SRP, UA Use Tree Rings to Analyze Droughts

The Salt River Project and the University of Arizona's Laboratory of Tree-Ring Research have partnered to use tree-ring reconstructions of annual streamflow to study variations in the water supply of the Upper Colorado and Salt-Verde River basins over the past millennium.

Charlie Ester, SRP's manager of water resource operations, said the study's findings will be valuable to SRP water planning because they can provide a longer-term look at drought patterns in the Southwest and help determine if there are extended periods of concurrent drought on the Salt-Verde and Upper Colorado watersheds. In addition, the data will help SRP determine how available water supplies for the Phoenix metropolitan area from the Upper Colorado and the Salt-Verde River basins have varied over time, and help develop an assessment tool for implementing the project's results into operational water supply decision-making.

Progress reports were expected at the end of April and in July 2004, and will be shared with the Arizona Department of Water Resources, the Central Arizona Project, the U.S. Bureau of Reclamation, and cities in the greater Phoenix metropolitan area.

The tree-ring study is the latest SRP initiative that responds to the ongoing drought, during which streamflows into the Salt and Verde rivers have been below normal for five consecutive years and seven of the last eight January-through-May runoff seasons. The eight-year drought has resulted in below-normal storage levels in SRP's reservoir system, which is now at 46 percent of capacity compared to 44 percent a year ago.

The Upper Colorado River basin was one of the first river basins for which tree-ring studies were used to establish historical streamflow, and for which flows back to the late 1500s were reconstructed. The reconstruction showed that Colorado River allocations were based on perhaps the wettest period in the last 400 years. Subsequent tree-ring studies have extended long-term information on streamflow to other basins in the western United States, including the Salt and Verde rivers.

For more information, visit www.srpnet.com or contact Jeff Lane at jplane@srpnet.com.

How Much Water Do We Use?

Western Resource Advocates, based in Boulder, Colorado, recently published *Smart Water: A Comparative Study of Urban Water Use Across the Southwest*. According to the authors, lack of comparative data on water use and efficiency options has hindered urban water use efficiency. By publishing the report, the authors hope to improve awareness of water efficiency options by cities and their citizens and inspire further conservation. Topics covered include environmental issues related to water supply and growth, state-of-the-art concepts in water use efficiency, water use statistics, impacts of urban sprawl on water use, and recommendations for conservation. In Chapter 3, the report presents data compiled from surveys sent to municipal water providers on 2001 water usage in urban areas. A summary of the results for single-family residential daily per capita water consumption, in gallons per day (gpd) is shown below left.

The complete report is available at www.westernresourceadvocates.org/water/smartwater.html.

City	gpd	outdoor use, gpd	% outdoor use
Tucson, AZ	107	38	36
El Paso, TX	122	53	43
Mesa, AZ	123	54	44
Albuquerque, NM	135	65	48
Boulder, CO	140	70	50
Highlands Ranch, CO	140	71	51
Phoenix, AZ	144	75	52
Denver, CO	158	90	57
Grand Junction, CO	182	113	62
Taylorsville, UT	193	124	64
Scottsdale, AZ	203	134	66
Tempe, AZ	211	142	67
Las Vegas, NV	230	161	70

2001 single family residential daily per capita water consumption, in gallons per day.

Notes: Denver Water and the Taylorsville-Bennion Improvement District group multi-family residences with the Single-Family Residential billing category.

The Salt River Project (SRP) in Arizona provides untreated water for outdoor urban irrigation on a periodic basis (typically biweekly to monthly) to residential customers in Phoenix, Mesa, Tempe, and portions of Scottsdale. SRP deliveries are not included in the above figures.

More on Water as a Commodity: Water Mining in Texas

As a follow-up to *Southwest Hydrology*'s feature on Water as a Commodity (March/April 2004), readers may be interested in a series on water mining in Texas published by *The Alpine Avalanche*. Linda Bailey Potter, staff writer, produced a four-part series on water mining that ran in February, with particular focus on a proposal by Rio Nuevo LLC, a Midland, Texas corporation, that filed a lease application to mine water on state-owned land. The series can be accessed at www.alpineavalanche.com/articles/2004/02/ with the following extensions:

Part 1 – Ranchers, geologists differ on water science: 05/news/news01.txt

Part 2 – Water districts rescue West Texas: 12/news/news03.txt

Part 3 – Global water lords and West Texas: 19/news/news02.txt

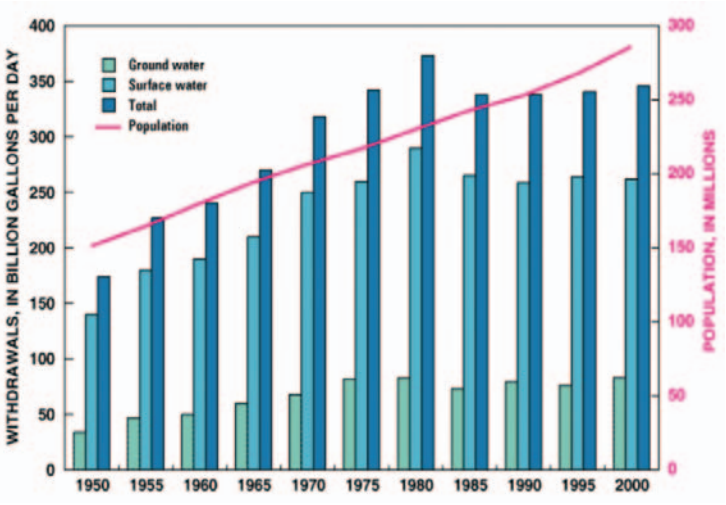
Part 4 – Texas water policy and political realities: 26/news/news02.txt

Additional, related articles by the same author can be found by searching the newspaper's archives.

USGS Finds U.S. Water Use Similar to 1985

New figures on U.S. water use released by the USGS in March indicated that about 408 billion gallons per day (Bgal/d) were withdrawn for all uses during 2000, a total that has varied less than 3 percent since 1985. The total included both fresh and saline water from groundwater and surface water sources. However, the amount of fresh groundwater withdrawn (83.3 Bgal/d) increased more than 14 percent in the 15-year period. One-fourth of all water

withdrawals went to California, Texas, and Florida; California and Texas also led with the most surface water and groundwater withdrawals, primarily for agriculture and thermoelectric power. The chart at right, from the USGS report, summarizes the population and water use trends from 1950 to 2000.



Trends in population and freshwater withdrawals by source, 1950-2000. (From USGS report, "Estimated Use of Water in the United States in 2000.")

An analysis of the USGS report by the Pacific Institute noted that the drop in per capita use indicates increased water use efficiency, but that the increase in groundwater pumping could pose a threat to fresh water supplies. Peter Gleick, president of the Pacific Institute, said that the fact that water use efficiency has improved with only limited efforts indicates that conservation efforts work, and massive new water projects are not required to meet a growing demand and to sustain a healthy economy. However, he expressed concern for the depletion of fresh water sources such as the Colorado River and the Ogallala aquifer, and called for a coherent national water policy that would allow the nation to "plan intelligently and improve our efficiency efforts [so that] we can have clean, secure supplies of fresh water, a thriving economy, and a healthy environment."

The USGS report, "Estimated Use of Water in the United States in 2000," (USGS Circular 1268, March 2004) is available at water.usgs.gov/pubs/circ/2004/circ1268. Pacific Institute analysis is available at www.pacinst.org/usgs.

New Web Site Provides Current Water Quality Testing Standards

Water professionals can now access up-to-the-minute developments in water quality testing standards and consult with other experts through a new Web site launched jointly by the American Public Health Association, the American Water Works Association, and the Water Environment Federation. The site provides a subscription-based service of "Standard Methods for the Examination of Water and Wastewater," an industry standard, providing more than 350 separate methods of water quality measurements used by industry scientists, analysts, and engineers. The online version offers the following additional services:

- new and revised EPA-approved methods continuously updated and available for download 24 hours a day, seven days a week;
- e-mail notification of additions, updates, and approvals as they happen;
- fully searchable text;
- an e-newsletter highlighting the latest issues and trends; and
- access to a community of experts through online discussion forums.

Introductory subscription rates announced in April begin at $200 per year for one user; discounts are available for multiple users and two-year subscriptions.

To subscribe, visit www.StandardMethods.org.

Caffeine: A New Pollution Indicator

Aerotech Environmental Laboratories

Due to heavy rains or other factors, excess wastewater may pass through a treatment plant untreated and into streams and other water supplies. When this occurs, health officials currently test the water for fecal coliforms to determine the amount of possible hazardous contaminants that could be entering downstream. The efficacy of this test method is limited by a short sample hold time, a short target organism lifespan, and the possibility of contamination from nonhuman sources such as livestock.

Researchers in Switzerland recently determined that using caffeine as a wastewater indicator is an effective technique that water treatment operators

Continued next page

can utilize in monitoring water quality and wastewater treatment efficiency. Many other chemical indicators of human waste such as prescription drugs and personal care products have been considered for use as possible tracers, but break down more readily during the treatment process.

Large amounts of caffeine are consumed and discarded annually into sewer systems via human excretion or by disposal into drains. Although approximately 99 percent of contaminants are removed from wastewater at sewage treatment plants, caffeine is so abundant and its chemical structure so stable that it can remain at detectable levels in treated water. Suggested sampling for caffeine in water requires a one-liter amber glass bottle preserved with hydrochloric acid 1:1 (2 milliliters per 1 liter) in duplicate if mass spectrometry is desired.

The preceding information appeared from Aero Environmental Tech Tips, a free program distributed by Aerotech Environmental Laboratories. To subscribe, send email to aeltechtips@aerotechlabs.com with the subject "Add Environmental Tech Tips." For more information on caffeine sampling in water, contact Aerotech's Environmental Project Manager at 866-772-5227.

New USGS Software for Hydrologic Data Analysis

The U.S. Geological Survey has released a new software library designed to enable scientists to conduct a wide range of statistical and graphical analyses of hydrologic data. The software is designed for use with the proprietary statistical package S-PLUS for Windows. It comprises functions, dialogs, and datasets for the analysis of water resources data, extending the statistical and graphical capabilities of S-PLUS. The software library has procedures for:

- trend estimation (seasonal Kendall test and related slope estimators)
- methods for analysis of water-quality data with multiple detection limits
- record extension techniques
- hydrograph plotting
- Piper and Stiff diagrams
- subseries plots for seasonal data
- USGS-style boxplots

The software contains numerous datasets that illustrate techniques for analyzing surface-water and water quality hydrologic data as well as extensive documentation to guide application of the techniques.

The library requires S-PLUS 6.1 for Windows. S-PLUS is a commercial statistical and graphical analysis software package produced by Insightful Corporation (www.insightful.com). Quotes for the software must be requested from the company.

The USGS library may be downloaded free at water.usgs.gov/software/library.html.

Study Shows 100,000 Acre-Feet of Landscape Irrigation Could Be Conserved in California

California could save 100,000 acre-feet of water per year, if irrigation of large landscapes did not exceed an efficiency rate of 100 percent of reference evapotranspiration, according to a recent study sponsored by the California Landscape Contractors Association.

Reference evapotranspiration, or ET_o, is an estimate of the water needed to irrigate cool season grass in a specific geographic location. Irrigation in excess of 100 percent of ET_o is widely viewed as wasteful – no matter what the style or design of the landscape.

The study was undertaken by John B. Whitcomb, Ph.D., an expert in water demand analysis. Its three objectives were to: 1) determine current water use on California's commercial, industrial, and institutional (CII) landscapes; 2) estimate this use as a percentage of ET_o; and 3) estimate potential water savings if the landscapes were irrigated at no greater than the 100 percent level.

Using published information from the California Department of Water Resources, the report concluded that the state's CII sites use 1.17 million acre-feet of water per year, or 13.3 percent of California's urban water use. Of those sites, those with a dedicated landscape water meter use 0.64 million acre-feet of water per year, or 7.3 percent of the state's urban water.

Using water-use data from 449 large CII landscapes in California, the study estimated that they currently are being irrigated at an average 93 percent of ET_o, however 50 percent of the state's large landscapes are irrigated at more than 100 percent.

The study concluded that the variation at which sites are irrigated results from numerous factors. An interesting finding was that sites with a high percentage of turfgrass, usually considered the most water-intensive plant, did not exceed the 100 percent threshold more often or to a greater degree than sites with other types of plants. According to the study, "This evidence suggests that the conversion from turf to other irrigated plant materials (such as shrubs) does not necessarily convert into lower water use given current (inefficient) water management practices."

If water waste (defined as irrigation in excess of 100 percent of ET_o) was eliminated, 100,000 acre-feet of water would be saved per year on the large CII sites with dedicated meters. 133,000 acre-feet per year would be saved between now and 2020 if future population increase estimates are taken into account. Far more water would be saved if large CII sites with mixed (nondedicated) meters were figured into the calculations.

The study report can be obtained by contacting CLCA at larryrohlfes@clca.org. CLCA is a nonprofit trade organization of state-licensed landscape contractors and landscape-related limited specialty contractors.

EPA Redesigns STORET Warehouse

The U.S. Environmental Protection Agency maintains two data management systems containing water quality information for U.S. waters: the Legacy Data Center (LDC) and STORET. The LDC is a static, archived database and STORET is an operational system actively being populated with water quality data.

The STORET National Data Warehouse

has recently been redesigned, improving speed and making possible larger and more flexible user-defined queries. The STORET Warehouse is EPA's main repository for ambient water quality and biological monitoring data. The new warehouse allows users to download raw data in a delimited text file form that can easily be imported into standard analysis software such as spreadsheets and GIS.

To retrieve data from STORET, visit www.epa.gov/storet and click on "Obtaining Water Quality Data." Media for which data are available include water, soil, sediment, air, and "other," as well as biological and habitat results. A recent search for water data in the Southwest listed 350,000 Arizona measurements, 18,000 California measurements, 1.2 million Colorado measurements, no New Mexico measurements, 40 Nevada measurements, no Texas measurements, and 2.9 million Utah measurements.

For more information, contact Cary McElhinney, 202-566-1188, mcelhinney.cary@epa.gov.

Study Examines Quality of Central Arizona Streams

In a report released in January 2004 by the U.S. Geological Survey, the water quality of streams in central Arizona was assessed on the basis of temperature, pH, and dissolved-oxygen content, as well as on concentrations of dissolved salts, suspended sediment, and nutrients such as nitrogen and phosphorus.

David Anning, lead author of the report and a hydrologist with the USGS in Tucson, Arizona, said that water quality as measured by these parameters "varies seasonally and also with the amount of streamflow." He adds, "These variations and typical values for these water-quality parameters differ for streams flowing under natural conditions, streams that are regulated by large reservoir systems, and streams that receive treated municipal wastewater or agricultural return water."

The study found that water quality in the upper Salt River is related to climate and hydrologic modification. For example, dissolved salt concentrations in the upper reaches of the river during low-flow conditions are usually much higher than the EPA's recommended upper limit for drinking water. This water, however, is impounded in a reservoir system before delivery to municipal and agricultural users. Within the reservoir system, dissolved salt concentrations are diluted by runoff from winter snowmelt and summer monsoon storms. During wet years, this dilution can reduce concentrations below EPA's upper limit, which represents an improvement in water quality as a result of climate. From 1950 through 1998, the amount of precipitation generally increased in the upper Salt River Basin, and as a result, concentrations of dissolved salts in reservoir releases generally decreased during the same period.

The report, "Assessment of selected inorganic constituents in streams of the Central Arizona Basins study area, Arizona and Northern Mexico, through 1998," by David Anning, is published as U.S. Geological Survey Water-Resources Investigations Report 03-4063. It is available at water.usgs.gov/pubs/wri/wri034063. For more information, contact Dave Anning at dwanning@usgs.gov.