



ARIZONA WATER RESOURCES NEWS BULLETIN

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IRRIGATION LEADING USE OF NATION'S GROUNDWATER

Arizona ranks in the top 10 among the 50 states in terms of total amount of groundwater pumped and amount of groundwater pumped per square mile of land surface, according to recently compiled U.S. Geological Survey (USGS) data.*

Ranked sixth in total gallons of groundwater pumped (See Table 1), Arizona is ranked tenth among the 50 states in terms of intensity of groundwater use, or total pumpage per square mile of land area (See Table 2).

The rankings are based on 1975 USGS data on national water use and indicate that groundwater development has major significance not only in the arid and semiarid West but in the East and on the island state of Hawaii as well.

With the exceptions of Florida and Arkansas, states listed in Table 1 are in the arid-semiarid West where irrigation agriculture predominates. Table 2, however, includes Hawaii, New Jersey and Massachusetts in addition to Florida and Arkansas.

The groundwater-use intensity data indicate that these five non-western states make significant demands on groundwater reserves to satisfy combined needs for water in the public, rural and industrial sectors as well as in irrigation agriculture.

Hawaii's second ranking in Table 2 indicates its dependence on groundwater despite generally plentiful rainfall. This dependence on groundwater stems from the presence of basalt rock formations which capture runoff and store it in underground reservoirs, thus reducing streamflow.

**TABLE 1
TOTAL GROUNDWATER PUMPAGE***

Rank	State	Million Gallons per Day
1	California	19,200
2	Texas	10,900
3	Nebraska	5,610
4	Idaho	5,560
5	Kansas	4,960
6	Arizona	4,720
7	Florida	3,210
8	Colorado	2,650
9	Arkansas	2,600
10	New Mexico	1,570

**TABLE 2
GROUNDWATER PUMPAGE INTENSITY***

Rank	State	Gallons per Minute per Square Mile
1	California	85
2	Hawaii	76
3	New Jersey	73
4	Nebraska	51
5	Idaho	46
6	Kansas	42
7	Florida	41
8	Arkansas	35
9	Massachusetts	31
10	Arizona	29

NOTE: Data courtesy David D. Todd, *The Ground Water Newsletter*, Berkeley, California.

*Data do not include power generation and saline water uses.

208 WATER QUALITY PLANNING

Water quality planning will continue to be ineffective under the 208 program until cause-and-effect data are known, until planning efforts become more comprehensive, and until public participation is broader, according to a recent General Accounting Office (GAO) report.

The GAO report, *Water Quality Management Planning Is Not Comprehensive and May Not Be Effective for Many Years*, states that 208 planning is not comprehensive although "water quality management planning needs to be comprehensive if the nation's water quality problems are to be solved."

Why?

208 planning agencies are required by law to fulfill 11 complex planning tasks and "unreasonable time constraints" have produced programs which cannot effect solutions to water-quality problems, according to the GAO report.

Because of the lack of reliable data, many 208 planning agencies have to generate water-quality data during a two-year planning period. The GAO report says that the "initial 2-year period for submitting 208 plans may not result in plans being comprehensive or solutions to problems being addressed adequately."



States' reluctance to support 208 planning without federal help contributes to inadequate planning and paucity of public participation impairs 208 program planning effectiveness, the GAO report noted.

According to the GAO report, the Environmental Protection Agency should reassess the 208 program and advise Congress about the time needed to develop cause-and-effect water-quality data.

The GAO report also suggested consideration of alternatives to 208 planning programs and broadening public participation in planning beyond special public-interest groups.

Copies of GAO Report CED-78-167 are available from the General Accounting Office, Distribution Section, Room 218, 441 G St., NW, Washington, D.C. 20548.

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PUBLICATIONS

Desert Landscaping

Design and the Desert Environment: Landscape Architecture in the American Southwest has been published by the University of Arizona Office of Arid Lands Studies (OALS) as Arid Lands Resource Information Paper Number 13.

"With an ever-diminishing water supply, plus increasing water costs imposed as a conservation measure, there is growing need for information about drought-tolerant native plants (or suitable introduced species) that can be used in landscaping, both residential and institutional, as well as industrial complexes, and for erosion control," Patricia Paylore, Editor, states in the Foreword to the book.

"Nurserymen, horticulturists, highway engineers, and soil and water conservationists are seeking a compact source of information on plants, trees, shrubs, and groundcovers that thrive on the natural rainfall only in arid climates, and that are not only aesthetically pleasing but also suitable for introduction and cultivation for a variety of very practical needs and uses," says Miss Paylore.

"In this Paper author Miller has addressed the growing awareness on the part of inhabitants of arid climates of both scarcity and cost of water uses for landscaping dominated by water-loving plants, and offers a guide to alternatives," Miss Paylore concludes.

Landscape architecture, or environmental design, in the hot, arid U.S. Southwest must be responsive to climate extremes, distinctive landforms and vegetative communities that are the desert environment, according to James D. Miller, author of the publication.

The 216-page Paper is divided into three major sections. In the first, *Deserts: Their Natural Context*, aridity is defined and climate, landforms, vegetative communities and the natural patterns of the desert Southwest are discussed.

Building on information presented in the first section, the second section, *Implications for Design*, presents descriptions of passive methods to control solar radiation and wind and to conserve water in arid-land landscaping.

More than 200 species of trees, shrubs, groundcovers and vines recommended for desert landscaping are listed in the final section, *Recommended Plant Material*. Cultural information for each plant is presented in a matrix. Photographs of many of the plants are included.

The publication has 84 illustrations and photographs. Appendices discuss Arizona native plant law and list references cited and a bibliography, 174 references total.

The book costs \$12.50 and is available from the Office of Arid Lands Studies, University of Arizona, 845 N. Park Ave., Tucson 85719.

Publication of Arid Lands Resource Information Paper Number 13 was supported in part by the U.S. Department of the Interior Office of Water Research and Technology Grant 14-34-0001-6254 (W-211) to the Office of Arid Lands Studies. Miss Paylore is the principal investigator and editor.

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Federal-State Water Use Relations in the American West: An Evolutionary Guide to Future Equilibrium, is available from the Office of Arid Lands Studies, University of Arizona, Tucson, as Arid Lands Resource Information Paper Number 11.

Federal-state water resources development relations are examined in the publication through a literature review conducted by the authors.

A framework is created by authors to explain water policy development in the Colorado River Basin states of Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming.

Distributive, redistributive and regulatory politics are defined by the authors as being the three arenas within which water policy discussions are held. Following explanation of the political model, the authors explore development of water projects and policies in the Basin.

The foundation of federal water policy is defined by the authors as being the Reclamation Act of 1902. Using the Act as a basis, the authors discuss the Colorado River Compact, the Boulder Canyon Project, the Colorado River Storage Project, the Central Arizona Project, the Mexican Water Treaty of 1944 and the Colorado River Basin Salinity Control Act.

The Carter administration proposal in 1977 to remove water politics from the distributive arena is examined by the authors who conclude that the administration yielded on most of its proposed changes to avoid repeating a congressional confrontation and because western governors were united in opposition to administration proposals. Although the distributive arena is most beneficial to the western states, the authors point out that those states must acknowledge dependence on federal financing to realize water resources development.

Authors of the 155-page publication are Milton H. Jamail, Pima Community College, Tucson; and John R. McCain and Scott J. Ullery, both of the University of Arizona, Tucson. Included in the paper is an annotated bibliography containing 166 citations.

This publication is one of a series prepared and published for the Water Resources Scientific Information Center under provisions of Grant No. 14-34-001-7819 to the University of Arizona Office of Arid Lands Studies. Patricia Paylore is Principal Investigator and Series Editor.

Information about acquiring this publication is available through the Office of Arid Lands Studies, 845 N. Park Avenue, University of Arizona, Tucson 85719, or by calling (602) 626-1955.

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Areas in Avra Valley that could be inundated during a 100-year flood are approximated on a map prepared by the U.S. Geological Survey (USGS) in cooperation with the Pima County Board of Supervisors.

The September 26, 1962, flood in Avra Valley was comparable to a 100-year flood in most of Valley. Chance of a 100-year flood occurring during any given year is 1-to-100, 1 percent.

Most of the Avra Valley natural drainage system consists of small, braided channels bordered by narrow bands of dense vegetation. These drainage systems cause runoff to spread over extended land areas during flooding, but at shallow depths. Some areas between Brawley and Blanco washes in Avra Valley could be entirely inundated during a 100-year flood.

The map, *Areas subject to inundation by the 100-year flood in Avra Valley, Pima County, Arizona*, will be useful to planners and administrators concerned with future land development in Avra Valley, according to Robert D. Mac Nish, USGS District Chief, Water Resources Division, Tucson.

R. H. Roeske prepared the map which was published as USGS Water-Resources Investigations 78-33.

Copies of the map are available at the Pima County Highway Department, 1313 S. Mission Rd., Tucson. The report also is available at the following USGS offices: Federal Building, Room 5-A, 301 W. Congress St., Tucson; and Valley Center, Suite 1880, Phoenix.

The map is available for perusal at USGS National Center, Room 5B410, 12201 Sunrise Valley Drive, Reston, Virginia.

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Annual Arizona Groundwater Summary Data

Groundwater pumpage in Arizona totaled 5.5 million acre-feet from spring 1977 to spring 1978, according to a map report prepared by the U.S. Geological Survey (USGS) in cooperation with the Arizona Water Commission (AWC).

Nearly 171 million acre-feet of groundwater had been pumped from Arizona aquifers at the end of 1977, according to the report. Groundwater pumpage in Arizona averaged 5.4 million acre-feet during the five years preceding report preparation and has resulted in water-level declines in many areas of Arizona.

The map gives data relative to potential well production, depth to water in selected wells during spring 1978, and water-level changes in selected wells during 1973-78.

A small-scale map gives groundwater pumpage data for 1977. Annual and accumulated groundwater pumpage since the beginning of record is detailed in a table included on the map report.

The report, *Annual Summary of Ground-Water Conditions in Arizona, Spring 1977 to Spring 1978*, was published as USGS Water-Resources Investigations 78-144.

Copies of the map report are available at the AWC office, 222 N. Central Ave., Suite 800, Phoenix. The map report is available also at the following USGS offices: Federal Building, Room 5-A, 301 W. Congress St., Tucson; Valley Center, Suite 1880, Phoenix; 2255 N. Gemini Drive, Building 3, Flagstaff; and 1940 S. 3rd Ave., Yuma.

The report can be perused at the USGS office, National Center, Room 5B410, 12201 Sunrise Valley Drive, Reston, Virginia.

CONFERENCES

Water Conference

The annual joint meeting of the Arizona Section, American Water Resources Association, and the Hydrology Section, Arizona-Nevada Academy of Science, will be held Friday, April 13, 1979, in the Arizona State University Memorial Student Union, Tempe. Registration will begin at 8 a.m. in the Student Union second floor lobby.

The morning session will include papers on hydrology and water resources technology and a discussion about a study which focused on operating the Central Arizona Project. Institutional aspects of water resources will be the subject of papers presented during the afternoon session.

Authors and the papers scheduled to be given during the morning session are listed below in order of presentation:

Winter Precipitation on a Southeastern Arizona Rangeland Watershed, H. B. Osborn, R. B. Koehler and J. R. Simanton;

Hydrologic Investigation of the Dry Lake Region in East Central Arizona, J. J. Lemmon;

Sediment Production from a Chaparral Watershed in Central Arizona, T. E. Hook and A. R. Hibbert;

An Exchange System for Precise Measurements of Temperature and Humidity Gradients in the Air Near the Ground, L. W. Gay;

An Interactive Model of Suspended Sediment Yield on Forested Watersheds in Central Arizona, W. O. Rasmussen and P. F. Ffolliott;

A Water Budget for a Semiarid Watershed, S. R. Saplaco and P. F. Ffolliott;

How to Select Evapotranspiration Models, T. E. A. van Hylckama, R. M. Turner and O. M. Grosz;

Ground Water in the Santa Cruz Valley, M. Flug;

Solar Powered Irrigation Pumping Experiment, D. L. Larson and C. D. Sands II;

Tests on Arizona's New Flood Estimates, B. M. Reich, H. B. Osborn and M. Baker; and

Central Arizona Project Operation study, A. L. Graves.

The papers scheduled to be given during the afternoon session are listed below in order of presentation:

Health Effects of Application of Wastewater to Land, J. Goff;

Early Public Involvement in Federal Water Resources Projects, F. Johnson and M. Thuss;

Negotiating the Water Future of Pima County, Arizona, M. Thuss;

A Multiattribute Approach to the Reclamation of Strip-mined Lands, F. Brinck, L. Duckstein and J. Thames;

Visual Impacts: Perception and Modification of Surface Mining Operations of the Black Mesa, J. Rodiek;

The Long Range Impacts of Development of Stream Flow, P. D. Trotta;

Needs and Trends in Arizona Water Service Organizations, J. L. Emel, M. D. Bradley and K. J. DeCook;

An Examination of the Buckhorn-Mesa Watershed Environmental Impact Statement (U.S.D.A., S.C.S., 1978): A Look at State-of-the-Art Reports, D. A. Altshul;

Land Use Planning for the San Tiburcio Watershed, R. Armijo and R. L. Bulfin;

Economics of Technology Adoption in Groundwater Irrigation, J. C. Wade;

An Evaluation of Water Management Systems for the Sonoita Creek Watershed, H. Robotham; and

The Effects of Second-Home and Resort Town Development on Stream Discharge in Navajo and Apache Counties, T. Hogan and M. E. Bond.

Further information is available from K. James DeCook, Water Resources Research Center, 102 Old Psychology, University of Arizona, Tucson 85721, phone (602) 626-1009, or Gerald Harwood, School of Renewable Natural Resources, 204 Biological Sciences East, University of Arizona, Tucson 85721, phone (602) 626-4406.

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Water Conservation Symposium

The Arizona Section, American Water Resources Association (AWRA), will sponsor a *Symposium on Water Conservation Alternatives* Thursday, April 12, 1979, at the Adams Hotel in Phoenix. Registration will begin at 8 a.m. The Symposium will begin at 8:30 a.m. and end at 4:30 p.m.

Gary D. Cobb, Director, Office of Water Research and Technology, Washington, D.C., will be the keynote speaker for the Symposium. Cobb also is chairman of the Task Force for Implementation of the President's Initiatives on Water Conservation.

C. L. Linser, Chief of Planning Branch, Arizona Water Commission, Phoenix, also will address Symposium registrants. Linser supervised preparation of Part I, Phase III of the Arizona State Water Plan, titled *Water Conservation*.

Three panel discussions are scheduled. The first panel, *Research Potential for Water Conservation*, will be presided

over by Dr. Herman Bouwer, Director, U.S. Water Conservation Laboratory, Phoenix.

Application of Water Conservation Alternatives is the subject of the second panel. Presiding will be Mr. Bill Warskow, Supervisor, Watershed Division, Salt River Project, Phoenix.

The third panel will address *Future Outlooks for Water Conservation*. Dr. Charles Downs will preside. He is Professor of Water Resources Systems Management at Arizona State University, Tempe.

Copies of the Program may be obtained from the Symposium Chairman James Goff, Boyle Engineering Corp., P.O. Box 3030, Newport Beach, CA 92663, phone (714) 752-0505, or from K. James DeCook, Executive Secretary of the Arizona Section, AWRA, at the University of Arizona, Water Resources Research Center, Tucson, AZ 85721, phone (602) 626-1009.

An early registration for the Symposium will begin at 4 p.m., Wednesday, April 11, 1979, at the Adams Hotel. A "get-acquainted" session will be held from 5 to 7 p.m.

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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 85721.

UNIVERSITY OF ARIZONA
WATER RESOURCES RESEARCH CENTER
WATER INFORMATION SECTION
TUCSON, ARIZONA 85721