EVALUATING THE EFFECTIVENESS OF THE CASA DEL AGUA WATER CONSERVATION DEMONSTRATION TOUR IN PROMOTING WATER CONSERVATION BEHAVIORS

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Abstract

A typical single family residence in Tucson, Arizona (Casa del Agua) was retrofitted with water conserving devices, graywater and rainwater recycling systems, and a low water use landscape. An educational tour designed to promote the incorporation of these water saving techniques has been ongoing at the home since December, 1985. A questionnaire survey was administered between April and July 1988 to determine the extent of water conservation behavior, demonstrated by the adoption of the water conservation techniques, of the Pima County population and the tour participants. Both population samples exhibited similar water conservation behaviors. It was also determined, from the analysis of the survey results, that the tour led to additional water conservation technique adoption.

Introduction

The population of the Greater Tucson area is growing at a rapid rate. Currently the area relies totally on groundwater to meet the needs of the expanding population. Approximately 60% of the water consumed in the area is "mined" groundwater.

> The imbalance of groundwater withdrawals and recharge in an active management area is referred to as the groundwater overdraft. To achieve the goal of safe-yield, over-drafting or "mining' of groundwater must be discontinued (Arizona Department of Water Resources 1988, p3).

The Tucson Active Management Area (AMA) (Figure 1) is the groundwater regulatory branch of the Arizona Department of Water Resources (DWR) for the Greater Tucson area. The Greater Tucson area is wholely contained within the Tucson AMA. It has set a goal of achieving "safe-yield" by the year 2025.

> Safe-yield means that long term groundwater withdrawals do not exceed natural and artificial recharge of the aquifer. (Arizona Department of Water Resources 1988, p1).

One of the objectives of the Tucson AMA is to require reasonable water conservation efforts by all water users. In the Tucson AMA total water use is approximately 169 gallons per capita

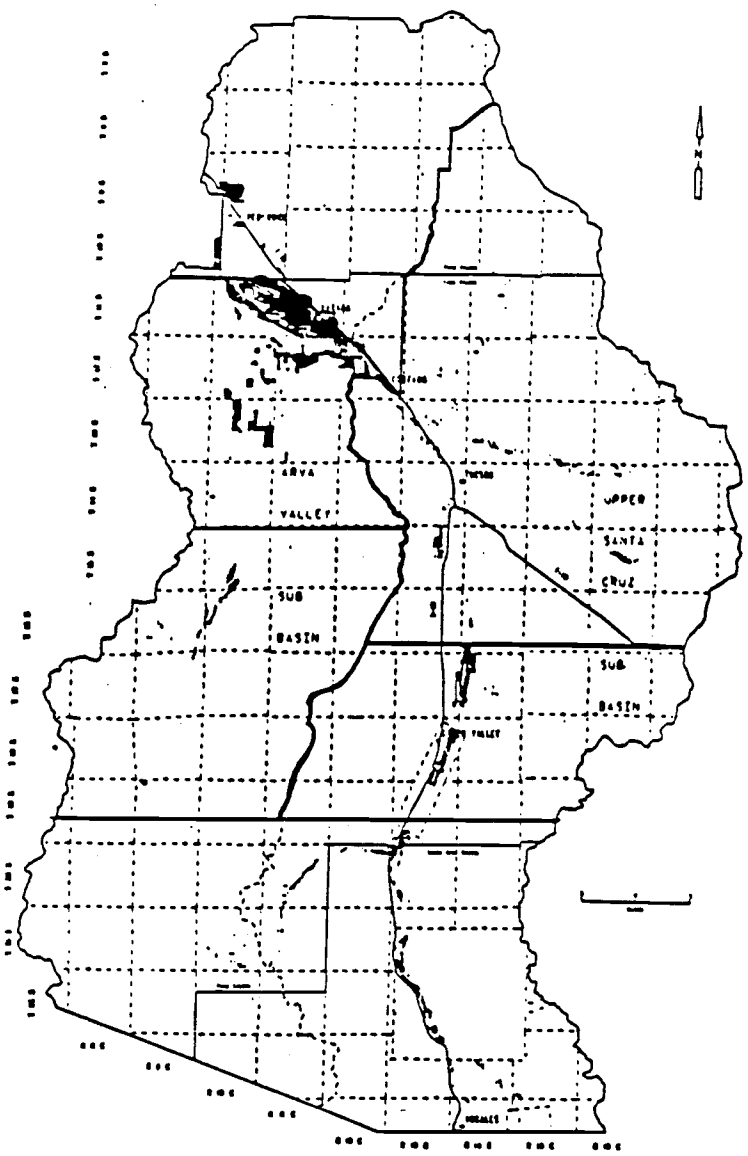


Fig. 1 Tucson Active Management Area Source: Ariz. Dept. of Water Resources

per day (gpcd). Of this amount 107 gpcd, or 63% of the total, is consumed by residential users (Arizona Department of Water Resources 1988). The goal for the year 2000 is 151 gpcd total use and 96 gpcd for residential use (Johnson 1989).

Residents of single family homes represent 86% of the residential water users and account for 53% of the water used in the Tucson Water service area (Roundtree 1988). The Casa del Agua demonstration and education program targets this population group as well as the home building industry.

A community water conservation demonstration/education project, Casa del Agua, was constructed to evaluate the potential for reducing water consumption in the residential sector, demonstrate water conservation technologies and techniques and educate the public concerning those technologies and techniques.

Casa del Agua has shown that it is possible to conserve water at the residential level and in turn lower the demand for water in the Greater Tucson area. Lowering demand makes reaching the Tucson AMA goal of "safe-yield" possible. Educating the public concerning water conservation and the need to lower demand is an objective of both the Tucson AMA and Casa del Agua.

This study evaluates the effectiveness of the demonstration/ education component of the Casa del Agua project in promoting water conservation behavior increases.

Overview of Casa del Agua Project

An existing single family home located in the Tucson area was retrofitted with state of the art water conservation technologies. It was opened in November 1985. The reasons for establishing the facility were to: demonstrate that water conservation can be achieved at the single family residence level; field test low water use landscaping irrigation practices, indoor water saving fixtures, rainwater harvesting and graywater recycling systems at the residential level; educate the public concerning water conservation practices that do not require lifestyle changes.

The Casa del Agua project has demonstrated that it is possible to save 60% of the municipal water consumed in a typical single family residence by incorporating all the water conservation practices demonstrated. The project has also demonstrated that it is possible to reduce municipal water use by 40-50% through the installation of low flow fixtures (1 or 1.5 gallon per flush toilets, 2.5 gallon per minute low flow shower heads, 2.5 to 3 gallon per minute faucet aerators) and xeriscape landscapes (low water use landscapes) with drip irrigation systems (Karpiscak, Foster, DeCook, Brittain, Gerba and France 1989).

Adding rainwater and graywater recycling systems that

require storage tanks is expensive and may not be appropriate for all individuals. An option for using rainwater harvesting that is effective and relatively inexpensive is the utilization of rain gutters to divert the water to appropriate landscaping. In addition, graywater recycling systems are stringently regulated and require county health department approval prior to installation.

Most indoor water conservation fixtures are relatively inexpensive to install. Xeriscaping can be incorporated gradually at existing residences and immediately after occupancy at new residences. When old landscaping does not have to be removed first, the cost of replacing existing high water demanding landscaping, with an attractive low water demanding xeriscape landscape, is no more than the cost of a water consuming landscape. Since maintenance costs are lower and water bills are reduced when xeriscape landscapes are installed, it is to the homeowners economic advantage to install xeriscape landscaping.

Public Education Tour

A primary component of The Casa del Agua Community Water Conservation Demonstration/Education and Evaluation Project is public education. Tucson Water, Pima County Wastewater Management Department, the University of Arizona and the Southern Arizona Water Resources Association cooperated to develop an educational tour that demonstrates methods by which water can be conserved at the residential level in the Greater Tucson area.

The public information tours consist of three main components. The first component is an introductory presentation that includes an overview of the project, the names of sponsors, a brief background history of the home, a presentation of some structural water conservation devices available for use in the home, some behavioral approaches to water conservation and a summary of some of the research findings.

The second component of the tour is a video tape presentation that details the retrofit of the home, explains the need to conserve water in the Tucson area and shows some of the water conservation devices currently in place at Casa del Agua. The video tape reiterates much of what is stated in the oral presentation and also incorporates graphics to illustrate the effectiveness of the retrofit in conserving water.

The third component of the education package is the outside walking tour of the property. During this part of the tour, participants can see firsthand the exterior water conservation retrofits. These retrofits include a rainwater harvesting system, a graywater recycling system, xeriscape landscape and a greenhouse installed along the south side of the home which allows passive heating of the home and vegetable gardening during the winter.

Brochures and pamphlets are also available for the tour

participants. These publications cover a wide variety of water conservation topics.

Need for the Study/Problem Statement

Casa del Agua is a unique project. No other water conservation demonstration/education single family residence exists. The purpose of this study was to determine the effectiveness of the water conservation education tour in promoting water conservation behavior adoption. A survey concerning water conservation behavior practices was administered to the participants of the tour and a systematic sample of Greater Tucson area residents. Specifically, the study identified the status of water conservation behavior of the sample populations and, also, changes occurring in those behaviors after completion of the tour by the study group portion of the sample population.

If lessons learned at Casa del Agua are to be applied to similar programs in the future, it is important to evaluate the effectiveness of the educational tour for water conservation behavior changes--exhibited as the installation of water conservation devices or technologies.

The need for this study was motivated by the fact that the quantity of good quality water continues to decline and the general public and home building industry need to become more aware of methods to conserve existing water supplies. Distributing information concerning ways to conserve these supplies to the public sector is an objective of the Tucson AMA's Groundwater Management Plan into the 1990's. Public education is an element of the DWR water management philosophy essential to sustaining a strong and effective management principle (Arizona Department of Water Resources 1988). The tour at Casa del Agua, through the public information presented, contributes in meeting the objectives of DWR.

Methods

A study group consisting of the visitors to Casa del Agua and a control group, composed of a systematic sample of Tucson area residents, made up the sample population. For the study group, there were 117 self-administered questionnaires completed and returned between April and July 1988. All visitors were asked to participate in the survey. Pre- and post tour respondents who agreed to participate in the telephone follow-up survey were contacted approximately six months after visiting Casa del Agua. There were 63 follow-up questionnaires completed from the 82 respondents who had agreed to participate in the survey.

The control group was a systematic sample of Pima County homeowners. This group was comprised only of single family homeowners. The sample was large enough to include all zip code

areas in the Greater Tucson area. Survey responses from the control group were compared with the responses of the pre-tour study group. There were 117 completed questionnaires returned from the 406 mailed.

The data provided the following information:

1. A summary of water conservation behaviors among the tour participants and a systematic sample of Tucson area residents.

2. An identification and ranking of water conservation behaviors among those same two groups.

3. An identification of the effectiveness of the educational tour for increasing water conservation behaviors among the tour participants.

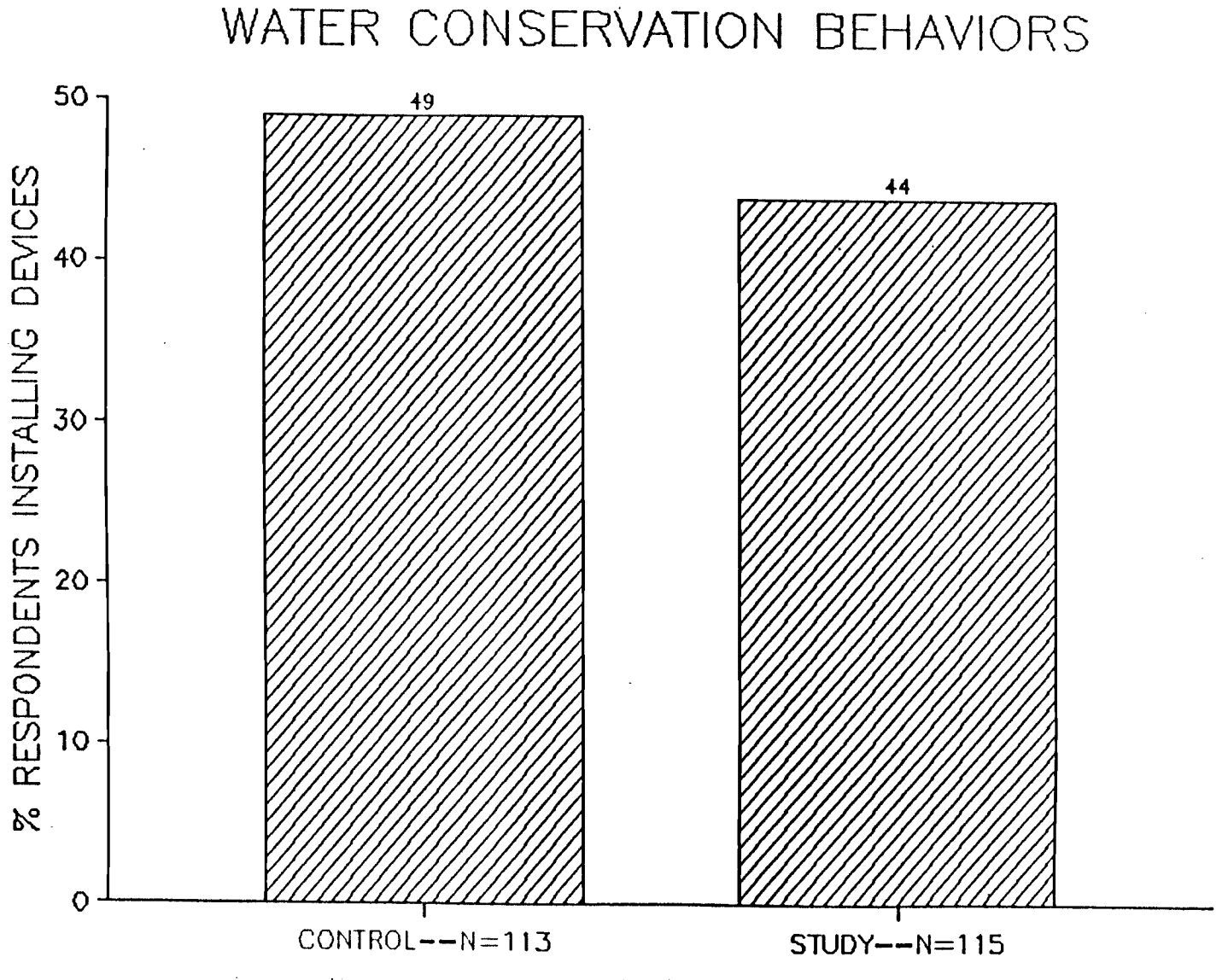
Findings and Data Interpretation

The tour participants stated various reasons for visiting Casa del Agua. The reasons included: 1) to learn about water conservation, 2) to learn about methods for conserving water inside the home, 3) to learn about methods for irrigating landscaping efficiently, 4) to learn about types of low water use plants currently available, 5) to learn about rainwater harvesting methods, and 6) to learn about graywater recycling systems.

Water conservation methods, listed on the questionnaires by the respondents, for conserving water inside the home included: using low flow toilets; using low flow shower heads; repairing leaky pipes or faucets; placing toilet tank water displacement devices inside the toilet tank; and, installing water pressure regulators at the water city water meter. Non-structural or behavioral methods listed included: not leaving the water running while brushing teeth; only washing full loads of dishes and clothes; turning water off while lathering in shower; and, only flushing toilet when solid waste present.

The methods listed for conserving water in the yard areas, or outside of the home, included: utilizing various rainwater harvesting techniques; recycling household graywater for use in landscape irrigation; installing drip irrigation systems; planting low water use landscapes; and, installing a pool cover and using it when pool is not in use. Non-structural or behavioral methods listed included: only water every other day; not watering between 4 and 8 P.M.; and, not leaving water running and forgetting to turn it off.

Figure 2 displays the percentage of respondents who had installed water conservation devices from the study and control groups. The control group had a larger percentage of respondents who had installed devices. The percentages of respondents from



Water Conservation Behavior Comparison-Study vs. Control Group

both groups are very similar, however.

The number of water conservation devices installed or practices adopted by the study group ranged from zero to three with the mean number of devices installed or adopted being .40 prior to the tour. The control group also had a range of from zero to three devices installed or practices adopted with a mean of .45 devices installed or practices adopted.

The control group had a greater percentage of respondents who had installed water conservation devices than the pre-tour study group (Figure 2). A reason for this could be that the study group desired to learn about water conservation before installing any devices. This also demonstrates that the study group exhibited no more water conservation behavior than the control group.

Figure 3 displays the pre- and post tour questionnaire responses concerning water conservation behavior adoption. The percentage of respondents installing water conservation devices increased for the study group after the tour and prior to the follow-up survey. A greater percentage of respondents installed devices or adopted water conservation practices after the tour. Also, between the tour and the follow-up survey, the study group installed or adopted 1.52 mean number of devices or practices with a range from zero to four devices installed or adopted.

The tour increased the percentage of respondents installing water conservation devices or adopting water conservation practices between the tour and prior to the follow-up questionnaire (Figure 3). This indicates that the tour educates as well as motivates individuals to increase their water conservation behaviors.

Conclusions

As the findings indicate, the percentage of respondents from the control group installing water conservation devices was slightly greater than the percentage from the tour group prior to the tour. The tour participants can be said to be similar in water conservation orientation to the study group since the difference in the percentage of respondents installing conservation devices between the two groups was not great enough to be of significance. The tour participants are representative of the Tucson area population.

As the findings indicate, the tour was effective in increasing the percentage of respondents installing water conservation devices or adopting water conservation practices. It can be concluded from this that the tour accomplishes what it was intended to do; namely, educating the public about water conservation and promoting the installation or adoption of water conservation practices or adoptions.

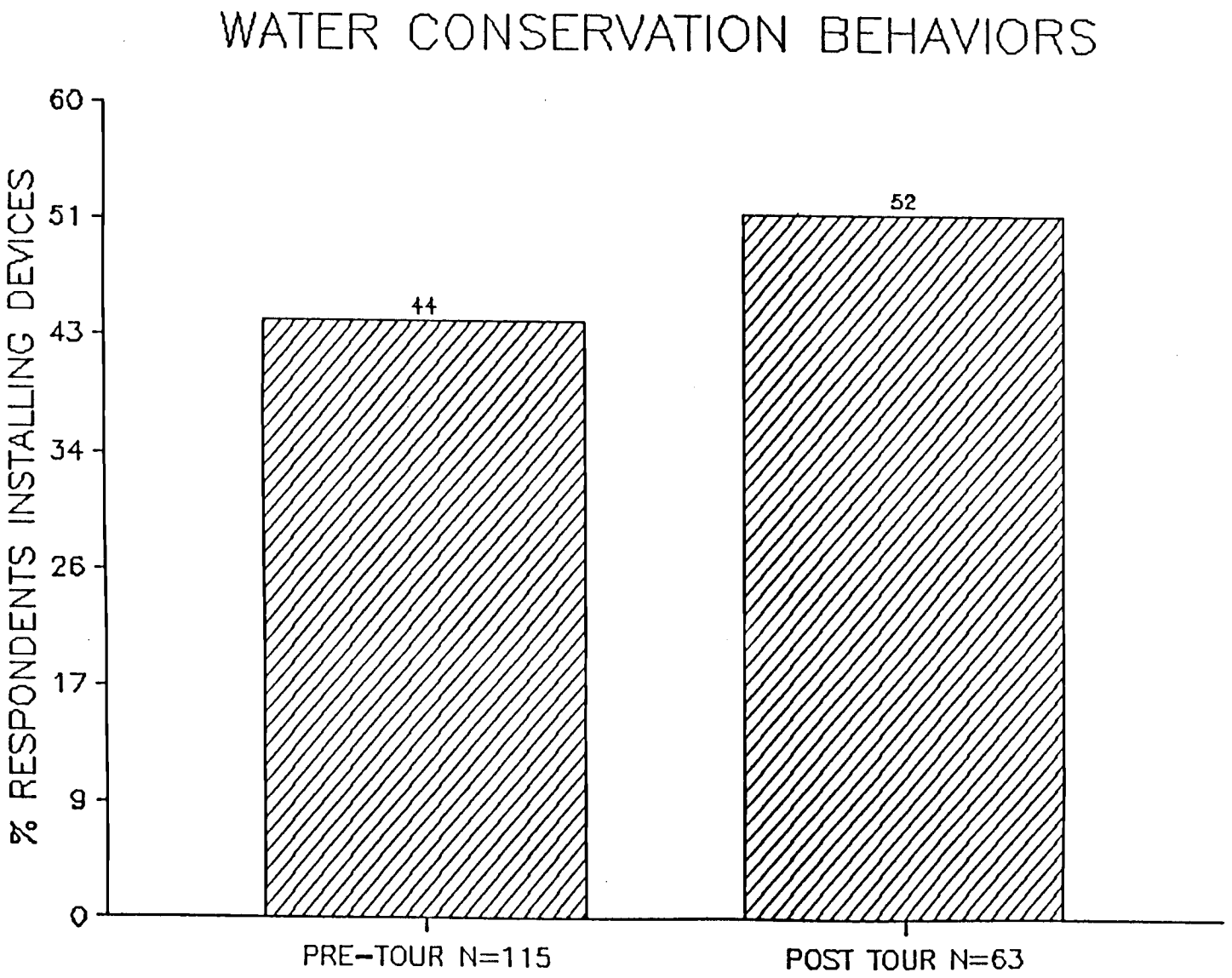


Fig. 3 Water Conservation Behavior Comparison-Pre- vs. Post Tour

Recommendations

The following recommendations can be made based on the conclusions:

1. Casa del Agua should continue to exist as part of a water conservation education program. The tour has been shown to be effective in educating the participants about water conservation, and promoting increased water conservation behavior. The facility should be continued as long as water issues are viewed as important within the community.

2. The number of visitors to Casa del Agua should be increased. This would allow for more individuals to be made aware of the need and means to conserve water.

3. A new, expanded, centrally located facility should be phased in as the need to conserve water increases with population growth. This would allow new water conservation technologies to be displayed and demonstrated.

References

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