



COLORADO WATER

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WATER EDUCATIONAL-TECHNICAL ASSISTANCE PROGRAMS SPAN THE GLOBE

The Worldwatch Institute, a Washington-based resources think tank, released a report in December, 1984 predicting that the Ethiopian drought is a forewarning of widespread water crises in the 1990s that could rival the energy crisis of the last decade. These water crises will also aggravate the already severe problem of providing food for the world's hungry.

Assisting developing countries to effectively utilize their natural and human resources through technical and educational aid is one of the most important investments the United States can make, and Colorado State University has been actively involved in international development programs since the 1950s. Locations of CSU's international technical and educational assistance programs are shown on the world map below. The programs, including research, extension and training, provide a rich background of experience in long-term, large-scale project management around the world.

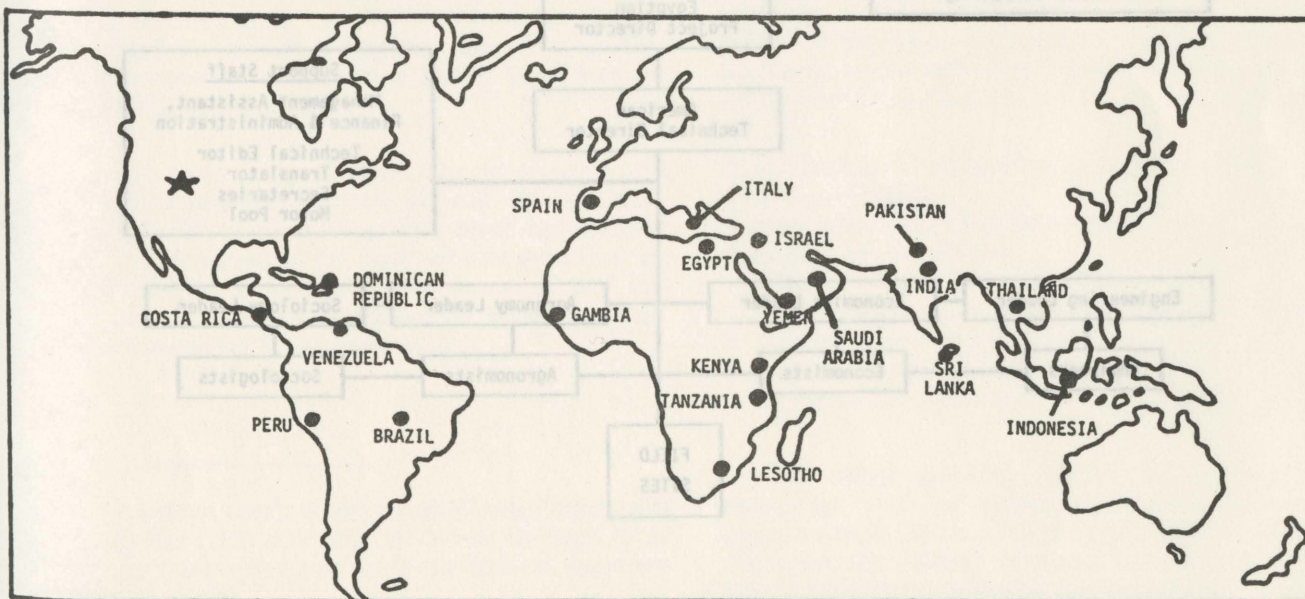
This experience uniquely qualifies CSU to manage and participate in such programs because of the scope

and depth of its expertise and its commitment to successfully manage large projects.

This issue of COLORADO WATER focuses on Colorado State University's Egypt Water Use and Management Project. Other international technical and educational assistance programs will be described in the next issue.

Improving Egypt's Irrigation System in the Old Lands

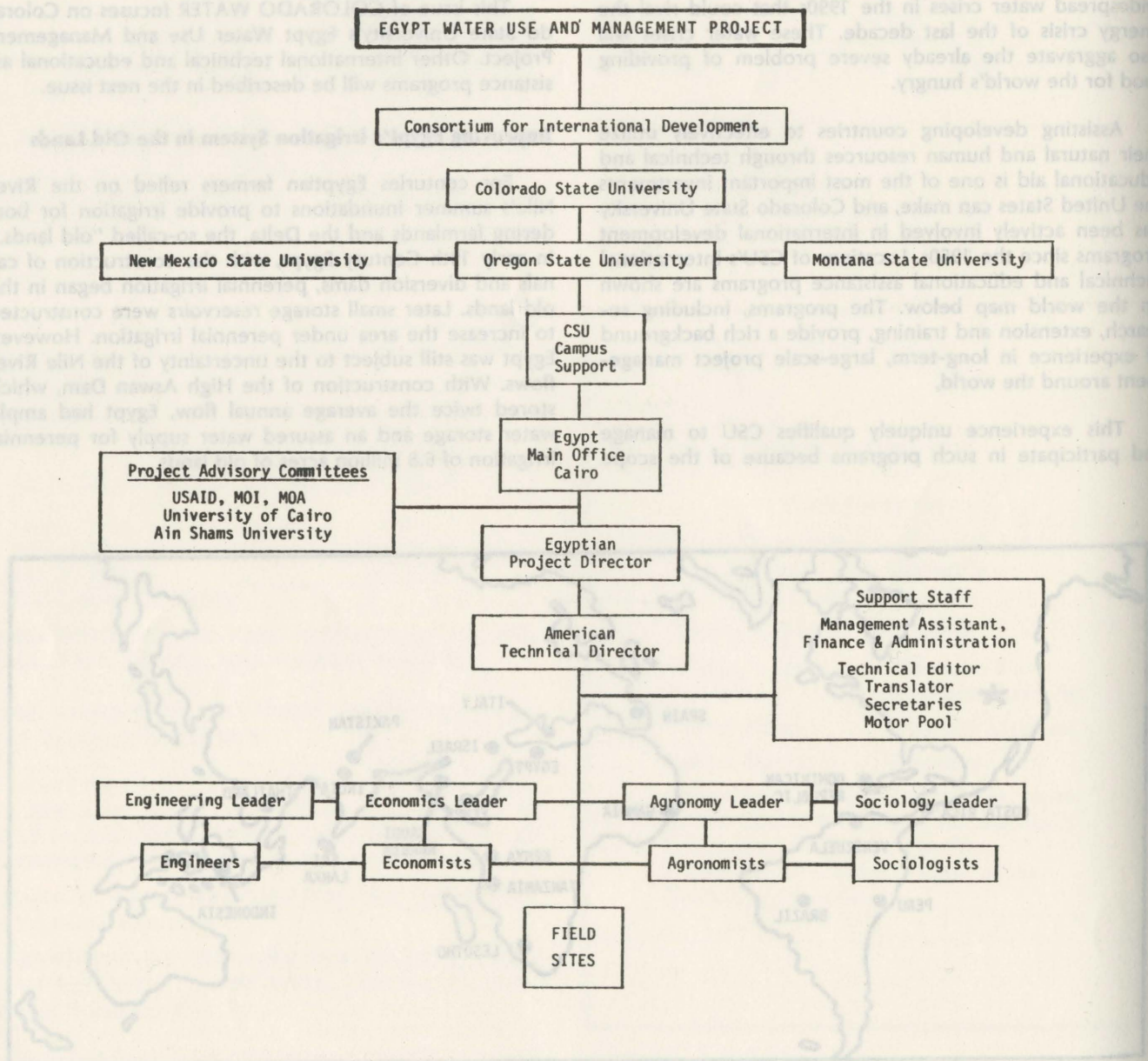
For centuries Egyptian farmers relied on the River Nile's summer inundations to provide irrigation for bordering farmlands and the Delta, the so-called "old lands." In early 19th Century Egypt, with the construction of canals and diversion dams, perennial irrigation began in the old lands. Later small storage reservoirs were constructed to increase the area under perennial irrigation. However, Egypt was still subject to the uncertainty of the Nile River flows. With construction of the High Aswan Dam, which stored twice the average annual flow, Egypt had ample water storage and an assured water supply for perennial irrigation of 6.8 million acres of old lands.



To increase the efficiency and effectiveness of crop production, Egypt's Ministry of Irrigation (MOI) recognized that it must also have knowledge of improved on-farm irrigation management, delivery systems and drainage. As a result the Egypt Water Use and Management Project (EWUP) was initiated in 1977, funded jointly by the Arab Republic of Egypt and the U.S. Agency for International Development (USAID). The Consortium for International Development (CID) was the USAID contractor for the project and CSU was the lead American university. The project was managed by CSU and involved full-time work of 65 professionals in the fields of Agronomy, Irrigation Engineering, Economics and Sociology.

American personnel were drawn from CSU, Oregon State University, New Mexico State University and Montana State University. Egypt's personnel came from the Ministry of Irrigation and Ministry of Agriculture (see staffing diagram).

Training was an important component of the project, and over 150 Egyptian professionals received specialized training in irrigation science and water management. A hands-on field training course in on-farm water management was included. This course is being presented once a year by the Egyptian Government for personnel training.



Applied research and extension education programs with small farmers were carried out in three major crop-producing areas:

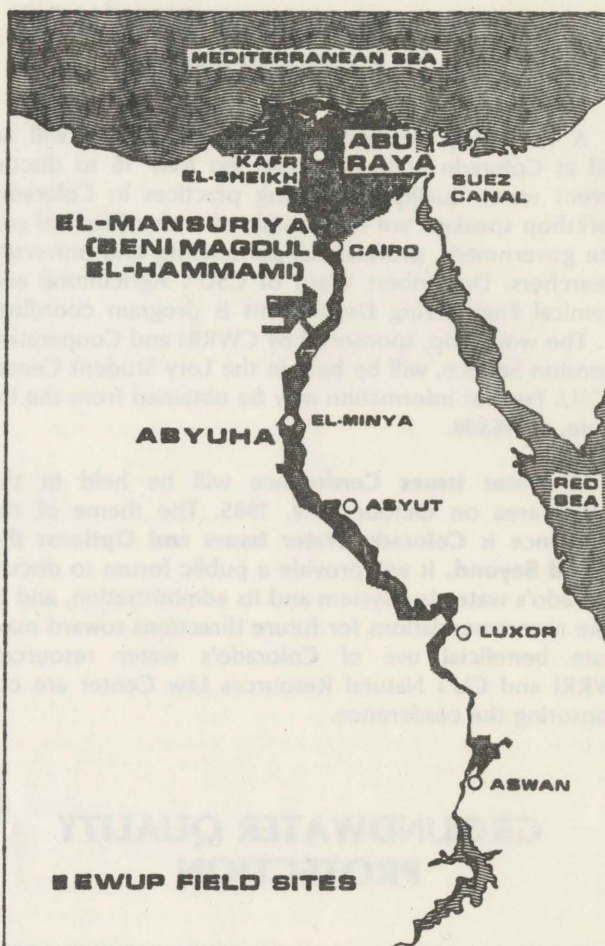
EL-MANSURIYA — A vegetable-producing area serving the Cairo market.

The work at this site included channel lining, elevated *mesqas*,* buried pipeline and continuous-flow water delivery, and farmer organization for *mesqa* operation and maintenance.

ABU RAYA — a major cotton and rice producing region. Land leveling, appropriately designed level furrow and basin irrigation systems, and farmer-organized *mesqa* system operation and maintenance were emphasized at this site.

ABYUHA — An upstream area producing beans, cotton, sugarcane and other crops.

Selected to represent upstream areas of Egypt, work at this site included land leveling, long level furrow and basin irrigation, renovation of distributary canals, improvement of the gravity irrigation system, and farmer organization to maintain and operate the *mesqas*.



One critical aspect of the work involved the development of water users' associations, composed of groups of farmers served by a common source of water. EWUP personnel found the farmers willing and able to cooperate with each other in scheduling irrigation times and in maintaining improved *mesqas*.

Another major project effort was to improve the design and management of water delivery systems. Channels were reconstructed using both lined and unlined sections. To demonstrate the value of improvements, an entire distributary canal system was renovated and improved. Various types of structures for water measurement and controlling flows were installed.

**Mesqas* are private canals served by distributary canals, and may serve 20 to 300 acres and be owned by from 10 to 100 farmers. Ninety-five percent of the farms in Egypt are five acres or smaller.

On-farm interaction was an important element of the program and the farmers, who recognized the need for improved irrigation methods, showed a willingness to cooperate and test new irrigation practices. They noted significant improvements and benefits in irrigation system performance that resulted from the project, including:

- elimination of high and low spots in the fields
- increased yields
- good advance of the inflow stream
- good water distribution
- decreased water application
- reduced water-lifting time — reduced work for animals
- decreased labor requirements
- decreased need for surface drainage
- improved soil conditions.

The EWUP project provided the experience and knowledge base for expanded irrigation improvement programs in Egypt. As a part of Egypt's most recent Five-Year Plan, the Ministry of Agriculture intends to implement a *National Irrigation Improvement Program*.

CWRRI SCHEDULES WORKSHOP AND CONFERENCE

A **Workshop on Water Quality Monitoring** will be held at Colorado State University on May 16 to discuss current water quality monitoring practices in Colorado. Workshop speakers are responsible officials of federal and state government, professional consultants, and university researchers. Dr. Robert Ward of CSU's Agricultural and Chemical Engineering Department is program coordinator. The workshop, sponsored by CWRRI and Cooperative Extension Service, will be held in the Lory Student Center at CSU. Further information may be obtained from the Institute, 491-6308.

A **Water Issues Conference** will be held in the Denver area on October 8-9, 1985. The theme of the conference is **Colorado Water Issues and Options: the 90s and Beyond**. It will provide a public forum to discuss Colorado's water law system and its administration, and to make recommendations for future directions toward maximum beneficial use of Colorado's water resources. CWRRI and CU's Natural Resources Law Center are co-sponsoring the conference.

GROUNDWATER QUALITY PROTECTION

"Pollution and depletion of groundwater are fast taking their place among this country's most pressing environmental problems . . . Successive studies are documenting that the problems are worse than previously suspected and further, that most sources of contamination are uncontrolled." Thus says a new national coalition composed of representatives from industry, state government, environmental interests, natural resource management, and agriculture.

The National Groundwater Policy Forum intends to come up with recommendations for national policy on responsibilities of federal, state, and local governments for groundwater monitoring, quality protection, and reclamation of polluted groundwater. The Forum's chairman, Governor Bruce Babbitt of Arizona, says that the federal role should be to collect data and set standards that would then be applied by the states. He believes that national policy must include standards that allow acceptable levels of degradation for some groundwater bodies, because it is not feasible to maintain pristine groundwater quality.

The Forum is intended to crystallize a consensus among major interests on national policy direction. It reflects a growing conviction that critical water policy issues

are not being met by Congressional or federal government leadership. Another similar organization, the National Water Alliance, was created last year to expedite development of national water policy initiatives. The Alliance, unlike the Forum, was initiated by concerned members of Congress although its Board of Directors, numbering 20, contains representation similar to that of the Forum.

The Forum will be financed by donations from the Ford Foundation, the Donner Foundation, Exxon Company-USA, and the H.J. Heinz Company Foundation. Mr. Ted Schad, long-time staff director for committees of Congress and of the National Academy of Science will be its staff director.

RALEY NAMED ACTING FRONT RANGE DISTRICT DIRECTOR

Bill Raley became Acting District Director for Cooperative Extension Service's Front Range District on February 1. Bill will serve 3/4 time in the district assignment until a new director is appointed. He will remain 1/4 time as CWRRI's Water Resource Specialist. He replaces Donald D. Kaufmann, named Acting Associate Director of the Cooperative Extension Service.

TECHNOLOGY TRANSFER BY PUBLICATION DISTRIBUTION

Technology transfer and information dissemination are important elements of the Institute's program. Its publications have proven to be an effective way to help water users and managers become aware of new developments and technology. The Institute has distributed more than 12,000 publications since 1980 in the following three categories:

- COMPLETION REPORTS** — Final reports on completed research containing details of procedure, analyses of data and conclusions reached.
- TECHNICAL REPORTS** — Technical information of interest to water resource professionals.
- INFORMATION SERIES** — Information of general public interest on water-related subjects.

COLORADO WATER CONGRESS SUPPORTS ENDANGERED SPECIES RECOVERY PROGRAM

Federal proposals made in 1983 to implement *The Endangered Species Act* in a manner that would have required minimum flows in the Upper Colorado River Basin and in the Platte River Basin generated a swift response by Colorado water users. The Colorado Water Congress (CWC), Colorado's statewide water organization, established a Special Project on Threatened and Endangered Species in December, 1983. Bob Thomason, CWC President, chairs a Management Committee for the special project. He says, "There is no question the federal proposals would have nullified state water rights systems in Colorado, Wyoming, Utah, and Nebraska, and abrogated longstanding interstate water allocation compacts which have been approved by the U.S. Supreme Court."

Tom Pitts, Loveland consulting engineer, was selected as coordinator for the project. The project organization includes political, legal, and technical subcommittees to address endangered species issues. Sixty-five water managers, engineers, attorneys, and scientists are actively involved in the work.

The effort to date primarily has involved working with the Federal Government and the States in developing solutions to the endangered fish species problems in the Upper Colorado River Basin. After more than a year's effort on the Upper Colorado, Tom Pitts assessed the situation:

"The basic problem is that once these species were listed as endangered, no significant efforts were mounted to recover these species. The Colorado Water Congress supports an aggressive, affirmative

program by the Department of the Interior to recover these species, as required by The Endangered Species Act. There are a wide range of alternatives that could be implemented to recover the endangered fish species. Nullifying water rights systems in three states and abrogating longstanding interstate compacts are not acceptable alternatives. Those kinds of solutions aren't necessary, and they are neither reasonable nor prudent."

Pitts said that the Colorado Water Congress will continue working with the federal and state governments during 1985 to develop what he hopes is an implementable, effective recovery plan for the endangered species.

To deal with the Platte Basin, the Colorado Water Congress has joined with the Wyoming Water Development Association and the Nebraska Water Resources Association to form an Interstate Task Force on Endangered Species. Mr. Pitts functions as Interstate Task Force Coordinator. Initial federal proposals would have nullified water rights systems in Colorado, Wyoming, and Nebraska and abrogated longstanding Platte River interstate water compacts.

The Task Force recently petitioned the Secretary of the Interior to establish working committees on the Platte River similar to those on the Colorado River, and anticipates a favorable response. Pitts says the Task Force is committed to working with the Bureau of Reclamation, U.S. Fish and Wildlife Service, the affected states and others to develop effective, constructive means of meeting endangered species needs in the Platte Basin.

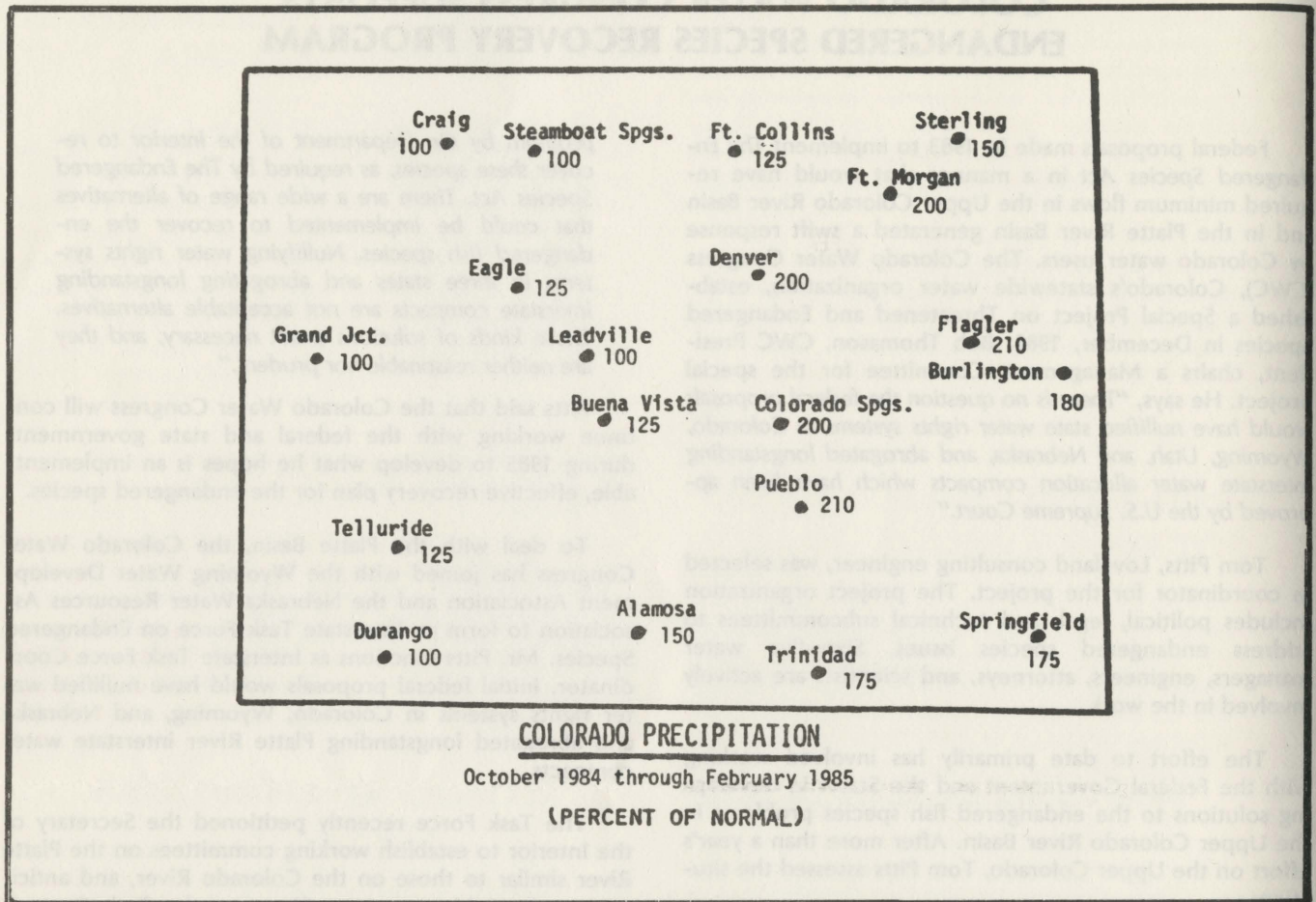
COLORADO WATER ISSUES PUBLIC FORUM

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:

April 16 STATUS OF DENVER METRO SYSTEM-WIDE EIS — Dick Gorton, EIS Director, Omaha

May 21	STATUS OF NEW DEVELOPMENTS IN INDIAN WATER RIGHT FILINGS — Chris Hermann, Attorney General's Office
June 18	ENVIRONMENTALIST'S VIEW OF THE SYSTEMWIDE EIS — Robert Weaver, Chairman, Environmental Caucus
July and August	NO FORUM; Forum will resume September 17, 1985.



COLORADO RIVER SALINITY LEVEL LOWEST IN 30 YEARS

Extremely high flows in the Colorado River have reduced salinity to its lowest level in 30 years, according to the Bureau of Reclamation's 12th biennial progress report. All mainstem reservoirs were flushed by these high flows, says the report, and contain water of unusually low salinity. The report, *The Quality of Water - Colorado River Basin*, describes the Bureau's Salinity Control Program and the quality of water in the Colorado River Basin.

The Bureau's latest salinity projections show that salt concentration limits at Imperial Dam will be satisfied until 1993 by salinity control units already in operation. However, by the year 2010 water withdrawals caused by new developments in the basin are projected to increase from 9.6 million acre-feet per year (1983) to 12.8 million. The

river's reduced flow and diluting capacity will make an annual 1.5 million-ton salt load reduction necessary to maintain the numeric salinity criteria at Imperial Dam.

The report notes that with further water development and its associated pollution, nutrient loading to mainstem reservoirs is becoming a problem. The added nutrients in some reservoirs are causing them to become eutrophic, while reservoirs further downstream are becoming nutrient-poor.

The report is available from Bureau of Reclamation, Upper Colorado Regional Office, P.O. Box 11568, Salt Lake City, UT, 84147, Attention: UC-761.

CONFERENCES

- April 16-18, 1985 HYDROLOGY DAYS, Colorado State University, Fort Collins. Contact: Professor H.J. Morel-Seytoux, Civil Engineering Department, CSU, 491-8549.
- April 18-20, 1985 14TH ANNUAL ROCKY MOUNTAIN GROUNDWATER CONFERENCE, Colorado State University, Fort Collins. Contact: J.P. Waltz, Dept. of Earth Resources, CSU.
- April 22-26, 1985 18TH ANNUAL OIL SHALE SYMPOSIUM, Grand Junction, CO. Contact: Dr. Janice Hepworth, Colorado School of Mines, Golden, CO, 273-3321.
- May 1-3, 1985 SMALL HYDROPOWER AND FISHERIES SYMPOSIUM, Denver, CO. Contact: Conferences and Institutes, College of Engineering and Architecture, Washington State University, Pullman, WA 99164-2992. (509) 335-7225.
- May 2-4, 1985 4TH INTERNATIONAL ASSOCIATION ON WATER POLLUTION RESEARCH AND CONTROL WORKSHOP ON INSTRUMENTATION AND CONTROL OF WATER AND WASTEWATER TREATMENT AND TRANSPORT SYSTEMS, Denver, CO. Contact: Dr. J.F. Andrews, Dept. of Environmental Science and Engr., Rice University, Houston, TX 77001.
- May 16, 1985 WORKSHOP ON WATER QUALITY MONITORING, Colorado State University, Fort Collins, CO. Contact: Conference Services, CSU, 491-6222.
- May 26-30, 1985 WATER AND WATER POLICY IN WORLD FOOD SUPPLIES, Texas A&M Univ. Contact: Jack L. Cross, Room 138, Memorial Student Center, Texas A&M Univ., College Station, TX 77843. (409) 845-9519.
- June 17-19, 1985 GEOPHYSICS FOR HAZARDOUS WASTE SITE INVESTIGATIONS, University of Nevada, Las Vegas, NV. Contact: National Water Well Assoc., Education Foundation, 500 W. Wilson Bridge Rd., Worthington, OH 43085.
- July 15-17, 1985 MULTIVARIATE ANALYSIS OF HYDROLOGIC PROCESSES: STOCHASTIC-DETERMINISTIC, Colorado State University, Fort Collins, CO. Contact: Hydrology and Water Resources Program, Engineering Research Center, CSU, 491-8552.

July 23-26, 1985 ACID RAIN AND THE WEST: DIRECT AND INDIRECT EFFECTS, Gunnison, CO. Contact: Theo Colburn, Rural Communities Institute, Western State College, Gunnison, CO 81230. 943-2082 or 641-2747.

July 23-26, 1985 NATIONAL WILDERNESS RESEARCH CONFERENCE, Colorado State University, Fort Collins, CO. Contact: Glen E. Haas, Recreation Resources Department, CSU, 491-7283.

BOOK REVIEW

Water Scarcity — Impacts on Western Agriculture, Edited by E.A. Engelbert and A.F. Scheuring.

Agricultural production in the semi-arid Western United States is dependent upon irrigation. It now utilizes some 90 percent of developed water supplies. Competition for available water supply due to increased demands in both agricultural and non-agricultural sectors continues to increase.

This volume is the first to address in a comprehensive manner the effects of this increasing competition upon agriculturalists, urbanites, food processors, land developers, environmentalists and others. It is composed of the contributions of over 70 experts — academic, agricultural, business and government (including eight from Colorado) — who were brought together in a conference at Monterey, California during September, 1982 by the Arid and Semi-Arid Zone Ecosystems Committee (MAB#4) of the U.S. Man and the Biosphere Program.

In the last chapter summary, Gilbert White, Emeritus Professor of Geography, University of Colorado, concluded that, "Excluding those areas facing rapid groundwater exhaustion, the depletion of supply available to irrigation — whether because of economic competition or legal restraint or physical deterioration — seems likely to be slow and gradual. No immediate crisis looms. The opportunities for progressive readjustments therefore are large."

by Henry P. Caulfield, Jr.
Professor of Political Science
Colorado State University, and
Chairman of MAB#4

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- CR134 EFFECTS OF ALTERNATIVE ELECTRICITY RATES AND RATE STRUCTURES ON ELECTRICITY AND WATER USE ON THE COLORADO HIGH PLAINS, by Richard L. Gardner and Robert A. Young with Lawrence R. Conklin. **\$4.00**

Groundwater pumping for irrigation represents the largest agricultural consumer of energy in Colorado, primarily in the 600,000 acres of pump-irrigated land overlying the Ogallala aquifer region. This study used computer models of a representative quarter section of irrigated land to estimate the demand for electricity and pump irrigation water and to analyze the effects of various rate structures on farm resource allocation and income.

- IS52 A CRITICAL ASSESSMENT OF METHODOLOGIES FOR ESTIMATING URBAN FLOOD DAMAGES-PREVENTED BENEFITS, by David Plazak. **\$3.00**

This report provides a clear, complete discussion of methods of calculating urban flood damages-prevented benefits, and critically appraises these methods with emphasis on identifying data, assumptions, and techniques that may lead to erroneous estimates of benefits. The emphasis is on the frequency-damage method.

- IS53 PROCEEDINGS: HIGH-ALTITUDE RE-VEGETATION WORKSHOP NO. 6, Edited by Thomas A. Colbert and Robin L. Cuany. **\$8.00**

Presents papers given in the several sessions of the workshop held at CSU in 1984.

OTHER PUBLICATIONS

WATER QUALITY CRITERIA: AN OVERVIEW FOR PARK NATURAL RESOURCE SPECIALISTS, Director, Water Resources Field Support Laboratory, National Park Service, 107C Natural Resources, Colorado State University, Fort Collins, CO 80523.

A MODULAR THREE-DIMENSIONAL FINITE-DIFFERENCE GROUNDWATER FLOW MODEL, by Michael G. McDonald and Arlen W. Harbaugh. Scientific Publications Co., P.O. Box 23041, Washington, D.C. 20026-3041.

WASTEWATER TREATMENT PLANTS: PLANNING, DESIGN, AND OPERATION, by Syed R. Qasim. Holt, Rinehart and Winston. ISBN 0-03-062449-5.

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