Colorado Water

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

DECEMBER 1997

GROW WITH THE FLOW:

8th South Platte Forum Tackles Growth and Water in the South Platte Basin

See Page 12

Water professionals and faculty come together to ponder problem solutions for the basin. From left: Kevin Dennehy, U.S. Geological Survey; John Stednick, Professor of Earth Resources, CSU, and Todd Harris, Metro Wastewater Reclamation District.

Colorado State University

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COLORADO WATER

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Editor Shirley Miller Writers: Laurie Schmidt and Maile Ceridon

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Robert C. Ward, Director

(Please note that all 1996 issues of COLORADO WATER should be Vol. 13 and all 1997 issues should be Vol. 14)

EDITORIAL

CWRRI'S EVOLVING MISSION

Editorial by Robert C. Ward

In recent years a number of water management organizations have undergone a strategic planning process. These plans, collectively, provide insight into changes taking place in water management today. Given that the Colorado Water Resources Research Institute (CWRRI) is currently implementing provisions of its 1997 reauthorization by the Colorado legislature (HB 97-1218), it is necessary for CWRRI to understand the changes and incorporate them into its future operational structure.

The 1996-2005 Strategic Plan for the U.S. Geological Survey utilizes an "increasing emphasis – decreasing emphasis" summary to capture the salient changes affecting the nature of its work over the next 10 years. I would like to use this same framework to capture the changes I see affecting higher education as it attempts to connect its water education and research activities to the needs of Colorado's water users and managers. The points summarized below are derived not only from the USGS plan, but also from plans of other federal, state and local water management agencies.

Decreasing Emphasis	Increasing Emphasis
- traditional water disciplines	- non-traditional water disciplines
- basic research	- applied research
- single water use studies	- integrated watershed studies
- avoidance of controversial issues	- engaging in controversial issues
- results available after research	- information available during research
- paper reports	- electronic information
- refereed journal article product	- information for water users/mangers
- investigator-driven studies	- issue-driven studies
- wilderness area studies	- studies involving population centers
- distribution and quantity of resources	- quality and accessibility of resources
- restoration studies	- mitigation studies

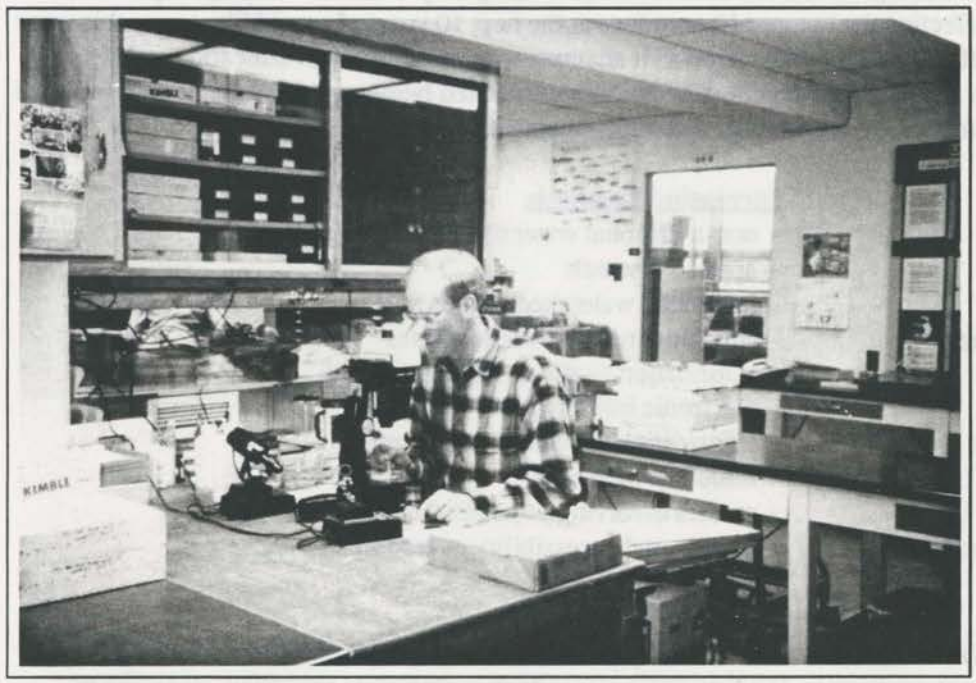
Such changes do not mean that there will no longer be a need for the "pure scientist" who follows his/her instincts wherever they lead. Nor does it mean that we will not continue to conduct water research after proposals are "peer" reviewed by fellow scientists. Such research tends to follow the collective interests/instincts of disciplinary scientists. How does society, in general, and higher education, in particular, identify the research interests of water users/managers and address them? The changes, very briefly summarized above, indicate that a number of water management organizations, in looking to the future, are calling into question some basic tenets of higher education (e.g., disciplinary research and refereed journal articles). As CWRRI proceeds to implement the provisions of HB 97-1218, I will be discussing these, and other changes taking place, with faculty and Colorado water users and managers. The goal is to ensure that the new CWRRI responsively serves both the needs of Colorado's water users and managers as well as the research and education objectives of faculty in a mutually beneficial manner.

RESEARCH

CSU'S LARVAL FISH LABORATORY UNIQUE AMONG FISHERY RESEARCH LABS

by Laurie Schmidt

Many research studies aimed at producing data to steer endangered fish recovery programs focus on examining the fish during their adult life stage. The Larval Fish Laboratory (LFL) at Colorado State University, however, takes a bit of a different approach. The lab was established in 1978 within CSU's College of Forestry and Natural Resources. Dr. Clare Carlson, then professor in the Fishery and Wildlife Department, and Darrel Snyder, who was a graduate student at the time and now serves as the lab's collection curator, opened the lab to provide a research facility for studying the early life of fishes with an emphasis on Colorado's endangered species.



Dr. Kevin Bestgen, Director of the Larval Fish Lab, which now houses about 3 million specimens of fish eggs, larvae, and early juveniles.

When the LFL opened, little was known about the taxonomy of early life stages of fishes in Colorado's river basins. Information regarding the distribution, abundance, reproductive habits, and various life stages of fishes was limited, at best. According to Dr. Kevin Bestgen, research associate and director of the Lab, various individuals and organizations that donated samples during the early years of the Lab gave its data inventory a real boost. The Lab now houses about three million specimens of fish eggs, larvae, and early juveniles. These holdings represent over 200 North American freshwater and anadromous species from across the continent.

Sampling and tracking tools, such as electrofishing and radiotelemetry, have also contributed to the Lab's acquisition of information related to the life history of endangered fish species.

One of the most significant projects the Lab has been involved in is looking at the effects of the Flaming Gorge Dam on populations of four endangered fishes, including Colorado squawfish, in the Colorado River Basin. This inter-agency study, which began in 1992, has taken a life-history stage approach to examining what effects stressors, such as non-native species and flow variations, have on endangered squawfish at specific life stages. One component of the study involved conducting Lab experiments that described predation rates and combining results with growth rate information. The ultimate goal was to assemble a model that would track growth and survival of early life stages. Although the model has been developed specifically for squawfish, it has a general application for the management of all endangered species as well.

"Our main goal is to assess factors that limit the distribution and abundance of endangered fishes to aid managers with recovery

activities," said Bestgen. He cited two factors that are generally responsible for the declining status of native fishes. The first is habitat modification, and the other is the introduction of non-native fishes. According to Bestgen, the effects of non-native species may be equal to or more severe than those associated with habitat modification or loss, although they aren't always as obvious.

Another research area of the Larval Fish Laboratory is examining contaminants as stressors on fish that are exposed to them. One study, conducted at the Rocky Mountain Arsenal, examined the amounts of energy fish expend to offset the effects of chemicals they are exposed to. According to LFL research associate Dr. Dan Beyers, "If a fish is forced to expend energy on compensating effects of chemical exposure, then it's going to have less energy for growth and reproduction." Through this type of research, the Lab provides an important interface between fish ecology and toxicology.

"We've expanded our horizons in recent years," said Bestgen, "but there are still a variety of issues we'd like to look at here in the Lab." One of these is investigating the ecology and status of eastern plains fish. According to Bestgen, the South Platte River is highly regulated and used for many purposes, including irrigation and municipal water supplies. Fish issues could become a concern in the future. "We know very little about the biology of fish populations in the eastern plains," said Bestgen. "We should learn all we can about what those species of fish need to thrive **before** they become threatened or endangered."

With strong ties to the Department of Fishery and Wildlife Biology, the Larval Fish Lab is wholly supported through contract and grant monies. It is staffed by research associates, technicians, and also provides work-study opportunities for fishery biology students.

In addition, scientists from many different agencies, including the Colorado Division of Wildlife, the U.S. Fish and Wildlife Service, the U.S. Bureau of Reclamation, the U.S. National Park Service, the U.S. Geological Survey, the Utah Division of Wildlife Resources, the New Mexico Department of Game and Fish, the Arizona Department of Game and Fish, The Nature Conservancy, Heritage Program, and cities and municipalities work with the Larval Fish Lab on a cooperative basis.

Two Colorado River endangered species -- the Humpback chub (foreground) and the Razorback sucker (background) are a focus of the Larval Fish Lab's recent research activities

The Larval Fish Lab's emphasis on research related to early-life history stages and fish reproduction is unique among North American university, government, and private ichthyological research laboratories. "One of our primary missions is to provide reliable scientific data to those charged with managing aquatic resources. But we're not the managers," said Beyers. "We just want to give the managers the information they need to make wise decisions."

WATER RESEARCH AWARDS

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

Colorado State University, Fort Collins, CO 80523

Evaluation of the Interagency Standardized Monitoring Program Technique (ISMP), Kevin R. Bestgen, Fishery & Wildlife Biology. Sponsor: Colorado Division of Wildlife.

Douglas Preble's Meadow Jumping Mouse, Christopher A. Pague, Fishery & Wildlife Biology. Sponsor: Colorado Division of Wildlife.

The Effects of Cattail Invasion on Prairie Wetlands, David J. Cooper, Fishery & Wildlife Biology. Sponsor: Colorado Department of Transportation.

Reduction of Pesticide Use in Colorado — Commercial Greenhouses, Karen Lynn Panter, Horticulture & Landscape Architecture. Sponsor: Colorado Dept. of Public Health & Environment.

Ecological Modeling in Support of County Decision Making, N. Thompson Hobbs, Natural Resource Ecology Lab. Sponsor: Colorado Division of Wildlife.

Wetlands Initiative, William Given, Fishery & Wildlife Biology. Sponsor: Colorado Department of Natural Resources.

Methodologies for Design of Soil Covers for Waste Disposal Sites, Steven R. Abt, Civil Engineering. Sponsor: Nuclear Regulatory Commission.

Evaluation of NEXRAD Doppler Weather Radar Algorithms & Mesoscale Analysis & Prediction, Thomas H. Vonderhaar, CIRA (Dept. of Atmospheric Science). Sponsor: NOAA-National Oceanic & Atmospheric Admin.

A Multisensor Satellite Study of Upper Tropospheric Water Vapor & Clouds, Graeme L. Stephens, CIRA (Dept. of Atmospheric Science). Sponsor: NOAA-National Oceanic & Atmospheric Admin.

Impact of Enhanced Cloud Condensation Nucleus Concentrations..., Graham Feingold, CIRA (Dept. of Atmospheric Science). Sponsor: NOAA-National Oceanic & Atmospheric Admin.

CIRA Activities & Participation in DMSP Satellite Processing & Analysis, Thomas H. Vonderhaar, CIRA (Dept. of Atmospheric Science). Sponsor: NOAA-National Oceanic & Atmospheric Admin.

Temperature, Precipitation & Wind Continuity with Automated Surface Observing System-ASOS, Thomas B. McKee, CIRA (Dept. of Atmospheric Science). Sponsor: NOAA-National Oceanic & Atmospheric Admin.

Hydrologic Forecasting System Evaluation & Development Support, Lynn Johnson, CIRA (Dept. of Atmospheric Science). Sponsor: NOAA-National Oceanic & Atmospheric Admin.

GOES Science Improvements, Thomas H. Vonderhaar, CIRA (Dept. of Atmospheric Science). Sponsor: NOAA-Natl Oceanic & Atmospheric Admin.

Improving Manure Management to Protect Water Quality in the Southwestern U.S., Jessica G. Davis, Soil & Crop Sciences. Sponsor: Utah State University.

Toxicity Tests on Leachate for Mine Waste Characterization, Stephen A. Flickinger, Fishery & Wildlife Biology. Sponsor: GS-State Partnerships.

Pallid Sturgeon: Morphological Redescription & Diagnosis of Larvae Based on a New Gene... Darrel E. Snyder, Fishery & Wildlife Biology. Sponsor: USFWS-Fish & Wildlife Service.

Measuring the Value of Threatened & Endangered Species, John B. Loomis, Agricultural & Resource Economics. Sponsor: Bureau of Reclamation.

Report Describing the Snowfall & Snowpack Density for the United States, Thomas B. McKee, Atmospheric Science. Sponsor: DOI-Bureau of Reclamation.

Century Erosion Study, Dennis Ojima, Natural Resource Ecology Lab. Sponsor: USGS-Geological Survey.

Establishment of Baseline Water Quality Conditions in the National Park Service, Judith L. Hannah, Earth Resources. Sponsor: NPS-National Park Service.

Development of Environmental Contaminant Encyclopedia, John D. Stednick, Earth Resources. Sponsor: NPS-National Park Service.

Precipitation & Sediment Transport in the Rio Puerco Basin, William R. Cotton, CIRA (Dept. of Atmospheric Science). Sponsor: USGS-Geological Survey.

Measurement of Mercury Deposition at Chassahowitzka & Okefenokee National Wildlife Refuge..., David M. Swift, Natural Resource Ecology Lab. Sponsor: NPS-National Park Service.

Recreation Management of Western Water, Glenn E. Haas, Natural Resource Recreation & Tourism. Sponsor: Bureau of Reclamation.

Exposure to Metals in Albuquerque Constructed Wetland Test Cells, Howard S. Ramsdell, Environmental Health. Sponsor: USGS-Geological Survey.

Investigation of Baseline Conditions & Potential Effects of Acid Mine Drainage on Water..., Bruce A. Wunder, Biology. Sponsor: National Biological Survey.

Hydrologic Effects of the Grand Ditch on Rocky Mountain National Park, Lee H. MacDonald, Earth Resources. Sponsor: NPS-National Park Service.

Toxicological Studies at the Eastern Municipal Water District Wetlands, Hemet, CA, .Bruce A. Wunder, Biology. Sponsor: National Biological Survey.

Ecology of Western Reservoirs, Darrell G. Fontane, Civil Engineering. Sponsor: National Biological Survey.

Water Quantity/Routing Model Development Klameth River Basin, Oregon & California, Marshall Flug, Civil Engineering. Sponsor: National Biological Survey.

Federal Clean-Up Assistance, Eric P. Bergersen, Cooperative Fish & Wildlife Research. Sponsor: USGS-Geological Survey.

Partitioning of Ecosystem Respiration & Vectors of Water Loss..., Eugene F. Kelly, Soil & Crop Sciences. Sponsor: NASA-National Aeronautics & Space Admin.

Study of the Role of Clouds in the Relationship Between Land Use/Land Cover & the Climate..., Stanley O. Kidder, CIRA (Dept. of Atmospheric Science). Sponsor: NASA-Marshall Space Center.

VEMAP Phase II (Vegetation/Ecosystem Modeling & Analysis Project), Dennis Ojima, Natural Resource Ecology Lab. Sponsor: National Aeronautics & Space Admin.

Field to Farm to Ecosystem Scale Decision Support Models, Jose D. Salas, Civil Engineering. Sponsor: USDA-ARS-Agricultural Research Service.

Field Studies & Modeling of Cropping Systems & Their Impact on Water Quality..., Gary A. Peterson, Soil & Crop Sciences. Sponsor: USDA-ARS-Agricultural Research Service.

U.S. Agroecozones using GIS Colorado, Edward T. Elliott, Natural Resource Ecology Lab. Sponsor: USDA-ARS-Agricultural Research Service.

The National Atmospheric Deposition Program (NRSP-3), David M. Swift, Natural Resource Ecology Lab. Sponsor: USDA-CSRS-Coop. States Research Service.

Operational/Management Technical Support Offpost Pump & Treat System, James W. Warner, Civil Engineering. Sponsor: ARMY Rocky Mountain Arsenal.

Snow Distribution & Runoff Forecasting, Kings River Basin, California, Kelly J. Elder, Earth Resources. Sponsor: DOD-ARMY-Corps of Engineers.

Optimum Dimensions of Sediment — Basin Preliminary Investigation, Daniel Gessler, Civil Engineering. Sponsor: ARMY-Corps of Engineers.

Wetland & Endangered Species Survey, Support for Fort McCoy, Wisconsin, Robert B. Shaw, Forest Sciences. Sponsor: ARMY-Corps of Engineers.

Numerical Model Study of Off-Channel Sediment Storage Area, Daniel Gessler, Civil Engineering. Sponsor: ARMY-Corps of Engineers.

Numerical Model Study of Medora Crossing, Daniel Gessler, Civil Engineering. Sponsor: ARMY-Corps of Engineers.

Clouds & Water Vapor in the Climate System: RPA & Satellites, Graeme L. Stephens, Atmospheric Science. Sponsor: Harvard University.

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

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

Uncertainty & Risk Analysis Under Extreme Hydrologic Events, Jose D. Salas, Civil Engineering. Sponsor: National Science Foundation Engineering Grant.

The CSU-CHILL Radar Facility, Steven A. Rutledge, Atmospheric Science. Sponsor: National Science Foundation — Geosciences.

Interdisciplinary Approaches to Identification & Mitigation of NPS Water Quality Impacts, John D. Stednick, Earth Resources. Sponsor: University of Wyoming.

Clouds & Ocean-Atmosphere Interactions in the Pacific Basin, David A. Randall, Atmospheric Science. Sponsor: Department of Energy.

Regional Climate Change Impacts on the Great Plains, Dennis Ojima, Natural Resource Ecology Lab. Sponsor: University of California at Davis.

Effects of Sediment Contaminants on Macroinvertebrate & Fish Assemblages on Lower Lakes, William H. Clements, Cooperative Fish & Wildlife Research. Sponsor: USFWS-Fish & Wildlife Service.

Inventorying & Monitoring Natural Resources Status & Trends in the National Park System, Jim C. Loftis, Chemical & Bioresource Engineering. Sponsor: DOI-NPS-National Park Service.

Validating Alternative Manure Management Systems, Reagan M. Waskom, Soil & Crop Sciences. Sponsor: American Farm Bureau Research Foundation.

Effectiveness of Pollution Prevention Surveys at National Parks, Harry W. Edwards, Mechanical Engineering. Sponsor: EPA-Pollution Prevention Grants Program.

Global Climate Change: Emissions, Control & Economic Analysis, William J. Parton, Natural Resource Ecology Lab. Sponsor: RCG/Hagler, Bailly, Inc.

Turfgrass Production, Anthony J. Koski, Horticulture & Landscape Architecture. Sponsor: Jacklin Seed Company.

Consumptive Use Model, Luis Garcia, Chemical & Bioresource Engineering. Sponsor: Riverside Technology, Inc.

Geographic Information System for Agricultural Chemicals Exposure, John R. Nuckols, Environmental Health. Sponsor: Westat, Inc.

Exploring Shifts in Value Orientations Toward the Natural Environment, Michael J. Manfredo, Natural Resource Recreation & Tourism. Sponsor: US Department of Agriculture.

Develop Updated & Improved Estimates of Recreation Values, John B. Loomis, Agricultural & Resource Economics. Sponsor: USDA-USFS-Rocky Mountain Experiment Station.

An Assessment of the Demand & Supply of Wilderness in the United States, John B. Loomis, Agricultural & Resource Economics. Sponsor: USDA-USFS-Forest Research.

Water Quality & Ecosystem Studies in Northwest Alaska, Daniel E. Binkley, Forest Sciences. Sponsor: USDA-USFS-Forest Research.

Efficiency of a Biotic System for Remediating Radionuclide Contamination, Floyd W. Whicker, Radiological Health Sciences. Sponsor: University of Georgia.

Foraging Behavior and Population Dynamics of Beaver in Regulated and Unregulated Arid Riparian Ecosystems, Kenneth R. Wilson, Fishery & Wildlife Biology. Sponsor: USGS-Biological Resources Division.

The University of Colorado, Boulder, CO 80309

A Circulation Model of the Western Pacific Marginal Seas, Lakshmi Kantha, Aerospace Engineering. Sponsor: Department of the Navy.

Phase Chemistry of Tank Sludge Residual Components, Kathryn Nagy, Geological Sciences. Sponsor: Department of Energy.

Cooperative Agreement for Information Management of Hydrologic and Reservoir Data, Rene Reitsma, Civil, Environmental, and Architectural Engineering. Sponsor: Department of the Interior, Bureau of Reclamation.

Improving the Predictability of Polar Climate Through the Assimilation of Remotely-Sensed Data, James Maslanik, Aerospace Engineering.Sponsor: National Aeronautics and Space Administration.

Variations in GPS Time Series: A Study of Hydrological Loading Effects, Kristine Larson, Physics. Sponsor: National Aeronautics and Space Administration.

Satellite Remote Sensing of Ecosystem Structural and Functional Change in Spatially Heterogeneous Regions, Carol Wessman, Environmental, Population and Organismic Biology. Sponsor: National Aeronautics and Space Administration.

El Nino Prediction Using Heuristic Algorithms, Peter Webster, Astrophysical and Planetary Sciences. Sponsor: National Aeronautics and Space Administration.

National Conference on Climate Change, Climate Variability, and Water Resources Management, Kenneth Strzepek, Civil, Environmental, and Architectural Engineering. Sponsor: National Science Foundation.

The Pacific Profiler Network: Tropical Dynamics Research, Susan Avery, Electrical and Computer Engineering. Sponsor: National Science Foundation.

An Opportunity to Profile State Parameters and Winds Near the Northern Peruvian Coast During a Large El Nino, Ben Balsley, Electrical and Computer Engineering. Sponsor: National Science Foundation.

A Clearinghouse on Natural Hazards Research and Applications, Dennis Mileti, Sociology. Sponsor: National Science Foundation.

Climate Change of the Last 500 Years: Simulations Versus Data, Jonathan Overpeck, Geological Sciences. Sponsor: National Science Foundation.

Drought in the Australian Outback: Milankovitch and Anthropogenic Forcing of the Australian Monsoon, Gifford Miller, Geological Sciences. Sponsor: National Science Foundation.

Labrador Sea Variability Over Decade to Millennial Time Scales, Jonathan Overpeck and Gifford Miller, Geological Sciences. Sponsor: National Science Foundation.

Patagonia Lake Drilling Project (PATO): Phase I, Vera Markgraf. Sponsor: National Science Foundation.

Public Policies Affecting Competition for Western Ranchlands, William Riebsame, Geography. Sponsor: American Farmland Trust.

Divergence Over the Coare Region, Leslie Hartten. Sponsor: University of New Mexico.

Reservoir Stratigraphy and Its Controls on Reservoir Architecture and Performance: An Investigation of Key Surfaces and Fabrics in Marginal Marine Environments, Andrew Pulham, Geological Sciences. Sponsor: Various Oil Companies.

Operation of the Snow and ice Distributed Active Archive Center, Roger Barry, Vince Troisi, and Ronald Weaver, Geography. Sponsor: National Aeronautics and Space Administration.

Alluvial Architecture and Floodplain Paleosols: Field Evaluation of Theoretical Models, Mary Kraus and Andrew Pulham, Geological Sciences. Sponsor: National Science Foundation.

Late Quaternary Ice Sheet Extent, Chronology, and Paleoceanography, East Greenland Margin/Denmark Strait: Implications for the Arctic and North Atlantic Oceans, John Andrews and Anne Jennings, Geological Sciences. Sponsor: National Science Foundation.

Thermodynamics and Structural Studies of Hydrophobic Protein Cores Created by Rational and Combinational Techniques, Deborah Wuttke, Chemistry and Biochemistry. Sponsor: American Chemical Society/Petroleum Research Fund.

Investigation of Soil Aquifer Treatment for Sustainable Water Reuse, Gary Amy, Civil, Environmental and Architectural Engineering. Sponsor: Arizona State University.

Regional Attributes for the Colorado Front Range: Niwot Ridge/Green Lakes Valley and The Shortgrass Steppe, Carol Wessman, Population and Organismic Biology. Sponsor: Oregon State University.

Development of Safe and Rapid Biofilm Inoculum Protocol to Enhance Commercialization of Biological Processes for Drinking Water Treatment, Joann Silverstein, Civil, Environmental, and Architectural Engineering. Sponsor: Colorado Advanced Materials Institute.

Histological Stream Standards, David Norris, Population and Organismic Biology. Sponsor: Division of Wildlife.

Salt, Faults, and Minibasins: Geometry, Evolution and Interaction, Mark Rowan, Bruce Trudgill, and Paul Weimer, Geological Sciences. Sponsor: Various Oil Companies.

The above list includes new research projects and projects that received supplemental funding.

MEETING BRIEFS

GROW WITH THE FLOW: GROWTH AND WATER IN THE SOUTH PLATTE BASIN

A Summary of the 1997 South Platte Forum
October 29-30, Longmont, Colorado

by Laurie Schmidt

The 1997 South Platte Forum was held at the Raintree Plaza Conference Center in Longmont, Colorado on October 29-30. This year's Forum focused on the timely issue of growth in the South Platte River Basin. Rapid growth in this region has led to increasing conflicts over competing uses of water. Agriculture, industry, urban development and recreation are all placing demands on South Platte water supplies. In addition, there is an increasing realization of the need to preserve the river's natural ability to provide habitat for wildlife.

Forum participants included, from left, Chuck GrandPre, Colorado Division of Wildlife; Barbara Kirkmeyer, Weld County Commissioner; and Gene Schleiger, Northern Colorado Water Conservancy District

Resolving these conflicting demands requires compromises and unique thinking. The goal of this year's conference was to present the many differing viewpoints on these complicated issues and to provide a forum for the exchange of ideas and information.

On Wednesday, the Forum began with a novel session that looked at water development in the South Platte Basin from two unique perspectives. The "Land of Plenty" panel asserted that water development is necessary to meet the needs of future population growth. Lee Rozaklis, Chief Engineer, Hydrosphere, presented new data that suggests that there are ample sources to meet the basin's future water needs (please refer to Rozaklis' talk in its entirety in this issue of ***Colorado Water***). The "Land of Depletion" panel presented an opposing viewpoint, questioning whether there is enough water in the state to meet all the competing demands while still protecting the environmental integrity of the basin.

Colorado Senator Hank Brown was the keynote luncheon speaker on Wednesday. Senator Brown focused on issues related to growth and environmental impacts, asserting the need for quality research and long-term planning to maximize scarce water resources. He also discussed the urgency of educating the public to dispel the myth that halting water storage projects will prevent growth. "You can put a stop to new water projects, but that's not going to put a stop to growth," he said.

On Thursday, Colorado Senator Don Ament gave the morning keynote address, presenting his perspective on South Platte development issues. Senator Ament stated that during the past century, western water projects have provided a mechanism for flood control, hydroelectric power, irrigation, metropolitan water supplies, and an overall improved quality of life. He appealed to audience members to work together to balance the competing demands for water, saying, "Don't come to the table with your mind already made up. Come ready and willing to resolve the issues."

Dick Wolfe, State Engineer's Office, and Nolan Doesken of CSU's Climate Center exchange thoughts at the South Platte Forum

Other Forum sessions addressed a variety of South Platte Basin issues, including the South Park Conjunctive Use Project, the effects of development on endangered/declining species, urban encroachment into traditionally rural/ farming areas, and designation of the South Platte as a National Wild and Scenic River.

Initiated in 1989, the South Platte Forum has provided an avenue for the multi-disciplinary exchange of information and ideas essential to the management of natural resources in the South Platte Basin. Its stated mandates are *to enhance the effective management of natural resources in the South Platte River Basin by promoting coordination between state, federal, and local resource managers and private enterprise and to promote the interchange of ideas between disciplines to increase awareness and understanding of South Platte River Basin issues and public values.*

The success of this year's Forum can largely be attributed to the manner in which it accommodated the exposure of so many differing viewpoints. While quick fixes to South Platte Basin water management problems are not likely, dialogue is the first step toward solution.

Proceedings of the 1997 South Platte Forum are available at a cost of $5.00 per copy from:

CE Resource Center
General Services Center
Colorado State University
Fort Collins, CO 80523
Phone: (970) 491-6198
FAX: (970) 491-2961

Dave Freeman, Sociology Department, CSU; and Bart Woodward, President, Board of Directors of GASP, share ideas during break at the Forum

FLOOD CONFERENCE:
Assessing the July 28, 1997 Flood in Fort Collins, Colorado
Colorado State University, November 6, 1997

by Laurie Schmidt

An overflow crowd of more than 400 people attended the CSU Water Center's Flood Conference on November 6, 1997 in the Lory Student Center

"Close your eyes and pretend you're an emergency responder. Raging floodwaters are stranding residents and motorists. There are fires blazing. A train has derailed. 911 calls are coming in every 16 seconds. And there are 162 people in imminent danger. What are you going to do? What decisions are you going to make?"

This was the scenario that Glenn Levy, Fort Collins Emergency Management Coordinator, asked audience members to close their eyes and envision at a recent flood conference held at Colorado State University.

Catastrophic floods affect communities at many different levels. Because of their immediate onset, flash floods can have particularly devastating consequences on a community, including economic, social, and geographical effects. On November 6, 1997, the Water Center at Colorado State University hosted a symposium to assess impacts of the July 28, 1997 flash flood that occurred in Fort Collins. The purpose of the conference was to produce a record of the flood's consequences and to help the City of Fort Collins, its residents, and the university community understand all facets of the tragic and disastrous occurrence.

Levy's presentation helped audience members comprehend the perspective of those charged with saving lives during a catastrophic event. "We have a different perspective on the situation," said Levy, "because when everything else fails, we're the ones you call." He commended the decisions made by his crew that night, saying that the logistics they were forced to deal with were incredible.

Levy concluded his talk by showing a video of some of the rescue efforts that took place on the evening of the flood — a five-minute film that evoked an emotional response from nearly all members of the audience.

Fort Collins Mayor Ann Azari shared her personal experiences from the night of the flood and emphasized the fact that, although we can take certain precautions, living on the high plains of Colorado means assuming a certain level of risk. "We can have the most advanced, award-winning stormwater drainage system in the country," she said, "but we have to learn how to live better with risk."

Tom McKee, State Climatologist and CSU Atmospheric Science professor, discussed the climatological conditions that led to the flood, explaining how difficult it is to gather data from an event of this magnitude. McKee also pointed out that, while many Fort Collins residents have complained about the lack of advance warnings, the flood was a very difficult one to predict. "There was very little lightning, and except for the unusual amounts of rainfall, the storm did not have many characteristics that would have drawn your attention on radar," he said.

One theme that emerged repeatedly throughout the conference was the importance of communicating risk and emergency response to the public. According to Tom McKee, many Fort Collins residents were unaware that flooding had already begun in the western region of the city as early as Sunday afternoon, the day before the flash flood. Glenn Levy said, "Our education program needs some work – people need to know that you don't drive through that kind of water!"

Dave Greiling, Executive Editor of the Fort Collins Coloradoan, discussed media response during the flood. "Disasters can be the most difficult events to cover – there are stories everywhere," he said. Greiling talked about the widespread national interest that followed the Fort Collins flood, but pointed out that "while the day-to-day coping was beyond the scope of the national media, the local media was here for the long haul."

Other guest speakers gave presentations on a variety of topics related to the flood, including damages and recovery on the Colorado State University campus, a historical overview of flooding in Fort Collins, emotional costs of the flood, discharge measurements and runoff analyses, and preliminary plans for a Flash-Flood Research Laboratory.

The conference was free of charge and was attended by over 400 people, including members of the academic community, private businesses, city and state government, and residents of Fort Collins. Comments made by attendees throughout the day indicate that the conference was a tremendous success in highlighting the different perspectives of such a vast array of disciplines and fields. Many thanks to Dr. Neil Grigg and his staff for organizing such a highly informative conference on an event that touched so many of our lives this past summer.

FEATURES

WHAT WATER CRISIS?

by Lee Rozaklis
Chief Engineer, Hydrosphere

Editor's Note: Lee Rozaklis presented the following paper at the 8th Annual South Platte Forum October 29-30, 1997 in Longmont, Colorado

Over the last few years I have had the privilege of working on several regional water supply studies of the South Platte Basin, and I would like to share some of the insights I have gained on the municipal/industrial (M&I) water supply situation in the basin. These studies have included the Senate Bill 96-74 study, the Metro Water Supply Investigation and related follow-up studies, and studies related to the Colorado-Big Thompson and Windy Gap Projects.

I have geared this talk as a response to a concern I hear more and more — that we are now having another water crisis in Colorado. This concern appears to be based on the following perceptions:

- There is unprecedented growth in the basin;
- We are pumping Denver Basin aquifers dry;
- There is a wholesale drying up of agricultural land;
- We are decimating the West Slope with additional diversions; and
- We will have to resort to draconian conservation measures to somehow keep up with future water demands.

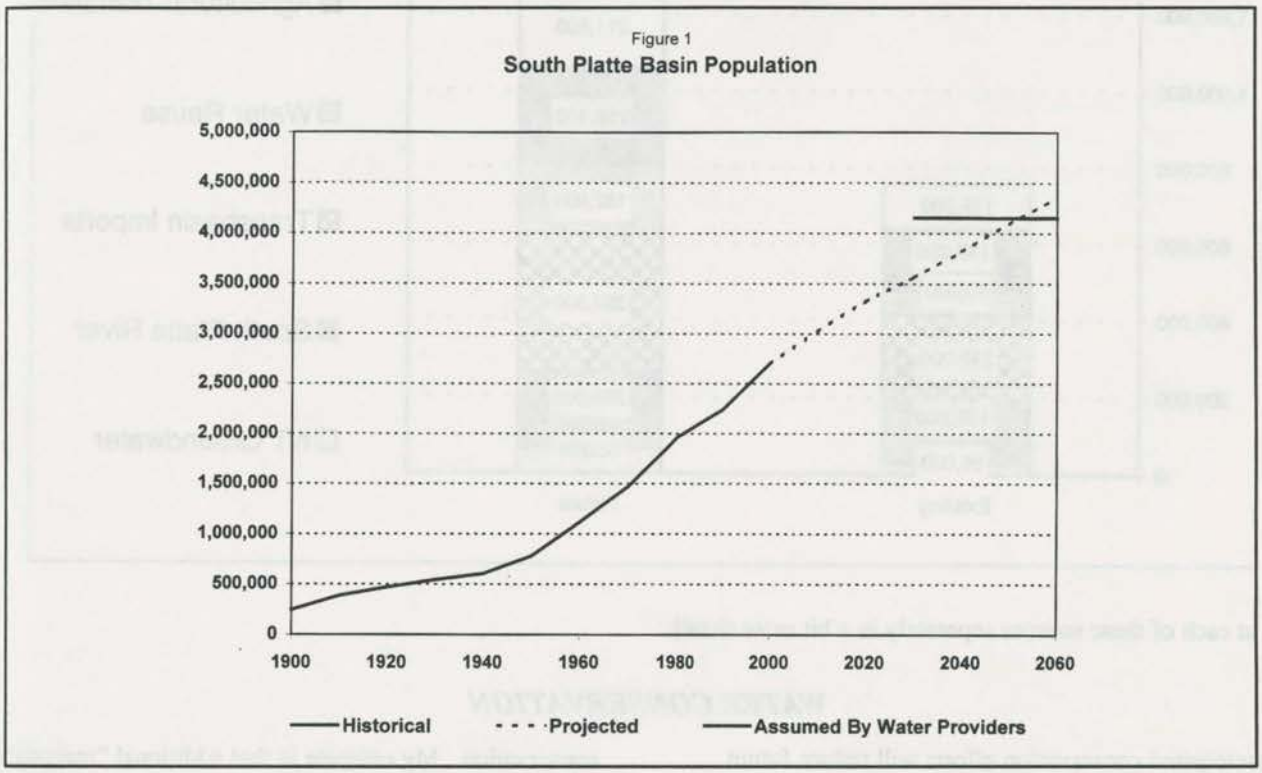
Let me start with the basin's population growth. Here is a graph (Figure 1) of the South Platte Basin's population growth from the turn of the century to the present. In the South Platte Basin of Colorado, we have gone from 250,000 people to about 2.6 million people in the last 100 years. The state projects an additional one million people by the year 2030.

In comparison, when I examined the water supply plans of municipal water providers in the basin, I found that those providers are planning to meet a combined future service area population of about 4.1 million people. So, the water supply community is ahead of this curve by a good 20 years, looking at plans in place.

Another interesting thing is that most water providers are talking in terms of "build-out," or ultimate demand. This is because their service areas are becoming limited either by adjoining communities, by natural barriers or by open-space purchases made by cities,

counties, and, increasingly now, by the state. I would say that a majority of the providers we talked to and a majority of the demands associated with the providers are now what I would term "build-out" demands. Denver Water now has a build-out projection of about 1.5 million people for its combined service area. Douglas County now projects a build-out population of 400,000 to 450,000 people, as a result of its downzoning and open space preservation efforts. Thornton, Boulder, Broomfield, Lafayette, Louisville, Westminster, Arvada, Northglenn, and Englewood all have build-out projections and are unlikely to go beyond those projections.

Figure 1
South Platte Basin Population



Let us look at the supply side. There are six basic categories that cover all municipal water supply sources:

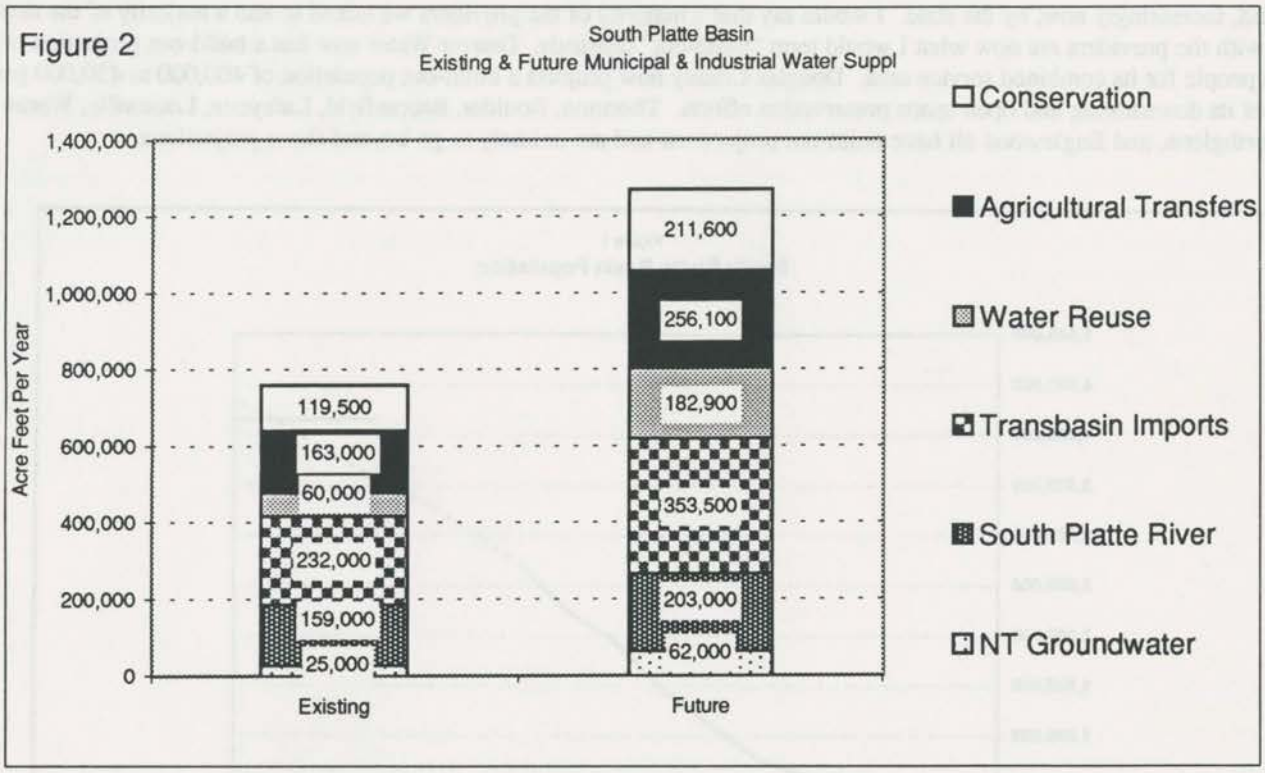
- Conservation;
- Transfers from in-basin agriculture;
- Water reuse;
- Transbasin imports;
- South Platte River water development; and
- Non-tributary groundwater.

In 1996, municipal and industrial water use in the basin totaled about 640,000 acre-feet of water per year, as shown in Figure 2. This estimate was compiled from detailed surveys of all water providers in the basin. Conservation efforts are credited with saving about 120,000 acre-feet per year. That is, absent conservation efforts, M&I use would be about 760,000 acre-feet per year.

To meet the demands of projected growth in the basin, providers are currently planning for expansions, as shown in Figure 2, of the following:

- An additional 92,000 acre-feet of water conservation;
- An additional 93,000 acre-feet of transfers from in-basin agriculture;
- An additional 123,000 acre-feet of water reuse, including exchanges, augmentation and direct reuse;
- An additional 121,000 acre-feet of transbasin imports;
- Development of another 44,000 acre-feet of South Platte supply; and
- Use of Denver Basin groundwater growing from 25,000 acre-feet per year to about 62,000 acre-feet per year.

Figure 2



Let's look at each of these sources separately in a bit more detail:

WATER CONSERVATION

Currently anticipated conservation efforts will reduce future demand by about 17 percent compared to what it otherwise would be. Still, on a basin-wide average, future M&I uses will average about 230 gallons per capita per day. That is a raw water number inclusive of all raw water and treated water system losses. The obvious conclusion is that there are still significant additional savings that could be gained from water conservation. My estimate is that additional "reasonable" water conservation efforts that reduce M&I demand by an additional 10 to 15 percent basin-wide. And of all the six categories of water supply sources, conservation probably has the least impact to other resource interests — to West Slope supplies, to stream flows for endangered species, and to continuance of irrigated agriculture.

AGRICULTURAL TRANSFERS

Over 93,000 acre-feet of South Platte irrigation water will be converted to M&I use in the next 50 years under currently planned activities by individual providers. Most of this water is already owned or controlled by municipal water providers. We are not looking, under current plans, at additional wholesale acquisition of lands. There will be dry-up of irrigated agricultural land, but it will primarily involve water rights already owned or controlled by municipal water providers. This additional conversion of irrigation water will occur roughly on a 50/50 basis between the metro area providers and northern Front Range providers. This 93,000 acre-feet will represent less than a seven percent reduction in South Platte Basin irrigation water use over the next 40-50 years, compared to where we are now.

WATER REUSE

Municipal supplies from planned water reuse activities will increase by more than 200 percent in the next 40-50 years. By water reuse, we mean exchanges, augmentation plans, substitute supply arrangements, non-potable reuse to irrigate parks and golf courses, and direct or indirect potable reuse. Even at these future reuse levels, the basin will have over 80,000 acre-feet of excess legally reusable return flows remaining as a result of transbasin imports, non-tributary

groundwater use, and changes of water rights on a consumable basis. Potable reuse is technically feasible and is rapidly becoming cost-competitive with many other sources in much of the South Platte Basin. It is going on in parts of the region already, typically as indirect potable reuse, but potable reuse nontheless. By indirect potable reuse I mean wastewater that is discharged to a surface stream and then taken out a mile or two downstream by alluvial wells.

TRANSBASIN IMPORTS

M&I transbasin imports will increase by about 50 percent under currently planned activities. Overall, transbasin imports in the South Platte Basin will increase only about 20-25 percent, because a lot of transbasin imports are used for irrigation in the Front Range. About 90 percent of these increased imports will occur via existing projects and under existing water rights. We will probably not see any major new projects being built to affect this change, for the most part. In the future, transbasin imports for M&I use will comprise about 60 percent of the total imports into the basin. That is, a significant percentage of future imports into the basin will continue to be for irrigation purposes.

SOUTH PLATTE WATER DEVELOPMENT

Additional M&I development of South Platte River flows will occur primarily through increased use of existing storage facilities and water rights and enlargements of existing reservoirs. If you look at providers' current plans, you do not see many new dams — perhaps three or four relatively small proposed new reservoirs. Most of the growth in South Platte water use will occur through more intensive use of existing reservoirs and enlargements of existing reservoirs. Projected future M&I use of South Platte River flows will comprise less than 15 percent of the basin's average native flow of 1.4 million acre-feet per year.

DENVER BASIN GROUNDWATER

Future M&I use of Denver Basin groundwater will likely increase by over 150 percent. On a percentage basis, that is a large number; in terms of actual volume it is insignificant. Most of this use will occur in Douglas County. The recoverable groundwater beneath Douglas County alone is more than 160 million acre-feet. Future Douglas County M&I use of groundwater will represent less than .05 percent of recoverable groundwater in storage in Douglas County. Under Senate Bill 5 rules, that would be a 2,000-year supply. This is under current plans for build-out or near build-out conditions without any particular conjunctive use arrangements in place with Denver.

WHAT CAN WE CONCLUDE?

These are tentative conclusions, and obviously subject to a lot of debate.

- The basin's water providers are currently planning to meet growth well beyond the year 2030, probably to the year 2050 or 2060 if you look at the combined services area projections and the plans in place to meet them.

- Future planning activities primarily involve the use of existing water rights and projects already in hand. What do I mean by already in hand? Do I mean sources that will require no permits, no changes in water rights, no facilities whatsoever? No, obviously there will be changes of water rights; there will be permitting activities. But by and large they will not require major construction of new, capital-intensive facilities that cause gross environmental impacts. In the early 1980s everyone was planning to build major reservoirs — Two Forks on the South Platte, a major Clear Creek reservoir, Coffintop Dam on the St. Vrain, the Poudre project — everywhere you looked the proposed solution was major storage projects. If you look at everyone's current plans, you no longer see major storage being seriously considered.

The basin's water providers are currently planning to meet growth well beyond the year 2030, probably to the year 2050 or 2060...

...you no longer see major storage being seriously considered.

- As a result of currently anticipated water supply plans, South Platte flows out of Colorado are likely to increase. This is simply a result of the mix of water supply sources being contemplated. Much of the basin's future water demands will be met with additional transbasin diversions, transfers from agriculture, and non-tributary groundwater development — these supplies increase the return-flow supply to the region. If you quantitatively evaluate the combined effect of the future mix of water supply sources being pursued, you find that the amount of water going out of the South Platte on an annual volumetric basis will increase. Much of that increase will come in the fall, winter and early spring months, due to relatively higher municipal return flows during this period; hence, the utility of a Tamarack recharge project to re-regulate those flows to help meet endangered species' needs downstream.

- Impacts to the South Platte Basin agriculture on a basin-wide level will be relatively minor. This does not mean that there will be no local areas where there is pressure exerted on irrigation rights. But on a basin-wide level, we are not looking at a wholesale reduction in irrigated agriculture water supplies or activities.

- The use of Denver Basin groundwater will remain at relatively low levels, even without conjunctive use. Future municipal water supply plans for Douglas County currently anticipate an aggregate use of about 62,000 acre-feet per year. Under conjunctive use discussions currently underway between Denver and Douglas County, this 62,000 acre-foot projection could be significantly reduced through a conjunctive use arrangement with Denver to store South Platte and Colorado River surface flows.

- There will be significant additional conservation and reuse opportunities remaining in the basin. Most of the conservation savings currently anticipated are simply the result of extrapolating savings from existing programs into the future. Significant potential for further savings will remain, due primarily to several factors beyond our control. For instance, the industry-wide move to more efficient water-using appliances and plumbing fixtures has yet to make a big difference in our existing water uses. Over the next 30 or 40 years it will, irrespective of anybody's wishes.

- The ability to use the significant amount of reusable return flow remaining in the basin will be largely contingent on the region's cost of water supplies, but at a given cost that water will remain available.

- The region's overall municipal water supply picture is not without problems, and I have purposely not emphasized the problematic side of things. There will certainly be impacts associated with water development, but water supply is not a limit to growth and is probably a relatively minor problem related to meeting growth in the South Platte Basin. The region as a whole, through the combined actions of individual water providers, is changing its overall water supply strategy compared to 10 to 15 years ago from primarily new storage development to enhancing the use of the already built regional infrastructure.

- Discussions underway as part of the Metro Water Supply Investigation have illuminated additional opportunities in this area. The Douglas County Water Resources Authority and Denver Water are seriously examining cooperative conjunctive use projects that would use the immense storage capability of the Denver Basin Aquifer and proposed offstream reservoir sites in Douglas County to capture additional Colorado River and South Platte surface supplies. A "northeast Metro area" group of providers is looking at ways to coordinate reuse and exchange activities in the South Platte below Denver to make additional use of the reusable return flows which, in the case of Denver, they are legally required to do under the Blue River decree. A "northwest Metro area" group is looking at ways to cooperatively regulate some of Denver's currently unused Moffat system supplies.

As a result of currently anticipated water supply plans, South Platte flows out of Colorado are likely to increase...

Impacts to the South Platte Basin agriculture on a basin-wide level will be relatively minor...

The use of Denver Basin groundwater will remain at relatively low levels, even without conjunctive use.

There will be significant additional conservation and reuse opportunities remaining in the basin.

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UNIVERSITY WATER NEWS

NEW FACULTY IN WATER

by Laurie Schmidt

Diane McKnight
Department of Civil, Environmental, and Architectural Engineering
University of Colorado/Boulder

Diane McKnight is a recent faculty addition to the Department of Civil, Environmental, and Architectural Engineering at the University of Colorado at Boulder. Dr. McKnight received her M.S. in Civil Engineering and her Ph.D. in Environmental Engineering from Massachusetts Institute of Technology. From 1979-1996, she worked as a research hydrologist with the Water Resources Division of the U.S. Geological Survey.

Dr. McKnight is a fellow at the Institute of Arctic and Alpine Research (INSTAAR) at the University of Colorado. She also is Associate Director of INSTAAR's Mountain Research Station (MRS) and is involved in organizing the summer course program at MRS. She is particularly interested in biogeochemistry involving natural organic material and trace metals in lakes and streams. Her research in Colorado, conducted at INSTAAR, has focused on acid mine drainage and on pristine lakes in Rocky Mountain National Park and in Green Lakes Valley. In addition, she is a co-investigator on the McMurdo Dry Valleys Long-Term Ecological Research (LTER) project in Antarctica. This project focuses on the hydrology and ecology of glacial meltwater streams in the dry valleys, which have been experiencing a warming trend characterized by greater streamflow since the area was first explored in 1908.

As associate professor, Dr. McKnight teaches Stream Ecology, Surface Water Quality Monitoring, and a graduate seminar on Natural Organic Material. She also serves as the current president of the American Society of Limnology and Oceanography.

Jessica Davis
Department of Soil and Crop Sciences
Colorado State University

Jessica Davis was appointed Associate Professor in the Department of Soil and Crop Sciences at Colorado State University in 1995. Dr. Davis received her M.S. in Soil Science from Texas Tech University and her Ph.D. in Soil Science from Texas A & M University. From 1989-1995, she was Assistant Professor of Soil Chemistry in the Department of Crop and Soil Science at the University of Georgia's Coastal Plain Experiment Station. Prior to that, she spent two years working with the U.S. Agency for International Development in Niger, West Africa.

Dr. Davis' areas of expertise are environmental issues related to fertilizer use and animal waste management. Her research focuses particularly on environmental problems, such as movement of agricultural chemicals into surface and ground waters, proper and economic use of fertilizers, and management of animal wastes in crop production (see webpage at http://www.colostate.edu/Depts/SoilCrop/extension/Soils/). At Colorado State University, she is responsible for the Environmental Soils Extension and Research Program. She launched the formation of the Colorado Manure Management Task Force, which includes participants from industry, research, regulation, and education, and she also initiated a manure management internship program to provide environmental soils students the opportunity to work with livestock producers. In 1996, Dr. Davis was awarded two grants to study the effects of manure management impacts on the environment. The first, a $206,000 grant, was awarded for the purpose of reducing environmental contamination from feedlot manure in the South Platte River Basin. The remaining $60,000 was for the improvement of manure management to protect water quality in the southwestern U.S.

Dr. Davis teaches Nutrient Management of Animal Waste (AN 300-O), which she describes as "Everything you wanted to know about manure, but were afraid to ask." The course focuses on managing manure to enhance soil, water, and air quality. Discussion topics include confined animal feeding regulations; feeding livestock to reduce nutrient output; managing manure through collection, storage, treatment, and utilization processes; and manure marketing.

CSU HOSTS FIRST ANNUAL STUDENT WATER SYMPOSIUM

by Laurel Saito

The First Annual Colorado State University Student Water Symposium was held in the Lory Student Center on October 22 and 23. This interdisciplinary event highlighted the breadth and expertise in water resources at CSU and gave students an opportunity to practice their presentation skills while learning and networking in water resources. Dr. Peter E. Black of the SUNY College of Environmental Science and Forestry gave the keynote presentation. The first Ph.D graduate from the Watershed Science Program in CSU's Department of Earth Resources, Dr. Black provided thoughtful insights on the meaning of interdisciplinary water resources.

From left: Laurel Saito, Symposium Coordinator; Dr. Peter Black, CSU Grad and Keynote Speaker, and Chris Arp, Masters student in CSU's Department of Earth Resources.

The symposium was a multi-departmental effort, sponsored by The Water Center and 6 departments, and organized entirely by a student committee composed of 14 graduate and undergraduate students from many of these departments. The symposium featured over 30 oral presentations and 9 poster presentations by both graduate and undergraduate students from 10 departments across campus. Each presentation was judged by CSU faculty and researchers from water-related disciplines. The following students received awards for their outstanding presentations:

BEST GRADUATE ORAL PRESENTATION (TIE):

Rod A. Chimner, Graduate Degree Program in Ecology
Presentation: **Water table level effects on evapotranspiration rates in the San Luis Valley, Colorado**

Stiven D. Foster, Department of Environmental Health
Presentation: **The biological effects of drinking water with elevated levels of copper and a low pH in juvenile mallards**

Paul J. O'Connor, Department of Fishery and Wildlife Biology, Graduate Degree Program in Ecology
Presentation: **Benthic community response to introduced bamboos in tropical headwater streams**

BEST UNDERGRADUATE ORAL PRESENTATION:

Julie Hawkins, Department of Earth Resources
Presentation: **Evaluating surface water flow paths in a subalpine wetland**

BEST GRADUATE POSTER PRESENTATION (TIE):

Mary D. Andre, Department of Civil Engineering
Presentation: **An evaluation of the start-up performance of a cold climate subsurface constructed wetland system for wastewater treatment**

Jennifer A. Keeley, Department of Civil Engineering
Presentation: **3d modeling of a dike field at Alhambra Crossing, Lower Mississippi River**

BEST UNDERGRADUATE POSTER PRESENTATION:

David Cline and Andy Leifheit, Department of Civil Engineering
Presentation: **Kaibab Park channel rehabilitation project**

Abstracts submitted by the students as well as information about the symposium can be viewed on the symposium's web page at http://www.engr.colostate.edu/depts/ce/wcenter/wtrsym/.

Approximately 200 people attended the event, and volunteers from the CSU students chapters of the American Water Resources Association and the American Fisheries Society were instrumental in assisting with the sessions. Plans are underway to begin organizing next year's event. If you are a student who is interested in water resources and would like to help organize the next CSU Student Water Symposium for Spring 1998, please send an e-mail to watersym@engr.colostate.edu or call 484-6787.

ASDSO SCHOLARSHIPS AVAILABLE

The Association of State Dam Safety Officials (ASDSO) established its Dam Safety Scholarship Program in 1992. Scholarships up to $5,000 will be awarded for the 1998/99 school year. Successful recipients must be U.S. citizens and enrolled at the junior or senior level in an accredited civil engineering program, or in a related field as determined by ASDSO, and must demonstrate an interest in pursuing a career in hydraulics, hydrology or geotechnical disciplines, or in another discipline related to the design, construction, and operation of dams. Undergraduate students planning to graduate in May/December 1999 will be eligible for the 1998 senior scholarship. Undergraduate students planning to graduate in May/December 2000 will be eligible for the 1998 junior scholarship. Awards made to a person at the junior level may be renewed the following year at the discretion of ASDSO. However, the junior scholarship recipient must re-apply if interested in receiving a scholarship for the senior year.

Minimum Criteria - Applicants must have a cumulative grade point average of 3.0 for the first two years of college and be recommended by their academic advisor. They must also submit a typewritten essay describing his or her goals and purpose for applying. Basis for Award - Selection will generally follow these guidelines: Academic Scholarship, Financial Need, Work Experience/ Activities, and Essay. ASDSO will be the final determiner in each instance as to which applicants will be recipients of a scholarship.

Final Application Date - Application forms can be obtained by writing to ASDSO at the address below and must be received by ASDSO no later than February 14, 1998. Announcement of successful candidates will be made in May of 1998. WHERE TO SEND APPLICATION: Association of State Dam Safety Officials, 450 Old Vine St., 2nd Floor, Lexington, Kentucky 40507. Questions call: (606) 257-5140.

INVENTORY OF COLORADO'S HIGHER EDUCATION ACTIVITIES AND EXPERTISE IN WATER

Five years ago, CWRRI published an inventory of the water expertise available in Colorado's higher education system in its newsletter, *Colorado Water*. The inventory consisted of a list of water-related courses available and of faculty who apply their disciplines to water resources. It included water expertise at the Colorado School of Mines, the University of Colorado at Boulder, and Colorado State University. Recently, the inventory was updated, and it is being provided again to the readers of *Colorado Water* in a sequence of issues. In this issue is a list of the "water" faculty at **Colorado State University.** Copies of the complete inventory of "water" faculty and courses are available on the CWRRI website (**http://www.ColoState.EDU/Depts/CWRRI**) or upon request from CWRRI. During the next year, the **complete** inventory list will be published in *Colorado Water*.

COLORADO STATE UNIVERSITY FACULTY EXPERTISE IN WATER RESOURCES, 1997-98

This inventory of water expertise at Colorado State University has been designed to facilitate access of the expertise by Colorado citizens. The inventory is a brief summary; specific details on the water faculty or courses can be obtained by calling or writing the faculty members listed. To facilitate access by off-campus citizens, the categories of expertise are identified by current terminology rather than by academic disciplines. Faculty are listed only once under the topic most relevant to their teaching, research and/or service. Except as noted, all addresses can be completed by adding, "Colorado State University, Fort Collins, CO 80523." Also, all phone extensions can be completed by adding (970) 491-xxxx. E-mail addresses are provided where available.

Department Abbreviations

AT	Atmospheric Science	H	Horticulture and Landscape Architecture
B	Biology	HY	History
CB	Chemical and Bioresource Engineering	M	Mathematics
CE	Civil Engineering	MB	Microbiology
CWRRI	Colorado Water Resources Research Institute	ME	Mechanical Engineering
EA	Agricultural and Resource Economics	NREL	Natural Resource Ecology Laboratory
EH	Environmental Health	PL	Philosophy
EN	Bioagricultural Sciences & Pest Management	PO	Political Science
ER	Earth Resources	RR	Natural Resources Recreation & Tourism
F	Forest Sciences	S	Sociology
FW	Fishery and Wildlife Biology	SC	Soil and Crop Sciences
		ST	Statistics

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PUBLICATIONS

U.S. GEOLOGICAL SURVEY REPORTS

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

Water-Quality Assessment of the Rio Grande Valley, Colorado, New Mexico and Texas — Organic compounds and trace elements in bed sediment and fish tissue 1992-93 (National Water-quality Assessment Program), by Lisa F. Carter. Water-Resources Investigations Report 97-4002.

Comparative Study of Ground-Water Quality, 1976 and 1996, and Initial Gain-and-Loss Assessment of Boulder Creek, Boulder County, Colorado, by Breton W. Bruce, USGS and Christopher O'Riley, City of Boulder. Water Resources Investigations Report 97-4091.

Evaluation of Streamflow Traveltime and Streamflow Gains and Losses Along the Lower Purgatoire River, Southeastern Colorado, 1984-92, by Russell G. Dash and Patrick Edelmann. Water Resources Investigations Report 96-4291.

Effects of Land Use on Water Quality of the Fountain Creek Alluvial Aquifer, East-Central Colorado, by Daniel T. Chafin. Water Supply Paper 2381-D.

Metal Speciation in the Upper Arkansas River, Colorado, 1990-93, by Melanie L. Clark and Michael E. Lewis. Water Resources Investigations Report 96-4282.

Physical and Chemical Characteristics of Terrace Reservoir, Conejos County, Colorado, May 1994 through May 1995. Water Resources Investigations Report 96-4150.

Precipitation-Chemistry Data at Selected Sites in Northwestern Colorado, by Anthony J. Ranalli Open File Report 97-112.

Surface-Water Quantity and Quality Data, Rocky Flats Environmental Technology Site Near Denver, Colorado, Water Year 1996, by Mark E. Smith, John W. Unruh, and Clayton H. Thompson. Open File Report 97-194.

Hydrologic and Water-Quality Data, Guanella Pass Area, Colorado, Water Year 1995, by Michael R. Stevens, David A. Johncox, and Jennifer R. Cox. Open File Report 97-204.

Summary of Floods in the United States During 1990 and 1991, edited by P.R. Jordan and L.J. Combs. Water Supply Paper 2474.

Nitrogen and Phosphorus Data for Surface Water in the Upper Colorado River Basin, Colorado, 1980-94, by Kirby H. Wynn and Norman E. Spahr. Open File Report 97-233.

Field Screening of Water, Soil, Bottom Sediment, and Biota Associated with Irrigation Drainage in the Dolores Project and the Mancos River Basin, Southwestern Colorado, 1994, by David L. Butler, USGS; and Barbara Campbell Osmundson and Richard P. Krueger, USFWS. Water Resources Investigations Report 97-4008.

Water-Quality Assessment of the Rio Grande Valley, Colorado, New Mexico and Texas—Fish Communities at Selected Sites, 1993-95, by Lisa F. Carter. Water Resources Investigations Report 97-4017.

Computation of Selected Hydraulic Variables for the Lower Yampa River in Northwestern Colorado, by J. E. Vaill. Open File Report 97-347.

OTHER WATER REPORTS

Twenty Years Later: What We Have Learned Since the Big Thompson Flood, edited by Eve Gruntfest. A Natural Hazards Center Special Publication (SP #33, 1997, 230 pp., $20). Contact: Natural Hazards Research and Applications Information Center at Phone 492-2150, FAX 303/492-2151. Hazards Center Library is now online at: http://www.colorado.edu/hazards/litbase/litindex.htm

National Onsite Wastewater Treatment: A National Small Flows Clearinghouse Summary of Onsite Systems in the United States, 1993

The National Small Flows Clearinghouse (NSFC) announces the release of an exclusive report on the status of onsite wastewater systems across the nation. *National Onsite Wastewater Treatment: A National Small Flows Clearinghouse Summary of Onsite Systems in the United States, 1993,* is a 414-page document containing information from local health departments and onsite agencies in 46 states.

The report provides information on various issues related to onsite technologies. Among the data provided are commonly cited problems with onsite systems, which local agencies work with onsite systems, permit and system costs, and who has responsibility for onsite system maintenance. The NSFC, which initiated the project in 1994, compiled information from more than 1,500 local health departments and onsite agencies involved with wastewater technologies.

The report costs $17.50 plus shipping and handling. Currently, orders are being taken by the NSFC at (800)624-8301 or by e-mail at *nsfc_orders@estd.wvu.edu*. Orders may also be faxed to (304)293-3161. Request item# WWBKGN89 when placing the order.

WATER SUPPLY

The Surface Water Supply Index (SWSI) developed by the State Engineer's Office and the U.S.D.A. Natural Resources Conservation Service is used as an indicator of mountain-based water supply conditions in the major river basins of the state. It is based on stream flow, reservoir storage, and precipitation for the summer period (May through October). During the summer period stream flow is the primary component in all basins except the South Platte basin where reservoir storage is given the most weight. The following SWSI values were computed for each of the seven major basins for October 1, 1997 and reflect conditions during the month of September.

Basin	Oct. 1, 1997 SWSI Value	Change From Previous Mo.	Change From Previous Mo.
South Platte	3.9	- 0.1	0.0
Arkansas	2.3	- 0.6	+1.7
Rio Grande	3.6	+1.0	+3.6
Gunnison	2.7	- 0.2	+2.2
Colorado	3.7	+0.4	+1.8
Yampa/White	4.2	+0.4	+4.0
San Juan/Dolores	3.8	+0.1	+5.1

SCALE

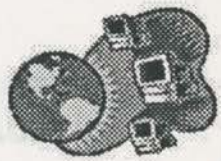
-4	-3	-2	-1	0	+1	+2	+3	+4
Severe Drought		Moderate Drought		Near Normal Supply		Above Normal Supply		Abundant Supply

The water supply conditions are excellent statewide, continuing the conditions of previous months. Above averabe stream flows, reservoir storage, and precipitation during September resulted in above normal SWSI values for all seven major mountain-based stream drainages. Basin administrators in both the northwest and southwest corners of the state reported significant amounts of precipitation during the month which resulted in especially large stream flows.

Check the CWRRI Web Page for the complete 1997/98 Inventory of Colorado's Higher Education Activities and Expertise in Water. CWRRI's "Useful Water Links" section was also updated and contains many new, interesting links.

http://www.colostate.edu/Depts/CWRRI

WWW WATER PATHS



Find-Water Related Information Quickly and Easily!

DESCRIPTION	WEBSITE
USDA announces the availability of a voluntary program to develop wildlife habitat that helps farmers, ranchers, and other landowners protect critically important wildlife habitat. **USDA's Wildlife Habitat Incentives Program (WHIP)** provides both technical assistance and cost-share payments to landowners to help establish and improve fish and wildlife habitat.	**http://www.nhq.nrcs.usda.gov**
While you surf the NRCS page, be sure to check out their new **"State of the Land"** web site. The site includes NRCS maps and other analysis products (based on the Natural Resources Inventory, Census of Agriculture, and other databases) and information on how NRCS, its partners, and American agriculture are tackling environmental issues.	**http://www.nhq.nrcs.usda.gov/land/home.html**
US NonProfit Gateway is a web site established to help non-profit groups tap ways to partner with federal agencies. The page has links to grants, budgets, volunteer opportunities, and agency partnerships information.	**http://www.nonprofit.gov**
New **Save Our Streams Catalog** offers books and videos written, field-tested, and published by staff at the SOS Program. Also offers reference books and basic biological monitoring equipment.	**http://www.iwla.org** **Click on Save Our Streams** **Call 800-BUG-IWLA**
Summaries of seven **Management Systems Evaluation Areas (MSEA)** available on Internet. Each MSEA studies a BMP implementation on a watershed scale, with cause and effect scenarios.	**http://www.nal.usda.gov/wqic/wgwq.html**
Published by the Center for Watershed Protection, **Watershed Protection Techniques newsletter** focuses on urban watershed restoration and protection tools. It includes hard science and real world applications.	**http://www.pipeline.com/~mrrunoff/** **To subscribe call 301-589-8745**
Water Information Program — Southwestern Water Conservation District, Durango, CO. The site contains information on water conservation, water terms and definitions, information on local and regional reservoirs, updated USBR reservoir statistics, and "cool links."	**http://www.waterinfo.org**
For information about water, sanitation and the environment in Third World countries, access the **OneWorld** web page.	**http://www.oneworld.org**
Watershed 96 Plenary Proceedings — published by Water Environment Federation and EPA.	**http://www.epa.gov/OWOW/watershed/Proceed/** **(be sure to enter upper case where shown)**
The Small Flows Journal, 3rd issue — published by the National Small Flows Clearinghouse.	**http://www.nsfc.wvu.edu**
The State Engineer's newsletter now can be accessed on the web. The web site also contains a link to the State Engineer's Annual Report.	**http://water.state.co.usstrmline.htm**
"Top 10 Watershed Lessons Learned" is the name of a new page on EPA OWOW's web site.	**http://www.epa.gov/OWOW/lessons**
Access the web site for **The Centre for Water Policy Research,** the focus for research into Australia's water and water-related resources.	**http://www.une.edu.au/cwpr**

WATER NEWS DIGEST

by Laurie Schmidt and Maile Ceridon

ALLOCATION

Aurora and Colorado Springs Reach Accord on Water Use
Aurora and Colorado Springs may soon have access to water in Eagle County that they have been fighting to get for years. The two cities have rights to 60,000 acre-feet of water in the Eagle River Basin, but their project to divert water over the Continental Divide, known as Homestake II, has been held up in court for years. The recently reached agreement, which comes after a ruling by the U.S. Supreme Court that sided with Eagle County, would limit the amount of water taken each year to 20,000 acre-feet. The cooperation is unprecedented, at least when it comes to Colorado Springs and Eagle County. The parties have been at odds since the 1970s when Colorado Springs and Aurora proposed Homestake II.

Colorado Springs Gazette, 9/30/97; Denver Post, 10/5/97

Rocky Mountain National Park Hydrologist Discovers Water Windfall
A National Park Service hydrologist leafing through a 60-year-old agreement found a new source of water for Rocky Mountain National Park. The 1938 pact with the Bureau of Reclamation allocates three cubic feet per second from waters within the park's borders – equal to about 2,100 acre-feet of water per year. When Ken Czarnowski found the clause in the agreement six years ago, he did a double take. A check with NPS lawyers proved that he had, indeed, discovered a treasure. Czarnowski's find recently earned him the National Park Service Director's Award for Natural Resource Management. He was also praised for obtaining rights to Mirror Lake, located in the park's northern section, where a private company wanted to build a dam.

Colorado Springs Gazette, 9/25/97; *Denver Post*, 9/25/97

APPOINTMENTS

Mark Schaefer to Serve as Interim Director of USGS
U.S. Secretary of the Interior Bruce Babbitt announced the appointment of Mark Schaefer, Deputy Assistant Secretary for Water and Science, as Interim Director of the USGS. Schaefer holds a B.A. from the University of Washington and a Ph.D. from Stanford University. Before joining the Department in 1995, Schaefer was Assistant Director for the Environment in the Office of Science and Technology Policy, Executive Office of the President, where he was responsible for a variety of domestic environmental science, technology, and education issues. Dr. Schaefer will serve until a new director is selected, or until Schaefer's interim appointment expires. Selection of a new director will include peer review, recommendations by the National Academy of Sciences, nomination by President Clinton, and confirmation by the Senate.

USGS Press Release, 9/24/97

EDUCATION

Local Entities Plan Joint Environmental Education Complex
Work will begin early next year on a $3 million interagency welcome center and environmental education complex east of Fort Collins. The complex, at the southwest corner of Prospect Road and Interstate 25, will include a visitors center, amphitheater, native plant and wildlife garden, exploration wetlands, and an extensive trail system through rolling prairie and riparian forest. Project leaders from Colorado State University and the City of Fort Collins expect the complex to draw 500,000 visitors a year. The Fort Collins Convention and Visitors Bureau will also move to the new facility, scheduled to open in August.

Fort Collins Coloradoan, 10/18/97

ENDANGERED SPECIES

Fish Recovery Plan Passed by River Panel
The Colorado River Water Conservation District board won praise on October 21 for approving a "West Slope manifesto" on the Endangered Fish Recovery Program. The manifesto spells out a list of facts and assumptions and calls for action aimed at serving the interests of Western Slope water users. In particular, the resolution:

- Calls on the U.S. Fish and Wildlife Service to back off on its demands for instream flows and to put more emphasis on eliminating exotic fish, improving riverbottom habitat, and stocking native fish;
- Asks the U.S. Fish and Wildlife Service to promptly define recovery so everyone knows what the target is;
- Asks the Bureau of Reclamation to quit stalling over Round II water sales from Ruedi Reservoir; and
- Asks transmountain water diverters to share with the Western Slope the burden of meeting instream flows for fish.

There was last-minute debate over the wording of the manifesto by Ute Water Conservancy District officials and water lawyers.

Grand Junction Daily Sentinel, 10/22/97

Officials Eye $75 Million State Fund for Endangered Species
State officials are proposing a one-time transfer of up to $75 million from the state's general fund to establish a trust fund to pay for endangered species recovery programs. Senator Don Ament will introduce a bill in the 1998 Legislature for the endangered species trust fund. He pitched the idea to water users at a Colorado Water Congress meeting on November 14. At the same meeting, state Division of Wildlife Director John Mumma instead proposed a 0.12 percent sales tax to fund species recovery, saying that he doesn't want to transfer wildlife workers out of game and fish programs. In addition to funding the existing recovery programs, the state trust fund or sales tax would fund work to prevent additional species listings. Tom Pitts, a Loveland consulting engineer, offered no hope to those looking for an exit from endangered species responsibilities. "The Endangered Species Act is the most powerful environmental law in history," he said. "It is zealously protected by Congress, and the chances of water users changing it are zero."

Grand Junction Daily Sentinel, 11/15/97

Preble's Meadow Jumping Mouse Proposed as Threatened or Endangered Species
The Preble's meadow jumping mouse can leap six feet in the air, but that's not far enough to escape the subdivisions, shopping malls, and highways that are proliferating in its Front Range habitat. The mouse is now proposed by the U.S. Fish and Wildlife Service to be listed as threatened or endangered. If the mouse is listed, Front Range cities and developers will find themselves in much the same bind as Western Slope water users and anglers in connection with four Colorado River endangered fish species. What the mouse needs, and is losing to urban development, is damp meadow and shrub habitat along the streams and rivers that run from the mountains onto the plains. The Colorado Department of Natural Resources hopes that by next March, the listing decision deadline, a group working on preservation of the mouse's habitat can come up with a clear and well-financed plan. That could head off listing the species as endangered.

Grand Junction Daily Sentinel, 11/16/97

ENVIRONMENT

Park Service Plans War on Tamarisk in Colorado National Monument
Colorado National Monument has declared war on tamarisk. The Nature Conservancy estimates that tamarisk guzzles five million acre-feet of water per year in the Southwest, enough to satisfy the current domestic potable water consumption in the Grand Valley for more than 400 years. The National Park Service issued a draft environmental assessment for the removal project, with a November 28 deadline for comment. A native of the Middle East, tamarisk has deep roots, relative immunity to extermination efforts, and relative uselessness as wildlife habitat or forage. In addition, it has no natural predators or disease to limit its spread, and each plant produces up to 500,000 seeds per year. The superintendent of Colorado National Monument described the problem as one of "management" within the monument's boundaries, citing successful methods being used in Arches and Zion National Parks.

Grand Junction Daily Sentinel, 10/31/97

Wetlands Loss Slows to 117,000 Acres Per Year
In its latest assessment, the U.S. Department of Interior said net loss of wetlands averaged 117,000 acres a year between 1985 and 1995. That's down from annual rates of 290,000 acres the previous decade and 458,000 acres before that. Officials attribute the decline in losses overall to federal, state, and local wetlands protection programs, government and private restoration efforts, enactment of the Swampbuster Law, and tax law reforms that make wetlands conversion less profitable. The wetlands report for the 1985-1995 period said that 965,000 acres of wetlands were lost due to agriculture. The amount of wetlands continues to shrink, even though 78,000 acres are restored annually.

Boulder News, 9/19/97

LEGISLATION

Long Battle Over Taylor River Diversion Resumes
A second trial over Arapahoe County's proposal to divert enough Taylor River water for half a million new residents began on October 20 in Gunnison water court. The battle over the Union Park Project is nearly a decade old, and Western Slope lawyers say they feel confident they can eventually win the case and prevent the transmountain diversion. Arapahoe County is expected to argue that it can legitimately tap Taylor Park Reservoir, but a federal attorney will argue against that idea. If Arapahoe County is successful in proving that the 90,000 to 120,000 acre-feet of water it wants are available, the county must go through a second trial focusing on whether the water is needed and whether the complex transmountain diversion is feasible.

Grand Junction Daily Sentinel, 10/20/97

Plan to Export Water from San Luis Valley Postponed
A plan to export groundwater from the San Luis Valley to the Front Range has been postponed until after the 1998 legislative session. Stockman's Water Company said its plan to send 100,000 acre-feet of groundwater to subscribers will have to wait until lawmakers approve the Replacement of Groundwater Depletions bill. If the Stockman plan is approved in water court, the company will drill about 50 wells into the confined aquifer and pump the water through a pipeline over Poncha Pass to the Arkansas River, where the Front Range will tap into it. El Paso County water districts are trying to lock in water supplies to accommodate future growth. But many residents, farmers, and businesses in the San Luis Valley see the project as one that would dry up wetlands, harm wildlife, and leave the high-desert communities lacking a resource crucial to their economic survival.

Colorado Springs Gazette, 10/2/97; Denver Post, 11/17/97

Romer Offers Conditional Support of Collbran Reclamation Transfer

Governor Roy Romer has issued a letter supporting the "concept" of the $12.9 million sale of the federal Collbran Reclamation water project to the Ute Water Conservancy District, but also listed concerns cited by opponents of the transfer. Senator Ben Nighthorse Campbell has introduced a bill to transfer the water project, which includes Vega Reservoir and 15 others on the Grand Mesa, the southside canal, and the Molina Power Plant. Ute would pay cash for the project and recoup its expenses through power sales. The legislation calls for a simple transfer and avoids the typical federal regulatory process. However, a Grand Valley environmental group is contesting the proposed sale, saying it is being done without public hearings and compliance with federal law. The Concerned Citizens Resource Coalition, the Sierra Club, the Grand Valley Audubon Society, and the Town of Collbran have recently intensified lobbying against the bill.

Denver Post, 10/12/97; *Grand Junction Daily Sentinel*, 9/30/97, 10/9/97

POLICY

Western Slope Trout Limits Reduced

The Colorado Division of Wildlife drastically reduced the trout bag limit on the Western Slope to two fish in streams and four fish in lakes. The regulation, which has been called an enforcement nightmare, is expected to go into effect on January 1. The diminished bag and possession is aimed at preserving fisheries depleted by whirling disease, a parasite that has been blamed for the disappearance of entire age classes of trout in many major rivers, including the Colorado and Gunnison.

Grand Junction Daily Sentinel, 11/14/97

PROJECTS

"Citizens Environmental Assessment" to Determine Impacts of Draining Lake Powell

The Salt Lake City-based Glen Canyon Institute released a strategy plan for a "citizens environmental assessment" (CEA), a document that will explore whether Glen Canyon Dam should be relieved of its duty. Institute officials promise their CEA will follow the National Environmental Policy act closely. They hope to show scientifically that draining Lake Powell will not only restore the inundated Glen Canyon, but will also ensure the long-term health of the Grand Canyon. Amidst claims by lawmakers that the idea is "nutty" and "loony, " the president of the Sierra Club said the organization is asking Congress only to study the idea at this point. The Glen Canyon Institute says it will spend up to $400,000 on the CEA, with more than $100,000 coming from anonymous donors. Within two years, it hopes to release a draft CEA listing various alternatives the public can scrutinize in another round of public hearings.

Denver Post, 10/9/97; *Grand Junction Daily Sentinel*, 10/9/97, 10/28/97

Colorado Lawmakers Push State-Built Water Projects amidst National Controversy over Dam-Building

Federal and state agencies, as well as private developers, have built more than 600 major dams this century in the arid West, from concrete behemoths like Hoover and Glen Canyon to unimposing piles like the Western Canal on Butte Creek, a tributary of California's Sacramento River. But beginning in the 1970s, the huge dams became increasingly controversial. Not only do they prevent natural flooding, but they also kill millions of valuable salmon migrating to the sea. More and more, Westerners are of the opinion that just because politicians in the 1930s cut deals to build dams, it doesn't mean that people in the 1990s have to live with them. The Western Canal is currently being dismounted, and two more dams on Butte Creek will come down next spring. On Washington's Elwha River, another dam is likely to be demolished by 2000. Despite this, many Colorado legislators support the building of water projects in Colorado's major river basins. A bill to be introduced in Denver next January promotes the construction of at least two dams. The bill is also a response to pledges made this summer by both Colorado Springs and Aurora to back off attempts to limit local control over water project decisions in their jurisdiction – known as 1041 powers.

Grand Junction Daily Sentinel, 10/29/97; *Newsweek*, 11/17/97

Second Flood Planned for Grand Canyon

Federal officials hope a second, smaller artificial flood of the Grand Canyon will produce the same environmental benefits as the first. Pending approval from federal wildlife officials, the U.S. Bureau of Reclamation plans to increase releases from Glen Canyon Dam November 3-5. The flood planned for November would run 31,000 cfs through the canyon for 48 hours. The objective is to stir sediment to rebuild beaches and sandbars that have eroded since the last flood in the spring of 1996. According to government studies, the first flood on the Colorado River returned nutrient-rich sediment to native fish and plants and restored several major rapids, debris-clogged side canyons, and old beaches. The idea was to undo environmental damage from Glen Canyon Dam, which cuts off the river's natural flow and its cycle of flooding the Grand Canyon with sediment-rich water.

Fort Collins Coloradoan, 10/24/97; *Grand Junction Daily Sentinel*, 10/25/97

Impact Study Conducted for Loveland Reservoir Expansion

A $190,000 study to determine how the planned expansion of Green Ridge Glade Reservoir would affect the environment and downstream water users should be complete by January. Earlier this year, Loveland officials approved the plan to expand the reservoir from 600 acre-feet to 6,000 acre-feet. The assessment will determine how the expansion will affect threatened and endangered species, other wildlife, and wetlands. If an environmental assessment proves to be inadequate, the expansion will require a more extensive environmental impact statement.

Fort Collins Coloradoan, 10/22/97

New Dam in China could be a Monumental Risk

An undertaking rivaled only by the construction of the Great Wall is taking place in China. The Three Gorges Dam, a 600-foot wall of concrete, is designed to hold back a reservoir that would stretch from New York City to Boston. Its construction is forcing the resettlement of more than 1.2 million people along the river, which flows 3,900 miles from deep in the Chinese interior to Shanghai on the Yellow Sea. The dam is intended to control flooding along the lower Yangtze, where high waters have killed an estimated 300,000 people this century. It will also serve as the backbone for a national power grid that will supply 18,000 megawatts of electricity. But critics in China and abroad argue that it will flood important archeological sites and partly inundate the Three Gorge's scenery that has inspired generations of Chinese poets. Critics also claim that flood control and hydropower could be achieved at less cost and with less disruption to people's lives and the environment by fortifying existing dikes and building smaller dams upstream. The flood waters are set to rise to 264 feet after the temporary barrage is completed next month; to 445 feet when the dam is half built in 2003; and to 577 feet when the project is complete.

Denver Post, 11/8/97; *USA Today*, 11/7/97

Pueblo Plans New Reservoir North of Leadville

The Pueblo Board of Water Works is in the process of purchasing the Escondido Ranch, located along U.S. 24 north of Leadville, as part of a long-range plan to build a new reservoir. The city's water utility is buying the 1,100-acre ranch and its water rights for $1 million. Pueblo already owns the water rights to a 1,132-acre ranch adjacent to Escondido. The city hopes to build a 28,000 acre-foot reservoir encompassing both ranches within the next 15 to 20 years. Three transmountain diversions in the Lake County area would feed into the proposed reservoir: the Ewing Ditch near Ski Cooper, the Wurtz Ditch, and the Wurtz Extension.

Peaks News Net, 10/31/97

Romer and Schoettler Give Support to Scaled-Down Animas-La Plata Project

Gov. Roy Romer and Lt. Gov. Gail Schoettler publicly announced that they support the scaled-down version of the Animas-La Plata Water Project (Animas-La Plata Lite) favored by the Ute Tribes and southwest Colorado water districts. In doing so, Romer and Schoettler rejected an alternative proposed by environmentalists and some southern Utes to provide federal funding to the tribe to be used to buy existing water rights from southwest farms and ranches instead of building a pump-storage reservoir. Animas-La Plata Lite would store 33,000 acre-feet of water a year for the tribes in Ridges Basin Reservoir near Durango, but does not include a system to deliver the water to the two reservations. Schoettler believes that supporters have "...come up with a more realistic proposal, at one-third the cost, that meets the Endangered Species Act in terms of taking water from the Animas River." Although the new proposal may sound ideal, it is not without its opponents. Earthlaw Attorney Lori Potter stated, "It seems like a rash move on the part of the governor's office when a billion taxpayer dollars and a free flowing river are at stake." The price of the new proposal is estimated at $290 million, while the original version was estimated at $740 million.

Grand Junction Daily Sentinel, 11/19/97

TECHNOLOGY

New Database Offers Wealth of Land Information

A new tool will soon allow anyone with Internet access to find out what animals might be living on a particular piece of land, what vegetation grows there, and what development is planned. ScoP, the System for Conservation Planning, is a computer database of Colorado's lands, plants, and animals. The system is being built by Colorado State University from state and federal maps and from maps provided by the Colorado Division of Wildlife and individual counties. Planners, developers, and environmental groups should all find the database helpful. Although the system won't be on-line for several months, anyone interested can find more information about it at http://www.nrel.colostate.edu/scop.

Denver Post, 10/28/97

WATER LAW

Kansas v. Colorado Update

Special Master Arthur L. Littleworth filed his Second Report in Kansas v. Colorado with the U.S. Supreme Court on September 8, 1997. The U.S. Supreme Court is expected to issue an order giving the States an opportunity to file exceptions to the report. The Special Master's recommendations are as follows:

- That the court approve his order denying Kansas' Motion for Injunction,
- That the court approve the Stipulation of the states quantifying depletions to usable Stateline flow caused by post-compact pumping in Colorado for the period 1950-85 in the amount of 328,505 acre-feet,
- That depletions of usable Stateline flow for the 1986-94 period be determined to be 91,565 acre-feet,
- That Colorado's efforts to bring the state into current compliance with its compact obligations have been sufficient to preclude at this time the need for interim injunctive relief, or to require changes in Colorado's Measurement Rules or Use Rules; that such Colorado activities continue to be closely monitored through the remaining trial proceedings; that compact compliance for 1996 and subsequent years be determined, and that any depletions for 1995 also be determined,
- That the Court approve the Stipulation of the states which, together with the Resolution of the Arkansas River Compact Administration, established an Offset Account in John Martin Reservoir for the storage and delivery of replacement water to Kansas to offset depletions of usable Stateline flow,
- That evidence be received on a suitable remedy for past

compact violations, whether such remedy be in water or in money,

- That if a suitable remedy in this case should include money damages, those damages should be based on Kansas' loss rather than on any gain to Colorado, subject to the overriding consideration that the remedy provide a fair and equitable solution,
- That if the remedy in this case includes money damages, the 11th Amendment does not preclude damages to the State of Kansas from being based, in part, on losses incurred by its water uses, again subject to the overall consideration of fairness,
- That the unliquidated nature of Kansas' claim for damages does not bar the award of prejudgment interest, whether the remedy includes money damages or water repayment; that the possible award of prejudgment interest will depend upon the evidence presented in future trial proceedings.

Water News, 10/31/97

WATER QUALITY

Chevron Cited by EPA for Dumping Brine Water

The U.S. Environmental Protection Agency has cited Chevron Production Company and the Colorado Water Quality Control Division for six years of brine water spills from injection lines in the Rangely oil field. The federal notices of violation are based on 164 spills that discharged a total of 4.1 million gallons of brine water into gullies and ditches that drain into the White River. The EPA's concern stems from the fact that the White River is listed as critical habitat for endangered native fish, and because salinity in the lower Colorado River, where the discharges will flow, is already an international problem. Chevron has hired an outside attorney and intends to fight the citation. Fines could top $4 million. EPA also cited the state Water Quality Control Division because state officials have declined to take enforcement action against Chevron.

Grand Junction Daily Sentinel, 10/18/97

Heavy Algae Growth in Eagle River Scrutinized

Excessive growth of algae in the Eagle River from Minturn to Gypsum will come under scientific scrutiny in a year-long study launched this month by the Colorado Department of Public Health and Environment. Scientists have begun taking samples of water, algae, and insects from five locations on the river. They will also take monthly water samples from sewage treatment plants and tributary streams in the area. Residents say the river is cloudy and has a musty odor. Study results are expected in 1999.

Grand Junction Daily Sentinel, 10/2/97

Research to Identify Human-Related Contamination Sources

Greg Goblinck of the Rhode Island Department of Environment Management, Division of Water Resources, is currently investigating the use of fluorescent whiting agents (FWAs) as an indicator of an illegal connection to a storm water drainage system or an individual sewage disposal system (ISDS). Since most laundry detergents contain FWAs, research will determine the usefulness of utilizing these FWAs to aid in the identification of human-related contamination sources. While the ecotoxicology of detergent-derived FWAs was studied extensively in the 1970s, recent studies include occurrence in sewage and river water, removal from waste water, and degradation in natural waters.

Focus Newsletter, 7/28/97

Rifle Residents Suspect Water is Polluted

Rural residents in Rifle pressed officials at Barrett Resources, Inc. and the Colorado Oil and Gas Conservation Commission to continue testing for natural gas contaminants in their water wells. Their worries stem from the September 16 eruption of a water well at a private residence in the Spruce Creek basin that sent a plume of water shooting 20 feet in the air. According to drilling experts, the eruption was the result of one of the state's worst out-of-control wells, which was being drilled nearly a mile away. A plume of high-pressure gas made its way underground to the aquifer that feeds the residence's well. The state Oil and Gas Commission will be testing all wells in the area annually as a result of the incident. Meanwhile, residents of the rural area are calling for a better system of notification if problems occur again.

Grand Junction Daily Sentinel, 10/23/97

Silt Filling Denver Reservoir

Tons of mud are filling Denver's Strontia Springs Reservoir on the South Platte River, 15 months after a forest fire in southern Jefferson County caused massive erosion. Denver Water officials estimate that 400,000 cubic yards of silt have washed down Buffalo and Spring Creeks since the fire on May 18, 1996. The dirty water takes longer to process at two filter plants, and particles have twice shut down an electric generator inside the dam. Denver Water plans to dredge the reservoir by 2012, at a cost of $5-6 million. Dredging had not been scheduled until 2032.

Rocky Mountain News, 10/1/97

WEATHER

Colorado Has Yet to Meet El Nino

The heaviest snowstorm since 1979 pounded the Front Range on October 24-25, causing a state of emergency for what many considered the first dose of the much-talked-about El Nino. But according to Wes Etheridge, a meteorologist with Weather Data, the dramatic "Blizzard of 97" was a routine weather event in the sense that it was not spawned by the extraordinary climate circumstances in the equatorial Pacific that have created the largest El Nino on record. The blizzard had more typical origins. A cold air system blew down from western Canada and through Utah, then looped through northern New Mexico where it pulled up moist air from the Gulf of Mexico. "Although Denver can expect more moisture and some warmer winter temperatures, El Nino's overall effects are hard to predict," Etheridge said.

Boulder News, 10/27/97; *Rocky Mountain News*, 10/27/97

WILDERNESS

Yellowstone Geysers Awake after Years of Dormancy

For 20 years, Giant Geyser, capable of blasting a tower of water twice the height of Old Faithful, was virtually dormant. But so far this year, the gusher in Yellowstone National Park's Upper Geyser Basin has erupted 33 times. Giant Geyser's eruptions usually last for more than an hour, spewing about 1 million gallons of boiling water. The reappearance of the geyser is significant because the blasts are higher than the normal bursts of 200 feet or so. Giant's awakening coincides with a renewal of activity in the nearby Splendid Geyser, which was dormant through most of this century. Yellowstone is the most seismically active area in the United States, and geologists say it is possible that recent earthquakes may have helped revive the geysers.

Grand Junction Daily Sentinel, 11/13/97

Mesa County Won't Pursue Heritage River Status for Colorado River

In the face of unanimous opposition by the Mesa County Commissioners, the steering committee for Grand Valley riverfront projects dropped any notion of pursuing American Heritage River status for the Colorado River. President Clinton expects to announce the first 10 designated rivers in January, and nomination packages are due next month. Although Mesa County Commissioners understand that the designation doesn't bring any additional control of private property rights or water rights, they see no advantage to participating in the program.

Grand Junction Daily Sentinel, 11/6/97

CALLS FOR PAPERS

CROSS CURRENTS IN WATER POLICY — UCOWR '98

Sponsored by the Universities Council on Water Resources

This conference will explore the inherent conflicts between old water policies and new concepts associated with sustainable development. Attention will be given to issues in the Western U.S. through discussion of the current Western Water Policy Review Advisory Commission efforts and examination of river management in the Pacific Northwest. Implications for university research and the education of future water professionals will be discussed. Contributed papers and posters are invited that address contemporary issues in water policy and management, national, regional, or international, including:

- **Legal and institutional reforms**
- **Incentive-based water policies**
- **Interdisciplinary perspectives on water management**
- **Risk assessment**
- **Conflict resolution, including interstate issues**
- **Integrating policy and technology**
- **Management of water quality and ecosystems, including hypoxia**
- **River management**
- **Water quantity and allocation**

Submit abstracts of no more than one page by January 15, 1998 to:
Dr. Tamim Younos, UCOWR '98 Technical Program Chair
Virginia Water Resources Research Center
10 Sandy Hall, Virginia Tech, Blacksburg, VA 24061-0444
Phone: 540-231-8039 — FAX: 540/231-6673 — e-mail: tyounos@vt.edu

MINING IN COLORADO: WATER ISSUES AND OPPORTUNITIES

March 13, 1998 — Mount Vernon Country Club, Golden, Colorado

As we approach the end of this century, we face a myriad of challenges related to mine water at abandoned mines, at currently active operating mines, and at proposed future mine sites. This one-day symposium will address all aspects of mine water issues and opportunities, including pre-mining water rights, water quality of mine discharge, and utilization of existing mines as water storage reservoirs. You are invited to submit a 1-page abstract. Approximately 20 minutes will be allowed for each presentation and discussion. Send abstract to: AWRA, P.O. BOX 9881, DENVER, CO 80209-0881. For further information contact Isobel McGowan at 303/477-5338.

HYDROLOGY DAYS — March 30 - April 3, 1998
Colorado State University, Fort Collins, Colorado

HYDROLOGY DAYS will be held **March 30 - April 3, 1998,** at Colorado State University, Fort Collins, Colorado. Hydrology Days 1998 is dedicated to pioneers in the development of numerical techniques for ground water modeling: Dick **COOLEY** and Lennie **KONIKOW** , U.S. Geological Survey; George **PINDER**, University of Vermont; and Tom **PRICKETT**, Thomas A. Prickett & Associates, Inc.

Included will be special sessions on "Historical Perspectives and Modern Approaches to Development and Application of Numerical Models: Simulation, Calibration, Management, Optimization, Accounting for Uncertainty," and on "Floods: Flash, Small and Large-Scale." The City of Fort Collins and the Colorado State University campus were not spared from the worst storm to ever hit Fort Collins. Papers on all aspects of floods are welcome. Other sessions will include "Use of Modern Tools in Hydrology: GIS, Internet WWW Data Access, Remote Sensing, and Object-Oriented Programming." Awards and prizes will be presented for the best student papers as oral or poster presentation in the categories of B.S., M.S. and Ph.D.

Send three hard copies (original plus two) of single-page abstract(s) without a specific format and include: title, author's name, affiliation, full mailing address, telephone, fax, e-mail, and indication of student status (MS, PhD), if applicable. Include a cover letter indicating presentation preference of oral or poster. Indicate your special audio-visual needs. Abstracts are due by **January 9, 1998** to:

Professor H.J. Morel-Seytoux, HYDROLOGY DAYS, 57 Selby Lane, Atherton, CA 94027-3926. Phone and Fax: (650) 365-4080; E-mail: morelsey@usgs.gov.

The preliminary program, final program and registration information on the AGU Meeting are available at: http://www.lance.colostate.edu/depts/ce/netscape/wnew.html. or contact: Janet Lee Montera, Civil Engineering Department, Colorado State University, Fort Collins, CO 80523-1372. Phone: 970/491-7425 — FAX 970/491-7727; E-mail: jmontera@engr.colostate.edu.

COSPONSORS — American Geophysical Union (AGU) Hydrology Section and the Front Range Branch; American Society of Civil Engineers (ASCE), Water Resources Engineering Division, and the Colorado Section, American Water Resources Association.

HYDROLOGY DAYS — 1999 PREVIEW

Hydrology Days 1999 will be dedicated to the "former students, colleagues and friends" of Professor Morel-Seytoux. Instead of being held on the main campus at Colorado State University, Hydrology Days will be held on the Pingree Park Campus during the summer. For more information, as it becomes available, contact Professor Morel-Seytoux. Pingree Park, Colorado State's unique mountain campus and conference center, lies in a secluded valley surrounded by the mountains of the Mummy Range, Rocky Mountain National Park, Roosevelt Forest, and the Comanche Peak Wilderness Area — a place to escape to high clear streams, alpine wild flowers, and lodgepole forest pines. See the website — http://lamar.colostate.edu/~hfsweb/pingree/pingree.html.

1998 *USCOLD* ANNUAL MEETING AND LECTURE
August 10-14, 1998 — Buffalo, New York

The U.S. Committee on Large Dams (USCOLD) has issued a Call for Papers for its 18th Annual Meeting and Lecture. The theme of the Lecture will be Managing the Risks of Project Development, Safety Operation. The Lecture will be organized by the USCOLD Committee on Public Awareness, with the support of the Committees on Dam Safety and Monitoring of Dams and Their Foundations. The Committees invite abstracts on: Project Planning and Social-Economic Issues, Risk Management Framework for Dam Safety, and Project Operation and Monitoring. Authors should submit 200-400 word abstracts by December 15, 1997 to Richard C. Harlan, Chair, 1998 USCOLD Lecture, FAX 415/288-9881, e-mail rcharlan@email.msn.com.

MEETINGS

OGALLALA AQUIFER SYMPOSIUM

Ogallala Aquifer "Solutions for Sustainability"

February 12, 1998 — 8:00 a.m. - 3:30 p.m.

Northeastern Junior College, Sterling, Colorado

TECHNOLOGY IN AG WATER MANAGEMENT
Precision Farming
Farming Practices
Irrigation Technology and Practices

WATER MANAGEMENT POLICIES
Future Management Issues
Local Water Districts Policies
State Rules and Regulations

MANAGEMENT DECISION IMPACTS
High Plains Water and Weather Impact
Ogallala Water Quality
Geology and Hydrology

For information contact Mahdi Al-Kaisi, U.S. Central Great Plains Research Center, P.O. Box 400, Akron, Colorado 80720, Phone 970/345-0508 or 970/345-2259 Main Office, FAX 970/345-2088.

13TH HIGH ALTITUDE REVEGETATION WORKSHOP

March 4-5, 1998

University Park Holiday Inn, Fort Collins, Colorado

Topics of specially invited speakers will include long-term reclamation research results, new products, collection and use of native seed, ecological restoration in the National Parks and plant materials. Presentations stress "nuts and bolts" reclamation and include current problems, solutions and case studies presented by speakers from academia, government and industry. The keynote address will be by Mr. Mike Edwards, Assistant Editor of National Geographic Magazine, who will speak about the catastrophe at Chernobyl. The banquet speaker will be Ms. Louise Johnson, head of the flood recovery team at Yosemite National Park. Her subject will be the "Flood of the Century" at Yosemite.

Participants can also take a tour of the Colorado State Forest Service nurseries. poster papers and exhibitor displays will be included at the workshop. Poster papers regarding any aspect of high altitude revegetation are invited. To volunteer a poster paper, contact Jeff Pecka at (303)708-9126, or Krystyna Urbanska at 632-4308 in Zurich, Switzerland. To reserve exhibit space, please contact Bill Agnew at (970) 226-5729 or Mark Thiesen at (800) 621-0444. A brochure with the full agenda and complete registration information will be available in December. Cost: Regular: $170 with lunches, banquet and proceedings; Student: $15 without proceedings and meals.

Please direct questions or address corrections to
Gary Thor, phone: (970)491-7296; FAX: (970)491-0564; e-mail: garythor@lamar.colostate.edu.

A RIVER OF DREAMS AND REALITIES — PAST, PRESENT, FUTURE

4th Annual Arkansas River Basin Water Forum

February 4-5, 1998 — La Junta, Colorado

The Arkansas River Basin Water Forum will continue to provide an opportunity to share ideas and methods of addressing the various needs for the water flowing through the Arkansas River. A panel discussion on historic successes and failures will set the background for further debate on future development and regulation. Special group sessions on such issues as channel maintenance, water quality, wetlands concerns, and farming methods will provide technical information as well as opportunity for general discussion. Please visit our web site for year-round participation in Forum activities at: <http://www.uscolo.edu/arkriver.> For more information contact: Joe Kelley, City of La Junta, P.O. Box 489, LaJunta, CO 81050; Phone 719/384-7358, FAX 719/384-8412.

WETLANDS/WILDLIFE WORKSHOP

January 27-28, 1998 — Sacramento, California

The Wildlife Habitat Council in cooperation with the Environmental Protection Agency, the Natural Resources Conservation Service, the U.S. Fish and Wildlife Service, and the U.S. Army Corps of Engineers are sponsoring this workshop to address the techniques, opportunities, benefits and cost of wetlands management. For information and registration contact: Wildlife Habitat Council, 1010 Wayne Ave., Suite 920, Silver Springs, MD 20910; Phone 301/588-8994, FAX 301/588-4629, e-mail joy@wildlifehc.org, website: www.wildlifehc.org.

40th Annual Convention
COLORADO WATER CONGRESS
Northglenn, Colorado — January 29-30, 1998
For information contact the CWC office at 303/837-0812

CALENDAR

Jan. 26-29 — CONFERENCE ON TAILINGS AND MINE WASTE '98, Fort Collins, CO. Contact: Linda Hinshaw, Dept. of Civil Engineering, Colorado State University, Fort Collins, CO 80523-1372, Phone 970/491-6081, FAX 970/491-3584/7727.

Feb. 4-5 — A RIVER OF DREAMS AND REALITIES -- PAST, PRESENT, FUTURE, 4th Annual Arkansas River Basin Water Forum. Contact:Joe Kelley, City of La Junta, P.O. Box 489, LaJunta, CO 81050; Phone 719/384-7358, FAX 719/384-8412.

Feb. 12 — OGALLALA AQUIFER SYMPOSIUM -- SOLUTIONS FOR SUSTAINABILITY, Sterling, CO. Contact: Mahdi Al-Kaisi, U.S. Central Great Plains Research Center, P.O. Box 400, Akron, Colorado 80720; Phone 970/345-0508 or 970/345-2259 Main Office, FAX 970/345-2088 .

Mar. 4-5 — 13TH HIGH ALTITUDE REVEGETATION WORKSHOP, Fort Collins, CO. Contact: Gary Thor, phone: (970)491-7296; FAX: (970)491-0564; e-mail: garythor@lamar.colostate.edu.

Mar. 20-29 — WETLANDS ENGINEERING & RIVER RESTORATION CONFERENCE, Denver. CO. Contact: American Society of Civil Engineers, Phone 703/295-6029; FAX 703/295-6144, or visit ASCE Web Site at http://www.asce.org.

Apr. 19-23 — FIRST FEDERAL INTERAGENCY HYDROLOGIC MODELING CONFERENCE, Las Vegas, NV. Contact: Don Frevert or Jim Thomas, Phone 303/236-0123 x235; FAX 303/236-0199; or E-mail dfrevert@do.usbr.gov or jthomas@do.usbr.gov.

Apr. 26-28 — WATER DISTRIBUTION SYSTEM DISINFECTION RESIDUALS WORKSHOP, Philadelphia, PA. Complete information is available on the Internet at http://www.awwa.org/tande/dsdrw.htm.

Apr. 28-30 — SOURCE WATER PROTECTION INTERNATIONAL 98, Dallas, TX. Contact: National Water Research Institute, 10500 Ellis Ave., PO Box 20865, Fountain Valley, CA 92728-0865, FAX 714/378-3375, E-mail NWRI-1@worldnet.att.net.

May 3-6 — WATERSHED '98 — WATERSHED MANAGEMENT: MOVING FROM THEORY TO IMPLEMENTATION, Denver. CO. Contact: Water Environment Federation at 800/666-0206 or E-mail confinfo@wef.org.

Sept. 27-Oct. 2 — GAMBLING WITH GROUNDWATER, Physical , Chemical, and Biological Aspects of Aquifer-Stream Relations, Las Vegas, NV. Contact: IAH/AIH Conference Las Vegas — Conference Headquarters, Attn: Helen Klose, 2499 Rice St., Suite 135, St. Paul, MN 55113-3724, Phone 612/484-8169, FAX 612/484-8357, e-mail AIHydro@aol.com.

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