

# ARIZONA WATER RESOURCES NEWS BULLETIN

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## MEETINGS HELD AT FLAGSTAFF

A number of highly interesting research papers were presented April 19-20 at the Joint Annual Meeting of the Hydrology Section, Arizona Academy of Science, and the Arizona Section, American Water Resources Association. The sessions were held on South Campus at Northern Arizona University. Abstracts of papers given at the AWRA Section meeting will appear in the next two issues of the Arizona Water Resources Project Information Bulletin.

New officers elected for the Arizona Section of AWRA were as follows: President, Ron Boster, Resource Economist at the Rocky Mountain Forest and Range Experiment Station, Tucson; Vice President, Marvin Murray of the College of Engineering and Technology, Northern Arizona University; and Secretary-Treasurer, Bob Gale, Hydrologist for the Tonto National Forest, U.S. Forest Service, Phoenix. Editors of the AWRA Newsletter, appointed for the coming year, are Bert Thomsen of the U.S. Geological Survey, Phoenix, and Linda White of the Department of Watershed Management, University of Arizona.

## NEW PROJECT FOR UA-HUNGARIAN JOINT RESEARCH

The pace of the University of Arizona cooperative research in water resources with Hungary is being stepped up by the team of University of Arizona and Hungarian scientists. Implementation of theoretical studies of decision models under uncertainty will be made for a case study in the Debrecen water district in Hungary. Water resource problems in the district will be studied from the system viewpoint to provide a plan for optimal development in this district. The plan will coordinate demands for irrigation, urban water supply, salt build-up and drainage, and flood protection. A novel system of seasonal pumped water storage will be among the alternatives evaluated. This storage method pumps water from the river, whose source is in a neighboring country, to a reservoir in the Hungarian foothills where it is conveniently available as needed for irrigation or low flow augmentation.

The Debrecen area is semiarid with precipitation just slightly above that of southern Arizona. However, the population density is much higher than that of Arizona. The Arizona scientists expect that the techniques developed in this case

study will provide valuable insight and methodology for handling Arizona's water resources as the state becomes more populated. In fact, the Debrecen area involves transfer of large quantities of water as in the Central Arizona Project.

Four scientists from the University of Arizona and four Hungarian counterparts have taken part in this research, which includes familiarization trips to Hungary for the University of Arizona scientists and to Arizona for the Hungarians. These scientists were assigned from the University of Arizona: Lucien Duckstein (Department of Systems and Industrial Engineering), Martin Fogel (Watershed Management Department), Donald Davis (Department of Hydrology and Water Resources), and the late Chester Kiesel (Department of Hydrology and Water Resources). The Hungarian members of the group are: István Bogárdi of the Water Resources Center, Ferenc Szidarovszky of the Eötvös University of Budapest, Miklós Domokos of the Center for Hydrologic Research, and László David of the National Water Authority.

Other contributing University of Arizona scientists are: Jean Weber (Management Department), Sidney Yakowitz (Department of Systems and Industrial Engineering), and John Thames (Watershed Management Department). Students who have been working on the project, which is supported by a three-year, \$61,630 grant from the National Science Foundation, are quite enthusiastic about the problems attacked and methodologies developed. A list of papers written jointly is available from the Systems and Industrial Engineering office, Extension 1513 or 1511, University of Arizona, Tucson.

## PUBLICATIONS PERTINENT TO ARIZONA AVAILABLE

*Proceedings of the Nebraska Irrigation Short Course* (January 14-15, 1974) have been published by the University of Nebraska, Extension Service, Lincoln, Nebraska 68503. Topics of special interest include "Extracting Nitrates from Ground Water," "Irrigation Management to Save Water and Energy," "Sprinkler Application of Liquid Wastes from Holding Ponds," and "Re-Use Systems."

*Remote Sensing and Water Resources Management* is a collection of papers presented at a recent symposium sponsored by the American Water Resources Association dealing with a wide range of water resource areas. The purpose of the



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Symposium was to examine the application of remote sensing techniques to water resources management and research problems. Both airborne and satellite acquired data were considered for their application to water quality and quantity monitoring. While remote sensing methods for water temperature, land use, etc., were found to be well established, the Symposium showed that developing techniques for remote sensing of water quality and biological parameters showed promise. The hard-bound book is available for \$15.00 from the American Water Resources Association, Urbana, Illinois 61801.

*Evaporation Suppression: A Bibliography* was produced by the Water Resources Scientific Information Center (WRSIC), Office of Water Resources Research, Washington, D.C. The publication references over 340 publications dealing with evaporation suppression from worldwide sources. The document is available from the National Technical Information Service, Springfield, Virginia 22151.

*The Status of Arizona's Environment, 1973* is a summary report encompassing the status of air pollution, water pollution and sanitation in Arizona as of December, 1972. The report was prepared by Environmental Health Services of the State Health Department and is intended to promote a better understanding of efforts and progress in these areas.

*Arizona Land Marks* published by the Arizona State Land Department is the 61st annual report issued and covers the FY 1972-73 activities. The report provides an excellent overview of each Division's activities. One Division Arizonans may not be fully aware of is the Forestry Division. The goals and objectives of the Division are stated as follows:

To develop the timber lands of the trust for maximum long-term production and use while increasing revenue-producing capabilities of the land.

To obtain intensive management for privately-owned timber land by providing assistance for the prevention, detection, and control of forest insects and diseases, and by assisting rural and urban communities with tree planting programs.

To improve watersheds, forage and water yields with good management practices.

The State forestry program in conjunction with the forest cooperative timber management program provides professional and technical assistance and advice to private land owners within the State in the development of sound resource

management programs. This consists of about 10 million acres for timber and woodland management which includes desert woody plants. During the past year the Forestry Division updated the management plans and State forestry programs, and in accordance with the plans two million board feet of timber were sold.

### WATER RECYCLING SYSTEM

A water recycling system for domestic use, designed by Gregory E. Maksi, Assistant Professor of Mechanical Engineering Technology at the State Technical Institute at Memphis, was demonstrated recently to State Department officials in Washington as a possible answer to some of the water deficiencies facing developing nations.

The 800-gallon capacity unit is said to lose only one percent per day of the wastewater it handles. The first phase is passage of the wastewater to an aerobic digestion unit for removal of organic matter. Additional solids separation takes place in a filter unit for removal of organic matter. Additional solids separation takes place in a filter tank. The residual liquid is introduced to a semipermeable membrane for final purification. Maksi says that the technique can be adapted to industrial use, and may also have application in the space program.

### PRESIDENT NIXON PROPOSES \$7 BILLION FOR FISCAL 1975 ENVIRONMENTAL PROGRAMS

The President's budget request for FY 1975 for environmental programs is approximately \$7 billion, an increase of \$1.7 billion over 1974.

The largest portion of environmental expenditures is for pollution control and abatement activities. This reflects the expansion of the construction grants program for sewage treatment facilities under the 1972 Water Pollution Control Act (Public Law 92-500). The outlays for such grants will be \$3.35 billion, 70 percent of all pollution control and abatement activities. While the construction grant program is the largest component of this category, it is only one of a number of programs to fight pollution conducted by 15 Federal agencies. Other abatement and control activities are reflected in Table 1.

TABLE 1  
POLLUTION CONTROL AND ABATEMENT ACTIVITIES BY FUNCTION  
(in millions of dollars)

Type of Activity	Budget Authority			Outlays		
	1973 actual	1974 estimate	1975 estimate	1973 actual	1974 estimate	1975 estimate
Financial aid to State and local governments*	7,242	4,362	371**	908	2,282	3,632
Research and development	599	688	735	489	644	719
Federal abatement and control operations	217	263	297	215	265	304
Manpower development	16	13	11	14	13	12
Reduce pollution from Federal facilities	311	270	321	174	344	392
Other pollution control and abatement activities	135	171	194	125	166	204
Total	8,521	5,768	1,929	1,925	3,714	5,263

\*These figures include water and sewer programs of the type funded by FHA and OEO.

\*\*Contract authority for the EPA in 1975 was made available in 1974 as provided by law, and therefore appears in the 1974 column for Budget Authority instead of the 1975 column.

Among the media, water receives the greatest share, largely as a result of grants and loans for construction of municipal water treatment facilities. (See Table 2.)

**TABLE 2**  
**POLLUTION CONTROL AND ABATEMENT**  
**ACTIVITIES – BY MEDIA OR POLLUTANTS**  
(in millions of dollars)

Media or Pollutants	Obligations		
	1973 actual	1974 estimate	1975 estimate
Media polluted:			
Water:			
Construction grants and loans . . . . .	3,299	4,478	5,159
Other . . . . .	431	561	696
Air . . . . .	461	630	701
Land . . . . .	61	62	66
Other (e.g., living things, materials) . . . . .	293	279	292
Multimedia (i.e., more than one of above) . . . . .	<u>131</u>	<u>114</u>	<u>145</u>
Total . . . . .	4,676	6,124	7,059
Selected pollutants:*			
Solid wastes . . . . .	150	198	200
Pesticides . . . . .	61	68	71
Radiation . . . . .	181	192	236
Noise . . . . .	66	88	62

\*Funds for selected pollutants are included in the "media" breakdown above.

**NATIONAL WATER COMMISSION**  
**CHAPTER REVIEW**

The September-October, 1973 issue of the Water Resources News Bulletin detailed the objectives of the National Water Commission. Important recommendations were set forth by the Commission in mid-June, 1973. The Commission report is available from the Superintendent of Documents, Washington, D.C., setting forth seven basic themes:

1. Future increasing demands for water are not inevitable, but are very much in the control of society through its policies.
2. Regarding national policies, we should shift from water development to protection of water quality.
3. Water use and land-use planning should be very closely coordinated.
4. We should conserve our water supplies.
5. Sound economic principles should be the key to project evaluation.
6. It is time to review and update water laws, both federal and state.
7. Development and management of water supplies should take place at the lowest capable level of government.

This News Bulletin summarizes the more important findings and recommendations relating to theme number four, conservation of water supplies, which is timely for Arizona. The topic is discussed in Chapter 7 of the Commission report titled "Making Better Use of Existing Supplies."

**A Permit System for Riparian States**

The purpose of this section is to set forth principles applicable to a system of regulated withdrawals of water for municipal, industrial, and agricultural use in a riparian jurisdiction while simultaneously providing protection within the

system for instream values having importance to riparian landowners and to the public.

While the Commission asserts that no crisis in water use exists generally in the humid East, it recommends that riparian states direct attention to regulation of water withdrawals before a crisis arises. When competition for water supply intensifies, the court-administered riparian legal system of allocation will not be adequate to meet social needs. It is ponderous, expensive, and uncertain in result. In time, most riparian jurisdictions are likely to require a system of water allocation that facilitates development by providing security of investment while protecting social and environmental values of instream uses. The basic approach is to establish minimum flows to protect such social and ecological values as esthetics, recreation, and the biosphere. The water remaining is subject to development for use in producing goods and services. The basic features of the permit system recommended by the Commission are presented. More important recommendations are:

1. Permits should be required for all withdrawals of water – surface or ground.
2. There should be no restrictions on who may apply for a permit or on the location where water may be used.
3. Permits should be subject to cancellation after a specific period of nonuse.
4. Permits may be limited in time, but initial period should be long enough for the permittee to amortize his investment comfortably, and renewal should be automatic unless the permit agency finds the water is necessary for a higher public purpose.
5. Definite rules for allocating water in periods of shortage should be adopted before shortages occur.
6. Permits should be freely transferable to promote the reallocation of water to more productive uses.

**Reducing Water Losses by Improved Efficiency**

One means of making more efficient use of available water supplies is to reduce losses in existing systems. These losses occur from evaporation, leakage in storage and transmission systems, and careless use of water by ultimate recipients, whether they be farmers, householders, or manufacturers. Not all losses can be eliminated, and not all those capable of being reduced should be, since the value of the water saved should exceed the costs of saving it. Nevertheless, improved water conservation practices give promise of significant savings at acceptable costs.

**Reuse of Municipal and Industrial Wastewater**

This section considers the technological, economic, and managerial problems of wastewater reuse. It should be recognized that reuse occurs at the present time. One-third of the Nation's population currently depends on municipal withdrawals from streams containing, on the average, one gallon of previously used water out of 30 gallons of flow. In some cases, as much as one gallon out of five of municipal water supply has been used before. Ordinarily, these supplies have received only conventional purification.

The rate at which the Nation will move toward greater reuse of wastewater depends on advances in treatment technology, costs, and the indirect consequences of more stringent water pollution controls. Present treatment technology is already adequate to permit reuse of municipal effluents for purposes not involving human consumption. In several localities, municipal wastewater is being treated and recycled directly into a system for reuse for industrial, recreational, and ground water recharge purposes. Many of the changes in

treatment which would be required for direct reuse of wastewater for industrial purposes will be required in any event by higher water quality standards. Direct reuse of industrial effluents will become progressively more attractive. The controlling factor in direct reuse for industrial purposes is the cost of alternative sources of supply. As costs of alternative supplies rise or as quality of wastewater improves, direct reuse should increase materially. When it does, much of the water supply which industry would otherwise use can be released for other purposes, including human consumption.

The prospects for direct reuse of municipal effluent for human consumption depend both upon technology and public acceptance. Existing treatment technology can produce water that meets current federal drinking water standards in terms of physical, chemical, and bacteriological criteria. However, those standards were not designed for application to municipal wastewater effluents. They do not take into account possible toxic ingredients sometimes found in wastewater. As a result, some public health groups are concerned about (1) possible viral hazards, and (2) trace amounts of new chemicals for which possible adverse health effects are not now predictable. These concerns stem both from the unpredictability of effects of reuse for human consumption and from the great difficulty of proper monitoring and operation of waste treatment facilities. At present, most sewage treatment plants are susceptible to breakdown. Presumably, proper design for contingencies, similar to those for water treatment plants, will be necessary if direct reuse for human consumption is to become a reality. If and when these public health concerns are mitigated by further research, large-scale direct reuse of wastewater for human consumption will become a distinct possibility.

Recommendations were:

1. The potential for reuse of wastewaters should occupy a prominent spot in future planning for overall water resource utilization.

2. In regions where a high-quality source of water is used for irrigation of cropped fields or recreation turf areas such as golf courses and a source of treated municipal wastewater is available, arrangements for water exchange should be considered. Nutrient-rich municipal wastewater could be used for irrigation and exchanged for high-quality water which could be used for domestic and industrial use.

3. Direct reuse of water for human consumption should be deferred until it is demonstrated that virological and other possible contamination does not present a significant health hazard. The Commission endorsed the research program proposed by the American Water Works Association.

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University of Arizona  
Tucson, Arizona 85721**

4. The net cost of treatment of water for reuse should be compared with the costs of such alternative sources of water as desalting and interbasin transfers before any such alternative is adopted.

#### UPCOMING EVENTS

The 47th Annual Conference of the Arizona Water and Pollution Control Association to be held at Grand Canyon, Arizona, May 9-10, 1974.

Special Conference on Planning for Water Quality Management to be held at the Center on Environmental Quality Management, Cornell University, Ithaca, New York, June 26-28, 1974.

National Symposium on the State of Drinking Waters to be held at the University of North Carolina, Chapel Hill, September 26-27, 1974.

A three-day workshop covering preparation of Environmental Impact Statements and their use as decision-making tools is offered by the Institute of Man and Science. The program, designed for professionals involved in the assessment of social and environmental impacts, including members of consulting firms, planners and social scientists, will be offered twice. The first session is scheduled for May 28-31; the second for June 11-14. Additional information from Gordon A. Enk, Director of Economic and Environmental Studies, The Institute of Man and Science, Rensselaerville, New York 12147.

Please address your news items or comments on the News Bulletin to any of the three editors:

**Phil Briggs, Arizona Water Commission, Suite 800, 222 North Central Avenue, Phoenix, Arizona 85004.**

**Jim DeCook, Water Resources Research Center, University of Arizona, Tucson, Arizona 85721.**

**Ken Foster, Office of Arid Lands Studies, University of Arizona, Tucson, Arizona 85719.**

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