

PETER W. MAYER, P.E.

Principal

WaterDM
Demand Management
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WORK EXPERIENCE

Principal, WaterDM. 2013-present. (Registered Professional Engineer, Colorado)

Editor, Water Efficiency Watch Online Conservation Journal, 2002-present

Vice President, Partner, and Senior Project Engineer, Aquacraft, Inc. Water Engineering and Management. 1995-2012

Editor, Calvert Independent. 1988-1990

Coordinator, University of Wisconsin, College Year in India Program, Madurai, India 1991-92

Educator-Fellow, Oberlin Shansi Memorial Association, Madurai, India 1986-88

Station Manager, WOBC-FM, Oberlin, Ohio 1985-86

AFFILIATIONS

American Water Works Association

Chair – M22 manual re-write sub-committee

Member – Water Conservation Division, Planning Evaluation and Research Committee, Customer Metering Practices Committee

Former Trustee – Water Conservation Division

American Water Resources Association

Alliance for Water Efficiency

EDUCATION

Master of Science, 1995, Water Resources Engineering, Department of Civil, Environmental and Architectural Engineering, University of Colorado, Boulder.

Bachelor of Arts, 1986 Oberlin College, Oberlin Ohio. Anthropology (Honors).

SELECTED PROJECTS

Senior Technical Advisor, Web Content Manager, Alliance for Water Efficiency (2007 – present)

The Alliance for Water Efficiency is a national NGO focused on promoting water conservation and efficiency. Peter Mayer helped found the organization and now serves as a senior technical advisor and the web content manager.

Contact: Ms. Mary Ann Dickinson, AWE, (866)-730-2493

Residential End Uses of Water Study Update, Water Research Foundation (2010 – 2014)

Peter Mayer is the architect of this Aquacraft-led research study that measured residential water use in 25 cities across the US and Canada. Mr. Mayer prepared the proposal and served as principal investigator for first two years of the project before leaving Aquacraft to start WaterDM. Mayer is a co-author of the final project report.

Contact: Ms. Maureen Hodgins, Water Research Foundation, 303-734-3465

Eastern Municipal Water District – Water Efficient Guidelines for New Development (2012-13)

Peter Mayer prepared a set of detailed, voluntary water efficiency guidelines for new construction in the Eastern Municipal Water District that go beyond current building codes and standards to increase water use efficiency.

Contact: Ms. Elizabeth Lovsted, P.E., Eastern Municipal Water District, 951-928-3777 x. 4307

City of Westminster Residential Demand Study and Conservation Plan Preparation (2012)

Peter Mayer and Aquacraft conducted a residential end use study in Westminster, Colorado to determine water use patterns and the level of water efficiency achieved. This information was then used in support of preparation of new water conservation plan for the City.

Contact: Mr. Stuart Feinglas, City of Westminster, (303) 658-2400 x2386

Northern Water Conservation Survey and Plan Development (2011)

The Northern Colorado Water Conservancy District hired Peter Mayer and Aquacraft to conduct a survey of its' 45 municipal members. The results of the survey were used to update Northern's water conservation plan for the Bureau of Reclamation.

Contact: Ms. Esther Vincent, Northern Water, (970) 622-2356

Colorado Water Supply Initiative Municipal and Industrial Conservation Strategies (2010)

In support of the Statewide Water Supply Initiative (SWSI), the Interbasin Compact Committee (IBCC), and other water conservation efforts throughout the state, the CWCB contracted with Peter Mayer and Aquacraft to develop the conservation strategies section of the 2010 SWSI update. The purpose of this project was to:

- Incorporate recent water conservation-related efforts into the SWSI 2010 update,
- Update the range of potential future water conservation savings, and
- Provide water conservation strategies that may contribute toward meeting the projected 2050 M&I water supply gap] and help address Colorado's future municipal and industrial (M&I) water needs.

Contact: Mr. Kevin Reidy, CWCB, (303) 866-3339

Best Practices Guide for Colorado Water Conservation (2010)

Colorado Water Wise contracted with Peter Mayer and Aquacraft to research and produce a guidebook on water conservation best practices for Colorado. The guide was published in 2010 and is available for free download.

Contact: Ms. Brenda O'Brien (303) 973-4026

Evaluation of California Weather-Based “Smart” Irrigation Controller Programs (2005-2009)

Smart irrigation controllers that use prevailing weather conditions to adapt water applications to the actual needs of plants represent a significant advancement. Peter Mayer was the principal investigator on this study for the California Department of Water Resources, the California Urban Water Conservation Council, and approximately 30 participating water agencies examined the impact of 3,112 smart controllers on water use in northern and southern California.

Contact: Ms. Marsha Prillwitz, CUWCC (916) 552-5885

Water Conservation: Customer Behavior and Effective Communications (2006 – 2009)

Peter Mayer and Aquacraft subcontracted to ICF International on this AwwaRF research project which examined water conservation social marketing programs and measured the impact of utility outreach efforts on customer behavior. The study examined water conservation communication campaigns in terms of customer recognition, attitudinal changes, behavior modification, and verifiable water use reductions and recommended the most effective methods and techniques for designing and implementing water conservation social marketing campaigns.

Contact: Ms. Susan Turnquist, AwwaRF (303) 347-6130

Water Budgets and Rate Structures: Innovative Management Tools (2005-2007)

Water budget rate structures are an innovative and increasingly popular tool for water utilities trying to convey an effective water efficiency message. This AwwaRF Tailored Collaboration project co-lead by Aquacraft and A&N Technical Services examined all aspects of water budgets and how they fit into the pantheon of water rate structures.

Contact: Ms. Susan Turnquist, AwwaRF (303) 347-6130

Water Conservation Plan Development and Demand Forecasting (2006–2010)

The State of Colorado requires that utilities seeking loans file a water conservation plan that includes detailed demand forecasts that incorporate water conservation. Aquacraft has developed conservation plans and demand forecasts for the cities of Aurora, Fort Collins, Glenwood Springs, Westminster, and Greeley, Colorado. In addition, Peter Mayer was contracted by the Colorado Water Conservation Board to review submitted conservation plans for compliance with statute.

Contact: Ms. Veva Deheza, CWCB, (303) 866-3339

Expert Testimony NEORSW Wastewater Case (2008)

Working with the Department of Justice, Peter Mayer developed a detailed research plan for the City of Cleveland to help them determine the contribution of wastewater flows from single-family, multi-family, and non-residential customers.

Contact: Kristin Furrie, DOJ, 202-616-6515

US EPA National Water Efficiency Market Enhancement Program (2004-2005)

The EPA is interested in starting a water efficiency program comparable the Energy STAR program. This project involves investigating potential product categories and product lines that improve water efficiency and could be including the EPA program, such as weather based

irrigation control technology.

City of Carnation Water Conservation Demand Analysis (2004-2005)

In late 2004 Peter Mayer worked with the Pacific Institute, Carollo Engineers, and King County, Washington to determine the conservation potential evaluate the cost-effectiveness of water conservation in new and existing homes and businesses in the City of Carnation. Carnation is a small town that is currently not sewered. The County and the City are working together to provide a sanitary sewer system and treatment facility.

National Multiple Family Submetering and Allocation Billing Program Study (2002-2004)

Charging residents in multi-family house separately for water is growing trend in the United States. Peter Mayer was the principal investigator for this study which looked at the entire phenomena of submetering and allocation billing techniques and examined the potential water savings, regulatory issues, utility concerns, water rates, and regulatory climate.

Tampa Retrofit Project (2002-2003)

This is the third part of the study of the impacts of high efficiency fixtures and plumbing devices on residential water demands in combination with the studies in Seattle and East Bay. This study will build upon the results of the other two studies by using fixtures and appliances which exceed the efficiencies of those used there. As a whole, the three studies will give a very accurate picture of the saving potential from interior retrofits in typical American homes.

Colorado Department of Human Services Water Rights Study (2003)

The Department of Human Services has been charged with achieving a 20% reduction of all utilities in the current fiscal year. Aquacraft is working in association with Long Energy to determine the water rights available to DHS and the most efficient use and distribution of their water resources.

Pinellas County Utilities Water Conservation Opportunities Study, (2002)

Pinellas County Utilities, located just west of Tampa, Florida, has an active water conservation and alternative supplies program. They came to Aquacraft and asked, “where can we go from here to save water?” Peter Mayer lead this study that measured water use in samples of single-family and multi-family homes and made recommendations for future water conservation programs that could achieve the most savings in this specific community.

Virtual Water Efficient Home Web Site, (2001-2002)

Developed all primary content for the California Urban Water Conservation Council’s H2Ouse.org virtual water efficient home web site. Peter Mayer consulted with the CUWCC regarding on-going development of the innovative site.

East Bay MUD Conservation Retrofit Study, (2001-02)

This water efficiency retrofit study will measure the impact of high performance plumbing fixtures in 35 single-family homes in the Oakland California metropolitan area. Each home in the study will be fully retrofit with ULF toilets, conserving clothes washers, LF showerheads, and LF faucet fixtures. Aquacraft will collect flow trace data from each home before and after the

retrofits so that the impacts of each fixture class can be measured and the cost-effectiveness evaluated. This study is funded by the US Environmental Protection Agency and EBMUD.

CII Demand Assessment and Conservation Plan, Westminster, CO, (2000-01)

The City of Westminster, a suburb of Denver has experienced substantial growth in the commercial, industrial, and irrigation sectors. Aquacraft evaluated trends in water use for this sector using available billing data and information from the local tax assessor and then developed a detailed water conservation plan targeted at these customers. Ten site audits were conducted to assess the conservation potential of individual customers. The final report is in the review process.

Seattle Home Water Conservation Study, Seattle Public Utilities and EPA, (1999-2000)

This water efficiency retrofit study measured the impact of high performance plumbing fixtures in 37 single-family homes in Seattle. Each home in the study was fully retrofit with ULF toilets, horizontal axis clothes washers, LF showerheads, and LF faucet fixtures. Aquacraft collected flow trace data from each home before and after the retrofits so that the impacts of each fixture class could be measured and the cost-effectiveness evaluated. This study was used to promote the most promising water efficiency measures and products and to weed out measures that were not cost-effective.

Commercial and Institutional End Uses of Water, AWWARF, (1998-2000)

This study evaluated water use among commercial and institutional end uses of water in five cities. This study provided information on the most significant commercial and institutional customers in typical municipal water systems and the purposes for which these customers use water. Aquacraft was the prime contractor for this project. Our role in this study, beyond project management, was to conduct direct measurement field studies of CI demand and to assemble and edit the final report. We performed detailed water audits in 24 sites ranging in size from small restaurants to large high school campuses and implemented a variety of water use measurement programs to determine where water is used in these settings. The final report is available for purchase from AWWA.

Water Conservation Plan, City of Thornton, CO, (1998-2000)

The City of Thornton is faced with one of the highest growth rates in Colorado and an expensive new water supply. The impacts of water conservation on their system could be dramatic. Aquacraft, in conjunction with HDR consultants completed a water conservation plan for Thornton to determine the impact of a range of conservation measures on the City's water supply. Efficiency measures in the residential, CII, and landscape sectors were evaluated using Aquacraft's integrated conservation model. All conservation measures were compared to the City's structural alternatives in terms of yield and cost.

Demand Analysis for the University of Colorado, (2000)

Aquacraft has conducted detailed demand analysis on two sites at the University of Colorado – The Mountain Research Station and the Cristol Chemistry Building. The Mountain Research Station is an alpine research facility with over 40 buildings including biology labs, dormitories, dining facilities, cabins, etc. Aquacraft performed a detailed audit of the site and prepared a disaggregated water budget and conservation plan. The Cristol Chemistry Building is one of the

largest chemistry labs on the University Campus. Aquacraft collected flow trace data from this site and prepared a demand analysis report.

Water Conservation Futures Study, City of Boulder, CO, (1998-1999)

The City of Boulder is fortunate to have an abundant supply of high quality water, and they do not project any shortages in water supply between current conditions and build out. Nonetheless, the City recognizes that there are demand management issues to address both from the perspective of equity in the billing system and in the need to identify other potential uses for its water resources (such as in-stream flow maintenance). Aquacraft was part of the team hired by the City to conduct an analysis of the future of water conservation in all sectors in Boulder.

Water Efficiency in Water Wise and Standard New Homes, (1999-2000)

Aquacraft conducted a study in Westminster Colorado to determine how water use in specially designed “Water Wise” homes compares with other new homes built at the same time. This project measured the impact of the 1992 Federal plumbing codes compared to homes equipped with advanced efficient plumbing fixtures including conserving clothes washers and re-circulating hot water systems. Aquacraft’s flow trace analysis technique was used to measure end uses in each of the 40 participating study homes.

Residential End Uses of Water Study, AWWARF, (1996-1999)

Peter Mayer was the lead author of this landmark study, funded in combination by the American Water Works Association Research Foundation and 14 cities across the US and Canada, disaggregated water use data were obtained from nearly 1200 single family residences. In addition to characterizing water use in the single-family sector, these data were used to develop a model of residential water use based on the demographic characteristics of the households and the specific water using fixtures and appliances present. The project was completed on schedule and on budget.

Comparison of Demand Patterns among CI and SF Customers, Westminster, (1997-1998)

Westminster, Colorado is a growing community in the Denver metropolitan area. The city is working on the development of a cost of service based rate system. In order to assist with this effort Aquacraft has collected flow trace data on a series of single family, multi-family, irrigation, and commercial accounts during peak demand period for the City. These data have been used to develop daily and hourly peaking factors for each category and a set of normalized demand parameters for use in projecting demands in future customers.

Analysis of Southern Nevada Xeriscape Project, (1998-2000)

Aquacraft performed a detailed evaluation of a Xeriscape conversion program in Las Vegas. 50 accounts that participated in the program are compared with 50 turf accounts that did not. Flow trace analysis techniques were used to separate indoor and outdoor consumption in the 100 study houses. Significant savings were found among Xeriscape homes. Report is available from Aquacraft.

Westminster, Peak Use Study, (1996)

As part of its water planning process, the City of Westminster needed information on daily and hourly peaking factors for its major classes of customers. Aquacraft conducted a baseline study of peak use in single family, multifamily, irrigation, and commercial/industrial customers for the City. This study generated peak use factors as ratios to average day demands and in terms of gallons per day per unit.

Westminster Residential Water Use Study, (1995-1996)

Using Aquacraft's flow trace analysis capabilities, 60 single family residential customers, divided into three distinct age groups, were sampled. The data traces from the meters were disaggregated into end uses so that the variations in water use in homes of different ages could be investigated. A primary goal of the study was to determine whether new homes, built to exceed the 1991 Energy Policy Act standards used less water per unit than other homes in the system.

PUBLICATIONS

Suero F., P.W. Mayer, and D. Rosenberg. 2012. *Estimating and Verifying United States Households' Potential to Conserve Water*. Journal of Water Resources Planning and Management. 138(3), 299–306.

P.W. Mayer, and S. Feinglas. 2012. Evaluating Changes in Water Use and Conservation Effectiveness. WaterSmart Innovations Conference. Las Vegas, NV.

Maddaus. M. and P.W. Mayer. 2011. Demand Hardening: Assessing Potential Impacts with End Use Models. WaterSmart Innovations Conference. Las Vegas, NV.

Mayer, P.W. and M. Dickinson. 2011. The Alliance for Water Efficiency's Home Water Works Website. WaterSmart Innovations Conference. Las Vegas, NV.

Mayer, P.W. 2010. Demand Hardening: Big Myth, Small Reality. WaterSmart Innovations Conference. Las Vegas, NV.

Mayer, P.W. 2010. Guidebook of Best Practices for Municipal Water Conservation in Colorado. WaterSmart Innovations Conference. Las Vegas, NV.

Mayer, P.W., et. al. 2010. *Improving Urban Irrigation Efficiency By Using Weather-Based "Smart" Controllers*. Journal of the American Water Works Association. February 2010. Vol. 102, No. 2.

Mayer, P.W. 2009. Do Weather-Based Irrigation Controllers Save Water? Results from a large field study in California. American Water Works Association 2009 Annual Conference and Exposition. San Diego, CA.

Mayer, P.W. et. al. 2009. Water Efficiency Benchmarks for New Single-Family Homes. WaterSmart Innovations Conference. Las Vegas, NV.

Mayer, P.W. et. al. 2009. Evaluation of California Weather-Based “Smart” Controller Programs Results and Perspective on a Large Field Study. WaterSmart Innovations Conference. Las Vegas, NV.

Mayer, P.W. 2009. Benefit-Cost Analysis for Water Conservation Planning. Colorado Water Wise Annual Event. Denver, CO.

Mayer, P.W. et. al. 2009. Evaluation of California Weather-Based “Smart” Irrigation Controller Programs. California Department of Water Resources, Sacramento, CA.

Mayer, P.W., et. al. 2008. *Water Budgets and Rate Structures: Innovative Management Tools*. American Water Works Association Research Foundation. Denver, CO.

Mayer, P.W. et. al. 2008. The California Water Smart Irrigation Controller Project Results and Perspective on a Large Field Study of an Important Emerging Technology. WaterSmart Innovations Conference. Las Vegas, NV.

Mayer, P.W. et. al. 2008. *Water Budgets and Rate Structures: Innovative Management Tools*. Journal of the American Water Works Association. May 2008. Vol. 100, No. 5.

Mayer, P.W., et. al. 2008. Cost Effective Conservation Programs. Proceedings of the AWWA Water Sources Conference. Reno, NV.

Mayer, P.W., et. al. 2008. Water Use in New and Existing Single-Family Homes - Update on EPA Benchmarking Study. Proceedings of the AWWA Water Sources Conference. Reno, NV.

Mayer, P.W., et. al. 2007. Water Budgets and Rate Structures – Innovative Management Tools. Proceedings of the AWWA Annual Conference, Toronto, Ontario.

Mayer, P.W. 2007. *Saving Water Indoors*. Home Energy Magazine. Special Issue.

Mayer, P.W., et. al. 2006. *Third-party Billing of Multifamily Customers Presents New Challenges to Water Providers*. Journal AWWA. August 2006, Vol. 98, No. 8.

Mayer, P.W. 2006. Submetering Billing Programs in Multi-Family Housing. Proceedings of the Water Sources Conference 2006, Albuquerque, NM.

Mayer, P.W. 2006. WaterWiser - Progress and Change, Benefits and Capabilities of an On-Going On-Line Resource. Proceedings of the Water Sources Conference 2006, Albuquerque, NM.

Mayer, P.W. 2005. End Uses of Water: Practical Data Collection, Analysis, and Utility. Arab Water World. May/June 2005.

Mayer, P.W, et. al. 2004. National Submetering and Allocation Billing Program Study – Project Overview and Preliminary Results. Proceedings of the Water Sources Conference 2004, Austin,

TX., Proceedings of the AWWA Annual Conference, Orlando, FL.

Towler, E., P.W. Mayer, et. al. 2004. *Completing the Trilogy – Impact and Acceptance of Retrofit Conservation Products*. Proceedings of the Water Sources Conference 2004, Austin, TX.

Chesnutt, T.W., and P.W. Mayer, 2004. *Water Budget-Based Rate Structures: A New Look at an Old Idea*. Proceedings of the Water Sources Conference 2004, Austin, TX.

DeOreo, W.B., M. Gentili, and P.W. Mayer, 2004. *Advanced Cooling Water Treatment Pays for Itself in Urban Supermarkets*. Proceedings of the Water Sources Conference 2004, Austin, TX.

Mayer, P.W., W. DeOreo, and W. West, 2003. *Conservation Opportunities - A Florida Community Takes Stock*. Proceedings of the AWWA Annual Conference Anaheim, CA.

Mayer, P.W. et. al. 2002. *Great Expectations – Actual Water Savings with the Latest High-Efficiency Residential Fixtures and Appliances*. Proceedings of the Water Sources Conference 2002, Las Vegas, NV.

Mayer, P.W., W.B. DeOreo, & D. Kaunisto. 2002. *Raw Water Irrigation – System Sizing Poses an Interesting Problem*. AWWA Annual Conference Proceedings. Denver, CO.

Mayer, P.W., W.B. DeOreo, A. Dietemann, and T. Skeel. 2001. *Residential Efficiency: The Impact of Complete Indoor Retrofits*. AWWA Annual Conference Proceedings, Washington, D.C.

Maddaus, L.A., & P.W. Mayer. 2001 *Splash or Sprinkler? Comparing Water Use of Swimming Pools and Irrigated Landscapes*. AWWA Annual Conference Proceedings, Washington D.C.

W.B. DeOreo, A. Dieteman, T. Skeel, P. Mayer, et. al. 2001. *Retrofit Realities*. Journal American Water Works Association, March 2001.

DeOreo, W.B., P.W. Mayer, J. Rosales, et.al. 2000. *Impacts of Xeriscape on Single Family Residential Water Use*. Proceedings of Fourth Decennial National Irrigation Symposium, Phoenix, AZ.

Mayer, P.W., K. DiNatale, and W.B. DeOreo. 2000. *Show Me the Savings: Do New Homes Use Less Water?* AWWA Annual Conference Proceedings. Denver, CO.

Mayer, P.W., W.B. DeOreo, et. al. 1999. *Residential End Uses of Water*. American Water Works Association Research Foundation, Denver, Colorado.

Mayer, P.W. and W.B. DeOreo. 1999. *Conservation Potential in Outdoor Residential Water Use*. AWWA Annual Conference Proceedings. Chicago, IL.

Dziegielewski, B., W.Y. Davis, and P.W. Mayer. 1999. *Existing Efficiencies in Residential Indoor Water Use*. AWWA Conserv99 Proceedings. Monterey, CA.

Mayer, P.W., W.B. DeOreo, et. al. 1998. *Residential End Use Study Progress Report: Year 2*. AWWA Annual Conference Proceedings. Dallas, TX.

Mayer, P.W., W.B. DeOreo, R. Allen, et. al. 1997. *North American Residential End Use Study: Progress Report*. AWWA Annual Conference Proceedings. Atlanta, GA.

Mayer, P.W., J.P. Heaney and W.B. DeOreo. 1996. *Conservation Retrofit Effectiveness: A Risk Based Model Using Precise End Use Data*. AWWA Conserv96 Proceedings.

DeOreo, W.B., P. Lander, and P.W. Mayer. 1996. *New Approaches in Assessing Water Conservation Effectiveness*. AWWA Conserv '96 Proceedings.

DeOreo, W.B., J.P. Heaney, and P.W. Mayer. 1996. *Flow Trace Analysis to Assess Water Use*. Journal of the American Water Works Association. Vol.88, No. 1, Jan.

Mayer, P.W. and W.B. DeOreo. 1995. *A Process Approach for Measuring Residential Water Use and Assessing Conservation Effectiveness*. AWWA Annual Conference Proceedings. Anaheim, California.

Mayer, P.W. 1995. *Residential Water Use and Conservation Effectiveness: A Process Approach*. Master's Thesis. University of Colorado, Boulder.

AWARDS

- 2010 AWWA Water Conservation Division Best Paper Award – “Improving Urban Irrigation Efficiency by using Weather-Based ‘Smart’ Irrigation Controllers.”
- 2008 AWWA Water Conservation Division Best Paper Award – “Water Budgets and Rate Structures: Innovative Management Tools.”
- 2006 AWWA Water Conservation Division Best Paper Award – “Third Party Billing of Multi-family Customers Presents New Challenges to Water Providers”
- 1996 Montgomery-Watson Master’s Thesis Award, Second Place
- 1996 American Water Works Association Academic Achievement Award, Honorable Mention