/92

EPA Cleanup Plan for Lowry Criticized

Environmental experts have detailed a $62 million plan to clean up Lowry Landfill's liquid waste, but some residents called the plan a Band-Aid solution. The Environmental Protection Agency's recommendation calls for building walls on each of the four sides of the 400-acre landfill to stop contaminants from migrating. A wall on the landfill's northern border where most of the contaminants gather would collect the liquid, which would then be pumped to a planned water-treatment plant. The eastern and western walls would stop contaminants from leaving the site, while the southern wall would prevent clean water from flowing into the landfill. There are 142 million gallons of liquid waste on the site. If the EPA proposal is approved and implemented, about 10.5 million gallons of contaminated water will be cleaned each year, extending the entire cleanup process over at least 30 years. Opponents of the plan want a more rapid elimination of the contaminants, but excavating and cleaning 85 percent of the landfill could cost as much as $4.5 billion. EPA has identified at least 275 parties who are responsible and liable to pay for the project.

Denver Post 12/10/92

WILDERNESS

New Wilderness Bill Unveiled

Colorado's top lawmakers have unveiled a compromise wilderness bill that would forever protect 766,670 acres of the state's undeveloped high country. Groups on both sides of the issue said they think the latest version will work. The legislation enjoys unusual bipartisan support, with Sen. Hank Brown (R) and Sen. Ben Nighthorse Campbell(D) backing it in the Senate, and Rep. Scott McInnis (R) and Representatives David Skaggs (D) and Pat Schroeder (D) co-sponsoring it in the House. Gov. Roy Romer also endorsed the bill. The proposed law would resolve the most divisive issue--whether the federal government gets the right to water flowing through federal wilderness tracts--largely by avoiding it. Instead of awarding or disavowing a federal wilderness water right, the bill renders the issue moot in 19 headwaters tracts by restricting the construction of any new dams. In three areas that lie downstream of possible water projects--the Piedra, Tabeguache, and Roubideau tracts on the Western Slope--the bill specifically rejects federal water rights. But it calls for the Forest Service to work with the Colorado Water Conservation Board to secure state water protection. The bill was endorsed by the Colorado Water Congress and the Colorado Environmental Coalition.

Denver Post 1/26/93

WETLANDS

Catamount Developer Wins Wetlands Permit

The proposed Lake Catamount resort near Steamboat Springs has won a permit to fill wetlands. The Army Corps of Engineers has sent a draft permit to Lake Catamount Joint Venture, developer of the project, allowing it to fill 9.26 acres of wetlands at the resort - sites proposed for ski trails, roads and other developments. To satisfy COE requirements, the developers purchased the 900-acre Brinker Ranch 30 miles away, and plan to use ponds there for wetlands habitat. Opponents say the replacement lands do not compare to the habitat that will be destroyed.

Rocky Mountain News 1/27/93

WILDLIFE/ENDANGERED SPECIES

Wildlife Areas Get Approval

The Colorado Wildlife Commission recently approved two leases in Weld County to establish a watchable wildlife area on the Cache La Poudre River near Windsor and allow public fishing access to continue at Seeley Lake near Greeley. The state Division of Wildlife will lease 40 acres of land and four acres of water, including about one-half mile of the Poudre

River, from Kodak for use as a watchable wildlife location. Construction of a parking lot and foot trail is planned, and signs describing wildlife and riparian habitat will be installed. No hunting, fishing, or trapping will be allowed. The cost of the lease is $1 per year for 10 years. The wildlife commission also approved a new five-year lease for fishing access to Seeley Lake, a popular warm-water angling site north of Greeley.

Greeley Tribune 1/16/93

Endangered List Expanded

Federal endangered species protection should come faster because of a settlement reached in a lawsuit between the Interior Department and several environmental groups. The Interior Department's Fish and Wildlife Division agreed to designate 400 plants and animals as endangered and subject to special protection by September 1996. More than 900 other species will be given priority for evaluation, the government's first step in considering a plant or animal under the Endangered Species Act. The suit was filed by environmental groups critical of the way the Department was handling applications for protection.

Grand Junction *Daily Sentinel 1/16/93*

Critical Zone Circles Colorado River Basin

A pending designation of critical habitat for endangered fish will likely take in lower stretches of the Yampa, White, Colorado, and Gunnison rivers, according to a U.S. Fish and Wildlife official. John Hammill, coordinator for the agency's endangered fish recovery program, said the designation will take in the whole Colorado River Basin, from western Colorado to the Mexico border. The designation was triggered by a Sierra Club lawsuit after the agency listed the razorback sucker as an endangered species, but failed to designate its critical habitat.

A likely move by the federal government to name critical habitat for the endangered fish will halt plans for two long-sought dams on the Yampa River, but isn't expected to scuttle plans to move water rights for the Juniper and Cross Mountain dams to different sites. The move, however, will be contingent on some of the water rights being converted to instream flows to benefit the endangered razorback sucker and other native fish. The plan is to move some of the water rights upstream to enlarge Elkhead Reservoir near Craig, enlarge Stagecoach Reservoir near Steamboat Springs, and/or build a new reservoir on the Williams Fork River, south of Craig. A U.S. Fish and Wildlife Service official said the Service is committed to taking the Juniper and Cross Mountain rights and moving them upstream to allow water development to meet future needs.

Grand Junction *Daily Sentinel* 12/2/92

Final Word Out on August Fish Deaths

No single cause has been found for last summer's fish kill on the Big Thompson River, say reports from six government agencies who investigated the incident. About 2,000 trout were found dead in a two-mile stretch of the river Aug. 27. The city of Loveland is considering hiring an environmental consultant to take a "big picture" look at the fish kill and another that occurred in the river in 1990, killing about the same number of trout. The fish kills were just upstream from the city water treatment plant's intake pipe. No contamination of Loveland's drinking water was found, however. The Northern Colorado Water Conservancy District is evaluating its algae treatment process that at one time was suspected of playing a role. Some believe the water was contaminated by illegal dumping.

Fort Collins Coloradoan 1/8/93

LITIGATION

AWDI Law Firm asks Off the Case

The law firm of Saunders, Snyder, Ross & Dickson, P.C.-wants to withdraw as counsel for American Water Development, Inc. because the company has not paid its fees and expenses. AWDI is trying to export billions of gallons per year of San Luis Valley water and sell it to cities. The motion to withdraw was filed in mid-January with the Colorado Supreme Court where the AWDI case is on appeal.

Pueblo Chieftain 1/21/93

Water Decree Lawsuit has no Merit: States

Wyoming and Colorado attorneys have told the U.S. Supreme Court that Nebraska's lawsuit over a 1945 North Platte River water decree should be dismissed because it has no merit. While a Wyoming attorney told the court Nebraska has failed to show any violations of the decree, Colorado's attorney general added that issues raised by Nebraska are immaterial to the basic question of whether the decree had been violated. Nebraska attorneys countered that Wyoming wants the case dismissed to block proof that the decree guarantees a level of streamflow above the Tri-State Dam via "return flows" even though they are not specifically apportioned by the decree. Nebraska sued Wyoming in 1986 over its management and water development plans for the North Platte River. Wyoming filed for summary judgement in March 1989, but that request was denied. After the hearing the Supreme Court took the case under advisement. A ruling is expected this summer.

Montrose Daily Press 1/19/93

PEOPLE

Brownell Named to Water Commission

Jon B. Brownell of Hooper has been appointed to the Colorado Ground Water Commission by Gov. Roy Romer. Brownell, a farmer and co-owner of Alpine Potato Co. and Brownell Farm Supply, is chairman of the Monte Vista Cooperative Board and director of the San Luis Valley Irrigation District.

Pueblo Chieftain 12/12/92

CONSERVATION

Study: Front Range Water Supply Adequate

A recently released report says Front Range cities have enough water without building new reservoirs or transferring West Slope water for the next 40 years, even with an anticipated 800,000 new residents. The report, issued by Hydrosphere Resource Consultants of Boulder, recommends: Cities pay farmers not to plant during a drought year; Denver's north metro area get its water from northern Colorado water projects via a DOE-funded pipeline from Carter Lake and creative sharing of water; Pump underground water during drought years only and mix with surface water to get the area through tough seasons; Conservation, which could save 10 to 15 percent; Use Chatfield and Cherry Creek reservoirs to store more water.

Greeley Tribune 1/3/93

Platte River Task force to Develop Conservation Plan

A Platte River task force which includes irrigators, environmental interests, and bankers, is charged with writing a plan to save 27,400 acre-feet of Platte River water a year. The task force was formed as part of a January 1992 settlement between the Central Nebraska Public Power and Irrigation District and the Wildlife Federation, and as part of Central's application for a new 50-year operating license for Kinglsey Dam on the Platte River. In exchange for Central's pledge to conserve water, the federation agreed not to oppose Central's efforts to obtain irrigation rights for 33,000 acres of farmland in Kearney, Gosper, Philps, and Dawson counties. The plan could include lining of canal systems to reduce water losses.

Greeley Tribune 12/6/92

LEGISLATION

Bruce Muscles Water District to Drop Tax Hike

Only days after announcing a property tax increase that flew in the face of Amendment 1, the Southeast Colorado Water Conservancy District rescinded the action. Board members voted unanimously to drop the 0.04 mill levy increase--it would have raised $90,000 a year--after Amendment 1 architect Douglas Bruce threatened to sue them. When the board approved the tax increase last month on an 8-5 vote, board members said they thought they were exempt from Amendment 1 because they were an "enterprise." The board runs an eight-county district that oversees use and storage of Arkansas River water. Ninety percent of the property tax raised by the district goes to the U.S. Bureau of Reclamation for the Fryingpan-Arkansas water project. The other 10 percent covers administrative costs. Tommy Thompson, director of the water district, warned that failure of the district to meet its contractual requirements might make it difficult to have sufficient water for rafters, fishing, and recreation.

Rocky Mountain News 12/8/92

WATER RATES

Windsor OKs Water Loan Deal

The Windsor Town Board has unanimously approved a $265,680 loan refinancing deal with First Security Bank in Windsor. The loan, originally financed through an out-of-town investment company in 1991, was used to pay for 250 shares of Northern Colorado Water Conservancy District water. The 175 acre-feet of water currently supplies town residents. The original loan, financed at 8.5 percent, was refinanced at a 4.9 percent interest rate and will save the town $34,600 in interest.

Greeley Tribune 12/4/92

Denver Water Department Proposes Rate Hikes

Denver residents would face the first of three annual water rate increases under a proposal announced by the Denver Water Department. The price of water would rise 7 percent under the plan. In addition, Denver customers likely face 7 percent hikes for each of the next three years. Denver Water Board members are to decide whether to approve the rate hike after a public hearing Feb. 2.

Denver Post 1/20/93

RECREATION

Windsor Receives $10,000 Grant to Help Build Lake Trail

Windsor town officials have received $10,000 to help construct a recreation trail around Windsor Lake, which should be completed in late summer. The 2.37-mile trail project earned a grant from Colorado Initiatives, a community-improvement grant project sponsored by US West, the Colorado Department of Local Affairs, and the University of Colorado. Long-term plans for the 10-foot wide trail include extensive tree-planting, covered fishing docks, bird-watching areas, a paddle boat rental shop, and picnic areas.

Greeley Tribune 1/12/93

GROUNDWATER

Water Application is Opposed

The U.S. Army's Pinion Canyon Maneuver Site has joined with the Southeastern Colorado Water Conservancy District, Purgatoire River Water Conservancy District, and about 50 individuals in filing protests to an Oklahoma man's application asking for the right to pump 7,3358 acre feet of water annually from the Dakota-Cheyenne aquifer. Many who share the aquifer fear the pumping could endanger their own well-water rights. There is also concern that the aquifer is connected to the Purgatoire and Arkansas rivers and that tapping the aquifer could reduce river flows allocated to others in Colorado and downstream. The application asks the water court to rule that the groundwater is "non-tributary." State water engineers will

study in the next four months whether the aquifer is connected to surface waters and if pumping would deplete surface flows.

Montrose Daily Press 12/2/92, *Rocky Mountain News* 12/5/92

WATER QUALITY

Wastewater Study Approved

The Hotchkiss board of Trustees has passed a resolution that authorizes a joint wastewater feasibility study between Hotchkiss and Paonia. Both Hotchkiss and Paonia received $65,000 grants from the Colorado Department of Health to investigate the possibility of a mutual wastewater treatment facility.

Montrose Daily Press 1/18/93

Four Cities Get Grant For Flats Water Precautions

The Department of Energy has awarded a $40 million grant to Northglenn, Thornton, Westminster, and Broomfield to protect their water from Rocky Flats contamination. Tests have shown that runoff water from the Rocky Flats plant contains minute amounts of radioactive particles, toxic solvents and heavy metals. Projects are already under way to protect Standley Lake and the Great Western Reservoir. The Standley Lake Protection Project calls for building a series of canals, ditches and pipelines to divert contaminated water. Water from the Great Western Reservoir will be replaced by water piped in from the northern Front Range. The projects, slated for completion in 1995, will cost $80 million. The federal government has given the cities $60 million, with the rest soon to come.

Rocky Mountain News 1/1/93

Water Quality Projects Enhanced Cropland

The Agriculture Department says farmers put water-quality practices into effect on 550,000 acres of cropland in fiscal 1991 under projects initiated by the department. The practices included nutrient management, animal waste systems, strip-cropping, field border strips, irrigation management, and integrated pest management. Ten-thousand producers participated in 74 selected agricultural watersheds and 16 demonstration projects across the country.
Greeley Tribune 12/20/92

Canadians See Water Pollution as Main Global Problem

Water pollution is the biggest environmental concern among Canadians, according to a national environmental survey. Some 34 percent of Canadians cited water pollution as one of the most serious environmental dangers facing the world today. The next most frequently cited world environmental issues were the thinning ozone layer and air pollution. A similar survey conducted a year earlier also showed water pollution to be the environmental issue of most concern to Canadians.

U.S. Water News 12/1992

Bankrupt Mine Exceeding Water Pollution Limits

The Environmental Protection Agency has confirmed that effluent from the Summitville gold mine's water treatment plant carries up to 5 parts per million of copper. The state permit for the mine, located near Wolf Creek Pass, allows a daily average of only 0.30 parts per million. The excess copper poses a threat to fish in the Alamosa River, but the EPA is allowing the discharges to avoid a more disastrous springtime overflow of the 280 million gallons in the mine's "heap leach" field contaminated with cyanide, copper and other heavy metals. Cyanide-laced water from the gold extraction already has killed aquatic life in 17 miles of the Alamosa River. EPA took over Summitville under the Superfund program on Dec. 16, 1992, 12 days after mine owner Galactic Resources ltd. of Vancouver, British Columbia, filed for Chapter 7 bankruptcy. Clean-up costs were estimated at $800,000 a month, but were revised upward to $1.11 million monthly because of rising labor costs.

Denver Post 12/29/92

NATIVE AMERICAN WATER RIGHTS

Indian Rule Threatens Wyoming Fishing

Decades of fisheries management in some of the nation's best fishing holes will end unless Wind River Indian Reservation leaders discontinue a new rule, a federal official says. The Shoshone and Arapaho Joint Business Council last month decided to require nontribal visitors to have an outfitter when fishing wilderness waters on the reservation. Non-members traditionally could fish and backpack for $7 a day or a $35 seasonal permit. Dick Baldes of the U.S. Fish and Wildlife Service said the outfitter regulation will mean an end to fish-stocking programs on the reservation waters. Eight outfitters will take control of the wilderness lakes and streams under the regulation, which basically privatizes what had been a public resource. Baldes also noted that the agency was not invited to meeting on the new regulation. The agency manages the fish and game on the reservation and makes recommendations on regulations as well as overseeing fish-stocking programs.

Rocky Mountain News 12/31/92

MISCELLANEOUS

Aqua Park Planned for Denver

A group proposing an aquatic life park in Colorado has settled on the city and county of Denver as the site for the $50 million project. Colorado's Ocean Journey plans to open the park in early 1996. The two sites under consideration are Stapleton International Airport, which will close in the fall of 1993, and the Central Platte Valley.

Grand Junction *Daily Sentinel* 12/13/92

Farm Groups Want Particulars on Clinton Ag Policy

Farm groups want to know how President Clinton and the new Congress will balance agricultural interests with the need for cleaner water and safer food. Farmers are concerned about reauthorization of the Clean Water Act and a couple of pesticide bills. EPA has identified pollution from agricultural soil erosion, pesticides and fertilizers as the main culprits in non-point source pollution. The Clean Water bill also is important because of its language on wetlands. The National Academy of Sciences is studying the newest set of definitions, but the Farm Bureau wants Congress to determine which wetlands are important and which can be farmed without hurting the environment. Farmers also want to be sure that more research is done to determine how much pollution agriculture really causes.

Coloradoan, Jan. 31, 1993.

Commission will Review Western Water Policy

In one of his last actions in office, President Bush appointed a Wyoming man to head a new commission that will review western water policy and recommend ways to resolve water conflicts. Tom Sansonetti, most recently the Interior Department's top lawyer, will serve without pay, Wyoming's congressional delegation announced on January 22.

The 22-member commission, authorized by the Omnibus Water Bill of 1992, is to spend three years reviewing federal activities in 19 western states that affect the allocation and use of water, then is to report back to Congress in November 1995.

Source: *Denver Post*, Jan. 23, 1993

CONFERENCES, MEETINGS, WORKSHOPS

CALLS FOR PAPERS

1993 Annual Conference, The Association of State Dam Safety Officials--Sept. 26-29, 1993, Kansas City, MO. Submit one-page, single-spaced abstract, maximum one-page single-spaced biographical sketch of all authors, and entry form (available from ASDSO). Contact: Association of State Dam Safety Officials, P.O. Box 55270, Lexington, KY 40555; Phone 606/257-5146; FAX 606/258-1958. Deadline: March 1, 1993.

Nominations - Regional Awards of Merit--ASDSO is accepting nominations for Regional Awards of Merit to be given to individuals, companies, organizations, municipalities, or other entities working in the dam safety field that have made outstanding contributions to dam safety on a regional level. Send nominations to ASDSO (address above). Two winners will be selected from the Western Region. All awards will be presented at the 1993 ASDSO Annual Conference. Nomination forms are available from ASDSO. Deadline: June 15, 1993.

Innovative Rehabilitation Designer of the Year Award--Nominations are also being accepted for this award which will recognize a unique and innovative remedial design that improves the safety of a dam and exemplifies the high professional engineering standards that dam safety requires. Award will be presented at the 1993 ASDSO Annual Conference. For guidelines and entry form contact ASDSO at address above.

RMWPCA 1993 Mid-Year Conference, April 23, 1993, Denver, CO--The conference theme will be **MEETING THE CHALLENGE**. In addition to invited speakers, papers are solicited for the following sessions: Management Challenges - suggested topics include the impact of Colorado's Amendment 1, the impacts of CWA, SDWA, CAA, SARA, ADA and other regulatory challenges, funding, and new management approaches; Clean Act Air Challenges - suggested topics include an overview of CAA requirements, what is coming up in Colorado, New Mexico and Wyoming, and special factors in hazardous or industrial waste design; Biosolids Challenges - suggested topics include developing a Sludge Management Plan, how to meet the new pathogen standards, what is going to happen to septage, etc. Submit one-page abstract by Feb. 26, 1993 to RMWPCA Mid-Year Conference, c/o Tom Gallier, City of Fort Collins, 3036 East Drake Road, Fort Collins, CO 80525.

29th Annual Conference of American Water Resources Association, Aug. 29-Sept. 3, 1993, Tucson, AZ. Conference topics are Watersheds & River Systems, Water Resources Data Collection & Analysis, Institutional & Legal Issues, and Management of Water Resources. Submit three copies of abstract, not to exceed 250 words, and include title, all authors' names and their affiliations. On separate page full mailing addresses and phone numbers for each author. Send abstract to: Hanna J. Cortner, Director, Water Resources Research Center, 350 N. Campbell, Univ. of Arizona, Tucson, AZ 85721. Phone 602/621-7607.

International Symposium on Chemistry and Biology of Municipal Water Treatment: Current Status and Future Directions, Oct. 24-29, 1993, Canada Centre for Inland Waters, Burlington, Ontario, Canada. Organized by Chemical Institute of Canada-Hamilton Section and the Wastewater Technology Centre, Burlington, Ontario. Program includes panel discussions. Abstract: double spaced, less than 200 words, author's name, affiliation, address, phone and FAX numbers. Send to: CAB-MWT'93, SYMPOSIUM CHAIRMAN, Dr. B.K. Afghan, Analytical Chemistry Research, Research and Applications Branch, National Water Research Institute, Canada Centre for Inland Waters, P.O. Box 5050, Burlington, Ontario, Canada L7R 4A6. Deadline: April 1, 1993.

MEETINGS

1993 Governor's Agricultural Outlook Forum, Feb. 19, 1993, Colorado Convention Center, Denver, CO--cosponsored by Colorado Governor Roy Romer, the Colorado Department of Agriculture, and graduates of the Colorado Agricultural Leadership Program. The 1993 Forum will explore two critical issues facing Colorado agriculture - international trade and environmental protection. In 1993, Congress must decide whether to adopt legislation approving NAFTA; it is vital that Colorado agriculture, business, and civic leaders understand its consequences for our state. In the first morning session, participants will hear from two international trade officials who helped craft the agreement. A former U.S. Undersecretary of Agriculture will provide a balanced national viewpoint. During the afternoon session, six seasoned veterans from the Oregon Watershed Improvement Coalition will share some concrete answers to this question.

Registration is $80 if received by Feb. 8, $90 thereafter. Make checks payable to '93 Governor's Ag Outlook Forum and mail to Colo. Dept. of Agriculture, 700 Kipling Street, Suite 4000, Lakewood, CO 80215. For information call (303) 239-4100.

Municipal Water Providers in a Changing Regulatory Landscape--Feb. 26, 1993, Boulder. Annual joint workshop sponsored by the Natural Resources Law Center, CU School of Law, and the Boulder County Bar Association's Natural Resources and Environment Section. Scheduled from 8:30-3:00 at the CU School of Law and includes lunch. Topics include:

- Colorado's "Can & Will" Doctrine;
- applicability of Amendment 1 to municipal water suppliers and special districts;
- applicability of Amendment 1 to pending conditional water rights cases; and
- federal rights-of-way cases.

Cost is $80 for BCBA members and *85 for non-members through Monday, Feb. 22. After that the price is $95 for both. Discounts for academics, government and public interest representatives.

For information call the Natural Resources Law Center at 492-1288.

AWWA Conferences/Workshops, 1993--The following technical and professional conferences and workshops have been announced for 1993 by the American Water Works Association (AWWA). Contact AWWA Meetings Department, Phone 303/794-7711; FAX 303/795-1440.

Distribution Systems Modeling Workshop, Mar. 22-23, Cincinnati, OH.
Customer Service Workshop for Water Utilities, Mar. 28-31, Seattle, WA.
Legislative/Regulatory Workshop (government activities affecting drinking water), Apr. 26-28, Washington, DC.
AWWA Annual Conference and Exposition, June 6-10, San Antonio, TX.
Distribution Systems Symposium, Sept. 26-29, San Diego, CA.
Water Quality Technical Conference, Nov. 7-11, Miami, FL.
Joint Residuals Conference, Dec. 5-8, Phoenix, AZ.
CONSERV93, Dec. 12-16, Las Vegas, NV.

American Water Foundation/Bureau of Reclamation Seminars--For information about the following seminars, contact: American Water Foundation, 1616 - 17th St., Denver, CO 80202. Phone 303/628-5516; FAX 303/628-5469.

Environmental Management of Water Resources Projects, Aug. 2-13, 1993
Design and Construction of Roller Compacted Concrete Dams, Sept. 6-17, 1993
Operation, Maintenance and Management of Irrigation Drainage Projects, Oct. 11-22, 1993

CALENDAR

Feb. 21-24	**AGRICULTURAL RESEARCH TO PROTECT WATER QUALITY**, Minneapolis, MN. Contact: Soil and Water Conservation Society, 7515 NE Ankeny Rd., Ankeny, IA 50021-9764; Phone 515/289-2331, FAX 515/289-1227.
Feb. 24-26	**WESTERN WATER LAW AND POLICY - IMPLICATIONS FOR WETLAND AND RIPARIAN ECOSYSTEMS**, Lakewood, CO. Contact: The Nature Conservancy, Colorado Field Office, 1244 Pine St., Boulder, CO 80302. Sponsored by Rocky Mountain Chapter of the Society of Wetland Scientists.
Feb. 26-27	**SUSTAINABLE AGRICULTURE CONFERENCE**, Greeley, CO. Contact: Central Colo. Water Conservancy District at 330-4540.
Mar. 14-18	**SYMPOSIUM ON GEOGRAPHIC INFORMATION SYSTEMS AND WATER RESOURCES**, Mobile, AL. Contact: AWRA, 5410 Grosvenor Lane, Suite 220, Bethesda, MD 20814-2192; Phone 301/493-8600.

Mar. 30-April 2	**13TH ANNUAL HYDROLOGY DAYS**, Colorado State University, Fort Collins, CO. Contact: Janet Lee Montera, Department of Civil Engineering, Colorado State University, Fort Collins, CO 80523, Phone 303/491-7425, FAX 303/491-7727.
Apr. 19-21	**CRITICAL ISSUES IN WATER QUALITY: A WORKSHOP**, Tallahassee, FL. Contact: Y.P. Hsieh, Perry Paige Bldg., Rm. 115, Wetland Ecology Program, Florida A&M University, Tallahassee, FL 32307. Phone: 904/599-3065.
May 3-5	**WATER MANAGEMENT IN THE '90s: A Time for Innovation**, Seattle, WA. Contact: ASCE, 345 E. 47th St., New York, NY 10017-2398.
June 6-10	**AMERICAN WATER WORKS ASSOCIATION ANNUAL CONFERENCE AND EXPOSITION**, San Antonio, TX. Contact AWWA, 6666 W. Quincy Ave., Denver, CO 80235.
June 18-19	**APPLICATION OF ADVANCED INFORMATION TECHNOLOGIES: EFFECTIVE MANAGEMENT OF NATURAL RESOURCES**, Spokane, WA. Contact: ASAE, 2950 Niles Rd., St. Joseph, MI 49085-9916; Phone 616-429-0300, FAX 616/429-3852.
June 20-23	**JOINT INTERNATIONAL SUMMER MEETING OF THE AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS AND THE CANADIAN SOCIETY OF AGRICULTURAL ENGINEERING**, Spokane, WA. Contact: American Society of Agricultural Engineers, 2950 Niles Rd., St. Joseph, MI 49085-9659; Phone 616/429-0300.
Aug. 3-6	**UNIVERSITIES COUNCIL ON WATER RESOURCES ANNUAL MEETING**, San Francisco, CA. Contact: Dr. Howard S. Peavy, Dept. of Civil Engr., Montana State University, Bozeman, Mt 59717; 406/994-6690.

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