

Colorado Water

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

WATER ITEMS AND ISSUES . . .

February 1994

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UPCOMING MEETINGS --see page 36

UPPER ARKANSAS WATERSHED FORUM

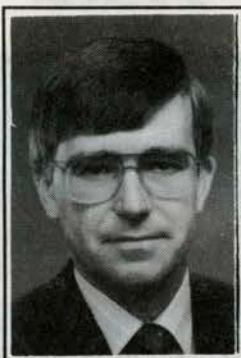
Thursday, April 7 and Friday, April 8, 1994

Trail West Resort, Buena Vista, Colorado

BIODIVERSITY: MEETING TOMORROW'S CHALLENGES TODAY

March 18, 1994

Sheraton West, 360 Union Boulevard, Denver



LOTS TO TALK ABOUT!

As water management in Colorado and the West becomes more inclusive, a lot more water information is being produced and distributed. To prepare each issue of *COLORADO WATER*, we face the task of deciding what information to include and what information to exclude -- we simply can't include

everything! In fact, *COLORADO WATER* includes only a small part of all the water information we receive. We try to publish the news that is most relevant to the largest number of our readers, and we also want to make sure that the water activities of higher education are made known to Colorado's water managers and citizens.

Let me walk you through this issue of *COLORADO WATER* to show you how we decide what to include.

As this newsletter and its readers have aged (?), we have noted the tendency of some readers to not recall past articles on certain subjects. To remedy this situation, we have prepared a five-year index to *COLORADO WATER*. The 1993 index is included in this issue, and the five-year index is available upon request.

Next are summaries of recently completed CWRRI research projects. Realize that these are short summaries, and if you are interested in the complete research report, please let us know. The list of externally-funded water research is next. This is a good overview of the water-related research Colorado's higher education faculty are currently performing for sponsors outside the university (generally federal agencies).

The "Features" section this month includes a very informative article about Michael Creed Hinderlider, former Colorado State Engineer. Included in the article is an interesting perspective on the creation of the Colorado Water Conservation Board. Also included are an article updating readers on the status of the Ogallala Aquifer and the second part of our review of drought in Colorado.

Bob Volk, Director of the Nebraska Water Center, put together a list of water-related educational materials last year, an excellent source of information for water professionals to hand out the next time they are asked about a water issue or concern. Thus, this list has been included to help you better inform Colorado citizens who may inquire about a particular water issue. You might want to have copies of Bob's list handy for distribution.

Then, there are all the water-related seminars taking place on Colorado's campuses of higher education. These "conversations about water" can be very informative and should be made

known to all *COLORADO WATER* readers. If you see a seminar you would like to attend, please do so.

And, also, we must make sure our readers: (1) know about new water publications; (2) are aware of upcoming water meetings; (3) learn about new data bases; and (4) are informed about water news as viewed by others around the state. In particular, *COLORADO WATER* readers should be aware of the 1994 Nebraska Water Conference dealing with conjunctive use. Also, there is a new Upper Arkansas Watershed Forum taking place in April. All so important. Even if we can't attend, we like to know what's happening.

Thus, you get an idea of how we view the enclosed information. We hope you find it useful and helpful to your role in Colorado's water scene. Please let us know if there is other information you wish we would include, or if there is some you think we could omit. We want *COLORADO WATER* to be very useful to you!

COLORADO WATER

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Editor

Shirley Miller

Writers

David Barnes

Denise Fisher

Jennifer Roberts

Greg Silksens

Heather Ward

David Williams

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Robert C. Ward, Director

INDEX TO COLORADO WATER NOW AVAILABLE

by
Greg Silkensen

As circulation of the Colorado Water Resources Research Institute newsletter **COLORADO WATER** has increased and its size and scope have expanded over the past five years, the need for a subject index to the newsletter has become increasingly evident.

Recently an index has been developed to better access major articles and editorials located in the newsletter. The following index accesses 1993 issues of **COLORADO WATER**, and is organized by subject headings. Listings are by title under each subject heading, and specify author, date of the issue, and page number.

Available upon request from the institute is an index to the last five years (1989-1993) of **COLORADO WATER**. The institute welcomes comments readers have regarding the usefulness of the index, possible changes (including additional subject headings), and any other suggestions. To request a free five-year index, please contact the institute:

Colorado Water Resources Research Institute
410 North University Services Center
Colorado State University
Fort Collins, CO 80523
TEL: 303/491-6308 FAX: 303/491-2293

1993 COLORADO WATER INDEX

Colorado Water Research

"The Powell Consortium: A Basinwide Approach to Water Research," Stephanie Ward, 8/93, p.14.

"Message Received! But Where Do We Go From Here?" Ward, ed., 10/93, p.2.

Colorado Water Policy/Management

"The Role For the State of Colorado on Front Range Water Challenges," Gov. Roy Romer, 2/93, p.5 (presented at the 1993 Colorado Water Convention 1/4-5/93).

"An Analysis of Colorado and Federal Law in Contrast to the Report of the Long's Peak Working Group," Greg Hobbs, 4/93, p.14.

"A Vision of the South Platte," Lloyd Walker, 12/93, p.9.

Regional Water Policy/Management

"Meeting California's Water Needs," Duane L. Georgeson, 4/93, p.13 (presented at the 1993 Colorado Water Convention 1/4-5/93).

"Park City Principles: A New Approach to Western Water Management," Stephanie Ward, 8/93, p.13.

National Water Policy/Management

"An Analysis of Colorado and Federal Law in Contrast to the Report of the Long's Peak Working Group," Greg Hobbs, 4/93, p.14.

"Meetings of Waters: The Conceptual Confluence of Water Law in the Eastern and Western States," George William Sherk, 6/93, p.12.

Drought

"How has Drought Affected Colorado in the Past?" 12/93, p.6.

Ecological Integrity

"South Platte River Observations: Historical Clues to the Evolution of a River's Ecology," Greg Silkensen, 4/93, p.4 (presented at the 1992 South Platte River Basin Conference 10/92).

"Achieving Ecological Integrity Through the Federal Clean Water Act," Max H. Dodson, 6/93, p.9 (presented at the 1992 South Platte River Basin Conference, 10/92).

Integrated Watershed Management

"The USGS NAWQA Program: Improving the Information Base for Integrated Decision-Making in the Platte River Watershed," Greg Silkensen, 12/93, p.10.

"Legal Issues Associated With an Integrated Watershed Management Approach," Judge Robert Behrman, 12/93, p.11.

Irrigation/Agriculture

"Recommended Water Quality Criteria For Agricultural Diversions in Colorado: Summary of Project Technical Report 1, Colorado Agricultural Experiment Station, Project No. 1372-647, 1/93," T.D. Gates, T.G. Sanders, T.H. Podmore, 2/93, p.7.

"Rural Impacts -- Water Marketing in Colorado's Future: Debate and Analysis," John Stencil, 4/93, p.11.

Modeling

"IDS Develops Innovative Decision Support Systems for Natural Resources Management," 2/93, p.8.

Proposed Water Projects

"The Roan Creek Proposal: A Boon or Bust?" Stephanie Ward, 8/93, p.10.

Water Education/Information

"Who Needs to Know?" Ward, ed., 2/93, p.2.

"Walking a Fine Line," Ward, ed., 4/93, p.2.

"Oops!" Ward, ed., 6/93, p.2.

"CWRRI Reports: Access and Availability," Lindsay Sweetser, 6/93, p.13.

"Water-Related Information Abundant at CSU's Morgan Library," Mary DeMartini, 6/93, p.15.

"Murals of Water: A Historical Overview," Denise Fisher, 8/93, p.6.

"The Wisdoms of Water: Interpretations of Colorado's Water History," Denise Fisher, 10/93, p.8.

"Seeking!" Ward, ed., 12/93, p.2.

Water History

"South Platte River Observations: Historical Clues to the Evolution of a River's Ecology," Greg Silkensen, 4/93, p.4 (presented at the 1992 South Platte River Basin Conference 10/92).

"How Did We Get Here?" Ward, ed., 8/93, p.2.

"Murals of Water: A Historical Overview," Denise Fisher, 8/93, p.6.

"The Wisdoms of Water: Interpretations of Colorado's Water History," Denise Fisher, 10/93, p.8.

WATER RESEARCH

STUDY SHOWS NO CORRELATION BETWEEN LOW FLOWS AND INCREASED TOXICITY

The amount of ammonia that can be released to surface waters of Colorado and other states is regulated by law for the protection of aquatic life. Point source dischargers such as cities and industries spend large amounts of money to convert ammonia to other forms of nitrogen in order to remain below the regulatory limits. In calculating the limits for a given discharger, regulatory authorities must take into account the least favorable conditions that may occur. It is standard practice to assume that the lowest stream flows will coincide with the least favorable chemical conditions for ammonia toxicity. However, the truth of this assumption has never been tested with field data. A study of 12 sites in Colorado by University of Colorado researchers shows that 11 out of 12 sites have no association between low flow and unfavorable chemical conditions. These findings raise the possibility of revising calculation procedures for permits to make them more realistic. This could result in considerable savings to some dischargers.

The technical completion report for this project is titled, *Improvements in the Colorado Ammonia Model by Simultaneous Computation of Extremes in Flow and Water Chemistry*, by William M. Lewis and James F. Saunders (see CWRRI Publications, page 29).

RESEARCHERS FIND NEW MINERAL THAT CONTROLS IRON SOLUBILITY IN BOGS

In their efforts to alleviate the damaging impacts of mining in Colorado, CWRRI researchers have discovered a new iron oxide precipitate, $\text{Fe}_3\text{O}_4 \cdot x\text{H}_2\text{O}$, that most likely controls the solubility of iron in many bog-like areas. The discovery of this mineral and the oxidation reduction (redox) relationships that accompany its presence is an important contribution to environmental soil chemistry.

Mining activities in Colorado have had a considerable impact on the concentrations of heavy metals in rivers and streams.

Many ores that were mined for silver and gold also contained sulfides of lead, cadmium, zinc and copper. When these mining wastes were exposed to oxygen and water, the minerals produced an acidic environment. The higher acidity increased the solubility of the metals, which were ultimately transported into streams and rivers. This water was often used downstream for irrigation purposes. At some sites, high concentrations of many of these heavy metals still persist in the waters and soils.

Since bogs intercept mine drainage water in many Colorado mining areas, if maintained they may be an important method of removing heavy metals. However, if drained, bogs may become a major contributor to heavy metal contamination. High-altitude wetlands in mining districts provided an ideal situation in which to examine the effects of oxidation reduction on metal solubility. Heavy metal sulfides of polluted soils and sediments taken from the California Gulch area near Leadville, Colorado have added considerably to the knowledge of how changing conditions (redox) affect the formation and dissolution of metal sulfides under bog conditions. Researchers found that the newly discovered mineral forms as an amorphous, mixed valency, iron oxide under strongly reducing conditions. It can form both as an oxidized environment becomes reduced and also as a highly reduced environment becomes oxidized. In a very vivid way, this has demonstrated the effect of redox on the formation and dissolution of metal sulfides and the role that sulfides play in immobilizing heavy metals in reduced environments such as occur in bogs.

Results of this study will help in developing guidelines for the management of bogs to avoid future problems should the bogs be drained and oxidized conditions return.

The technical completion report for this project is titled, *Heavy Metal Removal from Waters by Mountain Meadow Bogs*, by E.W. Brennan and W. L. Lindsay (see CWRRI Publications, page 29).

IDS DEVELOPS MAPS THAT SHOW POTENTIAL EVAPOTRANSPIRATION FOR COLORADO'S WESTERN SLOPE

Devising better methods to determine the amount of water needed for irrigated agriculture can lead to better conservation of water resources. When farmers calculate how much water they will need for their crops, they must first have an estimate of the crop water requirements. Depending on the irrigation application method, the crop water requirement is comprised of water used by crops in the process of evapotranspiration and losses that occur through surface runoff and seepage to the groundwater. For highly efficient irrigation methods, the amount of evapotranspiration is the determining factor in water use.

What is evapotranspiration? Evapotranspiration is water lost as vapor to the atmosphere (evaporation) and water used by crops (transpiration). A common technique for determining evapotranspiration is to calculate water requirements for a reference crop and then to use multiplication factors to calculate estimates for other crops. Evapotranspiration for a reference crop is commonly referred to as ETr.

The Integrated Decision Support Group (IDS) at Colorado State University has developed a set of maps that represent the

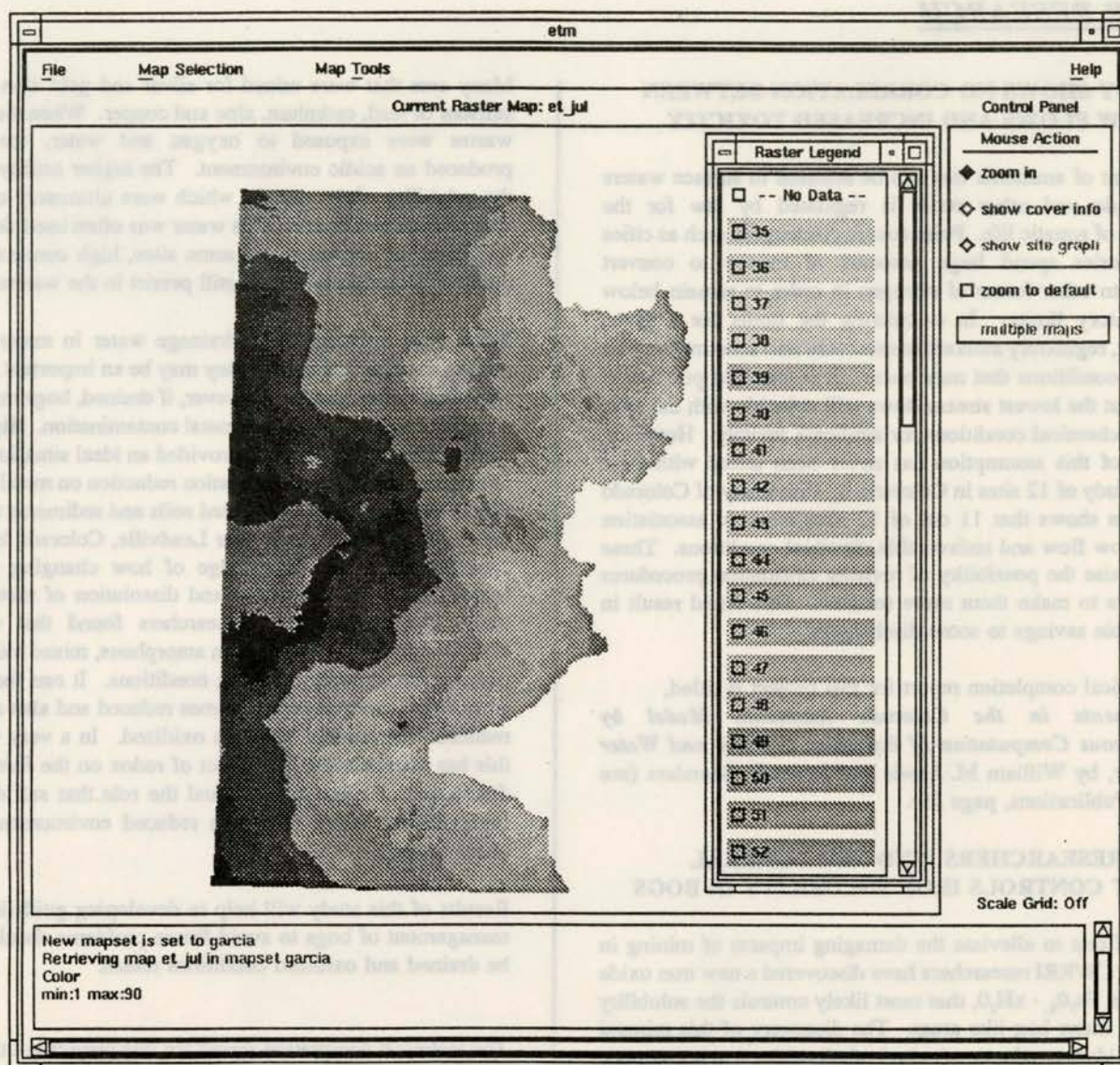


Figure 1: Evapotranspiration Reference map for July Displayed with Graphical User Interface Development by the Integrated Decision Support Group.

(ET_r maps) for Colorado's Western Slope, bordered on the east by the Continental Divide. In accordance with current developments in the irrigation science community, the Penman-Monteith equation was used to calculate ET_r and alfalfa was selected as the reference crop. Data parameters required as input for the Penman-Monteith equation are maximum and minimum temperature, relative humidity (or dew point temperature), solar radiation, and wind-speed. During the course of the project, weather data were identified and/or collected from the following sources:

- o COAGMET - Colorado Agricultural Meteorological Network.
- o WTHR - Maintained by the Joint Center for Energy Management.
- o RAWS - Remote Automatic Weather Stations.
- o UCC - Utah Climate Center.
- o NWS - National Weather Service.

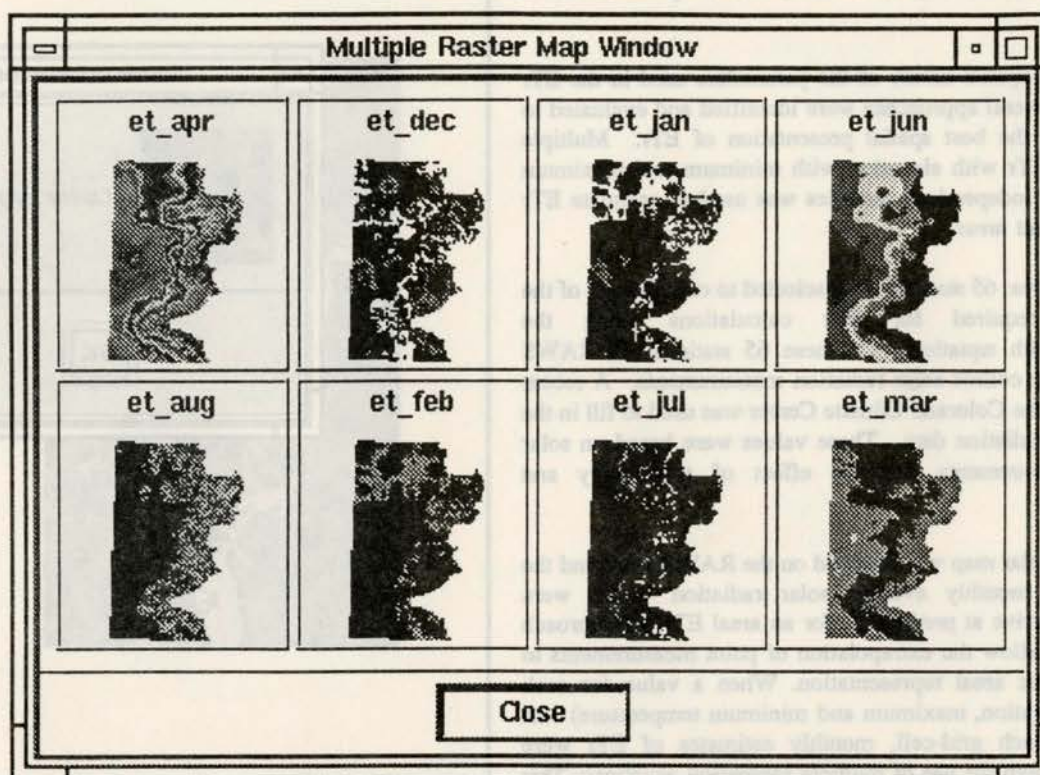


Figure 2:

Pop-up window
with
multiple raster
maps displayed

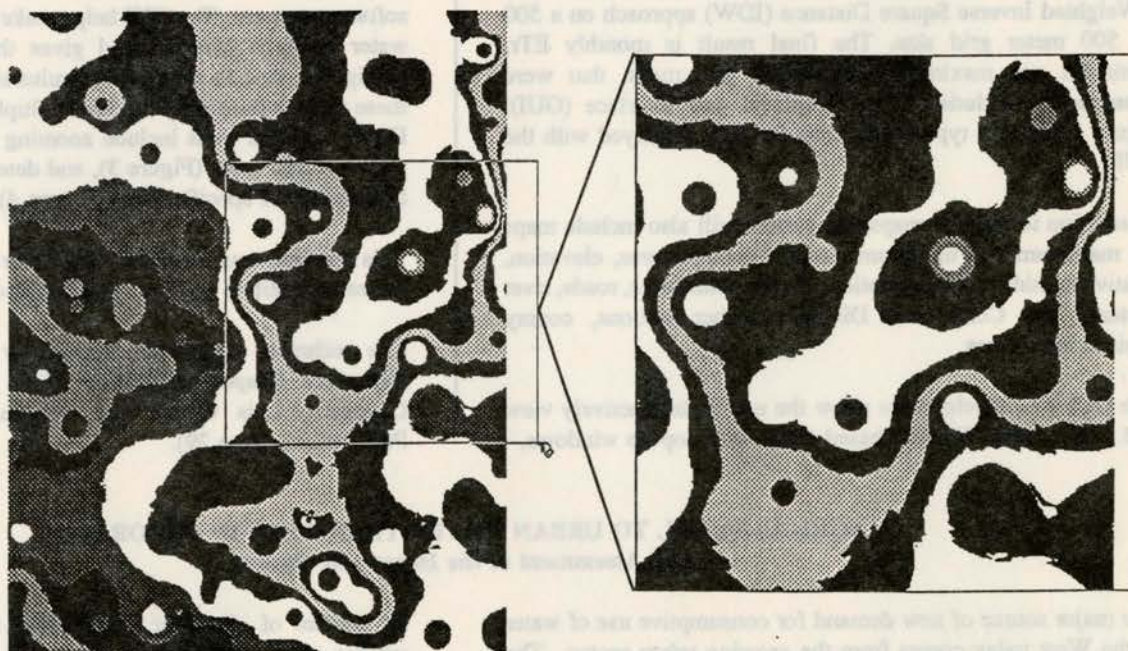


Figure 3: Selecting a portion of the map with the zoom-in option

Where possible, the data were subjected to a quality check. For all the stations, monthly averages were used to calculate monthly ETr, resulting in monthly ETr values for 65 point locations (stations).

Because of the spatial nature of the parameters used in the ETr calculations, several approaches were identified and evaluated to come up with the best spatial presentation of ETr. Multiple regression of ETr with elevation with minimum and maximum temperature as independent variables was used to calculate ETr for data-deficient areas.

In the project area, 65 stations were selected to collect most of the input data required for ETr calculations using the Penman-Monteith equation. Of these 65 stations, 52 RAWs stations did not collect solar radiation measurements. A recent study done by the Colorado Climate Center was used to fill in the missing solar radiation data. These values were based on solar radiation measurements and the effect of topography and precipitation.

This regional solar map was overlaid on the RAWs sites, and the corresponding monthly average solar radiation values were adopted. To arrive at predictions for an areal ETr, an approach was sought to allow the extrapolation of point measurements to their appropriate areal representation. When a value for each parameter (elevation, maximum and minimum temperature) was obtained for each grid-cell, monthly estimates of ETr were calculated through the use of multiple regression equations. This resulted in monthly grid-maps of ETr.

Finally, using geographic information systems (GIS), the ETr contour maps were created using ARC/INFO and GRASS to transfer the point data into spatial interpolated grid values, using a Weighted Inverse Square Distance (IDW) approach on a 500 by 500 meter grid size. The final result is monthly ETr, minimum and maximum temperature grid maps, that were subsequently included in the graphical user interface (GUI). Figure 1 shows a typical ETr map for July displayed with the GUI.

In addition to the ETr maps, the system will also include maps for maximum and minimum monthly temperatures, elevation, relative humidity, solar radiation, county boundaries, roads, river systems, the Continental Divide, weather stations, county capitals and others.

The GUI was developed to allow the user to interactively view and query maps. Window-based GUIs with pop-up windows,

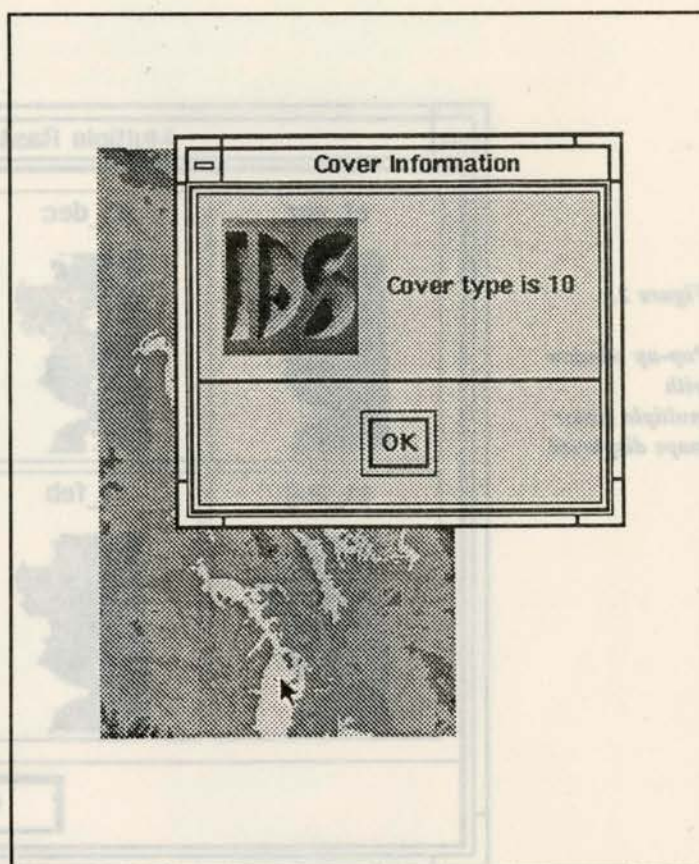


Figure 4: Cover type information displayed

menus and icons have become a common feature of most software systems. The GUI helps make these maps available to water resource planners and gives them tools to view and manipulate data to estimate agricultural water demand. One of these tools is the ability to view multiple maps for display as in Figure 2. Other tools include zooming into individual maps to view specific areas (Figure 3), and determining the exact cover type values of specific areas (Figure 4).

This research was funded by the Colorado Water Resources Research Institute and the State Engineer's Office of Colorado.

The technical completion report for this project is titled, *Reference Evapotranspiration Maps for Colorado*, by Luc Claessens, Luis Garcia and Marvin Jensen (see CWRRI Publications, page 29).

AGRICULTURAL TO URBAN WATER TRANSFERS IN COLORADO: An Assessment of the Issues and Options

The major source of new demand for consumptive use of water in the West today comes from the growing urban sector. The population of the West long has been concentrated in its urban areas, but the dominant demand for the additional development of water until recently has been for irrigation use. Even now,

80 percent of all water withdrawals in the West from both surface water and groundwater go to agricultural uses. The traditional solution to meeting new water demands in the West was to enlarge the usable supply -- either by building water storage projects or by tapping groundwater sources. Concern

about protection of remaining undeveloped streamflows and about mining of groundwater limits the ability of these sources to meet new demands. Increased attention has turned to purchasing rights to water used in irrigation and transferring the water to urban uses.

In the past such transfers occurred when urban growth expanded onto agricultural land. Either formally or informally, water used for irrigation became part of the urban water supply. The land use and the water shifted simultaneously and incrementally so the effects were perhaps less noticed and raised fewer concerns.

Recently there have been two important differences in Colorado: (1) Cities are purchasing water rights used on agricultural lands far removed from their boundaries; and (2) the purchases are of larger blocks of water rights. Transfers have moved from a gradual, incremental process of change to -- in some cases -- highly visible, sometimes rather dramatic transactions.

The implications of large-scale, long distance water transfers are prompting review of state water transfer policies. In a recently completed CWRRI project, the principal investigator summarizes water rights experience in Colorado and discusses Colorado law applying to transfers. These approaches are discussed under four broad headings: (1) Conditioning Water Transfers; (2) Regulatory Approaches to Reducing Agricultural Use; (3)

Providing Incentives to Conserve; and (4) Short Term Transfer Approaches. In the project completion report, the investigator summarizes:

There are opportunities in Colorado to improve utilization of the state's water resources and to meet the needs of urban areas without undermining the agricultural economy of the state. At present the legal system promotes only one type of transfer -- permanent sale of water rights with dry-up of formerly irrigated lands. We suggest here mechanisms that provide options to this approach -- by providing incentives to make more efficient use of water presently diverted, by facilitating short-term transfer arrangements that could address much of the present demand (such as for drought-year supplies), and by assuring that transfers do not impose uncompensated losses on local communities and resources.

The technical completion report for this project is titled, *Agricultural to Urban Water Transfers in Colorado: An Assessment of the Issues and Options*, by Teresa A. Rice and Lawrence J. MacDonnell (see CWRRI Publications, page 29).

SUSTAINING EASTERN COLORADO'S DRYLAND AGROECOSYSTEM

Colorado's Eastern Plains are characterized by fertile soil, but as in other dryland agricultural areas around the world, precipitation is often unpredictable and sporadic, and evapotranspiration rates are high. Successful dryland agriculture is dependent on rainfall during the growing season and on soil moisture stored during fallow periods. In eastern Colorado, wheat followed by fallow is the predominant dryland cropping pattern. The region has been a productive dryland agricultural area for nearly 100 years, yet there have been repeated episodes of crises resulting from climatic variability.

The quest for sustainability in dryland agricultural systems must have water management issues as a primary focus. However, other factors such as soil erosion, depletion of soil organic matter, pest impact and costs associated with pesticides and fertilizers also are important.

AES Project Takes Interdisciplinary Approach

-- An interdisciplinary approach to synthesize the complex interactive factors in dryland agriculture will be taken in a project recently funded by the Agricultural Experiment Station. The investigators will address questions such as:

How do the intensive rotational systems affect beneficial and pest insects, plant pathogens and weeds?

How do the intensive rotational systems alter the crop/weed competition for soil moisture?

What are the short and long-term effects of the intensive rotational systems on soil quality and nitrogen fertility?

How would the addition of legume cover crops change these relationships?

How do these systems impact ecological relationships in the soil?

Why does wheat grown in the most intensive rotation sometimes yield more than wheat in the wheat-fallow system, even though soil water at planting is less?

These questions will be addressed at the systems level so that the complex interactions of the components can be characterized and the system as a whole understood. Project goals are to increase net return to individual farmers, increase the economic viability of rural communities, decrease soil erosion and improve soil and water quality, improve biological control of insect pests while decreasing the use of pesticides, and increased sequestration of CO₂ in the atmosphere.

Project investigators are: Bill Brown, Joe Hill, Mark VanGessel and Phil Westra, Plant Pathology and Weed Science; Ted Elliott and William Hunt, Natural Resources Ecology Lab, Jack Fenwick, Gary Peterson and Dwayne Westfall, Agronomy; Tom Holtzer and Frank Peairs, Entomology; Ed Sparling, Agricultural and Resource Economics; and Karen Wilken, Extension Specialist, Food Science and Human Nutrition.

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

- EXPLICIT SIMULATION & PARAMETERIZATION OF MESOSCALE CONVECTIVE SYSTEMS, William R. Cotton, Atmospheric Science
- STORMS - MULTISCALE SIMULATION & ANALYSIS, William R. Cotton, Atmospheric Science*
- CLIMATIC INFLUENCES AFFECTING ATLANTIC TROPICAL CYCLONE VARIABILITY, William M. Gray, Atmospheric Science*
- ACID-MINE DRAINAGE IMPACTS ON IRRIGATED AGRICULTURE IN THE ALAMOSA RIVER BASIN, Grant E. Cardon, Agronomy
- ADMINISTRATION OF THE NPS/CSU COOPERATIVE PARK STUDIES UNIT, David M. Swift, Natural Resources Ecology Lab
- BUREAU OF RECLAMATION - LOWER GUNNISON BASIN SURGE IRRIGATION RESEARCH, Dennis W. Lamm, Cooperative Extension Services*
- MOISTURE MOVEMENT & HEAVE BENEATH SIMULATED FOUNDATION SLABS ON EXPANSIVE SOIL, John D. Nelson, Civil Engineering*
- MODELLING OF CO₂ IMPACT ON A GRASSLAND SYSTEM, Dennis Ojima, Natural Resource Ecology Lab
- A MODELING & REMOTE SENSING STUDY OF THE RADIATIVE HEATING OF CLOUDS IN SUPPORT OF ARM, Graeme L. Stephens, Atmospheric Science
- HYBRID STRIPED BASS IN PONDS, Stephen A. Flickinger, Fishery & Wildlife Biology
- STATISTICAL FRAMEWORK FOR UTILIZATION OF RADAR DATA IN TROPICAL RAINFALL MEASURING MISSION, V. Chandrasekar, Electrical Engineering*
- QUANTIFICATION OF FEDERAL RESERVE WATER RIGHTS FOR NATIONAL PARK PURPOSES, Thomas G. Sanders, Civil Engineering*
- 3-D FACIES ARCHITECTURE OF THE NIOBRARA RIVER: MODERN ANALOG FOR PETROLEUM RESERVOIRS...Frank Ethridge, Earth Resources
- MOISTURE MOVEMENT AND HEAVE BENEATH SIMULATED FOUNDATION SLABS ON EXPANSIVE SOIL, John Nelson, Civil Engineering*
- MONITORING OF 35 DEC SITES, Chester C. Watson, Civil Engineering*
- GROUNDWATER MONITORING OF BMPS IN THE SAN LUIS VALLEY, Deanna Durnford, Agric. & Chem. Engineering*
- EXPERT SYSTEM DEVELOPMENT FOR DAM SAFETY, Tom Siller, Civil Engineering

University of Colorado, Boulder, CO 80309

- MODELING FOR DESIGN AND TESTING OF TREATMENT AND REMEDIATION TECHNOLOGIES FOR AQUIFERS CONTAMINATED WITH ORGANIC WASTES, Tissa Illangasekare, Civil, Environmental, and Architectural Engineering*
- WESTSIDE MAIN CANAL MODELING STUDY, Edith Zagana, CE&A-Advanced Decision Support for Water & Environ. Systems*
- A GENERAL FRAMEWORK FOR CORROSION CONTROL BASED ON UTILITY EXPERIENCES, Marc Edwards, Civil, Environmental and Architectural Engineering
- SCALE AND MECHANISM OF LATERAL HETEROGENEITY IN THE OCEANIC UPPER MANTLE, Anne Sheehan, Cooperative Institute for Research in Environmental Sciences
- MEASUREMENT AND INTERPRETATION OF CARBON ISOTOPIC RATIOS IN METHANE BY GC-IRMS, James White, Institute of Arctic and Alpine Research
- ROTATING HYDRAULIC CHANNEL FLOW WITH FRICTION, Daniel Ohlson, Program In Atmospheric and Oceanic Sciences
- INTEGRATING LANDSAT TM IMAGERY AND THE CENTURY ECOSYSTEM MODEL, Heidi Van Everen, Cooperative Institute for Research In Environmental Sciences
- HIGH RESOLUTION STRATOGRAPHIC STUDIES AND OCEAN/CLIMATE MODELS: CRETACEOUS OF NORTHERN SOUTH AMERICA, Erle Kaufman, Geological Sciences
- REMOVAL OF BROMATE FROM OZONATED DRINKING WATER, Qadeer Siddiqui, Civil, Environmental and Architectural Engineering
- MODELING OF THE VADOSE ZONE IN SOIL OF THE ROCKY FLATS PLANT, Tissa Illangasekare, Civil, Environmental and Architectural Engineering*
- POTENTIAL IMPACTS OF GLOBAL CLIMATE CHANGE ON WESTERN RIVER BASINS STUDY, Rene Reitsma, CE&A-Advanced Decision Support for Water & Environ Systems*
- DEVELOPMENT ON THE FOREST FRINGE: A PILOT STUDY OF MOUNTAIN LAND USE CHANGE IN COLORADO, William Riebsame, Geography
- DIFFUSE COMPETITION AMONG SMALL LANDBIRDS IN COTTONWOOD RIPARIAN FORESTS ALONG THE SOUTH FORK SNAKE RIVER, IDAHO, Carl Bock, Environmental, Population and Organismic Biology

- POTENTIAL FOR ECOSYSTEM RESTORATION BY BEAVER WITHIN THE PIKE-SAN ISABEL NATIONAL FORESTS,
 COLORADO: A PLANNING STUDY, John Windell, Environmental, Population and Organismic Biology
- DESIGN AND DEVELOPMENT OF THE POWER AND RESERVOIR SYSTEM MODEL (PRSYM), Edith Zagana, CADSWES, Civil,
 Environmental and Architectural Department*
- MODELING STUDIES FOR THE EAST HIGHLINE CANAL, Edith Zagana, CADSWES, Civil, Environmental and Architectural
 Engineering
- APPLICATION OF ATMOSPHERICALLY CORRECTED IMAGES AND REFLECTANCE OF SPECTRA FROM HIRIS TO THE
 IDENTIFICATION AND MAPPING OF STABILIZED EOLIAN DEPOSITS AS POTENTIAL INDICATORS OF GLOBAL
 CHANGE, Alexander Goetz, CIRES*
- ESTIMATING ECOSYSTEM BIOGEOCHEMISTRY THROUGH HYPERSPECTRAL ANALYSIS, Carol Wessman, CIRES*
- DROUGHT IN THE AUSTRALIAN OUTBACK: MILANKOVITCH AND ANTHROPOGENIC FORCING OF THE AUSTRALIAN
 MONSOON, Gifford Miller, Geological Sciences

*Indicates additional funds and/or extension of date

WATER SUPPLY

Colorado Basin Outlook Report, Jan. 1, 1994--The 1994 water year began in October with wet weather across Colorado, followed by continually drier conditions. Colorado's snowpack began with above normal early accumulations, but the percentages have continued to decrease with each week's dry conditions. Snowpack is currently below normal statewide. Reservoir storage is in good condition across the state, with the highest storage volumes in many years. Reservoir storage remains as the bright spot in the water supply picture for 1994. Storage volumes are above average in every basin, as water managers have taken advantage of the high runoff of last year. Prospects for runoff in 1994 are below average to near average across the state. Without improved winter precipitation, some basins will see a quick return to shortages in water supplies. (Issued by Paul W. Johnson, Chief, SCS/USDA; Released by Duane Johnson, State Conservationist, SCS, Lakewood. For more information contact Michael A. Gillespie, SCS/USDA, Lakewood at 303/236-2906.

Water Supply Conditions Update--State Engineer's Office--

The National Weather Service reports statewide precipitation averaged a low 52 percent of normal during December. The Weather Service 30-day outlook as of January 1 is for near normal temperatures over the entire state, with above normal precipitation over all but the southeast corner of the state which is forecasted to have normal precipitation. The NWS 90-day outlook is for both near normal temperatures and precipitation over the whole state.

The Surface Water Supply Index (SWSI) developed by the State Engineer's Office and the USDA/SCS is used as an indicator of mountain-based water supply conditions in the major river basins of the state. It is based on snow pack, reservoir storage, and precipitation for the winter period (Nov.-April). During the winter period snow pack is the primary component in all basins except the South Platte, where reservoir storage is given the most weight. The following SWSI values were computed for each of the seven basins on Jan. 1, 1994 and reflect conditions during the month of December.

<u>Basin</u>	<u>Jan 1, 1994 SWSI Value</u>	<u>Change From Previous Yr.</u>	<u>Change From Previous Yr.</u>
South Platte	+1.8	-0.8	+1.8
Arkansas	+0.0	-2.1	-0.1
Rio Grande	-1.2	-1.0	-1.9
Gunnison	-0.9	-1.9	-1.8
Colorado	+1.3	-1.1	+1.0
Yampa/White	0.0	-2.9	0.0
San Juan	-1.8	-1.9	-1.9
Dolores			

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

FEATURES

MICHAEL CREED HINDERLIDER: A COLORADO WATER BUFFALO

by
James E. Sherow
Kansas State University

Editor's Note: This paper was originally part of Dr. Sherow's dissertation research at the University of Colorado, which evolved into his first book (Watering the Valley: Development Along the High Plains Arkansas River, 1870-1950). James E. Sherow is currently an Assistant Professor of History at Kansas State University in Manhattan, Kansas.

Michael Creed Hinderlinder, the most powerful water buffalo* in the history of Colorado, never lost sight of the precious nature of water. From 1923 until his retirement in 1954 he oversaw the state engineer's office, initially given the responsibility to govern the appropriation of water in the districts as first created by the Second General Assembly in 1879. By the time he took his office he administered over 20,000 water rights to over 3 million acres of land, regulated all dams over ten-feet high, and monitored 215 stream gauging stations throughout the state. He also involved his office in lobbying for federal and public support to build reclamation and flood control projects, represented Colorado in negotiating several interstate water compacts, prepared hydraulic studies for important interstate and intrastate litigation, administered all interstate water compacts, and helped plan the future building of the water infrastructure, which still sustains the economy of Colorado.

As a highly representative specimen of his species, the western Water Buffalo, Hinderlinder typified his fellow colleagues' belief in conservation as defined within the American conservation movement at the turn of the twentieth century. The words efficiency, conservation, corporate-like government, scientific method, and social engineering all formed the watchwords of progressive reformers of his ilk. Hinderlinder strove to achieve these goals through a centralized bureaucracy managed by scientifically trained people such as himself. He believed in a commitment to the public interest governed by a self-proclaimed political neutrality. Hinderlinder's professionalism allowed him to achieve many of his goals; however, he also faced several problems arising from his conservation ethos.

Hinderlinder spent his formative years in the humid prairies of the Midwest. He grew up on a farm near Medora, Indiana, and frequently returned to it until his father's death in 1929. He attended Purdue University and graduated with a B.S. degree in civil engineering in June 1897. Hinderlinder embraced a mechanistic view of the universe wherein the earth is best viewed as a complex machine governed by a predictable set of God-given rational, physical rules, which humans can manipulate and control through mathematics. Hinderlinder defined progress within this mechanistic framework, which meant controlling and dominating nature through science.

Hinderlinder found the perfect application of newly acquired skills in the arid West. In 1898 he accepted a position with the Denver Board of Public Works until Addison J. McCune, the state engineer, hired him as a hydrographer in 1901. Hinderlinder joined the newly formed Reclamation Service in 1902, and quickly rose to the position of a district engineer and built a fine reputation for himself. In 1907 Hinderlinder joined with two other engineers, John E. Field and Abraham Lincoln Fellows, and formed a Denver-based consulting firm. In 1923 Hinderlinder's reputation as a hydraulic engineer led to his selection as the state engineer of Colorado, and he would remain in this office working ten to twelve hours, or more, six days a week until his retirement in 1954.

Hinderlinder firmly believed in planned economic growth, not in laissez-faire economics. He railed against unchecked greed while advocating economic growth. To overcome troubles associated with unchecked greed and to protect the public interest, Hinderlinder advocated a strong regulatory role for the state engineer. He believed in making careful studies of soil composition, topography, and crops within an irrigation system, and only when these factors were understood should a canal company be allowed to divert water needed to sustain agricultural operations. Effective regulation, he believed, was necessary for the "evolution of the social, economic and commercial development of a nation."

To guide the direction of this control, Hinderlinder firmly believed that an engineer must have vision, and the domination of nature formed a large part of his view. Nature existed as something for people to control and to use to further their prosperity; it left to people "the obligation" of directing the control and application of water to their needs. "In the degree," he stated, "that [man] is able to measure up to such obligation, may he expect to advance and enjoy the fruits of his labor, and in the same degree that he fails to do so, may he in time retrograde to the station of the savage." The absolute domination of nature, in this case of water, would result in material progress and civilization: "controlled and guided by the will of man, [water] becomes his never-tiring slave, turning the wheels of industry, energizing the levers of force, and bearing the burdens of commerce."

Difficulties, however, arose that lessened the effectiveness of Hinderlider's credo when set in practice. Shortcomings existed in the way in which he applied his scientific and political objectivity and in his pursuit and protection of the public interest. This does not imply anything devious or hypocritical in Hinderlider's professional ethics. To the contrary, he consistently practiced his keen sense of professionalism. The problem in his approach lay in the uncritical acceptance of his own ideology.

The construction and regulation of large dams illustrates some of the difficulties Hinderlider experienced implementing his philosophy. He never questioned the construction of huge storage projects like John Martin Dam, Eleven Mile Canyon Dam on the South Platte, and Ralston Creek Dam, even though he clearly recognized inherent bureaucratic and environmental problems in the application of the technology -- for example, the failures of Apishapa Dam in 1924 and of Castelwood Dam in 1933, and the salinity and downstream riverbed problems on the Arkansas River encountered after building John Martin Dam.

Hinderlider also experienced difficulties with irrigators over just what the public interest was. For example, from 1927 until 1948, irrigation companies such as Riverside and Sunnyside Park gave Hinderlider uncountable woe. The farmers kept their headgates open to divert river flow in violation of Hinderlider's order to the contrary. They refused to install automatic measuring devices on the diversion dam intakes. These irrigators fought Hinderlider because they believed his administration of their diversions unjust and inaccurate, so they took matters into their own hands. They proved so recalcitrant that Hinderlider asked Governor Johnson to activated the state militia to enforce the state engineer's decrees.

Hinderlider's power to personally direct water development in Colorado peaked in the mid-1930s. By this time Coloradans found themselves besieged by drought and interstate water suits. To deal with the problems, the Colorado State Assembly decided to create an agency apart from the state engineer's office to aid in both the protection and the development of water, and this office became the Colorado Water Conservation Board. Of course, Hinderlider opposed the creation of the board as the "proverbial unnecessary 'fifth wheel', which inevitably results in unnecessary cost to the public." However, Hinderlider lost his fight. Year after year state appropriations increased for the board and Hinderlider found his bureau losing status each successive year. He felt as though he reigned over a diminishing empire.

In 1954, tired of the heavy demands of his office, Hinderlider retired. For a few years thereafter he engaged in consulting engineering, but by the end of the decade he had withdrawn from active practice. In the early 1960s he began serious reflections on water in Colorado. The dams and conveyance systems built and regulated under his tenure invoked in him a deep feeling of pride in how he had ordered nature to quench the growing thirst of industries, cities, and farms. Indeed, this economic infrastructure, which has supported economic growth in Colorado, stands as a physical monument to his capabilities as an engineer. At the same time, however, Hinderlider had begun to lose some of his faith in Progressive engineering, and the water buffalo showed signs of greening, becoming somewhat of a radical environmentalist.

Hinderlider arrived at the opinion that the proper relationship of people to nature consisted of usufruct and stewardship. A Nigerian proverb he quoted read that the earth belongs "to a vast family of which many are dead, few are living, and countless members are yet unborn." He had now greatly extended his notion of the public good well beyond the narrow concerns of interest groups, and put himself at odds with selfish and immediate self-gratification so typical of modern consumerism. More importantly, though, his view toward nature had changed. In order to respect tradition, and to provide for posterity, Hinderlider hoped that usufruct and stewardship would characterize people's relationships with nature. He elaborated this with a quote from a "psalmist" who had emphasized how the Father, or creator, owned the earth, and people could use it only through His sufferance. As Hinderlider now believed, people by themselves could not own the earth; rather, they could use it only so long as they did not degrade God's creation for future generations.

At eighty-eight years of age, Hinderlider had verged on a serious critique of his youthful faith in Progressive engineering. Though not explicitly stated, he had moved away from an uncritical acceptance of the human domination of nature. He had joined ranks with people such as Wallace Stegner, who chided westerners to adapt their lives to aridity. By the time of his death in August 1967, Hinderlider's faith in Progressive engineering had lifted a bit like the wavering of the mirage revealing the dry expanses of Colorado.

* A water buffalo is an expert in western water issues. These people are usually hydrologists, or public water officials.

WHAT IS THE STATUS OF THE OGALLALA HIGH PLAINS AQUIFER?

Greg Silkenen

The Ogallala Aquifer, the country's largest underground water reserve, provides 30 percent of all irrigation water derived from groundwater in the United States. The USGS estimates the total drainable water in this aquifer to be approximately 3.25 billion acre-feet. The Ogallala covers an area of 174,000 square miles in eight states, extending from approximately the

100th Meridian on the east to the Rocky Mountains on the west, and from Texas on the south to South Dakota on the north. It is the sole source of water for much of the high plains region. Recently, the Colorado Water Resources Research Institute has received a number of requests for current and up-to-date information on the Ogallala Aquifer. Is

the aquifer still being depleted in Colorado? What is the current status of water levels? Within Colorado, the Ogallala Aquifer underlies the Southern and Northern High Plains Designated Groundwater Basins along the eastern edge of the state. Here, water levels in the aquifer generally continue to decline, although at a much slower rate in recent years when compared to the 1960s and 1970s. There are even areas where water levels have stabilized or risen slightly.

Water use continues to be a major concern, however, because the aquifer is a virtually nonrenewable resource. Recharge rates are extremely slow over time when compared with the average rate of water withdrawals. Natural recharge to the aquifer varies from 6 inches per year in the Sandhills of northwestern Nebraska to 0.024 inches per year in parts of Texas. Withdrawals from the aquifer in 1978 were 23 million acre-feet, which exceeds the annual flow of the Colorado River. Although the rate of withdrawal has decreased recently, "mining" of the aquifer continues.

COLORADO

The Ogallala Aquifer underlies approximately 9,000 square miles of the Northern High Plains of Colorado, and a smaller area in the Southern High Plains. Development of the groundwater resources of the region began prior to the 1950s. At that time the region contained an estimated 118 million acre-feet of groundwater. Beginning about 1965 irrigated farmland rapidly expanded on the eastern plains. Since that time approximately 17 million acre-feet of water has been mined from the aquifer.

The Colorado Division of Water Resources (DWR) has established a water monitoring network to obtain information on groundwater conditions, establish groundwater trends, and manage groundwater resources in the Northern and Southern High Plains Designated Groundwater Basins (NHP, SHP). In 1988 a study of depletion to the aquifer was undertaken at the request of the Colorado Groundwater Commission to determine if existing rules governing the depletion of the aquifer were adequate to properly manage it. Beginning in 1987 the DWR was directed to establish and maintain this state-wide groundwater monitoring network. As early as the 1960s, however, the United States Geological Survey and Colorado State University began monitoring wells in the region. During the winter of each year water level measurements are taken in approximately 700 wells in the basins, and the results are published by the DWR.

The average annual depletion of the Ogallala in Colorado's NHP Basin from 1965 to 1989 was approximately 700,000 acre-feet/year. Nearly 4400 high-capacity wells were operating in the basin as of 1993. Peak pumping in the area probably occurred in the early to mid 1970s and utilized 1.2 to 1.5 million acre-feet of water/year, about twice the present rate. Actual water level declines in the basin averaged about 0.66 feet/year between 1988 and 1993, and within this five-year period the rate of withdrawal has been declining each year as

well; 0.51 feet/year in 1991-1992, and 0.34 feet/year in 1992-1993. Water levels in the aquifer continue to show a regional decline, but there are localized areas near the NHP Basin margin where water use has been curtailed and which are showing stable or rising water levels in the aquifer. Several factors have contributed to less depletion of the Ogallala Aquifer in the Northern High Plains since 1975. These factors include: low crop prices during the 1980s which helped reduce water demand as farmers irrigated fewer crops; less water-intensive crops compared to earlier cropping patterns (corn, wheat, and sunflowers vs. sugarbeets and alfalfa); and unusually wet summers in the region.

For additional information on the status of the Ogallala in Colorado, contact: George D. VanSlyke, Chief, Geotechnical Services, Division of Water Resources, 818 Centennial Building, 1313 Sherman Street, Denver, CO 80203, TEL: 303/866-3581.

KANSAS

Agriculture in western Kansas also relies heavily on the Ogallala Aquifer for irrigation. In 1992 the Kansas State Board of Agriculture formed the Kansas Agriculture Ogallala Task Force to study and collect data on depletion of the aquifer. The task force recently issued its first report, with recommendations that include creating a provision in the 1995 farm bill that would provide subsidies to farmers who stop producing an irrigated crop or switch to a non-irrigated crop. The task force is also urging farmers to enroll farmland that currently is in the Federal Conservation Program (FCP) into the Water Rights Conservation Program. The latter program, begun last year, allows irrigators to sign a contract saying they will not use a water right for a period of five to ten years.

For additional information, or a copy of the Kansas Agriculture Ogallala Task Force Report, contact: Kansas Department of Agriculture, 901 South Kansas Avenue, Topeka, KS 66612, TEL: 913/296-3848.

TEXAS

In the Texas Panhandle, the High Plains Underground Water Conservation District No. 1 covers some 5.5 million acres, and also relies on the Ogallala Aquifer for irrigation. Here net depletion of the aquifer has been decreasing over the last three decades. The annual rates of withdrawals historically are: 1.6 million acre-feet from 1965 to 1970; 1.4 million acre-feet from 1970 to 1975; .5 million acre-feet from 1975 to 1980; 0.85 million acre-feet from 1980 to 1985; and 0.03 million acre-feet from 1985 to 1990. According to the district's records, the aquifer stabilized in 1985 for the first time since withdrawals began.

Depth-to-water measurements made by the district have shown an average groundwater level increase of 0.50 feet in 1986; 0.90 feet average increase in 1987; an average decline of 1 foot in 1988; and most recently an average increase of 0.14

feet in 1992. The 10-year average change in water levels between 1982 and 1992 has been -0.31 feet per year. This is in contrast to two and three feet average annual declines during the 1950s and 1960s.

Precipitation for the area during the 10-year period 1982-1992 has averaged 102 percent of normal as recorded at the National Weather Service stations at Lubbock and Amarillo. But the

district feels the sharp decline in the rate of dropping water levels more accurately reflects the effects of water conservation efforts than anything else.

For additional information, contact: A. Wayne Wyatt, Manager, High Plains Underground Water Conservation District No. 1, 2930 Avenue Q, Lubbock, TX 79405, TEL: 806/762-0181, FAX: 806/762-1834.

Sources:

The Cross Section. Monthly publication of the High Plains Underground Water Conservation District No. 1, April 1993.

High Plains Underground Water Conservation District No. 1. *Our Fourth Decade of Service: 40th Anniversary 1951-1991*.

Kromm, David E., and Stephen E. White, eds. *Groundwater Exploitation in the High Plains*. Lawrence: University of Kansas Press, 1992.

Romero, John C. *Water Levels in the Southern High Plains Designated Ground Water Basin*. Denver: Office of the State Engineer, Division of Water Resources, May 1993.

U.S. Water News, December 1993.

VanSlyke, George D. *Ground Water Levels in the Northern High Plains Designated Basin, 1993*. Denver: Office of the State Engineer, Division of Water Resources, March 1993.

VanSlyke, George D., and Steven A. Joliat. *Depletion to the Ogallala Aquifer Northern High Plains Designated Ground Water Basin*. Denver: Office of the State Engineer, Division of Water Resources, August 1990.

REFLECTIONS ON CONSERV93: The New Water Agenda

by Kathleen Klein

"Sustainable landscaping", "third-party impacts", "integrated watershed planning", "demand management" - these were the buzzwords at this year's CONSERV93 meeting. Sponsored by the American Water Works Association, the American Water Resources Association, and the American Society of Civil Engineers, CONSERV93: The New Water Agenda, attracted over 1100 people from across the country. Held December 12-16, 1993, at The Mirage resort complex in Las Vegas, Nevada, the gathering brought together a wide range of interests from federal, state and local government agencies, public and private utilities, academia, nonprofit organizations, and consulting and engineering firms. The conference reinforced the message that water conservation is an accepted water management practice, and is being implemented nationwide.

CONSERV93, lasting one full week, was overwhelming in its magnitude. The agenda included workshops (47), poster sessions, affinity group discussions, panel discussions, software demonstration sessions, tours and exhibits. Presentation topics reflected the diverse aspects of the water conservation field. Attendees and speakers came from all over the United States (including humid regions!), and from Mexico, Canada, Egypt, and Saudi Arabia.

CONSERV93 brought home the realization that water conservation will continue to play an important role in water

management decision-making. The conference was an excellent forum for discussion of many types of water-related issues in a national context. For example, several presentations and numerous individual discussions focused on the issue of declining utility revenues resulting from successful water conservation programs. It was recommended that long-term benefits such as deferred supply development and treatment costs be emphasized to the consumer that conserves but is also faced with a rate increase from his/her water utility. Also controversial was the subject of third-party impacts resulting from water conservation-driven transfers, especially in the agricultural sector. At issue were impacts to third parties resulting from changes in agricultural water practices and/or transfers of use.

Because water conservation programs have been in the implementation phase for a number of years now, many presentations concentrated on program evaluation results and tools for making existing programs better. The linkages between water supply planning and land use planning, human water use and ecological integrity, water quality and water quantity were also topics of discussion at CONSERV93. Participants brought many water-related issues to the forefront, and called for emphasizing the role of efficiency as we work to manage our water resources. The success of CONSERV93 is evidence that we are well on our way to doing just that.

IS COLORADO PREPARED FOR FUTURE DROUGHTS?

"In my opinion, this country must undergo a significant, philosophical change in how the public sector views the issue of drought...we must move from a reactive, crisis management approach to a more proactive...risk minimization approach..." Donald Wilhite, International Drought Information Center, University of Nebraska

Once a drought is on its way, how does Colorado prepare for it and deal with it? In its October 1987 report, "A Model for Western State Drought Response and Planning," Western States Water Council staff found that Colorado was one of only five states having definitive drought response plans; the others were Montana, North Dakota, Oregon and South Dakota.

In February, 1981, faced with the potential development of a drought emergency, Colorado Governor Richard D. Lamm called on the Division of Disaster Emergency Services (DODES) to begin to develop a drought plan -- a two pronged effort to include elements of assessment and response. The *Colorado Drought Response Plan* was published on May 15, 1981 as part of the broader Colorado Natural Disaster Emergency Operations Plan. It was updated in 1986.

ASSESSMENT AND RESPONSE

Regular monitoring by DODES includes using a modified version of the Palmer Drought Index and the Surface Water Supply Index (SWSI) developed by the Colorado State Engineer and the Soil Conservation Service. Maps are generated and sent to DODES each month for review. As the prospect of a drought becomes imminent, phases of the drought plan are activated according to the projected severity of the situation.

Phase I -- The Palmer Index uses a numerical scale generally ranging from +4 (extremely wet) to -4 (extremely dry). The SWSI values calculated by the State Engineer's Office are based on streamflow, reservoir storage and precipitation. When either of these indices drops to between -1.0 and -2.0, Phase I of the Drought Response Plan begins with DODES activating the Water Availability Task Force as part of the assessment system. Its basic function is to further assess and project various hydrologic parameters including snowpack, soil moisture, reservoir and groundwater levels, precipitation, streamflow and temperatures. WATF is chaired by the DODES Director, Len Boulas, and includes the Colorado State Engineer, the Office of the State Climatologist, the Soil Conservation Service, the National Weather Service, the U.S. Geological Survey, and the Bureau of Land Management.

Phase II -- Once the SWSI index falls below -2.0 in any river basin, indicating a moderate drought, the Water Availability Task Force prepares a Governor's Memorandum of Potential Drought Emergency, which activates a number of Phase II Impact Assessment Task Forces: municipal water, wildfire protection, agriculture, commerce and tourism, wildlife, economic impacts, energy and others.

Phase III -- As the drought becomes severe (at an index value of approximately -3.0) and the Review and Reporting Task Force determines that response problems require extraordinary

management, a Governor's Proclamation of Drought Emergency is prepared. This activates the Inter-Agency Coordinating Group and initiates the Phase III response system under the State Drought Plan. The group is composed of senior-level representatives from the Colorado Departments of Agriculture, Local Affairs, Natural Resources, the State Forest Service, the Office of Planning and Budgeting, and in a federal advisory capacity, the Federal Emergency Management Agency (Region VIII).

While many staff at local, state and federal agencies are charged with flood control, few devote much time to drought issues during periods of non-drought. Colorado is, one might say, at the "cutting edge" of drought planning with a clear outline for interagency response once an emergency develops.

In 1991, the Drought Hazard Mitigation Task Force emerged as a function of the broader mitigation efforts of the Colorado Natural Hazards Mitigation Council. The task force met in October and December, 1993 to discuss and plan priority projects for 1994, which will include:

- identify drought mitigation actions from other states;
John Clark, Gronning Engineering, Project Leader

- create a precipitation deficit index;
Thomas McKee, State Climatologist, Project Leader

- look at historic Colorado droughts to determine mitigation actions taken or that could have been taken;
Barry Cress, Project Leader

- develop a drought mitigation plan matrix;
Len Boulas, Director, Office of Emergency Management;

- develop graphs to portray drought situation to general public, project leader to be assigned

Colorado does have people devoting time to drought planning and interagency coordination during periods of non-drought -- let's all support their efforts.

For additional information contact Len Boulas, Chairperson of the Water Availability Task Force and the State Drought Mitigation Task Force; and Director, Office of Emergency Management.

Sources: *Western State Drought Management*, 1986 and *A Model for Western State Drought Response and Planning*, 1987, prepared by staff of Western States Water Council; *Drought Network News*, *Colorado's Water: Climate, Supply and Drought*, Colorado Water Resources Research Institute, June 1990.

WATER EDUCATION

Water-Related Educational Material Compiled by the University of Nebraska, Water Center/Environmental Programs

Bob Volk of the University of Nebraska's Water Center/Environmental Programs has put together this list of publications and material on water education. While there are over 70 publications on the list, printed below are those deemed most relevant to Colorado. Each entry includes the title, author, sponsoring agency (if there is one), contact and/or publication number, date, number of pages, and a brief summary of what the publication is about. The entries are categorized under either "General Education" or "K-12 Education."

GENERAL EDUCATION

TITLE Water Quality Self-Help Checklist
DATE November 1989
SPONSOR American Farm Bureau Federation
CONTACT American Farm Bureau Federation
Natural and Environmental Resources Division, 225 Touhy Ave.,
Park Ridge, IL 60068, TEL: 312/399-5700
PAGES 15

TITLE Water Resources Education: A Life Time of Learning --
Changing Roles in Water Resources Management and Policy
DATE June 27-30, 1993
SPONSOR American Water Resources Association (AWRA)
CONTACT Library of Congress Catalog Card Number: 93-71755
PAGES 716

TITLE Agriculture and Water Quality: Best Management Practices for
Minnesota
DATE 1991
SPONSOR Minnesota Pollution Control Agency
CONTACT not available
PAGES 64

TITLE America's Waters: A New Era of Sustainability -- Report of the
Long's Peak Working Group on National Water Policy
DATE December 1992
SPONSOR Natural Resources Law Center of the University of Colorado
CONTACT Natural Resources Law Center, University of Colorado School of
Law Campus Box 401, Boulder, CO 80309-0401, TEL: 303/492-
1288, FAX: 303/492-1297
PAGES 12

TITLE 1992 Annual Report Special Protection Area Program
DATE May 1993
SPONSOR Nebraska Department of Environmental Quality
CONTACT not available
PAGES 30

TITLE Water in Your Hands
DATE 1990
SPONSOR Soil and Water Conservation Society
CONTACT Soil and Water Conservation Society
7515 N.E. Ankeny Rd., Ankeny, IA 50021-9764, Tel: 800/THE-
SOIL
PAGES 15

SUMMARY

This checklist will help in analyzing water supply and farming operations.

These are the proceedings of the symposia on "Water Resources Education: A Lifetime of Learning" and "Changing Roles in Water Resources Management and Policy."

This handbook describes the major nonpoint source pollutants in rural areas in Minnesota and different practices that may be used as parts of an overall system for water quality, and it contains a resource directory.

The purpose of this statement is to be useful to the new Administration in charting national objectives and suggesting specific decisions for developing a new approach toward managing America's waters.

This report considers Nebraska's Special Protection Area (SPA) program, initiated in 1986 by an act of the Nebraska Legislature.

This comic explains the hydrologic cycle and erosion in understandable terms for children.

GENERAL EDUCATION

TITLE Nonpoint Source News-Notes
DATE June/July 1993
SPONSOR Terrene Institute and U.S. EPA
CONTACT News-Notes c/o Terrene Institute
 1717 K St. NW, Suite 801, Washington D.C. 20006
PAGES 30

TITLE Organizing and Conducting a Cleanup on Public Lands and Waterways: Water Quality Series Booklet 3
DATE not available
SPONSOR TVA
CONTACT not available
PAGES 32

TITLE Summary: Examples of Program Results National Water Quality Initiative Cooperative Extension System
DATE May 1993
SPONSOR U.S. Department of Agriculture
CONTACT not available
PAGES 12

TITLE Water Quality Research -- The President's Initiative, Program Review and Evaluation 1992, Priority Components: Summary - South and West Regions Combined
DATE 1992
SPONSOR U.S. Department of Agriculture
CONTACT not available
PAGES 10

TITLE Flood Plain Management: Why we need it
DATE 1987
SPONSOR U.S. Department of Agriculture, SCS
CONTACT Program Aid Number 1276
PAGES 6

TITLE Total Watershed Management: An Approach for the 21st Century
DATE not available
SPONSOR U.S. Department of Agriculture, EPA, state government, and universities, unofficially
CONTACT not available
PAGES 19

TITLE A Productive Nation in Harmony with a Quality Environment
DATE April 1992
SPONSOR U.S. Department of Agriculture, SCS
CONTACT not available
PAGES 8

TITLE Assistance Available from the Soil Conservation Service
DATE January 1991
SPONSOR U.S. Department of Agriculture, SCS
CONTACT Program Aid Number 1352
PAGES 31

TITLE Buffer Strips for Efficient Conservation
DATE not available
SPONSOR U.S. Department of Agriculture, SCS
CONTACT South National Technical Center, Fort Worth, TX
PAGES 3

SUMMARY

This publication contains the notes on Watershed 1993.

This booklet is intended for anyone interested in organizing a cleanup.

This is a sampler of initial results of the Cooperative Extension System's National Initiative that addresses the issue of surface and groundwater quality.

This summary reviews the President's Initiative on Water Quality, initiated in 1990 to provide new and expanded emphasis on the protection and enhancement of our water resources.

This pamphlet explains why flood plain management is needed.

This paper is intended to express the collective viewpoints of a group of professionals from the USDA, EPA, state governments, and universities to provide sound recommendations for improving upon the way in which publicly-funded water quality projects are planned, selected, implemented and evaluated.

This publication explains the five national strategies of the U.S. Soil Conservation Service.

This pamphlet describes the mission of the Soil Conservation Service and its areas.

This pamphlet explains buffer strips in simple terms.

GENERAL EDUCATION

TITLE Choose Clean Water: Water Quality and Quantity for the 90's
DATE June 1991
SPONSOR U.S. Department of Agriculture, SCS
CONTACT not available
PAGES not available

TITLE Clean Water: Our Conservation Commitment
DATE not available
SPONSOR U.S. Department of Agriculture, SCS
CONTACT Program Aid Number 1475
PAGES 9

TITLE Snow Surveys and Water Supply Forecasting
DATE June 1988
SPONSOR U.S. Department of Agriculture, SCS
CONTACT Agricultural Information Bulletin 536
PAGES 14

TITLE Soil Erosion by Water
DATE August 1987
SPONSOR U.S. Department of Agriculture, SCS
CONTACT Agricultural Information Bulletin 513
PAGES 15

TITLE News
DATE not available
SPONSOR U.S. Department of Agriculture, SCS
CONTACT P.O. Box 2890, Washington D.C. 20013
PAGES 2

TITLE Soil and Water Education
DATE (6 Issues, from Winter 1990 to Winter 1992)
SPONSOR U.S. Department of Agriculture, SCS
CONTACT U.S. Department of Agriculture, Soil Conservation Service
 P.O. Box 2890 Room 6002-S, Washington D.C. 20013-2890
PAGES 24

TITLE Water Quality Indicators Guide: Surface Water
DATE September 1989
SPONSOR U.S. Department of Agriculture, SCS
CONTACT SCS-TP-161
PAGES 129

TITLE Water Quality Technology
DATE May 1993
SPONSOR U.S. Department of Agriculture, SCS
CONTACT Wildon Fontenot TEL: 202/475-5250
PAGES 2

TITLE Accomplishments of the USDA Hydrologic Unit Area Projects
DATE June 1993
SPONSOR U.S. Department of Agriculture, SCS, Agricultural Stabilization and Conservation Service
CONTACT not available
PAGES 74

TITLE Water Quality Projects
DATE May 1990
SPONSOR U.S. Department of Agriculture, SCS, Extension Service, and Agricultural Stabilization and Conservation Service
CONTACT not available
PAGES 4

SUMMARY

These pamphlets are guides to aid farmers with controlling water quality and quantity.

This pamphlet describes the Soil Conservation Service's objectives and its 5-Year Water Quality Plan.

This booklet explains the importance of snow as a primary source of water supply in the Western United States.

This publication explains how soil erodes by water and what can be done to prevent it.

This handout details how the Soil Conservation Service formed a partnership with the Isaac Walton League of America (IWLA) to benefit water quality.

These magazines deal with water quality and quantity; wetlands, wildlife, and CRP; watershed protection; managing water quality results; sharing technology; and conservation education.

This guide simplifies procedures for assisting potential water quality conditions and aids in finding water quality solutions to problems from sediment, animal waste, nutrients, pesticides, and salts.

This issue provides a brief overview of some of the water quality software that is being developed in Fort Collins.

This publication gives a listing of the hydrologic unit area projects in each state.

This publication lists various water quality projects going on in various states.

GENERAL EDUCATION

TITLE Water Resources Division Information Guide
DATE December 1992
SPONSOR U.S. Department of the Interior, U.S. Geological Survey
CONTACT Office of Regional Hydrologist, USGS, 345 Middlefield Rd., Mail Stop 470, Menlo Park, CA 94025, TEL: 415/329-4414
PAGES 20

TITLE ACCESS Express
DATE February 1993
SPONSOR U.S. EPA
CONTACT Administration and Resources Management (PM-211D), EPA 220-B-93-002
PAGES 14

TITLE Case Studies in Wellhead Protection: Ten Examples of Innovative Wellhead Protection Programs
DATE December 1992
SPONSOR U.S. EPA
CONTACT Office of Water (WH-550), EPA 813-R-92-002
PAGES 35

TITLE EPA Journal (2 issues) Vol. 17, No. 5, Vol. 18, No. 1
DATE Nov/Dec 1991, Mar/Apr 1992
SPONSOR U.S. EPA
CONTACT Office of Communications, Education, and Public Affairs, 22K-1005, 175N-92-901
PAGES 64

TITLE EPA Wetlands Fact Sheets
DATE March 1993
SPONSOR U.S. EPA
CONTACT Office of Water (WH-556F), Office of Wetlands, Oceans, and Watersheds (A-104 F), EPA843-F-93-001a thru 001ff
PAGES not available

TITLE EPA's Pesticide Programs
DATE May 1991
SPONSOR U.S. EPA
CONTACT Pesticides and Toxic Substances (H-7506-C), 21T-1005
PAGES 25

TITLE Fact Sheet on Water Chlorination
DATE July 1992
SPONSOR U.S. EPA
CONTACT Office of Water WH-556
PAGES 1

TITLE Groundwater Protection: A Citizen's Action Checklist
DATE June 1992
SPONSOR U.S. EPA
CONTACT Office of Water WH550A, EPA 810-F-92-002
PAGES 2

TITLE Is Your Drinking Water Safe?
DATE June 1989
SPONSOR U.S. EPA
CONTACT Office of Water (WH-550), EPA 570/9-89-005
PAGES not available

SUMMARY

This guide briefly describes the Water Resources Division's missions, program, and organizational structure, and where and how to obtain specific types of hydrologic information. The guide also contains a listing of addresses, telephone numbers, and office hours for all offices.

The ACCESS Express is a quick reference guide to major EPA information contacts.

The Wellhead Protection Program is a pollution prevention program intended to protect the groundwaters that supply well and well fields that contribute drinking water to public water supply systems. This report discusses various wellhead programs that have been implemented.

These two issues discuss NPS pollution by runoff of rain and snowmelt and the fairness of environmental protection.

This publication contains numerous sheets of facts concerning wetlands.

This booklet is intended to introduce readers to EPA's pesticide program.

This sheet gives a background on water chlorination.

This fact sheet explains potential threats to groundwater supplies and what you should do to help protect your water.

This pamphlet discusses the comprehensive program enacted by Congress in 1974 to ensure that our drinking water is as safe as we think it is.

GENERAL EDUCATION

TITLE Preserving Our Future Today: Your Guide to the United States
Environmental Protection Agency

DATE October 1991

SPONSOR U.S. EPA

CONTACT Communications and Public Affairs, 21K-1012

PAGES 32

TITLE Streamwalk Manual

DATE March 1992

SPONSOR U.S. EPA

CONTACT Region 10, 1200 Sixth Avenue, Seattle, WA 98101

PAGES not available

TITLE The Water Quality Catalog: A Source Book of Public
Information Materials

DATE not available

SPONSOR U.S. EPA

CONTACT Water Pollution Control Federation

601 Wythe St., Alexandria, VA 22314-1994, TEL: 703/684-2400

PAGES 49

TITLE Bottled Water: Helpful Facts and Information

DATE not available

SPONSOR U.S. EPA, FDA

CONTACT U.S. Food and Drug Administration

Federal Office Building #9, Room 5807, 200 C St. SW, Washington

D.C. 20004, TEL: 202/512-6111

PAGES 3

TITLE Drinking Water: Stronger Efforts Needed to Protect Areas
Around Public Wells From Contamination

DATE April 1993

SPONSOR U.S. General Accounting Office

CONTACT Richard L. Hembra, Director, Environmental Protection Issues,

TEL: 202/512-6111

PAGES 37

TITLE A User's Guide to Water Resources Information

DATE March 1993

SPONSOR U.S. Geological Survey, National Water Information Clearinghouse

CONTACT U.S. Geological Survey, National Water Information Clearinghouse,

TEL: 800/H20-9000

PAGES 159

TITLE Water Resources Update: Annual Meeting Issue -- Water
Resources Education

DATE Spring 1993

SPONSOR Universities Council on Water Resources

CONTACT Universities Council on Water Resources,

4543 Faner Hall, Southern Illinois University at Carbondale,

Carbondale, IL 62901, TEL: 618/536-7571

PAGES 41

TITLE Maintaining Your Home Well Water System

DATE 1993

SPONSOR University of Wisconsin, Cooperative Extension

CONTACT Agricultural Bulletin Rm. 245, 30 N. Murray St., Madison, WI

53715, TEL: 608/262-3346

PAGES not available

SUMMARY

This publication explains the job and goals of the U.S. EPA.

Streamwalk is designed to be used by lay people; people who are interested in learning more about their streams and rivers.

The Water Quality Catalog is an educational resource for schools, local governments, professional organizations, the general public, and any other groups that would like information on water quality.

This handout gives information on bottled water.

This report to Congress examines the barriers hindering the development and implementation of the states' wellhead protection areas (WHP) and the options available to deal with these barriers.

This guide provides information sources for water-related information in Maryland, Virginia and the District of Columbia.

This issue of Water Resources Update focuses on the critical issue of education and water resources.

This folder contains information on home well water systems including septic systems along with a report by Richard Castelnovo on "Confronting Environmental Liability of the Farm: What Lenders Need to Know, How Farm*A*Syst Can Help."

GENERAL EDUCATION

TITLE NebGuide
DATE May 1993
SPONSOR University of Nebraska at Lincoln, Cooperative Extension, IANR
CONTACT File under: Pesticides, General B-13, Herbicides G93-1158-A
PAGES 4

TITLE Water Quality 2000 Final Report: "A National Water Agenda for the 21st Century"
DATE November 1992
SPONSOR Water Quality 2000
CONTACT Water Pollution Control Federation
 601 Wythe St., Alexandria, VA 22314, TEL: 703/684-2418, FAX: 703/684-2492
PAGES 8

K-12 EDUCATION

TITLE Youth Education Materials; Working Titles 1993 Publications Catalog
DATE 1993
SPONSOR AWWA
CONTACT American Water Works Association
 6666 West Quincy Ave., Denver, CO 80235, TEL: 800/926-7337, FAX: 303/794-7310
PAGES 12, 107

TITLE What is a Watershed?
DATE April 1992
SPONSOR U.S. Department of Agriculture, SCS
CONTACT Program Aid Number 420
PAGES 3

TITLE Educating Young People About Water: A Guide to Goals and Resources
DATE December 1992
SPONSOR U.S. Department of Agriculture, Cooperative Extension Water Quality Initiative Team
CONTACT Elaine Andrews
 University of Wisconsin-Madison, Environmental Resources Center, 216 Agricultural Hall, 1450 Linden Dr., Madison, WI 53706, FAX: 608/262-2031
PAGES 47

TITLE National Project WET
DATE not available
SPONSOR U.S. Department of the Interior, Bureau of Reclamation
CONTACT National Project WET
 Culbertson Hall, Montana State University, Bozeman, MT 59717, TEL: 406/994-1919
PAGES 2

TITLE WET: Water Education for Teachers
DATE not available
SPONSOR U.S. Department of the Interior, Bureau of Reclamation
CONTACT not available
PAGES 2

TITLE Acid Rain: A Student's First Sourcebook
DATE July 1990
SPONSOR U.S. EPA
CONTACT Office of Environmental Processes and Effects Research, Washington D.C. 20460, EPA/600/9-90/027
PAGES 59

SUMMARY

This NebGuide contains questions and answers about Atrazine.

Water Quality 2000 is a cooperative effort of more than 80 public, private and nonprofit organizations. Improvement has been made in the condition of the nation's water over the past 20 years, but the national goal of "fishable and swimmable" waters has not been attained in many years.

These publications contain educational materials for children and the publications catalog for AWWA.

This pamphlet explains in simple terms that a watershed is an area of land that drains water to a given point.

This publication is designed to assist in program planning and implementation to involve youth in the improvement of water quality.

This pamphlet explains how Project WET operates as an interdisciplinary water education program intended to supplement a school's existing curriculum.

This pamphlet discusses the water education program for Montana teachers.

The purpose of this guide is to help students better understand the science, citizen action, and research issues that are part of the acid rain problem.

K-12 EDUCATION

TITLE Clean Water From the Mountains to the Sea
DATE not available
SPONSOR U.S. EPA
CONTACT University of New Hampshire/University of Maine Sea Grant
 College Program
PAGES 2

TITLE Earth Day Every Day
DATE March 1993
SPONSOR U.S. EPA
CONTACT Office of Water WH-556, EPA 800-B-93-004
PAGES 103

TITLE Environmental Education Materials for Teachers and Young
 People (Grades K-12)
DATE July 1991
SPONSOR U.S. EPA
CONTACT Communications and Public Affairs (A-107), 21K-1009
PAGES 25

TITLE Science Demonstration Projects in Drinking Water (Grades K-
 12)
DATE April 1990
SPONSOR U.S. EPA
CONTACT Office of Water, EPA 570/9-90-007
PAGES 16

SUMMARY

This brochure helps explain how conserving wildlife depends on conserving habitats.

This publication is a teacher's kit for environmental science education.

This annotated compendium of educational materials contains entries ranging from workbooks to curriculum plans, to posters, to newsletters, films and computer software.

This pamphlet includes a brief selection of science demonstration projects related to drinking water for K-12 students.

Introducing**THE WATER EDUCATION CENTER**

Located on the University of Northern Colorado Campus in Greeley, the Water Education Center is a user-friendly resource facility being developed to provide information and ideas relative to water awareness in north-central Colorado. The Center is a joint venture between the Central Colorado Water Conservancy District and the University of Northern Colorado. Its primary mission is to assist teachers, librarians and other educators with a wide range of resources and to form a local clearinghouse/network for water-related issues.

Whether you are new to the "water arena" or an old salt, the Water Education Center is a place to get in touch with others involved in exploring the importance of water in our lives, focusing first and foremost on our own watershed. The Center's first issue of its newsletter, *The Water Shed*, contains a teacher survey. Survey responses will help the Center best meet the needs of the education community.

The Center Director is Ray Tschillard, UNC Lab School; Associate Directors are Connie Lance, CCWCD, and Mark McCaffrey, UNC Graduate Student Educational Leadership; and Advisors are Tom Cech, CCWCD, and Jay Hackett and William Hoyt, both of UNC.

For more information about the Center, contact the Central Colorado Water Conservancy District at 330-4540.

1994 CHILDRENS' WATER FESTIVALS

Below are dates of some of the upcoming Children's Water Festivals around the state. For additional information contact Tom Cech, Executive Director, Central Colorado Water Conservancy District, Phone 303/330-4540; FAX 303/330-4546.

March 8th	Grand Junction
March 28th	Wray
March 31st	Sterling
April 27th	Montrose
April 28th	Delta
May 3rd	Northglenn
May 17th	Aurora
May 19th	Boulder
May 24th	Fort Collins
October 7th	Loveland
Fall	Buena Vista

Cortez, Golden and others have plans for a water festival during 1994 but have not set a date.

Now Available -- RADIO EXPEDITIONS Teacher's Guide, "WATER: Thirsting for Tomorrow," NPR Outreach Department, 1993. Contains audio-cassette and guide that provides supplemental background text and classroom activities. For information contact: Outreach, National Public Radio, 2025 M Street NW, Washington, DC 20036.

UNIVERSITY WATER NEWS

"SMART VALVE" UNDER DEVELOPMENT AT COLORADO STATE

A team of Colorado State University students has developed a new product named the "Smart Valve" that can actually determine whether your yard or field needs watering. The system uses a ceramic wick to sense soil moisture levels and control when the yard is watered. The "Smart Valve," still in the prototype stage, is being developed through Colorado State's Manufacturing Excellence Center for D & E Enterprise of Aurora, which holds the patent on the product.

Mark Dickson, a student designer at Colorado State, said "Once this system is fully developed, it could be used to cut water waste dramatically, especially here in the West where water is so valuable." "With this system," Dickson said, "you get a precise watering time as well as a precise determination of the relative moisture in the soil." Wade Troxell, Department of Mechanical Engineering and Director of Colorado State's Manufacturing Excellence Center, said, "This product can have a profound impact on water usage."

Colorado State's Manufacturing Excellence Center is a consortium of 28 state-of-the-art teaching laboratories and research centers on campus dedicated to working with industry to improve manufacturing and assist in product development. The Center also serves as the regional office for the Mid-American Manufacturing Technology Center which helps small- and medium-sized Colorado businesses become more competitive.

Source: *Ram Page*, Feb.-March 1994

CWRRI REPORTS NOW ACCESSIBLE ON CARL, GOPHER, OTHER BASES

CARL, GOPHER--CWRRI's Completion Report Series has now been catalogued at Morgan Library and is accessible on CARL (Colorado Alliance of Research Libraries). CWRRI has three report series: Completion Reports, Information Series, and Technical Reports. Information about the three report series is also available on GOPHER. The GOPHER files contain a one-page abstract for each publication. The June, 1993 issue of *COLORADO WATER* provided information on how to access CARL and GOPHER. If you would like a copy contact CWRRI at 303/491-6308.

UWIN--The Universities WATER Information Network contains the USGS WRSIC (Water Resources Scientific Information Center) Database, with a directory of abstracts of water resources research since 1967. Can be searched by key word. UWIN is set up as an information gopher server on the Internet. Instructions for accessing UWIN are available from CWRRI or contact Faye Anderson, UWIN, c/o UCOWR Headquarters,

4543 Faner Hall, Southern Illinois University, Carbondale, IL 62901. FAX: 618/453-2671; e-mail: Faye@uwin.c-wr.siu.edu.

NIWR--This information base contains the National Institutes for Water Resources publications directory and water resources information for the public directory. Additionally, each state institute's expertise directory is being posted. All of this material is indexed for searching by the user. The following additional services will soon be available:

- directory of ongoing contracted research
- directory of water resources computer models
- events calendar
- jobs listings
- graduate education directory
- funding opportunities in water resources research
- bulletin board capabilities

Contact Faye Anderson, UWIN, at the address previously given for more information on the NIWR Directory.

CU-BOULDER/CADSWES AWARDED NSF RESEARCH GRANT

Clayton Lewis (Computer Science), Rene Reitsma (CADSWES/Geography), and Ilze Zigurs (College of Business), all of the University of Colorado at Boulder, were awarded a \$286,611 research grant from the National Science Foundation's Information, Robotics, and Intelligent Systems program. The grant covers a three-year period and supports research on "Model-Based Group Decision Support: The Impact of Shared Simulation Models and Tailorable Information Viewing on Group Decision Making Outcomes and Processes." The project addresses recent advances in the development of Group Decision Support Systems (GDSS) and object-oriented hydrologic simulation modeling. The researchers plan to develop tools and techniques that facilitate complex multiobjective decision making in environmental management. An important aspect of the project concerns a number of experiments for testing the virtue and applicability of user-specific perspectives that filter simulation data into information relevant to the decision making process.

NEW NHRA DIRECTOR NAMED

Dennis Miletic is the new director of the Natural Hazards Research and Applications Information Center at the University of Colorado. Miletic, sociologist and natural hazards researcher, replaces Gilbert White, who recently retired.

WATER-RELATED SEMINAR SERIES, SYMPOSIA AND SHORT COURSES

UNIVERSITY OF COLORADO

DAVID V. GOLIATH:

LOCAL AUTHORITY IN LAND USE, RESOURCE DEVELOPMENT AND ENVIRONMENTAL PROTECTION

Friday, February 25, 1994

A Symposium cosponsored by the
Natural Resources Law Center, University of Colorado School of Law
and the
Natural Resources and Environment Section, Boulder County Bar Association

The symposium will explore the interplay of local authority with federal and state authority in matters of land use, resource development, and environmental protection from a general perspective as well as contemporary regional examples. The program will include:

Overview and Policy Issues: Intergovernmental Cooperation and Conflict--*Eleanor S. Towns*, Acting Director, Lands, Minerals, Soils & Water, US Forest Service, Region 2, Lakewood

Local Regulation of Activities of Statewide Interest Under Colorado Land Use Legislation (H.B. 1041), *H. Lawrence Hoyt*, Boulder County Attorney. Case Study: Northern Colorado Water Conservancy District Pipeline.

Panelists: *Barbara J.B. Green*, Ballard, Spahr, Andrews & Ingersoll, Denver
Mark Pipher, Anderson, Johnson & Gianuzio, Colorado Springs
Charles Unseld, Planning Program Manager, Colorado Department of Local Affairs

The Use and Power of Institutional Controls to Resolve Environmental Dilemmas--*James Murray or William Lamont*, Murray Lamont & Associates, Inc.

LUNCH AT KITTREDGE COMMONS, *William Yellowtail*, Administrator, EPA Region VIII

The Interplay of State and Local Regulation of Oil and Gas Development--*Mary Larson*, Commissioner, Colorado Oil & Gas Conservation Commission; *H. Lawrence Hoyt*

Government Land Transfers: Impacts on Local Land Use Planning--*Eleanor S. Towns*; *Thomas R.H. Glass*, Public Lands Specialist, Western Land Group, Inc., Evergreen and *David G. Eisenstein*, Land Use Attorney and Planning Consultant, Boulder

Program includes wrap-up discussion and a reception at CU's Law School. Cost: Boulder County Bar member early registration \$85 through Feb. 21; \$99 thereafter. Non-member price \$90; \$99 after Feb. 21. Government, public interest and academic price \$55/\$65. Six CLE Credits approved. Lunch and reception included. Mail check payable to the Univ. of Colorado to: Natural Resources Law Center, Campus Box 401, Boulder, CO 80309-0401; or pay by VISA Mastercard. For information phone 492-1288; FAX 492-1297.

HOT TOPICS IN NATURAL RESOURCES--A Luncheon Program Series **Spring 1994 Programs**

12:00 Noon, Holland & Hart Conference Room, 555 17th St., 32nd Floor, Denver. Box lunches provided; One Hour of Continuing Legal Education. Contact Kathy Taylor for information--492-1288; FAX 492-1297.

Tuesday
March 8, 1994

What is the Role of the Public Utilities Commission in Colorado's Sustainable Energy Future?--*Christine Alvarez*, member of the Colorado PUC, Moderator; Panel members: *Bruce Driver*, Land & Water Fund; *Bill Martin*, Public Service Co. of Colorado; and *Paula Connelly*, Gorsuch, Kirgis, Campbell, Walker & Grover.

Thursday
April 7, 1994

Coalbed Methane Ownership: Facts, Issues, Opportunities and Solutions--*Elizabeth McClanahan*, Penn, Stuart, Eskridge & Jones, Abingdon, Virginia.

ROCKY MOUNTAIN WATER AND WASTEWATER PLANT OPERATORS SCHOOL
Standard and Advanced Courses -- March 20-25, 1994

For information contact:

Office of Conference Services, University of Colorado at 303/492-5151

COLORADO STATE UNIVERSITY

NATURAL RESOURCE AND ENVIRONMENTAL ECONOMICS LUNCHTIME SEMINAR SERIES, Spring 1994

Seminar series are held at 12:10 to 1:15 on Wednesdays. All seminars are held in room 110 Animal Science.

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|----------|--|
| Feb. 16 | CVM Derived WTP for Rural Water Supply Quality , Steve Piper & John Platt, U.S. Bureau of Reclamation |
| Feb. 28 | Effects of Dichotomous Choice Bid Structure on Mean & Variance of WTP , Kevin Boyle, University of Maine |
| March 9 | On the Validity of CVM: Effects of Personal Relevance, Quality of Information and Motivational Orientation , Tom Brown, U.S. Forest Service |
| March 30 | Economic Analysis of the Dam Safety Program in Bureau of Reclamation , Robert Hamilton & David Achterberg, U.S. Bureau of Reclamation |
| April 6 | Measuring & Optimizing Biodiversity , John Hof, U.S. Forest Service |
| April 13 | Measuring Passive Use Values for the Colorado River through Grand Canyon National Park , Dave Harpman, U.S. Bureau of Reclamation |
| April 20 | Testing the NOAA Panel Recommendations on CVM: Substitutes & Budget Constraints , John Loomis, CSU |
| April 27 | Comparing the Value of Direct & Indirect Use to Expressed WTP , Richard Walsh, CSU |

DEPARTMENT OF ENVIRONMENTAL HEALTH SEMINAR, SPRING 1994

Seminars are held Mondays 12:10 to 1:00 in Microbiology A108.

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|----------|---|
| Feb 28 | A Mechanistically-Based Dosimetry Model for Assessing Human Health Risks of Butadiene Exposure , Dr. James Bond, Chemical Industry Institute of Toxicology, Research Triangle Park |
| March 7 | Case Studies in Industrial Hygiene , Darrel Ruby, CIH, AT&T |
| March 21 | Legal Liability in Environmental Health , Laura Davis, J.D., Colorado Water Quality Control Commission |
| March 28 | PBPK/PBPD Modeling of the Toxicologic Interactions Between TCE and 1,1-DCE , Hisham El-Masri, Department of Environmental Health, CSU |
| April 18 | Current Research at the Agency for Toxic Substances and Diseases Registry , Dr. Allan Susten, Division of Health Assessment and Consultation, ATSDR, Atlanta |
| April 25 | Program Management at Superfund Sites , Dan Voss, MPH, Independent Consultant, Darlington, Maryland |
| May 2 | Metham Sodium Incident in California , Dr. Anna Fan, Pesticide and Environmental Toxicology Section, Cal-EPA |

INTERNATIONAL DEVELOPMENT NETWORK

Joint Tuesday noon brown-bag lunch program, CSU Lory Student Center, Room ST 165, Tuesdays at 12:10-12:55.

- Feb. 15 **Observations of a Woman Engineer in Egypt**, Darcy Noss, Grad. Student Engineering
- Feb. 22 **Development Needs for West Bank/Gaza Strip as an Autonomous Region**, Hamzi Maghrabi, Rep.SID, Denver
- March 1 **Bill Grauel**, Grad. Student, Forest Sciences, TBA
- March 22 **Sustainable Nutrient Management in Semi-arid Indian Soils**, Peter Motavilli, Research Associate Natural Resource Ecology Lab
- April 19 **Environmental Education of Private Nature Reserves in the Republic of South Africa**, Del Benson, Professor Extension Wildlife
- April 26 **Farming Systems in Pakistan: An Update**, Willis W. Shaner, Professor Mechanical Engineering

DEPARTMENT OF FISHERY & WILDLIFE BIOLOGY

The seminars will be held in room 231, Wagar Building at 3:10 pm. Refreshments available before the seminar in Room 130 Wagar.

- March 4 **The Effects of Electro-Injury on the Growth and Return of Hatchery-Reared Rainbow Trout**, Larry Zeigenfuss, M.S. student, FWB Dept.
- March 11 **Aquatic Ecosystem Structure: Exploring the Role of an Omnivorous Fish**, Roy A. Stein, Professor Aquatic Ecology Laboratory, Ohio State University
- April 22 **Dietary vs. Aqueous Exposures to Metal Mixtures in Rainbow Trout (*Oncorhynchus mykiss*)**, Russ Pickering, M.S. student

1994 WATER RESOURCES SCIENCE AND ENGINEERING SPRING SEMINAR SERIES

All seminars are held on Thursday at 12:10 p.m. in the Lory Student Center, unless noted otherwise. The room number follows the announcement. For information contact Dr. J.D. Salas, Hydrologic Science & Engineering Program, CSU, 491-8460.

- Feb. 17 **Temporal and Spatial Aggregation of Streamflow Processes**; Dr. Jose D. Salas, Professor and Program Coordinator, Hydrologic Science & Engineering Program, Department of Civil Engineering, CSU; Room 208
- February 24 **Use of Correspondence Analysis for Regional Flood Frequency Analysis**; Dr. Salvator Sirikundavyi, Research Associate, Department of Civil Engineering, Ecole Polytechnique, Montreal, Canada; Room 224
- March 3 **Hydrologic and Geochemical Control on Surface Water Chemistry on an Alpine Basin**; Dr. Mark Williams, Professor, Department of Geography, CU; Room 203
- March 10 **Control Methods for Uncertain Reservoir Systems**; Dr. Aristides Georgakakos, Associate Professor, Department of Civil Engineering, Georgia Institute of Technology; Room 208
- March 24 **Efforts to Use Forecast to Improve Reservoir Operations**; Dr. Jerry R. Stedinger, Professor, School of Civil and Environmental Engineering, Cornell University; Room 208
- March 31 **Interfacing GIS with Erosion Hazards Modeling on St. John Island**; Mr. Don Anderson, Watershed Sciences Program, CSU; Room 208
- April 14 **Overview of Contamination Problems at U.S. Army Superfund Sites**; Mr. Ira May, Chief Geology Section, U.S. Army Environmental Center; Room 208

- April 21 **Endangered Species Act in Water Planning in Colorado;** Dr. Leo M. Eisel, P.E., Vice-President, Wright Water Engineers, Inc.; Room 208
- April 28 **Flash Flood of May 3rd, 1993 in Central Chile;** Dr. Eduardo Varas, Professor, Department of Hydraulics and Environmental Engineering, Catholic University of Chile; Room 208
- May 2 **Entering the Watershed: A Holistic Approach to Watershed Management;** Mr. Robert Doppelt, The Pacific Rivers Council, Oregon; Room 206

COLORADO SCHOOL OF MINES

INTERNATIONAL GROUND WATER MODELING CENTER GROUND WATER MODELING SHORT COURSE 1994

Institute for Ground Water Research and Education, Colorado School of Mines, Golden, Colorado 804014-1887, Phone (303) 273-3103, Fax (303) 273-3278

- Feb. 21-25 **Practical Modeling of the Three-Dimensional Contaminant Transport and Remedial Action Designs Using Modular Flow and Transport Models**
- March 22-25 **Principles and Application of MODFLOW and Accompanying Modules (Anderson), Software: MODFLOW, MODPATH**
- April 11-13 **Principles and Application of Aquifer Testing (Arnold, Gilmer, Paschke), Software: AQUIX, SLUGC/T**
- May 9-13 **Principles and Applications of Chemical Reaction Modeling in Ground Water (Parkhurst, Plummer, Glenn), Software: PHREEQE, PHREEQEM, BALANCE, NETPATH**
- June 13-17 **Fundamentals of Stochastic Modeling of Flow and Transport in Porous Formations (Dagan, Rubin), Software: GEO-EAS**
- June 27-July 1 **Practical Modeling of Three-Dimensional Contaminant Transport and Remedial Action Designs Using Modular Flow and Transport Models (Zheng, Houlihan), Software: MODFLOW, MT3D (3D Method of Characteristics/FD)**
- July 19-22 **Solute Transport Modeling (Konikow, Goode), Software: USGS MOG**
- August 4-5 **Introduction to the Application of Geostatistics and Kriging to Spatial Estimation Problems in Ground Water (Hoeksema), Software: GEO-EAS, GEOPACK**
- August 10-13 **IGWMC Conference on Ground Water Modeling**
- Sept. 12-16 **Parameter Identification for MODFLOW (Hill, Cooley), Software: MODFLOWP**
- Oct. 18-22 **Principles and Application of MODFLOW and Accompanying Modules (Andersen), Software: MODFLOW, MODPATH**

ENVIRONMENTAL SCIENCE AND ENGINEERING Seminar Series, Spring Semester, 1994, Thursdays 4:00-5:00 p.m. Coolbaugh Hall 107

- Feb. 24 **Effect of Solution Chemistry on Mobilization of Clay Colloids From an Iron Oxide Coated Sand Aquifer,** Joseph Ryan, Civil, Environmental and Architectural Engr., University of Colorado
- March 3 **Uptake of Metals by Moravian III Barley Irrigated with Waters Affected by Acid Mine Drainage,** Peter Stout, Environmental Science and Engr., Colorado School of Mines

- March 17 **Characterization of Sorptive Behavior of Thorium (IV) Species in the Presence of Marine Colloidal Material**, Katheline Rosow, Environmental Science and Engr., Colorado School of Mines
- March 31 **Environmental Geophysics**, Robert Horton, U.S. Geological Survey
- April 7 **Using Geostatistics and Inverse Flow Modeling to Reduce Uncertainty**, Eileen Poeter, Geological Engr., Colorado School of Mines
- April 14 **Thorium, Marine Colloids, and the Carbon Cycle**, Bruce Honeyman, Environmental Science and Engr., Colorado School of Mines
- April 21 **Soil and Groundwater Remediation with Surfactants**, Helen Dawson, Environmental Science and Engr., Colorado School of Mines

WATER PUBLICATIONS, DATABASES

NEW CWRRI REPORTS

To order reports contact the CSU Bulletin Room, Aylesworth Hall, Colorado State University, Fort Collins, CO 80523; Phone 303/491-6198.

Managing an Interrelated Stream-Aquifer System: Economics, Institutions, and Hydrology, by J.T. Daubert, R.A. Young and H.J. Morel-Seytoux. Technical Report No. 47. Price: \$8.00

Seeking an Integrated Approach to Watershed Management in the South Platte Basin, Kathleen C. Klein, Editor. Proceedings of the October 27-28, 1993 Conference. Information Series No. 76. Price: \$8.00.

Enhanced Microbial Reclamation of Groundwater Polluted Toxic Organic Chemicals, by S.K. Schmidt. Completion Report No. 172. In print. Price: TBA.

Effects of Flow Diversion on Downstream Channel Form in Mountain Streams, by Sandra Ryan and Nel Caine. Completion Report No. 176. In print. Price: TBA.

Agricultural to Urban Water Transfers in Colorado: An Assessment of the Issues and Options, by Teresa A. Rice and Lawrence J. MacDonnell. Completion Report No. 177. In print. Price: TBA.

Improvements in the Colorado Ammonia Model by Simultaneous Computation of Extremes in Flow and Water Chemistry, by William M. Lewis and James F. Saunders, III. Completion Report No. 178. In print. Price: TBA.

Reference Evapotranspiration Maps for Colorado, by Luc Claessens, Luis Garcia and Marvin Jensen. Completion Report No. 182. In print. Price: TBA.

MISCELLANEOUS PUBLICATIONS

Nitrogen in the Environment: Sources, Impacts, Management--The University of Maine Water Resources

Program has published the proceedings of this Oct. 8, 1993 conference. Presents information about nitrogen fate and transport in New England's forests, agricultural soils, urban areas and coastal waters, plus a summary of the impact of nitrogen on human health and the results of groundwater monitoring efforts in Maine. Other topics include techniques for reducing nitrogen in sewage and urban stormwater and methods for modeling nitrogen concentrations in home wastewater systems. Order from the Water Resources Program, University of Maine, Phone 207/581-1490; FAX 207/581-1426. The cost is \$7.00 each plus postage.

Free SDWA Pocket Guides--The new, updated third edition of the Safe Drinking Water Act: Pocket Guide to the Requirements, published by the U.S. Environmental Protection Agency Region 9 Office, is now available through the National Drinking Water Clearinghouse (NDWC). The Guide is designed specifically for owners and operators of small drinking water systems. It includes Safe Drinking Water Act (SDWA) regulations that became effective January 1993. There are sections on contaminant types, sampling instructions, reporting and record keeping requirements, and anticipated changes in the SDWA regulations. Appendices give overviews of the Lead and Copper Rule and the Surface Water Treatment Rule, and their fairly comprehensive chart listing regulated contaminants, sources and their associated health effects. For a free copy of the SDWA Pocket Guide call the National Drinking Water Clearinghouse, 1-800-624-8301. There is a shipping and handling charge of \$2.00.

Small System Guide to the Safe Drinking Water Act--The Small System Guide to the Safe Drinking Water Act is a 58-page book published by the Community Resource Group, Inc. Southern Rural Community Assistance Program (RCAP). It helps to determine if a small community water system is meeting guidelines and provides information on: Safe Drinking Water Act; board responsibilities under SDWA; the standardized monitoring framework; the Total Coliform rule; Surface Water Treatment Rule; filtration, turbidity and disinfection rules; regulated chemical contaminants; the Lead and Copper Rule; public notification and what to do when contamination occurs.

To order contact Mary Scism, Community Resource Group, Inc., Southern RCAP, 2705 Chapman, Springdale, AR 72762. (501) 756-2900. \$5 plus shipping and handling.

Quality of Water, Colorado River Basin, Progress Report No. 16, Jan. 1993--The report describes estimates of future water demands, salinity control efforts, and their impact on water quality in the basin. Copies available upon request. Bureau of Reclamation, Upper Colorado Regional Office, P.O. Box 11568, Salt Lake City, UT 84147.

***Bibliography of Water-Related Studies, South Platte River Basin--Colorado, Nebraska, and Wyoming--Open File Report 93-106.** This report is being used by the South Platte NAWQA STUDY TEAM IN THE WATER-QUALITY ASSESSMENT OF THE BASIN.

Balancing Western Water Use--Western Water Law and Policy: Implications for Wetland and Riparian Ecosystems, Symposium Proceedings, Feb. 24-26, 1993. For information contact: Rocky Mountain Chapter of Society of Wetland Scientists, c/o Douglass Owen, USGS MS 939 DFC, Denver, CO 80225-0046.

Water--Reflections on a Critical Resource, Research & Exploration, Nov. 1993. Published under the "Geography of Fresh Water" Initiative. Includes map supplement showing principal aquifers of the conterminous U.S. For information call 703/648-6810 or electronic mail at internet nwsum@usgs.gov.

Park Waters in Peril, Feb. 1993. Contact: National Parks and Conservation Assoc., NPCA Conservation Programs Office, 1776 Massachusetts Ave., NW, Washington, DC 20036-1904. Phone 202/223-6722; FAX 202/659-0650.

Sustaining Water: Population and the Future of Renewable Water Resources, 1993. For information contact: Population Action International, 1120 19th St., NW Suite 550, Washington, DC 20036. Phone 202/659-1833; FAX 202/293-1795.

U.S. Geological Survey's National Water Quality Assessment Program (NAWQA), Edited by P. Patrick Leahy, Barbara J. Ryan and A. Ivan Johnson. Contact: American Water Resources Assoc., 5410 Grosvenor Lane, Suite 220, Bethesda, MD 20813-2192. Phone 301/493-8600; FAX 301/493-5844.

***Techniques for Estimating Specific Yield and Specific Retention from Grain-size Data and Geophysical Logs from Clastic Bedrock Aquifers, USGS WRI Report 93-4198.**

***Geomorphic, Hydrologic and Erosion Data for Selected Reclaimed Hillslopes, the Seneca II Mine, Rout County, Colorado, October 1988-July 1990, USGS WRI Report 92-4096.**

***USGS Open File-Reports and WRI reports are available from: U.S. Geological Survey, Books and Open-File Reports Section, Federal Center, Box 25425, Denver, CO 80225. Phone: 303/236-7476.**

EDITOR'S IN-BASKET

PASSAGE OF NAFTA MAY IMPROVE CONDITION OF RIO GRANDE

The passing of the North American Free Trade Agreement (NAFTA) presents an opportunity to bring about a positive change along the Rio Grande on the Texas-Mexico border. Pollution problems in the Rio Grande stem from the lack of wastewater treatment facilities on the Mexican side, as well as from industrial and agricultural wastes from sources on both sides of the border. Since human health conditions and environmental degradation along the river have a potential to be worsened by more economic growth in the region, issues of environmental standards and enforcement have been negotiated through NAFTA obligations.

The United States and Mexico would pay to clean up border environmental problems, in part financed by a new North American Development Bank. Each country would pay \$225 million over four years to the bank, money that would leverage at least \$2 billion for loans and loan guarantees.

Sources: *American Rivers*, Fall 1993, and *Economics & Finance*, Nov. 20 1993.

WATER SOURCES SOUGHT -- SOMETIMES BY UNCONVENTIONAL MEANS

With the era of big dams and ambitious aqueduct projects slipping into memory, officials are looking with interest at prospectors and their sometimes unconventional claims about new sources of water. Although some schemes are more improbable than others, the West is growing too fast for water officials to simply dismiss what might be a major new source. Many of the private schemes are as simple as a rancher offering to sell his irrigation water to a nearby town or, through a domino of exchanges, to a distant city. Some schemes involve investors buying up barren land and piping its underground water to sprawling housing developments at a handsome profit.

Other projects are more grandiose. A team of prospectors in northern Nevada wants to capture millions of gallons of mountain rainfall by drilling deep wells in hillside faults, funnel the water into the Humboldt River, and transport it to cities and farms downstream. The scheme, organized as Eco-Vision Inc., involves years of research and would cost tens of millions of dollars.

By far the most extraordinary of the prospecting efforts is that of Wally Spencer, a chemical company consultant and former rocket scientist. Spencer devoted two years to the pursuit of a prehistoric subterranean river, originally believing that it may be gushing with oil. Searching the desert floor with satellite maps and a secret contraption in his truck, Spencer says he has found a 500-million-year-old river running beneath Utah, Nevada, and Southern California. For \$5 million, he may reveal the river's location. He says he would waive the fee if Nevada granted him exclusive rights to the water, but that demand has been equally unpopular. Some say Spencer's ideas are on the fringe of science, but few have dismissed his claim as pure folly--a reflection, some say, of how furious the search for water has become.

Source: *Los Angeles Times*, 9/16/93

DENVER WATER USE FROM THE NATIONAL PERSPECTIVE

Denver's residential water use per capita is 165 gallons per day (gpd), according to the 1993 Information Please Environmental Almanac. The almanac showed a range of residential water use from a low of 41 gpd (Pittsburgh) to a high of 167 gpd (Birmingham). Eastern cities for the most part showed a lower water use rate--western cities generally use more water than their eastern counterparts. Total water use within a city depends, in addition to residential use, on how much is used by industry and commercial establishments. Denver has a total daily use of 247 gpd (165 residential, 82 commercial/industrial). Cities reported total daily use ranging from 280 gpd (Chicago) to 88 gpd (Virginia Beach). Newark reported high total daily use (274 gpd), yet has relatively low residential use (67 gpd).

Large variations in water use suggest that many cities could significantly improve their water conservation practices. Proof that conservation practices may make a difference is found when different cities within the same metro area use dramatically different amounts of water. For example, the almanac reports that Dallas residents use nearly 50 percent more water (116 gallons per day) than their neighbors in Ft. Worth and Arlington (78 and 77 gallons per day, respectively).

Source: 1993 *Information Please Environmental Almanac*, compiled by World Resources Institute, Houghton Mifflin Co.

USGS ASSISTING NATIONAL GEOGRAPHIC ON FRESH WATER INITIATIVE

The National Geographic Society, in partnership with The Conservation Fund and the U.S. Geological Survey (USGS), has developed a multi-year program of activities designated as the "Geography of Fresh Water" initiative. The initiative seeks to help make the American public aware that fresh water is an indispensable resource in need of protection and proper management. A major product of the partnership for USGS is a special issue of the Society's publication, *Research &*

Exploration, that is devoted to fresh water issues in the Middle East and the United States. It also features a color gatefold prepared by the EROS data center showing the seasonal vegetation index of the US. The USGS and the Society have co-produced a map supplement that shows the principal aquifers of the conterminous US in more detail than has ever been published before. The reverse side displays a photo essay on selected water issues. The USGS has been assisting the Society in this effort since June of 1992 when Gilbert M. Grosvenor, President of NGS and Dallas Peck, former Director of the USGS, signed a Memorandum of Agreement between the two organizations. A primary goal of the MOU is to foster collaboration among scientists on research about water. The Geography of Fresh Water initiative will continue in 1994, with an emphasis on nonpoint source pollution, coordinated by The Conservation Fund.

WQCC SCHEDULES HEARING ON WATER QUALITY MANAGEMENT PLAN

The Colorado Water Quality Control Commission has scheduled a hearing on Tuesday, March 8, 1994 for consideration of approval of the North Front Range Water Quality Planning Association's (NFRWQPA) 1993 update of the Area-Wide Water Quality Management Plan (208 plan) for Larimer and Weld counties. The hearing will be in the Florence Sabin Conference Room, Colorado Department of Health, 4300 Cherry Creek Drive South, Denver at 9:00 a.m.

UNIVERSITIES COUNCIL ON WATER RESOURCES REQUESTS AWARD NOMINATIONS

Award for Education and Public Service in Water Resources--Eligible are individuals, groups or agencies who have made significant contributions to increased public awareness of water resources development, use or management. The activity should have contributed significantly to public awareness in the area of water resources development, use and management, covering any one or a combination of the natural, biological and social sciences concerned with analysis of water resources. The effects should be of regional if not national scope and may have private or public sponsorship. Activities may focus on primary or secondary schools, legislative or other public fora or the media. University programs are not eligible. Nominations are by one-page letter plus supporting materials. Submit to: Chair, Education and Public Service Committee, UCOWR c/o Dr. Duane D. Baumann, Exec. Dir., 4543 Faner Hall, Southern Illinois University at Carbondale, Carbondale, IL 62901-4526. The award consists of a certificate and a letter of commendation. Deadline: March 31, 1994.

WEATHER NETWORK HELPS PROTECT CROPS, CUT IRRIGATION

A new statewide network of weather stations can help growers fight insect infestations and help fine-tune the amount of irrigation water they apply, perhaps reducing water use in some

areas by up to 30 percent. Last year, Colorado onion growers who followed reports from the statewide network escaped fungusborne crop diseases that hit other growers who farmed as usual. The reports gave warning to apply fungicides because weather conditions indicated an explosive fungal growth. The new 22-station network is a cooperative effort between ARS and Colorado State University. Each station daily records such weather-related information as minimum and maximum temperatures, vapor pressure, solar radiation, total wind movement during the day, precipitation, soil temperature, and minimum relative humidity. For more information about the network, contact Harold R. Duke, USDA-ARS Water Management Research Unit, Agricultural Engineering Research Center, Colorado State University, Fort Collins, CO 80523. Phone 303/491-8230; FAX 303/491-8247.

Source: Agricultural Research, April 1993

Making Your Well Water Safe is the title of a new brochure produced through Cooperative Extension of Colorado State University. The brochure was prepared by students April Rose and David Williams for the CSU Cooperative Extension Community Development Office in Pueblo. It provides information needed by the layman/general public on the appropriate treatment of home drinking water in rural areas. Richard G. Hallock, Extension Specialist, Pueblo, has distributed 50 copies of the brochure to Custer County and one to each of the commissioners in the 19 counties he serves. CWRRI has available a limited number of copies of the brochure (303/491-6308) or contact Richard Hallock at 719/549-2469.

WATER NEWS DIGEST

WATER PROJECTS

Draft Plan for Glen Canyon May Result in Freer-Flowing River

If a draft plan for managing Glen Canyon Dam in northern Arizona gains approval, the Colorado River could run through the Grand Canyon much as it did before the dam was erected in 1963. The Glen Canyon draft EIS, released by the Bureau of Reclamation (USBR) in early January, would protect the canyon from the erratic flows that have characterized the last quarter century. The EIS was ordered in 1989 in response to complaints that changes in water levels of up to 13 feet in one day swept away beaches and artifacts, damaged native plants and fish, and shortchanged Indian reservations and other users downstream. In 1991 the USBR issued interim regulations to manage flows until the EIS was completed. These cut the daily water fluctuations by 75 percent and kept dam discharges between 5,000 and 20,000 cubic feet per second (cfs). With passage of the Grand Canyon Protection Act in 1992 these measures became law. The draft EIS lists nine flow alternatives which will be open for public comment through April 11, 1994. The USBR will host a series of meetings and public hearings on the Glen Canyon Dam draft EIS from Jan. 27 through March 24.

PEOPLE

Steven W. Horn, formerly the Colorado Commissioner of Agriculture, is the new dean of the University of Wyoming College of Agriculture, effective December 1, 1993. Horn began his state service in 1978 in the Department of Natural Resources as a resource conservationist with the Colorado Soil Conservation Board and later was director for four years. He joined the Colorado Department of Agriculture in 1987 and was appointed commissioner in 1989. His BS, MS and Ph.D degrees are from Colorado State University.

Secretary of Agriculture Mike Espy has named **Paul Johnson**, an Iowa farmer, as chief of the Soil Conservation Service (SCS). Johnson is well known for his conservation leadership nationally and in Iowa as a member of the State Legislature. He has served as assistant commissioner for his local soil conservation district and has written several major pieces of environmental legislation.

Jack Ward Thomas has been named the 13th chief of USDA's Forest Service. Thomas is a world renowned wildlife biologist with degrees in wildlife management, wildlife science, and a doctorate in forestry. He has had a long career with the Forest Service and has exhibited great understanding of forest and rangeland ecosystem management principles.

Partial Sources: Experiment Station Letter 2202, 1/14/94
Experiment Station Letter 2197, 11/19/1993

The USBR will accept public comment until April 11. The only meeting scheduled for Colorado will be in Denver at the Marriott Denver West on March 21 from 7-9pm. For more information on the draft EIS or to send comments, write the Colorado River Studies Office, Bureau of Reclamation, P.O. Box 11568, Salt Lake City, UT 84147, TEL: 801/524-5479.

High Country News 1/24/94

Group Seeks Restoration of Two Buttes Reservoir

Baca County residents have started a lobbying effort to get the state to fund a feasibility study for the restoration of Two Buttes Reservoir, known for years in the region as a prime spot for walleye and trout fishing and goose hunting. It is located east of U.S. Hwy 287 between Lamar and Springfield. Several years ago the reservoir went dry, and residents want the lake restored as a prime sporting spot to build tourism in the area. The study would examine possible sources of water for the reservoir. Petitions will be circulated in the area, and members of the state's wildlife commission will be contacted.

Pueblo Chieftain 1/22/94

Electricity Wholesaler Eyes New Dam on Gunnison

Tri-State Generation and Transmission, which supplies power to the Delta-Montrose Electric Association and other power retailers, is considering a 150-foot high dam on the Gunnison River outside Delta to replace power-generation capacity it expects to lose at Glen Canyon Dam on the Colorado River. The utility hasn't made a decision on whether to pursue the dam and is looking at other options, such as buying excess power from other companies. Power capacity at Glen Canyon is expected to fall as new flow requirements on the Colorado River impact generating capacity at the dam. The earth-filled dam, estimated to cost \$90 million, would store about 43,500 acre-feet of water. Water from the dam would back up a few miles past the confluence of the Gunnison River and its North Fork, but would not intrude on the section of the Gunnison River long considered for wild and scenic designation or a national conservation area.

Grand Junction *Daily Sentinel* 1/21/94

Iron Mountain Reservoir Seen as Solution for State's Water Needs

Water leaders from both sides of the Continental Divide are dusting off the old Iron Mountain Reservoir proposal in hopes that it could meet both Eagle County and Front Range water needs. Water from the reservoir could boost low winter flows in the Eagle River when ski areas need a dependable supply, while preserving instream flows for fish and diluting polluted effluent from the Eagle Mine. Aurora and Colorado Springs believe the reservoir could offer a politically acceptable substitute to their controversial Homestake II project. The Iron Mountain Reservoir site is on Homestake Creek southwest of Red Cliff, just above the creek's confluence with the Eagle River. The reservoir would store about 100,000 acre-feet of water, and would be very similar to Ruedi Reservoir on the Fryingpan River. Eagle County's tremendous resort growth has put a severe strain on the Eagle River, which frequently drops below the state's minimum streamflow limits during the winter months that are so critical to the fishery. While the reservoir site is located outside of any wilderness areas, the reservoir would flood other wetlands, part of a scenic valley, and two national forest campgrounds. Also, there is evidence the site is a fractured geological formation unsuitable for dam construction.

Grand Junction *Daily Sentinel* 1/14/94

WATER QUALITY

Front Range Population Threatens Mountain Lakes

Recent population growth has led to elevated levels of nitrogen in high-country lakes and streams in areas adjacent to Colorado's Front Range, a development that could lead to alarming ecological changes, according to new research. Studies by CU, the University of Denver, the National Park Service, and the U.S. Dept. of Agriculture show nitrogen levels that have doubled since 1986. The excess nitrogen is coming from

vehicle exhaust, power plants, and farming. Nitrogen released into the atmosphere by those activities is absorbed by the tundra. If plants and soil become overloaded, the nitrogen will "leak" into streams and lakes, acidifying the water. This is just what has happened with a combination of nitrogen and sulfur in the eastern U.S., acidifying lakes and streams there. Nitrogen levels in Rocky Mountain National Park, the Snowy Range, and in the Green Lakes Valley west of Boulder are now as high as those recorded in the most acid-polluted water bodies of the East, according to CU's Institute of Arctic and Alpine Research.

Denver Post 12/8/93

ENVIRONMENT

EPA to Study Arkansas River Toxic Waste Site

The EPA is conducting studies at the historic Smeltertown site north of Salida on the Arkansas River, hoping to start cleaning up contaminants this summer. The site was home to a smelter and refinery where workers separated impurities from lead, copper, silver, and gold. Molten slag removed from furnaces at the site was dumped down a bluff near the Arkansas River. After the operation closed in 1919, the site was used by various railroad tie-treating companies, so it also is contaminated with creosote, a liquid byproduct. Preliminary EPA tests show both the smelting and tie-treating operations led to heavy metal contamination of soil as well as groundwater.

Pueblo *Chieftain* 11/24/93

Global Warming Threatens Colorado River Basin Water Supplies

The non-profit Pacific Institute of Oakland, CA has conducted a study for the EPA focused on climate change and the Colorado River Basin, which supplies water to 243,000 square miles in seven states. Scientists found warmer temperatures could deplete reservoirs from Colorado to Arizona, Mexico and California, alter water quality, and disrupt hydroelectric power generation. The study found high-altitude basins, where rivers begin and ski areas thrive, would be hardest hit. Results suggest the Colorado River Basin is extremely sensitive to climatic changes that could occur over the next several decades, and that citizens, water managers, and irrigators need to plan for droughts.

Rocky Mountain News 12/3/93

Army Ordered to Comply With State Cleanup Laws

The U.S. Supreme Court has granted state environmental regulators the power to enforce Colorado's tougher pollution standards during the \$2 billion cleanup at the Rocky Mountain Arsenal. U.S. Army officials had asked the court to be exempted from Colorado environmental laws while detoxifying the 27-square-mile arsenal. But the court rejected arguments that the cleanup should be dictated solely by the federal Superfund law. The ruling could prompt at least two major

changes in the Army's plans. One would be the Army's proposal to stockpile 830,000 cubic yards of contaminated soil in a new 115-acre landfill at a former industrial dumping pond called Basin A. The Army planned to construct the dump without an underground liner, something state regulations require to guard against toxic leaks. Another change involves Adams County drinking water wells which are polluted with DIMP, a chemical byproduct from nerve-gas production. Army officials argue the wells should be considered safe with 600 parts per billion (ppb), but the state has been proposing a much tougher standard of 8 ppb of DIMP. Key cleanup decisions about the arsenal are scheduled to be reached this year.

Denver Post 1/25/94

FBI, Justice Department Probe Summitville

The FBI and the U.S. Justice Department have launched a criminal investigation of the Summitville gold mine, which declared bankruptcy in December 1992 and prompted an emergency takeover by the EPA to prevent toxic mine tailings from reaching the Alamosa River. The federal probe is being led by the same prosecutor who directed the criminal case against the Rocky Flats nuclear weapons plant. The state's criminal probe of Summitville was hamstrung by Colorado laws that place an 18-month statute of limitations on the filing of charges for key environmental offenses. By contrast, federal statutes give prosecutors up to five years to file criminal charges for environmental offenses. The EPA has so far spent \$20 million to clean up the leaky cyanide heap-leach operation, which repeatedly broke state environmental laws. The ultimate cleanup of the mine is estimated to cost \$100 million.

Denver Post 1/25/94

WILDERNESS

Acid Snow Identified in Zirkel Wilderness

Scientists have found acid snow in high concentrations along the Continental Divide in the Mount Zirkel Wilderness Area, which could be coming from two coal-fired power plants nearby. The acid levels rival those found in dead lakes in the eastern U.S. and may be the worst in the Rocky Mountain West. Concern is high because the wilderness area is one of the wettest in the state, and acid runoff could damage wildlife, vegetation, and harm lakes and streams. Chemical isotope "fingerprinting" indicates links between the acid snow and sulfur dioxide coming from stacks of the Craig and Hayden power plants less than 50 miles away.

Montrose Daily Press 1/5/94

WETLANDS

Wetlands Provisions May Change

Legislation to amend wetlands provisions of the Clean Water Act was introduced recently by Rep. Gerry Studds, D-Mass.,

chairman of the House Merchant Marine and Fisheries Committee. The bill incorporates a number of provisions from the Clinton administration's wetlands proposal released in August. Provisions include the required use of the 1987 Army Corps of Engineer's wetlands delineation manual, pending completion of a study by the National Academy of Sciences; and a \$10 million fund to assist small landowners who cannot afford development plans to mitigate wetlands losses.

Greeley Tribune 12/19/93

WILDLIFE

Trout Disappearing

Young Rainbow trout in one of Colorado's premiere wild trout populations have disappeared for three years in a row, and Division of Wildlife (DOW) biologists are investigating. Based on population sampling in the Colorado River between Hot Sulphur Springs and Kremmling, it appears that young fish hatched in 1990-1992 have disappeared, despite the lack of evidence of any large-scale fish kill in the area. Biologists are particularly anxious to learn what's happening, because the wild Colorado River rainbows are recognized as a unique strain that reproduce well and grow rapidly in the river. The research project should begin this April, and will look at disease, predation, and water flows controlled by Windy Gap and Granby reservoirs upstream from the area where the fish are disappearing. The amount, timing, and temperature of water releases from the reservoirs can have major impacts on downstream fish.

Montrose Daily Press 1/21/94

Nearly \$10 Million Spent on Public Access to Wildlife Areas

The Colorado Division of Wildlife spent \$9.6 million to open more than 100,000 acres and 50 miles of streams to public wildlife areas in 1993. Included in the division's holdings are 28 properties totaling 90,000 acres leased from the State Board of Land Commissioners, as well as the James John State Wildlife Area acquired to protect wildlife habitat near Trinidad. In cooperation with state parks, the division spent \$7 million to stabilize water levels at John Martin Reservoir and to begin developing a permanent pool of water for the planned Great Plains Reservoirs State Park between Lamar and Eads.

Pueblo Chieftain 12/21/93

Fish Kill Planned to Aid Cutthroat

In an attempt to reintroduce Rio Grande Cutthroat trout into the Conejos River, the Colorado Division of Wildlife and the U.S. Forest Service plan to poison about 5 miles of the river. The action would eliminate other species of fish competing with the cutthroats, endangering their existence. It is possible the native Rio Grande sucker, on the endangered species list in Colorado, will also be introduced at the site. Currently non-native brown trout account for 81 percent of fish species in the river. Public

input is currently being taken. After an environmental assessment is finished, there will be a review period and an appeal period before the project is undertaken.

Pueblo Chieftain 1/14/94

PEOPLE

Wilkinson Tapped for NCWCD Post

Weld County resident Eric Wilkinson has been named general manager of the Northern Colorado Water Conservancy District. Wilkinson, who succeeds Larry Simpson, is a Colorado native who has been a water resources engineer at the district for the past six years. Prior to that he worked for the city of Greeley and the Colorado Division of Water Resources. Simpson, who took a job as water consultant for the World Bank, had been general manager for the district for 12 years. Darell Zimbelman, who has been interim manager, will remain the district's associate general manager and has been named chief engineer.

Greeley Tribune 1/8/93

CONSERVATION

L.A. to Construct Water Recycling Plant

Los Angeles has agreed to build a \$50 million recycling plant to replace water it diverts from Mono Lake. Diversions from the lake began in 1941, transporting the water 350 miles to the Los Angeles Aqueduct. The city's Water and Power Department has fought for years over how much water should be taken from the lake. After the lake's level fell dramatically, a court banned further withdrawals until it rose two feet from the current level. Groundbreaking for the plant will be early 1997 in the San Fernando Valley.

Grand Junction Daily Sentinel 12/14/93

UNC Gets Water-Saving Grant

The University of Northern Colorado has been awarded a \$100,000 grant from the Colorado Water Conservation Board for a project aimed at promoting water conservation in agriculture. UNC will build a new system that will irrigate 118 acres of campus lawns with raw water rather than using treated water from the city of Greeley. The newest technologies will be used to schedule watering based on soil moisture content and to monitor changes in water use to evaluate the effectiveness of the new system.

Greeley Tribune 11/24/93

WATER RATES

Suburbs Protest Denver Water Board Planned Rate Hike

Some of Denver's suburbs have asked the state legislature to force the Denver Water Board to get approval for all water rate

hikes from the Colorado Public Utilities Commission. Suburbs purchase nearly half of Denver's water supply, but the city refuses to include any suburban representatives on its five-member water board. A group of lawmakers is sponsoring a bill aimed at giving suburbs more control over their water rates. Suburban customers, who are charged higher rates, provided 61 percent of the Denver Water Board's revenue while receiving only 46 percent of the city's water. Last year, suburban residents lost a lawsuit in Denver district court that would have narrowed the disparity in water rates paid by suburban and city dwellers.

Montrose Daily Press 1/17/94

RECREATION

Forest Service to Limit Raft Trips

The U.S. Forest Service plans to limit the number of daily commercial raft trips on the Cache La Poudre River, as well as renovate campgrounds along the federally designated wild and scenic river. USFS capped the number of commercial raft trips on the river last year, but retracted the limit after six white-water rafting and kayaking companies complained. Next summer, each rafting company, which can launch from several locations, will be limited to 125 passengers each weekday, and 100 on weekends. Persons making commercial raft trips rose from 8,581 in 1989 to 21,415 in 1992. Commercial raft trips will also be limited in sections of the 148-mile Arkansas River, Colorado's most popular white-water destination.

Montrose Daily Press 1/3/94

Cost of Studies Scraps Plans for Expansion at Monarch

Plans to double the size of the Monarch Ski Resort on Monarch Pass have been scrapped due to the cost of environmental studies required by the U.S. Forest Service. The company had asked the forest service for permission to double its 670-acre permit area as part of its expansion plans. Resort officials did not think lift-ticket sales could cover the costs of expansion studies and the actual project. According to the forest service, Breckenridge has paid, on a per-acre basis, a comparable price for environmental studies for a recent expansion; however, the cost makes it difficult for small ski areas to grow.

Grand Junction Daily Sentinel 12/11/93

Eldora Wins Approval to Expand Snowmaking

The U.S. Forest Service will allow Eldora Mountain Resort to expand its snowmaking into an expert-terrain area and make other improvements outlined in the resort's master plan. The resort in turn has agreed to purchase downstream water credits to bolster streamflow that could be reduced by the expanded snowmaking. It has also paid for research of the capshell snail, a rare snail species that lives in a lake from which Eldora draws its water. Eldora has also agreed not to draw down water in Peterson Lake below six feet to protect the snail. The area in

question is known as the Corona Bowl, which has sat unused for many years. If the forest service decision is not appealed, the resort plans to begin making snow in the bowl this winter.

Rocky Mountain News 11/25/93

GROUNDWATER

La Plata County Requests More Data on Gas Wells

In the wake of methane gas seeping into a subdivision's water wells, La Plata County officials have requested additional help from oil and gas operators in identifying potential problems. Specifically, the request was for more consistent compliance with county notification procedures when problems occur and contributions of money or manpower to help test water wells and homes for methane seeps. Reports of methane-saturated water wells in the Pine River Ranches subdivision and the detection of explosive levels of gas behind one home prompted the county to begin testing.

Grand Junction Daily Sentinel 12/1/93

MEETINGS

6th Symposium on Issues and Technology in the Management of Impacted Wildlife, April 6-8, 1994, Glenwood Springs, CO. Paper and poster sessions will include both aquatic and terrestrial aspects of:

Impact identification and mitigation techniques for species and habitat management

Behavioral responses of fish and wildlife to human activities

Long-term research and planning efforts

Approaches for identifying and mitigating impacts to wildlife species and their habitats with regional approaches biodiversity

ecosystem approaches to management

wetlands, riparian and water issues

values of urban and rural land as wildlife habitat

recreation and wildlife on public lands

interaction of wildlife with mineral and energy development

natural resource damage assessment for habitat remediation and restoration

Call Thorne Ecological Institute, 303/499-3647, for information including early registration. A symposium program will be mailed upon request.

Water Policy and Management: Solving the Problems, May 23-26, 1994, Denver, Colorado -- The Water Resources Planning and Management Division, American Society of Civil Engineers, will hold its 21st Annual Conference May 23-26, 1994, in Denver, Colorado. The theme will be "Water Policy and Management: Solving the Problems." For information contact: Technical Program Chair Harry N. Tuvel, Boswell Engr., 330 Phillips Ave., So. Hackensack, NJ 07606. Phone 201/641-0770; FAX 201/641-1831.

14TH Annual "HYDROLOGY DAYS," April 5-9, 1994, Fort Collins, Colorado -- Provides a forum for hydrologists and hydrology students to get acquainted and to share problems, analyses and solutions. A Special Keynote Address will be given by Dr. L. Douglas James, Director, Hydrologic Sciences Program, National Science Foundation. **SPECIAL SESSIONS:** Large-Scale Experiments, Hydrologic and General Circulation Models; Cross-Scale Integration and Disaggregation of Hydrologic Processes; Integrated Physical-Stochastic Hydrology; The Transfer Function Approach in Hydrology; Hydrology of Landfills; Characterization of Soil Capillary and Hydraulic Properties; and Decision Support Systems for River Basin Management. **STUDENT AWARDS:** Awards and prizes will be presented for the best student papers as oral or poster presentation in two or three categories: B.S. and/or M.S. and Ph.D. candidates. Contact: Janet Montera, HYDROLOGY DAYS, Civil Engineering Dept., Colorado State University, Fort Collins, CO 80523. Phone 303/491-7425; FAX 303/491-7727.

Fifth International Symposium on Society and Resource Management, *Creating Research, Education, and Management Partnerships Among Natural Resource Professionals*, June 7, 1994, Fort Collins, CO. The overall theme of the symposium is creating education, research and management partnerships among natural resource professionals. Participants will have the opportunity to attend a wide range of professional development programs--three concurrent sessions of lecture/poster presentations, lecture-style presentations, and dialog sessions.

Hosted by **The Human Dimensions in Natural Resources Unit** of the College of Natural Resources, Colorado State University. For program information contact: Jennifer Pate, Symposium Coordinator, College of Natural Resources, Human Dimensions in Natural Resources Unit, 245 Forestry, Colorado State University, Fort Collins, CO 80523 Phone 303/491-2077; FAX 303/491-2255.

To register contact: 5th International Symposium, Office of Conference Services, Colorado State University, Fort Collins, CO 80523, FAX 303/491-0667.

32 Million Glasses of Water!

During the four days that World Youth Day participants converged on the area, Denver Water crews served about 2 million gallons of Denver water - enough to last 10 families a year.

Denver Water, Fall 1993

UPPER ARKANSAS WATERSHED FORUM

Thursday, April 7 and Friday, April 8, 1994

Trail West Resort, Buena Vista, Colorado

Participate in a unique conference that takes a look at water-related issues and their influence on the future of the Upper Arkansas Watershed. This two-day conference was developed by "watershed citizens," with the goal of improving communication about water-related issues in the Upper Arkansas Basin (Leadville to Florence) by gathering together as a community to share each other's programs, successes, perspectives and concerns; and encourage proactive and integrated partnerships. Anyone interested and concerned about the future of the Upper Arkansas Watershed including: citizens; local leaders in government and business; community and environmental interest groups; private, local, state, and federal water and land resource managers.

COST: \$20 includes: registration, materials, and four meals. Lodging available for \$40-\$60.

PLANNERS AND FUNDING: This conference was planned by diverse local groups of citizens (from Leadville to Florence) representing mining, agriculture, recreation, water development, municipal and environmental interests. Funding support comes for the Colorado Department of Natural Resources - Division of Minerals & Geology, the Environmental Protection Agency, and the Sangre de Cristo Resource Conservation and Development Council.

DRAFT PROGRAM INCLUDES:

Thursday, April 7

Keynote Address by Ken Salazar, Director, Colorado Department of Natural Resources (invited)

The Blind Men & the River--a parable for our times. Arkansas RiverWatch Program.

Listening With an Open Mind--Jim Pahlau, facilitator.

Water Quality--How Bad is the Water in the Arkansas?--Really.

LUNCH--"The Historical Irony of the Arkansas," Ed Quillen, Editor, *Colorado Central*.

Water Quantity--Is there enough to go around?

Demonstrations, Exhibits and the "Rivermasters" Contest

DINNER--The Honorable Roy Romer, Governor of Colorado (invited)

Friday, April 8

The Good News! Good Things Are Happening Up and Down the Watershed

Education--Educating future citizens about water

LUNCH--"Ecosystem Management," Jack Ward Thomas, Chief, U.S. Forest Service (invited)

The Future--What's Around the Bend?

Wrapping Up the Watershed

Invited session moderators include: U.S. Rep. Scott McInnis; State Rep. Ken Chlouber; State Sen. Linda Powers; Lake, Chaffee, Custer and Fremont county commissioners

CONTACT: Jeffrey Keidel, Upper Arkansas Watershed Coordinator 719/395-6035(w) or 719/395-8704(h)

AWRA - COLORADO SECTION

Presents a Symposium on

BIODIVERSITY: MEETING TOMORROW'S CHALLENGES TODAY

March 18, 1994 - Sheraton West, 360 Union Boulevard, Denver

Biodiversity, an abbreviation for biological diversity, seems to be the latest, hottest buzzword in the environmental and resource management arenas. What does it mean? How does this concept relate to the Endangered Species Act, holistic watershed management, ecosystem management, and Environmental Impact Assessment, to name a few: Is it just another passing concept or does it represent the keystone upon which humanity's survival depends? Plan to attend this full-day symposium to examine the meaning and implications of biodiversity on Colorado's water resources.

FOR INFORMATION CONTACT: Dave Merritt at Phone 303/945-8522, FAX 303/945-8799 or

Jerry Kenny at Phone 303/987-3443

NEBRASKA CONFERENCE FOCUSES ON CONJUNCTIVE USE POLICY IN THE LOWER PLATTE

(Editors Note: Given the interest in interstate Platte River water management, Colorado Water is reprinting an announcement of the 1994 Nebraska Water Conference where conjunctive use policy in the lower Platte will be discussed. This announcement appeared in the December issue of Water Current, the Nebraska Water Center's newsletter.)

Conjunctive use of groundwater and surface water will be the focus of the 1994 Nebraska Water Conference March 15-16 at the Cornhusker Hotel and Convention Center in Lincoln.

The development of a conjunctive use policy for Nebraska is still underway. In fact, there is considerable debate about the need for such a policy. The program for the conference will reflect this evolving policy status. The first morning will include presentations which will give a background on both the general topic and Nebraska's current conjunctive use policy. Reports will be made on pending policy proposals from the Governor's Water Council and in the Nebraska Legislature.

Warren Fairchild will outline the conference topic as a policy issue during the March 15 luncheon. A Nebraska native, he served as executive secretary for the Nebraska Soil and Water Conservation Commission, later the Nebraska Natural Resources Commission. In 1970 he moved to Washington, D.C., where he had positions with the U.S. Bureau of

Reclamation, Water Resources Council and World Bank. The afternoon session will open with case studies on conjunctive use potential in the Republican River and Platte River basins. Conference attendees will form small discussion groups to explore conjunctive use policy options in these two basins. The discussion groups will be aided in their tasks by leaders and resources from the state and nation.

Nebraska Governor Ben Nelson has been invited to speak to the conference at the March 16 breakfast. At the first morning session the findings from the discussion groups will be reported. A panel representing development, irrigation, power, municipal, environmental and agriculture interests will respond to the reports. Fairchild will provide a conference summary. Nebraska State Senator Chris Beutler has been invited to deliver a closing address to the conference at lunch.

Conference registration materials will be mailed in January 1994. It will also be included in the February 1994 issue of Water Current. Call (402) 472-7527 for more information.

CALLS FOR PAPERS

Annual Conference, AWWA, Rocky Mountain Section-- Crested Butte, CO. Sept. 11-14, 1994. *Call for Papers, Advance Notice.* Contact Technical Program Coordinators:

AWWA Technical Programs - Brian Janonis, 303/226-4955;
WPCA Technical Programs - Joe Chwirka, 303/393-6363; and
Preconference Workshops - Jose Velazquez, 303/289-1311.

Call for Operation Papers. One-page presentation outlines should be submitted by March 31, 1994 to the appropriate coordinator. In addition to a hard copy, please submit on a computer disk (WordPerfect or ASCII, 3.5" or 5.25" diskette). Action Now/Water Operations Program Coordinator: Mike Burns, Denver Water, 1600 W. 12th Ave., Denver, CO 80254. Phone 303/628-6358; FAX 303/628-6853. Wastewater Operations Program Coordinator: Dave Vogel, OMI, 5299 DTC Blvd., Englewood, CO 80111-3333. Phone 303/740-0019; FAX 303/740-7061. Conference Coordinator: Mark Van Nostrand, RTW, 1600 Stout St., Ste 1800, Denver, CO 80220. Phone 303/825-5999; FAX 303/825-0642.

7th International Symposium, Agricultural and Food Processing Wastes -- June 18-20, 1995, Chicago, IL. Topics include: Water pollution control, waste utilization, waste minimization and management procedures. Proposal instructions available from: Dr. David T. Hill, Agric. Engr. Dept., Auburn Univ., Auburn, AL 36849-5417. Phone 205/844-3531; FAX 205/844-3534. Deadline: April 15, 1994.

International Association of Hydrological Sciences--Boulder, CO. July 3-14, 1995. For information contact: Richard F. Hadley, 3784 S. Depew St., Denver, CO 80235. Phone 303/986-7130; FAX 303/871-2201. Abstract Deadline: Feb. 28, 1994.

Association of State Dam Safety Officials 1994 Annual Conference--Boston, Massachusetts. Sept. 11-14, 1994. For information contact: ASDSO, P.O. Box 55270, Lexington, KY 40555. Phone 606/257-5146 or 5140. Abstract Deadline: March 1, 1994.

1994 GROUNDWATER MODELING CONFERENCE - August 10-13, 1994
Jointly sponsored by Colorado State University and the Colorado School of Mines
To be held on the Colorado State University campus, Fort Collins, CO
Abstract Deadline: February 18, 1994
For information contact: Janet Montera Phone 303/491-7425; FAX 303/491-7727

UNIVERSITIES COUNCIL ON WATER RESOURCES ANNUAL CONFERENCE
Big Sky, Montana, August 2-5, 1994

This year, for the first time, the Universities Council on Water Resources will include not only invited, but also contributed papers at its annual conference. The Technical Program Committee solicits paper proposals from individual authors and poster presentations on topics related to:

**Groundwater Restoration; Watershed Restoration;
 Environmental Restoration from Natural Disasters;
 Environmental Restoration from Technical Advances;
 Restoration of Lakes, Rivers and Wetland Ecosystems;
 Policy, Economic, Legal and Social Aspects of Environmental Restoration;
 Educational Aspects of Environmental Restoration;
 Risk Analysis**

Send three copies of 1,000-word abstract to: Larry W. Mays, Dept. of Civil Engineering, Arizona State University, Tempe, AZ 85287. Phone 602/965-3589; FAX 965-0557. Abstract Deadline: March 15, 1994. Speakers are expected to register for the conference (\$225 fee includes selected meals, banquet, coffee breaks and a copy of the proceedings).

CALENDAR

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| Mar. 10-11 | WESTERN WATER LAW, Denver, CO. Contact: CLE International, 1541 Race St., Ste 100, Denver, CO 80206. Phone 800/873-7130; FAX 303/321-6320. |
| Mar. 16-18 | 11TH HIGH ALTITUDE REVEGETATION WORKSHOP, Fort Collins, CO. Contact: Office of Conference Services, Colorado State University, Fort Collins, CO 80523. To register call 303/491-7501. For questions about program content contact: Gary Thor at 303/491-7296. |
| Mar. 18 | BIODIVERSITY: MEETING TOMORROW'S CHALLENGES TODAY, Denver, CO. Contact: Dave Merritt at 303/945-8522 or Jerry Kenny at 303/987-3443. |
| Mar. 21-23 | ASSESSMENT OF MODELS FOR GROUNDWATER RESOURCES ANALYSIS AND MANAGEMENT, Honolulu, Hawaii. Contact: Water Resources Research Center, University of Hawaii at Manoa, 2525 Correa Rd., HIG 441, Honolulu, Hawaii 96822. Phone 808/956-6331; FAX 808/956-2538. |
| Mar. 23-26 | 9TH ANNUAL MEETING OF THE INTERNATIONAL ASSOCIATION FOR LANDSCAPE ECOLOGY, Tucson, AZ. Contact: Jim Laukes, The Univ. of Arizona Extended University, 1955 E. 6th St., Tucson, AZ 85719. Phone: 1-800/955-UofA; FAX 602/3269; internet jlaukes@ccit.arizona.edu. |
| Mar. 27-30 | SECOND INTERNATIONAL CONFERENCE ON GROUNDWATER ECOLOGY, Atlanta, GA. Contact: John Simons, USEPA, Groundwater Protection Div., Mail Code WH550G, 401 M St., SW, Washington, DC 20460. Phone 202/260-7091. |
| Mar. 27-31 | SYMPOSIUM ON THE APPLICATION OF GEOPHYSICS TO ENVIRONMENTAL AND ENGINEERING PROBLEMS, Boston, MA. Contact: Tom Fenner, SAGEEP '93, Geophysical Survey Systems, Inc., P.O. Box 97, North Salem, NH 03073-0097. |
| Apr. 5-9 | 14TH ANNUAL HYDROLOGY DAYS, Colorado State University, Fort Collins, CO. Contact: Janet Montera, Civil Engineering Dept., Colorado State University, Fort Collins, CO 80523. Phone 303/491-7425; FAX 303/491-7727. |
| Apr. 6-8 | 6TH SYMPOSIUM ON ISSUES AND TECHNOLOGY IN THE MANAGEMENT OF IMPACTED WILDLIFE, Glenwood Springs, CO. Contact: Thorne Ecological Institute, 5398 Manhattan Circle, Suite 120, Boulder, CO 80303. Phone 303/499-3647 (Carol Knepp or Susan Foster; FAX 303/499-8340. |
| Apr. 7-8 | UPPER ARKANSAS WATERSHED FORUM, Buena Vista, CO. Contact: Jeffrey Keidel, Upper Arkansas Watershed Coordinator, P.O. Box 938, Buena Vista, CO 81211. Phone 719/395-6035(w) or 719/395-8704 (h). |
| Apr. 10-14 | TOXIC SUBSTANCES AND THE HYDROLOGIC SCIENCES, Austin, TX. Contact: American Institute of Hydrology, 3416 University Ave., SE, Minneapolis, MN 55414-3328. Phone 616/379-1030; FAX 612/379-0169. |

- Apr. 17-20 RESPONSES TO CHANGING MULTIPLE-USE DEMANDS: NEW DIRECTIONS FOR WATER RESOURCES PLANNING AND MANAGEMENT, Nashville, TN. Contact: Ralph H. Brooks, Tennessee Valley Authority, Knoxville, TN. Phone 615/632-6770.
- Apr. 20-22 2ND ENVIRONMENTALLY SOUND AGRICULTURE CONFERENCE, Orlando, FL. Contact: Pat Neilson, P.O. Box 110570, Univ. of FL, Gainesville, FL 32611-0570. Phone 904/392-5930; FAX 904/392-9734.
- Apr. 27-29 WILDLIFE WATER DEVELOPMENT: INTEGRATED APPROACHES TO WILDLIFE MANAGEMENT AND CONSERVATION, Laramie, WY. Contact: Susan Powell, P.O. Box 3972, Laramie, WY 82071-3972. Phone 800/484-7801.
- May 11-13 DROUGHT MANAGEMENT IN A CHANGING WEST: NEW DIRECTIONS FOR WATER POLICY, Portland, Oregon. Contact: Western Drought Conference, International Drought Information Center, 236 Chase Hall, University of Nebraska, P.O. Box 830728, Lincoln, NE 68583-0728. Phone 402/472-6707; FAX 402/472-6614.
- June 7-9 1994 ANNUAL MEETING, GREAT PLAINS AGRICULTURAL COUNCIL, Bismarck, ND. Contact: Melvin Skold at 303/491-7370.
- June 7-10 FIFTH INTERNATIONAL SYMPOSIUM ON SOCIETY AND RESOURCE MANAGEMENT, Fort Collins, CO. Contact: Office of Conference Services, Colorado State University, Fort Collins, CO 80523. FAX 303/491-0667.
- June 9-12 IGWMC GROUNDWATER MODELING CONFERENCE 1994, Golden, CO. Contact: Janet Montera, Dept. of Civil Engr., Colorado State University, Fort Collins, CO 80523. Phone 303/491-7425; FAX 303/491-7727.
- June 6-17 INTERNATIONAL DAM SAFETY, OPERATION AND MAINTENANCE SEMINAR AND STUDY TOUR, Denver, CO., San Francisco CA and Sacramento CA. Contact: American Water Foundation, PO Box 480632, Denver, CO 80248-0632.
- June 13-15 CONSTITUTIONAL LIMITS ON ENVIRONMENTAL REGULATION: LAND, WATER, AND RESOURCES DEVELOPMENT AND USE. For information contact Kathy Taylor, 303/492-1288.
- 5TH INTERNATIONAL SYMPOSIUM ON SOCIETY AND RESOURCE MANAGEMENT, Fort Collins, CO. Contact: M.J. Manfredi, Human Dimensions in Natural Resources Unit, Colorado State University, Fort Collins, CO 80523.
- June 26-29 EFFECTS OF MAN-INDUCED CHANGES ON HYDROLOGIC SYSTEMS, Jackson Hole, WY. Contact: David Naftz, USGS, Salt Lake City. Phone 801/975-3389.
- July 12-15 SUSTAINING THE ECOLOGICAL INTEGRITY OF LARGE FLOODPLAIN RIVERS: APPLICATION OF ECOLOGICAL KNOWLEDGE, LaCross, WI. Contact: Dr. K.S. Lubinski, US Fish & Wildlife Serv., Environ. Mgmt. Tech. Ctr., 575 Lester Ave., Onalaska, WI 54650.
- Aug. 7-12 STORMWATER NPDES RELATED MONITORING NEEDS, Crested Butte, CO. Contact: Barbara Hickernell, 345 E. 47th St., New York, NY 10017. Phone 212/705-7836.

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