UWRL Research Project Finds Way to Save Water

It is generally agreed that water is too valuable to waste, and yet each year enough water evaporates from the surface of Utah's larger lakes and reservoirs to irrigate more than a half million acres of new land.

Research being conducted at the Utah Water Research Laboratory may now have discovered a way to salvage some of this "lost" water. Under the leadership of Dr. Trevor C. Hughes, the research team, which includes E. Arlo Richardson, State Climatologist, and graduate student James A. Franchekiewicz, publish their findings under the impressive title of "Evaporation Suppression by Reservoir Destratification." In layman's language this means, "reducing evaporation from lakes by cooling the water."

The principle seems simple enough. If you want to dry up a wet spot, apply heat. Water in a pan on the stove will dry up faster than the pan of water in the refrigerator, and mud puddles disappear faster under a bright sun than on a cold dreary day. The hand dryer in the washroom and the hair dryer in the bathroom are further evidence that heat hastens the evaporation process. Similarly, in a lake or reservoir the sun shining on the surface causes the water to heat up and evaporate faster and faster with each degree of temperature rise. Dr. Hughes and his co-worker noted, however, that the water is not uniformly heated—that the water in the lowest depth is cold and that somewhere between the cold water at the bottom and the warm water at the surface is a layer of water that acts as a barrier to the passage of heat, oxygen, and other substances. Dr. Hughes calls this layer a thermocline and says it is very effective in preventing the warm water on the surface from mixing with the cold water at the bottom. He suggests that the thermocline can be destroyed by mechanically mixing the water, and that if this is done, the surface water would be cooler, and thus the evaporation would be reduced.

Dr. Hughes reports that this type of mixing is done routinely on several water supply reservoirs in the U.S. to improve the quality of the water by increasing the dissolved oxygen content, eliminating taste or odor, or by controlling the growth of algae. The fact that the cooler water does not evaporate as fast has been overlooked as an added benefit.

The methods which have been used successfully to "destratify" (destroy the thermocline) reservoirs include the releasing of air bubbles along the reservoir bottom or the pumping of cold deep water to the surface. "Both methods result in mixing currents which, if continued at an adequate level of energy input, can produce complete elimination of the temperature gradient," says Dr. Hughes.

The physical dynamics of evaporation has been described mathematically by the research team and the equation predicts the change in evaporation associated with a change in water surface temperature. This information was then extended into a "heat budget" mathematical model which accounted for physical and hydrological characteristics of the reservoir. Testing the model with data collected from the reservoirs in

Water Lab Anticipates New Leadership

Applications for the position of Director of the Utah Water Research Laboratory were accepted up until December 31, 1975. The search committee is now in the process of reviewing all candidates and hopefully will make the announcement soon. The vacancy was created last July when Dr. Jay Bagley, after 9 years of successful leadership, decided to step down. Dr. Bagley is still with the lab, is acting director for the Utah Center for Water Resources Research, and has busied himself in active research projects. Carrying the leadership role of the laboratory until the permanent director is appointed is Dr. Calvin Clyde, acting director.

Aquarius Editorial Responsibilities Shift

Responsibility for editing and expedite technical reports through the publication process has increased to the extent that editor Donna Falkenberg is left with no time to organize, edit, and publish the bi-monthly newsletter, Aquarius. Acting Director of UWRL Calvin Clyde, and Jay M. Bagley, Acting Director UWRL have now taken steps to infuse new life into this worthy cause. With this issue, the Aquarius is now being edited by UWRL staff researcher Frank W. Haws, who will work with Donna to bring readers of Aquarius the latest word on what is going on in the water industry of Utah. If you have news of interest or views you wish expressed, please send them to Mr. Haws at the Utah Water Research Laboratory, UMC 82, USU, Logan, UT 84322.
Citizen's Advisory Council Meets at Water Lab

The 16-member Citizen's Advisory Council for Water Resources Research met on November 21-22, 1975, at the Utah Water Research Laboratory to hear reports of current research and to discuss priorities and directions for future research. This council provides a valuable service by bringing to the researcher suggestions which can improve the effectiveness of his work. The citizen's viewpoint is also necessary if the researcher is to focus his energies and intellect upon pertinent people-oriented problems.

Mr. Lynn M. Thatcher, Director, Utah Division of Health, was acting chairman for the meetings. During the course of the 2-day meeting, the council discussed the need for placing priorities on research efforts and suggested that the UWRRL should give emphasis to the following topics: 1) Water problems related to energy; 2) water quality and environmental problems; 3) land use problems; 4) water resources development and conservation; and 5) Great Salt Lake management problems. The council also discussed salinity problems of the Colorado River Basin and other water pollution items including safe drinking water and the new EPA standards.

The council this year has two new members. Mr. Dee Hansen, Utah State Engineer, and Mr. Ray Nielsen, a representative to the Utah State Legislature from Fairview, Utah. The other members of the council are: Angus H. Bolliston, Vice President of Zion's First National Bank, Provo, Utah; Jay R. Hingham, President Hingham Engineering Company, Bountiful, Utah; Mrs. Eugene L. Bliss, member of the Board of Trustees of the Utah Environmental Center, Salt Lake City, Utah; Wayne D. Criddle, a principle in the engineering firm of Clyde-Criddle Woodward, Inc., Salt Lake City; Frank Davis, Vice President, Utah Power & Light Company, Salt Lake City; Ival V. Goslin, Executive Director, Upper Colorado River Commission, Salt Lake City; Dee C. Hansen, State Engineer, Salt Lake City; Gordon E. Harmon, Executive Director, Department of Natural Resources, Salt Lake City.

Joint Meeting

The Citizen's Council met jointly with a panel of Utah State University deans and directors who constitute a council to oversee and coordinate research programs on campus. The membership of this University Council consists of: Jay M. Bagley, Acting Director, Utah Center for Water Resources Research; Thadis W. Box, Dean, College of Natural Resources; C. Elmer Clark, Assistant Director, Agricultural Experiment Station; Calvin G. Clyde, Acting Director, Utah Water Research Laboratory; M. Judd Harmon, Acting Dean, College of Humanities, Arts and Social Sciences; Ralph M. Johnson, Dean, College of Science; Doyle J. Matthews, Dean, College of Agriculture, Director, Agricultural Experiment Station; E. Joe Middlebrooks, Dean, College of Engineering, Director, Engineering Experiment Station, Chairman of UCWRR Council; John M. Neuhold, Director, Ecology Center; and Dean F. Peterson, Vice President for Research, Utah State University.

Dr. William S. Butcher [left], chats with Lyman Thatcher during Break.

Leonard H. Johnson, Assistant Director, Natural Resources Department, American Farm Bureau, Salt Lake City; Daniel F. Lawrence, Director, Division of Water Resources, Salt Lake City; Dixie Leavitt, Senator, Utah State Legislature, Cedar City; Lynn S. Ludlow, General Manager, the Central Utah Water Conservancy District, Orem; Chandler P. St. John, Supervisor, Wasatch National Forest, Salt Lake City; Lynn M. Thatcher, Director, Utah Division of Health, Salt Lake City; and Charles Wilson, General Superintendent, Salt Lake City Water Department, Salt Lake City.

Institute Publishes New Report

Wade Andrews and William C. Dunaway have published the results of a study they have been making on the "social effects of changes in uses of Bear Lake." This study has been funded under the allotment program of the Utah Center for Water Resources Research. Those interested in reading this report can obtain a copy by writing to the Institute for Social Sciences Research and Natural Resources, Utah State University, Logan, Utah. Ask for "Social Effects of Changes in Uses of Bear Lake, An Interstate Body of Water," research monograph No. 5.

Coming Events

4th Annual AWRA Conference
Thursday, Feb. 19, 1976
Rodeway Inn
Salt Lake City, Utah

The 4th Annual Conference of the Utah Section of the American Water Resources Association will be held at the Rodeway Inn in Salt Lake City on February 19, 1976. This year's meeting is organized around the theme, "Critical Water Problems in Utah." Mr. Jack Barnett, Executive Director of the Western States Water Council, will be the featured luncheon speaker. Panel discussions during the day will treat the topics, "How can inter-departmental and inter-governmental disputes over water resources development be minimized?" and "An evaluation of public participation in water planning," and "Reallocation of water rights in Utah," "Current status of Indian water rights in the West," and "Economics of water resource planning," Professor Alan B. Davis of the Political Science Department at Weber State College is program chairman this year and invites all interested persons to attend.
Ten Years Ago — Do You Remember?

Two hundred years ago the United States of America was born, but can you remember what happened just 10 years ago? It was in 1966 that:

Jay Bagley was appointed Director of the Utah Water Research Laboratory, replacing Vaughn Hansen.

Helen Lundstrom was appointed Dean of Women, replacing Leah Dunford Parkinson.

Evan Stevenson was appointed Director of Auxiliary Enterprises

Tony Knapp was football coach and had on his team that year MacArthur Lane and Alke Taylor.

LaDell Anderson had a new junior college transfer on his team by the name of Shaler Hallman.

Where does the time go?

New Publications

Utah Water Research Laboratory Editor, Donna Falkenborg, has had a busy year. During the past year she has been responsible for the publishing of 20 separate project reports and occasional papers and has many more nearing the completion date on her desk. These reports are of little value unless read. So order your copy now from the Utah Water Research Laboratory, Utah State University, Logan, Utah 84322. The cost of the publication is indicated next to the publisher number.


Utah, the researchers were able to form a prediction model which would allow them to extend their results to any other reservoir.

As a result of this study the researchers arrived at the following conclusions:

1. Thermal mixing can suppress evaporation on deep reservoirs. In 17 of Utah’s lakes it is estimated that evaporation can be reduced 15 to 25 percent.

2. Thermal mixing does not damage the environment and does not add questionable chemicals to the water, is independent of wind, does not concentrate heat near the surface, and can account for a net annual reduction rather than only a seasonal change.

3. Significant suppression of evaporation can occur if the following conditions are present:
   a. Sufficient depth (more than 60 feet) to produce a natural thermocline and to provide a larger volume of cold water for mixing, and
   b. An outlet below the thermocline and sufficient outflow in relation to storage to transport a significant amount of excess heat from the reservoir.

4. The estimated amount of water which can be salvaged annually from Utah’s reservoirs is 172,000 acre feet. Lake Powell would contribute about 82 percent of this amount.

Dr. Hughes is convinced that the potential for saving water by thermal mixing is great and that research should be continued so that the water needed for energy production and salinity control will not deprive existing economic uses of a valuable resource.
OWRT National Leaders Visit Center

Here to attend the joint meeting of the Citizen’s Advisory Council and the Water Resources Research Council was the current Director of the Office of Water Research and Technology, U.S. Dept. of Int., Dr. William S. Butcher. Dr. Butcher brought with him the newly appointed Assistant Director for Research, Dr. James S. Burton. At a luncheon meeting on Friday, November 21, 1975, Dr. Butcher was the featured speaker. He stressed the importance of maintaining a strong partnership between the Office of Water Research and Technology and the state centers for water resources research.

Dr. Butcher was formerly a professor of Civil Engineering at the University of Texas at Austin, and has been a special assistant on water resources to the President’s Sciences Advisor. He has also been associated with the Water Resources Research Center of the Desert Research Institute, University of Nevada, and with the University of California in Los Angeles.

Dr. Burton served as Director of the Water Resources Research Center at the Washington Technical Institute in Washington D.C. before joining the OWRT in the key position of Assistant Director for Research. Dr. Burton conferred on Saturday, November 22, with several CWRR project leaders.

January Has Been a Busy Month For Workshops

Utah State University has been host to four workshops during January in which participants increased their knowledge about some aspect of water. The first of these, held January 5 and 6, attracted consulting engineers and designers of municipal water distribution systems. The workshop, headed by Roland W. Jeppson, was entitled Analysis of Steady Flow in Pipe Networks, and was taught by Dr. Jeppson, Gary Z. Watters, and A. Leon Huber, all affiliates of the Utah Water Research Laboratory.

The second workshop, held January 7-9, was jointly sponsored by the Utah Water Users Association and the Utah State University Extension Service. It was called a Water Users Workshop by its director Richard E. Griffin, water research specialist. The course was designed as a “refresher” for leaders in the field of water management. Utah’s water laws, an update of Utah’s water plan, and the EPA permit system were subjects discussed.

The third workshop, also under the direction of water specialist Richard E. Griffin, was held January 13-15 for users of sprinkler irrigation systems and was sponsored by the Sprinkler Irrigation Association. Jack Keller, Richard Griffin, Morgan Powell, Grant Hanson, and Dave James were the instructors.

Completing the list is the workshop for persons interested in turf irrigation. Mr. Griffin again heads this workshop which is designed for highway department personnel, building and grounds supervisors, professional grounds keepers, turf irrigation specialists, park and recreation specialists, golf course managers and technicians, and the layman who has an interest in turf and irrigation systems. This workshop, scheduled for January 27-29, featured a talk by Dee Hansen, Utah State Engineer, and workshop instruction from USU’s David R. Walker and industry specialists Michael Bischoff, Mel Burnington, Bruce Leibroch and Joe Polidori.

New Publications Continued from Page 3


PRWG165-14 "Colorado River Regional Assessment Study." Parts One through Four.

Utah Center for Water Resources Research
Utah Water Research Laboratory
UMC 82
Utah State University
Logan, Utah 84322
Snowmobiles Increase the Yield of Dry Land Wheat Says UWRL Researcher

The rapidly growing snowmobiling industry prompted one UWRL researcher, about four years ago, to seek an answer to the question of what the new winter recreation activity would do to the field of dry land wheat which seemed to be made just for snowmobiling. The large, gently sloping or undulating snow covered fields are an ideal place to test the speed and maneuverability of a new over snow vehicle, but what does this do to the tender, growing wheat sprouts at the bottom of the pile? When county agents asked this question of Mr. Joel E. Fletcher, a hydrologist at the Utah Water Research Laboratory, Professor Fletcher went to the field to look. Later he secured the cooperation of Thiokol Corporation, which supplied him with an over snow vehicle and a roller similar to those used by ski-resorts so that he could conduct some experiments.

Contrary to popular thinking, instead of damaging the wheat crop, the snow compaction caused by the snowmobile treads and by the roller actually increased the yield of wheat. Looking closely at the process, Professor Fletcher found that as a result of the compaction, snow mold was eliminated, the ground surface was not frozen hard, and the snow melted and entered the soil at a slow rate so that erosion was reduced. "Everything was positive," said Professor Fletcher, "so far we have found no detrimental effects."

Professor Fletcher has continued his experiments this past winter with financial aid and equipment assistance supplied by Thiokol. He has also teamed with Professor Rex R. Nielson of the Utah Agricultural Experiment Station who has been dusting snow with fly ash to induce melting which, like compaction, prevents the growth of snow mold. Their work this year has taken them to farms in Western Cache Valley, and to Pocatello Valley, Blue Creek and Howell Valleys in Box Elder County. Their work will be finished this summer when the final tabulation of wheat yields are in.

Thiokol has shown a keen interest in this work and, under the direction of Mr. Douglas Austin, has provided their famous "Imp" snowmobile and a pair of compactors to the researchers and to farmers interested in testing the new method on their own fields. It is said that one enterprising rancher in Box Elder County, who hearing of the work, put up a sign at the entrance to his farm "Snowmobilers Welcome."

Compacting the snow covering the wheat fields increases the soil moisture, reduces erosion and prevents snow mold, thus wheat yields are increased.

Annual Conference of AWRA Held in Salt Lake City SLC

The Fourth Annual Conference of the Utah Section of the American Water Resource Association (AWRA) was held February 19, 1976 at the Rodeway in Salt Lake City. Dr. Alten B. Davis, professor of political science at Weber State College, was program chairman for the event which attracted about 70 participants from various agencies throughout the state.

Five separate panels discussed topics of current interest to water resources. Dr. Robert David Wolff, with the U. S. Corps of Engineers in Washington, D.C., led the first discussion on the evaluation of public participation in water resource development; Mr. Dee Hansen, Utah State Engineer, then discussed the reallocation of water rights in Utah, and Mr. Paul Sant, U.S. Bureau of Reclamation in Salt Lake City discussed the need to minimize disputes over water resource development.

Luncheon speaker for the conference was Mr. Jack Barnett, executive director of the Western States Water Council. He talked about the politics of Water Resource Development. One of the afternoons discussed the current status of Indian water rights in the West with Mr. John Carver, professor of law at Denver University, presenting the main address. The last panel was directed at the role of economics in water resource planning and was led by Dr. Richard Alston, professor of economics at Weber State College.

Proceedings of the conference will be available later in the year for all participants.

WRC to Study Water for Energy

The Water Resources Council (WRC) has received funds from the Energy and Research Development Agency (ERDA) to assess the water requirements and water availability for non-nuclear energy technologies. The WRC will study legal constraints, water and waste disposal costs, and will analyze the environmental, social, and economic impacts of the dedication of water to energy uses.
### Current List of Projects Funded at UCWRR

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<thead>
<tr>
<th>Title</th>
<th>Leader</th>
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<tr>
<td>Structure of Integer Programming Models for Water Resource Planning</td>
<td>T.C. Hughes</td>
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<td>Future Chemical Composition of the Great Salt Lake Brines</td>
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<td>The Impact of Energy Resource Development on Utah Water Utilizations</td>
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<td>Water Resource Plans</td>
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<td>A Review of Organizational and Institutional Capacities to Plan,</td>
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<td>Manage, and Control Water Resource Problems in Two Major River</td>
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<td>Areas—Phase III</td>
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<td>The Effects of Early Planning on Improving Post Development</td>
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<td>Management in Multi-Purpose Water Resource Development</td>
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<td>Integrating Waters Resources and Land Use Planning—Phase 1</td>
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<td>Resource Development and Ute Indian Self-Determination</td>
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<td>A Study of Interactions Among Different Levels of Analysis in</td>
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<td>Comprehensive River Basin Planning</td>
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<td>Intermittent Sand Filter Scrapings: Deposition, Utilization, and</td>
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<td>Sand Recovery</td>
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<td>Evaluation of Flood Risk Factor in the Design of Storm Drainage</td>
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<td>A Study of the Overall Energy Efficiency of Pollution Control</td>
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<td>Technologies for Energy Conversion Processes</td>
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**PRJ 177-1** "Naturally Occuring Organic Compounds and Algal Growth in a Eutrophic Lake." V. Dean Adams, Russell R. Renk, Peter A. Cowan, Donald B. Porcella. June 1975. ($4.00)


**PRJ 122-1** "A Study of Alternative Methods to Modernize Water Institutions and Eliminate Problems of Multiple Jurisdiction and Conflicting Objectives." Frank W. Haws. September, 1975. ($2.00)


Water Quality

Possible Pollution of Water by Oil Shale Mining is Being Studied at UWRL

Oil shale, "the rock that burns," has long been known as a potential source of energy. Rich deposits were discovered in several western states, including Utah, from 1912 to 1915. The Utah deposits are part of a geologic formation known as the Green River Formation and are located in the Uinta Basin near the junction of the Utah, Wyoming, and Colorado borders. The large scale development of Utah's oil shale resources has, until now, been suppressed by unfavorable economic factors. However, due to the rising price of both domestic and foreign crude oil, this development is on the verge of being freed from its economic bonds. Therefore, a research team at UWRL, consisting of Dr. V. Dean Adams and Dr. Donald B. Porcella as project leaders, Darwin Sorensen, and graduate students Russel Runke, Mary Cleave, and Gary Merrill, is conducting a study in order to evaluate the potential impacts a large scale oil shale processing industry may have on the quality of Utah's water resources.

Oil shale is actually a misnomer for this energy bearing rock for it contains no oil and is not a shale. The rock, or inorganic portion of the "shale," is actually a marlstone, and it contains a highly insoluble organic substance called kerogen. Upon heating, the "shale" releases its kerogen both as a gas and as a heavy liquid. The liquid portion of the kerogen can then be upgraded to a syncrude (synthetic crude oil), which is equivalent to a high grade crude oil. The syncrude can then be further refined to various end products such as ordinary crude oil.

The actual oil shale processing procedure consists of mining the shale, heating it to release the kerogen, and then disposing of the spent shale. Underground mines will probably be employed in Utah to extract the shale from the earth due to the depth of the deposits. The release of the kerogen is accomplished through a process called retorting, whereby the shale is heated either by contacting hot gases or preheated ceramic balls. The spent shale will initially be disposed of in surrounding canyons. When the mined out area becomes large enough, spent shale will be placed underground. However, the need for surface disposal sites will continue since the shale expands to almost 150 percent of its original volume in the retort process.

The study being performed by the UWRL research team will attempt to identify and to quantify both inorganic salts and organic compounds which may be released from the processing and/or disposal of these salts and organics on area water resources. Evaluation of these impacts will be made by studying the effects of the identified salts and organic compounds on the growth of algal cultures. Further studies on the effect of the organic compounds on hereditary traits of special strains of bacteria will also be conducted.

These studies have significance with respect to the fate of the released materials in aquatic food chains and the possible impacts on higher organisms. For example, the ability of various compounds to cause cancer may be related to this interference transfer of hereditary material by bacteria.

The work is funded through the Utah Water Research Laboratory under a research program of the State of Utah. Persons and agencies interested in sharing research results on the environmental impacts of oil shale development are urged to contact Dr. Adams or Mr. Jerry Dossler at Utah Water Research Laboratory, UMC 82, Utah State University, Logan, Utah 84322.

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Aquarius

a newsletter of the
Utah Center for Water Resources Research
Utah State University

Glen L. Taggart ... president USU
Jay M. Bagley ... acting director UCWRR
Calvin G. Bagley ... acting director UWRL
Mardye Matthews ... secretary UCWRR
Frank W. Haws ... editor
Donna Falkenberg ... editor

We invite you to submit your news items for inclusion in the Aquarius Newsletter. The letter will be sent free of charge to those requesting it.

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News Notes

Dr. Calvin Clyde, acting director of the Utah Water Research Laboratory, recently returned from Tanzania, East Africa, where he participated as a member of a review team in the evaluation of certain major contracts in that country. Other members of the team included Dr. Art Smith of the USU Range Science Department and Dr. Yun Kim of the USU Sociology Department.

The University of Vermont has recently announced that a new director of the Vermont Water Resources Research Center has been appointed. Professor E. Alan Marra, an Environmental engineer with experience in teaching and research, will assume the post vacated last April by the retirement of Professor Harold G. Wilm.

The annual spring meeting of the American Geophysical Union is being held in Washington D.C. during the week of April 12-15, 1976. Six special sessions have been planned to discuss recent developments in Hydrology. Included in this is one session on the use of Landsat Digital Data in hydrologic studies.

The 13th annual Management Institute for Water and Waste Water Districts and Municipalities was held at Utah State University March 30 and 31, 1976. This year's sponsors of the institute included the Cooperative Extension Service of USU, the Utah League of Cities and Towns, the American Water Works Association, intermountain section; the Utah Water Pollution Control Association and the Utah State Division of Health, Bureau of Water Quality.

"The State of America's Drinking Water" is the title of a new publication available from the Water Resources Research Institute of New Mexico. This publication is the proceedings of a national symposium and consists of twenty-one presentations on such subjects as the Impact of the Safe Drinking Water Act, health relationships of todays water supplies, water supplies for rural areas and small communities, and the state of the art of water supply. Inquiries may be sent to the institute at 124 Reddick Building N.C. State University, Raleigh, N.C. 27607.
### Current Research Being Conducted at UWRL

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<td>Management Practices for Control and Quantity of Irrigation Return Flow—Phase II</td>
<td>L.S. Willardson</td>
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<td>Assessment of the Impacts of PL 92-100 in the Colorado River Basin</td>
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<td>Nat'L Commis. on Water Quality</td>
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<td>Bio-Stimulation and Nutrient Assessment</td>
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<td>The In-Channel Processes which Contribute to the Salinity of the Price River, Utah</td>
<td>J.P. Riley</td>
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<td>Studies to Investigate Properties of Material in Phosphate Mines in Relation to Optimum Design of Spill Dumps</td>
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<td>Field Measurements of Manning’s “n” in Domestic Sewers</td>
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<td>Johns-Manville</td>
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<td>Inventory Related to Water Quality Objectives, Bear River Basin, Type IV, Idaho-Utah-Wyoming</td>
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<td>USDA-SCS</td>
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<td>Quality Monitoring and Application of a Quality Model to the San Pitch River System</td>
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<td>Experimental Weather Modification</td>
<td>G.E. Hill</td>
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<td>State Water Resources Planning</td>
<td>J.M. Bagley</td>
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<td>Development of a Consumptive Water Use Map for Utah</td>
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<td>Impacts of Water Quality Discharge Permit Programs on Water Rights Administration</td>
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**Publications**


**PRWG 87-1** "Regional Analyses of Runoff Characteristics for Small Urban Watersheds." George B. Shih, J. Paul Riley, and Eugene K. Israelson. April 1975. ($2.50)

**PRJEW 011-1** "The Effects of Artificial Destratification on the Water Quality and Microbial Populations of Hyrum Reservoir." Douglas D. Drury, Donald B. Porcella, and Robert A. Gearheart. June 1975. ($3.00)


**PRWA 21-1** "Water Quality as an Approach to Managing Recreational Use and Development on a Mountain Watershed—South Fork of the Ogden River-Valley Area." Bruce A. Johnson, and E. Joe Middlebrooks. June 1975. ($2.50)

**PRWG 165-1-4** "Colorado River Regional Assessment Study." Parts One through Four. ($40.00/set or $10.00 each)

Publications can be ordered from the Utah Water Research Laboratory. Utah State University, Logan, Utah 84322. The cost of the publication is indicated. Please order by number and title.
California Engineer Becomes New Director of the UWRL

On July 1, 1976, Dr. L. Douglas James officially became the third director of the Utah Water Research Laboratory, succeeding Dr. Jay M. Bagley and Dr. Vaughn Hansen. Dr. James will also be the director of the Utah Center for Water Resources Research. In this dual capacity, Dr. James will direct the research activities of about 30 professional researchers and be responsible for the direction of a research effort that annually expends more than 2½ million dollars.

Dr. James comes to this new position highly qualified both through education and experience. Born and raised in the San Joaquin Valley of California, he graduated from Modesto High School, and then enrolled at Stanford University in Palo Alto, Calif. He was awarded the B.S., M.S., and Ph.D. degrees in Civil Engineering from that institution where he also worked for one year as a research assistant.

His first appointment after receiving his terminal degree in 1964 was with the University of Kentucky as an associate professor of Civil Engineering. In 1970 he transferred his allegiance to the Georgia Institute of Technology and for the past year he has been a visiting professor at Stanford University and the University of Washington.

Much of Dr. James' research work has been concerned with water resources planning, floodplain management, and hydrologic modeling. He has been a consultant to various companies and governmental agencies and has published numerous articles, reports, and books on his research findings.

Aquarius welcomes Dr. James to Utah and wishes him success in his latest challenge.

Water Pollution Act in Flux

Water Quality Report In, Amendments Afoot

The National Commission on Water Quality has handed in its report with recommendations for changes in the 1972 Water Pollution Control Act. Based on these and on public clamor for change in the complex Act, a multitude of amendments are being proposed.

The Commission’s final report proposes that the 1983 goals be postponed to a date not less than five or more than 10 years after the present deadline, July 1, 1983. Other key recommendations in the Commission’s report would allow extensions of time for the 1977 water quality goals on a case-by-case basis, allowing for flexibility. An important element of the report is a call for decentralization: Congress would allow certification to any state to exercise full authority of the discharge permit and construction grant program. An amendment to this effect has been introduced by Congressman James Wright (Texas) and James C. Cleveland (N.H.). The idea is to cut some of the red tape in getting construction funds out of Washington.

The Commission’s Report asks that the program be given the stability of fund authorization over a fixed term of years (not less than five years or more than ten, and for not less than $5 billion a year, nor more than $10 billion). The present House Public Works Committee Bill would extend funds for three years and change the basis on which funds are allocated to states to a formula based on population as well as need (this could merely mean obsolete equipment).

Continued Page 3
Supreme Court Decision Affects State's Rights

The western states have lost a battle to maintain their sovereign control over underground water. The Devil's Hole pupfish won.

In a unanimous opinion written by Chief Justice Warren E. Burger, the supreme court has recently ruled that the government has the right to control pumping which it says is threatening the rare species of wildlife with extinction.

The Devil's Hole pupfish is a species less than an inch long which is believed to have lived for at least 30,000 years in a 200-foot deep limestone pool in Death Valley in Nevada. It survives nowhere else in the world. The pupfish population in the pool ranges from 200 to 500 at different times of the year.

In 1968, Francis and Marilyn Capparet, owners of a 12,000 acre cattle ranch adjacent to Death Valley National Monument, started pumping irrigation water from deep wells.

In August, 1971, the government filed suit against the Capparets, claiming the right to control pumping of the water under a proclamation by the late President Harry S. Truman in 1952 which set aside Devil's Hole as part of Death Valley National Monument.

The high court agreed with the government's contention that in withdrawing land from general public use for a purpose it also has the power to set aside the ground water.

Summary of Water Conference Available

Mr. Warren D. Fairchild, Director of the U.S. Water Resources Council, has announced the availability of the Summary, 1975 National Conference on Water. Over 200 participants from a wide variety of backgrounds and philosophic viewpoints joined in the Conference. The speakers included then Secretary of Interior Rogers C. B. Morton, and then Secretary of Army Howard Callaway, Secretary of Agriculture Earl Butz, and Chairman of the Council on Environmental Quality Russell W. Peterson.

The Summary is a compilation of the conclusions of the eight panel discussions, papers presented at the eight panels, speeches given by the high-ranking officials present, and an executive summary.

Mr Fairchild indicated that the Council is considering sponsoring another National Conference on Water in 1977. No further details on the projected 1977 Conference are yet available.


The stock number to be used in ordering is 024-001-02788-4. The price is $3.60.

Aquarius

a newsletter for the
Utah Center for Water Resources Research
Utah Water Research Laboratory
Utah State University

Glen L. Taggart ........... president USU
L. Douglas James ........ director UWRRL and UCWRR
Mardyne Matthews .......... secretary UCWRR
Frank W. Haws ............ editor
Donna Falkenborg .......... editor

We invite you to submit your news items for inclusion in the 'Aquarius' Newsletter. The letter will be sent free of charge to those requesting it.

News Notes

More than 150 million streamflow, water-quality, and groundwater measurements collected at more than 100,000 sites across the country are now available through the National Water Data Storage and Retrieval System (WATSTORE), according to a new U.S. Geological Survey leaflet.

The 15-page leaflet describes the types of data contained in the USGS-maintained WATSTORE files and provides instructions for obtaining the data from any of 45 Water Resources Division district offices across the country.

Single copies of these leaflets are free upon request to the Branch of Distribution, USGS, 1200 South Eads Street, Arlington, Va. 22202.

OWRT Fiscal Funding for 1976 Completed

The Department of the Interior has announced that seven research projects, totaling $415 thousand, have been selected for funding by the Office of Water Research and Technology to complete the major portion of its fiscal year 1976 water research program.

According to Dr. Williams S. Butcher, Director of OWRT, 264 proposals were submitted for consideration of FY76 funding under provisions of Title II of the Water Resources Research Act. Thirty projects were previously announced. Of the 37 total funded proposals, three were awarded to Jim Mulder, Barry Crawford, and Wade Andrews through the Utah Center for Water Resources Research.

The Title II program provides for research grants, contracts, or other arrangements with educational institutions, and with private firms and individuals for the conduct of research that seeks solutions to urgent water problems throughout the nation. The last seven announced research projects relate to improving water resources planning and management methods and procedures, solution of energy-related water problems, and improving water use efficiency.

Coming Events

"Better Cities Through Water Resources Planning and Management" is the theme of a specialty conference of the Water Resources Planning and Management Division and the Urban Planning and Development Division of the American Society of Civil Engineers to be held at the University of Minnesota August 18-20, 1976.
UWRL Staff Writes Manual on Soil Erosion Control

As part of the contract with the Transportation Research Board of the National Academy of Sciences, researchers at the Utah Water Research Laboratory teamed together to write a manual to be used nation-wide, entitled "A Manual of Erosion Control Principles and Practices." This manual is part of the final project report to the Transportation Research Board which funded a two year study of methods to control erosion during highway construction. The researchers personally looked at erosion control practices in 32 states and gathered data and information from all 50 states and Puerto Rico.

Project leaders were Calvin Clyde and Earl Israelsen of the UWRL staff. They were assisted by Paul Packer and Eugene Farmer from the Forest Sciences Laboratory, and Joel Fletcher, Eugene Israelsen, Frank Haws, and N. V. Rao, from the Utah Water Research Laboratory.

Since the "dust bowl" days on the Great Plains in the 1930's erosion control practices have been developed and used on agricultural lands. Only recently have these practices been adapted for construction sites as well. The magnitude of the problem can be visualized when it is realized that over a million acres of land each year is converted from agricultural use to such uses as shopping centers, new homes, schools, industrial parks, airports, and highways. Erosion occurring in these areas, particularly during the period of construction, can be as high as 200 times greater than the same land covered with timber and as high as 10 times greater than the land with cultivated row crops.

Uncontrolled erosion resulting from construction activities causes significant damage to the environment. The sediment that is produced pollutes surface water, restricts drainage, fills reservoirs, damages adjacent land, and upsets the natural ecology of lakes and streams. Erosion during construction also increases costs and causes extensive delays and repairs.

The recently completed study had three major objectives: (1) To determine if the present methods for controlling erosion during highway construction throughout the United States are effective, (2) To write a manual describing principles and practices for good erosion control, and (3) To identify research needs in erosion control.

To gain the knowledge they needed about present problems and practices throughout the United States, the researchers sent questionnaires to all state highway departments throughout the United States and Puerto Rico. Questionnaires were also sent to offices of the Soil Conservation Services, the Corps of Engineers, and the Environmental Protection Agency.

Wischmeier Honored at National Meeting

A National Soil Erosion Conference was held May 25-26 at Purdue University, Lafayette, Indiana in cooperation with ARS and SCS to honor W. H. Wischmeier presently Research Leader of the Soil, Water, and Air Group, Agricultural Research Service, USDA at Lafayette, Indiana. Mr. Wischmeier is known for his development of the Universal Soil Loss Equation which is widely recognized as a major contribution to the soil conservation effort in the United States.

Representing UWRL at the conference was Joel E. Fletcher who read a paper authored by himself and Eugene Farmer of the Forest Sciences Laboratory, Logan, Utah. Fletcher and Farmer have been part of a UWRL research team which has recently completed a study of soil erosion during highway construction for the Department of Transportation in which the work of Wischmeier was extensively used. The universal soil loss equation is an essential part of the erosion control effort and Wischmeier's contribution is recognized and appreciated.

Water Pollution Act

Continued from Page 1

Corps of Engineers Curb

One proposed amendment that has wide implications has been introduced by Rep. John B. Breaux (La.). The Breaux amendment would narrow the definition of "navigable waters," a court interpretation of the original 1972 Act required a Corps of Engineers permit for discharge of dredged or fill material into any inland water—estuaries, salt creeks, streams or wetlands. The Corps objected and felt this interpretation would extend even to ponds for irrigation or for watering of livestock. The Breaux amendment would restrict Corps permit jurisdiction to navigable waters used to transport interstate or foreign commerce "shoreward to the high-water mark." Environmentalists, in an unusual twist, would prefer to see the Corps responsibility for discharge continue over all wetlands and inland waterways.

—asce News—June, 1976
Erosion Control Manual
Continued from Page 3

Bureau of Land Management, the Army Corps of Engineers, the U.S. Bureau of Reclamation, the U.S. Forest Service, the Associated General Contractors, and to some special interest groups such as the Sierra Club, Trout Unlimited, the Wilderness Society, and others. Personal visits by members of the research team were made to 32 selected states to observe first-hand some erosion problems and to interview knowledgeable people who were working to solve them.

Letters were also sent to all of the agricultural research and experiment stations in the country, and to other specific locations where erosion research had been or was being conducted, to request data related to the effectiveness of various erosion control measures. All of these were compared, analyzed, and categorized for inclusion in the report.

The study made use of the University of Soil Loss Equation which had been developed by W. H. Wischmeier of the U.S. Department of Agriculture's Agricultural Research Service. Under the guidance of Mr. Joel Fletcher this equation was made applicable to the entire United States. The original equation was limited to the eastern United States. With the equation the potential soil erosion can be estimated and the effectiveness of various control measures can be evaluated.

It is anticipated that construction people everywhere will benefit from the manual developed during this study. Construction personnel can now design and construct projects on which the sediment production can be kept within pre-determined limits.

Water Quality Expert is also Top Speaker

Dr. James H. Reynolds, Assistant Professor in the Civil and Environmental Engineering Department and Utah Water Research Laboratory at Utah State University, is the Utah Jaycees' top speaker.

Reynolds won the public speaking contest at the state Jaycees convention in Moab recently. He represented the northern district and topped other district winners.

At the national Jaycee convention June 19-16, Reynolds competed against other state winners. His speech topic is "Service to Humanity is the Best Work of Life."

Reynolds, who lives in Hyde Park, Utah, is a member of the board of directors of the Logan Jaycees and was named the outstanding project chairman of the group last year.

Utah Center for Water Resources Research
Utah Water Research Laboratory
UMC 82
Utah State University
Logan, Utah 84322

PUBLICATIONS


Publications can be ordered from the Utah Water Resources Laboratory, Utah State University, Logan, Utah 84322. The cost of the publication is indicated. Please order by number and title.
Joel E. Fletcher Retires After Varied and Colorful Career

State governments should give people accurate information on potential hazards such as floods, so the people can know the risks and decide whether to take them, Joel Fletcher believes.

Fletcher, professor of civil and environmental engineering at Utah State University and the Utah Water Research Laboratory, says that, for example, real estate people should be required to show potential home buyers or builders a map, made up by the state, showing flood plains of a river bed or below a dam. Then the prospective home owner could decide, fully aware, whether to take a chance on being flooded.

Another example: the state should provide accurate information on the potential for the level of a body of water such as Great Salt Lake to rise or lower, so that anyone building industrial or recreational facilities can know the possible consequences.

Fletcher's expressions on the topic are an indication of his continuing informed interest in water problems in the West, as he retires from Utah State University.

Retirement in this case is a relative term. Fletcher says retirement will free him to have a more flexible schedule. "Our kids are on both ends of the country and it is too far to visit them both on just a vacation time," he says, but it is clear that much of his work will continue.

Some of that work has to do with water levels and water uses in Utah and neighboring states. He is a consultant to the State Department of Water Resources.

Continued Page 2

Professor Fletcher at his new office in the UWRL Annex where colleagues and students still seek his help and advice. When you need a practical solution to a complex problem, just ask Joel.

Continued Page 3

UWRL Researchers Attend AWRA Meetings

The 12th Annual Conference of the American Water Resources Association was held at the McCormick Inn in Chicago, September 20-22, 1976. Utah was well represented as 12 papers of the approximately 90 papers presented were read by Utah researchers. The theme of the meeting was "Water—Center of Crises—Past, Present and Future." The Utah researchers read papers in irrigation, rainfall modification and water management, water quality and modeling, urban water resources, watershed and stream modeling, surface water and groundwater relationships, and water resources development.

The papers read by Utah participants were as follows:

1. The Effects of Irrigation Management on Salinity Levels within the Colorado River by J. Paul Riley and J. J. Jurinak.
2. A Hydro-Quality Model to Predict the Effects of Biological Transformation on the Chemical Quality of Return Flow by V. A. Narasimhan and J. Paul Riley.
3. Predicting Aquatic Ecosystem Responses to Cold Cloud Seeding by Eugene K. Israelson.
5. Hydro-Salinity Simulation of Selected Agricultural Subbasins Within the Colorado River System by A. Leon Huber, J. Paul Riley, and V. A. Narasimhan.

Continued Page 3
News Notes

UWRL staff members on leave to pursue other fields of interest at the present time include: Dr. Cheng-lung Chen, who is working with the Gulf Coast Hydroscience Center of the Geologic Survey in Bay St. Louis, Miss.; Dr. Daniel H. Hoggan, formerly assistant director of the UWRL is working in geothermal energy for ERDA's Advanced Technology Division at Idaho Falls, Idaho; and Dr. Donald B. Porcella, who is working with the Environmental Protection Agency in Corvallis, Oregon.

Other staff members who always seem to be on the go are: James Reynolds, who just recently returned from Sidney, Australia where he gave a paper at the International Association of Water Pollution Control; Eugene Israelsen and Calvin G. Clyde, who attended the ASCE Hydraulics Conference at Lafayette, Indiana; Donald B. Porcella, Dennis George, W. J. Garnney, and Lester Dixon, who attended the meetings of the Water Pollution Control Federation in Minneapolis, Minnesota; Dan Filip, who attended meetings of the National Conference on Disposal of Residues on Land held in St. Louis, Missouri; Jay Bagley and Dan Hoggan, who attended the Interstate Conference of Water Problems held in Biloxi, Mississippi; L. D. James, who represented the Center at meetings of the CWIC and PSIAC held in Jackson, Wyoming; and Trevor C. Hughes, who just returned from a meeting of the Rural Water Conference held in Lincoln, Nebraska.

New Research Funded

Matching Grant Projects FY 1977

The following projects have received a grant from the Office of Water Research and Technology to perform research in water-related fields.

- "Alternative Energy Development Options and the Impact on Water Sources on Weather Modification. He is also a consultant to the Southern Pacific Railroad and the Great Salt Lake Minerals Company, predicting evaporation and forecasting lake levels.

His current USU projects include completing a manual on evaporation control during highway construction, a manual estimating peak flow of small watersheds, and a design method for mechanical compacting of snow for controlling snow mold and increasing water supply on winter wheat crops.

He sees the level of Great Salt Lake rising another few feet within the next few years. That prediction is based on a short-range cycle of higher-than-average precipitation.

"There is evidence of the rise in my studies of tree rings and a study at MIT on sun spot activity affecting precipitation," he explains.

The rising lake level causes him to have questions in his head about the advisability of the Central Utah Project, designed to bring water from the Colorado River drainage into the Great Salt Lake drainage.

"From 1,300,000 to 1,500,000 acre feet a year is going to waste in Great Salt Lake now. This is water of irrigation quality. A lot of land could be brought under irrigation with that amount of water, with some pumping," he maintains.

Fletcher came to USU in 1963 as the first employee of the Utah Water Resources Laboratory. His first assignment was to help raise funds to build the laboratory. His first two proposals brought in a million dollars in grants from the National Institutes of Health and National Science Foundation. That, plus other grants and State of Utah funds built the laboratory and helped launch the far-reaching water-related research that has great importance not only in Utah but regionally and internationally.

One of the early projects he worked on was weather modification research. A series of renewals has run the amount of that effort to more than $2 million.

The results are clear-cut: storms can be turned on and off or their nature changed.

"If we have a cumulus-nimbus cloud mass we can let it go and produce the rain, hail, lightning or tornados that are in its potential. Or we can seed it with silver iodide crystals at various known levels and either decrease or eliminate its effect. We have the potential to increase or decrease rain, hail, lightning and water supply," he explains.

His consulting work with the State Department of Water Resources involves lecturing to municipal and farm groups on the research and possibilities of cloud seeding.

Weather modification projects in southern Utah (to increase winter snow pack) and in northern Utah-southern Idaho (to change summer storm characteristics) are working now, with citizen groups contracting with private firms for the work and weather modification scientists such as Fletcher serving as consultants.

Joel Fletcher grew up in Logan. His father, Calvin, was head of the Art Department at USU for many years. Calvin's third wife, Irene Thompson, reared her own children and those of his first two wives, was Utah Mother of the Year in 1968.

After getting a bachelor's degree in chemistry and a master's in soil chemistry from USU, Joel did doctoral work in irrigation engineering at the University of California, Davis, but had that cut short by World War II. He returned to USU in 1963 from work with the Agricultural Research Service of the U.S. Department of Agriculture in Idaho and Arizona.

His wife is the former Florence Bickmore. Their sons are James, professor of communication and journalism at the University of Georgia, and J. Richard, a clinical psychologist for Unified Social Services in Newark, California. There are eight grandchildren.

Aquarius

A newsletter for the
Utah Center for Water Resources Research
Utah Water Research Laboratory
Utah State University

Glen L. Taggart .......... president USU
L. Douglas James ... . . director UWRL and UCWRR
Maryanne Matthews .... secretary UCWRR
Frank W. Hawes ............... editor
Donna Falkenberg .......... editor

We invite you to submit your news items for inclusion in the Aquarius Newsletter. The latter will be sent free of charge to those requesting it.
Ellis Armstrong Writes Book - Returns to Utah

Dr. Ellis L. Armstrong and his wife Florine sold their home in Washington this summer and have returned to Salt Lake City to begin a new career in engineering consulting and teaching. Dr. Armstrong will fill a newly created position at the University of Utah as adjunct professor of Civil Engineering.

Dr. Armstrong is probably best known in Utah as the former director of the regional office of the Bureau of Reclamation and a staunch supporter of the Central Utah Project. From that post he was named, in 1969, Commissioner of Reclamation, a post he held until 1972.

From 1937 to 1958 he was Commissioner of Public Roads for the State of Utah, went on to become manager of the U.S. portion of the St. Lawrence Power and Seaway Project, became U.S. Commissioner of Public Roads, and later Chairman of the United States Committee of the World Energy Conference.

He was born in Cedar City, Utah, and graduated from Utah State University. He also has a doctorate in engineering from the Newark College of Engineering.

Publishes New Book

For the past two years, Dr. Armstrong has been working on a new book, "The History of Public Works in the United States, 1776 to 1976." This book is the official Bicentennial project of the American Public Works Association, and is now available to interested readers. A copy can be obtained by writing to the APWA Commission, 1776 Massachusetts Avenue, Washington, D.C. 20036. The cost is $10.00 if ordered before December 31, 1976.

Assisting Dr. Armstrong, who edited the book, were Dr. Michael Robinson and R. SueAnn M. Hoy. Dr. Robinson received his doctorate in American history from the University of Wyoming in 1973.

The book has 20 chapters and is well illustrated. One of the pictures is of the Glen Canyon Dam near the Utah-Arizona border. Another depicts Utah's famed Rainbow Bridge National Monument.

This interesting story of the development of public works systems in the United States is based on materials provided by federal, state and local units of government.

The First Road

The book contains much information as: "The National Pike or Cumberland Road was the nation's first important road built with federal funds."

The nation's first MacAdam Road was a 10-mile turnpike in Maryland which was built in 1829.

The book has a chapter on the nation's colorful canal-building era. The most familiar canals are the Erie Canal, connecting Buffalo and New York City, and the 51-mile long Panama Canal, linking the Pacific with the Atlantic Ocean, via the Caribbean Sea.

Other Chapters

There are also chapters on the nation's automobile age, the railroad era, irrigation, airways and airports, public buildings, parks and recreation, educational facilities, light and power, urban mass transportation, military installations, and aerospace.

UWRL Researchers

Continued From Page 1

9. The Use of Statistical Models to Fit Annual Flood Series by A. Leon Huber and Joel E. Fletcher.

PUBLICATIONS

PRJR-012-1 "Hydrologic Impact of Burning and Grazing on a Chained Pinyon-Juniper Site in Southeastern Utah" Gifford, Gerald F., John C. Buckhouse, and Frank E. Busby. June 1976. $2.00

PRJSBA-016-1 "Nitrogen Cycling in Microcosms and Application to the Biology of the Northern Arm of the Great Salt Lake" Steele, John C., Frederick J. Post, and Donald B. Porcella. June 1976. $2.00

PRJEW-016-1 "Development of a Water Quality Simulation Model Applicable to Great Salt Lake, Utah" Jones, Craig T., Calvin G. Clyde, William J. Grenney, and J. Paul Riley. June 1976. $3.00

PRJER-033-1 "Disposal Alternatives for Intermittent Sand Filter Scrapings Utilization and Sand Recovery" Elliot, Jerry T., Daniel S. Filip, and James H. Reynolds. June 1976. $3.00

PRWG-86-1 "Application of a Hy- drologic Model to the Planning and Design of Storm Drainage Systems for Urban Areas" Shih, George B., Eugene K. Israelsen, Robert H. Farnell, and J. Paul Riley. May 1976. $2.00


CWRR—Publications


Publications (except*) can be ordered from the Utah Water Resources Laboratory, Utah State University, Logan, Utah 84322. The cost of the publication is indicated. Please order by number and title.
Technical Report Released

Section 80 (c) of the Water Resources Development Act of 1974 directed the President to "make a full and complete investigation and study of principles and standards for planning and evaluating water and related land resources projects."

In September 1974, President Ford assigned responsibility for the study to the U.S. Water Resources Council, stating that the "study of major water resources policies . . . represents a unique opportunity to move further towards principles and standards and cost sharing arrangements for Federal water and related land programs that can be fully supported by both the executive branch and the Congress."

While the President's recommendations to the Congress are not expected until later this year, the Council has released the 20 volume technical report which constitutes the background and the perspective from which the recommendations are to be made. Seven departments, 18 agencies within those departments and seven independent agencies—involving 70 different appropriations accounts—are presently involved in planning, implementing and operating, maintaining and rehabilitating federal and federally assisted water and related land programs and projects.

The technical report studies the ways in which those activities are financed and undertaken by various agencies, the range of purposes and the relative importance of different purposes in the various regions of the country. It reflects the current federal involvement in water programs and projects. It is the first such comprehensive study of federal water undertaken and it required a major effort by the participating federal agencies to collect the information and to assure its completeness and consistency.

New Research Funded
Continued From Page 2

Resources and Salinity" A. Bruce Bishop and Rangesan Narayanan—$54,930.

"Sorptivity—A Feasible Concept for Infiltration Estimation on Small Rangeland Watersheds?" Gerald F. Gifford—$12,449.


"The Development of Procedures to Identify and Predict the Impact of Agricultural Return Flow" A. Leon Huber and J. J. Jurink—$52,197.

"Impact of Water and Soils Having High Source-Sink Potentials on Water and Salinity Management under Irrigation in the Upper Colorado River Basin" Lyman S. Willardson and John Hanks—$60,450.

Committee Seeks Help in Preparing Directory

The AAAS Committee on Arid Lands is preparing a directory of North American scientists who are active in research in some aspect of arid lands. The directory will include persons from Geology and Geography, Biological Sciences, Anthropology, Social and Economic Sciences, Engineering, Medical Sciences, Agriculture, Atmospheric and Hydropheric Sciences, and other related sciences.

The directory will be on computer tape at the University of Arizona Office of Arid Land Studies and will be updated continually. Persons wishing to utilize the directory may obtain all or a portion of it at cost upon request.

In order to simplify handling the anticipated large number of names, the Committee asks that persons wishing their names to appear in the directory submit the following information in the order indicated:

Name:
Title:
Professional Address (including zip code)
Specific interests as related to Arid Lands Research:
Arid Regions Studied:
This information should be sent to:
Gordon L. Bender
Department of Zoology
Arizona State University
Tempe, Arizona 85281

Utah Center for Water Resources Research
Utah Water Research Laboratory
UMC 82
Utah State University
Logan, Utah 84322
Citizens Advisory Council Meets at UWRL to Hear Reports of Researchers

In a joint meeting, held at the UWRL on September 17, 1976, members of the Citizens Advisory Council for Water Resources Research and the five deans who make up the University Water Resources Council heard various investigators of the Water Resources Center describe their latest research findings. Dr. James, who directs the activities of both the Utah Water Research Laboratory and the Center for Water Resources Research, told the council that these organizations are actively pursuing research in seven major program areas. These areas are: Atmospheric Water Resources; Hydraulics and Fluid Mechanics; Hydro Climatic Measurements; Water-energy Systems; Conservation, Planning, and Management; and Water Quality Management.

Dr. James then introduced several principal researchers who reported on the following projects:

Frederick J. Post, Associate Professor of Biology at USU, reported on nitrogen cycling as a water quality factor in the Great Salt Lake. He was followed by Joseph M. Glassett, Associate Professor of Chemical Engineering at BYU, who described a predictive method of determining the future chemical composition of the Great Salt Lake brine; and William J. Grenney, head of the Environmental Engineering Division at USU, talked about a water quality management model he was developing of the Great Salt Lake. Rounding out the discussion involving Great Salt Lake, Anjchi Lin, Associate Professor of Civil Engineering at U of U, described his study of the transport processes within the lake.

Erosion control during highway construction was the subject of the next report by C. Earl Israelien, Associate Professor of Civil Engineering at USU. He noted that the UWRL has just completed a manual for erosion control practices which is being distributed nationally by the Highway Transportation Board. An improved method for estimating water runoff from small urban watersheds was next reported by A. Leon Huber, Research Assistant Professor at UWRL, followed by a discussion of experimental weather modification by Geoffrey E. Hill, Research Associate Professor at USU. The final report was given by James H. Reynolds on the treatment of municipal waste using intermittent sand filters.

Where are We Going in Research

At a panel discussion held in conjunction with the Citizens Advisory Council meeting in Logan, Utah, September 17, 1976, Dean F. Peterson, Vice-President for Research at USU, presented his views concerning the nationwide trends in water resources research. He indicated that many today have a preoccupation with the application of research results and attempt to accelerate and perhaps even "force" the utilization of research findings faster than is actually needed. He said there is also a growing skepticism about the usefulness of research.

Impact of Regulation

Much of this, Dr. Peterson said, comes about as one of the impacts of regulation. He indicated the legislation passed by the "environmental" congress of the late 1960's had been translated by bureaucrats into unreal and unnatural rules and regulations, and the issuing of standards that make no sense. He cited the zero discharge of pollution into water courses as an example. Dr. Peterson further indicated that interest in research has waned since 1959 and he felt the recent marriage of OWR to saline research was unfortunate and would further reduce the effectiveness of water resources research.

Dr. Peterson has many years experience in water related research and administration and is respected both nationally and internationally for his keen insight into the problems of water resources development and use.

Other Panelists

Other panelists who presented perspectives from other points of view were Wade H. Andrews, Chairman of the Institute for Social Sciences Research in Natural Resources at USU; Jay M. Bagley, Professor of Engineering at USU; and Chandler P. St. John, Supervisor of Wasatch National Forest.
Corporate Boundary Perspective 
Limits Efficient Use of Water

Communities might save a lot of money, solve water shortage problems and improve fire protection by cooperative regional planning for municipal water development.

A model for doing the planning has been developed by engineers at the Utah Water Research Laboratory, Utah State University. It uses 23 Cache County communities for study purposes, but is applicable to any area, says Trevor C. Hughes, associate professor at UWRRL.

Worth Billions

"Nationwide, good regional planning could take advantage of cost savings that would be worth billions of dollars," Hughes says.

But what Hughes calls "the corporate boundary perspective" limits what can be done to effect such saving at present.

Parallel pipe lines and other facilities connecting a single water source with several communities are results of limited planning.

In many cases, one community develops all the local high quality water sources such as spring flow and wastes what it doesn't use. A neighboring community may at the same time be searching for more water.

Integer Programming

Using a procedure called integer programming, Hughes and his coworkers have developed a systems approach that is easily adaptable to any region. Hughes says it is also simple enough to be used by planning engineers who are not mathematical programming specialists.

The model's main objective is to find out how water can be supplied at least cost. The water savings and improved fire protection through improved water supply are side benefits.

Seeking lowest cost, the computer model considers scores of constraints such as seasonal demand, capacities of pipes, wells and springs, and variables such as developing new sources, changing capacities or population shifts.

It considers all of these variables simultaneously and finds the least expensive ways to develop water systems.

"Preliminary runs using information from the Cache County communities indicate, for example, that several communities should interconnect their water supplies to save money," Hughes said.

Social Problem

The work of the UWRRL engineers gets at the engineering and technical problems of regional planning.

A remaining problem is the social-legal institutional one, Hughes says.

"At present municipal water supply systems are planned on the basis of individual corporate boundaries. Planning engineers are expected, indeed are usually directed, to limit the scope of their studies to the existing city boundary. City fathers typically are not interested in the interconnection between their water supply and that of other communities," he explains.

He noted that this is understandable since regional planning costs money and individual cities don't want to pay for planning for areas beyond their present or probable future boundaries.

Regional Planning Limited

Also, there are some statutory limitations on such planning in Utah and some other areas.

Regional planning efforts supported by state planning agencies and financed by the federal government are limited by county boundaries, rather than natural hydrologic basins, and are too general to be of value for water supply planning, the USU engineer adds.

Dean F. Peterson Leaves
University to Seek New
Career in Washington

The former dean of the College of Engineering and present vice president for research at Utah State University has left his Logan base after 19 years at the university.

It won't be his first departure, nor will it be his first assignment with the Agency for International Development. And it won't be Dean F. Peterson's first stay in Washington, D.C.

Dr. Peterson, an international authority on water resources, will assume a soil scientist post with AID in its Technical Assistance Bureau, Agriculture Division. He will supervise programs in research and technical assistance in soils, water, fertilizers and bio-fixation of nitrogen.

The popular professor and administrator, whose background is filled with assorted high level assignments, is listed in "Who's Who in America," "Who's Who in the West," "Who's Who in Engineering" and "American Men in Science."

He has been honored by election to the National Academy of Engineering and as an honorary member of the American Society of Civil Engineering, that body's highest honor.

He performed his first consultancy for AID in 1956, dealing with irrigation management in Afghanistan, Ceylon, India, Iran, Jordan, Lebanon, Pakistan, Turkey and Yemen. For the next four years, he conducted irrigation practices seminars on a global basis.

In 1966, Dr. Peterson went to Washington, D.C., where he was a technical assistant to the White House in the Office of Science and Technology dealing with federal water research coordination and the salinity of the Lower Colorado River.

The native of Delta, Utah, holds a bachelor of science in civil engineering degree from Utah State University. He has masters and doctor's degrees in civil engineering from Rensselaer University.

Dr. Peterson has served on advisory committees to the U.S. Department of Agriculture and to private industry. He has been chairman of the Universities Council on Water Resources, the National Science Foundation Advisory Panel on Weather Modification, and the Rocky Mountain Section of the American Society for Engineering Education, and has held numerous other professional

Aquarius

a newsletter for the
Utah Center for Water Resources Research
Utah Water Research Laboratory
Utah State University

Glen L. Taggart, president USU
L. Douglas James, director UWRRL and C.W.R.L.
Mardyce Matthias, secretary UCWRRL
Frank W. Haws, editor
Donna Falkenburg, editor

We invite you to submit your news items for inclusion in the Aquarius Newsletter. The letter will be sent free of charge to those requesting it.

Continued on page 5
**International Conference on Terminal Lakes**

Utah Water Research Laboratory in cooperation with Weber State College and the Utah Geological Survey is sponsoring an International Conference on Domestic Terminal Lakes to be held on the campus of Weber State College next May 2-5, 1977.

The conference chairman is Deon C. Greer, Chairman of the Geology-Geography Department at Weber State, who says, "We are hopeful of having the world's outstanding authorities on terminal lakes in attendance at these meetings. We have already made arrangements to bring several visitors from the USSR and Israel, and we hope to interest visitors from other countries as well."

The conference will consist of several sessions and papers will be read on the following subjects: lake level control and hydrology, brine chemistry, manufacturing application of brine chemicals, historic climatology and lake level prediction, and solar energy and other innovative uses of terminal lakes.

Those interested in receiving further information or in presenting papers should contact Deon C. Greer, Conference Chairman: Department of Geology-Geography, Weber State College, Ogden Utah USA 84408; or telephone (801) 399-5941 extension 260.

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**Utah Water Users Plan Annual Workshop**

The Utah State University Extension Service in cooperation with the Utah Water Users Association has announced the topics to be discussed at the next annual workshop to be held January 19, 20, 21, 1977 at Utah State University. Designed as a three-day refresher course for agricultural water users, the workshop this year will feature outstanding leaders from the water management field who will answer such timely questions relating to storage dams as: could a failure like the one that resulted in the Teton Dam disaster happen in Utah? What is happening with regard to safety requirements and inspections?, and are storage rights being challenged because of safety regulations?

Another topic of interest will center around the "208" studies presently being implemented as part of Public Law 92-500. The effect of these studies on agricultural water users will be highlighted.

The universities' role in providing for the needs of food production through improved irrigation practices throughout the world will also be discussed.

Pre-registration forms and information on housing and other facilities can be acquired by writing to the Conference and Institution Division, Utah State University, UMC 01, Logan, Utah 84322.

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**Aquarius to Publish Popular Version of Research**

The Citizen's Advisory Council for Water Resources spent some time at their recent meeting held at the UWRL on September 18, 1976, discussing ways in which the research knowledge generated by the various research groups in the state could be transferred to the non-technically trained users. Council member Charles Wilson, Superintendent of the Salt Lake City Water Department, led the discussion about this "technology transfer" problem and indicated a need for some kind of publication written in lay language and directed to the practical grass roots citizen. A further need exists to present in understandable fashion the current water issues and research needs. The council praised the work of Utah Science, a publication of the Agricultural Experimental Station, and suggested a format similar to that might be used to popularize water research. The council agreed that Aquarius could also possibly fulfill some of these needs.

Following the Citizens Council recommendations, the editors of Aquarius met with Director Douglas James and decided to issue a popularized publication series presenting current issues and the results of recent studies dealing with selected topics of interest. The first issue is scheduled to appear in May, 1977, and will address the management of the Great Salt Lake.

Other topics already suggested for future issues include institutional problems in Utah water management, small water supply systems, water modifications, water for coal and oil shale development, hydraulic modeling, water salvage and reuse, Federal and State roles in Utah water management, and land use in mountain watersheds. Readers of Aquarius are invited to mail comments on the appropriateness of any of these topics or suggest other issues for consideration.

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**PUBLICATIONS**

PBWG138 "A Technique for Predicting the Aquatic Ecosystem Response to Weather Modification" is the title of a UWRL project report recently completed by Eugene K. Israelson, David R. Bernard, Thomas M. Tweek, and Henry M. Runke.

In the past considerable effort has been spent on the development of techniques for increasing precipitation from clouds by seeding. Little attention has been given to identifying and evaluating the impacts of these activities on the aquatic ecosystems. The objective of the study covered in this report was to apply simulation techniques to predict the impacts of cloud seeding on the aquatic ecosystem within the area subject to weather modification.

A small mountain watershed near Logan, Utah, was selected for the study. A hydrologic and water temperature model was calibrated to the watershed to predict the change in water temperature and stream velocities from arbitrary increases in the snowpack. The predicted velocities and temperatures were used to link the hydrologic system to the aquatic ecosystem. Results of the study indicate trends which might be expected if various decreases of water temperature and increases in stream velocity were to occur.

Copies of the publication are available from the Utah Water Research Laboratory, UMC 82, Logan, Utah 84322, for $3.00 each.

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**Dean F. Peterson**

Continued from page 2 offices. He is a captain in the naval reserve and has been active in scouting.

From 1958 to 1969, Dean Peterson served as director, Office of Water for Peace in the U.S. State Department, functioning as a special assistant to the Undersecretary of State for Political Affairs, responsible for coordination and international leadership in the water resources area. So, the Petersons knew the D.C. area well and are looking forward to returning to the nation's capital.

"My interest has been in the international area for some years. I've been at Utah State University for a long time, and this will give me a chance to get into a second career."

"Besides retirement is coming up for me here, and I can't face all those retirement parties," Dean Peterson quipped.
News Notes

UWRL staff members continue to travel and meet with others to promote the interest of better research. Omitted from our list of travelers in the last issue was the name of Dr. V. Dean Adams, who presented a paper before the American Chemical Society in San Francisco last August. His paper was entitled, "Naturally Occurring Trace of Organic Compounds in Mountains, Streams, Freshly Fallen Snow, and a Eutrophic Lake." We really didn't intend to forget you, Dean. Others who are on the go include Dan Filip who presented a paper entitled, "Utilization of Algae Laden Intermittent Sand Filter Scrapings" before the American Society of Agricultural Engineers in Chicago; and A. Bruce Bishop who presented a paper at a Rockefeller Foundation sponsored conference in San Diego, California, which was concerned with the United States-Mexico border resources development program. Bishop's paper was entitled, "Impact of Energy Development on Colorado River Water Quality." Also, at a forum sponsored by Resources for the Future on the impacts of energy development on fish and wildlife in the Colorado River, Dr. Bishop presented a paper entitled, "Physical and Ecological Aspects of the Upper Colorado River Basin in Relation to Energy Development." Also presenting a paper was David Bowles who spoke at the AGU meetings in San Francisco.

Other busy people include Geoffrey Hill who went to Boulder, Colorado to do further research; Kirk Kimball and Lance Revig who attended the Colorado River Water Users Association convention in Las Vegas; and Director L. Douglas James who was in Washington, D.C. to chair a National Academy of Sciences panel on flood plain information.

Associate Director Calvin Clyde attended a meeting of the ASCE task force on research held in St. Louis, Missouri; Mardyne Matthews attended the OWRT Administrative Coordinators meeting in Denver, Colorado; and J. Paul Riley, A. Bruce Bishop, John E. Keith, and Jay C. Andersen returned from Africa where they participated in a study of finances and cost allocation of water resources development on the Senegal River.

UWRL Building Budget Discussed

State Representative Ray Nielsen, and Vice President for Business at USU, Dr. W. Boyd Christensen, recently discussed budgeting procedures before the joint council meeting held at UWRL in September. Dr. Christensen explained the USU budget process and listed 17 separate steps required before final budget approval. He placed particular emphasis on the budget process for capital facilities requests which include new buildings. Representative Nielsen traced the same process through the governor's office and on to the legislature.

Of particular concern to the council is the need to complete the physical facilities for the UWRL. One portion of the building which was planned for small laboratories and additional offices was not completed at the time the building was erected in 1962. The need for this space has intensified in recent years, and efforts are being made to seek an appropriation from the next session of the Utah Legislature.

Representative Nielsen and Vice President Christensen explain budget process to Council.

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