



**Evaluation and Cost Benefit Analysis
of Municipal
Water Conservation Programs**

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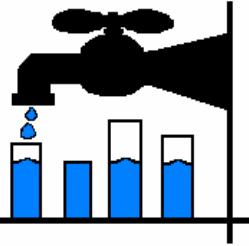
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**Water Conservation Alliance
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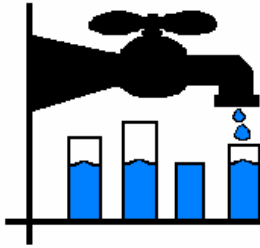
About WATER CASA



Celebrating its eighth year, the Water Conservation Alliance of Southern Arizona (Water CASA) continues to provide a means for member water providers to augment their individual conservation programs and to improve the region's overall water conservation efforts. Today, members include: Community Water Company of Green Valley, Flowing Wells Irrigation District, Town of Marana Water Department, Metro Water District, Oro Valley Water Utility, Pima County, and the U.S. Bureau of Reclamation

Water CASA provides a broad array of services to members and uses economies of scale to make conservation purchases for them. In addition, Water CASA provides a strong and unified voice for water use efficiency in the region, and is active in conducting innovative applied research to increase the knowledge base and inform water demand management decision making.





ACKNOWLEDGEMENTS

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Three years in the making, ECoBA was only possible because the many utilities contacted agreed to pull together large quantities of disparate data, to answer many, many questions and, in general, to offer up their water conservation efforts for scrutiny, comparison and detailed analysis. Willingness of utilities to participate exceeded our wildest expectations. For every utility included in this research, there are at least ten others who were contacted, who wanted to participate, and who were eventually eliminated because complete data was simply not obtainable. Water CASA thanks them for their efforts as well.

We are indebted to several reviewers of the project who were invaluable to us as we developed the methodology for our analysis and for their ongoing advice as the research developed. Thanks to Heather Campbell, Bonnie Colby, Elizabeth Corley, Jason Davis, David Esposito, Roger Hartley, Tanya Heikkila, Ken Seasholes, and Jackie Moxley.

During the course of the research several key water conservation professionals were particularly helpful in our efforts to find appropriate cases to analyze and to appropriately use dissimilar data sets. We acknowledge the key efforts of Chris Dundon, Kim Pickett, Kim O'Cain and Kelly Kopp in the ECoBA experience.

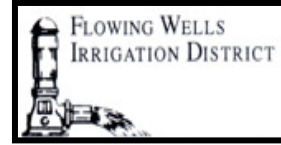
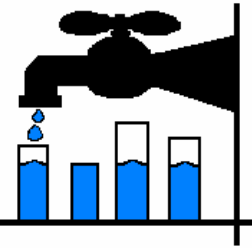
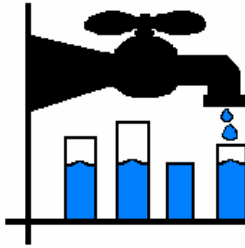


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INTRODUCTION

The ECoBA project came about as the Water Conservation Alliance of Southern Arizona (Water CASA) members expressed the need for more rigorous evaluation of conservation efforts. We were searching for more or better ways to determine what we should do more of, do less of, or do next, in our efforts.

In 2001, the board and staff of Water CASA, in consultation with our benefactors at the US Bureau of Reclamation, began to think in broad terms about what information was needed to bring about increased effectiveness in water conservation efforts. It was decided that an investigation of the **actual** water savings for actual water conservation programs and the comparable direct costs related to achievement of those savings would greatly inform our future efforts in water use efficiency.

ECoBA is meant to provide water conservation decision-makers at all levels of government, and within water utilities, a thorough analysis of conservation measures which have been, or are currently being implemented, in order to ascertain the **actual** water savings, and the direct costs and benefits related to each program's implementation.

This analysis is meant to serve as a decision-making tool, offering the reader a large amount of information not currently available. And, while it does not provide any easy answers, this information will, we hope, enable anyone with an interest in better water resource management to make increasingly more suitable water conservation program choices.

WHAT THIS STUDY IS:

An apples-to-apples comparison of water conservation programs, which to the degree possible, incorporates similar types of costs and benefits of the programs (administrative costs, rebate costs, savings on water bills).

A snapshot in time of what results conservation programs are actually achieving.

WHAT THIS STUDY IS NOT:

A place to find easy answers to conservation programming. It can serve only as a source for facts and data intended to inform the water resource management decision-making process.

An attempt to justify or defend water conservation programs. The case for conservation has been well made by many others, many different ways.

An attempt to quantify every possible cost and benefit.

WHY WE NEEDED TO DO THIS

The situation as we found it: actual water savings for a given conservation measure was almost impossible to find. With a few exceptions, after-the-fact assessment of water conservation measures is rarely done. Instead, quantification of water savings, costs, etc. are often seen only as estimates prior to program implementation, when they are used as the rationale for implementing the measure.

Estimating potential levels of water savings has often proved to be inaccurate.

Costs and benefits of water conservation efforts need to be considered and presented in the same quantifiable manner that infrastructure and other water management options are developed and evaluated.

HOW DO YOU DECIDE :

What to do first if you are going to begin a water conservation program for your utility or municipality?

What program to implement next if you plan to increase or augment your current water conservation efforts?

What conservation programs to eliminate or strengthen as your demand management efforts evolve and your need to conserve increases?

Saving the 'next increment of water' is going to be more difficult, therefore more costly, so our decisions must be ever more sound.

The likelihood of continued scarcity of dollars for water conservation efforts necessitates greater rigor in our expenditure decisions for conservation efforts.

PROJECT OBJECTIVES

- ◆ To evaluate ACTUAL water conservation programs, comparing water use data within measures as well as between them.
- ◆ To provide a thorough analysis of conservation measures that have been, or are currently being implemented, to ascertain the ACTUAL water savings, and the direct comparable costs and benefits related to each program's implementation.
- ◆ To ultimately increase the amount of water saved per staff hour and dollars expended on demand management efforts.

LESSONS & RECOMMENDATIONS

- ◆ **There are no easy answers in water conservation program development. There are simply too many factors and variables involved in reaching appropriate, tailor-made decisions for a given utility. Those in decision-making positions will quickly discover that a one-size-fits-all approach does not work.**
- ◆ **At all levels of water resource management, COMMITMENT to conservation as a water management tool is necessary in order to achieve maximum program effectiveness.**
- ◆ **Everyone working in conservation needs to fully understand, and factor into their program recommendations, the social and economic factors of their service areas.**
- ◆ **Conservation programs should more often target areas of actual high inefficiency rather than just overall high water use.**
- ◆ **Make the often thankless and frightening effort to go back and evaluate your programs: be willing to change direction, doing more of what is working and less of what is not.**
- ◆ **There is a disconnect between the conservation staff and the rest of the water resource management team in many utilities. Also, there is often an even a greater disconnect between the conservation folks and those who are the utility data 'gatekeepers'. These issues need to be addressed in order to achieve the most meaningful program selection, implementation and evaluation possible.**
- ◆ **The balance between soft conservation efforts (public awareness, customer service, utility goodwill) and the hard, goal based (gallons or AF saved) targeted programs needs to be more clearly understood by the public and by decision-makers. Though both types of program efforts are very necessary, programs are often ascribed as a conservation effort when in fact little in savings has been achieved. Additionally, the effort was not evaluated by the utility for its ability to either raise public awareness or to save water.**
- ◆ **A higher premium should be placed on good record keeping: the back up of all data, the recording and monitoring of all program related expenditures and results. Consumption records need to be kept as far back as possible.**
- ◆ **The importance of tracking program participation in detail, including water consumption for participants and similar non-participating households, or the whole customer class can not be overstated.**
- ◆ **Passive conservation is occurring and ongoing everywhere with ordinances, code changes, natural replacement of fixtures, and new technologies, so there will be diminishing savings to be achieved with water conservation actions taken now compared to times past. The cost to save the next increment of water will only be higher than to save the previous increment, so sound program decisions are ever more vital.**

SUGGESTED AREAS OF ADDITIONAL STUDY

We wish we had had more cases for comparison, particularly more ordinance and water use assessments, and water harvesting and gray-water incentive efforts. These types of programs are increasingly used by utilities, but there is not yet adequate post-measure data to analyze.

We wish we had been able to look at more multifamily, commercial and industrial programs. There are fewer of them being implemented and they are more difficult to compare as many are tailored for a specific facility. The potential for savings may well be higher in these sectors than in single family.

“The majority of water providers have not assessed the cost-effectiveness of their particular conservation programs. Although detailed benefit/cost analyses are often conducted to justify structural water supply improvements, this level of analysis for water use efficiency measures is virtually non-existent.”

Smart Water Report, Western Resource Advocates, 2003

Effectiveness of a variety of environmental education and public awareness efforts needs in-depth study. Looking at actual campaigns and curriculum evaluations with the goal of trying to tease out water savings and attempting to get at quantifiable costs and benefits of these efforts is a worthy effort.

There is a need to develop estimates of water savings degradation across program types and to have better estimates of the occurrence of free riders for different types of programs.

More work is essential on the **value** of conservation programs: quantifiable and intangible costs and benefits, replacement costs, etc.

HOW TO USE THIS REPORT

The entire contents of this ECoBA Study are contained on the CD-ROM which accompanies this document.

ECoBA is organized by type of water conservation measure. Please see the **TABLE OF CONTENTS** (page 6). Following this **INTRODUCTION** are the **METHODOLOGIES** and **ASSUMPTIONS** used for our analysis.

OVERALL FINDINGS come next, followed by **DATA TABLES**, and then **WORKSHEETS** for the **INTERACTIVE CALCULATOR**, which accompanies this report. This calculator enables any utility to perform an analysis of their own conservation programs using a slightly simplified version of the ECoBA methodologies and assumptions. Next are the **FINDINGS** for each type of measure (see Table of Contents).

The complete **CASE NARRATIVES** and analysis for each program from each participating utility are found only on the accompanying CD-ROM. These narratives are grouped by type of measure, not alphabetically (see Table of Contents).

The final piece of the ECoBA report is the **BIBLIOGRAPHY**.

STUDY LIMITATIONS

GENERALIZABILITY

The results of each analysis are unique to the situation of the utility, and are not meant to be used as an exact predictor of savings or costs, but rather as a general guide. Costs and benefits (and the resulting economic analyses) are especially prone to variations from program to program.

NOT ALL COSTS AND BENEFITS WERE QUANTIFIED

In order to make comparison of analyses more valid, only direct costs and benefits that could be quantified for all programs were included. Therefore, there are costs and benefits that could have been quantified, but were not. Most notably, savings to the participant on sewer bills and savings to the utility in avoided costs of supply are not included. These and other, more intangible, costs and benefits are listed at the end of each case narrative. Often, the unquantified benefits outweigh the unquantified costs, resulting in an understatement of the net benefit of the programs.

WATER SAVINGS CALCULATIONS LIMITED BY THE ACCURACY OF THE CONTROL GROUP

In most cases, the control group includes all single family residential connections or all residential connections. In a case where the participants were categorically different than the rest of the population, the water savings will be less accurate. An example of this is washing machine rebate programs, where participants have a higher average water use than other customers.

SIMPLIFYING ASSUMPTIONS

A number of assumptions were made to simplify the analyses. These assumptions limit the accuracy of calculations. However, by making them across the board we are still able to compare different types of programs in a similar way. An example of this is the assumption that there is no degradation in water savings over time.

“ . . . water managers and planners need to measure the effectiveness of their conservation efforts. Unfortunately, most will readily admit that water conservation programs have been poorly quantified in the past . . .

Cost-Effective Cost Effectiveness:
Quantifying Conservation on the Cheap, AWWA Toronto 1996

NO SENSITIVITY ANALYSIS

No sensitivity analysis was conducted to show a range of possible results based on differing assumptions.

NO CONTROL GROUP FOR CERTAIN PROGRAMS

Analyses of programs that were utility-wide, or included a whole segment of the utility, such as residential, do not include a control group. Water savings are therefore solely the difference in water use from pre-measure to post-measure. This does not take into account other factors in customer water use, most notably changes in weather.

“NEGATIVE” WATER SAVINGS

Some analyses show “negative” water savings, where control group water use decreased more (or increased less) than participant water use.

“NEGATIVE” COST PER ACRE FOOT SAVED

Some analyses show a “negative” cost per acre foot of water saved. Though awkward in its presentation, this indicates that the utility incurred costs related to the program and that there were no water savings attributable to those costs; that actually an increase in participant water use, relative to the control groups water use, occurred.

“Accurately measuring . . . the effectiveness of conservation efforts has been the Achilles heel of urban water planning for many years”.

Residential End Uses of Water, AWWA 1999