



ANNOTATED BIBLIOGRAPHY

A & N Technical Services, Inc. *BMP Costs & Savings Study: A Guide to Data and Methods for Cost-Effectiveness Analysis of Urban Water Conservation Best Management Practices, July 2000.* Santa Monica, CA: A & N Technical Services, Inc. for California Urban Water Conservation Council, 2000.

- These guidelines link conservation program costs and water savings to the Memorandum of Understanding Regarding Urban Water Conservation in California's set of Best Management Practices.
- This report identifies and summarizes the best available information about program costs and water savings.
- Assesses the reliability and generalizability of information currently available for quantifying and valuing conservation activity and for preparing cost-effectiveness exemption claims.
- Identifies the absences of, and notes critical deficiencies in, cost and savings estimates needed to quantify and measure the cost-effectiveness of specific BMPs.

Beecher, J.A., T.W. Chestnutt, and D.M. Pikelney. *Socioeconomic Impacts of Water Conservation.* Denver, CO: AWWA Research Foundation, 2001.

- This report explores the interrelationship between water conservation programs and socioeconomic characteristics and impacts.
- This report uses a simplified conceptual model to illustrate how socioeconomic characteristics and socioeconomic impact variables are related to water use and conservation on page 14.
- There is a table that provides a basic framework for understanding the connection between conservation and affordability on page 52.
- There is a list of the range of possible socioeconomic impacts that might result from conservation programs on pages 63-65.
- Page 71 has a benefit-cost assessment of Denver's low-income conservation program.
- There is a list of benefits from selected utility programs on page 89.
- Chapter 6 provides a planning and evaluation framework that water utilities can use for data collection and impact assessment. Includes a summary and various tables and descriptions of analytic tools such as cost-effectiveness analysis and net-benefit analysis (pp. 91-102).

California Department of Water Resources. *Sample 2000 Urban Water Management Plan.* California, 2000.

- The California Department of Water Resources prepared this 2000 sample urban water management plan for the imaginary City of New Albion. This sample plan is a guide, synthesized from local water supplier experiences, and is designed to

illustrate how to effectively prepare an urban water management plan.

California Urban Water Agencies with California Urban Water Conservation Council and United States Environmental Protection Agency. *A Guide to: Customer Incentives for Water Conservation*. California, 1994.

- This handbook is intended as a guide to help water agencies through the process of selecting incentives that are appropriate and cost-effective for their jurisdiction.
- Incentives are divided into four categories:
 - Information incentives
 - Access to conservation technologies
 - Cash transfers
 - Financing

California Urban Water Conservation Council. *Guidelines for Preparing Cost-Effectiveness Analyses of Urban Water Conservation Best Management Practices*. California, 1996.

- The purpose of this manual is to develop guidelines to conduct consistent cost-effectiveness analyses of Best Management Practices and Potential Best Management Practices based on sound economic principles

Campbell, H.E. and R.M. Johnson. *The Cookbook: Doing Multivariate Analysis of Residential Single-Family Water Conservation Programs*. Tempe, AZ: Morrison Institute for Public Policy, 1999.

- This book describes some basic rules of thumb for performing multivariate analysis of single family residential conservation programs. It is written so that water providers who may not have a strong background in statistics will be able to do a sound analysis of their programs. It includes:
 - How much and what kind of data you need ideally and as a bare minimum.
 - How to organize and clean your data for analysis.
 - How to perform different types of analyses and possible problems with each.
 - How to interpret the results from these analyses.

Campbell, H.E., R.M. Johnson, and E.H. Larson. *Prices, Devices, People, or Rules: The Relative Effectiveness of Policy Instruments in Water Conservation*. Tempe, AZ: Arizona State University, 2000.

- This paper presents results from a multivariate regression analysis incorporating variables controlling for several categories (forty-one variables were used to control for five categories).

Chestnutt, T.W. *Performance Standards for Demonstrating Urban Water Conservation*. California: A & N Technical Services, Inc. for California Urban Water Conservation Council, 1997.

- This book discusses the idea of performance standards, provides a description of alternative standards and describes measurement issues associated with each alternative.
- This book also discusses implementation issues related to compliance monitoring and provides a summary of the

advantages and disadvantages of each performance alternative.

- The alternative performance standards presented include percentage cutback, per capita targets, percentage reduction of forecast demand, and cost-effectiveness of conservation practices.

Dueker, L. and P. Regli. *Goal Billing: A Water Conservation Surcharge/Discounts System*. Scottsdale, AZ: City of Scottsdale Water Resources Department.

- This report discusses the goal billing system, which is a water conservation surcharge and discount rate system that is designed to encourage water conservation.

Gary Fiske & Associates. *California Urban Water Agencies Urban Water Conservation Potential Final Report*. Portland, OR: Gary Fiske & Associates, 2001.

- This study estimates potential savings for a subset of water conservation Best Management Practices assuming full implementation of the Memorandum of Understanding Regarding Urban Water Conservation in California.

Gerston, J., M. MacLeod, and C.A. Jones. *Efficient Water Use for Texas: Policies, Tools, and Management Strategies*. College Station, TX: Texas Agricultural Experiment Station and Texas A&M University, 2002.

- This paper presents alternative conservation and water management strategy options, the challenges of implementing them, and their overall costs and benefits.

Gleick, P. H., et al. *Waste Not, Want Not: The Potential for Urban Water Conservation in California*. Oakland, CA: The Pacific Institute, 2003.

- This report discusses the potential for urban water conservation in California, including how much can be saved and where it can be saved. They estimate that 1/3 of California's current use (more than 2.3 million AF) can be saved with existing technology. And 85% of this can be saved at less cost than developing new sources. The document estimates potential savings by sector and by end use.

Longstreth, M. and R.B. Billings. *Water Use and Conservation in Multiple Family Dwellings in Tucson, Arizona*. Tucson, AZ: University of Arizona, 1990.

- This report on the Tucson Water project studies water use and conservation in apartments that were randomly selected in Tucson.

Mayer, P.W., K.D. DiNatale, W.B. DeOreo, and D.M. Lewis. *Show me the savings! Do new homes use less water?* Westminister, CO: Aquacraft, Inc., 1999.

- This study examines water use in four samples of homes in the City of Westminister, Colorado:
 - Homes built prior to 1977
 - Homes built from 1984-1993
 - Homes built after 1997

- Water Wise homes built in 1998 specifically to use less water
- The study disaggregates water use into component end uses such as toilets, faucets, clothes washers, showers, etc. and compares the use at the fixture level, on a daily per capita basis, and in terms of annual demand.
- Also examines irrigation water use.
- Research was carried out by conducting audits at the 40 homes selected for the study.
- Results were compiled completed using a combination of historic billing data, data provided by the City, the analyzed flow trace data, and the audit results.

Metropolitan Domestic Water Improvement District. *Toilet Rebate Program and Toilet Leak Detection Program for Existing Residential Customers.* Tucson, AZ: Metro Water District, 2000.

- This report summarizes Metro Water District's toilet rebate program including the cost of replacing the toilets and an estimate of how much water was saved.
- This report also includes a summary of the results of an outdoor water self-audit as well as the cost to implement the audit and a comparison of the water histories of the audits received.
- The report discusses the landscape water advice guide mailed to each District, the welcome packets given to new homeowners, ordinances, public information and education programs, etc.
- Includes a copy of Metro Water District's rate structure.

Michelsen, A.M., J.T. McGuckin, and D.M. Stumpf. *Effectiveness of Residential Water Conservation Price and Non-price Programs.* Denver, CO: AWWA Research Foundation, 1998.

- The purpose of this study is to build upon and extend previous water conservation research efforts to evaluate the effects of price and non-price conservation programs on residential water demand in different urban areas of the southwestern United States.
- Three models of residential water demand were tested using maximum likelihood regression techniques.
- Analyzes data using statistical methods such as ANOVA and regression to identify trends water use, impacts of water conservation efforts, and socioeconomic and climatic-related parameter changes.
- Uses linear and multiplicative models.
- Uses the revenue-consumption model to analyze the effectiveness of alternative rate structures on residential water savings.

Montgomery Watson. *City of Houston Water Conservation Plan.* Houston, TX: Montgomery Watson, 1997.

- This water conservation plan, prepared by Montgomery Watson, considers over 200 conservation measures and evaluates 20 conservation programs in order to provide the City of Texas with one recommended plan. The measures were evaluated using present value cost-benefit analysis, and water savings, benefits, and costs were estimated.

The Morrison Institute. *Some Best Bets in Residential Water Conservation: Results of Multivariate Regression Analysis, City of Phoenix, 1990-1996 Final Report.* Tempe, AZ: Morrison Institute, 1999.

- This report documents and analyzes the results of a multivariate regression analysis designed to estimate the effects on residential, single-family water consumption of a host of factors, particularly water conservation policies.

Moxley, M. A memo to Warren Tenney re: Analysis of Toilet Rebate Program. Tucson, AZ: Metropolitan Domestic Water Improvement District, 8 June 2001.

- This memo summarizes in a graph the conclusions made after evaluating the consumption records of the participants of the toilet rebate program for 1998-1999. Results show that there was a 9% reduction in total water use by participants and an 8% reduction in the average monthly water consumption of participants.

Pekelney, D.M. et al. *Guidelines to Conduct Cost-Effectiveness Analysis of Best Management Practices for Urban Water Conservation.* California, 1996.

- Guidelines of the use of cost-effectiveness analysis in defining Best Management Practices (BMPs) for urban water conservation in California.
- Urban water suppliers, environmental organizations, and other interested parties signed a Memorandum of Understanding (MOU) to implement BMPs.
- The California Urban Water Conservation Council (CUWCC) was established to oversee the definition of BMPs and their implementation. The fundamental criterion, established in the MOU, for defining BMPs is cost-effectiveness. Hence, to implement the MOU, guidelines were needed to conduct and evaluate CEA studies.

Pekelney, D.M., T.W. Chestnutt, and D.L. Mitchell. *Cost-Effective Cost-Effectiveness: Quantifying Conservation on the Cheap.*

- This paper presents concrete alternatives by which the results of a water conservation program can be quantified in a reliable and cost-effective manner.
- Gives recommendations for conducting a cost-effectiveness analysis and cost-benefit analysis and how to obtain NPV.
- Discusses avoided costs (avoided cost of wastewater treatment, avoided energy costs, etc.).
- Discusses discounting costs and benefits.

Planning and Management Consultants, Ltd. *Evaluation of Urban Water Conservation Programs: A Procedures Manual.* Carbondale, IL: Planning and Management Consultants, Ltd., 1992.

- This manual defines water conservation and then describes a procedure for a systematic analysis of water conservation alternatives divided into two parts: conservation planning and evaluation procedures.
- The purpose of the planning portion of the manual is to determine conservation potential and conservation opportunities

for a water service area and to conduct a preliminary evaluation of conservation measures with respect to their potential water Protection savings, costs, and benefits.

- The purpose of the program evaluation portion of the manual is to provide concepts and procedures for generating estimates of reliable water savings, program costs, and other conservation parameters that are used in the formulation and evaluation of demand reduction alternatives in the conservation planning process.

San Antonio Water System Conservation Division. *2001 Water Conservation Report*. San Antonio, TX: San Antonio Water System, 2001.

- This report provides a record and analysis of conservation program results in San Antonio for 2001.
- Includes a section on “outcome measures” that describes a process of reviewing current and imminent programs in terms of water savings, cost for water saved and general budget.
- Includes a “per capita use water analysis” that relates water use to PET (Potential Evapotranspiration) to determine the effect of drought restrictions on water use.

Saving Water Partnership. *Regional 1% Water Conservation Program 2002 Annual Report*. Seattle, WA, 2003.

- This report reviews the annual progress of the 1% Program, a program aimed at helping customers served by the Seattle Public Utilities water supply implement conservation behaviors and equipment.
- Cost-effective conservation measures as well as short and long-term savings are illustrated in the report.

Sheikh, Bahman. *Building Water Conservation into New Homes in Chula Vista, California*. San Francisco, CA: 2001.

- An economic analysis was conducted comparing 14 specific water conservation options, their characteristics, costs, benefits, and feasibility of implementation during the construction state of new residential development.
- There is a Benefit/Cost Analysis of Water Conservation Measures.
- **Discount rate of 7% is mentioned on page 13.**

Southwest Florida Water Management District. *Development of Water Conservation Options for Non-Agricultural Water Users*. Florida, 2000.

- This study identifies, evaluates, and prioritizes non-agricultural water conservation measures in the Central and Southern region of Southwest Florida Water Management District.
- Includes an inventory and evaluation of the previous, existing, and future water conservation measures for the non-agricultural water uses (Appendix B-1 includes costs and savings of conservation measures and detailed lists of costs and benefits can be found throughout the report).
- Section 3 provides detailed descriptions of voluntary and mandatory conservation measures and evaluates them with

respect to water savings potential and cost-effectiveness (calculates total present worth of program costs using a discount rate of 8%).

- Section 4 provides detailed descriptions of the feasibility, implementation, and cost analysis of individual water conservation measures and includes water savings, program costs, and the cost-effectiveness ratio of selected programs.
- Concludes with the estimated total program costs, projected water savings, and the overall cost-effectiveness ratio.

Sovocool, K.A. and J.L. Rosales. *A Five-Year Investigation into the Potential Water and Monetary Savings of Residential Xeriscape in the Mojave Desert*. Las Vegas, NV: Southern Nevada Water Authority.

- This study quantifies the residential water and economic savings realized by converting from traditional turf grass to xeric landscaping in the Mojave Desert.
- Lists Best Management Practices, which provide the framework for implementing the water conservation plan.
- Data & Data Analyses included:
 - Datalogger analyses for quantification of outdoor irrigation
 - Pre/Post-Conversion Analysis using monthly consumption data from five years before conversion to as many years after conversion as records permitted.
 - Analysis of Economics (data on landscape maintenance economics was obtained via surveys sent to study participants)
 - Comparative Consumption Data (annual consumption on a per area basis)
 - Comparative Irrigation Cost Data (annual cost to irrigate a 100 square feet of xeric area and turf grass)
 - Xeric Area System Design and Consumption Data (flow rates for each irrigation station)
 - Xeric Area Canopy Coverage and Consumption Data (impact of coverage on mean annual consumption)

Tucker, Jeff. 2003. "Saving water isn't cheap." *Arizona Daily Sun* 6 July 2003.

- This article discusses the impact of water conservation on revenues in Flagstaff -- less water consumption means less revenue for the City utilities.
- In spite of conservation measures, the City uses more water due to growth, which offsets the loss in revenue from the conservation but does little to address the long range concern that more water is being used every year in Flagstaff.

U.S. Environmental Protection Agency. *Cases in Water Conservation: How Efficiency Programs Help Water Utilities Save Water and Avoid Costs*. USEPA, 2002.

- This report illustrates how 17 different water utilities across the United States are saving water through strategic water-efficiency programs. (There's a concise summary table at the front of the report that lists each city's problem, approach, and results.)

U.S. Environmental Protection Agency. *Water Conservation Plan Guidelines*. Washington, D.C.: USEPA, 1998.

- These guidelines are for use by water utilities in preparing a water conservation plan.

Vickers, Amy. *Water Use and Conservation*. Amherst, MA: WaterPlow Press, 2001.

- This book responds to water needs by addressing where and how water is used and then applying effective efficiency technologies and practices that form the basis for water conservation.
- The book is divided into six chapters, most of which describe the costs and benefits of the efficiency measure being addressed in the chapter:
 - Planning a Successful Water Conservation Program
 - Residential and Domestic Water Use and Efficiency Measures
 - Landscape Water Use and Efficiency Measures
 - Industrial, Commercial, and Institutional Water Use and Efficiency Measures
 - Agricultural Water Use and Efficiency Measures
 - The Water Conservation Network
- Page 360 and others discuss evapotranspiration.

Western Resource Advocates. *“Smart Water: A Comparative Study of Urban Water Use Efficiency Across the Southwest.”* Boulder, CO: Western Resource Advocates, 2003.

- The report offers detailed recommendations for addressing efficiency shortfalls, as well as providing substantial city-by-city data.
- It gives southwestern towns and cities a means of measuring their water efficiency against others in the region, inventories cutting-edge efficiency practices, and shows how they can be implemented.
- Variations in regional climate do not account for variations in metropolitan water use.

Xeriscape Conversions Residential and Commercial Case Studies. “Saving Money Through Xeriscape” Conference. Tucson, AZ: Sawara and Tucson Water, 1992.

- This report summarizes costs and savings resulting from converting six lots to Xeriscape in Tucson.