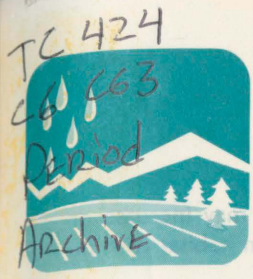
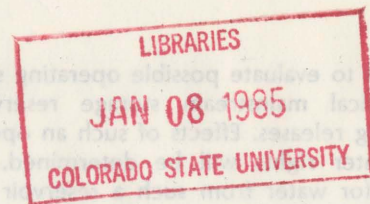


COLORADO WATER RESOURCES RESEARCH INSTITUTE

COLORADO STATE UNIVERSITY

October-December, 1984



RESEARCH FOCUSES ON HABITAT-WATER DEVELOPMENT ISSUES

Environmental Legislation-Water Development Analyzed

Limitations created by federal environmental legislation impose certain restrictions on development of Colorado's water resources and in some cases completely preclude such development. The effects of the Wilderness Act, Wild and Scenic Rivers Act, and Endangered Species Act were analyzed in a 1983 Institute project conducted by Dr. Glen D. Weaver, CSU Professor of Geography. "The limitations created by these Acts potentially restrict Colorado's ability to develop its water resources," says Weaver, "and this becomes especially important when Colorado must deliver more than half of its natural runoff to downstream states."

Development used in a broad sense, says Weaver, includes the building of new diversion, storage, conveyance, or hydroelectric facilities; maintenance or enlargement of existing structures; operational changes that alter quantity or timing of river flows; installation of stream gaging or hydrometeorological equipment, cloud seeding or other augmentation programs; groundwater pumping or any other action associated with the lawful exercise of water rights.

The effects of these legislative statutes, says Weaver, include:

Wilderness Act — Congress has designated 2.6 million acres of wilderness land in Colorado, and an additional 1.3 million acres for potential future wilderness designation. Nearly all of the designated area and more than one-third of the potential area is in the alpine-subalpine watersheds where runoff provides one-fifth of Colorado's renewable water supply. Most water development activity within such areas requires either a Presidential or Congressional exemption.

Wild and Scenic Rivers Act — Twelve rivers are under study in Colorado for possible designation as wild and scenic rivers. Study rivers are protected against water-project development during the period Congress allocates for their study and for an additional three-year period after reports are completed and submitted to Congress. Three options exist for study rivers: nondesignation; federal designation; or designation under a state-administered preservation system.

Determination of instream flow requirements should be made an integral part of the Congressionally authorized study procedures, says Weaver. He notes there is a lack of information concerning required instream flows needed for river preservation purposes.

Endangered Species Act — Fifteen threatened or endangered species have been designated in Colorado. The most serious constraints to project development will be those imposed by the Colorado squawfish, Humpback chub, and Whooping Crane, says Weaver.

Additional study is needed in the Colorado River Basin to determine if downstream flow requirements can be managed to minimize adverse effects on endangered fishes.

In the South Platte, further depletions of streamflow would adversely affect the critical habitat of the whooping crane in central Nebraska if such depletions occur between February 1 and May 10 or September 16 and November 15. This situation could preclude full development of Colorado's remaining compact entitlement to South Platte River flows.

"The emphasis of the report on wilderness constraints is not intended to promote development to the exclusion of preservation," says Weaver. "Rather, it should be viewed as contributing to the larger information base needed by Coloradoans if they are to make rational tradeoffs between these two beneficial, but oftentimes conflicting, water uses."

The report, *Effects of Wilderness Legislation on Water Project Development in Colorado*, is available from the Institute (Completion Report No. 124, Price: \$8.00).

Wildlife Habitat on South Platte a Concern

Two FY1984 Institute projects are considering methods for efficient management and use of Colorado's entitlement water while maintaining habitat conditions for Whooping Cranes and Sandhill Cranes downstream in central Nebraska. The studies include an assessment of periodic flushing as a method for maintaining river channel habitat acceptable for crane needs. The CSU hydrologic simulation model SAMSON is being used in the

studies to evaluate possible operating strategies for a hypothetical mainstream storage reservoir in supplying flushing releases. Effects of such an operation on Colorado water rights will be determined. Efficient delivery plans for water from such a reservoir to water users in Colorado will also be investigated with SAMSON. Possibilities for planned use of canal seepage and return flow in water deliveries will be explored.

The Lower South Platte Water Conservancy District, U.S. Fish and Wildlife Service, and Bureau of Reclamation are cooperating with the Institute in a joint effort to achieve satisfactory river habitat conditions for the South Platte.

Dr. Hubert J. Morel-Seytoux and Dr. H.W. Shen of CSU's Civil Engineering Department are conducting these studies.

In a related study, Professor Larry MacDonnell of CU's Natural Resources Law Center will analyze the legal framework established by the Endangered Species Act and its potential impact on Colorado water rights. Environmental issues such as the Whooping Crane habitat will be studied to seek an approach that will accommodate both endangered species protection and necessary water development.

Reservoir Flushing Alters Downstream Habitat

Reservoir flushing is a standard practice that may affect river habitat conditions. Periodic flushing reduces sediment accumulations in reservoirs, but what are the consequences downstream? Results of a recent Institute study show that downstream ecosystem dynamics may be greatly altered.

Sediments in reservoirs of the Rocky Mountain region are typically composed of fine silts and clays having relatively high levels of nitrogen, phosphorus, and trace

metals attached. Sediment flushing thus may increase organic loading and enrich the downstream habitat with nutrients and potential toxins.

Dr. James V. Ward of CSU's Zoology Department and international authority on aquatic biology, found that adverse effects can be reduced if sediments are released during one concentrated period rather than at widely spaced intervals of time. The season of release was not an important factor at the sites studied (Dry Creek Reservoir and North Platte River-Guernsey Reservoir, Wyoming).

Dr. Ward recommends pre-release studies before reservoir flushing at different sites, because faunal composition and life cycles of aquatic organisms may vary from stream to stream and from site to site.

The project report *Effects of Releases of Sediment From Reservoirs on Stream Biota*, is available from the Institute (Completion Report No. 116, Price: \$4.00).

Endangered Fishes Tolerate High Salinity

Tests of three species of fish for their tendency to avoid various concentrations of total dissolved solids show that the current levels of salinity in the upper Colorado River system should not adversely affect Bonytail chubs, Humpback chubs, and Colorado squawfish.

Bonytail chubs tolerated approximately four times the present TDS concentration of the Green River and the Colorado River. Humpback chubs avoided water containing more than 5,100 mg/L, while Colorado squawfish preferred a concentration less than 1,150 mg/L. Concentrations avoided were higher than those existing in the Upper Colorado River and most of its tributaries.

A report, *Studies Related to Fish Tolerance and Preferences of Colorado River Endangered Fishes to Selected Habitat Parameters*, is available from the Utah Water Research Institute, Utah State University.

WATERBORNE DISEASES PREVALENT IN COLORADO?

The November issue of *U.S. Water News*, in an article about Oregon's water quality, states that Oregon ranks second only to Colorado in the number of per capita waterborne diseases in the United States. Pennsylvania, Washington, New Jersey, California and New York ranked respectively behind Colorado and Oregon in outbreaks per million population. Giardiasis was the most prevalent disease.

The National Park Service Water Lab at CSU recently completed a study that examined the relationship between backcountry use and possible contamination by *Giardia lamblia* in two watersheds that are popular with recreationists. The study will be summarized in the next issue of *Colorado Water*.

CSU TOPS IN WATER RESOURCE EDUCATION

The Universities Council on Water Resources has just published a listing of water resources courses acceptable for graduate credit from its 73 member universities. Colorado State University ranks first with almost twice as many course offerings as the majority of universities. Of the 138 CSU courses offered, the majority (95) are in engineering and physical sciences, with 26 in environmental and biological sciences and 17 in social and behavioral sciences. Teaching responsibilities for these courses involve more than 100 faculty.

CSU also leads in the number of different disciplines offering water-related academic courses. The departments listed include Agricultural and Chemical Engineering, Atmospheric Science, Civil Engineering, General Engineering, Earth Resources, Agronomy, Botany and Plant Pathology, Chemistry, Environmental Health, Fishery and Wildlife Biology, Horticulture, Natural Resources, Zoology and Entomology, Agricultural and Natural Resource

Economics, Political Science, Sociology, and Recreation Resources.

"Our reputation nationally and internationally in water resources education and research is certainly high measured by volume and scope of research, our stature among water professionals, and recognition by organizations such as USAID, World Bank, Corps of Engineers, Bureau of Reclamation, National Science Foundation, and other federal agencies," says Dr. Norman A. Evans, Institute director.

"I believe Coloradoans also highly regard our water resources education and research capabilities," he says. "We constantly try to orient our water programs toward Colorado needs and problems, and to give Colorado the maximum advantage of this tremendous pool of scientific and technical water resource expertise."

ARIZONA MANDATES CONSERVATION

Arizona has captured the attention of water users throughout the west with a completely revised Groundwater Code that mandates sweeping water management reforms designed to head off disastrous overdraft of groundwater. Even with new water soon to be available from the Central Arizona Project, it was evident that water demands would still deplete Arizona's groundwater supply and had to be lowered.

Strict regulation of water use was mandated in four Active Management Areas (AMAs) where groundwater overdraft is severe. Conservation, limits on non-agricultural water uses, and a ban on new irrigated acres are required in AMAs. The management goal for all AMAs is safe-yield by the year 2025. Safe-yield occurs when groundwater withdrawals equal recharge, thus eliminating overdraft.

Arizona Department of Water Resources projections indicate that by 2025 use of CAP water, combined with conversion of irrigated lands to urbanized areas, will reduce groundwater overdraft by 75 percent. The remaining 25-percent overdraft will be made up by mandated conservation to reduce demand.

The long-range plan established by the new Code is divided into five management periods of 10 years each. The State Department of Water Resources must develop a management plan for each AMA, including conservation requirements for all agricultural, municipal, and industrial water users and distributors. The goal is to reduce total

groundwater withdrawals by 25 percent.

AMA groundwater users pay a withdrawal fee to help finance the plan's implementation. After the first 10 years the fee may be increased, if necessary, to finance local water augmentation projects. If the goal of safe-yield has not been reached by the end of the second 10-year period, part of the fee may be used to purchase and permanently retire irrigated land. The fee may not exceed \$5 per acre-foot.

Limits are placed on the amount of water that may be delivered for irrigation, based on consumptive use and actual acres planted, with minimum levels set for irrigation efficiency. Efficient conveyance is required of all water providers.

The target level for urban water deliveries has been set at 140 gallons per capita per day. Any municipality exceeding that rate must reduce its excess by 25 percent in the first 10-year period and reach the target level by 2025.

Lester Snow, Director of the Tucson AMA, said that the implementation of the new Groundwater Code is moving along well despite the many complex problems to be resolved. He said it is a water management plan that had to be implemented, and the fact that it is now underway is due substantially to the personal attention given its development by Governor Babbitt. Water managers in all Western States will watch its progress closely.

1983 — THE YEAR OF THE FLOOD

1983 was unique in that almost all the contiguous United States experienced significant flooding — and this may place the year among the great flood episodes in the United States, reports the U.S. Geological Survey in its 1983 Yearbook. Streamflows in the Mississippi and Missouri River Basins, the Great Basin, and the Colorado River Basin reached their highest peak in 55 years and possibly even during the 20th century.

In the Colorado River Basin above-normal snow accumulation and spring rains caused significant high flows on the Colorado, Gunnison and White Rivers. Near Meeker, the White River discharge exceeded all previous maximum discharges for the station's 78-year operation.

The frequency of floods in parts of at least 14 states exceeded that which can be expected to occur on the average of once in 100 years, with a few exceeding once in 200-year events, says the report.

OPINIONS MIXED ON PROPOSED NATIONAL RESEARCH CENTER

The National Water Alliance's proposal for a national water resources research center and information clearinghouse met mixed reactions in public hearings held during September. Opinions ranged from "bureaucratic boondoggle" to "only a national center can coordinate large federal expenditures for research on water issues."

The first view was expressed by Jay H. Lahr, Executive Director of the National Water Well Association, in the September 21 issue of *Environment Reporter*. He said the national center and clearinghouse would duplicate the work of existing agencies and undermine the work of the U.S. Geological Survey, Environmental Protection Agency, Agricultural Research Service, and other agencies.

The second opinion was expressed by Dr. Y.Y. Haimes, President of the Universities Council on Water Resources. He said "There are large federal expenditures for research on water issues. These funds are spread over many federal agencies, universities, industries, and private firms. That this massive program should be coordinated is easy to see. Only a national center or organization can do this."

The initiative for the study on a National Research

Center came from the newly formed National Water Alliance. James Magner, Executive Director, has described the proposed center as an agency to coordinate research, set priorities, and conduct multi-disciplinary studies not being done by other state or Federal agencies. The Alliance hopes to have specific recommendations for Congressional action ready by 1985.

Among existing water research agencies are the 54 state and territorial water resources research institutes. Dr. James C. Warman, Chairman of the National Association of Water Institute Directors, testified that these existing institutes can accomplish the goals envisioned in the Alliance's proposals if Congress provides adequate funding and authority.

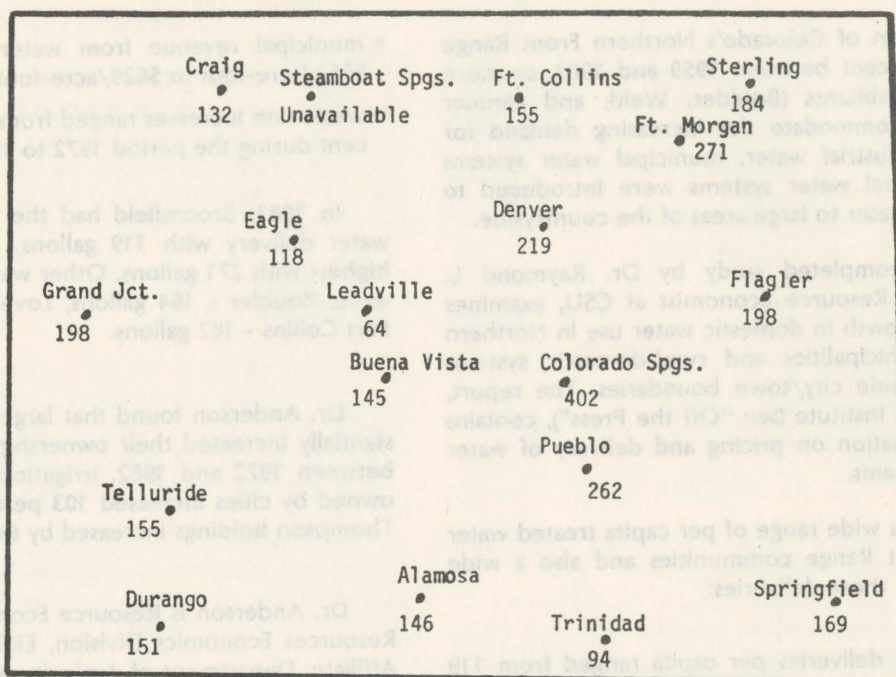
FILM MERITS INTERNATIONAL AWARD

An educational film produced by the Institute under contract with the U.S. Environmental Protection Agency has been awarded second place in the 1984 AGRO Film Awards. The film, titled *Municipal Wastewater — America's Forgotten Resource*, was awarded second place in the category of "Informative and Prestigious" films. Thirty-three nations submitted entries in the competition. This award represents an outstanding accomplishment and international recognition for the CSU movie production team.

Carlos Seegmiller produced the film, assisted by Bruce Graydon. Both are former members of CSU's Office of Instructional Services. The script was written by Professor Fred Shook of the Technical Journalism Department, and Project manager and technical consultant was Dr. Norman A. Evans, Institute director.

EPA will use the film as an educational tool on land treatment and disposal of secondary municipal wastewater. Successful treatment sites from all over the United States are shown in the movie, with descriptive statements provided by local waste treatment managers and local officials. The objective is to show local officials and consulting engineers that land treatment technology is being successfully used, and to encourage consideration of its adoption for municipal waste disposal where appropriate.

One copy of the film was provided to each of the 50 states. In addition, two sets of a slide-tape presentation accompany the film, containing information on unique legal requirements which differ between the eastern and western regions of the country.



COLORADO PRECIPITATION

October 1984 through November 1984
(PERCENT OF NORMAL)

ACID DEPOSITION

Accumulating evidence suggests a cause-effect relationship between burning fossil fuels and acid deposition, but there is not a solid foundation of facts. Better known as "acid rain," the phenomenon includes "dry" as well as "wet" acidic deposition of sulfur and nitrogen compounds to the earth, descending in rain, snow, on dust particles and in gaseous form.

Sulfur oxides are the prime component of acid deposition, with an estimated 70 percent caused by burning coal. Nitrogen oxides come from emissions of automobiles, trucks, aircraft, railroad engines and boats. Natural sources of acid in the atmosphere include volcanoes, mudflats, and forest fires.

Water quality data collected by the U.S. Geological Survey for the past 10 to 15 years at 47 small headwater streams across the country show that where sulfur dioxide emissions have decreased, water quality has reflected decreases in acid deposition. Likewise, where sulfur dioxide

emissions have increased, acid deposition has increased.

But the relationships of emissions and acid deposition are not well understood. Ice core analysis studies show evidence of acidic periods long before man began burning fossil fuels. Drought, climate, and the natural acid-neutralizing capacity of some soils and surface waters may be important factors.

In Colorado, precipitation samples at a Front Range research site showed little evidence of acid deposition. John Stednick, CSU watershed science specialist, said the precipitation was "fairly clean" at the site. Lake and stream sampling data collected throughout the Rocky Mountain region by the Natural Resources Ecology Laboratory at CSU shows the same result.

In an ongoing study, the National Park Service Water Laboratory located at CSU is monitoring Colorado lakes, rivers and streams for evidence of acid deposition effects.

DOMESTIC WATER USE IN NORTHERN FRONT RANGE

The population of Colorado's Northern Front Range increased 203 percent between 1959 and 1983, or more than 325,000 inhabitants (Boulder, Weld, and Larimer Counties). To accommodate the increasing demand for domestic and industrial water, municipal water systems expanded and rural water systems were introduced to supply domestic water to large areas of the countryside.

A recently completed study by Dr. Raymond L. Anderson, USDA Resource Economist at CSU, examines the patterns of growth in domestic water use in Northern Front Range municipalities and rural-domestic systems serving areas outside city/town boundaries. The report, available from the Institute (see "Off the Press"), contains up-to-date information on pricing and delivery of water through these systems.

Results show a wide range of per capita treated water deliveries in Front Range communities and also a wide range of prices for those deliveries:

- municipal water deliveries per capita ranged from 119 to 271 gallons per day

- municipal revenue from water charges ranged from \$253/acre-foot to \$629/acre-foot
- water rate increases ranged from 85 percent to 363 percent during the period 1972 to 1982.

In 1983, Broomfield had the lowest daily per capita water delivery with 119 gallons, while Greeley had the highest with 271 gallons. Other water deliveries per capita were: Boulder - 164 gallons, Loveland - 169 gallons, and Fort Collins - 182 gallons.

Dr. Anderson found that larger cities and towns substantially increased their ownership of raw water supplies between 1972 and 1982. Irrigation company water stock owned by cities increased 103 percent, and Colorado-Big Thompson holdings increased by 64 percent.

Dr. Anderson is Resource Economist with the Natural Resources Economics Division, ERS/USDA, and Professor Affiliate, Department of Agricultural and Natural Resource Economics, CSU.

COLORADO WATER ISSUES PUBLIC FORUM

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. Authoritative speakers present programs of current interest to water managers, professionals, and interested citizens.

Upcoming topics include:

- December 20 Cancelled because of Christmas holiday
- January 15 PROPOSED SALE OF WATER TO SAN DIEGO THROUGH PRIVATE ENTERPRISE — John Musick, representing Galloway Ltd.
- February 19 PROPOSED GREEN MOUNTAIN EXCHANGE — "FISH OR CUT BAIT" — Gregg Hobbs; Davis, Graham and Stubbs
- March 19 THE SOUTH PLATTE BASIN WATER COALITION: PROMOTING COOPERATION ON THE RIVER — Tom Cech, Executive Secretary; Central Colorado Water Conservancy District

COLORADO TO OWN SATELLITE MONITORING SYSTEM

The Colorado Water Resources and Power Development Authority has purchased and given to the State of Colorado a satellite stream monitoring system to be managed by the State Engineer. Dr. Jeris Danielson, State Engineer, described the system at the South Platte Basin Water Coalition's October 22 meeting.

The satellite system consists of 82 monitoring stations and a central receiving station with associated computer facilities. The monitoring stations, installed on rivers throughout the state, send instantaneous data on river flow conditions through a satellite to the control center for processing. River data can include stage, discharge, and certain water quality measurements.

The data will be available to any water management organization through its own remote computer terminal. A user charge will be necessary, Danielson said, because the General Assembly wants about half the operating cost to be covered by water users.

GROUNDWATER QUALITY MONITORING

State water quality and health officials (have) made protection of groundwater a major goal and . . . intend to ask state lawmakers for a program to better monitor groundwater quality "There's almost no data on groundwater quality on a statewide level," said Tad Foster, a member of the Water Quality Control Commission. "There's a need for some way of obtaining that data."

Daniel P. Jones
Denver Post, 10/2/84

Groundwater experts at CSU are currently developing techniques for designing a groundwater quality monitoring network that will give the most accurate and reliable assessment of statewide groundwater quality. The Institute project is sponsored by the U.S. Bureau of Reclamation.

The research team's objectives are to develop: (a) statistical techniques for interpreting groundwater quality data with assurance of reliable conclusions; and (b) design criteria of a sampling network including locations and frequency for samples.

Principal investigators are Drs. Jim Loftis and Robert Ward, Agricultural and Chemical Engineering Department, CSU, and Dr. Tom Sanders, Civil Engineering Department, CSU. This team has worked together previously on a similar project to improve surface water quality monitoring systems.

CONFERENCES

- Feb. 4-6, 1985 NATIONAL CONFERENCE ON WATER RESOURCES RESEARCH, Chevy Chase, MD. Contact: William L. Powers, Executive Secretary, Universities Council on Water Resources, 310 Agricultural Hall, University of Nebraska, Lincoln, NE 68583-07111. Telephone: (402) 472-3305.
- Apr. 16-18, 1985 LAND TREATMENT: A HAZARDOUS WASTE MANAGEMENT ALTERNATIVE, Austin, TX. Contact: Continuing Engineering Studies, College of Engineering, Coorell Hall 2.102, The University of Texas at Austin, Austin, TX 78712.
- Apr. 23-25, 1985 NONPOINT POLLUTION ABATEMENT-TECHNICAL, MANAGERIAL AND INSTITUTIONAL PROBLEMS AND SOLUTIONS, Milwaukee, WI. Contact: C. Michael Farmer, Conference Coordinator, Division of Continuing Education, Marquette University, 1918 West

Wisconsin Avenue, Milwaukee, WI 53233.

- May 1-3, 1985 SMALL HYDROPOWER AND FISHERIES SYMPOSIUM, Denver, CO. Coincides with ASCE annual meeting. Contact: Conferences and Institutes, College of Engineering and Architecture, Washington State University, Pullman WA 99164-2992 (509) 335-7225 or (509) 335-1404.
- May 19-23, 1985 NATIONAL CONFERENCE ON NON-POINT SOURCE POLLUTION, Kansas City, MO. Contact: Judy Taggart, No. American Lake Management Society, 1815 "H" St., N.W., Suite 1000, Washington, D.C. 20006. Telephone: (202) 833-3382.
- July 23-26, 1985 NATIONAL WILDERNESS RESEARCH CONFERENCE, Colorado State University, Fort Collins, CO. Contact: Glenn E. Haas, Department of Recreation Resources, CSU (303) 491-7283, or Sally A. Ranney, President, American Wilderness Alliance, Denver, (303) 758-5018.
- Nov. 17-21, 1985 3RD INTERNATIONAL DRIP/TRICKLE IRRIGATION CONGRESS, Fresno, CA. Contact: Dr. Kenneth H. Solomon, U.S. Salinity Laboratory, 4500 Glenwood Drive, Riverside, CA 92501.

OFF THE PRESS

The following publications are available upon request at prices listed plus postage of:

Up to 99¢	\$.75
\$1.00-\$4.99	\$1.00
\$5.00-\$9.00	\$1.50
\$10.00 and over	\$2.00

Send order and check payable to Colorado State University to:

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- CR132 SPECIFIC YIELD BY GEOPHYSICAL LOGGING POTENTIAL FOR THE DENVER BASIN, by David B. McWhorter. \$4.00

Reviews the concept of specific yield,

usual methods for its estimation, and the potential for use of bore-hole geophysical measurements as an alternate method for estimating specific yield.

TR46 EXPANSION OF WATER DELIVERY BY MUNICIPALITIES AND SPECIAL WATER DISTRICTS IN THE NORTHERN FRONT RANGE, COLORADO, 1972-82, by Raymond L. Anderson \$4.00

OTHER PUBLICATIONS

FIRST ANNUAL WESTERN STATES WATER COUNCIL WATER MANAGEMENT SYMPOSIUM PROCEEDINGS, Western States Water Council, 220 So. 2nd E., Salt Lake City, Utah 84111.

The following publications are available from:

U.S. Government Printing Office
Superintendent of Documents
Washington, D.C. 20402

ACID RAIN AND TRANSPORTED AIR POLLUTANTS: IMPLICATIONS FOR PUBLIC POLICY, Price \$9.50.

PROTECTING THE NATION'S GROUNDWATER FROM CONTAMINATION, GPO Stock No. 052-003-00966-8. Price: \$7.50.

U.S. GEOLOGICAL SURVEY FY1983 YEARBOOK, Price: \$4.00.

The following publications are available from:

Chief, Water Resources Branch
National Park Service
301 So. Howes
Fort Collins, CO 80521

STATUS REPORT: ACID RAIN RESEARCH IN THE NATIONAL PARK SERVICE, 1982. Technical Report 82-1.

WATER MANAGEMENT IN PARK AND RECREATION AREAS. Technical Report 82-5.

SUMMARY OF GEOLOGIC FACTORS THAT MAY INFLUENCE THE SENSITIVITY OF SELECTED WATERSHEDS IN ROCKY MOUNTAIN NATIONAL PARK, COLORADO TO ATMOSPHERIC DEPOSITION. Technical Report 82-6.

AUTOMATIC WATER SAMPLERS FOR FIELD USE. (Evaluation) Technical Report 83-1.

OBSERVATIONS ON THE ECOLOGY OF COLORADO SQUAWFISH IN THE YAMPA RIVER, COLORADO, 1982. Technical Report 83-7.

HYDRAULIC AND SEDIMENT TRANSPORT INVESTIGATION, YAMPA RIVER, DINOSAUR NATIONAL MONUMENT. Technical Report 83-8.

MEASUREMENTS OF BEND FLOW HYDRAULICS ON THE FALL RIVER AT LOW STAGE. Technical Report 83-9P.

BEDLOAD TRANSPORT AND HYDRAULIC GEOMETRY RELATIONS FOR FALL RIVER, ROCKY MOUNTAIN NATIONAL PARK, COLORADO, June-August, 1983. Technical Report 84-Romo-1.

A RESOURCE MANAGER'S GUIDE TO WATER QUALITY CRITERIA. Technical Report 84-4.

Happy New Year n.a.s.

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