



# COLORADO WATER

Newsletter of the Water Center at Colorado State University

## STRATEGIES IN WESTERN WATER LAW AND POLICY: COURTS, COERCION AND COLLABORATION

*AUGUST 1999*

The 20th Annual Summer Conference of the Natural Resources Law Center, University of Colorado, was held June 8-11

See page 16

### **AG DAY**

**Celebrate Agriculture:  
A Growing Tradition**

*September 11, 1999  
Hughes Stadium  
Fort Collins, Colorado*

*Ag Day is an 18-year tradition that celebrates Colorado's agricultural industry and its contributions to a safe, nutritional food supply*

See page 28



*Speakers Joseph Sax, Boalt Law School, University of California, and David Getches, Raphael J. Moses Professor of Natural Resources Law, University of Colorado, with Judy Troast, Bureau of Reclamation, a conference sponsor*

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### COLORADO WATER

Vol. 16, No. 4

August 1999

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

**Published by the**

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**EDITORIAL****PROVIDING WATER INFORMATION  
IN THE 21<sup>ST</sup> CENTURY:  
PLANNING A PROACTIVE ROLE BY HIGHER EDUCATION**

*by Robert Ward, Director*

The American Geophysical Union (AGU) recently published a report entitled, "Waiting for a Signal: Public Attitudes toward Global Warming, the Environment and Geophysical Research". The report derives from an AGU concern that public opinion on the topics addressed by AGU members is generally not well understood, and that a clearer understanding of public opinion on these topics could facilitate dialogue on important environmental and geophysical issues.

The report examines public opinion regarding a number of issues, including the problem of water availability. While the topic of 'water availability' was being examined, the study revealed that today water quality is of more concern to the public. Within public opinion, a frustration was expressed regarding the ability to solve water quality problems. On the other hand, there was the opinion that, in theory, there is a painless technological solution for water availability – it is possible to transform seawater into pure, drinkable water – and to obtain plenty of water from the oceans.

Environment News from The Netherlands, a Dutch newsletter, recently noted a decline in the public's concern for the environment and water. Dutch public awareness about the environment is not a new issue (it has been addressed for many years and is here to stay), but more effort and the right strategy are needed to keep up the momentum toward a sustainable environment. The newsletter also reviewed "environmental communication" in Denmark, Mexico and France. Each country has its 'environment' and its own particular problems and perceptions, but a common theme is the importance and attention given to the environment and the role of a well-informed public. How the public is informed varies by country. The Netherlands tends to use information 'campaigns.' Danes foster debate on environmental issues. In France, the national environment ministry focuses on directing the efforts of local authorities to take the necessary steps to inform the public. In Mexico, it is unusual for the environment minister to take part in a public debate, as in Denmark. Campaigns in Mexico are not organized by the national government, but rather by local governments. The environment ministry in Mexico does work closely with universities to produce videos and radio commercials telling consumers what they can do to help the environment.

Both of these reports indicate, in many ways, that public attention to environment and water issues has matured. The public knows about water 'problems' and is now looking for solutions. It is no longer effective to 'scare' the public into action regarding a particular water problem. They have been

'scared' too many times without solutions being presented. The public needs information that, while carefully documenting a problem, also provides options for solutions – solutions that are deemed feasible and effective, and whose effects can be measured and reported back to the public.

The AGU report also noted that the public debate about water availability, in the opinion of the authors, is stalled by a lack of credible information. The recent experience in Colorado with 'water' initiatives placed on the ballot tends to confirm this finding. The citizens of Colorado were asked to vote on initiatives that required considerable understanding about the subtleties of Colorado water management. Weaknesses in providing the public with water information were, in many ways, highlighted during the fall 1998 election in Colorado.

Rapid population growth is an underlying reason that a well-organized and continuous water information program is needed in Colorado. Many newcomers question the traditional values associated with water as different priorities and values accompany the new citizens. Beyond the traditional farming, mining, and sport hunting and fishing economies, the new citizens bring major high-tech manufacturing centers, large retirement communities and extensive recreation developments. The newcomers do not use water in traditional ways. In many cases, they want the water left unused for their enjoyment in the natural setting. They demand that endangered species be protected and desire minimum flows for rafting. The water information needs of Colorado citizens today are much more diverse than they were 20, or even 10 years ago.

Colorado universities provide water education and conduct water research that, in turn, constantly produces new information about water. This information is made available to university students in their courses, and to water professionals via research reports, journal articles, and technical and scientific presentations at professional meetings. Cooperative Extension at Colorado State provides water information to the general public.

Given the maturation of public attitudes toward environmental issues; the changing water information needs in Colorado; and the growing role of ballot initiatives related to water in Colorado, is higher education using its water information resources most effectively? Cooperative Extension, the Agricultural Experiment Station and the Colorado State University Water Center are sponsoring an examination of



changing water information needs and the appropriate response by higher education, particularly within Cooperative Extension. The effort is co-chaired by Dan Smith, a Professor in CSU's Soil and Crop Sciences Department, and Reagan Waskom, a Water Quality Extension Specialist.

Beyond collaboration with a diverse group of their university colleagues, Dan and Reagan also will contact a wide range of Colorado water professionals and citizens seeking insight into the changing water information needs and thoughts regarding a proper response by higher education. If you have any thoughts about the water information needs of Colorado citizens and the role higher education can play in meeting



### ALISON ADAMS RECEIVES NATIONAL DISSERTATION AWARD

Alison Adams, a recent Civil Engineering Ph.D. graduate of Colorado State University, received the Universities Council on Water Resources (UCOWR) Dissertation Award in the category of water resources management. The award, which was presented during the July annual UCOWR meeting in Kamuela, Hawaii, recognized the originality, technical quality, connection to previous research and soundness of Dr. Adams Ph.D. dissertation.

Dr. Adams' dissertation, *Analysis of Regional Water Conflicts: The Case Study Approach*, addressed the need to incorporate non-technical components into the advances being made in water resources modeling and decision support system developments. She reformulated and synthesized three regionally significant decision processes to determine which factors affected the respective regional water decisions. The case studies she used, which represented complex water issues from three different regions of the U.S., were:

- ◆ The West Coast Regional Water Supply Authority's Resource Development Plan (Tampa Bay area of Florida), which was intended to guide the Authority's development of water resources to meet municipal demand through the year 2030;
- ◆ Two Forks Dam, a water supply project that was intended to meet future water demand of the Metro Denver area and the Front Range of Colorado; and
- ◆ The Chelan Agreement (Washington State), which was intended to cooperatively plan for water resources management to best meet needs of the State's residents.

Dr. Adams has accepted a job with Tampa Bay Water, where she is involved in implementing a large-scale optimization program for managing the operations of 11 wellfield facilities in an environmentally sensitive manner.

Also during the UCOWR meeting, Robert Ward was presented with a "Friend of UCOWR" award, recognizing his contributions to the organization.

these needs, please contact Dan at (970) 491-6371 (e-mail: [dsmith@agsci.colostate.edu](mailto:dsmith@agsci.colostate.edu)) and/or Reagan at (970) 491-6103 (e-mail: [rwaskom@agsci.colostate.edu](mailto:rwaskom@agsci.colostate.edu)). The planning effort will be completed in June 2000 and will result in an action plan to guide the combined water outreach efforts of Cooperative Extension, the Agricultural Experiment Station and the CSU Water Center at the beginning of the 21<sup>st</sup> century.



*Dr. Alison Adams, left, speaking with Rita Schmidt Sudman, Executive Director of the Water Education Foundation, shortly after Dr. Adams received her UCOWR dissertation award.*



RESEARCH



COLORADO EFFORTS TO REFINE CRITERIA FOR ‘EXTREME PRECIPITATION EVENTS’ BEGAN IN 1994

Colorado’s Dam Safety Program, administered by the State Engineer’s Office, uses the National Weather Service’s Probable Maximum Precipitation (PMP) criteria as a basis for determining where failure of a dam could be catastrophic to the public. The NWS standard is determined based on national values as presented in its Hydrometeorological Report series. In the late 1980s, the Weather Service revised its maximum possible rainfall standards to characterize an “extreme meteorological event” as about 25 inches of rain in 72 hours. This raised concerns that a national value rather than a regional value did not take into account mountainous areas such as those found in Colorado. In addition, the Colorado Water Conservation Board required criteria that better represent Colorado’s unique hydrologic and climatic conditions for basins and watersheds, because these criteria could have significant implications on spillway design, sizing requirements and overall dam safety policies.



In 1994, in response to the scientific uncertainty regarding the magnitude of precipitation that can occur at high elevations in the Rocky Mountain region, a proposal for a study was developed by a volunteer committee of meteorologists, hydrologists, and professionals/engineers from universities, consulting firms, dam owners, and state and federal agency representatives with the following goals:

|           |  |  |
|-----------|--|--|
| Phase I   | <ul style="list-style-type: none"> <li>◆ Collect extreme precipitation (EP) data studies.</li> <li>◆ Develop/verify EP Database.</li> <li>◆ Assemble professionals in the field to reach consensus on which technology would be applicable for predicting EP in Colorado’s mountains.</li> </ul>   | <p>Phase I.—With funds provided in SB 94-029, through the Colorado Department of Natural Resources, Phase I of the study was undertaken by CSU faculty. It was the first step in a comprehensive effort to better understand extreme precipitation as a function of location and elevation and its impact on dam safety regulations.</p>   |
| Phase II  | <ul style="list-style-type: none"> <li>◆ Research/development of model(s) for use.</li> </ul>  | <p>The study focused on observational precipitation and streamflow data for a period of 125 years. Colorado State University researchers identified more than 300 storms since the late 1800s that produced heavy precipitation either locally or over sizeable areas in or near the mountains of Colorado. Thirty-six storms were identified as the heaviest storms of record for selected geographic regions of the state.</p> |
| Phase III | <ul style="list-style-type: none"> <li>◆ Creation of data for isohyetal maps and depth-duration data of EP. Correlation of data with hydrologic records (including paleo-hydrologic).</li> <li>◆ Peer review and endorsement by other agencies.</li> <li>◆ Documentation, development of the procedures for use by practitioners.</li> </ul> |  |

This set of 36 storms would be used in future numerical modeling studies for extreme precipitation in elevated regions or in future deterministic studies of probable maximum precipitation (PMP).

Selected findings from Phase I of the study include:

- ◆ The heaviest precipitation amounts and the largest number of extreme storms observed in Colorado have occurred along the Front Range from northwest of Fort Collins southward to Trinidad.



- ◆ The largest numbers of extreme storms affecting mountainous areas west of the Continental Divide have occurred in southwestern Colorado, most often during late summer and fall. Many of these storms contain moisture sources with tropical origin.
- ◆ The frequencies and magnitudes of extreme precipitation events are lowest in the northern mountains and northwestern valleys of Colorado.
- ◆ Precipitation amounts that have been observed associated with extreme storms are lower at high elevations than at lower elevations.

A complete listing of storms is presented in the final report, along with descriptions on data sources and analysis methods (Climatology Report #97-1, May 1997). The principal investigators were Thomas B. McKee and Nolan J. Doesken, Colorado Climate Center, Department of Atmospheric Science.

### *Phases II and III*

In 1997, Colorado Senate Bill 97-008 authorized continuation of the extreme precipitation study through funding provided to the Colorado Water Conservation Board, and first authorized in SB94-029, to "...develop a state model based on the characteristics of 20 selected storms identified in the first phase of the project to predict extreme rainfall for any selected drainage basin above 5,000 feet elevation..." The Phase II award was made to the Atmospheric Science Department of Colorado State University and Principal Investigators William Cotton and Thomas B. McKee.

With Senate Bill 97-008, the project scope was changed and Phases II and III were merged to complete the project in its initial time frame. Using the extreme precipitation data and storm characteristics collected in Phase I, Combined Phase II and Phase III tasks were: to develop an atmospheric model for basins above 5,000 feet (Phase II objectives) and to develop a procedure and methodology for the computation of extreme precipitation values for a basin including depth, duration, areal extent, and estimating the probable frequency (Phase III objectives).

An important component of the project is the close coordination among University researchers, the Colorado Division of Water Resources Project Manager, and a Technical Review Group comprised of a volunteer committee of practitioners. Alan Pearson, Chief of the Dam Safety Branch, was appointed as Project Manager, and the DNR Project Management Team will include Hal Simpson, State Engineer, Jack Byers, Assistant State Engineer, and Peter Evans and Larry Lang of the Colorado Water Conservation Board. The Technical Review Group will assist the DNR Project Management Team with project oversight and guidance in the performance of the provisions and terms of the contract.



### *RAMS (The Regional Atmospheric Modeling System) to be used in study*

RAMS is a highly versatile numerical code developed by scientists at Colorado State University for simulating and forecasting meteorological phenomena and for depicting the results.

RAMS is an outgrowth of two earlier atmospheric modeling programs conducted independently during the 1970s. A cloud model developed under the direction of Dr. William R. Cotton contributed state-of-the-art methods for modeling microscale dynamic systems and cloud processes. A mesoscale model developed under the direction of Dr. Roger A. Pielke contributed expertise in the modeling of mesoscale systems and the influence of land-surface characteristics of the atmosphere. The independently developed models have been combined into the CSU Regional Atmospheric Modeling System (RAMS).



In 1986, the process of merging the capabilities of the two models into a unified multi-purpose modeling system began, and thus was born the new RAMS code. To introduce a high degree of flexibility and versatility in RAMS and to take advantage of the ever-increasing capabilities in computer hardware and software, RAMS was built on an entirely new framework, with numerical schemes and parameterizations from the earlier models adapted to the new model structure.

After two years of concerted effort, the first version of the new RAMS code was in use as a research tool. A major program of development has continued to the present day, resulting in many improvements and new capabilities

Current research using RAMS includes atmospheric scales ranging from large eddy simulations of boundary layer clouds, to simulations of large convective systems, to regional climate studies.

*Our plan is to apply a three-dimensional (3-D) convective storm model to develop a method of estimating extreme precipitation and to develop concepts of how extreme precipitation varies with altitude in Colorado. The model we will use is the Regional Atmospheric Modeling System developed at Colorado State University under the direction of Professors Cotton and Pielke. RAMS has been applied to the simulation of convective storms and rainfall in many parts of the world, the U.S., and in particular in Colorado. Rams also has been run as a prototype real-time forecast model over Colorado since 1991.*

*William Cotton*



### THE U.S. ARMY CORPS OF ENGINEERS' CHERRY CREEK DAM STUDY



When the National Weather Service, in the late 1980s, revised its maximum possible rainfall standards, the revision resulted in Cherry Creek Dam being listed as deficient. The revised standards increased the maximum possible rainfall by more than 50 percent. Many have challenged the amount, saying it is several times higher than any flood the area has ever seen. The NWS's "extreme meteorological event" of 25 inches of rain in 72 hours is double the amount that fell in the Cherry Creek area during the 100-year flood of 1935, which led to the construction of Cherry Creek Dam. However, if water ever did top the dam, it could result in a crumbling dam that would send water toward Denver at 1.7 million cubic feet per second, potentially killing as many as 10,000 people and causing \$15 billion in damage, according to the Corps' project manager.

The Corps points out that it uses four different standards to determine a spillway design flood (SDF). Standard 1 applies to the design of dams capable of placing human life at risk or causing a catastrophe, should they fail. Cherry Creek Dam falls into this category. For Standard 1 dams, the SDF is based on the Probable Maximum Precipitation (PMP) occurring over the watershed above the dam site. This standard is applied to all dams designed today by the Corps, and was used on Chatfield dam, Westerly Creek dam, and Bear Creek dam spillway designs. The original rainfall event and PMP studies for Cherry Creek dam spillway design flood and subsequent dam safety analyses are listed below followed by Table I, which lists pertinent data for each event. The critical amount of runoff needed to fail Cherry Creek dam is also displayed.

◆ 1935 Event – May 30-31, 1935 event over the South Republican River basin transposed over Cherry Creek.



- ◆ HMR 44 – 1970 Site-Specific PMP for Chatfield Dam applied to Cherry Creek basin. Developed by the NWS.
- ◆ HMR 55A – NWS Generalized Regional Report published in 1988 for the area between the Continental Divide and the 103<sup>rd</sup> Meridian.
- ◆ Site-Specific – 1995 analysis specifically for Cherry Creek basin. Developed by the NWS.

**Table I**  
**Cherry Creek PMP and Storm Study History**

| PMP and Storm Studies | Storm Length (Hours) | Total Rainfall (Inches) | Runoffl (Inches) | Peak Discharge (cfs) | Volume (acre-ft.) |
|-----------------------|----------------------|-------------------------|------------------|----------------------|-------------------|
| 1935 Event Pattern    | 9                    | 11.5                    | 8.1              | 180,700              | 166,700           |
| HMR 44                | 96                   | 23.9                    | 9.7              | 376,000              | 207,000           |
| HMR 55A               | 96                   | 29.22                   | 16.25            | 635,000              | 359,200           |
| Site Specific PMP     | 72                   | 24.7                    | 12.75            | 524,700              | 262,500           |

The Corps had studied three fixes for the dam so it could handle the probable maximum flood:

- \* Raise it by 15 feet;
- \* Raise it by nine feet and add a second spillway, or
- \* Raise it by seven feet and add a dry dam upstream.

The construction of dry dams, which hold water only during flooding, was the most controversial and expensive of the proposed upgrades, estimated to cost about \$140 million. Six locations were identified, including one at the site of the old Castlewood Dam, which breached in 1933. The dry dams, if constructed, would have displaced dozens of residents. Residents urged the Corps to consider other options, such as building several smaller retention areas, widening Cherry Creek, or restoring the old Castlewood Canyon Dam. A concern was that a number of historic ranches and structures would be threatened by the project.



*Cherry Creek Basin (photo courtesy of Corps of Engineers Omaha Office)*

In a June 22, 1999 letter to interested parties, Kenneth S. Cooper, Deputy District Engineer at the Corps' Omaha District Office, said the preliminary screening of Cherry Creek Dam had been completed and only the following alternatives would be considered further:





***At the request of Colorado Representatives Tom Tancredo and Joel Hefley and U.S. Senators Wayne Allard and Ben Campbell, the CSU study will include the Cherry Creek Basin as a demonstration test area for the newly developed extreme precipitation estimation model.***

- ◆ No federal action,
- ◆ A stand-alone dam raise on Cherry Creek Dam of approximately 15 feet in height,
- ◆ A stand-alone spillway on the Cherry Creek Dam embankment with possible spillway crest elevations varying from 5600 feet to 5623 feet in elevation, or
- ◆ A spillway in combination with a dam raise on the Cherry Creek Dam.

Cooper said a draft Dam Safety Report and Environmental Impact Statement (EIS) are scheduled to be provided to the public for review and comment during the winter of 1999/2000. In separate correspondence dated June 22, the Corps announced a joint public meeting regarding the PMP study to be

held July 22 at the Holiday Inn Denver Southeast, 3200 Parker Road, from 7:00 p.m. to 9:30 p.m. Additional information on the Cherry Creek Dam Safety Study can be found at the Corps' web site: <http://www.now.usace.army.mil/html/gis/hydro/cherrycreek.html>.

### CSU RESEARCH WILL INCLUDE CHERRY CREEK BASIN

At the request of Colorado Representatives Tom Tancredo and Joel Hefley and U.S. Senators Wayne Allard and Ben Campbell, the CSU study will include the Cherry Creek Basin as a demonstration test area for the newly developed extreme precipitation estimation model. Representative Tancredo has described the Colorado State University study as one that started as a grassroots effort. The concern of people living upstream from and near the dam is, however, that the study won't be finished until June 2001. The Corps plans to announce its recommendation for fixing the dam and will release a draft environmental impact statement by the end of this year.

The Colorado Legislature, local officials and the state's elected leaders in Washington recently have acted to get a study going before the Corps makes its final decision regarding the dam's repairs. On May 5 the Colorado Legislature passed a resolution granting the Colorado Water Conservation Board \$75,000 for an independent review of National Weather Service data used by the Corps. The money must be matched locally, and leaders from Greenwood Village, Douglas County and Arapahoe County have said they are ready to pitch in for an independent study, estimated to cost about \$150,000. However, Corps officials have expressed faith in the NWS data and acknowledge that an independent review would not necessarily change their position that the dam is unsafe.

Sources include articles from the *Denver Post*, 5/10/99 and 6/8/99; the *Douglas County New Press*, 12/2/98; the State Engineer's Quarterly Newsletter, *Stream Lines*, Vol.No. 13, No. 2; and news releases from the Corps of Engineers Omaha District Office.

The Denver Post said on July 23 that Tom Tancredo and Joel Hefley had announced that the House Appropriations Committee will include a provision in the Energy and Water Appropriations bill that halts the COE Cherry Creek dam study until National Weather Service data can be reviewed by Dr. James Cotton at Colorado State University.



Access THE RAMS HOMEPAGE at <http://rams.atmos.colostate.edu> for more information about the Colorado State University study on Extreme Precipitation and the RAMS model.

 **WATER EXCHANGES IN COLORADO:  
OPPORTUNITIES AND CONSTRAINTS  
FOR THE FUTURE**

by

*David M. Freeman and John Wilkins-Wells  
Department of Sociology, Colorado State University*

## Introduction

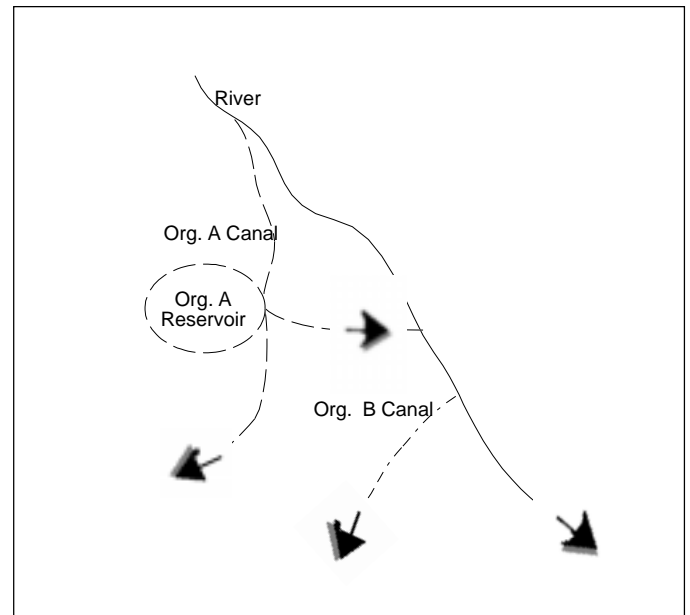
Problems of water management and policy are importantly social-organizational because people must organize to secure water, transport it, store it, divide it into usable flows, dispose of it, and pay costs of managing it. The kinds of organizations that people create and sustain for the control of water intimately impact water's productivity, distributional justice, and environmental sustainability.

The research objective is to systematically examine a much-neglected aspect of the social organization of water, i.e., water exchanges among agricultural, municipal, industrial, and other users. The basic idea of a water exchange is simple enough; an exchange consists of a trade of water between two or more users from one point of diversion to another. Exchanges must be completed in such a manner as to prevent injury to the vested water rights of others. They are of research interest because they have offered, and continue to offer, much potential for increasing water productivity, distributional justice

## How Organizations Exchange Water

Depicting a typical situation, Figure 1 assists in explaining how exchanges work and why they are important. Organization A has a topographical opportunity to store water in a surface reservoir which can be filled by gravity by its supply canal. (See Figure 1). However, the reservoir is situated too low for Organization A to release that reservoir water back into its own canal. Rather than build pumps to physically lift A's storage water into A's supply ditch—an expensive option given initial capitalization and recurring costs—Organization A releases water back to the river when requested by Organization B. B works with the river commissioner to allow Organization A to take B's water knowing that, at a mutually agreed upon time, Organization A will pay its water debt to B. Both parties are better off. Organization A has expanded its supply of water available to its users by using B's water right, while Organization B has gained the flexibility and control that comes with having a water bank account that releases B from the

constraints imposed by fluctuating and declining summer river flows. Water has moved uphill from B to A and back by virtue of an exchange agreement implemented at minimum transaction cost and at no cost in time, capital, or hydrocarbon energy. Social organization has substituted for money and energy.



*Figure 1. WATER EXCHANGE*

## Significance of Exchange

Exchanges increase water productivity when they are undertaken to improve timing and distribution of water relative to crop and other user demands. They often increase distributional justice because they can provide additional water to those with junior rights. Exchanges can also improve fish and wildlife habitat by permitting a given water organization to allow its water to run in the river bottom to downstream storage knowing it can be exchanged for another user's water when needed at the upstream headgate. Exchanges are a major tool, therefore, for addressing pressing water issues as we look ahead to the 21<sup>st</sup> century.



## Research Program

The study centers on two questions:

◆ What factors have affected success or failure of exchanges as judged by

the variety of users over time?

◆ Are water exchanges increasing or declining in importance for agricultural, municipal, and environmental purposes in a rapidly changing social, economic, and political environment?



The research program involves:

◆ Securing from the office

of the State Engineer information on river diversions historically classified as water exchanges to build an inventory of principal exchanges.

◆ Studying court proceedings pertaining to identified water exchanges and



obtaining other historical descriptions of them.

◆ Interviewing key informants (e.g., water commissioners and exchange partners) to fill in details about historical

origin and traditional purposes of the exchange, methods and frequencies of exchange, changes over the years, and current pressures to expand or retard exchanges.

◆ Doing participant observation of selected exchanges of interest.

◆ Building a spreadsheet including specific exchange data and background information such as: a) annual water supply for the entire basin, including native, foreign and special project water (e.g., C-BT water in the case of the Cache La Poudre River basin).

◆ Analyze, report, and interpret the meaning of the data.

## Preliminary Reflections

Water exchanges in the Cache La Poudre River basin may very well be the oldest and most continuously practiced exchanges in the West. Similar exchanges conducted in Idaho, for instance, and along the middle Snake River, generally only date from the construction of the American Falls Reservoir. Other exchanges are often a result of the supplemental water provided through 20<sup>th</sup> century Reclamation projects; as with the Colorado-Big Thompson project. Few, if any, water exchanges in the West predate four of the principal exchanges found and currently practiced along the Cache La Poudre River, all of which were operative before the turn of the 20<sup>th</sup> century.

Water exchanges are too little studied. There has been little systematic quantitative and qualitative study of water exchanges and of their significance for improved water management. The Colorado State Engineer has been aggressive in developing an historical quantitative database of stream flows, and much information is available from the U.S. Geological Survey on river flows in the West. Yet when one looks at the amount of research that has been conducted using this data, there is surprisingly little to be found.

One cannot approach the study of water exchange solely from a water-accounting perspective, balancing a multi-party exchange as if it were some kind of checkbook. Much in any water exchange involves trust and a general willingness to forego an exact quantitative balance of benefits. Considerations playing into calculations include timeliness of flows, reduction of conveyance loss along reaches of a river or canal, banking water for later uses, assisting the local river commissioner in managing the river more effectively for many appropriators, and making alliances with municipal, industrial, and environmental agendas. Rarely would it be possible to adequately comprehend an exchange by attempting to exactly balance quantities on both sides of an equal sign. Exchanges must make all parties winners but they do not ensure that all partners win equally.

The sociology of water organization and exchange is a most promising area of inquiry and is freighted with implications for future water management and policy. The work has just begun.

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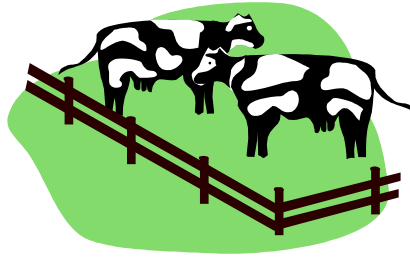
## CONFINED ANIMAL FEEDING OPERATION'S AMENDMENT 14, GORE'S CLEAN WATER ACTION PLAN CHALLENGE PRODUCERS

*The impact of confined animal feeding operations on water quality continues to be a debate, and a red-hot issue in Washington. Spurred on by Vice President Al Gore, who has made water quality one of his priorities, Colorado researchers still look for answers with a wealth of questions stemming from last year's passage of Amendment 14 and Gore's Clean Water Action Plan.*

Andrew Seidl, Colorado State University Cooperative Extension public policy specialist, is a member of a national task force to research national environmental policy that impacts livestock facilities. The group looks at the influence of federal policies such as the 1972 Clean Water Act. The group also studies state legislation on water quality including Amendment 14 and that legislation's effect on agriculture, particularly the growth, location and concentration of livestock feeding facilities. "I think we'll see that a state's willingness to enforce its water policies, rather than the stringency of the state's policies, will be a larger factor in a corporation or producer's decision to locate in one place or another," said Seidl.

Colorado's water quality policy, added Seidl, is enforced by the Water Quality Control Commission. The commission doesn't have the resources to strictly enforce the policy. In fact, to Seidl's knowledge, since the Clean Water Act was passed in 1972, Colorado has never collected a noncompliance fine from an agricultural operation, although our state laws are more strict than many states. "Currently, compliance is expected, but there's no funding toward monitoring and enforcement." He's quick to caution, however, that many agriculturalists also are environmentalists. "No one's against clean water," he said. "No one. However, many rural Coloradans either don't appear to be convinced that there is a problem, or that state or federal regulations are the way to solve existing problems." Today, there's a push to encourage compliance with help from government loans and grants that assist producers in building lagoons to store effluent, or purchasing equipment to assist them in using effluent as fertilizer.

Seidl is no stranger to the issues of water quality. In research funded by the Colorado State University Agricultural Experiment Station, he's looking at the impact of livestock on agricultural land values and the value of surrounding real



estate. Livestock impacts include odor and water quality, especially near lakes or water ways with recreational use. However, the livestock industry also serves to increase real estate values indirectly through the creation of jobs and support of communities.

As part of the study, Seidl and a team of researchers will look beyond livestock impacts. The group will investigate the effects of different species and sizes of confined animal feeding operations on the land and its value, and the costs and benefits of air and water quality policies to producers, local governments and rural communities. Seidl also is a member of a Colorado task force formed to educate the public about Amendment 14, and its failed counterpart, Amendment 13.

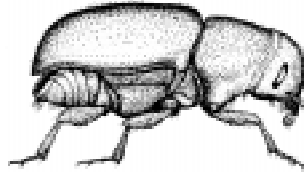
After Amendment 14 passed, Seidl was a member of a team charged with assisting the Water Quality Control Commission to draft specific legislation to carry out what was intended by the Amendment through a series of hearings. Seidl and others, including additional Colorado State Cooperative Extension specialists, tried to ensure that language used in the legislation was accurate. Those studies have helped Seidl and others give Coloradans and decision makers a more accurate view of agriculture's role in water quality. Seidl, and other members of these task forces including Reagan Waskom, Lloyd Walker and Jessica Davis, all Colorado State Cooperative Extension specialists, have worked toward a common goal. "Our concern is that local, state and federal policy should be based on demonstrated need through objective, science-based information rather than conventional wisdom, political expediency, lobbying and advertising blitzes. We need to have good science in order to figure out how to get clean water for the least amount of money. We need to determine, if and when we form more policy, who bears the cost and who benefits from it? We want to meet clean water goals at a low cost to producers so they can continue to be good stewards of land," he said.





## **WHAT'S BUGGING OUR WATERSHEDS?** Part 1

by Bob Sturtevant, Forester



*Adult Mountain Pine Beetle (MPB)*

### ***They're back!***

*The Mountain pine beetle (MPB) *Dendroctonus ponderosae*, which was responsible for the death of two million Colorado trees during the late 1970s, is making a comeback. This is no surprise to foresters in the Rocky Mountains, who have experienced the cyclic nature of such infestations every 20-30 years. Colorado is entering a period of population buildup and can expect to lose trees numbering in the hundreds of thousands to this insect over the next 5-7 years. It is estimated that there are currently 150,000 infested trees in Colorado from the 1998 beetle flight. By the end of the 1999 summer flight we will see an additional 300,000 trees killed by this insect.*

Mountain pine beetles develop in pines, particularly Ponderosa, lodgepole, Scots (Scotch) and limber pines. Bristlecone and pinyon pine are less commonly attacked. During early stages of an outbreak the insects attack trees weakened through stress. Common stress factors are construction damage, over-crowded stands, fire damage, mistletoe infection and old age. Once populations increase to epidemic levels, MPB may strike any of their favorite pines with a preference for the larger-diameter trees.

***With a successful attack, the numerous beetles tunnel under the bark, where they mate and the females lay eggs along a vertical gallery. These eggs hatch into larva and feed on the inner bark, growing larger during the next few months.***

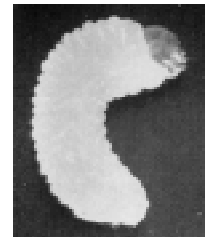
During the month of June the Colorado State Forest Service (CSFS) is flooded with calls concerning MPB. Around this time landowners notice their tree(s) turning brown. It seems to happen overnight. One day the tree is green, the next brown. While it actually doesn't happen this quickly, it is a relatively fast transition. The process that causes this "fading" actually began the previous summer.

MPB have a one-year life cycle in Colorado. In mid to late summer adult beetles emerge from the brown-needled infested trees and fly to new green trees. With a success-

ful attack, the numerous beetles tunnel under the bark, where they mate and the females lay eggs along a vertical gallery. These eggs hatch into larva

and feed on the inner bark, growing larger during the next few months. In early summer of the following year, the larva pupate into adults

and the cycle continues.



*Larva of a MPB. These are found under the bark in tunnels.*

While the larva's feeding on the water-conducting tissue under the bark causes girdling, it is actually a blue-stain fungus carried by the beetle that kills the tree. The fungus blocks transport of water and nutrients from the roots to the branches and rapidly starves the tree. This is why the tree turns brown so quickly in early summer.

Left unchecked, MPB can kill large patches of trees. While this is a natural occurrence, few landowners enjoy losing the majority of their trees. With the suppression of natural disturbances such as fire in the forest ecosystems, bug populations have become more destructive and occur more





frequently. The best control for MPB is a healthy forest. A healthy pine forest in Colorado generally has well-spaced trees that are free

of serious disease problems. Crowded conditions create stress in the trees as they compete for sunlight and nutrients. In many cases trees need to be thinned to achieve a well-spaced condition.



The appearance of a forest thinned to help prevent MPB.

Treating individual trees infested with MPB is a labor-intensive task. The tree must be cut, the limbs removed, and one of several treatments performed. Treatments include:

- ◆ Burning the log (preferably in a fireplace or stove).
- ◆ Debarking the log.
- ◆ Burying log under 8 inches of soil.

### Colorado Counties



1998 MPB based on aerial survey of 1997 attacks fading in June '98





- ◆ Haul to a “safe site” a mile or more from any pine trees.
- ◆ Solar-drying using plastic.

Chemical treatments for infested wood are limited. The only chemical labeled for MPB (Lindane) is no longer being produced. You may find limited

quantities of the chemical this year, but it is becoming hard to find.

There are preventative sprays available for high-value trees. Both carbaryl (Sevin) and permethrin (Astro) are registered to prevent beetle attacks. The spray is applied to the trunk in early summer to deter beetles from boring into the tree. Many tree service companies perform preventative spraying for landowners. Costs average \$15-20 per tree, but price may vary depending on the number of trees you want to protect and the distance the spray truck must drive. Forested subdivisions would benefit by organizing property owners to have their trees sprayed by the same company.

By the time this article is published, this year’s beetle flight will be occurring. Inspect your trees as soon as possible! If you suspect they have successfully been attacked, contact your local Colorado State Forest Service office. We have several good publications that explain what to look for and how to take care of your infested trees. Our MPB fact sheets can also be accessed through our web site:

[www.colostate.edu/Depts/CSFS/csfsmgnt.html](http://www.colostate.edu/Depts/CSFS/csfsmgnt.html).

If you start treatment in the fall, you have many more options available. If you wait until the trees fade in the following summer, your treatment options are limited. Trees left untreated can produce enough adult beetles to successfully attack 2-3 new trees.

A healthy forest is no accident! Caring for your forest land takes time and effort. The Colorado State Forest Service is available to help keep your trees green and healthy.

***Mountain Driveway Best Management Practices Manual and Guidance Available***---Driveways in mountainous areas can be sources of sediment, oil, grease, household chemicals and de-icers that can run off into sensitive mountain streams. Local authorities have indicated that poorly designed driveways in mountain areas are reducing the quality of streams, lakes, reservoirs, wetlands and bogs. Construction of driveways in mountainous areas often requires special consideration and planning due to factors such as short growing season, steep slopes, limited topsoil underlain by bedrock and sensitive streams. These factors may pose special challenges when attempting to revegetate a site, design drainage features or install BMPs that require anchoring to the ground, such as silt fences and straw bales. In response to the need for guidance relating to implementing BMPs in mountain areas, Wright Water Engineers, Inc. has completed the “Mountain Driveway Best Management Practices Manual” and a corresponding informational brochure for use by local governments, homeowners, developers, contractors, planners and others. The manual was developed with input from local experts from Denver Regional Council of Governments, Northwest Colorado Council of Governments, the Colorado State Forest Service, Urban Drainage and Flood Control District, local county governments and others. The project was supported by the Colorado Nonpoint Source Council and partially funded by a 319 grant.

The manual provides descriptions of 25 key best management practices (BMPs) that should be considered during design, construction and maintenance of driveways in mountain areas. The manual and brochure both provide a list of 15 key erosion and sediment control principles that can be applied to reduce erosion and sedimentation in mountain areas. The 25 BMPs in the manual include pre-construction planning, minimizing disturbance of vegetation/wetlands, stormwater diversion during construction, vehicle tracking pads, straw bales, sand bags, silt fences, sediment traps, sediment basins, brush barriers, check dams, vegetation buffers, grass-lined swales, revegetation, mulching, erosion control blankets, slope stabilization, slope drains, road drainage, drainageway and inlet protection, outlet protection, infiltration practices, stream crossings, source controls, and water maintenance (sanding and snow removal). Information for each BMP includes a brief description, installation guidelines, special considerations in mountain areas, maintenance considerations and an illustration demonstration proper implementation.

***For more information or to obtain a copy of the manual, please contact Jane Clary at Wright Water Engineers, Inc., (303) 480-1700 or [clary@wrightwater.com](mailto:clary@wrightwater.com), or Russ Clayshulte at Denver Regional Council of Governments, [relayshulte@drcog.org](mailto:relayshulte@drcog.org).***

 **NATURAL RESOURCES LAW CENTER  
 HOSTS 20<sup>TH</sup> ANNUAL SUMMER CONFERENCE**  
*by Ian Kalmanowitz*

From June 8-11, the Natural Resources Law Center held its twentieth annual summer conference, entitled *Strategies in Western Water Law and Policy: Courts, Coercion and Collaboration*. The conference began with a public forum on Tuesday night and featured Secretary of the Interior Bruce Babbitt, who led a panel discussion on the Western Water Policy Review Advisory Commission's report, "Water in the West." Other panel members were Denise Fort of the Advisory Commission, Craig Bell of the Western States Water Council, and author William DeBuys.

**Western Water Law – Major Developments** —

After a welcome address on Wednesday morning by NRLC Interim Director Kathryn Mutz, the first session of the conference got under way. The University of Colorado School of Law's Professor David Getches was the first speaker of the morning; Getches, along with Professor Jim Corbridge, founded the summer conference series, which led to the creation of the Natural Resources Law Center. Getches summarized the major developments in western water law in the 1990s, the most surprising of which is the protection of environmental values and uses of waterways that are controlled by dams and other "improvements" through their change in use or removal. Also seen in the 1990s is the increasing influence of federal environmental laws on water allocation, basin-wide adjudications, and broader participation at all levels of decision making.

**Keynote**

**Address –**

**Environmental  
 Restoration** —

In the keynote address that followed,

Patricia Beneke,

Assistant Secretary for Water and Science, Department of the Interior, highlighted environmental restoration projects that the Department of the Interior is currently undertaking in the Grand Canyon, the Platte River, the California Bay Delta, and the Florida Everglades. The intent of these projects is to protect these areas from further environmental harm, and to restore some of the natural



values that were lost due to water development. Highlights of such efforts include releases of water from Glen Canyon Dam into the Grand Canyon to simulate unobstructed flows of the Colorado River, and removal of cement drainage canals in the Everglades, which has allowed the River of Grass to flow on its natural course.

**THE COURTS**

The conference then turned to explore the first of three strategies in western water law and policy: contention in the courts. The first panel included three active participants in Colorado water cases. Judge Jonathan Hays of Water Division 1 focused his comments on current decisions and practices in Colorado Water Courts, including both surface and groundwater issues; and Justice Gregory Hobbs of the Colorado Supreme Court highlighted many of the changes that have occurred in Colorado Water Courts. Melinda Kassen of Trout Unlimited concluded the discussion from the perspective of an environmentalist who might practice in the Colorado water courts and provided her views on how these courts should change.



The final two speakers of the "Courts" segment of the conference explored basin-wide adjudications. Ramsey Kropf, an alum of the University of Colorado School of Law, provided valuable background information on general western stream adjudications and a very practical perspective on what works and what doesn't. Reid Chambers, a veteran of three decades of work with tribes in water adjudications and water rights disputes, evaluated the system of basin-wide adjudications in terms of its dominant purpose— to determine and quantify open-ended Indian and other federally reserved water rights in a state court forum that is presumably hospitable to state users. Chambers concluded with reflections on questions of finality of decisions, the rationality of resulting water allocations, and plausible alternatives to this expensive, time-consuming process.

**Snake River Basin Adjudication** — The Snake River Basin Adjudication (SRBA) was addressed by three extremely knowledgeable attorneys with diverse backgrounds. Charles Wilkinson, Moses Lasky Professor at the University of Colorado School of Law and moderator of the session, provided a background for the speakers through his reflections on the Snake River.



Michael A. Gheleta, a trial attorney with the



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Environment and Natural Resources Division of the U.S. Department of Justice in Denver, has worked on the SRBA for the Department of Justice since its nascence. Gheleta covered the adjudication of Federal water rights in the basin. Over 62 percent of Idaho's land is under the control of four federal agencies (Forest Service, BLM,

*among federal, state, and local agencies and tribal governments wherever possible,*

◆ *it maximizes the participation of community groups and the public, placing particular emphasis on ensuring community access to information about water quality issues, and*

◆ *it emphasizes innovative approaches to pollution control, including incentives, market-based mechanisms, and cooperative partnerships with landowners and other private parties.*

Baca stressed that the CWAP is not a final decision, but should be viewed as a blueprint for future action and that the goals of the CWAP will not be achieved without full public participation and broad public consensus on these contentious issues.

Bruce Zander, TMDL coordinator for Region 8 of the Environmental Protection Agency spoke next about the TMDL implementation process under 303(d) of the Clean Water Act. As of April 1999 there were about 45 legal actions in 34 states regarding the implementation, adequacy, pace of development, or application of TMDLs. Zander also noted that the EPA was currently taking steps to improve the TMDL program by revising the TMDL program regulations guided by the recommendations of a Federal Advisory Committee.

Proposed changes are scheduled for publication in the Federal Register this summer and after public review and comment final regulations will be published sometime in 2000.

Next David Holm, the Incoming President for the Association of State and Interstate Water Pollution Control Administrators, gave the state perspective on the TMDL process. Holm noted that the states favor the current approach to dealing with nonpoint source pollution in concert with appropriate combinations of cost effective regulatory and voluntary approaches involving multiple stakeholders in watershed-based efforts. Holm also stressed the need for Federal agencies to utilize management measures that have been certified by the state water quality agency and to be consistent with updated state management plans.

**Endangered Species Act** — The discussion turned to the Endangered Species Act (ESA) in the next session with a talk by Professor Joseph Sax, Boalt Law School, University of California, regarding the allocation of water resources to comply with the ESA. Sax stated that the general policy of the Babbitt administration toward resolving ESA issues has been to:



*From left: Professor Charles Wilkinson, Peter Monson, and Michael Gheleta from the Department of Justice speak about the Snake River Basin Adjudication.*

National Park Service, and Fish and Wildlife Service) and the federal government has filed over a third of the approximately 175,000 consumptive and non-consumptive claims in the adjudication. Peter C. Monson, Assistant Chief, Indian Resources Section of the Environment and Natural Resources Division of the U.S. Department of Justice in Denver followed, discussing Indian Water rights in the context of the SRBA. The claims asserted on behalf of the tribes include claims for consumptive uses on the reservations and non-consumptive claims on and off the reservations.

## COERCION

**Federal Goals – Clean Water Action Plan and TMDLs** — The changing face of coercion (command-and-control statutes) was the focus of the Thursday afternoon session, which began with a discussion of the Clinton Administration's Clean Water Action Plan (CWAP) by Sylvia Baca, the Acting Assistant Secretary of the Interior for Land and Minerals Management. She explained that the CWAP contained three guiding principles:

◆ *it encourages coordination and reduces duplication*



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◆ *strive for negotiated solutions using a partnership approach amongst the United States, local governments and local users;*

◆ *to make these agreements in the context of a large multi-species conservation strategy that gets ahead of the repeated crises that arise from isolated ESA consultations;*

◆ *provide incentives to water users that anticipate subsequent listings;*

◆ *build enough achievement into the program to serve as a cushion against future projects or activities;*

◆ *strive for recovery as opposed to simply avoid jeopardy, and*

◆ *look for creative solutions that avoid the most intractable prospects.*



profit organization Stewardship Initiatives), offered a philosophical and historical description of “collaboration” in western water issues. While acknowledging some concerns and deficiencies of collaborative processes, MacDonnell offered a generally optimistic assessment of these efforts, arguing that they offer the potential for concentrating more minds, more information, and more creativity in problem-solving efforts.

**River Basin Planning – The Texas Approach** — John Folk-Williams of Public Decisions Network followed with an examination of river-basin planning efforts currently under way in Texas pursuant to Senate Bill 1. As an experienced dispute-resolution practitioner, Folk Williams explored the mix of old and new ideas comprising the Texas approach, commenting upon the practical advantages and disadvantages of multi-stakeholder practices.

**Large-scale Ecosystem Restoration – Collaborative Approaches** — Dan Luecke, Regional Director of the Environmental Defense Fund, followed with a review of the deficiencies in large-scale ecosystem restoration processes reliant upon collaborative processes (e.g., the Platte). According to Luecke, some of the most troubling characteristics of these collaborative processes include the lack of standardized rules of procedure, the difficulty of integrating the scientific process (especially an adaptive management approach) into collaborative decision-making processes, the costs and delays of collaboration, and the observation that many parties are unlikely to have adequate incentives to resolve problems.

Sax then evaluated achievement of these goals on the Snake River in Idaho, the Middle Rio Grande in New Mexico, and the Platte River in Colorado, Wyoming and Nebraska. He concluded that the picture is positive but mixed.

**Indian Water Rights** — The final speaker for the afternoon was Mike Conner, Deputy Director of the Secretary of the Interior’s Indian Water Rights Office. Conner spoke about the federal government’s role in Indian water rights settlement cases. He noted that the Federal Government can provide resources for the tribes in getting to a settlement agreement. He stressed the difficulties associated with negotiating Indian water rights settlements and the problems water users have with the federal government representing the Indian tribes in these complex and difficult negotiations.

## COLLABORATION

The third day of the conference focused on the strategy of collaboration, with the morning session focused on exploring the value and limits of such processes, and the afternoon session examining issues on the Platte River. The morning’s first presenter, Larry MacDonnell (former director of the Natural Resources Law Center and now head of the non-



*Speaker John Folk-Williams with Mark Cavanaugh of the Colorado Governor’s Budget Office.*



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Institute**Collaborative Problem-Solving – Columbia River Intertribal Fish Commission** —

The final speaker before lunch was Ted Strong,

former director of the Columbia River Intertribal Fish Commission. Strong, while drawing upon several years of practical experience in collaborative problem-solving efforts, returned the discussion to a larger context, commenting on the “timeless wisdom” of collaboration. His appeal for greater respect and civility in water issues clearly struck a chord with all attendees, especially those hardened by decades of adversarial, incremental, and often counter-productive conflict.



**The Doctrine of Enlibra** — Following lunch, Utah Governor Michael Leavitt articulated the underlying philosophy behind the doctrine of Enlibra, recently endorsed by the Western Governors’ Association. Enlibra— meaning “to move toward balance”— calls for a fundamental reexamination of patterns of natural resources problem-solving in the region, and encourages the greater use of voluntary processes, incentives, and creativity. Collaborative processes are a central element of this vision.

The final afternoon session began with a discussion by the Colorado Attorney General, Ken Salazar, and members of his staff on the current efforts of the state with respect to water planning, conservation, and multi-jurisdictional cooperation.

The remainder of the afternoon took an in-depth look at the use of collaborative processes in the Platte River Watershed. Dale Strickland focused on the Platte River



*Utah Governor Michael Leavitt discusses the philosophy of Enlibra.*

Endangered Species Partnership, a tri-state agreement among Colorado, Nebraska and Wyoming to resolve several interstate water disputes and simultaneously meet the water needs of endangered species on the Platte. The concurrent Nebraska v. Wyoming litigation was also examined from both an historical and legal perspective.

#### FRONT RANGE WATER NEEDS

Finally, Lee Rozaklis and David Hallford discussed the present and predicted water needs of the Front Range metropolitan areas and innovative ways to meet those needs without excessive dependence on imports of water from the West Slope. Hallford also addressed the issue of the increased need of the West Slope for water to meet its own development needs and ESA instream flow requirements.

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*Conference notebooks are available from the Center for \$75, or on CD-ROM for \$10, plus shipping and handling charges. A set of 13 videotapes of the entire conference is available for \$100, or videos of individual speakers can be purchased for \$10 each, plus shipping and handling charges. Inquiries should be addressed to: Natural Resources Law Center, Fleming Law, Campus Box 401, Boulder, Colorado 80309-0401, (303) 492-1272, fax: (303) 492-1297.*

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### International Ground-Water Modeling Center 1999 Short Course Schedule

|   |            |              |               |                           |
|---|------------|--------------|---------------|---------------------------|
| <b>PHREEQC: Geochemical and Reaction Transport Modeling</b>                     | <b>OCT</b> | <b>21-23</b> | <b>\$1095</b> | <i>\$1295 after 10/9</i>  |
| <b>MODFLOW: Introduction to Ground Water Modeling</b>                           | <b>OCT</b> | <b>20-23</b> | <b>\$1345</b> | <i>\$1545 after 10/9</i>  |
| <b>UCODE – Universal Inversion Code<br/>Automated Calibration of “Any” Code</b> | <b>OCT</b> | <b>22–23</b> | <b>\$ 995</b> | <i>\$1195 after 10/10</i> |
| <b>Subsurface Multiphase Fluid Flow and Remediation Modeling</b>                | <b>OCT</b> | <b>28-30</b> | <b>\$1095</b> | <i>\$1295 after 10/15</i> |

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VISIT <http://www.mines.edu/igwmc/> FOR MORE INFORMATION

### **◆ RECORDKEEPING FOLDER AND INFORMATION PACKAGE ON SEPTIC SYSTEMS IS AVAILABLE**

The National Small Flows Clearinghouse (NSFC) announces the release of its revised septic system information folder, which was developed by the NSFC and reviewed in collaboration with the National Onsite Wastewater Recycling Association (NOWRA) and the Pennsylvania Septic Management Association (PSMA).

The Homeowner Onsite System Recordkeeping Folder (Item #WWBLPE37) provides a place to record and store information about your system and its maintenance. On the cover of the folder are sections for permit and local health department information and for a description of the system. This description consists of a checklist that covers septic tank and pump size, soil treatment system dimensions, accessories, and household information. Inside are tips for locating your system, space to sketch the location of the system, a safety checklist, and a section for recording the names, addresses, and certification numbers of your system's designer, installer, O&M provider, and pumper. The cost of this folder is 40 cents.

In addition, the NSFC offers a Homeowner Septic Tank Information Package (Item #WWPKPE28), packed with materials that give an overview on septic systems for homeowners. Included are several brochures on how to maintain a septic system and how to recognize potential problems. Also included are three issues of the NSFC newsletter *Pipeline* that focus on septic system operation and maintenance, management, and what happens when you have your system inspected. A fact sheet on various alternative household cleaning solutions is included that offers safe alternatives over chemical cleansers. The package costs \$2. To order either the folder or the complete information package, call the NSFC at 800/624-8301 or 304/293-4191 and request the product by item number. Orders can also be placed via e-mail at [nsfc\\_orders@estd.wvu.edu](mailto:nsfc_orders@estd.wvu.edu).

*Located at West Virginia University, the National Small Flows Clearinghouse is a nonprofit organization funded by the U.S. EPA to provide free and low-cost information about small community wastewater treatment. For more information, contact the NSFC at 800/624-8301 and request a free information packet or visit the NSFC's web site at <http://www.nsfcc.wvu.edu>.*

# CWRRI NEW FACULTY

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*Larry Roesner*  
*Department of Civil Engineering*  
*Colorado State University*



Dr. Larry A. Roesner is joining the faculty of Colorado State University in Fort Collins, Colorado, as the first Harold H. Short Endowed Professor in the Department of Civil Engineering. Larry comes to CSU from Camp Dresser McKee Inc. (CDM), a major international environmental engineering company, where he most recently served as Senior Vice President and National Technical Director for Water Resources, and Dean of CDM's Corporate University.

Larry received his B.S. in Civil Engineering from Valparaiso University before coming to Colorado State University to complete the M.S. in Hydrology. He then received his Ph.D. in Sanitary Engineering from the University of Washington.

The Harold H. Short Professor will teach students and work with industry and government to strengthen the nation's civil infrastructure systems that provide the vital support needed for economic development and social systems. In particular, Larry will focus on sustainable urban water infrastructure, including drinking water, wastewater, and stormwater systems.

These include:

- ◆ Improved urban stormwater infrastructure that focuses on protection of urban aquatic ecosystems and use of stormwater as a water amenity;
- ◆ Better on-site management of municipal water supplies to reduce demand and cost of treatment, and reduce wastewater contributions to municipal treatment plants; and
- ◆ Pilot studies with municipalities to insure that improved technical methods are implementable at the municipal level.

Larry has had more than 30 years experience in water resources and water quality engineering and management. He is a nationally recognized international expert in the development and application of hydrologic, hydraulic, and water quality simulation models.

Larry's areas of specialization include urban water resources management and ecosystem response to storm and waste water discharges from urban areas. He has been a principal developer of models designed to address these concerns including:

- ◆ STORM (Corps of Engineers model), a simplified urban storm and wastewater systems management model;
- ◆ SWMM EXTRAN (USEPA model), a sophisticated dynamic hydraulic simulation model for contiguous open channel and closed pipe systems;
- ◆ QUAL II (USEPA model), a river quality simulation model; and
- ◆ A reservoir temperature prediction model.

Models he has developed have been successfully applied to the development of solutions to challenging urban water resource planning and management problems in South America, Europe, and most major cities in North America.

As Dean of CDM's Corporate University of Continuing Education, he has emphasized the development of quality distance learning technology as a delivery vehicle. He has presented numerous lectures and workshops on modeling and urban water resources management.

Larry's accomplishments and contributions to the field of water resources and the engineering profession have been recognized by several organizations. He is an elected member of the National Academy of Engineering. This year, he was recognized by the American Society of Civil Engineers Water Resources Planning and Management Division with the Service to the Profession Award.

Larry begins with the Department of Civil Engineering on August 16, 1999.



# CWRRI NEW FACULTY

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*Peter Blanken*  
*Department of Geography*  
*and Environmental Studies*  
*University of Colorado*



Dr. Peter D. Blanken has recently joined the faculty of the University of Colorado at Boulder in the Department of Geography and Environmental Studies. Peter teaches courses dealing with land-atmosphere interactions including general climatology, climate and vegetation, and biometeorology.

Peter's research interests involve measurement of the physical processes controlling the exchange of energy, water and carbon between the surface and the atmosphere. He has studied these exchange processes from several surfaces including arctic lakes, boreal and subarctic forests, and alpine wetlands.

Peter received his B.Sc. (with first class honours) and his M.Sc., both in Physical Geography, from McMaster University in Hamilton, Ontario, Canada. His master's thesis was entitled: "Vegetation Controls on Evaporation from a Subarctic Willow-Birch Forest." He received his Ph.D. from the University of British Columbia, and completed his Dissertation on "Evaporation Within &

Above a Boreal Aspen Forest" with research conducted during his work on the Boreal Ecosystem Atmosphere Study (BOREAS) funded by NASA. BOREAS was a multi-disciplinary, multi-scale project designed to help understand the processes involved in the water, energy, and carbon dioxide exchange of the boreal (northern) forest. Peter's quantification of the processes involved in the evaporation above and within a boreal aspen forest and the algorithms he developed to model canopy conductance are being incorporated into the Canadian land surface scheme for use in the Canadian general circulation model.

Prior to joining the CU faculty, Peter was a Postdoctoral Fellow at McMaster University, where he worked on the Global Energy & Water Cycle Experiment (GEWEX).

Peter is currently continuing his work with the GEWEX project, which is a research project sponsored by the United Nations' World Climate Research Programme.

The Global Energy and Water Cycle Experiment (GEWEX) was initiated in 1988 by the World Climate Research Programme (WCRP) to observe and model the hydrologic cycle and energy fluxes in the atmosphere, at the land surface, and in the upper oceans. GEWEX is an integrated program of research, observations, and science activities ultimately leading to the prediction of global and regional climate change. Peter's role within this project has been to measure complete radiation and energy balance of a high latitude large lake (Great Slave Lake), the first effort of its kind. Algorithms developed from this research will be incorporated as a deep-lake component for Canada's general circulation model.

Peter is also interested in pursuing research on evaporation from wetlands in Colorado, and other studies on evaporation from various surfaces in arid climates.



## RESEARCH AWARDS AT COLORADO UNIVERSITIES

A summary of research award and projects is given below for those who would like to contact investigators. Direct inquiries to investigators 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                                   |
|---|---------------------------|------------------------------------|---|
| Bioremediation Technology in the Engineering Curriculum: Research Experiences...                                      | Reardon,Kenneth F         | Chemical & Biores<br>Engineering   | NSF                                       |
| Ecosystem Significance of Soil as a Long Term Sink for Anthropogenic Additions...                                     | Burke,Ingrid C            | Forest Sciences                    | NSF                                       |
| Development of a Next-Generation Atmospheric General Circulation Model  | Randall,David A           | Atmospheric Science                | DOE                                       |
| Interaction of the Cloudy Arctic Boundary Layer with Variable Surface Conditions ...                                  | Randall,David A           | Atmospheric Science                | NASA                                      |
| <b>Mojave Desert Vegetation Monitoring</b>  | <b>Rondeau,Renee</b>      | <b>Fish &amp; Wildlife Biology</b> | <b>DOI</b>                                |
| <b>A Comparison of Rooftop &amp; Standard Ground-Based Temperature</b>  | <b>Mckee,Thomas B</b>     | <b>CIRA</b>                        | <b>NOAA</b>                               |
| Parameterizing Subgrid-Scale Snow-Cover Heterogeneities for Use in Regional & Global Climate Models                   | Pielke,Roger A            | CIRA                               | DOC                                       |
| <b>Preble's Meadow Jumping Mouse Studies</b>  | <b>Schorr,Robert</b>      | <b>Fish &amp; Wildlife Biology</b> | <b>USAF</b>                               |
| <b>Atmospheric CO2 Inversion Intercomparison Project</b>  | <b>Denning,A Scott</b>    | <b>CIRA</b>                        | <b>NOAA</b>                               |
| Impact of Clouds on Nitrogen Species & Ozone in the NARE Boundary Layer   | Kreidenweis-Dandy,Sonia M | CIRA                               | NOAA                                      |
| <b>Services of RAMS (Regional Atmosphere Modeling System)</b>   | <b>Pielke,Roger A</b>     | <b>Atmospheric Science</b>         | <b>University of Puerto Rico</b>          |
| <b>Sediment Basin for 50 &amp; 55 Foot Channel</b>  | <b>Gessler,Daniel</b>     | <b>Civil Engineering</b>           | <b>COE</b>                                |
| <b>Environmental Analysis of Proposed Modifications at Friedberg and Schweinfurt Training Areas, Germany</b>          | <b>Shaw,Robert B</b>      | <b>Forest Sciences</b>             | <b>USDA-USFS-Rocky Mtn. Rsrch Station</b> |
| <b>Sensitivity of Cloud Resolving Simulations of Convective Precipitation &amp; Cloudiness to Various Methods ...</b> | <b>Cotton,William R</b>   | <b>CIRA</b>                        | <b>NOAA</b>                               |
| Clouds & Ocean-Atmosphere Interactions in the Pacific Basin   | Randall,David A           | Atmospheric Science                | DOE                                       |
| Inventorying & Monitoring Natural Resources Status & Trends in the National Park System                               | Loftis,Jim C              | Chemical & Biores<br>Engineering   | NPS                                       |
| <b>Colorado Land Stewardship Mapping</b>  | <b>Hobbs,N Thompson</b>   | <b>Nat. Res. Ecology Lab</b>       | <b>GOCO</b>                               |
| Water Quality & Ecosystem Studies in Northwest Alaska   | Binkley,Daniel E          | Forest Sciences                    | USDA-USFS                                 |

FEDERAL SPONSORS: BLM-Bureau of Land Management, COE-Corps of Engineers, DOA-Department of the Army, DOE-Department of Energy, DON-Department of the Navy, DOT-Department of Transportation, EPA-Environmental Protection Agency, NASA-National Aeronautics & Space Administration, NBS-National Biological Survey, NOAA-National Oceanic & Atmospheric Admin., NPS-National Park Service, NRCS-Natural Resources Conservation Service, NSF-National Science Foundation, , USBR-US Bureau of Reclamation, USDA/ARS-Department of Agriculture, Agricultural Research Service, USDA/NRS-Department of Agriculture, Natural Resources Service, USFS-US Forest Service, USFWS-US Fish & Wildlife Service.

STATE SPONSORS: CDNR-Colorado Department of Natural Resources, NCWCD-Northern Colorado Water Conservancy District, CDWL-Colorado Division of Wildlife, CDA-Colorado Department of Agriculture, CDPHE-Colorado Department of Public Health and the Environment.

OTHER SPONSORS: CID-Consortium for International Development, AWWA-American Water Works Assn.

UNIVERSITY DEPARTMENTS, INSTITUTES AND CENTERS: Colorado State: CBE-Chemical & Biological Engr., CIRA-Cooperative Inst. for Research in the Atmosphere, FWB-Fishery & Wildlife Biology, NERL-Natural Resource Ecology Lab, University of Colorado: IAAR-Institute for Arctic & Alpine Research, CIRES-Cooperative Institute for Research in Environmental Sciences, CEAE-Civil, Environmental, and Architectural Engineering, Lab. For Atmos. And Space Physics.

| Title  | PI                   | Dept.                        | Sponsor                  |
|--|----------------------|------------------------------|--------------------------|
| Southwest Colorado River Basin Water Quality-Montrose Lower Gunnison Unit  | Gray,Mary Mcphail    | Cooperative Extension        | USDA-NRCS                |
| Protocol for a State-wide Groundwater Quality Monitoring Program & Establishment of a Groundwater Quality Data ... | Cardon, Grant        | Soil & Crop Sciences         | USGS                     |
| Distribution, Habitat & Life History of Brassy Minnow in Eastern Colorado  | Kurt Fausch          | Fish & Wildlife Biology      | USGS                     |
| Description & Interpretation of Salinization in the Lower Arkansas Valley  | Tim Gates            | Civil Engineering            | USGS                     |
| Best Management Practices - Arkansas River Valley  | Valliant,James C     | Cooperative Extension        | CWCB                     |
| Sw Colorado River Basin Water Quality-Grand Valley Unit  | Gray,Mary Mcphail    | Cooperative Extension        | USDA-NRCS                |
| CloudSat Feasibility Study   | Stephens,Graeme L    | Atmospheric Science          | NASA                     |
| Cooperative Agreement for Hydrologic Model Development & Maintenance   | Labadie,John W       | Civil Engineering            | DOI-USBR                 |
| Consumptive Water Use & Irrigation Efficiencies in Mountain Meadows  | Smith,Danny H        | Soil & Crop Sciences         | Upper Gunnison River WCD |
| Basin Biological Survey  | Lyon,Margarette J    | Fish & Wildlife Biology      | San Miguel County        |
| Arkansas River Basin Watershed Forum   | Valliant,James C     | Cooperative Extension        | USBR                     |
| Planning & Design of an Organized Research Program for RMNP  | Manfredo,Michael J   | Nat Res Recreation & Tourism | NPS                      |
| Identification, Public Awareness, & Solution of Waterlogging & Salinity in the Arkansas River Valley               | Gates,Timothy K      | Civil Engineering            | DOI-USBR                 |
| Development of an Integrated System of Flow Forecasting for the Maule R. Basin, Chile                              | Diaz,Gustavo Eugenio | Civil Engineering            | Catholic Univ.of Chile   |
| Electrical Engineering Focused around the CSU- CHILL National Radar Facility-Research for Undergraduates           | Chandrasekar,V       | Electrical Engineering       | NSF - Engr. Grant        |
| Long-Term Ecological Measurements in Loch Vale Watershed, Rocky Mountain National Park                             | Parton,William J     | Nat. Res. Ecology Lab        | USGS                     |
| Evaluation of the National Hydrogeomorphic Slope Wetland Guidebook Applied to the...                               | Steingraeber,David A | Biology                      | CDNR                     |
| Comprehensive Statewide Wetland Characterization & Classification  | Culver,Denise R      | Fish & Wildlife Biology      | CDNR                     |
| Southwest Colorado River Basin Water Quality-Delta Lower Gunnison Unit   | Gray,Mary Mcphail    | Cooperative Extension        | USDA-NRCS                |

UNIVERSITY OF COLORADO  
BOULDER, COLORADO 80309

| Title   | PI                  | Dept.               | Sponsor |
|---|---------------------|---------------------|---------|
| Investigation of Soil Aquifer Treatment for Sustainable Reuse: Characterization of Effluent Organic Matter                              | Amy, Gary           | CEAE                | ASU     |
| Late Quaternary History of the Western and East-Central Ross Sea, Antarctica: A Contribution to the West Antarctic Ice Sheet Initiative | Andrews, John       | Geological Sciences | IAAR    |
| A Study of the Spatial and Temporal Transitions of Climate and Ecosystems in the Circumpolar Arctic                                     | Lynch, Amanda, Mark | CIRES               | NSF     |
| Feedback Coupling Between Flow and Reactions in Heterogeneous Porous and Fractured Media: Computational and Experimental Studies        | Rajaram, Harihar    | CEAE                | NSF     |
| Land and Land-Use Change in the Climate Sensitive High Plains: An Automated Approach with LANDSAT                                       | Goetz, Alexander    | CIRES               | NASA    |
| Sea Ice and Ocean Processes in Baffin Bay: A Study Using RADARSAT Data and Numerical Modeling   | Steffen, Konrad     | CIRES               | NASA    |



| Title   | PI                        | Dept.                                       | Sponsor                 |
|---|---------------------------|---|-------------------------|
| Greenland Ice Sheet Climatology and Surface Energy Balance Modeling: Greenland Climate Network  | Steffen, Konrad           | CIRES                                       | NASA                    |
| <b>Green River Temp. Study: Simulation and Optimization of a Coupled Flow and Water Temperature Model</b>   | <b>Rajaram, Harihar</b>   | <b>CEAE</b>                                 | <b>USBR</b>             |
| <b>Cultural Resource Management: Tech. Support to the Remediation Venture Office, Rocky Mtn. Arsenal</b>  | <b>Hoffecker, John</b>    | <b>IAAR</b>                                 | <b>NPS</b>              |
| <b>Extending the GTAP Data Base for the Analysis of Climate Change Policies</b>   | <b>Rutherford, Thomas</b> | <b>Economics</b>                            | <b>DOE</b>              |
| Reservoir Stratigraphy and Its Controls on Reservoir Architecture and Performance: An Investigation of Key Surfaces and Fabrics in Marginal Marine Environments | Pulham, Andrew            | Geological Sciences                         | Various Oil Com.        |
| <b>A Hierarchical GIS and Electronic Geobotanical Atlas for the Kuparuk River Basin, Alaska</b>   | <b>Walker, Donald</b>     | <b>IAAR</b>                                 | <b>Marine Bio. Lab.</b> |
| <b>Collaborative Research: Experimental Study of Basin Stratigraphy</b>   | <b>Syvitski, James</b>    | <b>IAAR</b>                                 | <b>Duke Uni.</b>        |
| <b>Seasonal Differences in Air-Snow Chemical Relationships at Summit, Greenland</b>   | <b>Steig, Eric</b>        | <b>IAAR</b>                                 | <b>NSF</b>              |
| Labrador Sea Variability Over Decade to Millennial Time Scales  | Overpeck, Johnatan        | IAAR  | NSF                     |
| <b>Niwot Ridge Long Term Ecological Research Program 1998-2004: Control on the Structure, Function, and Interactions of Alpine and Subalpine Ecosystems</b>     | <b>Seastedt, Timothy</b>  | <b>IAAR</b>                                 | <b>NFS</b>              |
| <b>A Framework to Reassess Basin Research and Educational Priorities in Hydrological Sci.</b>   | <b>Gupta, V.K.</b>        | <b>CIRES</b>                                | <b>NSF</b>              |
| <b>An Archive and Data Distribution Sys. For Glaciological and Cryospheric System Data from the Glaciological Data Center</b>                                   | <b>Scharfen, Gregory</b>  | <b>CIRES</b>                                | <b>NSF</b>              |
| Development of a 3-D Sea Ice Model for Climate Applications   | Curry, Judith             | Program in Atmospheric and Oceanic Sciences | NSF                     |
| <b>Ultrasonic Assessment of Damage in Concrete Materials</b>  | <b>Willam, Kaspar</b>     | <b>CEAE</b>                                 | <b>NSF</b>              |
| Development of an Embedded Crack Method for the Shear Behavior of Reinforced Concrete Structures  | Shing, P.S. Benson        | CEAE  | NSF                     |
| Observations and Modeling of Flow and Fracture Processes Leading to Iceberg Calving   | Amadei, Bernard           | CEAE  | NSF                     |
| <b>Measurements of C1O and CO2 for Accent</b>   | <b>Toohey, Darin</b>      | <b>CIRES</b>                                | <b>NASA</b>             |
| <b>In Situ Measurements of Halogen Oxides</b>   | <b>Toohey, Darin</b>      | <b>CIRES</b>                                | <b>NASA</b>             |
| <b>Atmospheric Studies Using POAM II Data</b>   | <b>Rusch, David</b>       | <b>Lab for Atmos. And Space Physics</b>     | <b>DON</b>              |

## CALL FOR PAPERS

### *The Small Flows Journal*

Papers are now being accepted for upcoming issues of The Small Flows Journal, the only juried technical journal devoted specifically to small community wastewater issues (i.e., communities with populations under 10,000 or communities handling less than one million gallons of wastewater flows per day).

For additional information about the journal, manuscript submission guidelines, and publication deadlines, contact Cathleen Falvey, editor, at **1-800-624-8301, ext. 5526**, or mail to Editor, The Small Flows Journal, National Small Flows Clearinghouse, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064.



## PUBLICATIONS

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

**The Quality of Our Nation's Waters -- Nutrients and Pesticides**. U.S. Geological Survey Circular 1225, 1999.

**Water-Quality and Bottom-Sediment-Chemistry Data for Left Hand Valley Reservoir, Boulder County, Colorado, January-August 1998**, by Robert A. Kimbrough. 1999. USGS Open-File Report 99-192.

**Review of Phosphorus Control Measures in the United States and Their effects on Water Quality**, by David W. Litke. 1999. USGS Water-Resources Investigations Report 99-4007, National Water-Quality Assessment Program.

**Fraser River Watershed, Colorado --Assessment of Available Water-Quantity and Water-Quality Data Through Water Year 1997**, by Lori E. Apodaca and Jeffrey B. Bails. 1999. USGS Water-Resources Investigations Report 98-4255.



## WATER SUPPLY

Positive SWSI values in all basins reflect normal to above normal water supply conditions in all of the state's major river drainages. The snowmelt runoff peaked in June, and while individual stream flows will vary in response to precipitation events, the trend will be for continued reduction in all flows as the summer progresses. Both stream flows and reservoir storage levels are currently above normal levels. Statewide reservoir storage at the end of June was approximately 130 percent of average.

The surface Water Supply Index (SWSI) was developed by the State Engineer's office and the USDA. 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 snowpack, reservoir storage, and precipitation for the winter period (November through April). During the winter period snowpack is the primary component in all basins except the South Platte basin, where reservoir storage is given the most weight. The following SWSI values were computed for each of the seven major basins for July 1, 1999, and reflect conditions during the month of June.

| Basin            | 7/1/99 SWSI Value | Change from the Previous Month | Change from the Previous Year |
|------------------|-------------------|--------------------------------|-------------------------------|
| South Platte     | 3.5               | -0.2                           | +1.0                          |
| Arkansas         | 2.5               | +1.8                           | +2.4                          |
| Rio Grande       | 1.9               | +1.6                           | +2.9                          |
| Gunnison         | 1.6               | +0.9                           | +2.6                          |
| Colorado         | 1.2               | +1.8                           | +2.8                          |
| Yampa/White      | 0.8               | +1.4                           | -0.2                          |
| San Juan/Dolores | 1.5               | +1.1                           | +2.2                          |

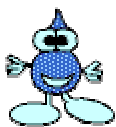
| SCALE          |                  |                    |    |   |                     |    |                 |    |
|----------------|------------------|--------------------|----|---|---------------------|----|-----------------|----|
| -4             | -3               | -2                 | -1 | 0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





## WEB PATHS

| Description  | Website  |
|--|--|
| <p><b>U.S. Bureau of Reclamation--1999 Hydrologic Modeling Inventory.</b><br/>This will be a compilation of a vast array of the hydrologic models available today, providing up-to-date information on the models and contact points for obtaining them. It will be available at:</p>  | <p><a href="http://www.usbr.gov/hmi">http://www.usbr.gov/hmi</a></p>   |
| <p>The award-winning <b>Natural Diversity Information Source (NDISP)</b> web site provides data and analysis about Colorado's animals, plants and natural communities to enhance land-use decisions. The site offers habitat maps of many wildlife and plant species and can predict how a land-use change will affect wildlife and habitat in an area. Team Leader Tom Hobbs, a DOW and CSU Scientist, was awarded the Society for Conservation Biology's 1999 Distinguished Service Award for an individual in government for his work on NDIS -- one of just six awards given worldwide.</p>  | <p><a href="http://ndis.nrel.colostate.edu">http://ndis.nrel.colostate.edu</a></p>   |
| <p>This web site contains a list of projects funded in FY1998 under the <b>State Water Resources Research Institute Program's Regional Competitive Grant Program</b>. A synopsis of each project can be obtained by clicking on the state abbreviation left of the project title.</p>  | <p><a href="http://water.usgs.gov/public/wrri/98grants/98grnts.html">http://water.usgs.gov/public/wrri/98grants/98grnts.html</a></p> |
| <p><b>Annual Progress Reports of the Agricultural Research Service's Colorado-Wyoming Research Council</b> (formerly the Natural Resources Research Center) are now on the web. Access the web page for information about:</p> <p>Soil-Plant-Nutrient Research, Fort Collins, CO<br/>Water Management Research, Fort Collins, CO<br/>National Seed Storage Laboratory, Fort Collins, CO<br/>Great Plains Systems Research, Fort Collins, CO<br/>High Plains Grasslands Research Station, Cheyenne, WY and Fort Collins, CO</p>   | <p><a href="http://www.akron.ars.usda.gov">http://www.akron.ars.usda.gov</a></p>   |
| <p>What Should Every Westerner Know? This web site provides an interactive dialogue about region and citizenship, a project of the <b>Center of the American West, University of Colorado at Boulder</b>.</p>  | <p><a href="http://www.centerwest.org/westerner">http://www.centerwest.org/westerner</a></p>   |
| <p>The <b>Colorado Water Quality Control Division</b>, guided by the Colorado Water Quality Control Act originally enacted in 1974, regulates the discharge of pollutants into the state's surface and ground waters and enforces the Primary Drinking Water Regulations. Access the web pages for information about the following:</p> <p>Water Quality Regulations<br/>Permitting<br/>The Water Quality Control Commission<br/>    Surface Water Quality Classifications and Standards<br/>    Ground Water Quality Classifications and Standards<br/>    Point Source Discharge Permit and Control Regulations<br/>    Watershed Protection Control Regulations<br/>    Other Water Quality Control Regulations<br/>        Reg 81 - Confined Animal Feeding Operations Control Regulation<br/>        Reg 82 - 401 Certification Regulations<br/>        Reg 83 - Passive Treatment of Mine Drainage Control</p> <p>Protecting your drinking water: Source Water Assessment and Protection Program<br/>New community water systems: Draft of Planning Manual (PDF)</p> | <p><a href="http://www.cdphe.state.co.us/wq/">http://www.cdphe.state.co.us/wq/</a></p>   |



## COLORADO WATER KNOWLEDGE

### Web Update

Materials from The Colorado Water Knowledge web site (<http://www.studyweb.com>) will be included in a CD-ROM teaching resource that will be produced by the Scottish Council for Educational Technology (SCET). The CD-ROM is being developed to demonstrate to secondary school teachers and FE lecturers how they can use the Internet to enhance their teaching. Activities for students related to the selected web pages will also be included on the CD-ROM. Val Perman of SCET said, "Your web pages have been selected because they provide relevant information for teachers in Scottish schools (and in some cases lecturers at FE Colleges) and because they provide opportunities for students (16+) to learn about relevant topics. We also hope to encourage teachers to use the Internet by introducing them to the kind of resources which the web offers. The sites we want to include have all been chosen for their excellence. At present Internet access is limited in [Scotland's] schools and hence the desire to provide the resource on a CD-ROM. Access is increasing and ultimately we would hope that teachers would use sites on the web itself." The CD-ROM will be non-profit and educational.

SCET is a partially publicly funded body, receiving a small core grant from the Scottish Office Education Department and has a remit to produce a range of educational resources which fit the Scottish curriculum. For further information about SCET visit the website at: <http://www.scet.com/>

The sites maintained by the Water Center are:

The Water Center at <http://watercenter.colostate.edu>

The Colorado Water Resources Research Institute at <http://cwri.colostate.edu>

Colorado Water Knowledge at <http://waterknowledge.colostate.edu>

*Dave Bartecchi*  
Website Administrator

## AG DAY '99 -- Celebrate Agriculture September 11, 1999



Ag Day is an 18-year tradition that celebrates Colorado's agricultural industry and its contributions to a safe, nutritional food supply for you and all consumers. Agriculture is the second-largest industry in Colorado, providing more than 86,000 jobs and producing more than \$4.4 billion in agricultural sales. **BARBECUE:** Come enjoy food grown or processed from the mountains to the plains. The barbecue begins two hours before the CSU football game, and is located in the parking lot south of Hughes Stadium. Ag Day offers the finest food and beverages, including apples, beans, beef, beer, cheese, ice cream, lamb, melons, milk, pork, potatoes, sugar, sweet corn, turkey, and wheat bread. **ACTIVITIES:** You can also learn about Colorado agriculture's growing tradition by visiting

the many activities and displays that will be available. **ORDER EARLY:** Barbecue attendance is limited and all tickets will be sold in advance. Obtain ticket order forms from: Ag Day '99, College of Agricultural Sciences, 121 Shephardson, Colorado State University, Fort Collins, CO 80523-1101.

*Sponsored by Colorado Agricultural Organizations, Colorado State University's College of Agricultural Sciences and the Department of Intercollegiate Athletics*





## WATER NEWS DIGEST

by Jamie Miller



### AGRICULTURAL WATER CONSERVATION

#### A new way to water crops

Center-pivot sprinklers are a more efficient way of watering crops, but they may intensify the effects of the region's salty water. Participants of a Colorado State University Cooperative Extension Service tour of the Arkansas Valley got to see what one farmer is doing to alleviate the problem while still stretching his water as far as possible. Paul Flack has substituted the spray heads on several sections of his sprinkler with drag hoses on an alfalfa field, and CSU irrigation specialist Jim Valliant said the practice seems to be a benefit. Valliant explained that droplets of water sprayed on the leaves of a crop like alfalfa can evaporate and leave salt crystals behind. Generally speaking, salt hurts plants, and the combination of direct salt on the leaves and the evaporation of valuable water can mean lower yields and higher water usage. The hoses, which drag behind the sprinkler as it makes its slow circles, put more water on the ground to soak into the dirt and roots. Another stop on Valliant's tour was the Holly drainage ditch, remarkable because it seems to be lowering the high water table in the area. High water tables increase soil salinity because the water at the surface of the ground evaporates, but not the salt in it. That salt stays in the topsoil and the soil gets saltier as more groundwater evaporates, eventually ruining some spots for crops. Valliant said he thinks the higher water tables are the result of the Pueblo and John Martin reservoirs having changed the basic flow of the Arkansas River. The river no longer gets flushed out in high-flow periods and so the river bottom - and therefore the water table - have risen.

*Pueblo Chieftain 7/25/99*



### FLOOD MANAGEMENT

#### North Boulder flood plan on hold for now

A recent restudy of the flood plain surrounding Fourmile Canyon Creek found that in a big flood, the creek's potential for danger and destruction in North Boulder is strong. Without mitigation, a 100-year flood would spill its waters onto 65 acres previously thought to be out of the flood plain that includes two schools, 65 mobile homes, 50 houses, several businesses and a housing development. Instead of pursuing a plan to protect many residences and businesses from flooding, the Boulder City Council decided that the issue needed more study and a wider range of options for any action. Recent findings also mean that many homes were built in the flood plain unknowingly, at a time when the conventional wisdom was that there was no need to elevate them. The study and a proposed \$9.2 million project to protect properties from such a flood have sparked a maelstrom of controversy. The project would include moving roads, acquiring houses and widening the creek course. The council voted not to move forward with this plan but opted instead to study the entire flood plain from the creek's emergence from the canyon mouth to where it crosses the city limits.

*Boulder Daily Camera 06/07/99*



### GOCO FUNDS

#### \$40 million GOCO funds awarded

The Great Outdoors Colorado (GOCO) Board has awarded \$40.8 million in lottery proceeds to 13 Legacy projects. Nine of the projects previously received grants, while four are new, including two that will result in new state parks: **JL Ranch, \$8.6 million, Colorado State Parks and the City of Colorado Springs**--1,680 acres at the base of Cheyenne Mountain will become El Paso County's first state park; **Lone Mesa, \$4.8 million, Colorado State Parks**--three ranches north of Dolores will be purchased for a state park. The other two new projects are: **St. Vrain River Corridor, \$3.3 million, Boulder County**; and **Preserving Colorado Landscapes, \$4.5 million, Colorado Division of Wildlife and The Nature Conservancy**. The projects receiving additional Legacy funds are: **Yampa River System Project, \$3 million, Routt and Moffat counties**; **Division of Wildlife Statewide Wetlands Initiative, \$3 million**; **Colorado Riverfront Greenway Project, \$2.9 million, Mesa County**; **Gunnison Ranchland Conservation Project, \$2.5 million**; **Cache la Poudre/Big Thompson Rivers Project, \$2.5 million, Larimer and Weld counties**; **Clear Creek Project, \$2 million, Jefferson County**; **South Platte River Project, \$1.5 million, Denver**; **Sand Creek Corridor Project, \$1.35 million, Aurora, Commerce City and Denver**; **Pikes Peak Greenway Project, \$1 million, El Paso County**.



### HABITAT IMPROVEMENT

#### Fish climb ladders of success

In three years, a total of 42 endangered Colorado pikeminnow have swum through a fish passageway near Grand Junction. The federal government is so pleased with the results that it plans to build another. Three decades after the pikeminnow was pushed to the brink of



extinction by Western dam building, federal officials are spending millions to help the rare fish swim around the river-blocking structures. With an estimated population of 650 adult fish, the Colorado and Gunnison rivers around Grand Junction are home to the world's second-largest surviving population of pikeminnow, a species formerly known as the Colorado squawfish.

*Denver Post* 07/06/99

### INSTREAM FLOWS

#### **CWCB withdraws water right applications**

The Colorado Water Conservation Board has withdrawn its water right applications for base flows to protect endangered fish in the Upper Colorado River Basin. Instream flow water right applications were filed in 1995 for the Colorado River main stem and the Yampa River. The filings met significant opposition. Among the objections were fears that such water rights could be used to oppose future change of use of water exchange proposals. CWCB Director Peter Evans has proposed preparing for basin-by-basin meetings to learn how local government, water interests and the public believe the CWCB should govern water rights in the future. The CWCB is looking for input on the amendments to its "Instream Flow Rules and Regulations" that it wants to adopt by the end of the year.

*Natural Resource News*, 6/99

#### **As Frying Pan River swells, so do residents' concerns**

As the Frying Pan River swelled in early June with water intended to help recover endangered fish downstream, local residents unleashed a torrent of concerns upon federal officials in charge of the program. At a public meeting sponsored by the U.S. Bureau of Reclamation, representatives from the Basalt area expressed fears that, however beneficial ongoing water releases are for endangered fish, the tradeoffs might not be worth it. The USBR began increasing flows from Ruedi Reservoir as part of a coordinated effort to increase flows from Western Slope reservoirs for about 10 days to boost the water level on a 15-mile reach of the Colorado River from Rifle downstream. USBR officials said public safety is taken into account as it plans releases for endangered fish.

*The Glenwood Post* 06/03/99

### LITIGATION

#### **Water suit hits Forest Service**

A Teller County water district has sued the state and federal forest services for contaminating groundwater with an insecticide. The suit claims that the U.S. Forest Service used an insecticide called ethylene dibromide to kill mountain pine beetles before the Environmental Protection Agency declared EDB a known carcinogen in 1983. The spraying was stopped after the declaration. The suit also claims the agency crushed and buried drums that contained EDB at its Woodland Park Work Center facility located up the groundwater gradient from the water district's six wells. The contamination was first spotted in March 1994. In October 1996, the Department of Public Health ordered the wells shut and then ordered the water district to clean them up.

*Denver Post* 06/30/99

#### **Controversy over river water rights turbulent**

The debate over river use in Routt County is reaching a boiling point between ranchers and boaters. Boaters on the Yampa and Elk Rivers are being warned they could get sued for using the river in the wrong place. Until the Supreme Court makes a decision on what part of the river a property owner owns, Routt County has posted signs around county bridges to warn river users that fishing, boating or tubing through someone's private property could be grounds for civil trespass. The signs were posted and paid for at the request of the Routt County Cattlemen's Association. Some area landowners believe Colorado should adopt policies that have been practiced in Idaho, Montana, Washington, and Oregon. All states have similar laws that the property owner owns everything above the high water mark. Therefore, the river and its banks belong to everyone. Assistant Routt County Attorney Jonathan Knauss said the issue is between ranchers and boaters, and the county does not want to get involved.

*Steamboat Pilot* 06/09/99

### PEOPLE/AWARDS

**J. William MacDonald** has been appointed Regional Director for the Pacific Northwest Region of the U.S. Bureau of Reclamation. His office is located in Boise, Idaho. MacDonald formerly served as a Special Assistant to USBR Commissioner Eluid Martinez.

#### **Trinidad mine receives reclamation award**

The Basin Resources, Inc., Golden Eagle Mine will receive a 1999 Office of Surface Mining Excellence in Reclamation Award. The coal



mine, which is located in the Trinidad area, was recently reclaimed to a post-mining land use of wildlife habitat and is now the Bosque del Oso State Wildlife Area.

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*Natural Resource News*, 6/99



#### WATER DEVELOPMENT/SUPPLY

##### **A-LP district allows changes**

The Animas-La Plata Water Conservancy District is sending a further revised version of its A-LP Project to Gov. Owens in hopes of avoiding a lawsuit. Under the 1986 Colorado Ute Indian Water Rights Settlement, Ridges Basin Reservoir south of Durango must be completed by Jan. 1, 2000. Otherwise, the Southern Ute Indian Tribe and the Ute Mountain Utes have until Jan. 1, 2005, to decide if they will wait longer or repudiate the agreement and seek a new resolution of their claims in court on the Animas and La Plata rivers. The A-LP board voted to go forward with support for a revised Colorado Ute Indian Water Rights Settlement, despite the lack of irrigation facilities that would benefit non-Indian customers of the district.

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*Durango Herald* 06/08/99

##### **Developers: Water fee increase too much for Greeley homebuyers**

Some Greeley real estate agents told the area Water and Sewer Board that the decision to raise water fees from \$2,920 to \$8,386 for a standard water tap over the next four years will hurt people trying to buy homes because the fee increase will be passed on to buyers from builders. But the board stood by its decision, saying the fee is necessary to pay for the city's water, regardless of the consequences on affordable housing. Currently, the city's water department is funded solely by water rates and fees. Homebuilders are urging the board to consider other funding sources such as gasoline tax, real estate transfer tax or sales tax. Board members want to place the cost burden of expanding the water system on those responsible for prompting the expansion.

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*Coloradoan* 06/26/99



#### WATER QUALITY

##### **USDA/DOI call for watershed approach**

As called for by President Clinton's Clean Water Action Plan (CWAP), the Departments of Agriculture (Ag) and Interior (DOI) have introduced a working draft of a proposed Unified Federal Policy for a Watershed Approach to Federal Land and Resources Management. The draft was released on June 14, 1999 for public discussion and review. Official publication of the proposal, along with a 90-day public comment period, is anticipated later this summer. The proposed federal agency commitments include: using a science-based approach to watershed assessment; developing and implementing common procedures for delineating, assessing and classifying watersheds; and conducting watershed assessments for federally managed watersheds. Under the classification of improving watershed management, federal land management agencies propose to select specific watersheds as priorities for management and restoration; identify certain watersheds on federal lands for special protection; incorporate watershed management goals into plans and programs; improve watershed conditions through restoration and adaptive management; and assist states and tribes in developing science-based Total Maximum Daily Loads (TMDLs).

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*Western States Water*, 6/25/99

##### **Boulder water meets EPA standards**

To comply with a new mandate from the Environmental Protection Agency, water utilities around the nation are required to produce a standardized report, called a Consumer Confidence Report, on just what's in the water they provide. The report, which will be mailed to Boulder residents in October, will include an assessment of 1998 water quality from the source to levels of contaminants. The report will also include a notice that people who require different water quality standards than the majority of the population, such as the elderly, children or those with health problems such as cancer or HIV, should seek advice from their doctor about drinking water.

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*Boulder Daily Camera* 06/15/99

##### **Chemical spills in Castle Rock stream**

About a half pound of potassium permanganate — used to reduce iron in drinking water — discharged into a storm drain that empties into the gulch along Memmen Ridge near Castle Rock. The spill may have occurred because the chemical built up inside the town well, but the oxidizer never entered the town's drinking water. Firefighters dammed the gulch to prevent the contaminated water from moving downstream and hurting aquatic life. The cleanup will cost Castle Rock about \$10,000.

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*Denver Rocky Mountain News* 06/23/99



### City may have to upgrade its water system if rules change

Durango's drinking water meets state and federal water quality standards, but new treatment equipment may be needed if more stringent regulations are put into place. All new Environmental Protection Agency (EPA) water quality regulations that took effect this year have been met, but other regulations proposed could take effect in 2000 if approved by the EPA. City water meets the new Disinfection and Disinfection By-products Rule, which reduces the level of chemicals used to kill pathogens in drinking water. These chemicals may be carcinogenic in large amounts. This requirement must balance the community's need for clean water with the use of potentially harmful chemicals. Durango should continue to meet this requirement as long as the quality of untreated water does not change. If the rule is expanded to include precursors, organic chemicals that form carcinogens when combined with chlorine, the city may have to look to new purification techniques.

*Durango Herald* 06/08/99

### Shattuck cap challenge

After indication that the Shattuck radioactive-waste site was beginning to shift, meaning cleanup is failing, experts from the Environmental Protection Agency began examining the clay and rock cap at the Superfund site to determine if it is sinking. After review, the EPA claimed that the cap covering radioactive waste is sound, but the review was challenged because it was conducted by contractors involved in the cap's construction. Denver EPA officials decided in 1992 to mix more than 50,000 cubic yards of radioactive dirt with concrete and flyash and entomb it at the former chemical processing plant. Neighbors of the site have long contended the cap isn't sufficient to keep contamination from leaking into the water table. Monitors at Shattuck show no radioactivity is escaping into the air, but whether groundwater is being contaminated is not known. Area residents want the waste removed.

*Coloradoan* 06/26/99 *Denver Post* 06/10/99, 06/11/99, 06/30/99 07/01/99, 07/02/99

### Watershed committee wants regionalized authority: Larger districts becoming the norm

Potential degradation of the Roaring Fork River has the Garfield County Watershed Committee seeking a commitment from county commissioners. First, they want to form a watershed advisory board, similar to the county's planning commission, to review development proposals. And, they want the commissioners to support an abbreviated 208 plan, which will guide county watershed activity in the future. Small homeowner association operated systems and "mom and pop" systems used to be the norm along the Roaring Fork River. Lately, larger districts have started to form. As water regulations continue to become stricter, it will be more difficult for the smaller authorities to operate.

*Glenwood Post* 07/07/99

## WATER RIGHTS

### Aurora runs into stubborn water owners

Aurora owns 58 percent of the water supplied by the Rocky Ford Ditch Company and is trying to buy most of the remaining water rights, but the town of Rocky Ford and a Colorado Research Center say they won't give up their water to the growing suburb. The southern Colorado community uses its 13 shares of the water channeled through the ditch from the Arkansas River to supply drinking water, replace water pumped by city wells and replenish a lake when needed. CSU's Arkansas Valley Research Center uses its 12 shares to water crops used for research. A lot of the research depends on growing crops in the same spot for several years.

*Rocky Mountain News* 06/14/99

## WETLANDS

### Trio banks on wetlands plan

When developers destroy wetlands, they're required by the Clean Water Act to rebuild them either at the site or elsewhere in the same watershed. But often the wetland is small and it can be hard to find a place to build another one, so they are not replaced. Approximately 60 acres are not replaced every year. A group of three men near Erie, Colorado plan to answer this problem by creating the first privately owned "wetlands bank" in Colorado. Few things are more valuable than water in the West, and the inability to obtain water rights is one of the main reasons many smaller wetlands aren't replaced. The cost of water makes this an expensive wetlands bank. But cost aside, developers won't have the hassle of monitoring wetlands for years to make sure they're thriving. The bank will be monitored by its creators for 5 years and turned over, along with the water rights, to the town of Erie to be managed as a wetlands area.

*Denver Post* 06/27/99 07/07/99





 **WHIRLING DISEASE****Local hatchery free of whirling disease**

The Durango Fish Hatchery was formally certified as being free of the parasite that causes the deadly whirling disease, giving the go-ahead to resume stocking fish throughout Southwest Colorado. A \$75,000 renovation effort, part of the wildlife division's \$13 million hatchery renovation program, is being created with this year's clean record. Durango is the third division hatchery that has been certified as free of the parasite since the renovation program began two years ago.

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*Durango Herald and The Coloradoan* 06/09/99

 **MISCELLANEOUS****Will Great Lakes Water Become a Trade Commodity?**

With one-fifth of the world's freshwater located in the Great Lakes basin, it comes as no surprise that these waters are in high demand. The contentious issue of exporting Great Lakes water in bulk was elevated in international importance last spring when the Ontario provincial government granted the Nova Group, Inc., a permit to take up to 600 million liters of water a year from Lake Superior for export to Asia. The action resulted in a strong public outcry that revoked the permit. If bulk water proposals such as the one put forth by the Nova Group Inc., are accepted, a precedent will be set under the North American Free Trade Agreement (NAFTA). NAFTA makes exporting water an extremely complicated issue. If water is exported, both governments will be subject to investors' compensation suits if they later decide to stop or reduce exports for environmental reasons. Under NAFTA, companies have the right to file claim for lost investments and lost business opportunities.

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*Minnogram:* Minnesota Water Resources Center 06/99

**Western Water Policy Review Advisory Commission**

Interior Secretary Bruce Babbitt recently spoke for the first time publicly about the report of the Western Water Policy Review Advisory Commission, *Water in the West Challenge for the Next Century*, which was published in June 1998. He said that while he found the report to be generally excellent, he also found fault with its "governance" recommendations. He emphasized adequate water supplies taking into consideration: (1) conservation and efficiency; (2) water transfers, allowing the market to work so water can move to higher valued uses; and (3) current storage, which we must have because of the continuing threat of droughts in the West. Babbitt said more emphasis is being placed on protecting river systems and riparian habitat, and people are coming together at the local level to address complex water problems on an ad hoc basis. He added that such efforts should not be placed in some new federal framework.

The Commission's report suggests that in order to realize the objectives of restoring aquatic ecosystems and achieving sustainable use, new institutions would be necessary. Specifically, the Commission's vision for new governance included federal resource agencies adopting practices which would encourage the growth of collaborative watershed groups. In addition, federal agencies would develop a cooperative process at the river basin level — utilizing existing entities where they exist and involving governmental leaders and "other stakeholders as appropriate" — to find jointly supported solutions to water problems.

Denise Fort, the Commission Chair, responded by explaining rather than defending the Commission's report. She indicated that the desire for recommendations on governance arose from the genesis of the Commission. Former Senator Mark Hatfield of Oregon, the primary sponsor of the bill authorizing the Commission, was frustrated with the myriad federal programs and resources spread across numerous federal agencies to address various water resource problems and needs. The Commission's recommendations were designed to help coordinate federal efforts at the basin level. She admitted, however, that given all the comments that they had received regarding the report, both favorable and unfavorable, virtually no one liked the governance recommendations.

There has been recent debate surrounding the Secretary regarding surplus waters in the Colorado River. The Bureau of Reclamation conducted a series of meetings to collect comments on criteria for how and when the Secretary should declare a surplus. California is entitled to 4.4 million acre-feet of Colorado River water each year, but since the 1970s it has been using more than that. Today, California draws about 5.3 million acre feet per year. California's additional use of the river has been possible largely because of surpluses from Upper Basin states that are not using their allotted share of the river and because the past 20 years has seen above-average precipitation.

Copies of the WWPRAC report are available online at <http://www.den.doi.gov/wwprac> or send requests to WWPRAC P.O. Box 25007, D-5001, Denver, Colorado 80225-007; (303) 445-2100; fax (303) 445-6465.

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*Western States Water* 06/11/99 *Coloradoan* 06/26/99



# CALLS FOR PAPERS



## ANNOUNCEMENT & CALL FOR PAPERS

### WATERSHED MANAGEMENT 2000 CONFERENCE

#### Science and Engineering Technology for the New Millennium

June 21-24, 2000

Colorado State University, Fort Collins, Colorado

Colorado State University, Fort Collins, Colorado, will host the eighth in a series of American Society of Civil Engineers Watershed Management Symposia. The focus will be on state of the art advancements in watershed management for the more challenging problems decisionmakers will face in the 21<sup>st</sup> century and beyond. The symposia will coincide with a major conference of the U.S. Committee on Irrigation and Drainage and an international conference of alumni of the Colorado State University Water Resources program.

The symposia is sponsored by American Society of Civil Engineers Water Resources Engineering Division and Water Resources Planning and Management Division. Numerous other professional societies and government agencies will participate, including: the American Water Resources Association, the American Society of Agricultural Engineers, the Society for Range Management, the Society of American Foresters, the Soil and Water Conservation Society, the International Erosion Control Association, the Bureau of Reclamation, the Corps of Engineers, the Bureau of Land Management, the Natural Resources Conservation Service, the Forest Service, the US Geological Survey, the Environmental Protection Agency, the National Park Service and the Office of Surface Mining, Regulation and Enforcement. Abstracts for technical papers are solicited. Topic areas will include but not be limited to:

|  |   |
|--|---|
| State of the Art Studies in Watershed Management | Sharing Watershed Information by Internet                                       |
| Watershed Analysis and Planning                  | Channel Hydrology and Watershed Management                                      |
| Modeling of Runoff, Sedimentation and Pollutants | Stormwater Runoff Management Regulation   |
| Conservation at the Watershed Level              | Design and Maintenance of Irrigation and Drainage Systems in Western Watersheds |
| Impacts of Urbanization and Vegetation Change    | Watershed Management - Historical Program Reviews                               |
| Watershed Management Education                   | Watable Management  |
| Decision Support Systems in Watershed Management | Design Criteria for Wetlands to Treat Water Quality and Drainage                |
| GIS Applications in Watershed Sciences           | Governmental Policy and Actions: Riparian and Wetlands Management               |
| Land Use Effects on Hydrology                    | ESA, TMDLs, NAWQA and NPRES   |

Abstracts should not exceed 500 words and should be typed in a double spaced format. If dual or multiple authors submit an abstract, one should be designated as the contact. The mailing address, daytime phone number, fax number and e-mail address for all authors should be provided. Three copies of the abstracts should be submitted by mail no later than **August 31, 1999**, to either address below:

Donald K. Frevert, Mail Code D-8510  
 US Bureau of Reclamation - Technical Service Center  
 PO Box 25007  
 Denver, Colorado 80225  
 phone: 303-445-2473  
 fax: 303-445-6351  
 e-mail: [dfrevert@do.usbr.gov](mailto:dfrevert@do.usbr.gov)

Marshall Flug  
 US Geological Survey - Midcontinent Ecological Science Center  
 4512 McMurry Avenue  
 Fort Collins, Colorado 80525 - 3400  
 phone: 970-226-9391  
 fax: 970-226-9230  
 e-mail: [marshall\\_flug@usgs.gov](mailto:marshall_flug@usgs.gov)

Notification of Acceptance for the conference will be sent out by October 31, 1999. Authors whose papers are declined will also be notified by this date. Decisions on acceptance will be based on the information provided in the abstract. Authors whose abstracts are accepted will be required to submit their papers by February 28, 2000. A non refundable \$100 preregistration fee will be due for all accepted abstracts by December 15, 1999. This fee will be credited toward the conference registration fee. All published materials and presentations will be in English.

Questions? Contact the American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, VA 20191-4400, Phone: 800-548-2723 or 703-295-6300, Fax: 703-295-6144.

Author Policy: ASCE does not normally reimburse authors for expenses incurred - either in the preparation of abstracts or final papers, or for travel to the conference. Authors who submit final papers for the conference proceedings imply agreement to register for the conference at the appropriate fee, to attend the conference and to present their papers in person.

# National Monitoring Conference 2000

April 25-27, 2000  
Hyatt Regency on Town Lake  
Austin, TX

## Call For Papers

Monitoring *for*  
the Millennium

In 1997, the interagency National Water Quality Monitoring Council (NWQMC) was established to implement a voluntary, integrated, nationwide strategy to improve water resource monitoring, assessment, and reporting. It sponsored its first conference in Reno, Nevada in 1998. Over 400 attendees participated in workshops and discussions on a variety of topics related to water monitoring issues.

People involved with water monitoring are invited to submit abstracts for papers or posters. Submissions should relate to the following topic areas:

- |  |   |
|--|---|
| 1) Water information strategies              | 4) Data management and accessibility                  |
| 2) Data collection methods and comparability | 5) Public awareness and stakeholder outreach          |
| 3) Institutional collaboration               | 6) Monitoring interactions among watershed components |



Abstracts Due September 1, 1999

<http://nwqmc.site.net>

## MEETINGS

### USGS SYMPOSIUM On Research Related To

### ENVIRONMENTAL EFFECTS OF ANIMAL FEEDING OPERATIONS (AFOs)

Fort Collins, August 30 – September 1, 1999

This open symposium will examine the complex issues related to if and how waste products from AFOs may be affecting water resources and ecological health. Scientists from Colorado State University, Ft. Collins, are collaborating to provide a field trip to livestock operations and discuss some of their research. An objective of this meeting is to provide an interactive forum for information and discussion on the latest research dealing with the effects of AFOs on water resources and human and ecological health, including information on state-of-the-art methods and tools that are being used or developed to aid AFO research. Presentations will cover a wide range of multidisciplinary research and field studies in order to gain an understanding of what is and is not known on this topic. Areas to be covered include: Nutrients, Antibiotics and other pharmaceuticals, Bacteria, viruses and protozoa, Trace elements, Source finger-printing methods, and Air quality.

For additional information, log on to <http://water.usgs.gov/owq/AFO/index.html>.

### 19<sup>th</sup> ANNUAL HYDROLOGY DAYS August 16-20, 1999 Colorado State University — Fort Collins, CO

The objective of the Annual Hydrology Days is to provide a forum for hydrologists and hydrology students to get acquainted and to share problems, analyses, and solutions.

Hydrology Days 1999 will be dedicated to the former students and worldwide professional colleagues of Hubert Morel-Seytoux. This will be the last year that Professor Morel-Seytoux will be the primary organizer of the group.

The conference provides an opportunity for students to present papers in a friendly atmosphere, within the structures of a fully professional conference. The five-day program will include volunteered papers, invited papers, student papers, and a poster session. Awards and prizes will be given for the best student papers as oral or poster presentations in the following categories: B.S., M.S. and Ph.D.

For program information and registration forms contact H.J. Morel-Seytoux at HYDROLOGY DAYS, 57 Selby Lane, Atherton, CA 94027-3926; Phone and FAX 650/365-4080; or e-mail [hydroprose@batnet.com](mailto:hydroprose@batnet.com).

For registration/general information contact: Ms. Marilee Rowe (Hydrology Days), Dept. of Civil Engr., Colorado State University, Fort Collins, CO 80523-1372; Phone 970/491-5247; FAX 970/491-6787; e-mail [mrowe@engr.colostate.edu](mailto:mrowe@engr.colostate.edu).

REGISTRATION FEES: \$240 by June 30, 1999; \$270 after June 30, 1999. Registration includes technical sessions, exhibits, posters, two lunches, refreshment breaks and two copies of the proceedings. One-day packages are available.

DEADLINE: May 3, 1999.

Website:

<http://www.engr.colostate.edu/depts/ce/>.