



COLORADO WATER

Colorado Water Resources Research Institute

Colorado State University

Fort Collins, Colorado 80523

May - June 1984

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COLORADO STATE UNIVERSITY

STATE APPROPRIATES FUNDS FOR WATER RESEARCH

The Colorado Legislature passed H.B. 1402 on May 21, 1984, providing an appropriation of \$67,000 for 1984-85 water research.

The state appropriation qualifies the Institute for federal cost-sharing funds for water research under P.L. 98-242, The Water Resources Research Act of 1983. This modest appropriation will enable the Institute to obtain \$150,000 in federal funds for research on Colorado water problems.

Congress overrode a Presidential veto to pass the Act in March, noting that "loss of a coordinated federal-state program would be devastating to our hope of solving current or future water problems."

"These combined state and federal funds will finance research and technology development Colorado must have for progress toward optimum use of limited water — a high-priority state goal," says Dr. Norman A. Evans, Institute director.

The Institute soon will initiate research projects requested by state officials and water-user organizations on several Colorado problems.

The **Endangered Species Act** will be the subject of a study by the Natural Resources Law Institute, University of Colorado. The focus will be the Act's potential impacts on water management options in the South Platte River Basin.

Low-Flow Criteria for municipal sewage discharge permits will be the subject of a study performed in cooperation with the Environmental Protection Agency, the Colorado Department of Health and Colorado municipalities. The objective is to develop and test viable alternatives to the 7-day, 10-year low-flow criteria now used. If successful, the results will lower municipal waste treatment costs in Colorado.

Methods and water requirements for **Aquatic Habitat Maintenance** in the lower South Platte River will be investigated. The central question is the practicability of maintaining a desirable geometric cross-section in the river for downstream crane habitat by controlled flushing. How will this strategy affect Colorado's water supply and water rights?

The computer simulation model recently developed for the lower South Platte Basin (SAMSON) will be used to test alternatives for water delivery from a hypothetical storage reservoir. Innovative methods such as use of return flows and groundwater pumping with river augmentation will be tested for efficiency.

Another project will be initiated in the San Luis Valley in cooperation with the Bureau of Reclamation and

USDA's Agricultural Research Service. Its objective is to improve estimates of **Evapotranspiration from Native Vegetation in the Closed Basin**. The results will determine how much water can be pumped legally from the Closed Basin into the Rio Grande River to help satisfy compact water-delivery requirements.

EFFLUENT TREATMENT COSTS: ARE THEY UNNECESSARILY HIGH?

Can the cost of waste treatment required in discharge permits be reduced? This question has been raised by officials of the Environmental Protection Agency, the Colorado Department of Health, municipal waste treatment departments, and designers of waste-treatment facilities. The answer will be sought in a research project developed by a steering committee representing each of the foregoing interests.

The steering committee will oversee the study to assure that the results can be accepted by both the regulating agencies and the effluent dischargers. The objective is cost savings in public funds where advanced waste treatment is required part of the time but not necessarily all of the time.

Colorado's water quality regulations, like those of most other states, require that effluent treatment levels meet quality standards at all streamflows equal to or greater than the 7-day, 10-year minimum flow (7Q10). Experts acknowledge that this "low-flow criteria" is super-conservative. It does not allow full use of the assimilative capacity of the receiving stream.

Savings of up to 16 percent for capital construction and up to 19 percent for annual operation are estimated if suitable new low-flow criteria can be developed.

Funding for the study will be solicited from both regulatory agencies and effluent dischargers. The USEPA and Colorado Department of Health will be asked to contribute, as will municipalities and industrial firms. An independent agency, such as a Council of Governments, will receive and disburse contributed funds to assure contributors of fiscal accountability. Estimated cost of the study is around \$60,000.

Further information on the project may be obtained from the Institute or the following members of the steering committee: Bruce Zander, USEPA (844-2721); John Scherschligt, Colorado Department of Health (320-8333); John Hendrick, Jack G. Raub Company (790-7784).

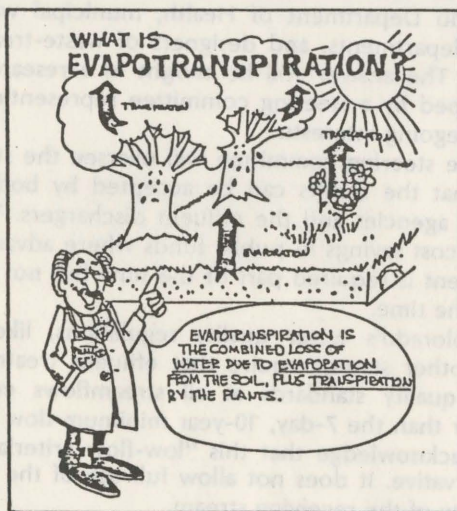
FORT COLLINS WATER MANAGEMENT SPOTLIGHTED

Fort Collins is one of the few Front Range cities that has successfully met rapidly growing water demands. The city's innovative management has caught the attention of water utility managers throughout the country. The December, 1983, *Water Resources Quarterly* contains a summary of the city's strategies written by Roger E. Krempel, Public Works and Water Utilities director.

The Fort Collins program includes conservation education, acquisition of water rights and wastewater reuse, says Krempel. Although a city ordinance requires water-saving devices and meter horns in new and remodeled one- and two-family homes, meters are not presently required. (Commercial properties and multi-family dwellings have always been metered.) Yet, he says, per capita water use dropped from 321 gallons in 1976 to 181 in 1982.

He attributes this to a very successful conservation education program which includes:

- weekly newspaper publication of a series of cartoons featuring "Professor ET's" message on domestic water conservation;



- daily newspaper publication of a lawn-watering guide;
- a "Conservation Corner" in the City's public library; and
- "Captain Hydro" water conservation workbooks furnished to the local schools.

Krempel also describes the city's strategy to assure that water will be available for future needs. Subdivision developers are required to provide the city water rights yielding three acre-feet per year for each acre of annexed land. If the developer does not own water rights he must pay the city the current market value of water rights. That money goes into a special fund and is used for water supply development or the purchase of water rights.

For example, the city recently purchased water rights yielding 1200 acre-feet for storage in the North Platte River Basin. This water will be released to the North Platte River in exchange for an equal amount diverted to the city via the Michigan River collection system.

Do-It-Yourself Plant Expansion

Fort Collins has two treatment plants, the newest operating only during the seven-month period of highest demand. City personnel recently completed expansion of that plant during its five-month shutdown. Said Krempel: "This approach has worked beyond our original expectations. Not only are we saving many thousands of dollars but the operations staff is gaining hands-on knowledge of every element of the expansion. They take pride of ownership in the facility and are learning new skills along the way."

Krempel said the *do-it-yourself* program cuts costs and boosts morale. It assures Fort Collins, Colorado, the treatment capacity needed to meet future water demands, he added.

Wastewater Trade

The city's water management program includes wastewater reuse. It delivers treated effluent to the Platte River Power Authority's Rawhide Power Plant for cooling water. The Authority now buys the water from the city but when its new Windy Gap project is finished in a few years, it will give the city raw water in exchange for treated effluent. This will increase the city's raw water supply by about 2310 acre-feet per year.

City Uses Advanced Technology

Advanced computer technology developed by Institute research is helping city staff manage Fort Collins' raw water supply and plan for future water demands. MODSIM 3, a hydrologic simulation model developed by Dr. John Labadie, CSU's Civil Engineering Department, is being used to plan for growth in the city's water supply system by city water resources engineers Dennis Bode and Andrew Pineda.

City staff use the new technology to find optimum management strategies for existing water supplies that include direct-flow river rights, reservoir storage rights and water exchanges with other water-right owners. Integrated management of reservoir releases and water exchanges are critical to maximum use of available water.

The model MODSIM 3 also has been used to develop the delivery plan for supplying cooling water to the Rawhide Power Plant. The plan reuses return flow from transmountain water imported from the North Platte Basin. A complex system of exchanges with that water allows the delivery of treated effluent from the city waste treatment system to the plant site 14 miles north of the city. Without computer simulation of the water system, it would be difficult to test complex management schemes for practicability and reliability.

EPA REGULATES UNDERGROUND INJECTION IN COLORADO

The Environmental Protection Agency implemented an Underground Injection Control (UIC) program for Colorado on June 24, 1984, affecting injection of fluids into underground sources of drinking water. This federal action was taken after Colorado declined to take over the program. Any UIC well not authorized by permit or exempted is unlawful effective June 24.

The UIC program regulates five classes of injection wells:

- CLASS I industrial and municipal disposal wells, nuclear storage and disposal wells that inject below the lowermost formation containing an underground source of drinking water;
- CLASS II injection wells associated with oil and gas production and liquid hydrocarbon storage;
- CLASS III special-process wells used in conjunction with solution-mining of minerals;
- CLASS IV wells that are used by generators of hazardous wastes or hazardous-waste management facilities and inject *into* or *above* an underground source of drinking water (these wells are banned after December 24, 1984); and

CLASS V wells that do not fall into any of the other categories, such as recharge wells, drainage wells, cesspools, in situ gasification of oil shale and coal, etc. There are a total of 16 well-types in Class V.

The following wells are exempted from the permit requirements for the indicated periods of time from June 24, 1984:

- existing Class II (except liquid hydrocarbon storage and enhanced recovery wells) wells are exempted for up to five years;
- existing Class I and III wells are exempted for up to one year;
- existing Class II liquid hydrocarbon storage and enhanced recovery wells are exempted for the life of the well;
- Class V wells are exempted until regulations are formulated or until EPA determines that a specific facility should be regulated by permit. Class IV wells are banned six months from the effective date of the program. These wells must be plugged and abandoned before this six-month period expires.

EPA will administer the Colorado program from its Denver Regional Office.

COLORADO RIVER SALINITY STANDARDS

Salinity standards for the Colorado River were adopted by the seven Basin states and the U.S. Environmental Protection Agency in 1976. The standards call for maintaining dissolved salt concentration at or below 1972 levels at 3 points on the lower main stem of the river.

As of 1983 the numeric standard has been met. Meanwhile, progress continues on investigations, planning and construction of projects designed to reduce the amount of salt in the river's water.

These projects are necessary as new irrigation projects are brought on-line in the Upper Basin. Furthermore, a U.S.-Mexico treaty places limitations on salt concentration in water going into Mexico.

Salt concentration during the past 10 years has dropped slightly at the three observation points. The filling of Lake Powell and other reservoirs during that period is thought to account for the decline. Salt concentrations at the three measuring points dropped from 1972 to 1982 as follows:

Site	1972	1982
Hoover Dam	723 mg/l	682 mg/l
Parker Dam	747 mg/l	717 mg/l
Imperial Dam	879 mg/l	825 mg/l

Most people take water for granted. We simply assume it will always be there when required for a variety of uses. Water is nature's most valuable resource. In only a few days, there is no life without water, yet we go about our daily lives with little interest in or concern about what many consider to be a "dry" subject — water!

Twenty years ago, Dr. Thomas B. Nolan, who was director of Interior's Geological Survey, said the "United States was using water at the equivalent of 118 trillion gallons a year: that the total lifetime water needs of persons living then were a staggering 6,000 trillion gallons." In the intervening years, those figures have most certainly increased, which points to the conclusion that water is truly a valuable resource, and that we must realize all the water on earth is all the water there is, so use it wisely and well.

State Representative Scott McInnis
Glenwood Springs
Colorado Rancher and Farmer, May 1984

THE HUSTON CASE AND GROUNDWATER LEGISLATION

"Water policy cannot be established by litigation. The courts do not lend themselves to establishing natural resources policy; rather, they resolve conflicts in the framework of given policy."

This is one of the conclusions drawn by Mr. David Brown of the Boulder law firm Moses, Wittemyer, Harrison and Woodruff. Speaking to the Colorado Water Issues Public Forum at Denver in January, Mr. Brown reviewed the results of the Huston case, a recent Colorado Supreme Court decision concerning groundwater law.

Seven years of litigation resolved some questions about non-tributary groundwater, but perhaps raised as many new questions as were answered.

Do water courts have jurisdiction over non-tributary groundwater? The answer seems to be that non-tributary groundwater outside of designated groundwater basins is under the jurisdiction of the water court. The court can determine whether or not specific groundwater is non-tributary, but it cannot determine the quantity of pumping to be allowed. This must be done through the process of a well permit from the State Engineer.

The decision does establish that the existing water law applies to non-tributary groundwater and that the water court does have jurisdiction. The 1983 amendment to the groundwater law (S.B. 439), which was designed to assure that non-tributary groundwater is within water court jurisdiction, was neither verified nor invalidated by the decision, but it directs the water court to consider that amendment.

Mr. Brown asserted that disputes over groundwater will continue to intensify and that the decision in the Huston case will not resolve them. Solutions can only come through legislative policy direction.

Governor Lamm has directed the Colorado Department of Natural Resources to study the issues and to recommend new policy directions. Dr. David Getches, director of the department, has initiated a task force of experts in law and hydrology representing government and the private sector to help evaluate alternative policies.

What issues lie ahead? The allocation of rights to groundwater in non-tributary aquifers does not depend upon the appropriation doctrine and hence does not fall into priorities of right. Surface-land ownership is the prerequisite to an application for a well permit and

through that a right to withdraw groundwater. Rules are needed to specify conditions on transfer of permit ownership, time limits for full development, termination of the permit, limitations on amount that can be withdrawn, etc.

Phased development of groundwater is another aspect that needs policy attention. Phased development with a corresponding conditional water right has been suitable for surface water development, but many believe this tactic is not appropriate for non-tributary groundwater. A time limit should be specified for full development in order to prevent an unused permit from blocking legitimate development.

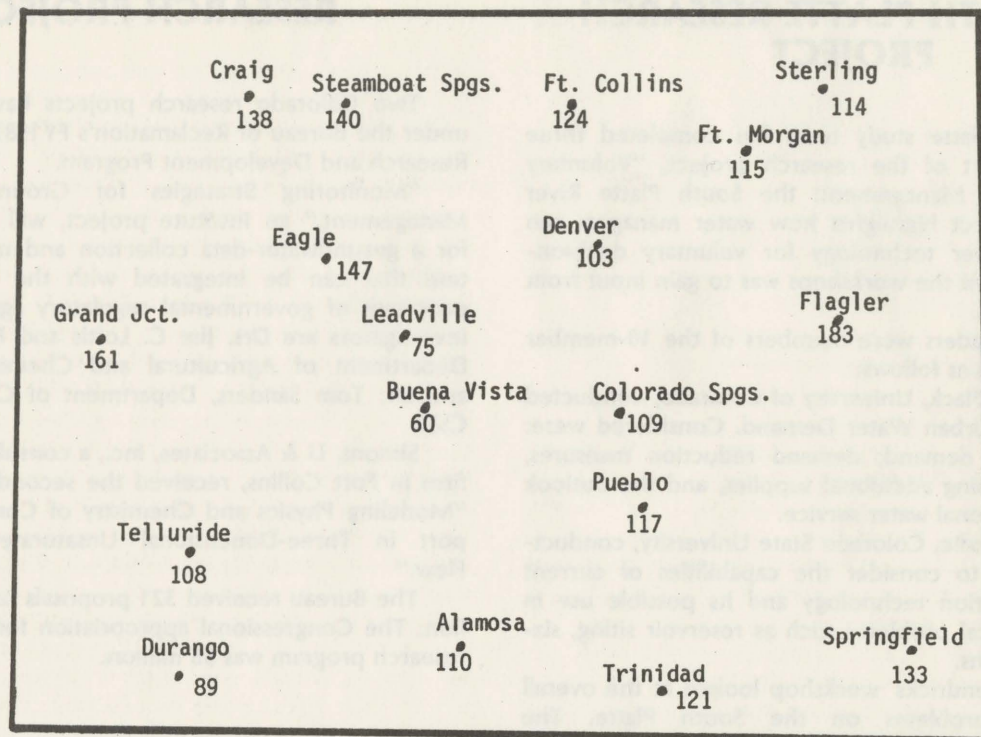
There also is the question of how to differentiate between non-tributary and tributary groundwaters. Many hydrologists say many groundwater bodies are some of both.

Finally, quality protection for groundwater is not well established in Colorado law. With the increasing practice of water recycling involving groundwater, the quality protection issue needs to be given serious attention.

Routt and Moffat county voters Tuesday approved a 1-mill levy tax for the Upper Yampa Water Conservancy District to build its proposed \$13.5 million Stagecoach Reservoir. John Fetcher, secretary for the water district, said voters approved the measure with 1,525 votes in favor and 1,206 votes against.

The Stagecoach Project will be located on the main stem of the Yampa River, about 16 miles south of Steamboat Springs. The reservoir is designed to hold up to 34,000 acre-feet of water, covering 800 acres of hay meadow. Construction is planned for 1986 and 1987.

Grand Junction Daily Sentinel
May 9, 1984



COLORADO PRECIPITATION

OCTOBER 1983 - MAY 1984
(PERCENT OF NORMAL)

FLOODPROOFING MANUAL COMPLETED

The Colorado Floodproofing Manual, produced by the Colorado Water Resources Research Institute, is now available from the Colorado Water Conservation Board. The manual presents concepts for implementing flood-plain management practices that will reduce the flood risk to life and property.

Designed for local flood-plain administrators and professionals in government and business, it describes procedures and design techniques to mitigate losses from floods. The manual notes that flood-prone areas have been identified in 266 cities and towns and in all of Colorado's 63 counties.

The Federal Emergency Management Agency funded the project, and preparation of the manual was under the administrative direction of Larry Lang, Chief, Flood Control and Flood-Plain Management Section, Colorado Wa-

ter Conservation Board. Simons, Li & Associates, Inc. provided technical assistance.

WATER FORUM LUNCHEON MEETING

The Forum meets on the third Tuesday of each month, 11:45 a.m. to 1:30 p.m. at Wyatt's Cafeteria, Wadsworth and Alameda in Lakewood, west of Denver. Authoritative speakers present programs of current interest to water managers, professionals, and interested citizens.

July 17, 1984

INTERSTATE COOPERATION ON
THE COLORADO RIVER

J. William McDonald, Director
Colorado Water Conservation
Board

August

No meeting — Forum will resume
September 18.

PRACTITIONERS PROVIDE INPUT TO SOUTH PLATTE RESEARCH PROJECT

The South Platte study team has completed three workshops as part of the research project, "Voluntary Basinwide Water Management: the South Platte River Basin." The project highlights how water managers can use new computer technology for voluntary decision-making. Purpose of the workshops was to gain input from field practitioners.

Workshop leaders were members of the 10-member team of specialists as follows:

Dr. J. Ernest Flack, University of Colorado, conducted a workshop on Urban Water Demand. Considered were: trends in water demand; demand reduction measures, limits on developing additional supplies, and the outlook for adequate regional water service.

Dr. John Labadie, Colorado State University, conducted a workshop to consider the capabilities of current computer simulation technology and its possible use in answering practical problems such as reservoir siting, sizing, and operations.

Dr. David Hendricks' workshop looked at the overall water quality problems on the South Platte. The workshop group discussed salt balance, nitrates and TDS, and strategies for approaching these problems.

In general, the practitioners' responses were very constructive and useful to researchers. The input gained will become part of the project's final report.

PARK SERVICE WATER RESOURCES TRAINING AT CSU

The National Park Service, in cooperation with Colorado State University, held a training course on water resources during the week of April 30. Thirty-five employees of national parks, national recreation areas and other NPS units all over the United States attended. The participants, mostly natural resource management specialists, came from as far away as Acadia National Park in Maine, Big Cypress National Preserve in Florida, and the national parks of Hawaii and Alaska.

The training course emphasized water quality in general and monitoring techniques for assessing pollution impacts on park waters in particular. Course organizers included Ray Herrmann, Mark Flora and Sam Kunkle of the NPS Water Resources Field Support Laboratory (WRFSL) in Fort Collins; and Bob Auckerman and Glenn Haas of the College of Forestry and Natural Resources at CSU. Training for NPS employees will likely continue to be one of the services offered by both the Lab and the NPS Water Resources Branch, also in Fort Collins.

USBR FUNDS TWO RESEARCH PROJECTS

Two Colorado research projects have been funded under the Bureau of Reclamation's FY1983 "focused area" Research and Development Program.

"Monitoring Strategies for Groundwater Quality Management," an Institute project, will develop criteria for a groundwater-data collection and management system that can be integrated with the decision-making processes of governmental regulatory agencies. Principal Investigators are Drs. Jim C. Loftis and Robert C. Ward, Department of Agricultural and Chemical Engineering, and Dr. Tom Sanders, Department of Civil Engineering, CSU.

Simons, Li & Associates, Inc., a consulting engineering firm in Fort Collins, received the second award to study "Modeling Physics and Chemistry of Contaminant Transport in Three-Dimensional Unsaturated Groundwater Flow."

The Bureau received 321 proposals totaling \$46.2 million. The Congressional appropriation for the nationwide research program was \$6 million.

FEDERAL FINANCING FOR WASTE TREATMENT

Congress is currently debating the outlook for future federal funding of waste treatment construction grants.

The House Public Works Committee recently reported out a new Clean Water Act (HR 3282) that would increase federal funding and provide for an innovative revolving loan fund for state use of project financing. The proposed Act also tightens controls on municipal sewage discharge into oceans.

The innovative financing aspect provides a \$1.6 billion annual revolving fund for loans, loan and bond guarantees, and interest subsidies. States would be eligible for a formula allocation from the fund. They would be required to provide 20 percent of the total loans.

This proposal is not a reduction in federal grants. The loan program is intended to supplement but not replace the existing grant program. On the other hand, EPA has recommended that federal construction grants to municipalities should be phased out.

The proposed Act also contains a non-point source pollution control program with \$150 million annually for matching grants to aid in implementation of state control programs. A 10-percent financial incentive in federal funds would be offered to states where the private sector participates in non-point source control measures.

In the short term, last year's Colorado River flooding damaged wildlife. But in the long term, the floods were a blessing, according to Colorado Division of Wildlife Commission Chairman Jim Kennedy. The Commission is a group of citizens appointed by the Governor to oversee the DOW. Kennedy told a March 31 meeting on flooding sponsored by the Professional Engineers Council that he had first assumed the overflowing streams and rivers damaged wildlife. But, he continued, "This is a short term destruction of wildlife. The long term effect is good. It improves the riparian zone by spreading the cottonwood and willow, wild plum, chokecherry, alder, and silverbell as well as the partially submerged plants — bullrushes, marshgrass..." It recharges groundwater and cleanses gravel, making it more receptive to fish eggs. Research, he said, indicates that the decline of willows, which provide vital wildlife habitat on the South Platte River in Colorado, is related to upstream water storage and diversion. The 1983 floods, which overwhelmed storage, may bring the willows back by spreading seeds and nutrients and recharging groundwater.

High Country News
April 30, 1984

1984 CONFERENCES

- July 23-25 EFFECTS OF ACID RAIN, Gunnison, Colorado. Contact: Lawrence J. MacDonnell, Director, Natural Resources Law Center, Fleming Law Building, Campus Box 401, Boulder, Colorado 80309. Telephone: (303) 492-1286.
- July 24-26 SYMPOSIUM ON INTEGRATION OF WATER RIGHTS at the ASCE Specialty Conference of the Irrigation and Drainage Division, Flagstaff, Arizona. Contact: Kenneth G. Renard, Southwest Rangeland Watershed Research Center, 2000 E. Allen Road, Tucson, Arizona 85719. Telephone: (602) 629-6381.
- July 29-31 20TH UCOWR ANNUAL CONFERENCE: "Educational Prerequisites for Water Resources Management," Baton Rouge, Louisiana. Contact: William Powers, Director, Water Resources Center, 310 Agriculture Hall, University of Nebraska, Lincoln, Nebraska 68583. Telephone: (402) 472-3305.

- August 12-16 20TH ANNUAL AMERICAN WATER RESOURCES ASSOCIATION CONFERENCE AND SYMPOSIUM, Washington, D.C. Contact: Arlene Dietz, Corps of Engineers, Institute for Water Resources, Casey Bldg., Fort Belvoir, Virginia 22060. Telephone: (202) 325-6768.
- August 12-17 20TH ANNUAL CONFERENCE AND SYMPOSIUM OF THE AMERICAN WATER RESOURCES ASSOCIATION, Washington, D.C. Contact: Kenneth D. Reid, American Water Resources Association, 5410 Grosvenor Lane, Suite 220, Bethesda, Maryland 20814. Telephone: (301) 493-8600.
- August 27-29 THE IMPACT OF MINING OF GROUND WATER, Denver, Colorado. Contact: NWWA, 500 N. Wilson Bridge Rd., Worthington, Ohio 43085.
- Aug. 27-Sept. 28 INTERNATIONAL REMOTE SENSING WORKSHOP, Sioux Falls, South Dakota. Contact: Office of International Geology, U.S. Geological Survey, 917 National Center, Reston, Virginia 22092. Telephone: (703) 860-6418.
- September 26-28 7TH NATIONAL GROUNDWATER QUALITY SYMPOSIUM, Las Vegas, Nevada. Contact: NWWA, 500 W. Wilson Bridge Rd., Worthington, Ohio 43085. Telephone: (614) 846-9355.

PUBLICATIONS

- STRUCTURAL FAILURES IN PUBLIC FACILITIES, Committee on Science and Technology, 2321 Rayburn House Office Bldg., Washington, D.C. 20515.
- EPA HEARING OFFICERS' REPORT on Incineration of hazardous waste in the Gulf of Mexico, Peyton Davis, Office of Water, U.S. Environmental Protection Agency, Washington, D.C. 20460.
- DRAFT REPORT BY THE COMMERCE DEPARTMENT on Different Assessments of the Future Need of Superfund, Rep. James Florio's Office, (202) 225-6501.
- REGULATIONS UNDER REVIEW, REVISION, AND DEVELOPMENT, Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Vol. 49, no. 77. Federal Register 49 FR 15702.
- NATIONAL SURVEY OF HAZARDOUS WASTE GENERATORS AND TREATMENT, STORAGE AND DISPOSAL FACILITIES UNDER RCRA IN 1981, (800) 424-9346.
- A CITIZENS GUIDE TO RIVER CONSERVATION, Gordon Binder, The Conservation Foundation, 1717 Massachusetts Ave., NW, Washington, D.C. 20036.

THE MYTH OF TVA: CONSERVATION AND DEVELOPMENT IN THE TENNESSEE VALLEY, 1933-1983, Environmental Policy Institute, 218 D Street, SE, Washington, D.C. 20003. Price: \$25 (plus \$2).

ACID RAIN STUDY, Acid Rain Study, National Wildlife Federation, 1412 16th St., NW, Washington, D.C. 20036. Free.

SAVING WATER IN A DESERT CITY (Tucson, Arizona), Resources for the Future, P.O. Box 4852, Hampden Station, Baltimore, MD 21211. Price: \$10 (plus \$1.50 postage and handling).

DEVELOPMENT OF A GENERAL PLANNING METHODOLOGY FOR STORM WATER MANAGEMENT IN URBAN WATERSHEDS, Purdue University Water Resources Research Center, West Lafayette, IN 47907.

PROPOSED MISSION STATEMENTS FOR A NATIONAL WATER RESOURCES RESEARCH CENTER AND A NATIONAL CLEARINGHOUSE FOR WATER INFORMATION, Dr. William Mills, Council on Environmental Quality, 722 Jackson Place, NW, Washington, D.C. 20006.

and flow data were reduced to monthly, seasonal, and annual statistical characterizations for five river stations and three tributary stations of the South Platte River. Distance profiles were plotted for flow, TDS, and salt-mass flows. Analysis for four reaches of the South Platte River between Henderson and Julesburg shows a net salt loss to the land of 380 tons per day.

CR 129 DISSOLVED SOLIDS HAZARDS IN THE SOUTH PLATTE BASIN, VOL. II: SALT BALANCE ANALYSIS, by C.D. Turner and D.W. Hendricks. \$7.00

Analyzes salt balance and basic data for development of a salt-balance model involving the major components of the lower South Platte system.

TR 35 THE ECONOMIES OF MESA COUNTY AND GARFIELD, MOFFAT, RIO BLANCO, AND ROUTT COUNTIES, COLORADO, by John R. McKean, Joseph C. Weber, and Ray K. Ericson. \$5.00

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CR 127 MATHEMATICAL MODELS FOR PREDICTION OF SOIL MOISTURE PROFILES, by H.J. Morel-Seytoux. \$4.00

Describes SOILMOP, a new technique for predicting water content profiles and infiltration — a cost-effective surface-subsurface hydrologic model that accurately portrays fluid movement in the unsaturated zone. It can be incorporated in complex models for prediction of the evolution of water quality both in the unsaturated zone and in the underlying aquifer.

CR 128 DISSOLVED SOLIDS HAZARDS IN THE SOUTH PLATTE BASIN, VOL. I: SALT TRANSPORT IN THE RIVER, by Ramon V. Gomez-Ferrer and D.W. Hendricks. \$7.00

Demonstrates how river salinity may be characterized in terms of both time and space variations. Fifteen years of daily and monthly salinity

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