

# Aquarius



UTAH CENTER FOR WATER RESOURCES RESEARCH - UTAH WATER RESEARCH LABORATORY

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## OWRR Selects Additional 10 For Funding

Secretary of the Interior Rogers C. B. Morton has announced the selection of 10 additional research projects for inclusion in the fiscal year 1974 water resources research program authorized under Title II of the Water Resources Research Act of 1964.

One of the 10 projects was for the Council of U.S. Universities for Soil and Water Development in Arid and Sub-Humid Countries (CUSUSWASH), of which USU is a member, to study "Water Production Functions and Predicted Irrigation Programs as Required for Water Resources Planning and Increased Water Use Efficiency."

This research involved methodology for estimating water production functions and related irrigation programs. The investigation will develop guidelines for predicting and planning such programs to achieve effective water allocations and increased water use efficiency in irrigated agricultural land. The award was for \$150,000.

Title II program—administered by the Office of Water Resources Research—provides funds to support the work of highly skilled and knowledgeable water research organizations and individuals, both academic and non-academic, in undertaking research into any aspects of water resource programs related to the mission of the Department of the Interior.

With the addition of the 10 new projects to those previously announced, a total of 43 research projects now comprise the FY 1974 Title II research program.

## E. J. Middlebrooks Named Dean of USU Engineering



E. J. MIDDLEBROOKS . . . Named Dean of College of Engineering at USU.

Dr. E. Joe Middlebrooks, Head of the Division of Environmental Engineering at USU, has been named Dean of the College of Engineering by the Institutional Council of USU.

Dr. Middlebrooks is professor of Civil and Environmental Engineering and is active in research at the Utah Water Research Laboratory.

He joined the USU staff in 1970. Prior to that he was at the University of California at Berkeley. He has also taught at Mississippi State University, the University of Florida, and the University of Arizona.

He received the B.C.E. degree in 1956 and the M.S.E. degree in 1960 from the University of Florida, and the Ph.D. degree from Mississippi State University in 1965.

## Five-day Water Resource Systems Short Course Planned August 5-9 At Utah State University

A five-day short course "Multi-Objective Analyses of Complex Water Resource Systems" will be held at Utah State University August 5-9, 1974.

Guest instructor will be Dr. Yacov Y. Haimes, who is an Associate Professor of Engineering in the Systems Engineering Department, School of Engineering, Case Western Reserve University.

Guest lecturers will include: Dr. Warren A. Hall, Director, Office of Water Resources Research, U.S. Dept. of Interior, and Dr. Gary Cobb, Assistant Director, U.S. Water Resources Council.

The short course, designed for engineers, planners, and public officials, should provide participants with basic knowledge of systems analysis and simulation, particularly as applied to water

resource systems; provide participants with some appreciation of the capabilities and usefulness of systems analysis techniques in water resource planning, and present the state-of-the-art in the field of multi-objective systems analysis in relation to planning, development, and management of water resource systems.

Classes will be conducted morning and afternoon of each day. Two optional evening "tutorial" sessions will also be available to those participants who are interested in asking additional questions and in working individually with the instructor.

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# Great Salt Lake Comprehensive Management Study

By Reed T. Searle,

Research Analyst, Legislative Council

(Editor's note: Presented at the USU Water Resources Research Council and Advisory Panel Meeting)

The Great Salt Lake is the world's 33rd largest lake—the United States' largest salt water lake, and one of Utah's most valuable physical features.

Economically, the present amount of minerals in the Great Salt Lake is estimated at 5 billion tons with a value assessed at over 90 billion dollars. The socio-economic value of the marshes sustained by the lake is incalculable. Tourists by the thousands visit the Great Salt Lake each year although the majority of them leave in disappointment over the lack of facilities and accommodations at the lake.

As a water resource, the lake contains at this time approximately 14.5 million acre feet of water. One century ago in 1873 it held approximately 2.5 times that amount or 32 million acre feet. The level of the lake, its volume, and its density fluctuate widely, not only annually but monthly.

As man has built beaches, docks, hotels, and resorts on the lake, the shoreline has receded leaving them high and dry. As new areas are found for beaches, the waters are discovered to be highly polluted. As man has built extractive industries, the concentration of the minerals has decreased threatening the viability of those industries. As one problem is solved another occurs and thus the lake continues to be wrought with problems and conflicts.

In the face of court battles over a few of these conflicts, the Utah Legislature is again attempting to develop a lake management system along with some directives in order to cause the realization of the lake's potential.

## From Where Has Come The Present Concern

Southern Pacific Railroad, pursuant to an easement obtained from the State of Utah in 1956, constructed an earth fill causeway across the northern part of the Great Salt Lake to replace the trestle that earlier had been used to support the railroad tracts. The cause-

way is solid fill across the lake, except for two 15 foot wide culverts. As a result, the lake has been divided into two separate parts or arms, restricting, and in many instances preventing travel by watercraft between the two arms of the lake.

The minerals in the brines of the northern arm have become more concentrated while those in the southern arm have been diluted. This arises in part because the tributary inflow of fresh water to the southern arm is much greater than the northern, and the causeway serves as a barrier to prevent an equalization of minerals in the brines. As a consequence, the southern arm has become less productive for the extraction of salts and minerals from the brines.

Suits have been filed against Southern Pacific Railroad in both state and federal courts by south arm industries but they have not yet succeeded in obtaining legal relief. Thus, those industries looked to the political forces in the state for relief.

On July 5, 1972, the Attorney General issued an opinion to Governor Rampton, at his request. In brief, the opinion issued by the Attorney General stated that the state could compel Southern Pacific Railroad to modify the causeway in order to restore the equilibrium of the lake. The matter was referred to the Legislature.

When pressed by attorneys of the south arm industries to order the modification of the causeway, the Attorney General raised a question as to whether the overall public interest of the state would actually be advanced by requiring modification of the causeway. That question was also referred to the Legislature and that body has determined that studies and research thus far completed have not adequately addressed the question as to whether total ultimate mineral production from the lake will be enhanced or jeopardized by restoring a balance of mineral concentration in the two arms of the lake. That, then, is an extremely important question which must be answered adequately before the Legislature will order that the causeway should or should not be modified.

The Utah Geological and Mineral Survey was asked to prepare a report concerning this question. Essentially, the report indicated that further research, analysis, and tests were needed, that there was no way anyone could definitively conclude from present data that the total interest of the state would be advanced by modifying the causeway. The staggering importance of the mineral resources of the lake dictate that research and study be carried out to determine whether or not the causeway should be modified. The quick decision made by the state which allowed the construction of the causeway with its unexpected result has stirred legislators to realize that it would be inane to confine, limit, or restrict the research to the immediate implications of the causeway.

Currently, an interagency technical team, made up of 38 state, federal, and local agencies, is identifying all relevant past and ongoing research and summarizing all existing research data and findings into a single document. They are also identifying the many research gaps. In addition, a Great Salt Lake Policy-Advisory Committee is being appointed. These two bodies will ultimately be responsible for recommending to the Legislature broad and specific goals, objectives, and policies to be followed in the management and development of the Great Salt Lake in the near and distant future. They will also advise the Legislature as to the institutional arrangements that should be created to plan, manage, and control the development and utilization of the lake and its resources.

The general objective of research with respect to the Great Salt Lake is to develop a body of knowledge and a group of research systems which will provide a basis for effectively predicting the present and future social, environmental, and economic utilities of the lake for alternative land-lake use proposals.

The questions that are important for research to answer are many. What will be the social and economic impacts of various possible changes in the lake's physical and hydrologic system? What will be the effects on water quantity

# Great Salt Lake

and quality of various diking proposals or from other possible internal structures? What are the social, economic, and environmental impacts both pro and con of various commercial and economic activities? These are the "what if" questions. The Legislature is also concerned with the specific questions such as: What are the environmental and economic relationships of existing and potential uses of the lake including recreation, water use, industrial development, wildlife management, and so forth? Is fresh water storage in the lake feasible and if so is it worth the cost? Is Farmington Bay safe for swimming? What is the limit on upstream water use to maintain the downstream water quality necessary for the successful operation of existing waterfowl migratories? For how long can certain minerals be extracted from the lake at their present rate? Does Utah have or can it develop a market for raw minerals which have extractive potential for the lake?

Political questions are also numerous. What should be the water priorities? Is it desirable to insure that a certain portion of tributary water research is for the Great Salt Lake or are urban, industrial, and agricultural uses higher priority? Should waters be treated before they enter the Great Salt Lake or is it a waste of money to treat waters that flow into the lake just so someone can swim in it? Besides swimming, what else should be considered in regard to the water pollution question?

The question of greatest and most immediate concern to the Legislature is what kind of institutional arrangements should be created to plan for, manage, and control the utilization and development of the lake? There are no less than 15 state divisions which have some kind of exclusive authority over certain aspects of the Great Salt Lake. How can these be coordinated or organized or directed so as to insure the proper implementation of a master plan or plans?

There are no less than 10 state organizations which a legislative mandate to undertake lake related research. How can these be coordinated and organized to produce the needed facts and analyses?

# NEWS NOTES

Donald B. Porcella was recognized as the "Outstanding Researcher of the College of Engineering" at USU's annual Engineers' Week banquet held at the University Center February 22.

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Joel E. Fletcher addressed the Northern Utah Grain Growers Association on "The Use of Cloud Seeding for Lightning Suppression, Hail Suppression, and Water Augmentation in Western United States" February 19. He also attended a meeting in Tremonton, Utah, sponsored by the Bear River RC&D Project to discuss weather modification potentials with farmers and ranchers from East Elko County, Nevada; Box Elder, Cache, and Rich Counties, Utah; and Oneida, Franklin, and Cassia Counties, Idaho.

Dr. Stanton J. Ware, Water Research Scientist at the Office of Water Resources Research recently visited the Utah State campus and water research scientists here and reviewed the program of the Utah Center. Dr. Ware also visited Brigham Young University and Weber State College.

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JeDon Emenhiser, Acting Dean, College of Humanities, Arts and Social Sciences, and John Neuhold, Director of the Ecology Center were recently appointed to the University's Water Resources Research Council. Dr. Irving S. Dunn, Acting Dean of the College of Engineering was named as Chairman of the Council succeeding Dr. Dean F. Peterson.

# Resources Council, Panel Meet

The USU Water Resources Research Council met in joint session with their statewide Advisory Panel November 7 to discuss research now in progress, current resources problems, and to give research direction to the water resources program of the University.

Dr. Jay M. Bagley summarized current water research, and Drs. William J. Grenney, J. Paul Riley, E. Joe Middlebrooks, and Trevor C. Hughes discussed four state research projects for which they are principal investigators.

Mr. Reed Searle, Project Director, Legislative Council, presented an overview of the Great Salt Lake Manage-

ment Plan, and Douglas Kirk of the State Planning Coordinator's offices discussed the planning function in Utah.

Members of the citizen advisory panel are: Angus Belliston, Vice-President, Zion's First National Bank, Provo; J. R. Bingham, Vice-President, Terracor Corporation; Mrs. Eugene L. Bliss; LaVaun Cox, Executive Director, Utah Petroleum Council; Wayne Criddle, Clyde-Criddle-Woodward, Inc.; Frank Davis, Manager of Engineering and Construction, Utah Power and Light Company; Ival V. Goslin, Executive Secretary, Upper Colorado River Commission; Gordon E. Harmston, Executive Director, Department of Natural Resources; Leonard Johnson, Assistant Director, Natural Resources Department, American Farm Bureau Federation; Chandler P. St. John, Forest Supervisor, Wasatch National Forest; Lynn M. Thatcher, Director, Division of Environmental Health; Charles Wilson, Head, Salt Lake City Water Department, all Salt Lake City; Dixie Leavitt, Cedar City; Lynn S. Ludlow, General Manager, The Central Utah Water Conservancy District, Orem; Homer U. Peterson, Delta.

## AQUARIUS

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

Glen L. Taggart ..... President, USU  
Jay M. Bagley ..... Director  
Anne P. Humble ..... Admin. Coordinator, UCWRR  
Donna Falkenborg ..... Editor

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

## New UWRL Publications Announced

Recently completed publications at the Utah Water Research Laboratory include:

PRWG100-5 "Interregional Planning of Water Resources Allocations by Systems Analysis Approach, A Summary Report," by John E. Keith, Jay C. Andersen, Alton B. King, Mark H. Anderson, Thomas C. Anderson, Calvin G. Clyde, and Daniel H. Hoggan. July 1973. (\$2.00)

PRWG105-1 "Effects of Temperature on the Toxicity to the Aquatic Biota of Waste Discharges—A Compilation of the Literature," by E. Joe Middlebrooks, M. J. Gaspar, R. D. Gaspar, J. H. Reynolds, and D. B. Porcella. October 1973. (\$3.00)

PRWG66-1 "Sorption Kinetics: Part 1, A Laboratory Investigation of Six Proposed Rate Laws Using Batch Reactors," by David W. Hendricks and Laxman G. Kuratti. July 1973. (\$3.00)

PRWG66-2 "Sorption Kinetics: Part 2, Modeling Longitudinal Concentration Profiles in a Packed Bed Reactor," by David W. Hendricks. July 1973. (\$3.00)

PRWG79-1 "A Study of Water Institutions in Utah and Their Influence on the Planning, Developing, and Man-

aging of Water Resources," by Frank W. Haws. September 1973. (\$2.50)

PRWG103-1 "Integrated Measurement of Soil Moisture by Use of Radio Waves," by Duane G. Chadwick. November 1973. (\$2.00)

PRWG104-1 "Computer Simulation of the Hydrologic and Salinity Flow Systems within the Bear River Basin," by R. W. Hill, E. K. Israelsen, and J. Paul Riley. 1973. (\$3.00)

PRCWRR816-1 "Preliminary Indicators of Income/Wealth Redistribution Associated with Bureau of Reclamation Projects," by Reed Willis, Allen LeBaron, Herbert Fullerton, Department of Economics, USU. October 1973. (\$2.00)

PRJER025-1 "Social, Economic, Environmental, and Technical Factors Influencing Water Reuse," by A. Bruce Bishop, Suravuth Pratishtananda, John Keith, Craig Colton, and A. Berry Crawford. December 1973. (\$2.00)

PRJEW115-1 "Evaluation of Techniques for Algae Removal from Wastewater Stabilization Ponds," by E. Joe Middlebrooks, Donald B. Porcella, Robert A. Gearheart, Gary R. Marshall, James H. Reynolds, and William J. Grenney. January 1974. (\$2.00)

PRJEW115-2 "Intermittent Sand Filtration to Upgrade Existing Waste-

## Middlebrooks Elected APEE President

Dr. E. Joe Middlebrooks was recently elected President of the Association of Professors in Environmental Engineering. Dr. Middlebrooks is Professor and Head of the Division of Environmental Engineering, College of Engineering.

The Association of Environmental Engineering Professors (formerly American Association of Professors in Sanitary Engineering) is a private non-profit organization founded in 1963. Its objectives are to strengthen and advance the fields of Sanitary and Environmental Engineering through cooperation among members of the academic profession.

The Association currently has a representation of some 90 universities, representing greater than 95 percent of the Sanitary and Environmental Engineering programs in the nation.

water Treatment Facilities," by Gary R. Marshall and E. Joe Middlebrooks. February 1974. (\$2.50)

PRWG136-1 "Modeling the Eutrophication Process," Workshop Proceedings edited by E. Joe Middlebrooks, Donna H. Falkenberg, and Thomas E. Maloney. November 1973. (\$3.00)

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