Colorado Water

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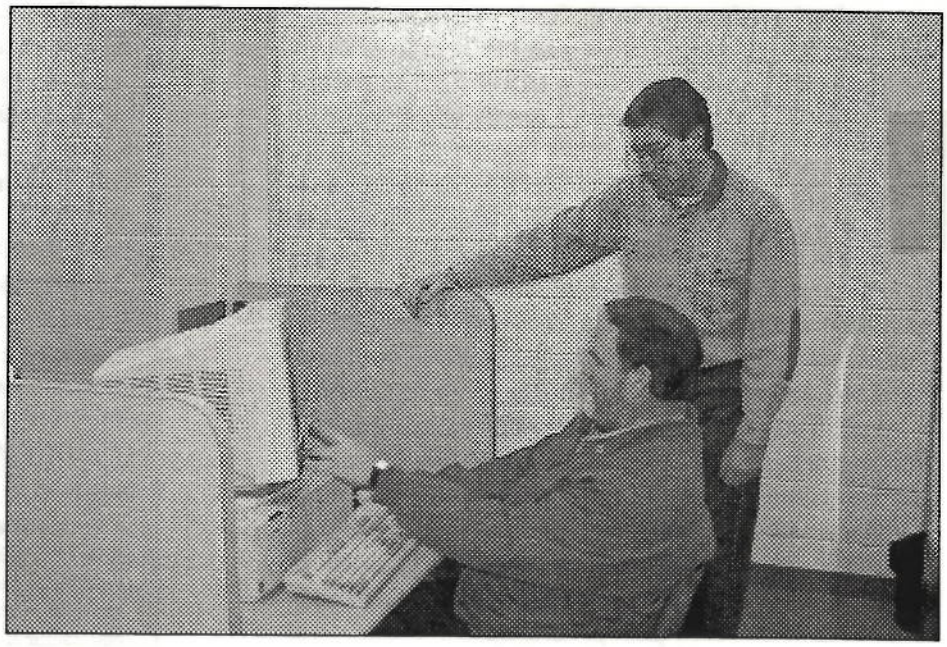

Tom Gill (seated) explains to fellow graduate student, Jason Ward, the computer tool he developed for the Julesburg Irrigation District

see page 7

ALSO IN THIS ISSUE:

Highlights of the
9th Annual South Platte Forum
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Colorado State University

WATER ITEMS AND ISSUES . . .

COLORADO WATER

Vol. 15, No. 6 December 1998

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EDITORIAL

When the Professor Meets ER!

The trenches of water management are often no place for the quiet contemplation of academics, especially when academics are addressing a topic involved in a current water management conflict. Such a situation may be developing around a Western Regional Project for which the Colorado Water Resources Research Institute (CWRRI) received funding this past August.

Due to concerns recently expressed by a number of water managers in Colorado, it is important to explain the new CWRRI research project and what CWRRI is doing to try to minimize the conflict between scientific research conducted on a university campus and that conducted as part of adaptive management efforts to implement a political agreement. As many of you know, CWRRI's state-based, federally funded water research program was terminated three years ago in favor of a Western Regional Competition for water research funds. The federal funding for 13 western water institutes was combined into a region-wide water research competition. The competition's criteria required researchers to work on regional problems involving more than one state.

Thus, to access this federal funding for water research in Colorado, CWRRI had to submit highly competitive, regionally based, water research proposals. Over the three competitions, CWRRI submitted 12 proposals and was able to share funding on two projects: (1) a severe sustained drought study in the Rio Grande River Basin; and (2) a study of methods for identifying and evaluating alternative ways to meet the flow needs of endangered species in western rivers. The Platte River Basin is a case study for the second project. Both of these studies involve development of methodologies to support better water management decision-making.

The Rio Grande study involves researchers from Colorado, New Mexico and Texas as well as water managers from the same three states. Given the concern Colorado has regarding protection of its water allocations via compacts, a number of water managers expressed concern over the study's modeling efforts. Would the researchers actually model the river as it exists or some variation of reality? Would suggestions be generated that imply violating the Rio Grande Compact to achieve some greater economic efficiency goal? The faculty involved in this study sought the input of Colorado water managers a number of times during the course of the study. The project was recently extended one year longer than originally planned due to more extensive modeling efforts, partly involving efforts to be as accurate as possible.

The model, however, is not a complete description of the hydrology of the Rio Grande – that is far beyond the scope of the study. The study's results can help managers evaluate the methods used to examine relative impacts of alternative management options. Research, in this case, is not producing a complete management tool, but rather is examining options that may warrant further study. Given the initiation of a Rio Grande Decision Support System by the State of Colorado under the auspices of the Colorado Water Conservation Board, it is hoped that the CWRRI project's results will be useful to those conducting the DSS development.

In the Platte River study, the Three States Cooperative Agreement currently is being implemented by a Governance Committee working closely with water managers in Colorado, Nebraska, Wyoming, and the Department of the Interior. An adaptive management approach is being used to implement the agreement. There appears to be concern that the results of the recently funded Western Regional Competition research project will be different from those developed through the adaptive management approach. The concern is that university-based research results will be different from scientific results currently available to, or derived by, the adaptive management approach. Having new science made available during the adaptive management process could delay or complicate the already complicated process. This is also a concern of the researchers. The two efforts are different and should not be confused. It is incumbent upon the researchers to properly 'context' their research so that the difference between university-based research is clearly understood relative to that conducted within the adaptive management process being used to implement the Cooperative Agreement.

Results of the Platte River university-based research are not intended to present the optimum way to solve the management problem at hand. The studies are exploring the combined use of hydrological modeling with economic analysis methodologies to better understand management options for meeting future water needs - under drought conditions in the Rio Grande study and under emerging ecosystem health concerns in the Platte study. The studies are not designed to look back at previous decisions, but rather to look ahead at future decisions and determine how science might provide better insight into options managers may want to explore further. No one should expect that just because university-based science produces insight into a particular option that that is the option that should be implemented by management. Hydrological and economic sciences are not the only factors in the ultimate decision over how to allocate water under stressful situations being examined here. Allocations of western water have always involved use of doctrines and procedures that, while attempting to incorporate the latest science and technology, also rely on public needs assessments, laws, court decisions, and administrative judgement to make the final allocation decisions, as it should be in a democratic society.

The above qualifications, however, do not eliminate concern of water managers over the outcomes of the recently funded university-based water research. Thus, the faculty involved are seeking to share development of their methodologies with the water managers, in both the Rio Grande and South Platte River basins, in hopes of making available additional information, data, and/or innovative approaches. The goal of this communication effort is to assure that the university-based water research is not redundant with science being developed in the Three States Cooperative Agreement.

To ensure that science works in support of water managers' decision making and not against them, the researchers and managers need to communicate regarding model development and options to be examined. We are working hard at present to develop a communication mechanism with which all parties feel comfortable. The goal is to develop good science that is available for use in future adaptive management efforts on the part of the Governance Committee and water managers involved. There is no desire to duplicate research efforts or work in areas where decisions have already been reached.

University-based water research, of course, can address a wide range of water topics, from basic hydrological science up to national public policy. Some of these studies get close to the decisions of policy makers and political negotiations. The goal in all cases is to enlighten society about options for improving water management, not to suggest that one discipline's conclusions about science provide all the answers about how water should be managed.

Hopefully, university-based water researchers can continue to work closely with water managers to provide new information and insight into future decisions the managers must make. CWRRI is constantly striving to find ways to work with water managers that are constructive and helpful, while at the same time ensuring that sound science underpins the research. It is a fine line sometimes, but it must be addressed to keep water research relevant and beneficial to Colorado.

Request for Proposals

The Montana Water Center's Drinking Water Assistance Program (DWAP) is seeking preproposals for testing promising new technologies for small public water systems. The DWAP responds to three needs: (1) small and isolated systems needing information, and low-cost treatment technologies and processes so they can provide affordable drinking water; (2) regulatory agencies needing credible third-party performance data; and (3) private-sector entrepreneurs needing assistance in advancing innovative technologies. DWAP assists these parties by funding rigorous, university-based validations/demonstrations of pilot technologies. This Request is for new demonstrations for the 1999-2000 program cycle. Approximately $310,000 in grants will be awarded to university researchers, with no grant exceeding $75,000. **DUE DATE: JANUARY 29, 1999.** Submit six (6) copies of your preproposal to:

Montana Water Center
101 Huffman Building
Montana State University
Bozeman, MT 59717-2690
Phone 406/994-6690, FAX 406/994-1774, e-mail wwrc@montana.edu

Congress has approved restoration of state-based water research programs under the Water Resources Research Act.

STATE-BASED WATER RESEARCH PROGRAM RESTORED

Federal Funding for State Institutes —After three years of a Congressionally mandated regional competitive grant program under the State Water Institutes Program, Congress has approved restoration of state-based water research programs under the Water Resources Research Act. The President has signed the Fiscal Year 1999 budget for the State Water Institutes Program which provides a total appropriation of $5,055,000, a $502,000 increase over Fiscal Year 1998. Of the total, $3,818,000 will be divided equally among the states and territories participating in the institute program "to support a state-wide competitive program of research, education and information and technology transfer developed in close collaboration with the Institute's advisory panel." One million is to be used to support 1:1 matching grants under a regional research program and $237,000 is for USGS administration of the State Water Institutes Program.

CWRRI Reauthorization Provides for New Advisory Committee. The Colorado Legislature reauthorized CWRRI for another 10 years (HB 97-1218) in 1997, and the legislation provided for the formation of a new advisory committee, the Advisory Committee on Water Research Policy (ACWRP), to guide CWRRI's water research programs. With its restored water research funding, CWRRI needs advice on water research priorities, water policy and funding issues from those in a strong position to understand Colorado's approach to water management. Thus, membership on CWRRI's new ACWRP is: Chair of the House Erg Committee (or appointed representative); Chair of the Senate Erg Committee (or appointed representative); Director of the Department of Natural Resources (or appointed representative); Director of the Department of Public Health and the Environment (or appointed representative); and six members of the general public who are well informed about water issues in Colorado. Membership terms on the ACWRP are four years and the initial general-public appointments are made in a staggered format. The chair will be elected by a majority of the membership, the director of CWRRI will serve as secretary for the ACWRP, and meetings will be open to the public. A list of members follows.

CWRRI ADVISORY COMMITTEE ON WATER RESEARCH POLICY

Senator Don Ament, Chair, Senate Agriculture, Natural Resources and Energy Committee
Representative Lewis Entz, Chair, House Agriculture, Livestock and Natural Resources Committee
Wade Buchanan, Executive Director, Department of Natural Resources
Patti Shwayder, Executive Director, Department of Public Health and Environment

Six Members of the General Public

Fred Anderson, Public Affairs Consultant and Former State Legislator, Loveland	Term expires 2001
Sara Duncan, Denver Water, Denver	Term expires 2003
Eric Kuhn, Colorado River Water Conservation District, Glenwood Springs	Term expires 2003
John Porter, Dolores Water Conservancy District, Cortez	Term expires 2001
David Robbins, Hill & Robbins, Denver	Term expires 2003
Bart Woodward, Snyder, President, Groundwater Appropriators of the South Platte Basin	Term expires 2001

Functions of the ACWRP — The ACWRP will address two functions: (1) advising CWRRI on research to be undertaken as part of the federally supported, state-based water research program; and (2) seeking state and local water research funding to provide the state match required. The Federal funding requires a 2:1 match. The ACWRP will identify and define Colorado water research efforts that can be addressed via partnerships between Colorado water users and managers and higher education.

Developing Partnerships with Colorado Water Managers —How will these partnerships be developed? The ACWRP will define priority problems and the scope of research and faculty will be asked to submit methodologies, resulting in a blend of what water users need and what faculty can offer. The ACWRP will also identify potential sources of funding. Using input

from ACWRP, specific water research priority topics will be described by the CWRRI director. A Call for Proposals will be distributed to faculty. Proposals will be reviewed by ACWRP, research will be selected by ACWRP, and funding arrangements will be developed, hopefully, through partnerships of the participants.

THANK YOU FROM THE DIRECTOR AND STAFF

CWRRI wishes to express its thanks and appreciation to members of its former advisory committees, the Research Planning Advisory Committee and the Technical Advisory Committee, for their commitment to CWRRI. Many serviced for a number of years. These committee members recommended research priorities, evaluated and ranked proposals, and often served on individual project advisory committees.

RESEARCH PLANNING ADVISORY COMMITTEE

Steve Arveschoug, Southeastern Colorado Water Conservancy District, Pueblo
Chelsea Congdon, Rocky Mountain Office, Environmental Defense Fund, Boulder
Ralph Curtis, Rio Grande Water Conservancy District, Alamosa
Nancy Driver, U.S. Geological Survey, Water Resources Division, Denver Federal Center
Paul Frohardt, Water Quality Control Commission, Colorado Department of Health
Tom Griswold, Water Utilities, City of Aurora
Don Halffield, Public Service Company of Colorado, Denver
Karen Hamilton, Region VIII, Environmental Protection Agency
John Hendrick, Centennial Water & Sanitation District, Highlands Ranch
Noel Hobbs, Camp Dresser & McKee, Denver
David Holm, Colorado Division of Water Quality Control, Denver
Uli Kappus, Water Resources Services-GEI Associates, Englewood
Rodney Kuharich, Colorado Springs Water Department, Colorado Springs
Chuck Lile, Colorado Water Conservation Board, Denver (retired)
James Lochhead (former Executive Director, Colorado Department of Natural Resources, Denver)
Dave Merritt, Colorado River Water Conservation District, Glenwood Springs
Dan Parker, Colorado Soil Conservation Board, Denver (retired)
George Reed, Kodak Colorado Division, Windsor (retired)
Leonard Rice, Leonard Rice Consulting Engineers
Hal Simpson, State Engineer, Colorado Division of Water Resources
Dan Law, Colorado Water and Power Resources Development Authority
L. Scott Tucker, Urban Drainage and Flood Control District
Mark Waage, Denver Water, Denver
Kenneth Wright, Wright Water Engineers, Inc., Denver
Eric Wilkinson, Northern Colorado Water Conservancy District, Loveland

TECHNICAL ADVISORY COMMITTEE

Will Clements, Fishery & Wildlife Biology, Colorado State University
Dan Smith, Soil and Crop Sciences, Colorado State University
David McWhorter, Chemical and Bioresource Engineering, Colorado State University
John Loomis, Agricultural and Resource Economics
John Stednick, Earth Resources, Colorado State University
Nelson Caine, Geography, University of Colorado, Boulder
Betsty Rieke (former Director, Natural Resources Law Center, University of Colorado)
James Heaney, Civil, Environmental and Architectural Engineering, University of Colorado
Charles W. Howe, Environment and Behavior Program, University of Colorado
Samuel B. Romberger, Geology and Geological Engineering, Colorado School of Mines
Keith Turner, Geology and Geological Engineering, Colorado School of Mines

RESEARCH

DEVELOPMENT OF DATA MANAGEMENT TOOLS FOR THE JULESBURG IRRIGATION DISTRICT

by Tom Gill, Graduate Research Assistant
Department of Civil Engineering
and
James F. Ruff, Professor, Hydraulics Program
Department of Civil Engineering

Editor's note: The water research described here involved close collaboration among Colorado State researchers and the staff and directors of the Julesburg Irrigation District.

Introduction

Researchers in the Civil Engineering Hydraulics program at Colorado State University (CSU) have been involved in a project with the Julesburg Irrigation District to help with the District's initial use of computer-based technology. The project, funded by a CSU Agricultural Experiment Station research grant, was organized in two phases.

In the first phase, an analysis of the District's water delivery operations was performed to determine the appropriate technology for the District at the current time. District needs and capabilities were examined. Various technologies utilized in water handling systems were discussed, and the applicability of each for the District was evaluated.

The second phase of the project involved the development of data handling software tools. Based on findings of the analysis performed in the first phase, tools for recording daily water delivery data and for further processing of this data were identified as the appropriate technology for the District at this time. The tools were developed with the cooperation of District personnel to complement the District's current records system and to address shortcomings.

Review of District Water Delivery Operations

Water in the Julesburg Irrigation District is delivered through a network of three canals, the Highline, the Settlers and the Petersen. Water sources include Julesburg Reservoir storage releases and South Platte River diversions. Nearly 300 parcels of land receive water delivery at one or more turn-out gates. Most parcels have a reservoir allotment based on acreage in addition to rights for delivery of river diversions.

The District, which was formed in 1911, maintains a record of all water deliveries to each parcel of land in a hand-entered ledger book format. A separate page in the ledger is used to record data for each land parcel. In addition to entering the discharge delivered, the charge against reservoir allotment must also be updated. Depending on flow conditions, charge against reservoir allotment may be full charge, partial charge or non-charge. Transfer of allotments among parcels and reservoir refill credits are recorded as well. Remaining reservoir allotment needs to be updated with each entry.

While the District's delivery records are concise and complete, there are shortcomings with this records system. Data entry and updating reservoir allotment are time-intensive tasks. Producers frequently request information on their remaining allotment. Meeting this request for producers who operate multiple parcels involves collecting information from the various pages in the ledger, which typically takes an hour or more. Additionally, constructing records such as total daily deliveries for each canal would involve searching each page in the record for each day of interest.

The District relies almost exclusively on the expertise of its personnel in daily operations. Producers place delivery or shut-off requests with the ditch riders. These requests, along with an assessment of the previous day's operation, are forwarded to the District Superintendent. The Superintendent uses information received from the ditch riders along with river discharge, remaining reservoir storage and canal routing time, and other considerations to determine the appropriate river diversions and reservoir release.

The District's physical characteristics lead to further reliance on expertise of personnel. There are a limited number of flow measurement structures in the district. Ditch riders rely on experience to set turnout gates to the appropriate openings. Summer rainstorms may cause significant overland runoff to flow into canals. Personnel must react to weather events by adjusting or shutting down river and reservoir inflow and by opening spill gates to prevent flooding due to canal overflows.

The above discussion of the District's records system provides some insight into its complexity. Expertise of the District secretary gained from experience with this system is vital to District operations as well. The District has established a practice of hiring new personnel for a training period prior to assuming a position. While this practice allows the District to retain a significant amount of expertise, when a key person suddenly becomes unavailable, the District loses a valuable asset.

Examining the District at an institutional level, essentially all shares are owned by agricultural interests.

Examining the District at an institutional level, essentially all shares are owned by agricultural interests. The District is governed by a three member board of directors. Each director serves a three-year term. One director seat comes up for renewal each year. Funding for major repairs or renovations requires passage of a bond issue, voted on by District shareholders. Currently the District is facing a significant debt obligation. Part of this represents expenditures for the recently completed renovation of the Julesburg Reservoir outlet works. A bond election in November of 1997 authorized replacement of a river diversion dam, with construction slated to begin in fall of 1998.

Technologies Considered

Four types of computer-based technologies were reviewed. Current applicability of the various technologies was considered for the District.

- A computer-based records system would be the most basic use of technology. Given the complexity of the District's water delivery system, and the needs identified with the current recording system, computerized recording tools would be of immediate benefit.

- An Expert System, a decision making tool designed to mimic the response of a human expert to given inputs, could be of benefit to the District given the role of personnel's expertise in district operations.

- A Decision Support System, (DSS), another decision making tool, identifies responses when given a set of inputs. Unlike an Expert System, a DSS is driven by a mathematical optimization model to identify the optimal output for given inputs, subject to meeting identified constraints.

- An automated canal system uses remotely sensed measurement devices and remotely operated hydraulic control structures in communication with a control algorithm similar to a DSS to manage distribution of water in a canal system.

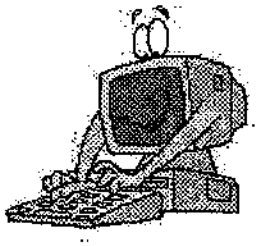
Development of an Expert System or a DSS would have required the availability of a computerized data bank of daily flow data. Clearly, the appropriate technology for the District at the current time was adoption of a computerized records system. The second phase of this project is thus focused on development of data recording and handling tools for the District.

Tool Development

The general objectives guiding development of a data recording tool included:

- Compatibility with the current records system.
- Ability to accommodate changes in land ownership and changes in tenant arrangements through tool editing.
- Expandability: As the District identifies additional tasks, the tool will need a capacity for addition of new capabilities.

A spreadsheet was selected as the appropriate software environment for construction of the tool. This selection was driven by the numeric nature of the information to be processed, the built-in features that the more powerful spreadsheet packages offer, and the identified needs for editing and expansion capabilities. For reasons of compatibility with other entities interacting with the District, the Excel spreadsheet package was used.



Data entry was facilitated by an index that identifies land parcels by the ledger-book page and by legal description. A macro button was placed in the index for each page. Activating the macro brings up a block formatted for data entry for the selected page. A record is updated by entering the date, entering the activity, (i.e., a discharge in the appropriate gate column, or a transfer in the credit column), and entering the charge fraction (if other than full charge). A memo may be entered as well.

Running balances are kept of remaining reservoir allotment and deliveries at each gate by using cell formulas. When new discharge or transfer data is entered, these automatically update. Cell formulas also direct copy of delivery and remaining allotment data into blocks formatted to display data for all parcels operated by each producer. Macro commands are coded to produce reports with this information for each producer. These reports may be generated individually using the spreadsheet menu commands, or generated for all producers in the District using macro buttons.

A companion tool was also developed which retrieves data from the records tool and presents this data in a more condensed format. In this tool, retrieved data is entered into two tables representing both total delivered water and charged delivered water at each parcel on each day. Summation of the columns of these tables yields the total delivered and charged delivered water for the season at each parcel. A macro was coded to produce reports containing this information, both in the form of a table and as a bar chart, for all parcels each producer operates. The reports may aid producers in reviewing water usage on respective parcels.

Summation of the rows of the total delivery table provides the total amount of water delivered in the district for each day of the season. This information was further sorted in the tool to provide the total daily deliveries for each canal. The District may find utilization for data in this format when performing analysis tasks such as mass-balance computations on canal reaches.

Tool Performance

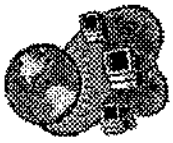
Development of the records tool included multiple demonstrations to District personnel and the incorporation of suggested revisions during spring of 1998. The tool was installed in the District's computer prior to the 1998 irrigation season. The District's intentions are to maintain records for at least two seasons in both the hand-entered ledger book and in the records tool. At the time of this writing, the 1998 irrigation season is essentially completed. The records tool was used throughout the season, and the District has indicated satisfaction with its performance.

The companion data retrieval tool is geared to produce summary data, and it will be used primarily for retrieving end of season data. The data retrieval tool was run with data entries in the records tool, current through 7/20/98, for testing and demonstration purposes. This demonstration showed that information stored in the records tool may be condensed into a new format in a matter of minutes, whereas the task of producing the same data from the hand-kept ledger might well take weeks.

Summary and Conclusions

The software tools developed in this project enable the Julesburg Irrigation District to maintain records of water deliveries with more efficiency than the ledger system currently used. Output generated by these tools allows the District to provide improved services to producers, both in timeliness and quality of information available. The data entry procedure, structured after the ledger book system, will minimize disruptions associated with transition between use of the ledger and the computer-based system. With these tools, the records become more than just documentation of deliveries. Data may be readily reorganized into other formats. The District now has the capability to utilize this data for analysis of operations and in decision making tasks. Having this capability in place will enhance many of the District's current operations, as well as the future ability to consider any of the higher levels of water-system operating technologies discussed earlier.

Tom Gill continues to work with the Julesburg Irrigation District to refine the application of the software tools to the District's current operations.



WEB PATHS

Description

Website

The US Geological Survey has recently released its latest education-based web site called "Water Science for Schools." The site is available for students aged 9-90 and for anyone who wants to find out more about the many aspects of water, from what it is to how we use it. The site is topic-based, including:

http://water.usgs.gov/droplet

Water Basics
Earth's Water
Special Water Topics
Water Q&A
Water Use Information, Data and Maps
Picture Gallery
Activity Center

The site includes help screens, navigation guides, a water glossary, a subject search, and links to schools conducting water studies and to other sources of water 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. The list includes new projects and supplements to existing awards. The new projects are highlighted in bold type.

COLORADO STATE UNIVERSITY
FORT COLLINS, CO 80523

Title	PI	Dept	Sponsor
Evaluation of the National Hydrogeomorphic Slope Wetland Guidebook...	Steingraeber, David A.	Biology	CDNR
Arkansas River Basin Research Study	**Clements, William H.**	**Fish & Wildlife Biology**	**CDWL**
Limon Wetlands Project: Why Do Cattails Dominate Marsh Wetlands?	**Cooper, David Jonathan**	**Earth Resources**	**DOT**
Ecological Modeling in Support of County Decision Making	Hobbs, N. Thompson	Nat. Resource Ecology Lab	CDWL
Modeling Flows for Fish Habitat Maintenance - Hydraulic Modeling	Wohl, Ellen E.	Earth Resources	CDWL
Evaluation of the Interagency Standardized Monitoring Program Technique (ISMP)	**Bestgen, Kevin R.**	**Fish & Wildlife Biology**	**CDWL**
Environmental Applications Research	Vonderhaar, Thomas H.	CIRA	NOAA
Impact of Enhanced Cloud Condensation Nucleus Concentrations on Microphysics...	Feingold, Graham	CIRA	NOAA
International Satellite Cloud Climatology Project Sector Processing Center for GOES...	Vonderhaar, Thomas H.	CIRA	NOAA
CIRA Activities & Participation in DMSP Satellite Processing & Analysis	Vonderhaar, Thomas H.	CIRA	NOAA
Hydrologic Forecasting System Evaluation & Development Support	Johnson, Lynn	CIRA	NOAA
Severe Weather Research	Vonderhaar, Thomas H.	CIRA	NOAA
Study of Large-Scale Motions, Boundary Layer Processes & Convective Parameterizations...	Johnson, Richard H.	CIRA	NOAA
Influence of the Tropical Western Pacific on Climate Dynamics	Schubert, Wayne H.	CIRA	NOAA
Simulations of the Interaction Between Deep Convection & the Ocean Mixed Layer...	Cotton, William R.	CIRA	NOAA
Funds for Satellite Data Reception & Analysis Support	Vonderhaar, Thomas H.	CIRA	NOAA
Dynamics of Whirling Disease on the Cache La Poudre River	**Bergersen, Eric P.**	**Coop Fish & WL Research**	**Montana State Univ.**
Development of Environmental Contaminant Encyclopedia	Stednick, John D.	Earth Resources	NPS
Precipitation & Sediment Transport in the Rio Puerco Basin, NM	Cotton, William R.	CIRA	USGS
Recreation Management of Western Water	Haas, Glenn E.	Nat Res Rec. & Tourism	USBR
Beaver Control of Tamarisk: Mechanisms & Management Applications	Anderson, David R.	Coop Fish & WL Research	USGS
Vegetation Cover Project - Canon City District BLM	Child, Dennis R.	Rangeland Ecosystem Science	
Pueblo Chemical Depot Permanent Vegetation Monitoring	Rondeau, Renee	Fish & Wildlife Biology	USFWS
Update to Agricultural Drainage Planning Program (ADPP)	**Garcia, Luis**	**Chemical & Biores. Engr.**	**USBR**
Monitoring Erosion-Control Projects in the Rio Puerco Basin, NM	**Wohl, Ellen E.**	**Earth Resources**	**BLM**
Ecology of Western Reservoirs	Fontane, Darrell G.	Civil Engineering	NBS
Stream Water Quality Modeling Technology Development	Garcia, Luis	Chemical & Biores. Engr.	USBR
Erosion & Sedimentation in Virgin Islands National Park	Macdonald, Lee H.	Earth Resources	USGS
Study of the Role of Clouds in the Relationship Between Land Use/Land Cover...	Kidder, Stanley Q.	CIRA	NASA

Title	PI	Department	Sponsor*
Estimating Non Market Values of Natural Resources	**Loomis, John B.**	**Agric & Resource Econ.**	**USDA/NRS**
Wetland & Endangered Species Survey Support for Fort McCoy, WI	Shaw, Robert B.	Forest Sciences	COE
Determining the Cause of Wetland Disappearance at the Great Sand Dunes	Cooper, David Jonathan	Earth Resources	NPS
Water Management Education Program for Navajo Nation Water Users	Podmore, Terence H.	Civil Engineering	USBR
The NBS Global Change Data Center	Simmons, Carol L.	Nat. Resource Ecology Lab	NBS
BLM Mancos Shale Disturbance Study	Lyon, Margarette J.	Fish & Wildlife Biology	BLM
Meeting Time-Dependent Instream Flow Requirements in a Fully Appropriated Multi-State River Basin	**Frasier, W. Marshall**	**Agric & Resource Econ.**	**USGS**
Biotic Control of Detrital Processing in Hawaiian Streams	Covich, Alan P.	Fish & Wildlife Biology	NSF
Convective Cloud Systems in Climate Models	Randall, David A.	Atmospheric Science	NSF
Identifying Ecoystem Controls on Biodiversity: US & UK	Wall, Diana H.	Nat. Resource Ecology Lab	NSF
Clouds & Ocean-Atmosphere Interactions in the Pacific Basin	Randall, David A.	Atmospheric Science	DOE
The NBS Global Change Data Center	Simmons, Carol L.	Nat. Resource Ecology Lab	NBS
Inventorying & Monitoring Natural Resources Status & Trends in the National Park System	Loftis, Jim C.	Chemical & Biores. Engr.	NPS
Water Resources Management Plan for the Chattahoochee River National Recreation Area	Smith, Freeman M.	Earth Resources	NPS
Developing a Decision Support System for the So. Platte Basin	Garcia, Luis	CWRRI	VARIOUS
Design of a Water Quality Monitoring Network-Big Thompson Watershed	**Loftis, Jim C.**	**CWRRI**	**N Front Range WQ Planning**
Upper Animas River Biological Evaluation	Clements, William H.	Fish & Wildlife Biology	Hydrosphere Inc.
Potential Losses of EPTAM during Sprinkler Application & the Influence of Soil Moisture...	Nissen, Scott J.	Bioagric.Sci & Pest Mgmt	Potato Admin., CO
Preble's Mouse Surveys for the U.S. Forest Service	**Schorr, Robert**	**Fish & Wildlife Biology**	**USDA-USFS**
Theories & Methods for Measuring Environmental Values & Modeling Consumer & Policy Decision Processes	**Loomis, John B.**	**Agric. & Resource Econ.**	**USDA-USFS-RMRS-CO**
Water Quality & Ecosystem Studies in Northwest Alaska	Binkley, Daniel E.	Forest Sciences	USDA-USFS
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MEETING BRIEFS

NOT IN MY WATERSHED:
Changes in Land and Water Use in the South Platte Basin
9th Annual South Platte Forum, October 28-29, 1998

A Forum Summary by Don Kennedy, Denver Water

Don Kennedy, Denver Water, summarizes the 9th Annual South Platte Forum

If this conference had taken place 10 years ago, it would have concentrated on agencies or companies outlining the great achievements they had individually accomplished. At this year's forum, the pattern of what I heard was how we are using partnerships and cooperation to accomplish goals.

Obviously, this is not a new concept and has happened in the past, but it is very apparent that it is occurring more and more all the time. Almost every presentation on the first day involved a partnership. It only makes sense that these partnerships continue. As more and more people move to Colorado, solutions and analyses need to occur together for the betterment of the whole.

As Dr. William Riebsame pointed out in his opening presentation, "A Special Geographical Perspective," the West needs to think about the landscape, where people are moving to, and what areas they are living in. He stated that the United States will be the most populated developed country in the next 20 years. We will be running into each other more often, so we should collaborate on more issues.

Instream Flows: Coming Soon to a River Near You —During the session I heard a real need for more field enforcement to monitor instream flow allocations. Cooperative partnership involving Trout Unlimited, the Colorado Water Conservation Board, and the Division of Wildlife has been established to address this issue, since the CWCB cannot do it all by itself. I also heard that we can establish instream flows in other ways besides through the CWCB Instream Flow Program. The example given was the South Platte River through Denver. By working out a cooperative agreement with the State Parks, Denver Water provided instream flows to this urban reach. In addition, Denver Water acquired gravel pit storage downstream for reuse, augmentation and exchange purposes. This will ensure instream flows for the urban reach of river and Denver Water will not lose water yield. These types of arrangements provide a benefit for all the parties involved.

The Miracle of Fishes and Flows — In this session, we heard about how a cooperative agreement provides a benefit to declining species in Colorado, makes up depletions for the endangered species in Nebraska, and creates riparian and wetland habitats for wildlife. The agreement includes the Northern Colorado Water Conservancy District, the Colorado Division of Wildlife, the Colorado Water Conservancy District, the South Platte Lower River Group, GoCo and Ducks Unlimited, quite a divergent group. In addition, there was discussion about the endangered species Cooperative Agreement with the States of Nebraska, Wyoming, and Colorado and the Department of the Interior. A governance committee with members from the three states, the water users, the environmental groups, and two federal agencies was created to implement this Cooperative Agreement.

Models, Maps and Modems — Participants presented the latest developments and mentioned that all the GIS tools used for decision making were based on contributions of a number of local and state cooperating entities, thereby providing a means to link a number of informational bases and models together.

Days of Swine, Bovine, and Roses — Session four looked at reasonable solutions for livestock management. Dave Lure of D&D Farms mentioned to me the need to get the message out on how livestock managers operate, so that people can begin to understand the business. This is counter-intuitive for a farmer, but necessary.

The ABCs of the TMDL — Eventually, the TMDL program of the Clean Water Act should get to the point where the Endangered Species Act is now, where cooperative agreements are put into place to try and meet everyone's needs — environmental groups, industry, and regulators — and still meet the intentions of the federal act. We all value clean water. We must find a way to work together, in the TMDL program, to identify our common goals and to achieve real improvements in water quality.

Can't We Just Get Along — In this final session, Hubert Farbes stated that we need to cooperate, because if we don't, we will not be able to meet municipal water supply needs in the future. Alan Covich said cooperative approaches to ecosystem management are needed. He used the example of the River Watch Program. Bob Sakata discussed what farmers are doing to meet environmental challenges and stressed that we need a balance.

It is apparent from past and present experiences that cooperative efforts result in more work initially, but provide the best results for everyone involved and have the potential to save a lot of money in litigation.

This issue of *Colorado Water* includes summaries of the following presentations at the 9th Annual South Platte Forum:

Keynote Luncheon Address by Ed Quillen, *Denver Post* Columnist, and

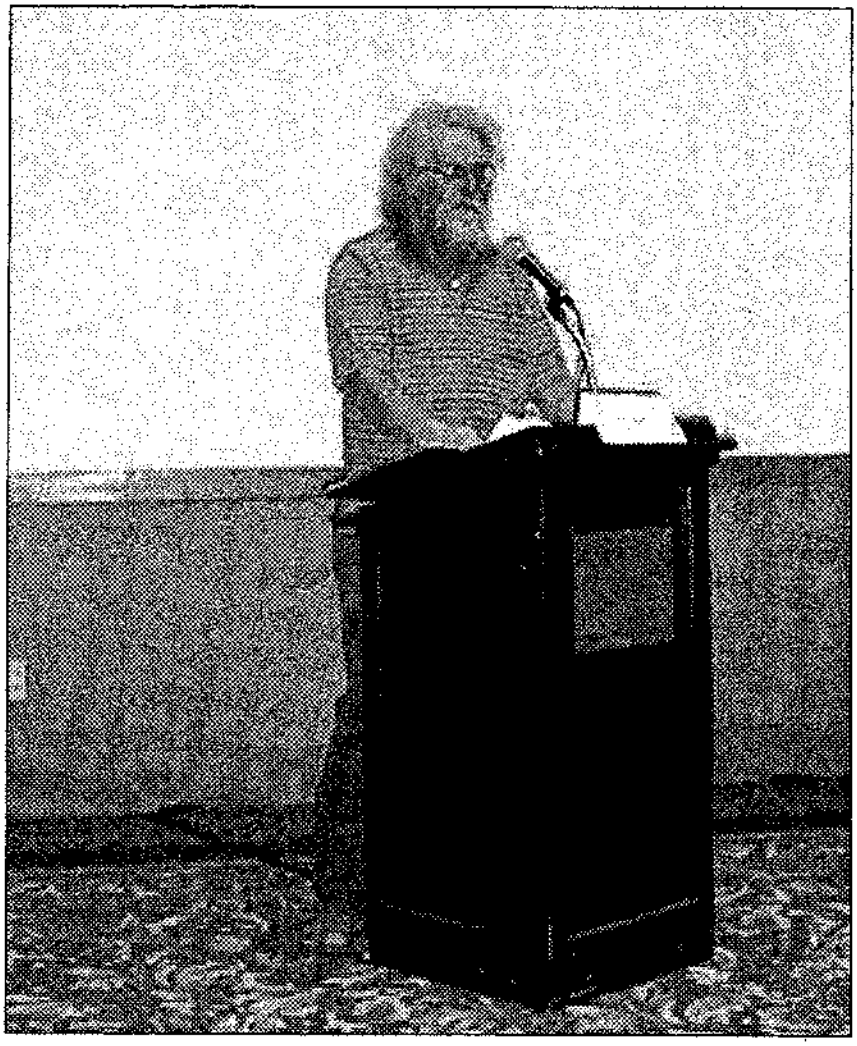
Presentations by Alan Covich, Department of Fishery and Wildlife Biology, Colorado State University; and Rob Sakata of Sakata Farms.

The 9th Annual South Platte Forum was held October 28-29, 1998 at the Raintree Plaza Conference Center in Longmont, Colorado.

The Forum is a cooperative effort of the Colorado Division of Wildlife, the Northern Colorado Water Conservancy District, Denver Water, the Environmental Protection Agency, the U.S. Geological Survey, the U.S. Fish and Wildlife Service, and the Colorado Water Resources Research Institute.

SOUTH PLATTE FORUM KEYNOTE ADDRESS

by
Ed Quillen, Denver Post Columnist



Given the topic of the forum, "Not in My Watershed," which is a play on "not in my backyard," we should give due honor to Thomas Jefferson, the leading political theorist this continent ever produced. The United States explored our part of the world in 1806-07 under his auspices. Jefferson liked to practice agrarianism, but he was an urbane, cultivated man who liked books, violins, good wine, and other urban amenities.

Jefferson sent Zebulon Pike out, in theory to find the headwaters of the Arkansas, and then of the Red River. No one seemed to know then that the Red River headwater is down in the panhandle of Texas. Pike ended up at the headwaters of the Rio Grande, which was Mexican territory, and was arrested. In his journal, Pike said he believed that with no difficulty he could find the central pinnacle of the continent where the headwaters of all the rivers were. Within a day's ride he could go from the headwaters of the Yellowstone to the headwaters of the Rio Grande, the Colorado, and the Platte. He referred to the South Platte as the Platte, because he didn't know about the North Platte, so I guess that makes him a pretty normal Colorado resident. You can often win bets by mentioning that the North Platte actually headwaters in Colorado.

There isn't quite this major pyramid that Pike talked about, but because several major rivers headwater within 50 miles of Salida all manner of water schemes get proposed. We have the Union Park reservoir proposed in Gunnison County, two drainages away from the Platte, but they can run it across the Arkansas River in Chaffee County and get water into the Platte. Most recently, we have Gary Boyce's plan in the San Luis Valley. It would take 150,000 acre-feet per year of recharge that supposedly goes into the Closed Basin, pump it over Poncha Pass, and then either trade some water or move it over Trout Creek Pass and get it to the Platte. Maybe we should rename the Platte the magnet river, because it seems to attract so much.

The San Luis Valley. Regarding Boyce's war in the San Luis Valley, nobody down there seems to be interested in too many facts. If you get a number they disagree with, you get cancelled subscriptions. I asked the State Engineer how much water the Rio Grande carries in a normal year, how much of it is used in Colorado, and how much should be delivered to New Mexico? The Rio Grande Compact is very different from the other compacts in that it is a 10-year average, and there is no deliver time. In theory, you could store all the water in Colorado and then once every 10 years dump it all down the Rio Grande. John Nichols would probably write a very angry novel about that, but Colorado would be abiding by the terms of the compact.

Western Water as a Religion. People fight these water wars so vehemently that it makes me think of religious wars, which is a way of getting to this topic: Western water is a religion, a system of faith and dogma, and the

connection with the real world is tenuous. Now, how many of you have seen a UFO? How many of you have seen a cfs? Could you bring one sometime? Cfs is also a product of belief. How many of you can tell me what a beneficial use is? That is one of the major terms of our religion. It is a piece of faith without a good definition. Gunnison has that problem right now, beating back challenges in water court from those who want to divert water from the Upper Gunnison. For Gunnison County to have much say, they have to show due diligence toward developing this water that they don't want to develop. They are going about it in a good Western Slope way. Their local conservancy district sent a couple of surveyors over to some rancher they knew who was pretty quick on the trigger. He chased them off, but that way they could say they tried and yet they know they will never build a reservoir on his property. That is probably enough to fool a water court on the Western Slope.

Our major world religious systems started in the Middle East, a desert, and I don't think it is a coincidence that deserts are where civilization first grew. Civilization seems to be tied to farming, and in a desert that means irrigation.

Our major world religious systems started in the Middle East, a desert, and I don't think it is a coincidence that deserts are where civilization first grew. Civilization seems to be tied to farming, and in a desert that means irrigation. In the Bible, the desert is a place of possible spiritual enlightenment, but it is also a place of wild beasts where the Devil roams. Our word "paradise" comes from a Persian word for an oasis. Note that we use the word "doctrine," which is otherwise a religious term, in phrases like "the Colorado Doctrine of Prior Appropriation." I think that we should keep some of that religious terminology in mind. In examining western water as a religion, I came up with two factions or cults, groups I will call the "buffaloes" and the "greens."

The Buffaloes and the Greens. Buffaloes and greens both have a theory that the world was once a different place. In the buffalo cult, the world was originally flush and green. Then something very terrible happened. I don't know what, but devastation and aridity took over. The buffalo cult said, "We must reclaim this." The land looked like it had been desert since two weeks after the sun started up, yet there was a vision that this was once a lush paradise. Something bad happened, but we can reclaim it. With the green cult, land that was always desert was always desert, but again, there was a catastrophe. Humans arrived and started diverting rivers so it wouldn't be dry. Then you got taxes, wars, and other blessings of civilization: the soil leaches nutrients, the ground gets salty, and the desert will return. This is the eschatology of the greens.

We have this ruined world, and there is the process of redeeming it in both religions. The buffalo with their reclaiming, so strong that back in 1981 when James G. Watt was appointed Secretary of the Interior, he restored the name of the Bureau of Reclamation, which had been changed to Water and Power Resources Administration under Carter. But we wanted the religion back in it, so it became the Bureau of Reclamation again. We are not really changing things under this vocabulary. We are restoring it by reclaiming it. The green cult wants to let it go back to desert: leave it alone; it was perfect before we got here. I didn't realize how strong that was until a friend called me who is involved in a local stakeholders' council. He asked, "What did this valley look like before white folks got here? Are there any descriptions? Was it lush and green?" I think not; most of that is leakage from irrigation ditches. You know, we are not big into concrete lining. I said I would nose around my references and find out.

The first recorded trip to our part of the world was by a Spanish conquistadore named Juan Bautista de Anza, and that was in 1779. He was busy chasing the Comanche, and crossed a narrow, steep pass (Poncha Pass), came down to the Rio Nepestle, which was their word for the Arkansas, forded it and got into some more dry mountains. He didn't really mention what our valley looked like. I checked on Fremont; no real mention there either. Apparently it just wasn't noteworthy. But I started wondering, why do they care? We have to deal with that valley the way it is today, not how it was in 1779 or 1843. We really don't know how lush it was.

Doctrines of the Buffaloes and the Greens. Now, we can move to the doctrines of these two branches of the western water religion. The buffalo says, "Water is absolutely private property. It is a private property right you can buy and sell." Postmodernists always talk about how everything is a social construction; there really isn't a

reality. I don't quite go along with that, but I like to think there is probably nothing that is more of a social construction than a water right. They don't exist in 99 percent of the world. When my wife moved out here from Michigan, she was shocked. In Michigan, the ditches you see are drainage ditches, not delivery ditches. You mean you can own land but not own the water that flows over it? But I can't quite believe it is fully a property right. Call your local county clerk or assessor, and ask what the going assessment rate is on a water right. I have to pay personal property taxes on the computers I use in my work. These are assets for productive use. But the farmer or mill owner, with his sacred private property water right, for some reason does not have to pay property taxes on it. I would have a lot easier time believing that water was property if it were taxed like property. If the water buffaloes want a few more converts, they should lobby for it.

Our Colorado Constitution, I think, tries to have it both ways. It says the water of Colorado is the property of the people of Colorado, but also that the right to divert shall never be denied.

The green attitude is that water is absolutely a public resource that private people can borrow. That came to a head in the Emmert case in Grand County where they were floating down the river, Con Ritschard met them with a scattergun, told them they were trespassing, and they took it all the way to the State Supreme Court. Con said, "I pay taxes for the land under the river, so therefore I control who can go down the river." Emmert said, "No. The Constitution says the waters of Colorado belong to the people of Colorado." I understand they have changed the law, but at the time the landowner won.

Our Colorado Constitution, I think, tries to have it both ways. It says the water of Colorado is the property of the people of Colorado, but also that the right to divert shall never be denied. Our pioneers were shrewd people. The first legislature taxed all occupations except mining and farming. You may note that they were all miners and farmers.

The buffalo doctrine is that we should conserve water because it is precious and hard to get, and we have to work very hard for it. The green doctrine says we should conserve water because that way we won't need to drown more valleys and we can keep our farms running (and our farms feed us). I had something of an attitude problem with both, and I have to thank my younger brother for teaching me the true approach we peons have to take with water, which is to waste every drop we can get our hands on. The more we waste the less the city can use to build more subdivisions, shopping malls, motels, hotels, schools, and other forms of progress. If you want to keep your town livable, you don't want people moving to it, and you can deprive them of a water supply by wasting it.

The buffalo attitude is that we should protect agriculture and its water rights, because we need to eat. The green means pretty much the same thing except what agriculture means: open space. Having grown up in Weld County, I think agriculture means big, outdoor, smelly chemical factories; but they never struck me as holistic or natural. All the farm kids in school were missing fingers, and why we romanticize farm labor I don't know. It is dangerous child labor, and we hold it up as a good way to raise children.

The buffalo attitude is water is the lifeblood of the American West, and it controls everything. The green attitude I learned from Dan Luecke, who is a hydrologist, the one I believe whose analysis killed the Two Forks reservoir. He did some studies on the factors of industrial relocation. What are the most important things to a company looking for site? Water was about 17th on the list behind interstate highways, telecommunications, behind almost everything. Folklore is what is right here. Water flows toward money. If you want proof, look at the major cities that get their water from the Colorado River — Denver, Los Angeles, San Diego, Phoenix — is any one of them near the drainage of the Colorado River? No. Where the money is, they make the water flow to it.

I always tell young, aspiring journalists who say they will study water, understand it, and get a job in Colorado, (a) "No, if you know anything, you will never get a job in Colorado journalism anyway;" and (b) "Follow the money. It is a lot more interesting than water, and if you track the money you will see where the water goes. If you track the water, it won't tell you much of anything except where the money is, and the money is always there first. Look where people are spending a lot of money, development, and you will see the water go there."

The Buffalo Paradise and the Green Paradise. Now

we get to the afterlife of these two religious cults. The buffalo paradise is cities, irrigated farms, and looks a lot like Iowa. I don't think that is a coincidence. If you look at our towns, they look like mid-western towns. The old buildings look like mid-western buildings. The people who built these areas thought that was how towns were supposed to look when they planted lilacs and lots of thirsty trees. Salida looks like a little town in Iowa or Michigan. But that isn't the only way you can build towns here. One-hundred miles from Salida sits the adobe capitol of the universe: Taos, New Mexico. The people who built Taos had a different idea of how towns should look: there should be a plaza with a cathedral and lots of adobe buildings.

After his initial surveys, Powell realized straight lines really didn't fit the topography here, and suggested that the West be organized in watersheds.

The green paradise has lots of free-flowing rivers, and they lie a lot about that. I don't think anybody has ever said "the free-flowing South Platte." I live next to the free-flowing Arkansas, and there is no dam across its main stem above Pueblo Reservoir, that is true, but every tributary that is too big to jump across has a dam on it. The rafting season would be about two weeks long if they had to rely on native water flows. Thanks to the generous people of the Western Slope, we have a rafting season that is 12-14 weeks long in a river whose flow is controlled almost to the gallon. But the rafting people will tell you it is a free-flowing river, probably as free-flowing as anything in Colorado.

Powell also, instead of talking about reclaiming land, talked about redeeming it. . . Again, this redeeming of the land — it was once green, some catastrophe happened, and we have to redeem it. When we talk about reclaiming and redeeming, we are looking backward to a past that none of us saw, none of us knows.

John Wesley Powell. Now we get to the charismatic prophet, the founder of the western water religion, John Wesley Powell. Powell was at heart a rationalist, part of the same Jefferson cartesian school that explains why we live in one of these big square states. After his initial surveys, Powell realized straight lines really didn't fit the topography here, and suggested that the West be organized in watersheds. It was a pretty socialistic vision, because he wanted a little land-use planning here. One-hundred sixty acres at the time was too big for an irrigated farm and more than one family could work, but it was too small for your normal arid ranch. He wanted a whole new way of organizing the West. He was a little late, and he also offended railroads, mine speculators, and real estate speculators, so he lost his job — the fate of many good government public servants.

The greens can read in Powell the majesties of Glen Canyon and the challenge and adventure when he is floating down the Colorado. The buffaloes can read Powell talking about how wonderful the day will be when there is not a drop of water in that horrible canyon, because it has all been diverted to beneficial use for farms. I think that is why Powell makes a really excellent religious figure for western water: you can read anything into him you want and quote the authority; the gospel of Powell will support you in whatever you want to do with western water.

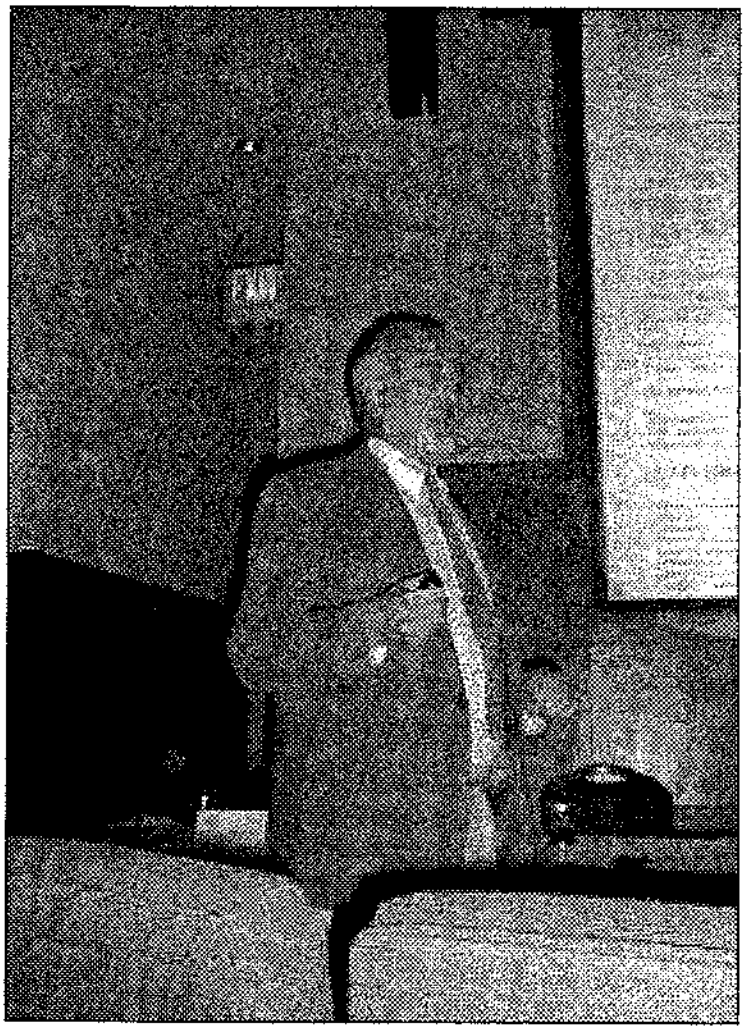
Powell also, instead of talking about reclaiming land, talked about redeeming it, an even more religious term. Again, this redeeming of the land — it was once green, some catastrophe happened, and we have to redeem it. When we talk about reclaiming and redeeming, we are looking backward to a past that none of us saw, none of us knows. I think we would do a lot better to get a little more scientific about it, drop the idea of reclaiming or redeeming, and start thinking about what we want now. How do we want this river to look? What do we want it to do? What and how many purposes does it serve? How can it best serve those purposes?

CAN'T WE ALL JUST GET ALONG?

Public Participation in Water Resource Decisions

by

Alan Covich, Professor
Department of Fishery and Wildlife Biology
Colorado State University



INCREASED NEEDS AND CHANGING VALUES

Changes in the South Platte Basin now and in the future include the public's perceptions of the basin as an ecosystem. How people value this river is clearly important, because people help to determine how the South Platte ecosystem works. The South Platte Basin will need to rapidly accommodate many more people with different values for alternative uses for water. Along with this rapid growth of the human population, we now have increased communication among water users and increased public interest in policy issues and decision making. Whereas water was traditionally valued primarily for food production, sanitation and drinking water supplies, today there is increasing demand for recreational fishing, swimming, and boating in all of our rivers, lakes and reservoirs.

There are now twice as many people on the planet as in 1962 and immigration into the South Platte Basin has accelerated in the past few decades. Hobbs and Theobald (1998: **http://blueberry.nrel.colostate.edu/escop/briefing.html**) note that Colorado's population grew by more than 452,000 people from 1990 to 1995, with more people moving into Colorado than any other state except Arizona. Nine counties in Colorado experienced growth rates exceeding 8 percent. The Front Range and the Plains that comprise the South Platte drainage have immigration rates and population growth rates that are faster than those for many developing countries. As a consequence, we are rapidly transforming the landscape and testing the limits of the resiliency of this complex ecosystem.

Human population growth can alter habitat quality for fish and wildlife by fragmenting the landscape and potentially increasing non-point sources of nutrients. In fishery and wildlife biology, we teach a variety of courses in population dynamics, especially focusing on changes over time in numbers of native and game fishes. These populations are of major public interest and can be greatly altered by human population growth. However, predicting where growth will occur is extremely complicated. Along with population growth, access to remote wilderness areas and isolated habitat refuges will become more difficult. What this increased human activity means to fish and wildlife is being viewed in many new ways. We now include the "human dimension" in all of our planning for fish and wildlife studies. If we are to deal with this rapidly changing landscape, especially in the South Platte drainage area, we must consider the "big picture" and how people value different uses of the river ecosystem.

Citizen interest in environmental issues continues to grow and communication among diverse groups of people has accelerated along with population growth. Technology now allows us to share information through the Internet and has

dramatically changed how we communicate with each other and with our public agencies and representatives. Formerly, if you wanted information about fish distribution in the State of Colorado, you could look it up in a book that you found on government documents shelves in the dustiest part of the library. Now, you can locate these data in full color in just a matter of minutes either in your local library or on your home computer with a modem connection to the Internet. Through cooperative efforts, we have been able to assemble a great deal of information. One example is "Colorado Water Knowledge" at Colorado State University (**http://waterknowledge.colostate.edu**), and another is the "Natural Diversity Information Source" (**http://blueberry.nrel.colostate.edu/escop/help/chapter1.html**). As these information alliances become available, there is more and more public interest from all sources. Current examples of the types of data collection and syntheses suggest that this active area of information analysis will continue to grow rapidly in the years ahead.

Colorado State University and its relations with state and local agencies

The Colorado Division of Wildlife and Colorado State University are cooperating with the Colorado Natural Heritage Program (with funding from The Nature Conservancy, Great Outdoors Colorado, and several private foundations) to assemble information about the distribution of different species and the habitats they need in order to persist far into the future. This information synthesis is helping to address issues related to rapid change in the Colorado landscape (**http://www.colostate.edu/Orgs/CNHP/**).

The Colorado Alliance for Biodiversity Collections has a goal of bringing together data and distributional information from the Museum of Natural History in Denver as well as the universities and many state and federal agencies. This information will be integrated, analyzed, and mapped to help provide solutions to particular problems created by increased highway building and development of all sorts.

At Colorado State University we also have attempted to look at how we teach and how we help through community involvement. A great deal has changed over the last few decades in how we communicate with our students, alumni and the general public. In the past, many of our current courses did not exist. CSU now has new courses in geographical information systems, remote sensing, landscape ecology, and various kinds of multivariate and spatial statistical methods that did not exist even ten years ago. CSU also has developed a Water Center to pull together all of the water interests and activities on campus in natural resources, engineering, and agriculture (**http://watercenter.colostate.edu/**). In November we had our Second Annual Student Symposium on Water Research and we have a new minor in water resources.

Grade Schools, High Schools and Other Groups have increased their outreach efforts.

On campus we try to keep up with curricular changes in the grade schools and high schools because many science teachers have developed new ways to stimulate students to learn how water resources can be managed. Chemistry and biology teachers are teaming up to provide their students with first-hand opportunities to learn about rivers and their ecological functions. Students are excited to learn about science that affects their daily lives. The study of ecology is one way to integrate many different sciences in ways that students can use. There is increased interest in examining water resources in an ecosystem-based, landscape-level perspective that did not generally occur a few decades ago. Now students are out collecting their own data on dissolved oxygen levels, dissolved nutrients, turbidity, temperature, and fish kills.

Outside of school there is also increased and sustained interest in teaching students about environmental issues from many sources. Cattlemen's organizations, farmers' organizations, 4-H groups, and scouting troops are just a few of the ways that students have increased their participation in environmental education programs. As a result, we have many more organized groups interested in environmental issues than in the past. Students are becoming more sophisticated in the questions they ask. They are learning about a wide range of issues from television channels devoted to ecology and the process of discovering new information over the Internet and from other library resources.

At Colorado State University's Pingree Park Mountain Campus we have hosted workshops for teachers who attend and bring some of their most motivated students with them. Many high school students know the names of aquatic insects, crustaceans, and fish as well as the ecological roles that these species play. They understand

what levels of dissolved oxygen are required for different species to live in particular coldwater or warmwater streams. These students are very excited about learning how rivers work. They also understand that ecology is generally important to their future. These teachers and students receive assistance from state and federal agencies. Many of these programs have federal and state matching funds and many others are wholly or partially voluntary programs. Here are just a few examples:

♦**The Big Thompson Watershed Forum, Loveland:** Some local high school programs are very successful and develop into larger outreach programs. For example, the Big Thompson Watershed Forum grew out of a series of meetings of the North Front Range Water Quality Planning Association in 1996 and was organized by Rob Buirgy, a chemistry teacher at Thompson Valley High School. Rob previously worked with students, local agencies, and the public to increase awareness about the watershed as part of the Big Thompson Water project.. Rob played a major role in getting students and agencies to exchange views among stakeholders and to assemble data on water quality that is made available to citizens throughout the Front Range. Two fish kills along the Big Thompson attracted considerable public attention in watershed management issues. Local, state and federal agencies working in Larimer and Weld counties have contributed funds to help develop this Forum to address issues associated with the federal Safe Drinking Water Act of 1996 and to develop efficient means of data collection and addressing water monitoring operations.

♦**Rocky Mountain Aquarium Foundation, Ft. Collins:** The "River Explorations" program is an interactive, Internet-based guide to aquatic ecology and education for students from grades 3 to 12 who want to learn about life in local flowing waters. This program is funded by the Rocky Mountain Aquarium Foundation, the National Forest Foundation, the Stryker Short Foundation, and by other private and public groups. Students examine uses of local waters and how decisions are made (**http://www.waterteach.org/**). There is growing interest in developing a freshwater aquarium complex in Ft. Collins that would create new opportunities for students and the general public to learn more about species diversity and the natural history of Colorado's many freshwater organisms (**http: // colorado.on.line. com/rmaf/educate.htm**).

♦**Rocky Mountain Hydraulic Laboratory, North St. Vrain:** One example of a local outreach effort is a field laboratory on the North St. Vrain, the Rocky Mountain Hydraulic Laboratory, that was established as a cooperative arrangement among several groups back in 1946. The Rocky Mountain Hydrologic Research Center is working with people in the Allenspark area to increase community involvement with graduate students and scientists working at the lab. A flume was first constructed there back in the '40s to study erosion and hydrologic features. The facility includes a small laboratory and bunkhouse. This site is locally available for groups to do a variety of different studies. In terms of ecosystem management, hydrologists and ecologists are working together to expand the activities of local stakeholders.

♦**The River Watch Program and the Rivers of Colorado Water Watch Network:** This program is supported primarily with Wallop-Breaux funds from the US Fish and Wildlife Service. The project has organized schools across the state to monitor streams in their local watersheds. With infra-structural support from the Colorado Division of Wildlife, this middle/junior and high school-based network really works. Students are asking new questions of their teachers and the teachers are being challenged in many ways to provide more and more opportunities for their students to participate in active learning about rivers, lakes, and reservoirs. The program started with 6 schools in 1990. There are now 260 schools in the network and the number is growing rapidly. Over 500 sites around the State of Colorado are monitored by high school science classes and state coordinators (anseiler@ix.netcom.com). The data are available to regulatory agencies and are collected and analyzed according to state water quality standards. Access this network to learn what many of these schools are doing (**http://elbert.state.co.us./riverwatch**). Participants are no longer just focusing on pristine environments at higher elevations, as might have been an emphasis in the past. These individuals are interested in what is going on literally in their own backyards in Denver. The public is concerned with recreational use of the South Platte River, both upstream and downstream from Denver Metro Sewage Treatment Plant. The notion that some people wish to kayak on the South Platte River downstream from Denver Metro's outfall is a new, more urban perspective on recreational use of river systems. In past years, most people living in large cities would not have expected recreational clean water downstream from the effluent of a large metropolitan sewage treatment plant.

♦**Global Rivers Environmental Education Network, or GREEN:** This group is international in its organization. With funding from a number of private foundations this network is providing many cross-linked web sites to obtain the latest news on water issues and where to purchase water monitoring equipment and supplies for schools and other groups. They are generating information from numerous community-based projects and serve as a clearinghouse for a growing environmental education community. They work with regional groups to develop wed-based curricular projects for schools around the world (**http://www.igc.org/green/**).

♦**USGS: South Platte National Water Quality Assessment, Denver:** The National Water Quality Assessment (NAWQA) studies by the U.S. Geological Survey have generated an enormous amount of recent information about the South Platte Basin that is available both on the Internet and at regional USGS offices. Their reports highlight how nutrients, pesticides, and sediments are spatially distributed in the South Platte Basin and how these water quality parameters relate to distributions of fish species and benthic invertebrates (**http://webserver.cr.usgs.gov/nawqa/splt/splt_home.html**).

♦**EPA: Community Based Environmental Protection Program, Denver:** The Environmental Protection Agency is developing a Community Based Environmental Protection Program that provides support for local groups to collaborate and to identify needs for improving environmental quality. EPA makes funding available so that public groups can organize around a particular issue, gather information about it, and get communication flowing. The nationwide program is still in its early stages, but EPA's Region 8 has helped to organize 15 local groups in Colorado that address different environmental issues.. These groups provide a wide range of information for the public. These local groups are learning how to focus public interest and to organize in a way that helps with ecosystem management. The EPA home page, which gives a count of how many people are accessing this information, shows 26, 217 Ahits@ since August 29, 1997, indicating how rapidly this source of information is being accessed (**http://www.epa.gov/region08/html/chep/cbepr8.html**).

CONCLUSIONS

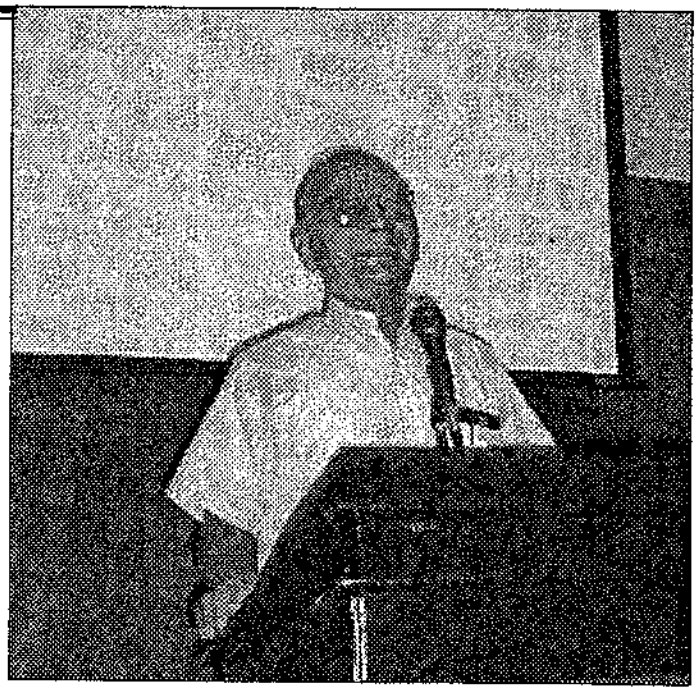
The future will be different from the past. As our populations grow in the South Platte Basin, we need to improve our means and modes of communication so we enhance our outreach efforts. It is critical that policy issues are widely understood by an increasingly interested and diverse public. Bringing ecosystem science into the discussions among these groups is an important consideration for Colorado State University. What ecologists and others know about how natural ecosystems function can be improved and widely used if we actively engage in open discussions. One way for water users to get along better is to communicate more effectively with a wider range of people. Because more local, state, and federal agencies are interacting in new ways, communication among students and the public in general is greatly enhanced. Many different groups have to communicate and participate, or this process of learning about other people's values will not work. If we review the information available on home pages from different parts of Colorado and the rest of the country, we can see that some areas are moving very aggressively toward public involvement. This community participation is a very positive sign. Many groups have increased their activities in environmental education as part of a dynamic process that integrates available information, evaluates its correctness, and attempts to interpret and monitor what is going on. If we share what we know, we are more likely to understand how and why some groups have different concerns and values about how water resources will be allocated in the future.

CAN'T WE ALL JUST GET ALONG?

Rob Sakata
Sakata Farms

How can we get along? I have a grandson six years old and he asked me, "Grandpa, can you make a noise like a frog?" I said, "Sure I can, David, but why do you ask?" He said, "At school the city kids said they heard their folks say, "You know, if all these damned farmers would croak, we could get along." Naturally, that is an exaggeration, and I made that one up.

I came here in 1942, so I have seen this great state flourish to where it is today. I firmly believe that it takes this kind of meeting of the minds to continue to make this a state we can be proud of as far as quality of life is concerned.



Being the president of several ditch companies and irrigation ditch companies, it is a marvel to me when I study the area's history. Many of our forefathers filed water rights before Colorado even became a state. When you look at our forefathers, who came from the east in covered wagons, saw the snow pack, and immediately had a vision that they could make this Colorado an oasis, that is the Wisdom of Solomon. I believe to keep it going will take that kind of wisdom.

. . . I experienced in 1955 a severe drought that lasted until 1959. It will be hard for you to believe that when I drove from Brighton to Greeley, I had to drive about 20 miles an hour with the headlights on because of the dust storm blowing over Highway 85 and even I-25.

Many of you probably were not born in the '50s, but I experienced in 1955 a severe drought that lasted until 1959. It will be hard for you to believe that when I drove from Brighton to Greeley, I had to drive about 20 miles an hour with the headlights on because of the dust storm blowing over Highway 85 and even I-25. We certainly have been blessed, and I firmly believe that one of the greatest blessings could be the many challenges that we confront. It might be a great blessing if God would confront us with another drought. We will certainly learn, and learn quickly, what to do. Things have been too easy and we are getting spoiled, just like we are spoiling our grandchildren. I have seen change come about, and I have witnessed and tried to change according to the circumstances.

The speaker from the Farm Bureau, I believe, mentioned the words "volunteer" and "economics." Economics is really the thing that drives us to do what we have to do. Less than two percent of us are left farming any more — less than two percent. The actual figure is 1.8 percent. The other thing that is really impressive is that less than two-tenths of one percent of us are producing over 80 percent of the food. I have mentioned this many times. If the industrial sector in our United States were as efficient and conscientious as we are, we never would have had Toyotas, Mercedes or Datsuns come into this United States.

I exaggerated with my opening story, but my son, Rob, who is on the State Water Quality Commission, is very active in trying to educate youngsters. Once a year the local Adams County Farm Bureau brings in kids from all over the county, takes them to the fairgrounds, and teaches them about farming. On the questionnaire they had, 90 percent of the kids thought the food came from the supermarket. With the program at Colorado State, it would be good to have some of these kids come to the farms, witness what we are doing, and see how we are protecting the environment and producing food.

Many speak about the endangered species. I feel as though I am the endangered specie at this point, because we are accused of causing much of the so-called "non-point pollution." I will be the first to say that we may not be completely innocent, but common sense would tell you this — think of this for a moment. I firmly believe, and all my colleagues in farming believe this too, that God granted us one of the greatest responsibilities of any profession. He granted us the responsibility of being the custodians of the most important natural resource we have — our water and our soil. We are not about to contaminate these, because it is our livelihood. It is our philosophy to leave it to our children and their children's children so they can survive and have a good living in an atmosphere that certainly is not one to get rich, but of great living out in the country. To see the miracle of nature, to see the miracles of God's work every day, is the greatest life that you could have. We are not about to pollute it.

Just the other day, I got an e-mail about nitrate pollution. Researchers working in a central California watershed had determined for the first time that high levels of nitrates are being released from crumbling bedrocks after years of melting. Much sloppy farming and factory pollution take a lot of this public bane for nitrate pollution. As I said, I don't believe we are completely innocent, but we are trying, and I believe we need to exercise all scientific measures we can. Several agencies are taking water samples from our irrigation wells — the Central Colorado Water Conservancy District, Weld County Health Depart-

ment, and the State Health Department. Not only that, we take water samples from the surface irrigation water as well as our well so that we can add the nutrients that we need for that plant to grow without adding more.

Our net return on our farm operation is quickly getting to be almost like that of the chain stores. The only thing we don't have is a store to market our product. We are completely integrated, from genetic engineering, owning our land, processing fresh vegetables, to our shop that manufactures all the necessary equipment that we need because we are so specialized. The only kind of equipment we buy is the tractor, disk and plough. Everything else we manufacture ourselves. We have our own international and domestic sales force that markets all our products. In spite of that, I have learned to put our net return on percentage of sales, because that is the way corporations do it. When Pepsi Cola comes out and says they have 24 percent return on sales, it just blows my mind. Our return is about six percent on gross sales, and that is before taxes. Any company that is going to survive will have to be in the 39 percent bracket; and additional state taxes bring it to about 45 percent; let's say 50 percent to make it easy mathematically. So, we have three percent return on sales.

Common sense tells you that we cannot use any more chemical than is necessary. We are continuously testing our soil. We know from the past 50 years what ingredients each commodity needs to produce a wholesome product, and with that we measure it and continuously take soil samples as the crop grows. We also take tissue samples to see what the tissue is absorbing compared to what the plant is taking or what is in the soil. We use the term "spoon-feeding," where we make our own equipment that opens up a little disk furrow alongside the plant, and we have the nutrients mixed as we need and apply alongside the root system. We do not use the big trucks that you have seen before, scattering the fertilizer all over the fields and even into the roadways.

As far as chemicals for insect control are concerned, we have a full-time entomologist and traps in many different fields to collect the female moth and we know exactly when that moth will lay its eggs. With correct timing, when it does lay the eggs, we are out there with our sprayer, and we can use about one-fourth of the chemical that would otherwise be necessary. Not only that, a year ago my son and a spray company worked together to use what you call an "air blast," not within the water but in front of where the spray goes. They developed a heavy air blast so that the air pushes down, and when a spray boom sprays the chemical, it follows that air and covers the plant. They found that they could cut chemical use to about a fourth of what had previously been put on. These are some of the things that we are doing.

Another thing is that whenever agriculture uses chemicals, it is called a "pesticide." When you go to the drugstore and get medicine the doctor has prescribed, that chemical is called "medicine." I think it is the same thing. In fact, would you believe that when I was a child about six years old, I remember my father growing celery, one of his specialties. One of the main chemicals he used at that time to kill insects was lead arsenic. Another was black leaf 40(?), which was nicotine-based. So, things have changed.

I am certainly not here to argue that the environmentalists and agencies are wrong. I think we need you; we need a balance. It is no different than when I drive home on I-25. If I am going 90 miles per hour I need a patrol car to stop me, so we have that policing agent. But they won't stop you if you are not going over the speed limit. And this is when I plead to all the agencies that are monitoring the environmental challenges that we have today: if we are going 100 miles per hour, stop us; we are doing something wrong and we should correct it. But, if we are traveling the speed limit, let us go and thank us for what we are doing.

I love history, and it was interesting to read that when Henry Ford mass-manufactured the Model-T Ford in the '20s, the blessing that people in New York were most thankful for was that finally we would get away from polluting the environment. Finally, we would get rid of all those horse droppings. To them, that was the problem. So, here we are, some 70-odd years later, and the automobile has become one of the greatest polluters. Congress recognized it, automobile companies have recognized it, and we are trying to correct it. I believe that we need all the agencies that are watching over us as a balance.

Now, how can we get along as far as water is concerned? In the State of Colorado, if I sell my surface water rights, the present law states that I must dry up that land completely. This is what could make an oasis into a dust bowl, as I mentioned earlier. If you have any doubts about my prediction, go visit the areas around Ordway, Sugar City and Crowley, sites of many different crops. Today these are dead towns, abandoned by agriculture!

The dry-up clause determined by the state water courts and the state water engineers should be reevaluated.

Most farmers on the Front Range have excellent irrigation wells. Whenever the cities buy our surface water, they are entitled to consumptive use of 50 percent, the cities are entitled to approximately 25 percent, and the balance must go back to the river. Therefore, why can't the farmers still be allowed to use their irrigation pumps to grow crops adjusted to whatever they could pump? This would prevent our state from becoming a desert instead of the oasis we see today.

In closing, may I emphasize that water is like our own finances. In a good year, we must save it for the lean years. Water is no different. Let us build more dams so that we can preserve the water that God blesses us with in the good years to be prepared for the lean years.

Remember: God helps those who help themselves. Proverbs 29:1, *Where there is no vision, the people perish.*

WATER SUPPLY

The month of October began the 1999 water year which starts a new accounting cycle and prompts consideration for what next year's water supplies will be. This includes looking at the winter stream flows, the amount of reservoir storage that will be carried over to next spring, and perhaps most importantly, anticipation of the start of the winter snowpack. October 1998 saw generally adequate water supplies for fall. All seven major stream basins in the state had the month's SWSI values above zero, as well as above normal precipitation amounts.

The Surface Water Supply Index (SWSI) developed by the State Engineer's office and the U.S.D.A. Natural Resources Conservation Service is used as an indicator of mountain-based water supply conditions in the major river basins of the state. It is based on stream flow, reservoir storage, and precipitation for the summer period (May through October). During the summer period stream flow is the primary component in all basins except the South Platte basin where reservoir storage is given the most weight. The following SWSI values were computed for each of the seven major basins for November 1, 1998 and reflect conditions during the month of October.

Basin	Nov. 1, 1998 SWSI Value	Change From Previous Mo.	Change From Previous Year
South Platte	3.2	+0.3	-0.7
Arkansas	1.8	+1.4	-0.7
Rio Grande	1.2	+0.8	-2.5
Gunnison	0.5	-0.4	-2.3
Colorado	1.9	+0.2	-1.9
Yampa/White	2.8	+1.0	-1.0
San Juan/Dolores	0.5	+0.9	-2.7

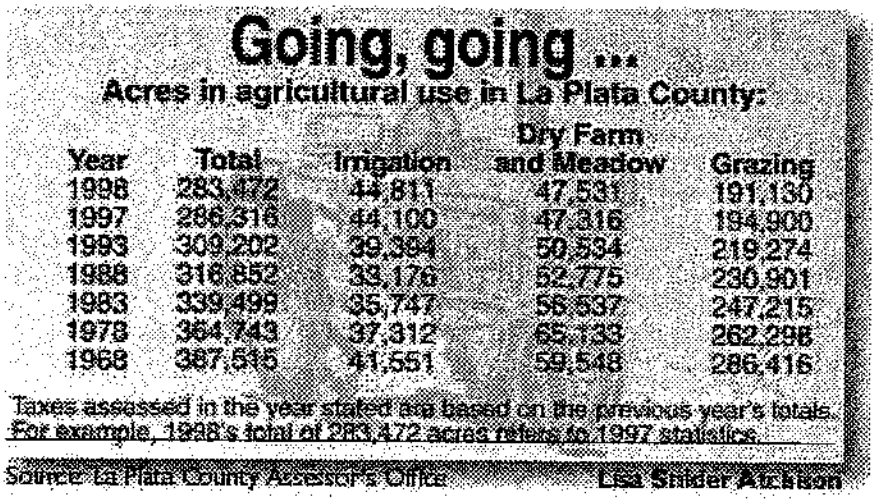
-4	-3	-2	-1	0	+1	+2	+3	+4
Severe Drought		Moderate Drought		Near Normal Supply		Above Normal Supply		Abundant Supply

WATER NEWS DIGEST

by Veva McCaig

AG LAND CONVERSION

Agricultural land falls to development



Going, going ...

Acres in agricultural use in La Plata County:

Year	Total	Irrigation	Dry Farm and Meadow	Grazing
1998	283,472	44,811	47,531	191,130
1997	286,316	44,100	47,316	194,900
1993	309,202	39,384	50,534	219,274
1988	316,852	33,176	52,775	230,901
1983	339,499	35,747	56,537	247,215
1978	364,743	37,312	65,133	262,298
1968	387,515	41,551	59,548	286,416

Taxes assessed in the year stated are based on the previous year's totals. For example, 1998's total of 283,472 acres refers to 1997 statistics.

Source: La Plata County Assessor's Office — Lisa Snider Atchison

Statistics support what everyone sees: Agricultural land is disappearing. The number of acres classified as agricultural in La Plata County has decreased steadily in the last 30 years. (See accompanying chart). Analyzing the numbers is a little tricky, the County Assessor said, because the figures represent status of the land for tax purposes. Land that isn't used for agriculture for two years will be classified as vacant. Also, changes in laws can skew numbers slightly. But according to the La Plata Open Space Conservancy, 90,000 acres of prime agricultural land are lost to development each year in Colorado. In a five-year period from 1991 to 1996, Montezuma County lost 1,844 (0.6 percent) of its 330,738 agricultural acres, according to the Montezuma County Assessor. In the five years before that, however, the county actually gained agricultural acreage. He said he believes the amount of true agricultural land has dropped in the last few years much more than the statistics show.

The Durango Herald 10/22/98

Water District questions need for instream flows claims

The Colorado River Water Conservation District has unanimously recommended that the Colorado Water Conservation Board dismiss water court claims to instream flows on the Colorado as it runs through the Grand Valley, a stretch considered critical habitat for the endangered Colorado squawfish and the razorback sucker. The CWCB had filed on behalf of the US Fish and Wildlife Service for flows in the Colorado and Yampa rivers for the protection of the endangered fish. Agencies led by the River District have questioned whether maintaining certain flows really were key to the survival of the fish.

Grand Junction Daily Sentinel 11/18/98

LITIGATION

Economic experts estimate damages

Colorado should pay Kansas $76 million in damages for diverting water from the Arkansas River, according to a team of experts hired by Kansas. They estimated that amount of damage to Kansas because of the proliferation of water wells in the Arkansas River basin in Colorado, said the Kansas Attorney General. Kansas sued Colorado over Arkansas River water in 1995, and the U.S. Supreme Court upheld Kansas' claim in 1995. The case was returned to a special master, who determined that Colorado's violation of the compact between 1950 and 1994 had wrongfully deprived Kansas of 420,000 acre-feet of water. In the second phase of the suit, the high court will determine the amount of damages.

Denver Post 11/27/98

Lafayette/Boulder dispute ditch diversions

In a court dispute over Lafayette's right to route water through the Anderson Ditch, Lafayette asserts a breach of contract by the New Anderson Ditch Co. over the ability of the city to run water through the ditch to Baseline Reservoir. At the heart of the trial is a quarrel

over water rights and a 1911 agreement signed between New Anderson Ditch Co. and Base Line Land and Reservoir Co., allegedly spelling out how much water can run through Anderson Ditch and from what sources that water should come. Boulder is the majority shareholder in Anderson Ditch, which diverts Boulder Creek water from the mouth of Boulder Canyon through University Hill and to the reservoir south of Baseline Road and east of Cherryvale Road. Lafayette sees the ditch as central to a clean water supply to Baseline Reservoir, an important aspect of the city's plans for future growth. In 1996, Lafayette outbid the city of Boulder, spending more than $10 million to obtain nearly 70 percent ownership of the reservoir. The next year, the Anderson Company cut the water flow from an extension of the ditch. About the same time Lafayette acquired 70 percent of the reservoir for more than $10 million from Base Line Co. The ditch company, with Boulder as its majority ownership, cut off the reservoir's water inflow through the ditch, arguing that the reservoir company sent too much water through the ditch and used it to deliver water from sources other than Boulder Creek. The ditch, which runs east and south through Boulder from the mouth of Boulder Canyon, is needed to provide up to two-thirds of the water flowing into Baseline Reservoir in dry years. Boulder's water resource coordinator and president of the ditch company said Lafayette could get water from a number of other diversion points from Boulder Creek. But Lafayette says but the problem is the ability to get water out of the creek above Boulder's sewage treatment plant.

The Daily Camera 1020/98,10/22/98

Golden sues feds over land deal

City officials are suing the federal government over a clause in a 70-year-old land deal that could take some of the city's mountain property. Golden acquired 1,650 acres from the federal government in the 1920s for watershed, but the agreement said the city could lose the land if it changed its use. Golden began acquiring property in the area in the early 1900s to fulfill an obligation to provide water to properties on Lookout Mountain. Most of the land was purchased from private owners, but the 1,650 acres were deeded from the federal government at a time when it was selling land grants to individuals and public entities. Golden plans to sell roughly 6,000 acres for development, but the proposal is opposed by open space advocates and Clear Creek County officials. Golden filed suit against Clear Creek County, saying the county's zoning deprives Golden of its ability to sell the property to developers. Now Golden is suing to clarify the terms of its agreement with the federal government. "This is a very friendly suit against the BLM to basically clear up technicalities," said Mike Bestor, Golden city manager. "Back in the 1920s, the United States patented some lands to the city of Golden for watershed purposes. They put a reverter clause in there which said that if you don't use these for watershed purposes ... then title to the land reverts back to the United States," said the assistant regional solicitor for Interior's Rocky Mountain Region. Clear Creek County also claims it is entitled to the property, based on a more recent transfer from the BLM to the county, said the Clear Creek county attorney.

Rocky Mountain News 10/ 26/98

PEOPLE

Farr Named Citizen of the West

William Farr, a water visionary and early promoter of the Colorado Big Thompson water project, has been named the 1999 Citizen of the West by the National Western Stock Show and Rodeo. Farr served 40 years as director of the Northern Colorado Water Conservancy District. He also served as president of the American National Cattleman's Association in 1971 and co-funded and directed the Colorado Cattle Feeders Association.

Fort Collins Coloradoan 9/24/98

Frank Milenski was an expert on water and farming

Frank Milenski, one of "the" water experts in Colorado, passed away in November. Milenski had been a member of the board of directors of the Catlin Canal Company since 1950 and had been president of the canal since 1960. He helped found the Winter Water Storage Program and amazed others by being able to remember each court decree date for each water right in the valley back to the 1860s. In 1993, Milenski was given the Wayne Aspinall Water Leader of the Year Award. He served on the Colorado Water Conservation Board and was the last surviving charter member of the Southeastern Colorado Water Conservancy District's board of directors, which oversees the Fryingpan/Arkansas Water Project. He became well-known during a 1960s fight for Catlin water by the Division of Wildlife. The agency bought Catlin water rights and tried to move the water to John Martin Reservoir. But the proposed move violated company bylaws requiring Catlin water to stay in Otero County for use by municipalities and irrigated agriculture. The 17-year case required four Supreme Court decisions, all of which backed Milenski and the Catlin. Milenski wrote two self-published books about the history of the Fry/Ark project and the Catlin. In a third book, "Frank's Ditties: Farm-osophies and Memorabilia," Milenski wrote, "To me there is nothing so large and so wondrous as the Great Planner's mastery of one of the great wonders of the world. Water."

The Pueblo Chieftain 11/18/98

RECREATION

GOCO eyes ways to spend lottery money

Spending on open space, parks and recreation, and wildlife improvements will increase by one-third next year, with Great Outdoors Colorado spending $42 million in Colorado Lottery funding. GOCO Executive Director Will Shafroth explained that beginning next year, GOCO's available funds will increase to $42 million a year from an average of $17 million per year in recent years. That funding increase and a guarantee of the program lasting until 2009 has the board pondering expansion of some of its duties. New interests may include biological diversity projects, protecting agricultural land, supporting buffer zones between cities, beefing up money for river corridor protection, anticipating future projects for community recreation, and recreational trails between regions. Since 1994, GOCO has awarded $138 million in grants.

Grand Junction Daily Sentinel 10/8/1998, *Pueblo Chieftain* 10/29/98

Whitewater park in Grand Valley area proposed

Whitewater parks are river channels that are transformed into man-made rapids by attaching natural rocks to the riverbottom in a way that forms a swift-moving channel. A whitewater park in the Grand Valley area may come because of two things: First, federal officials are planning to tear out the Price-Stubb dam on the Colorado near Palisade to bolster endangered fish recovery efforts. Second, the concept has the attention of the Riverfront Commission. A commissioner asked the owner of a recreation engineering and planning company that has transformed parts of Boulder, Steamboat Springs and Aspen into several whitewater parks to present the concept. He said the Colorado River has enough speed and volume to accommodate several parks, and while the parks are expensive, they are not compared to larger projects like recreation centers. The Golden City Council recently approved $160,000 for a seven-drop park. The Price-Stubb dam project raises the possibility of a partnership with the federal government because USBR will tear down the dam anyway, proponents said.

Grand Junction Daily Sentinel 10/9/98

Animas maintains Gold Medal fishing standards

The Animas River south of Durango still meets Gold Medal fishing standards, but just barely. Results of a Colorado Division of Wildlife fish-census study of two stretches of the Animas conducted in September show that the trout population has been cut roughly in half over the past two years. A DOW fisheries biologist said the decline seems to be the result of a stocking ban implemented last year rather than the effects of a trout-killing disease that surfaced in 1997. Rainbow trout are reproducing in the wild, he said, enough so to sustain the Gold Medal status in the Animas from Gateway Park to the High Bridge on U.S. Highway 550/160 – one of 13 waterways in Colorado given the designation. Gold Medal criteria call for at least 60 pounds of trout per acre of river, and 12 trout per acre over 14 inches long. The stretch of the Animas surveyed, a total of 24 acres, showed 65 pounds of trout per acre and 35 fish per acre over 14 inches. A 1996 survey turned up 128 pounds per acre and 61 fish over 14 inches on the same section. The Animas has gone unstocked since 1996, as officials continue to monitor the hatchery to determine if it is disease free. If it passes a final test in the spring, stocking could resume by summer 1999. Brown trout are not reproducing nearly as well as the rainbows, the study found. The DOW biologist speculated that since brown spawn in the fall, heavy sediment concentration in the river during the winter may smother developing eggs, depriving them of needed oxygen and preventing a successful hatch. Rainbow trout spawn in the spring and do not face similar problems, he said.

Durango Herald 11/18/98

WATER SUPPLY/DEVELOPMENT/PLANNING

DSS for Water: CRDSS, now RGDSS by Will W. Burt, Deputy State Engineer

Major components of CRDSS (the Colorado River Decision Support System) are now in place; and RGDSS, a similar system for the Rio Grande Basin (San Luis Valley) is now being planned. The data-centered design of CRDSS allows its software components to be transferred easily to the Rio Grande, and the unique aspects of the Rio Grande basin will be added into the DSS system. Then, the DSS system technology will be extended into the remaining basins, ultimately forming a Colorado Water Decision Support System. The major components developed in CRDSS are: a monthly time-step planning model; a consumptive use model; water administration tools; a central unified database; a consistent graphical user interface; graphical ("GUI") display, reporting, and graphing tools for easy use; and software that runs on common PC hardware using data accessed via the Internet.

Additional components necessary for a DSS for the San Luis Valley are: a groundwater model, linked to the surface water model;

additional well test data to allow proper calibration of the groundwater model; development of "operating rules" which reflect the Rio Grande compact, and a snowpack-runoff model. Project components have been identified and Statements of Qualifications are being sought from consultants. Work was expected to commence by mid-October, and is planned for completion in 2000 or early 2001.

Quarterly Newsletter of the Division of Water Resources, 1998, Vol. XII, No. 3

SECWCD addresses dam issue at public meeting

Approximately 45 residents of Lake County voiced opposition to the possible development of a reservoir on Tennessee Creek north of Leadville and the raising of water levels at Turquoise and Twin Lakes to meet populations growth primarily in El Paso and Pueblo counties. Proposing the possible developments was the Southeastern Colorado Water Conservancy District, which administers and allocates water flowing from the Frying Pan-Arkansas water project. Director Steve Arveshoug was asked by the Lake County commissioners to address the proposed developments, released in draft form in September, in a public meeting, The study looked at the long-term needs for that district, whose members include Salida, Colorado Springs, Pueblo and Buena Vista, among others, and 32 potential storage sites to meet those needs. From the original list of 32, the study narrowed the list to eight storage alternatives that merited further study. Four of those eight options would impact Lake County and neighboring Clear Creek reservoir:

- Raising the Turquoise Lake Dam five feet to create 9,000 acre-feet of storage.
- Constructing a new dam on Tennessee Creek to create a 28,000 acre-feet reservoir on land owned by the city of Pueblo just north of Leadville.
- Building a new dam and relocating an enlarged Clear Creek Reservoir further to the west.
- Reoperation of Frying Pan-Arkansas facilities, including Twin Lakes and Turquoise Lake, to create additional storage.

Arveshoug said the population in the area that SECWD serves - roughly Chaffee County to Lamar, is expected to increase from 620,000 residents, currently, to between 1.2 and 1.6 million people by the year 2040.

Salida Mountain Mail (from *Leadville Herald Democrat*) 11/19/98

Town of Morrison, Quarry Company Working Together

Scarce water-storage options in the area around Morrison have led to a joint effort by the town and CAMAS Colorado Inc. to turn the company's quarry into a reservoir. If all goes as planned, the cooperative effort will increase Morrison's water storage capacity twentyfold, with CAMAS claiming 10 percent of the reservoir. The reservoir would store raw, untreated water and would not be used for recreation. Planners anticipate the cost of the reservoir and water treatment facility to be $2.3 million. As part of the proposal, Morrison will sell water taps to CAMAS as a way to bankroll the town's part of the project. A water tap is a hookup to the city's water system. In turn, CAMAS cannot use the taps outside its 585-acre parcel. In what could amount to a water tap loan, Morrison can buy back the taps over a 10-year period. CAMAS and Morrison also plan to co-develop a phase II Cooley Reservoir that could store as much as 1,500 acre-feet.

Denver Post 11/15/98

Jeffco tower to track basin's water supply

A 60-foot tall, 18-inch wide steel tower to be erected near Aspen Park will soon be ready to measure escaping moisture. The tower will determine how much rain and snow moisture escapes basin soil through the air. Knowing the rate at which the water table recharges, determined in part by what is leaving through evapotranspiration, can help guide effective water use and future development. Engineers with the Army Reserve will erect the tower on Flying J Ranch, which Jefferson County Open Space is buying. It will be loaded with 100 pounds of solar-powered sensors that will measure wind, humidity, solar radiation and precipitation, among other items. Evapotranspiration already has been studied in other areas, especially around agricultural lands and large bodies of water, but this may be the first study of a mountainous region. The USGS will pay the $50,000 cost of the tower.

Denver Post 9/26/98

WATER QUALITY

Flats cleanup needs to progress, say Arvada officials

Arvada officials don't want to see any delays in cleanup and removal of radioactive waste at Rocky Flats Environmental Technology Site. They are working to establish an intergovernmental agreement with neighboring cities and counties to oversee cleanup of the facility. The Rocky Flats Local Impacts Initiative intergovernmental agreement, funded by the U.S. Department of Energy, will expire Dec. 31, and City officials believe a replacement agreement is necessary. They have had several informal discussions regarding such

an agreement with nearby cities and counties bordering the plant. Rocky Flats is bordered by Arvada, Westminster, Broomfield, Superior, the city of Boulder open space and Jefferson and Boulder counties.

Transcript and Sentinel newspapers 10/26/98

Nitrate levels are lower, state and hog farm agree

High nitrate levels in a field used by a local hog farm have been mostly cleaned up, according to the company and a regional health official. Health officials also found no reason to think the farm has contaminated ground water. The farm stirred controversy a few weeks ago when results from older ground-water tests showed high levels of nitrates. Levels above EPA's limit of 10 parts per million (ppm) for drinking water showed up in 6 of more than 100 tests during the last seven years. The director of Environmental Health Southeast in Lamar said the company doesn't seem to have contaminated either ground water or the field northeast of Eads. He said the high nitrate results in the six ground water tests were likely statistical flukes, and other high tests, which happened in 1995 and 1997, could be normal variations in ground water flows. Nitrate levels in Eads' water wells also haven't shown contamination.

Pueblo Chieftain 10/24/98

State lacks money to regulate hog farms

State Health Director Patti Shwayder has told the legislature's Joint Budget Committee that the ballot issue to regulate hog farms may provide only two-thirds of the $300,000 estimated cost of regulating the 1 million hogs being raised in the state. The ballot issue requires that state regulations be set to control odors from waste lagoons and to ensure that waste water doesn't contaminate other water supplies. It also sets a fast timetable — rules on odor must be in place by March 1 and waste-water restrictions by March 31. Further complicating the issue, Shwayder said, is uncertainty caused by slumping hog prices and unease in the industry over potential state rules. No one is sure what impact that will have on the growth of the industry in Colorado.

Rocky Mountain News November 24, 1998

Mine settlement provides towns with restoration grants

The towns of Ouray and Telluride are beneficiaries of about $1 million in restoration grants as part of a court settlement with the Idarado mine, state officials said. Ouray will get $417,906 for a restoration project on the Uncompahgre River and $150,000 for some land acquisition in Yankee Boy Basin. The town of Telluride will get $527,000 for a restoration project along the San Miguel River. The money was distributed by the Colorado Department of Public Health and Environment's Natural Resources Trustees. The money is part of a 1992 consent decree issued by a US District Court Judge, which settled the state's natural resources damage suit against the Idarado Mining Co. The San Miguel Basin is still eligible for $197,030 and the Uncompahgre Basin is eligible for $101,624.

Grand Junction Daily Sentinel 11/16/98

Jeffco wells to be tested

Water wells in Jefferson County will be tested for radioactive contaminants as part of a study funded by an EPA grant and the Colorado Department of Public Health and Environment. The study will determine how many wells have various radioactive contaminants, including gross alpha, radon, uranium and radium. There already are maximum contaminant levels for gross alpha and radium. The Jefferson County Department of Public Health and Environment will test selected wells at no charge to residents.

Denver Post 10/31/98

Nitrate pollution tied to crumbling bedrock

Widespread nitrate pollution in wells and reservoirs may come from the natural weathering of bedrock, not just from farming and factory pollution. Researchers working in a central California watershed have determined for the first time that high levels of nitrates are released as crumbly bedrock weathers year after year. Until now, the contamination has been blamed on overuse of fertilizer and releases of untreated livestock manure, as well as timber clear-cutting and factory emissions that contribute to acid rain. But exposed rock deposits around the world contain as much as 20 percent of the plant's total nitrogen, the researchers calculated.

Fort Collins Coloradoan 10/22/98

WATER USE

Reports say water use down

Federal analysts report that Americans' use of water declined by about 9 percent from 1980 to 1995, even as the U.S. population grew by 16 percent over the same period. The drop in water use, which came after decades of steady increase, is attributed by experts largely

to a gradual shift in focus away from finding ways to capture more water and toward devising ways of using it more efficiently. In October, similar findings outlined at a national water conference at Copper Mountain resort by a US Forest Service hydrologist said that despite mushrooming growth in the West, water consumption has fallen. The hydrologist said this is due to increased efficiencies in agriculture and industries and conservation programs. In addition, agricultural lands have been taken over by urban development at a time when conservation efforts have taken root. Whether the decline in water use will continue is unclear. Most of the drop occurred in the '80s, with a decline of only 2 percent reported from 1990 to 1995, the latest year for which numbers are available.

Denver Post 11/11/98

Scientists examine ancient lake at Mesa Verde

A multidisciplinary team led by Ken Wright, president of Wright Water Engineers Inc., Denver, has begun a hydrological study of the Mummy Lake site, located about 600 feet from Coyote Village, a Puebloan settlement that housed 200 to 300 people around 900 A.D. Excavations have shown its depth to be 8 to 9 feet (only 3 to 4 feet are visible). The site's construction included what most believe is a water intake canal fitted with a filtration system that would strain most of the sediments before the water entered Mummy Lake. But Eric Bikis, manager of the Durango office of Wright Water Engineers, has problems with the reservoir theory because of the lack of a consistent water source. Located at the top of the mesa, little runoff would flow into the catch basin even during years of heavy precipitation. Then, there are the two parallel walls that surround the basin about 10 feet apart from each other and filled with sediment scooped out from the pit by the ancestral Puebloans over the years. Bikis wonders, why not just dump it over the interior wall? Why build the exterior wall to trap the sediment? Most puzzling of all is the elaborate staircase descending into Mummy Lake. Bikis has a theory that for most of the year, Mummy Lake served as a ceremonial pavilion. During periods of heavy rainfall, it was used to capture some water that flowed across the mesa top. The team of hydrologists, archaeologists, soil experts and geologists are studying ancient rainfall and runoff data, analyzing the soil and geology of Chapin Mesa, and re-evaluating possible ancient canal routes. In the spring, they will gather with other Mesa Verde archaeologists, go over the data, and hopefully reach some sort of conclusion, Ken Wright said.

The Durango Herald 10/ 26/1998

CALLS FOR PAPERS

AMERICAN WATER RESOURCES ASSOCIATION - COLORADO SECTION
Annual Symposium, March 19, 1999 -- Mt. Vernon Country Club, Golden, Colorado
URBAN SUPPLY DEVELOPMENT IN COLORADO

New Water Development Projects of each Municipal Water Supplier
- Denver's Integrated Resource Plan (IRP) implementation
- Aurora's creative water development projects
- Regional cooperative projects in the Denver metro's northeast, northwest and southern areas
- Water for Colorado Springs, Pueblo, Grand Junction, Fort Collins, Greeley and others
- Water needs of smaller towns and communities
- Gravel pit conversions to municipal storage
- Water quality battles

Conjunctive Use of Surface and Groundwater
- Denver Basin withdrawals
- Groundwater injection
- Legal/Institutional issues
- Senate Bill 74 studies

East Slope - West Slope Concerns
- New regional studies of trans-mountain diversion, impacts and mitigations
- Legal/Legislative Issues

Environmental Concerns
- Endangered Species
- Instream flows
- Timing, location and magnitude of depletions

Conservation/Reuse
- Denver's market-driven conservation experiments
- Potable/sub-potable reuse projects

Conversion of Agricultural Use to Municipal Use
- The Barr Lake Plan: current status
- Conservation potential
- Interruptible or first-use innovative approaches

Regional Planning Processes
- The Farm Bureau's initiative
- Metropolitan Water Supply Investigation's next steps
- West Slope's QQ Committee
- Eagle River assembly

You are invited to submit a 1-page abstract on these or related topics. Approximately 20 minutes will be allowed for each presentation and discussion. **Please send your abstract to: AWRA, P.O. Box 9881, Denver, CO 80209-0881. DEADLINE: January 15, 1998.** For further information contact Rick McLoud of Centennial Water and Sanitation District at 303/791-0430.

INTERNATIONAL CONFERENCE ON THE CHALLENGES FACING IRRIGATION AND DRAINAGE IN THE NEW MILLENIUM
Sponsored by U.S. Committee on Irrigation and Drainage
Colorado State University, Fort Collins, Colorado
June 20-24, 1999

Professionals involved in water resources, agriculture and environmental issues are invited to submit abstracts of papers proposed for the conference. The call for papers and the abstract form are available on the USCID web site — **www.uscid.org/~uscid**, or Phone 303/628-5430, FAX 303/628-5431, E-mail: stephens@uscid.org. The abstract deadline is January 1, 1999.

FOURTH USA/CIS JOINT CONFERENCE ON ENVIRONMENTAL HYDROLOGY AND HYDROGEOLOGY
San Francisco, California -- November 7-10, 1999

The conference, sponsored by American Institute of Hydrology (AIH) is a continuation of joint meetings on the problems and solutions of mutual interest in environmental hydrology and hydrogeology in the USA and CIS (formerly USSR) organized by AIH in cooperation with major governmental agencies, scientific institutions and private organizations. The abstract deadline is February 28, 1999. Contact: AIH, Phone 651/484-8169, FAX 651/484-8357, Website: AIHydro@aol.com, e-mail: **aihydro@.org**.

HYDROLOGY DAYS 1999
Colorado State University, Fort Collins, Colorado
August 16-20, 1999

The 19th annual AGU Hydrology Days, August 16-20, 1999, will be held in Fort Collins on the campus of Colorado State University. These HD will be dedicated to the former students and worldwide professional colleagues of Hubert Morel-Seytoux. This will be the last year that Morel-Seytoux will be the primary organizer of the event. Papers are welcome on all topics in hydrology and hydrologic engineering. For more information, contact Hubert Morel-Seytoux at 57 Selby Lane, Atherton, CA 94027, USA; Phone and FAX 650/365-4080; e-mail: morelsey@usgs.gov or hydroprose@batnet.com. DEADLINE: May 3, 1999. Registration fee is $240 if preregistered by May 31, 1999; $270 afterward. Professional registration includes refreshments, 2 or 3 copies of the Proceedings, 2 lunches and attendance at all technical sessions. Registration is free for full-time students if preregistered by May 31; $30 afterward.

MEETINGS

ST VRAIN BASIN WATER RESOURCES SYMPOSIUM
Raintree Conference Center, Longmont, Colorado
February 3, 1999

The first segment of the meeting will focus on the Prebles Meadow Jumping Mouse, officially listed as a threatened species earlier this year. Speakers from the U.S. Fish and Wildlife Service, the Colorado Department of Natural Resources, and the private law firm of Trout & Raley, P.C. will discuss the impacts of this federal listing on basin and local water users.

The second segment will be devoted to an overview of the day-to-day operations of the St. Vrain Basin, with participation by the Division 1 Engineer, Dick Stenzel, and the District 5 Water Commissioners, officials of the St. Vrain & Left Hand Water Conservancy District, and City of Longmont Water Resources personnel.

The third segment of the meeting will be a presentation by Jeffrey J. Kahn, Esq., a shareholder of Bernard, Lyons & Gaddis, P.C. Mr. Kahn specializes in water matters and is counsel for the St. Vrain & Left Hand Water Conservancy District, as well as numerous ditch companies. He will speak on Ditch Company rights in a growing urban environment.

The meeting will conclude with lunch. Colorado Supreme Court Justice Gregory Hobbs will be the luncheon keynote speaker. For registration information, or to assist in sponsoring the symposium, contact Cynthia at 303/772-4060.

FOUR STATES IRRIGATION ANNUAL CONFERENCE

WWW.Wonderful.Wet.Water

University Park Holiday Inn, Fort Collins, Colorado -- January 13-15, 1999

This year's meeting begins the afternoon of the 13th with a series of three workshops:
♦Geographic Information Systems: What Every Water User Needs to Know, ♦Contract Renewals, and ♦Siphon Cleaning

General sessions on the 14th and 15th will present a diverse group of topics:

♦Opening Address	Eluid Martinez, Commissioner, U.S. Bureau of Reclamation
♦What's New in Washington: NWRA Update	Tom Donnelly, Exec.Vice President National Water Resources Association
♦The Family Farm Alliance's Western Irrigation Economic Benefit Review Study	Pat O'Toole, FFA Board Member, and Dr. Darryll Olsen, Principal Economist
♦Recreational Use of Federal Projects Lands	Vern Lovejoy, U.S. Bureau of Reclamation
♦Canal Rights-of-Way: Use and Abuse — What Irrigation Districts Can Do	Jerry Westbrook, Head, Land & Water Contract Services Branch Northern Colorado Water Conservancy District

LUNCHEON KEYNOTE ADDRESS: Representative Bob Schaffer, Colorado

♦Platte River Endangered Species Program - USBR Perspective	John Lawson, Manager, USBR Wyoming Area Office
♦Platte River Endangered Species Program - Colorado Perspective	Alan Berryman, Head, Engineering Services Branch, NCWCD
♦The Cost of Doing Business: Irrigation Companies & Districts In Today's Environment	John Wilkins-Wells, Faculty Affiliate, Colorado State University
♦Safety of Dams/O&M Budgets	Jack Garner, Area Manager, USBR, Eastern Colorado Projects Office, Loveland
♦Isotope Study	Ed Harvey, School of Natural Resource Sciences, University of Nebraska

For information contact Brian Werner or Candee Werth at Phone 970/667-2437, FAX 970/663-6907.

COLORADO WATER CONGRESS 1999 CONVENTION PROGRAM

Holiday Inn, Northglenn, CO — January 27-29, 1999

TENTATIVE PROGRAM — Contact: Colorado Water Congress, Phone 303/837-0812, FAX 303/837-1607.

Wednesday, Jan. 27, 1999	Meetings, Colorado Water Conservation Board and CWC Board of Directors
Thursday, Jan. 28, 1999	
8:30 am — Concurrent workshops	Engineering & Management Developments, The Ups n' Downs of Support Staff, Historical Perspective by Aspinall Recipients, Legal Ethics Issues, and Roundtable for Ditch Companies.
10:15 am — Concurrent workshops	Engineering & Management Developments, Endangered Species Issues, Roundtable on Water Education, and Legal Ethics Issues.
12:15 pm GENERAL SESSION	LUNCHEON — (Invited) Bill Owens, Governor-Elect of Colorado.
2:15 pm GENERAL SESSION I	Keynote: "The Best Way to Predict the Future is to Create It." Speaker TBA.
2:45 pm	Additional invited speakers: New Attorney General of Colorado, New Executive Director of the Colorado Department of Natural Resources, and President of the Colorado Education Association.
4:00 pm — Concurrent workshops	Water Conservation, Engineering & Management Developments, Water Quality Issues, Ground Water Issues, and Internet Opportunities.
6:00 pm — RECEPTION	
January 29, 1999	
7:00 am	LEGISLATIVE BREAKFAST
8:45 am GENERAL SESSION II	Panel, "The Generations Look at the 21st Century"
10:30 am GENERAL SESSION III	Panel, "Growth, Water Needs and the Environment
12:15 pm WAYNE N. ASPINALL LEADERSHIP LUNCHEON	Floyd E. Dominy, Retired Commissioner of the U.S. Bureau of Reclamation, will be the speaker. The 19th Annual "Wayne N. Aspinall Water Leader of the Year award will be presented.

COOPERATIVE EXTENSION ANNOUNCES
COLORADO AGRICULTURAL OUTLOOK FORUM
Adam's Mark Hotel, Denver, Colorado
February 11, 1999

WATER - OUR MOST PRECIOUS RESOURCE

A Breakout session on Water Management and Salinity will feature Dr. Jim Rhoades, former Director, U.S. Salinity Laboratory, Riverside, CA and recognized leader in salinity research; and Dr. Gary Banuelos, U.S. Water Research Laboratory, Fresno, CA, leader in salinity and selenium research.

February 12, 1999
SALINITY WORKSHOP

A Salinity Workshop featuring Dr. Jim Rhoades, recently retired Director of the U.S. Salinity Lab in Riverside CA and Dr. Gary Banuelos of the USDA Water Management Research Lab in Fresno, CA will be held Friday, February 12, 1999 in the Conference Room of Building 25 at the Federal Center in Denver, CO. The workshop will begin at 9:30 a.m. and is open to the public free of charge. The workshop will stress the importance of dealing with the growing problem of salinity. The Workshop is sponsored by Colorado State University Cooperative Extension, the Natural Resource Conservation Service and the Bureau of Reclamation. For further information contact Jim Valliant or Pat Clifford, CSUCE at 719/254-7608 or e-mail at valliant@coop.ext.colostate.edu; Lorenz Sutherland, NRCS at 719/384-5408, or e-mail psutherl@co.nrcs.usda.gov; or Paula Sunde, BOR, at 970/962-4367, or e-mail psunde@gp.usbr.gov.

PAM (Polyacrylamide) WORKSHOP TOUR
sponsored by
The Environmental Protection Agency and Cooperative Extension, CSU

February 15, 1999	PAM Workshop - Lamar
February 16, 1999	PAM Workshop - Sterling
February 17, 1999	PAM Workshop - Greeley
February 18, 1999	PAM Workshop - Grand Junction

For times and meeting places, call Jim Valliant or Pat Clifford at 719/254-7608.

5TH ARKANSAS RIVER BASIN WATER FORUM
CANON CITY, COLORADO -- April 23-24, 1999

The 5th Arkansas River Basin Water Forum will be held April 23-24, 1999 in Canon City at the Canon Inn. The Forum will start Friday, April 23, with registration at 8:30 a.m. The first day's session, "Watershed Information and Orientation to the Issues," will feature Water Needs and Storage Assessment as affected by water rights, biological, recreational and social issues. The Lake County Initiative will show how citizens, politicians and agencies working together are making a difference. Saturday morning, beginning at 8:30 a.m., will feature the session, "Current Opportunities in Our Watershed to Influence Decisions With Informed Opinions. It will have breakout sessions on Water Law, Health of our Watershed, Lower Arkansas Water Quality Issues, Water Exchanges and the Planning and Zoning Initiatives. The Forum will end with a luncheon presentation, "How Can We Participate in Our Watershed's Future?" Registration will be $35 for "early bird" or $40 at the door. For information on the Forum, contact David Cockrell at 719/549-2469, Larry Handy at 719/783-2481, Steve Reese at 719/539-7289 or Jim Valliant at 719/254-7608. Information about the Forum also can be found at the web site http://www.uscolo.edu/arkriver.

CALENDAR

Jan. 13-15	FOUR STATES IRRIGATION ANNUAL CONFERENCE, *WWW.Wonderful.Wet.Water*, Fort Collins, CO. Contact: Brian Werner or Candee Werth at Phone 970/667-2437, FAX 970/663-6907.
Jan. 24-27	TAILINGS AND MINE WASTE '99, Colorado State University, Fort Collins, CO. Contact: Conference Services, CSU, Phone 970/491-7501, FAX 970/491-3568.
Jan. 27-29	COLORADO WATER CONGRESS 1999 CONVENTION, Northglenn, CO. Contact: Colorado Water Congress, Phone 303/837-0812, FAX 303/837-1607.
Jan. 27-29	WATER QUALITY BEYOND 2000 - MEETING OUR TMDL CHALLENGE, Boise, ID. Contact Peggy Hammel, IWRRI, Morrill Hall 205, University of Idaho, Moscow, ID 83844-3011.
Jan. 28-29	COLORADO WATER CONGRESS ANNUAL CONVENTION, Holiday Inn, Northglenn, CO. For information contact the Colorado Water Congress, 1390 Logan, #312, Denver, CO 80203, Phone 303/837-0812, FAX 303/837-1607.
March 10-13	BENCHMARKING IRRIGATION SYSTEM PERFORMANCE USING WATER MEASUREMENT AND WATER BALANCES, San Luis Obispo, CA. Contact Larry D. Stephens, USCID, Phone 303/628-5430, FAX 303/628-5431, E-mail stephens@uscid.org. The USCID web page can be found at **www.uscid.org/~uscid**.
April 10-14	7TH MULTIDISCIPLINARY CONFERENCE ON SINKHOLES AND THE ENGINEERING AND ENVIRONMENTAL IMPACTS OF KARST, Harrisburg/Hershey, PA. Contact Gayle Herring, P.E. LaMoreaux & Assoc., Inc., Phone 423/483-7483, FAX 423/483-7639, E-mail pelaor@usit.net. Web page: **www.uakron.edu/geology/karstwaters/7th.html**
May 10-12	POTENTIAL CONSEQUENCES OF CLIMATE VARIABILITY AND CHANGE TO WATER RESOURCES OF THE UNITED STATES, AWRA Spring Specialty Conference, Atlanta, GA. Contact: Michael J. Sale, Phone 423/574-7305, FAX 423/576-8543, e-mail jon@ornl.gov.
June 2-5	FIFTH BENCHMARK WORKSHOP ON NUMERICAL ANALYSIS OF DAMS, Denver, CO. For information contact Pasquale Palumbo, Technical Secretariat, Via Pastrengo, 9, 24068 Seriate (BG), Italy. Phone 39-35-307-111, FAX 39-35-302-999, E-mail ppalumbo@ismes.it. See the U.S. Committee on Large Dams web page at **www.uscold.org/-uscold.**
June 20-24	INTERNATIONAL CONFERENCE ON THE CHALLENGES FACING IRIGATION AND DRAINAGE IN THE NEW MILLENIUM, Sponsored by U.S. Committee on Irrigation and Drainage, Colorado State University, Fort Collins, CO. See the USCID web site — **www.uscid.org/~uscid**, or Phone 303/628-5430, FAX 303/628-5431, E-mail: stephens@uscid.org.
June 30-July 2	SUMMER SPECIALTY CONFERENCE, AWRA — Two tracks: Science Into Policy: Water in the Public Realm — contact Vivian Drake, Phone 406/447-1668, FAX 406/447-1665, e-mail: drake@co.lewis-clark.mt.us. Wildland Hydrology: Contact Darren Olsen, Phone 801/752-4202, FAX 801/752-0507, e-mail: dolsen@bio-west.com.
July 7-9	WATERPOWER '99 — Hydro's Future: Technology, Markets and Policy Las Vegas, Nevada. Contact Liz Sigler at Phone 800/548-ASCE, ext. 6078 or 703/295-6078, FAX 703/295-6144, or E-mail lsigler@asce.org. Waterpower home page: **www.waterpower.org.**