Upper Verde Watershed Protection Coalition

Regional Water Conservation Program Development and Recommended Implementation Plan

Final Report

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Water Resources Consulting

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Chapter 1 - Introduction

In 2007, the Upper Verde Watershed Protection Coalition Board identified the development of a regional water conservation plan to improve water use efficiency within the region as a high priority for the Coalition.

This report summarizes the results of Sub Tasks 1 and 2 of the Water Conservation Program Development work task. The objectives of Tasks 1 and 2 were to: 1) identify and evaluate existing water conservation efforts currently underway within the Coalition area, 2) develop water use metrics to evaluate the effectiveness of these efforts**,** and 3) analyze the results of the regional water conservation opinion survey conducted in 2007 by the Coalition members. These chapters provide the background analysis necessary for development of the regional water conservation program analysis and recommendations for program implementation found in Chapters 5 through 9.

The program recommendations were developed through an interactive process during a series of workshops held with the Coalition's Technical Advisory Committee and public stakeholders. The conservation program recommendations presented in this report are consensus recommendations of the stakeholders. In addition, several presentations were made to the Coalition Board of Directors during the development of the program to solicit input and guidance from the Board.

Larson and Associates would like to thank the members of the TAC committee, stakeholders, and the Board of Directors for their valuable input and assistance in development of this plan.

Chapter 2 – Coalition Area Water Use Rates and Trends

2.0 Task Objective

The objective of this task is to collect and analyze historical water use data for the major water use sectors in the Coalition Area, including:

- Golf Courses
- Agricultural
- Industrial
- Small water providers (use less than 250 AF/YR as defined by the Arizona Department of Water Resources)
- Exempt well uses
- Large water providers (City of Prescott and Town of Prescott Valley)

Water use rates trends were quantified and characterized for each sector and evaluated in terms of additional water conservation potential. In addition, water use rates and trends among cities in other parts of Arizona and selected western cities are discussed and comparisons are made with Coalition Area water use trends.

2.1 Golf Course Water Use

Over the last decade, several new golf courses have been built in the Coalition Area. There are currently seven golf courses in the Prescott Active Management Area (AMA). Five of these courses are irrigated with effluent provided by the City of Prescott or the Town of Prescott Valley. These courses and the water sources are listed below:

Stone Ridge – Effluent from Prescott Valley
Antelope Hills (2 courses) – Effluent from City of Prescott
Prescott Golf and Country Club – Groundwater (Type 2)
Prescott Lakes Golf Club – Effluent from City of Prescott/Groundwater Type 2
Quailwood Greens – Groundwater (Type 2)
Hassayampa Golf Club – Effluent

Data for the seven courses within the Prescott AMA from 2001 to 2006 and turf and pond acreage data was obtained from the Arizona Department of Water Resources (ADWR). Total water use and use on a per acre basis is shown below.

To evaluate the relative efficiency of golf course water use, two measures were used. First, water use was compared to the ADWR Third Management Plan turf allotment of 4.9 AF/AC. The annual water use is considerably less than the allotment. This is largely due to the fact that the allotment assumes golf courses overseed in the winter as they do in the other Active Management Areas. However, the area's golf courses do not

Prescott AMA Golf Course Water Use: 2001 to 2006

Year	Acre-feet Total Use	(AF/AC) Use Rate
2001	2,248	3.73
2002	2,936	4.45
2003	2,498	3.79
2004	2,542	3.85
2005	2,359	3.57
2006	2,476	3.60
6-year Avg.	**2,631**	**3.83 AF/AC**

overseed. Therefore, the ADWR allotment is not a good metric to use to evaluate relative water use efficiency. Instead, the turf grass consumptive use irrigation requirements published by the University of Arizona – Yavapai County Cooperative Extension were used as the most appropriate metric.

These requirements indicate Kentucky bluegrass requires a total of 62.8 inches of water per year. If the average annual precipitation of approximately 19 inches is subtracted, the annual irrigation requirement would be 43.8 inches or 3.65 AF/AC. This assumes that all precipitation can be utilized by the turf and that irrigation is 100 percent efficient. The 6-year average use of 3.83 AF/AC is just slightly higher than the 3.65 AF/AC, indicating that golf courses are irrigating at approximately 95 percent efficiency on average. Golf course irrigation use, on the whole, is therefore very efficient, especially considering that approximately 70 percent of total water used is effluent. Golf courses using effluent must often irrigate at higher rates than those using fresh water because the higher dissolved solids content of effluent requires additional water application to leach salts from the turf root zone. This analysis indicates that the additional conservation potential for area golf course water use is limited.

2.2 Agricultural Water Use Trends

The Prescott AMA Third Management Plan (TMP) includes water conservation requirements for individual agricultural water users and irrigation districts. The TMP carried forward the conservation requirements from the Second Management Plan (SMP). These requirements included:

- Water duties for most Irrigation Grandfathered Right (IGFR) Holders based on a 75 percent irrigation efficiency.
- Requirement for irrigation districts to limit unaccounted-for water to less than 10 percent or line all their canals to reduce seepage losses (by January 1, 2002). A variance of up to five years could be obtained if the district showed it was taking steps to reduce unaccounted-for water.

The 75 percent efficiency is based on what is possible to obtain with a well-managed sprinkler irrigation system and is applicable to all crops historically grown in the AMA.

Land leveling is generally not cost-effective in the soils of the Prescott AMA. ADWR conducted economic studies in development of the SMP and determined that conversion to sprinkler systems was economically prudent irrigation management strategy. Conversion to sprinklers would increase average farm efficiency from 57 percent to 76 percent. Properly managed drip systems in the AMA can achieve 85 to 90 percent efficiency.

In 1997, agriculture used 7,572 AF of water or about 33 percent of the total water use in the AMA. IGFR lands totaled 5,600 irrigation acres and approximately 320 acres not holding IGFR's were irrigated with surface water. Approximately 1,700 acres were cropped (only 30 percent of the total potential acreage). In 1998, the City of Prescott executed an agreement with the Chino Valley Irrigation District (CVID). This agreement transferred all surface water rights from Watson and Willow Lakes to the City and made available 1,500 AF/YR of recovered effluent credits. In addition, Prescott has purchased IGFR lands within CVID and the land has been retired.

Beginning in 2002, many landowners began extinguishing their IGFR in anticipation of selling the rights to developers or cities for assured water supply (AWS) purposes. A total of 110,801 AF of credits have been extinguished and have not yet been pledged to particular AWS Certificates or Designations. These credits could support approximately 3,000 homes for 100-years (assuming 0.37 AF/YR average demand per home). In addition, urbanization of agricultural land has accelerated. The net effect is that significantly fewer acres of land are being farmed annually in CVID and elsewhere within the AMA. As of 2006, only 1,389.30 acres of IGFR lands are still active within the AMA. ADWR data indicates that in 2006, only 36 IGFR rights remained. The total annual water allotments for those acres is 4,624.06 AF. However, only 2,136.34 AF of water was used on those rights. Only one IGFR used more than 50 percent of its allotment. The difference in allotment and water used is due to improvements in irrigation efficiencies and fewer acres actively irrigated compared to the acreage that is the basis of the allotments.

2.2.1 Irrigation System Investment Trends

During the period from 1990 to 1997, irrigated lands in the AMA used 3.35 AF/AC/YR on average. Many farmers have made investments over the last 10-15 years in sprinkler irrigation (center pivot or lateral hose drag type) and drip irrigation systems. Increasing groundwater pumping costs as water levels have declined have made such investments more economically attractive. As of 2008, there are very few farms that still irrigate using flood techniques.

The Natural Resources Conservation Service manages a program to assist farmers and irrigations districts with implementing irrigation system improvements.

(References: Prescott AMA Third Management Plan; Personal communications, Kresta Faaborg, Prescott Office of the Natural Resource Conservation Service; Gordon Wahl, Arizona Department of Water Resources)

2.2.2 Agricultural Water Use in the Big Chino Sub-basin

In 2004, the Yavapai County Water Advisory Committee completed a report titled "Big Chin Sub-basin Historical and Current Water Uses and Water Use Projections." This study compiled data on current and historical agricultural water use rates in the area. All information in this section is derived from that report.

The majority of irrigated lands are in four general location in the Sub-basin: near Paulden, along Big Chino Wash approximately 15 miles northwest of Paulden (Upper Big Chin), along Williamson Valley Wash about 17 miles northwest of Prescott and along Walnut Creek. Irrigation system types in use include flood, furrow supplied by gated pipe, sprinkler, center pivot, and drip. Hand move and side roll sprinkler systems are common along Williamson Valley Wash, and furrow or border supplied by gated pipe and center pivot irrigation systems are founding the Upper Big Chino. Irrigated lands near Paulden are typically sprinkler irrigated. Field investigations in 2003 determined that approximately 2,552 acres were being actively irrigated. Total water use based on crop type, crop consumptive use, and estimated irrigation efficiency was estimated at 9,500 acre-feet. Total acreage irrigated with different systems and the irrigation efficiency was estimated by the researchers based on experience in other areas of rural Arizona, as follows:

System Type	Acres	Irr. Efficiency
Sprinklers	1165.5	60%
Gated Pipe	1250.4	50%
Flood	131.6	50%
Drip	4.8	75%

The average weighted irrigation efficiency within the sub-basin was 54.7 percent. Based on these estimates, it appears that significant improvement in overall irrigation system efficiency is possible in the future. As of 2003, approximately 54% of lands (1382 acres) were still being irrigated with gated pipe or flood systems that could be converted to more efficient sprinkler or drip systems. If irrigation efficiency were improved on these lands, the annual sub-basin irrigation use of 9,500 AF/YR could be reduced by approximately 10 percent.

2.3 Industrial Water Use Trends

There are very few large industrial water users in the Coalition Area. These are limited to one Sand and Gravel operation that pumps groundwater, one electronics plant, and one potato chip plant served by the City of Prescott. Due to the relatively small volume of these uses, water use efficiency of these users was not evaluated as part of this effort.

2.4 Small Provider Water Use Trends

Small water providers in the Coalition Area include private water companies, mobile home parks, well co-operatives, and institutional providers. In 1997 there were 17 small providers using a total of 521 AF/YR. In 2006, there were 21 providers and water use had increased to 1,183 AF/YR due to infill growth within many service areas and the addition of new providers. In 2006, most of the use was within the following service areas:

- Chino Meadows II – 211 AF
- Diamond Valley Water Users – 133 AF
- Granite Oaks Water Users – 207 AF
- Town of Chino Valley – 157 AF

In the mid 1990s, ADWR estimated the average per capita water use rates for small providers was 104 gallons per capita per day (GPCD), which is relatively low compared to large provider use rates. It is not known what the overall GPCD use rate trend has been since then. Because of the large number of providers, it is beyond the scope of this study to research the current use rates among small providers.

2.5 Exempt Well Water Uses

There are currently approximately 11,200 exempt well permits that have been issued by ADWR within the Prescott AMA. It is estimated that between 9,200 and 9,700 of these permits are active and have water use associated with them. Exempt well locations are concentrated in the Chino Valley and Dewey-Humboldt area, where most residents use water from their own wells. There is no way to know for certain how many wells are active and how much water was used, since owners are not required to meter and report water use to the state.

For planning purposes, ADWR is currently assuming an average water use per well of 0.24 AF/well. This is based on 85 gpcd use rate and 2.5 persons per household (57 gpcd indoor use and 18 gpcd outdoor use). This use rate assumption may be on the low side because it is based on interior use standards for new residential construction (based on 1.6 gal./flush toilets and other low-flow fixtures) and minimal outdoor use (essentially no turf irrigation). Results of the conservation opinion survey, discussed in Chapter 4 of this report, indicate that approximately 35 percent of exempt well owners irrigate turf and 11 percent irrigate more than 1,000 square feet of turf. While many well owners are extremely conservative out of necessity due to low well production rates, it is also known that some owners may irrigate 1 or more acres of pasture for livestock. In addition, according to the survey, 59 percent of exempt well owners live in homes older than 10 years that are likely to have older, inefficient plumbing fixtures. Based on this new information, a more accurate water use rate assumption may be in the range of 0.35 AF/AC to 0.4 AF/exempt well. Using 0.4 AF/well and 9,500 wells, the total estimated annual water use for exempt wells in the AMA is 3,800 AF/YR.

2.6 Large Water Provider Water Use Trends

Currently, the City of Prescott and the Town of Prescott Valley are the only large providers as defined by ADWR standards. It is anticipated that the Town of Chino Valley will soon have enough customers to be classified as a large provider. Historic water use data for Prescott and Prescott Valley was collected from reports filed with ADWR for years 1993 to 2007. This data was then analyzed to determine the water use efficiency trends over that period. The following parameters were looked at in gauging water use efficiency:

- Total gallons per capita per day (Total GPCD)
- Single Family Residential gallons per housing unit per day (SF GPHUD)
- Multi Family Residential gallons per housing unit per day (MF GPHUD)
- Non-residential use percentage of total water use
- Annual percentage of unaccounted-for water (non-revenue water)

Several assumptions were made, including the following:

- The average persons per household was based on the number from the 2000 Census for each provider: 2.1 pph for the City of Prescott and 2.6 pph for Prescott Valley.
- The number of housing units in each category was based on data provided by the water provider on its annual report. Some adjustments were made for Prescott Valley Multifamily unit counts for the years prior to 2005 because data on the annual reports for those years was based on metered connections and not housing units. This adjustment was based on year 2000 Department of Economic Security data based on the 2000 census.

Tables showing annual water usage and deliveries to various water use sectors for the City of Prescott and Town of Prescott Valley can be found in Appendix 1.

2.6.1 Weather Impact on Provider Annual Water Use

Weather variations have a significant impact on annual water use for individual water users and the total water delivered for providers. In relatively hot, dry years, water use typically increases. In cool, wet years with ample precipitation, outdoor water use is typically below that in normal years. During the 1993 to 2007 period, Arizona and the Coalition area experienced several years of extreme weather that caused variations in water use patterns that can be seen in the data. To estimate the degree to which weather influenced water use, average annual temperature and total annual precipitation data was compiled for the City of Prescott from NOAA data. This data was then compared to the both the 100-year averages and averages from 1993-2005. In general, the 1993-2005 period was significantly warmer and dryer than the 100-year averages. The comparison of the averages for the 1993-2005 period versus the 1898-2005 period are as follows. Data for each year is provided in Table 2.1 below. A qualitative rating was given for

Avg. Temperature 1898 to 2005 -	53.34	Degrees
Avg. Temperature 1993 to 2005 -	55.35	Degrees
Avg. Annual Precip. 1898-2005 -	18.95	Inches
Avg. Annual Precip. 1993-2005 -	15.9	Inches

each year to characterize the annual temperature and precipitation. Most years were below the long-term average precipitation, with the exception of 1993 and 1998. Years 2001 and 2002 were extremely dry and hot and this reflected in the provider water use rates.

Table 2.1
Annual Precipitation and Temperature Variations
Prescott, Arizona 1993-2005

Year	Mean Temp	Depart. 1898-05 Avg.	Depart. 1993-05 Avg.	Annual Precip.	Percent Depart. 1898-05 Avg.	Percent Depart. 1993-05 Avg.	Rating Temp.	Rating Precip.
1993	54.53	2.2	-1.5	19.83	4.6	24.7	Cool	Wet
1994	54.78	2.7	-1.0	18.25	-3.7	14.8	Cool	Wet
1995	55.68	4.4	0.6	16.15	-14.8	1.6	Avg.	Avg.
1996	56.45	5.8	2.0	10.76	-43.2	-32.3	Hot	Dry
1997	54.98	3.1	-0.7	16.19	-14.6	1.8	Avg.	Avg.
1998	54.86	2.8	-0.9	22.7	19.8	42.8	Cool	Wet
1999	55.17	3.4	-0.3	16.52	-12.8	3.9	Avg.	Avg.
2000	56.18	5.3	1.5	15.82	-16.5	-0.5	Hot	Avg.
2001	56.87	6.6	2.7	12.81	-32.4	-19.4	Hot	Dry
2002	55.98	4.9	1.1	7.17	-62.2	-54.9	Avg.	Ext. Dry
2003	56.52	6.0	2.1	15.43	-18.6	-3.0	Hot	Avg.
2004	54.91	2.9	-0.8	17.78	-6.2	11.8	Cool	Wet
2005	55.5	4.0	0.3	17.28	-8.8	8.7	Avg.	Avg.

2.6.2 Single Family Gallons per Housing Unit per Day (GPHUD) Use Trend

Single family water use comprised 54 percent of total billed consumption in 2007 for the City of Prescott. In Prescott Valley, 2007 single family use was 66 percent of total billed consumption. Figures 2.1 and 2.2 plot single family GPHUD for the two cities. As expected, the overall trend for both cities over the period is downward based on the best fit trend lines shown. However, there are significant variations from year to year due to weather and other factors. The impact of the 2000 to 2002 hot/dry period pushed single family water use upward for several years, particularly in the City of Prescott. Since 2003, water use rates have declined significantly in both cities. Based on the best fit trend lines, the estimated reduction in single family GPHUD use is approximately 9 percent for Prescott Valley. The best fit line for the City of Prescott indicates a slight reduction but this is misleading due to the large annual variations in water use. Since reaching a peak of 255 GPHUD in 2002, Prescott has seen a reduction in single family GPHUD water use of over 20 percent.

Figure 2.1

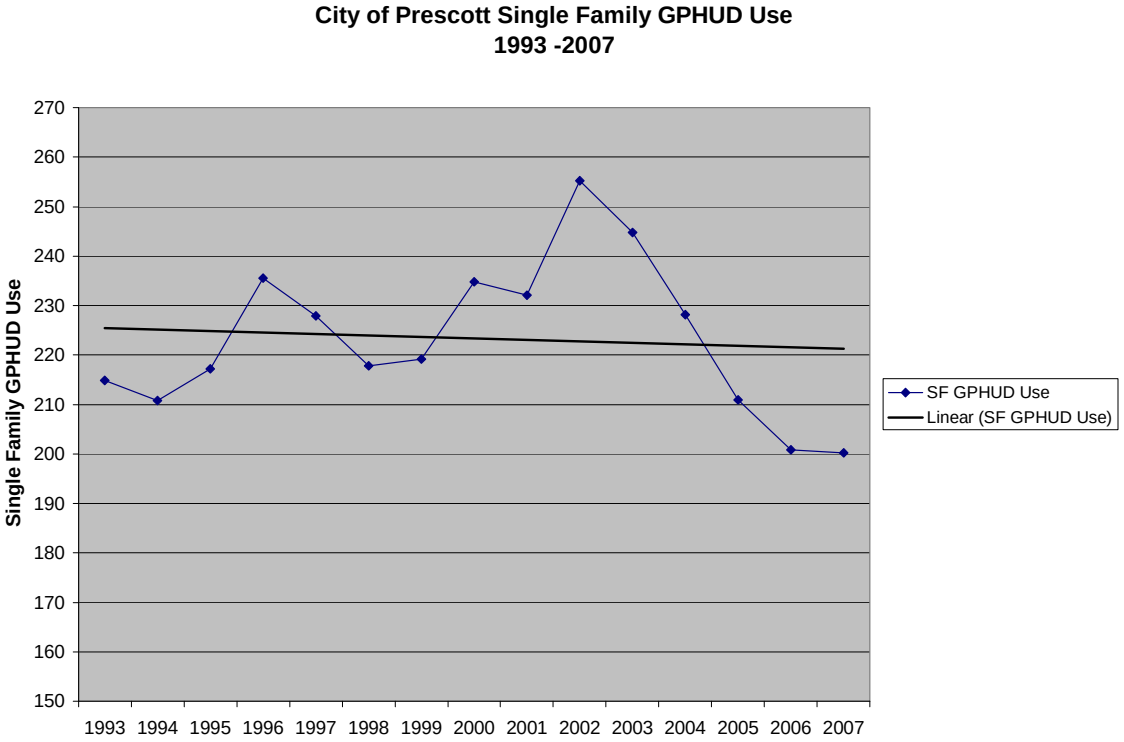
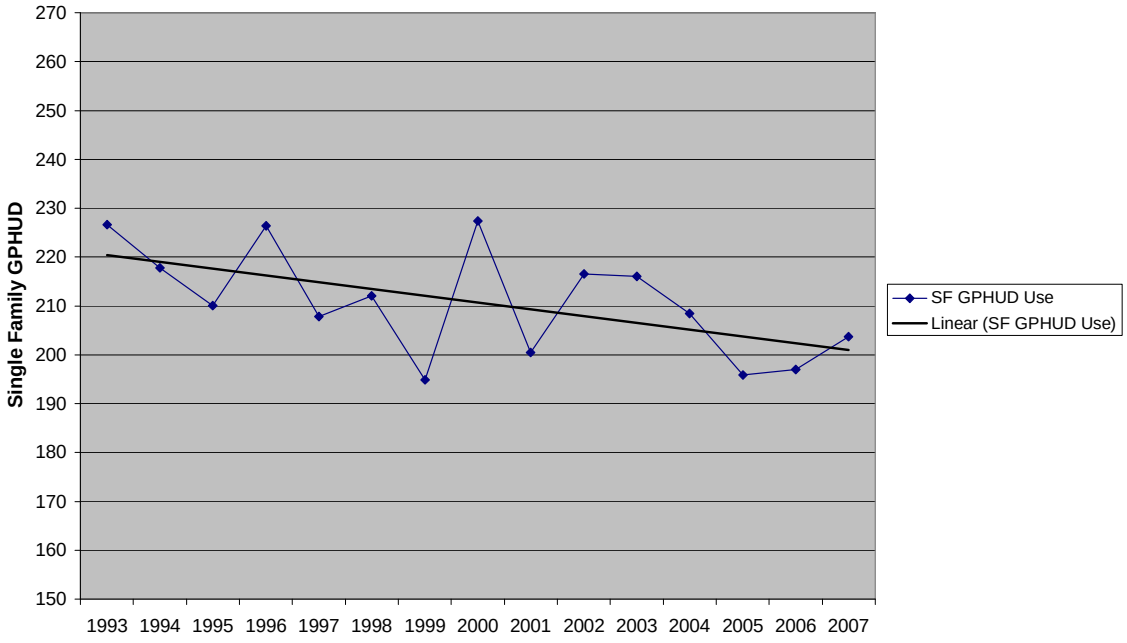


Figure 2.2



In recent years the single family residential GPHUD use rates are approximately the same in the two cities. However, per unit outdoor water use is probably higher in Prescott than in Prescott Valley because the average persons per household is 2.1 in Prescott versus 2.5 in Prescott Valley.

2.6.3 Multifamily Gallons per Housing Unit per Day (GPHUD) Use Trend

Multifamily housing in Prescott comprised 11 percent of total 2007 billed water consumption. In Prescott Valley, multifamily use comprised 8 percent of 2007 billed consumption. Figures 2.3 and 2.4 indicate multifamily water use and total gallons per capita per day water use for Prescott and Prescott Valley. The multifamily use rate is significantly lower in Prescott than in Prescott Valley, where family size in multifamily is considerably higher than in Prescott (Prescott Valley: 2.92 multifamily pph according to year 2000 DES figures).

In Prescott, the overall multifamily use trend was downward until 2003, when this trend was reversed. Since 2003, the use rate has increased significantly from about 80 GPHUD to 110 GPHUD. This recent upward trend is unexpected and should be investigated further to determine its cause and the impact on conservation potential for this water use sector in Prescott.

Until 2004, the Town of Prescott Valley had exhibited an increasing multifamily water use trend. Recently, this has been reversed, with about a 25 percent reduction from a high of 155 GPHUD in 2004 to 113 GPHUD in 2007.

2.6.4 Total Provider Gallons Per Capita Per Day (GPCD) Use Trend

Total GPCD water use is influenced by residential use, commercial and industrial (non-residential) use and other factors such as water losses and unaccounted-for water uses. One of the key determinants in calculating the total GPCD use rate is accurately estimating service area population. Inaccuracies in population, particularly for years between census years can lead to inaccurate estimation of a provider's GPCD water use rate. For these reasons total GPCD use rates should be used with caution when comparing use rates across service areas. Nevertheless, total GPCD is a commonly used measure of water use efficiency. It should be noted that the GPCD use figures provided in this report are not official, or endorsed or approved by the Arizona Department of Water Resources in any way. The figures provided here should therefore not be used as a measure of compliance with ADWR Third Management Plan Conservation Targets for the providers. The GPCD use figures are provided solely in order to determine recent trends in overall provider water use.

The total GPCD use rate for the Town of Prescott Valley has been relatively constant over the 1993-2007 period at slightly below 120 GPCD. However, there is approximately 6 to 7 percent variation above and below this average due to weather impacts and other factors. It should be noted that the 2005-2006 period exhibited about a

10 percent decrease from the 2002-2004 period. While single family GPHUD use has shown a decrease over the period, the total GPCD use rate has not shown this long-term trend due to an increase in commercial water use within the service area. In the 1990s, non-residential use comprised about 21 percent of total use in Prescott Valley. By 2007, this percentage had increased to about 26 percent. Non-residential water use is expected to continue to increase as a percentage of total use in Prescott Valley as the City develops, placing upward pressure on the current total per capita use rate.

The City of Prescott's Total GPCD use has remained relatively constant over the 1993-2007 period at approximately 150 GPCD, but has varied significantly between about 140 GPCD and 160 GPCD, depending on the year and weather conditions. Since reaching a high of 161 GPCD in 2003, use has declined steadily to about 145 GPCD (9 percent reduction). Non-residential water use as a percentage of total use has remained relatively constant over the period at about 35 percent. Higher commercial and industrial per capita water use is one contributor to the City of Prescott's higher total per capita water use rate compared to Prescott Valley.

2.6.5 How Community Differences Influence Water Use Rates and Conservation Program Approaches

Community demographic and other physical characteristics influence residential and commercial water use rates within communities. Several of the key determinants in water use rates include:

- Average residential lot size
- Household income levels
- Persons per household (pph)
- Percentage of newer housing units having low-flow plumbing fixtures
- Commercial/Industrial use percentage and types of users

Average Lot Size

Average lot size within a service area directly influences outdoor water use, the largest component of overall residential water use in most Arizona and western communities. All things being equal, subdivisions having larger lot sizes will use more water than those with smaller lots. The reasons for this include:

- Larger lots generally have more landscape water use up to a point. Very large lots (> 1 acre) in some instances will leave most of the lot in natural vegetation.
- Larger lots often contain larger homes that house larger family sizes that use more water indoors.
- Average income levels within large lot subdivisions are often higher so the cost of water is less of an incentive to conserve.

In 2006, the Central Arizona Groundwater Replenishment District (CAGRD) conducted a study to research per unit water use rates in member land subdivisions. Average

Figure 2.3

City of Prescott Total GPCD and Multi-Family GPHUD Water Use
1993-2007

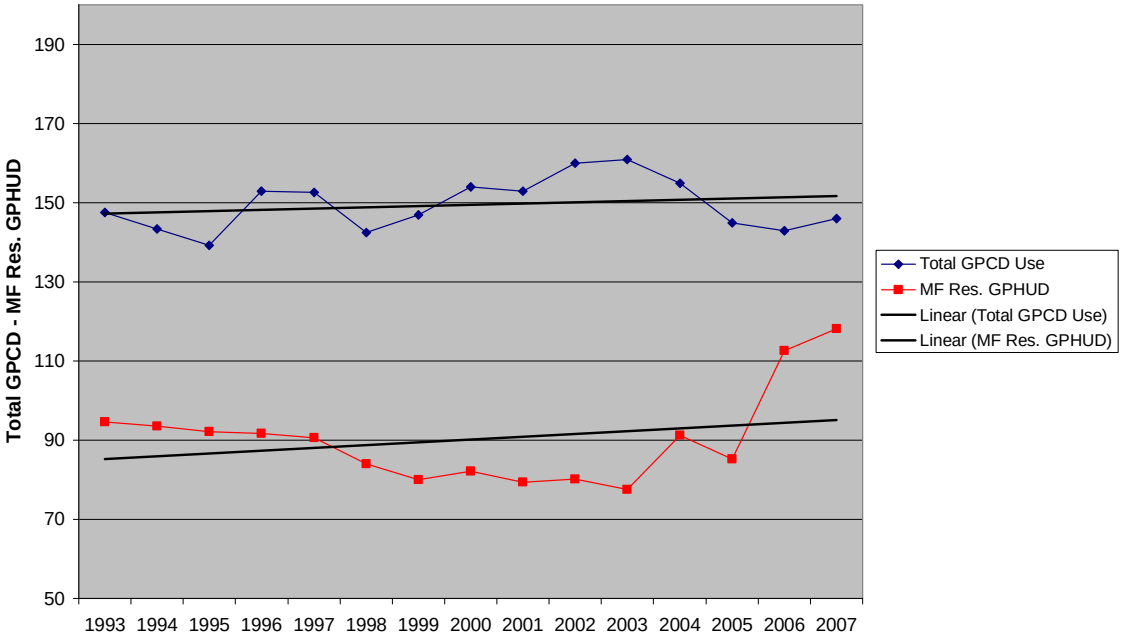
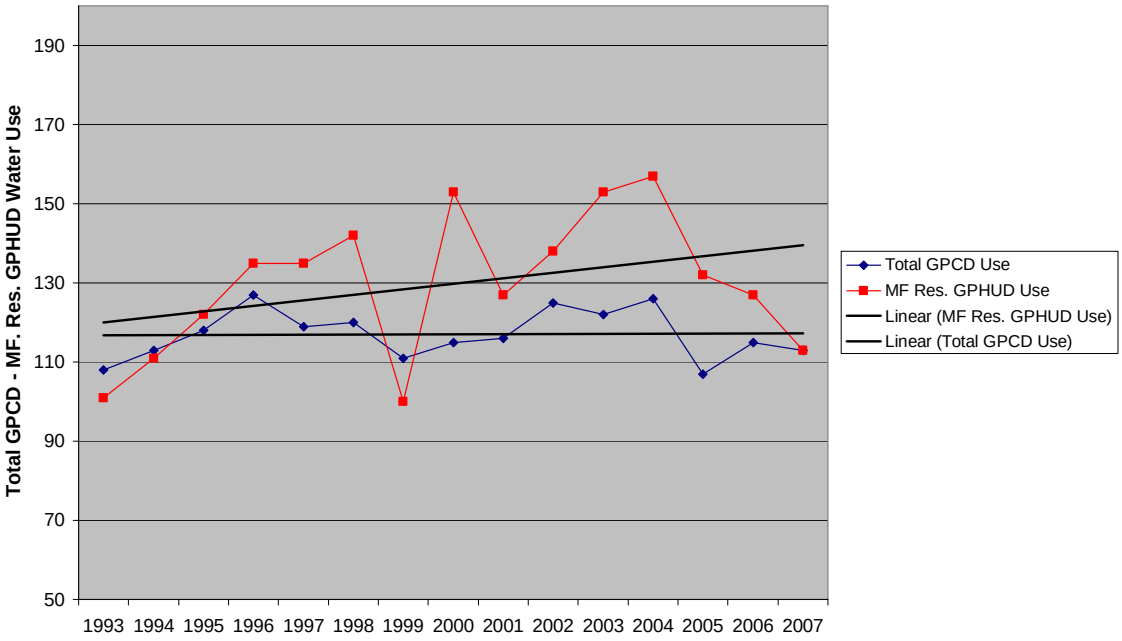


Figure 2.4

Prescott Valley Total GPCD and Multi-Family GPHUD Water Use
1993 - 2007

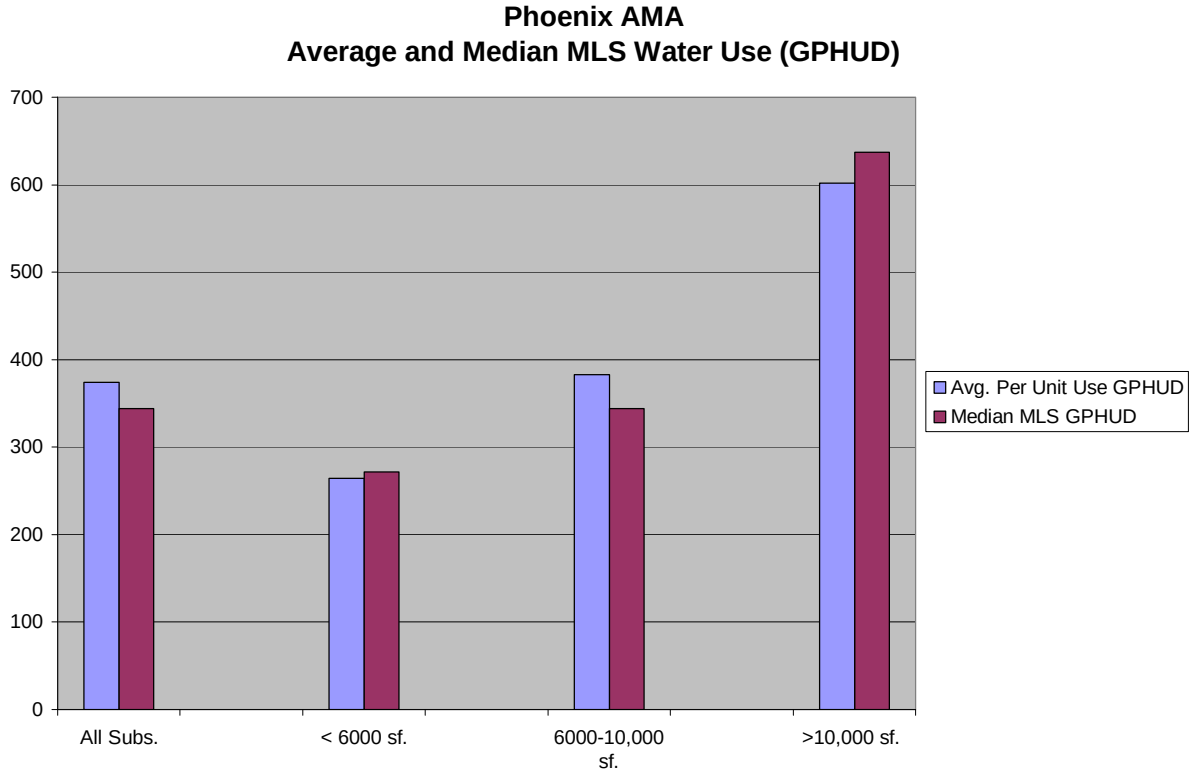


subdivision lot size was one of the variables that was examined. Figure 2.5 shows a clear relationship between lot size and average and median subdivision per unit water use in the Phoenix AMA (122 subdivisions sampled). Subdivisions with average lot size greater than 10,000 s.f. had average per unit use rates approximately twice the use rate of subdivisions having lots less than 6,000 s.f. (Reference: CAGRD Member Land Groundwater Use Efficiency Study, March, 2007). Future land use planning and zoning decisions can obviously have a large impact on future total GPCD and residential GPHUD use rates within a community.

Household Income

Household income influences the ability to pay for water and how consumers view the necessity to conserve water. All things being equal, higher income communities will exhibit higher water use rates than lower income areas.

Figure 2.5



Percentage of Newer Housing Units with Low-Flow Toilets and other Fixtures

Pursuant to Arizona and National plumbing codes enacted in 1993, homes built since the mid 1990s generally have 1.6 gallon per flush toilets, low-flow showerheads, and faucet aerators. ADWR's Third Management plan targets for new residential construction assume an interior use rate of 57 gpcd as opposed to 80 gpcd or higher for older homes.

Persons per Household

Persons per household (pph) influences overall population, per capita and residential unit water use rates. PPH is not constant over time and can change as the demographics of a community change, particularly in fast-growing communities where family sizes can increase or in older retirement communities that experience change as residents age.

Water Use Starting Point

It is intuitive that communities that are less efficient in terms of water use should be able to achieve higher levels of reductions with the implementation of water conservation programs. However, water conservation "Low-Hanging Fruit" must still be identified and specific water uses targeted for conservation efforts to achieve maximum savings.

2.7 Water Use Trends in Other Arizona Cities and Selected Western Cities

In order to gauge the water use efficiency trends of Coalition area large water providers, a literature review was conducted regarding water use trends over the last decade among other Arizona cities and selected Western U.S cities. Data on total GPCD use rates as well as total residential GPHUD use rates were collected and are presented here. In general, residential and total per capita use rates have declined over the last decade in many service areas although not all. In some cities, water use rates have declined dramatically in response to increasing water commodity prices, implementation of conservation rate structures, and implementation of comprehensive water conservation programs, including financial incentives for low-flow fixture installations and water conservation ordinances related to new development. The impact of new plumbing codes enacted in the 1990s is a key contributor to gains in water use efficiency, particularly in high growth communities.

2.7.1 Total Residential GPHUD Use Rate Trends

Data for total residential GPHUD water use in 2000 and in 2005 was obtained from ADWR for water providers in the Phoenix, Tucson, and Pinal AMAs. Both of those years were relatively normal weather years in terms of temperature and precipitation. This data is shown in Table 2.2 along with figures for the City of Prescott and Town of Prescott Valley. Over this period of time, there has been a significant downward trend for most water providers in the state, though not all. Reductions in total GPHUD use ranged from 0 percent for the City of Scottsdale to 33.7 percent for the Town of Marana. The average reduction for the Phoenix AMA providers was 15 percent. Decreases in

residential use rates were less in the Tucson AMA, with the exception of Marana, which experienced a 155 percent increase in housing units during the five-year period.

In general, fast-growing communities saw the greatest reduction in residential GPHUD water use. This is due to the fact that new housing units have low-flow fixtures and in many communities, new sub-divisions have smaller average lot sizes than the overall housing stock within the community. However, a high residential growth rate does not guarantee a significant reduction in residential water use. For example, the City of Goodyear experienced 177.5 percent growth in housing units but saw only a 6 percent reduction in GPHUD water use. Goodyear is a relatively high-income community with subdivisions having relatively large lot sizes. Scottsdale, another high-income community, saw no decrease in residential GPHUD. In contrast, the City of Tempe had the largest decrease in residential use despite having a relatively low residential unit growth rate. Tempe has implemented one of the most comprehensive water conservation programs in the state, including financial incentives for fixture retrofits, and conservation ordinances for new development.

The Coalition providers, Prescott and Prescott Valley, exhibited reductions in total residential water use during the 2000 to 2007 that were below the average for the Phoenix and Pinal AMA providers but higher than most providers in the Tucson AMA. Several Arizona providers' reductions exceed that of the Coalition providers even though the providers' housing unit growth rates were less than that of the Coalition providers.

The Town of Payson is another Arizona city that has exhibited a significant reduction in residential GPHUD water use over the last decade. Payson's residential GPCD use rate declined 18 percent from 1996 to 2006 (currently 84 GPCD or 193 GPHUD based on 2.3 pph). Payson has implemented a strict water conservation ordinance that prohibits new turf to be established in new or existing residential and commercial development. The City of Denver, Colorado has also exhibited significant residential use reductions. From 1996 to 2006, Denver residents reduced water use by 37 percent from 455 to 288 GPHUD.

Conclusions that can be drawn from these residential water use comparisons include:

- Residential water use rates have declined significantly in the Coalition area in comparison with many other Arizona water providers but not as much as cities showing the highest reductions.
- The Town of Prescott Valley residential GPHUD use rate in 2005 was among the lowest in the state.
- There are additional residential water conservation opportunities in the existing and new residential sectors within the Coalition area communities.

2.7.2 Total Gallons Per Capita Per Day (GPCD) Water Use Trends

To research overall total per capita water use trends in Arizona and other western states, an internet literature review was conducted. Table 2.3 shows total GPCD water use trends for selected cities in Arizona and other neighboring western states. It is interesting to note that total GPCD water use in Arizona's two largest cities, Tucson and Phoenix, has not declined significantly in comparison to other cities in Arizona and selected cities in other states. Tucson's GPCD water use has remained constant over the last decade at about 177 GPCD. City of Phoenix's water use declined by 6.5 percent from 1995 to 2004. Both of these cities' conservation efforts consist mainly of public education and information programs to encourage water use efficiency.

Table 2.2
Total Residential GPHUD Water Use Trends (2000-2005)
Phoenix, Tucson, Pinal and Prescott AMAs

Water Provider	Res. GPHUD 2000	Res. GPHUD 2005	% Change 2000 to 2005	% Housing Unit Change
Prescott AMA				
Prescott	192	178	-7.3	24.9
Prescott Valley	215	188	-12.6	25.0
Phoenix AMA				
Phoenix	389	321	-17.5	13.4
Mesa	326	278	-14.7	16.8
Peoria	348	267	-23.3	46.7
Gilbert	475	425	-10.5	52.5
Surprise	365	340	-6.8	
Avondale	233	181	-22.3	79.2
Scottsdale	420	420	0.0	10.2
Glendale	394	334	-15.2	13.1
Goodyear	348	327	-6.0	177.5
Sun City	341	261	-23.5	21.4
Tempe	409	305	-25.4	17.0
Tucson - Pinal AMA				
Tucson	248	236	-4.8	4.1
Marana	264	175	-33.7	155.0
Oro Valley	286	293	2.4	8.0
Metro Water	308	296	-3.9	3.5
Casa Grande -AZ Water	297	252	-15.2	40.7

In contrast, the cities of Albuquerque, New Mexico; Santa Fe, New Mexico; Las Vegas, Nevada; and Monterey, California have been able to achieve total GPCD use reductions of between 18 percent and 38 percent. Each of these cities has implemented intensive and comprehensive water conservation programs consisting of elements including: 1) intensive public education and outreach, 2) aggressive conservation rate structures, 3) financial incentives for residential and non-residential low-flow fixture installation or turf removal, 4) water audits, and 5) ordinances that apply to new development or retrofit on resale requirements. These findings indicate that overall per capita water use reductions exceeding 20 percent are possible if significant expenditures are made toward public education and financial incentive programs, conservation ordinances are implemented, and aggressive rate structures are implemented. However, the water use efficiency benefits resulting from these programs do not come without costs to the community.

Table 2.3
Total Gallons Per Capita Per Day (GPCD) Use Trends – Selected Western Cities

Water Provider	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	% Change for Period
Phoenix	233	230				221				215			-6.5
Tucson	177					177				177			0.0
Flagstaff												106	
Santa Fe	168	134	139	142	139	137	140	116	118	112	108	106	-35.7
Albuquerque	251	239	216	220	210	216	205	197	193	185	174		-30.7
Las Vegas			322					300				264	-18.0
Denver						206							
Monterey, Ca	153										95		-37.9

Chapter 3 – Existing Coalition Area Water Conservation Programs and Comparison to Programs in Other Jurisdictions

3.0 Water Conservation Program Survey Responses

A survey was prepared and sent to Coalition area stakeholders to gather information on water conservation programs currently in place within the region and those planned for implementation in the next 18 months. Meetings were then held with most survey recipients to clarify responses and obtain more detailed data on programs. The stakeholders the survey was sent to included: City of Prescott, Town of Prescott Valley, Town of Chino Valley, Town of Dewey-Humboldt, Arizona Department of Water Resources, Yavapai County Water Advisory Committee, Yavapai Prescott Indian Tribe, Prescott Water Conservation Committee (Howard Mechanic/John Zambrano), University of Arizona Cooperative Extension Office – Yavapai County.

3.1 Survey Responses – Existing and Planned Water Conservation Programs

The results of the survey responses by Coalition area organizations are tabulated in the tables in Appendix 1. Existing water conservation programs in the area consist of public education and awareness efforts, conservation education and training (school programs and workshops), conservation device giveaways, ordinances, customer financial incentives, and regional partnerships to promote efficient water use. The following sections summarize current and planned program coverage.

3.1.1 Public Education and Awareness Programs

The City of Prescott is currently the only water provider that has a full-time conservation program manager staff position. The other towns and organizations allocate a portion of water resources management staff positions to water conservation efforts. Other organizations also devote staff resources to water conservation efforts. Yavapai County supports a regional water conservation coordinator position as part of the Yavapai County Water Advisory Committee effort. A portion of this position's time is allocated to water conservation program planning. ADWR provides a staff position to promote water conservation efforts within the AMA, including Project WET (Water Education for Teachers) and the Pre-Rinse Spray Valve program. The Yavapai Prescott Tribe has conducted water quality and water conservation workshops for Tribal Members.

Though not all providers surveyed have each of these programs in place, conservation information is currently disseminated by water providers via radio spots, television spots on public cable channels, literature provided at pay stations, information provided through homebuilders and nurseries, restaurant table tents, community events, and through city websites.

3.1.2 Conservation Education and Training Programs

Project WET (Water Education for Teachers) is a state-wide program sponsored by the University of Arizona Cooperative Extension and Yavapai County. The program develops water education classroom curriculum and provides teacher workshops on how to use in the curriculum in the classroom. Each of the water providers and Yavapai County through the Water Advisory committee has helped fund Project WET efforts within the Coalition area. In 2007 and 2008 within the Prescott area, project WET provided 7 workshops attended by 78 educators. The educators reported that 8,744 students received water resources training as a result of Project WET efforts (Source: Yavapai Count Cooperative Extension). Yavapai County Cooperative Extension has also conducted two xeriscape workshops per year for area residents over the last few years. The Master Gardener Program, also conducted by the Extension office, has trained over 120 people in water efficient landscape design and irrigation principles.

The City of Prescott provides a speakers bureau to groups desiring talks on the area's water issues. The regional water conservation opinion survey conducted in 2007 (discussed in Chapter 4) was joint public education/awareness effort by the Coalition providers, Yavapai County, and other stakeholders. The Town of Prescott Valley is planning to construct a xeriscape demonstration garden in 2008/09.

3.1.3 Customer Outreach Programs (Audits)

The City of Prescott has provided over 500 self-audit kits to customers and staff has conducted 120 additional audits of residences. Water use at these accounts is being tracked to evaluate conservation savings. Several audits of commercial facilities and large turf facilities have also been conducted. Prescott Valley is planning to conduct audits of 12 City-owned turf facilities in 2008. Chino Valley is also planning to conduct audits of water use at Town parks.

3.1.4 Device Giveaways

All of the large providers in the area are participating in the Pre-Rinse Spray Valve Program sponsored by ADWR. The City of Prescott provides a kit to customers for a price of $10 that includes low-flow showerheads, faucet aerators, and hose nozzles. Rain gauges, flow rate gauges, toilet die tablets and audit kits are also provided at no charge. Irrigation controllers are also sold to Prescott customers.

3.1.5 Conservation Ordinances

The City of Prescott, Town of Prescott Valley, and Yavapai County all have ordinances in place that require reclaimed water use on new golf courses. Currently, no jurisdiction limits turf in new development, although the Town of Chino Valley has developed a comprehensive draft water conservation ordinance that is currently under Town review. This ordinance, if adopted, would prohibit the use of Town-supplied water for outdoor

turf irrigation in new residential development and prohibit the use of Town-supplied water for any type of outdoor irrigation in multifamily or commercial development. In 2007, City of Prescott staff brought a proposal to the City Council for turf limitations for new development. This proposal would have limited turf on new residential properties to 600 square feet. The proposal was not acted on by the Council.

The City of Prescott has in place an irrigation time-of-day requirement during the summer months that limits irrigation uses to between the hours of 8:00 PM and 8:00 AM.

The City of Prescott, Town of Prescott Valley, and Town of Chino Valley all have in place tiered water rate structures (increasing block) to encourage water use efficiency. Tiered rates are discussed in more detail in Section 3.3.2.

3.1.6 Financial Incentives (Rebates) for Conservation Retrofits – Other Programs

The City of Prescott is the only water provider in the area currently offering financial incentives to customers for the installation of low-flow fixtures or turf conversion to xeriscape. Prescott offers rebates for the following items: ULF and dual flush toilets, commercial urinals, high efficiency washing machines, hot water recirculation devices, irrigation controllers, turf conversion to xeriscape, leak repair, and conversion to drip irrigation. The amounts of the rebates offered can be found in Appendix 1. To date, Prescott has issued a total of about 900 rebates of various kinds. Account water use is being tracked to evaluate the level of water use savings following the installation of the new fixtures. Rebates for water harvesting equipment and rain sensors are in the planning stage.

The Town of Prescott Valley has taken a market-based approach to the sale of effluent storage credits for 100-year assured water supply certificates for new development. Credits were priced in an auction process, resulting very high dollar per acre-foot price. Water conservation should therefore be encouraged in subdivision design and construction. Prescott Valley and Chino Valley are conducting a pilot test program for the EcoBlue waterless urinal system retrofit. If successful, the program will be extended to other facilities. Prescott Valley provides turf areas in public places to discourage residential turf and has installed an ET-Based irrigation controller at one park as a pilot program. Prescott Valley is in the process of replacing meters at all production wells and a program to replace all customer meters with new radio read meters is 25 percent complete. Prescott Valley has a service line replacement program to replace rather than repair old butyl PVC lines.

3.1.7 Regional Partnerships

The water providers and other stakeholders in the region have formed several regional partnerships to encourage water conservation efforts. These partnerships include the Central Yavapai Water Conservation Partnership (now known as the staff work group). This committee is comprised of staff members active in water conservation issues for area water providers, towns, cities, stakeholders and ADWR. In addition, the Yavapai

County Water Advisory Committee (WAC) consists of 9 cities and towns, the Tribes, and the County. The WAC is currently involved in a 3-year joint study with the USBR to do an appraisal-level study of the County's future water demands and supplies. The development of the demand scenarios will involve consideration of future water conservation efforts and potential reductions in per capita water demands. Other groups active in conservation planning and implementation include the Citizens Water Advocacy Group and the Prescott Water Conservation Committee.

3.1.8 Other Water Use Efficiency Programs

Prescott, Prescott Valley and Chino Valley reuse virtually all treated effluent for either direct irrigation of golf courses or groundwater recharge. The Town of Prescott Valley has conducted water distribution system leak detection surveys in an effort to reduce lost and unaccounted-for water.

3.2 Alignment with ADWR Modified Third Management Plan Best Management Practices (BMP) Conservation Programs

Legislation passed in 2007 modified ADWR's non-per capita conservation program for the Third Management Plan (TMP) within the Active Management Areas. Beginning January 1, 2010, or the date a water provider profile is approved by ADWR (whichever is later), large providers that do not have a 100-year Assured Water Supply Designation will be required to comply with the new program. The program is optional for providers having an assured water supply designation. The new program requires providers to annually file a provider profile describing the service area characteristics of the provider and the conservation programs or "Best Management Practices" (BMPs) the provider has implemented during the year. A list of conservation programs eligible for consideration by the Department as a BMP is included in the modified TMP.

3.2.1 Modified TMP Conservation Program Requirements

At a minimum, regardless of the number of customer served by the utility, each provider regulated under the program must implement a metering program in which all customers are metered, a water conservation public education program, and one or more additional conservation measures. The number of programs required to be implemented depends on the number of service connections as follows:

Up to 5,000 Connections	1 additional program
5,001 to 30,000 Connections	5 additional programs
More than 30,000 Connections	10 additional programs

Both the Town of Prescott Valley and the City of Prescott would have to implement 5 additional programs and the Town of Chino Valley would need to implement only 1 additional program to comply. Approximately 50 municipal conservation programs have been identified by ADWR that will be considered as BMPs. The additional programs are divided into the following categories: Public Awareness/Public Relations, Conservation

Education and Training, Outreach Services, Physical System Evaluation and Improvement, Ordinances/Conditions of Service/Tariffs, Rebates/Incentives, and Research/Innovation Programs.

3.2.2 Alignment of Upper Verde Coalition Water Provider Programs with Arizona Department of Water Resources BMP Programs

The data collected on the current and planned conservation programs of the Coalition area water providers was compiled and cross-referenced with the 50 ADWR Best Management Practices programs. The existing and planned programs of the City of Prescott, the Town of Prescott Valley, and the Town of Chino Valley, if implemented, should comply with the BMP program requirements if enhancements are made to the public education and outreach portion of the programs to include direct communication on conservation issues with all customers at least twice per year (a basic requirement of the BMP program). It should be noted that ADWR does have significant latitude under the program to determine whether a particular program implemented by a provider under a specific BMP program complies with the intent of the program. The description of the requirements for many programs is very general and therefore open to interpretation.

Compliance with the basic requirements of the ADWR Best Management Practices Program is not difficult to achieve. Therefore, alignment with the program will not, in and of itself, ensure that Coalition area water providers will see continued improvements in water use efficiency. Municipal water conservation efforts within the Coalition area will need to go beyond the ADWR requirements to achieve additional reductions in per capita and per account water use in the future.

3.3 Comparison to Conservation Programs Implemented in Other Arizona Cities and Selected Western Cities

In developing recommendations for additional conservation program alternatives for the Coalition area, it is useful to inventory the types of programs that have been implemented over the last decade in other Arizona and western cities.

3.3.1 Financial Incentives Implemented in Arizona and Western Cities

Financial incentives to encourage homeowners, apartment complexes, and commercial customers to make investments in water conservation technology have been implemented by many cities and some wholesale water agencies in Arizona and other western states. There is a wide range of the types of incentives offered and the amount of the rebate for conservation investments. An inventory (not exhaustive) was done of the programs in place in selected Arizona and western cities. This inventory is not intended to advocate a particular approach to implementation of incentive programs within the Coalition area. Evaluation of the costs and benefits of various financial incentive program alternatives will be done in Task 3 and 4 of this project. Tables 3.1 and 3.2 list some of the financial incentives and rebate dollar levels that have been offered in selected cities in Arizona and other western states.

By far the most common incentive offered is to residential customers for installation of Ultra-Low Flow or ULF (1.6 gallon) Toilets, High Efficiency Toilets or HE (1.3 gallons or less), or Dual Flush Toilets. Some providers now offer rebates only for HE or Dual Flush Toilets, where previously a rebate was offered for ULF Toilets. The amount of the rebate offered varies from $30 to $165 per toilet, with most cities offering a rebate in the range of $100 to $125. Several cities also offer rebates for HET clothes washers in the range of $100 to $200, with $100 the most common incentive. Commercial facility urinal rebates for HET or waterless urinals have been adopted by several western cities. These rebates are in the range of $50 to $200 per urinal.

Rebates for turf conversion to xeriscape range from $0.25 per square foot (s.f.) to $1.50/s.f. In Monterey, California, a rebate of $0.30/ s.f. applies to installation of synthetic turf only. Las Vegas, Nevada offers $0.73/s.f. for artificial turf, in addition to $1.50/s.f. for xeriscape conversion. Most cities offering turf conservation incentives place a square footage limit or dollar limit per customer on the rebate.

Custom commercial financial incentives are now offered by several Arizona and western cities based on the amount of documented water savings multiplied by a dollar per acre-foot rebate amount. These commercial incentives are usually based on the cost of acquiring additional water resources and can be quite high. For example, the City of Denver, Colorado offers $4500/AF of water savings. In Las Vegas, two rebate amounts are offered, depending on whether the conservation investments reduce outdoor water use or indoor water use. A lower rebate is offered for indoor water use because Las Vegas reuses much of its effluent and obtains Colorado River use credits for discharged effluent return flows to Lake Mead.

Other incentives offered by the cities highlighted include rain sensors for irrigation controllers ($25 commonly), hot water recirculation devices ($100 to $200 commonly), and water harvesting equipment ($25-$30 per storage barrel). A few cities offer rebates for installation of irrigation controllers.

3.3.2 Conservation Ordinances Implemented in Arizona and Western Cities

Conservation ordinances can be divided into two general categories: 1) ordinances influencing customer water use behavior, and 2) ordinances influencing landscape and building design for new development.

The most common type of water conservation ordinance in Arizona and other western states is a requirement for new golf courses and other large turf areas to be irrigated with reclaimed water. This is currently in place in the Coalition area.

Ordinances Influencing Customer Behavior

An ordinance implemented by many utilities requires homeowners and businesses to prevent water runoff to streets and other forms of blatant water waste. Several cities and utilities have ordinances limiting outdoor water use to the cooler times of the day to minimize evaporation losses. The hours vary slightly from city to city, but generally irrigation is prohibited between the hours of about 8 or 9 A.M. to about 8 or 9 P.M during the summer irrigation season. The City of Prescott currently prohibits irrigation between the hours of 8 A.M. and 8 P.M. A few cities (including Flagstaff) have implemented three times per week watering schedules, but most cities reserve this measure for implementation during drought or other water system emergencies.

Water conservation-oriented rate structures can also significantly influence customer water use, particularly among high volume users. Each of the Coalition area water providers have in place a tiered rate structure to encourage conservation among high volume customers. Some western cities that have achieved relatively large percentage reductions in water use have adopted very aggressive tiered rate structures. Table 3.4 compares the current rate structures of the Coalition area cities with those in selected western cities. Santa Fe, New Mexico and Monterey, California are notable in the fact that a severe price surcharge is applied to almost any outdoor water use. These cities have achieved reductions in water use exceeding 30 percent since implementing these rate structures.

Table 3.1
Financial Incentives (Rebates) – Arizona Cities

Program Type	Scottsdale	Metro Water	Flagstaff	Payson	Mesa	Tempe
Financial Incentives (Rebates)						
ULF Toilets or Dual Flush	$75	$50 HET	$100 DF/HE	$100 DF		$75
HE Clothes Washers			$100	$200		
ULF Dishwashers						
Commercial Facility Urinals			$100			
Hot Water Recirc. Devices	$200		$100	$150		
Graywater Systems		$50				
Water Harvesting Equipment		$50				
Irrigation Controllers (Et)						
Rain Sensor						
Turf Conversion to Xeriscape	$.25/sf, max $1500		$.33/s.f. ($1500)		$50-$225/cust.	$500 max
Conversion to Drip System						
Leak Repair						
Custom Commercial ($/AF)	Turf to $3,000					50% to $20K
Model Home Efficiency Rebate						
Pool Covers						
Commercial Ice Makers						
Low Interest Loans						

Table 3.2
Financial Incentives – Western Cities

Program Type	Albuquerque	Santa Fe	Denver	MWD of Southern, Ca	Monterey California	So. Nevada Water Auth.
Financial Incentives (Rebates)						
ULF Toilets or Dual Flush	$125 to $200	Free	$25(Ulf) $125	$30 to $165	$100-$125 HET	x - com. Only
HE Clothes Washers	$100	$100/ULF	$150	$110	$150 -$200	
ULF Dishwashers					$150	
Commercial Facility Urinals					$200	$112
Hot Water Recirc. Devices	$100	$100			$200	
Graywater Systems						
Water Harvesting Equipment	$25-$150	$30/barrel			$25/100 gal.	
Irrigation Controllers (Et)				$630/ac com	$100	200
Rain Sensor			25			$25
Turf Conversion to Xeriscape	$.60 to 2000 s.f.					$1.5/sf,no cap
Conversion to Drip System						
Leak Repair						
Custom Commercial ($/AF)			$4,500/AF	$1000/AF		$812-$3250/AF
Model Home Efficiency Rebate				$2,500/home		
Pool Covers						$200
Commercial Ice Makers						$112/100 lb/day
Low Interest Loans						

Table 3.3
Conservation Ordinances – Arizona and Western Cities

Program Type	Flagstaff	Payson	Mesa	Tempe	Albuquerque	Santa Fe	Monterey California	So. Nevada Water Auth.
Ordinances								
Limitations on turf/xeris. Req.		New turf Prohibited			< 20 % turf			
Single Family Residential		x			x			50% front yd.
Multifamily Residential		x		x	x			40%
Commercial		x	x	x	x			25%
Common Area Landscape		x			x			Prohibited
Effluent Req. for Large Turf		x						
Turf in Public ROW		x						
Water Harvesting						x		
Graywater								
Car Wash Recycling								
Time of Day/Day of Week Rest.	TOD/ DOW	TOD/DOW			time of day			
Waterless Urinals in Comm.		New Comm.						
Hot Water Recirc. In New Dev.		x						
Fixture Retrofit on resale							x-toilets/sh	
Irr. Efficiency standards (Com)								
Reclaimed Use - Large Turf	x							
Conservation Rates	x			Mod. Home		Tiered	Water	Tiered
Other		Misters,		turf limits			Credits	

Table 3.4
Comparison of Tiered Rate Structures
(price/1000 gallons)

	Block 1	Block 2	Block 2	Block 4	Block 5
City	0-10,000	>10,000			
Santa Fe, NM	$4.09	$14.64			
	0-1,000	1-2,000	2-3,000	3-4,000	>4,000
Monterey, Ca	$1.68	$3.36	$5.04	$6.72	$13.44
	0-2,000	2-5,000	5-10,000	10-20,000	>20,000
Payson, AZ	$19.95	$2.65	$3.50	$4.00	$5.00
	0-4,000	4-20,000	20-30,000	>30,000	
Aurora, Co	$3.60	$4.50	$8.25	$10.75	
	0-11,000	11-30,000	31-40,000	>40,000	
Denver, Co	$1.81	$3.62	$5.43	$7.24	
	0-3,000	3-10,000	10-20,000	>20,000	
City of Prescott	$2.86	$4.30	$6.45	$12.90	
	0-8,000	8-20,000	>20,000		
Prescott Valley	$2.90	$3.48	$4.52		
	0-8,000	8-20,000	>20,000		
Chino Valley	$3.94	$4.93	$6.90		

Ordinances Influencing New Development

Ordinances requiring plumbing fixtures in new development that are more efficient than required by current state and national plumbing codes or landscaping limitations have not been widely adopted in Arizona or other western cities. Such ordinances may require HET or dual flush toilets and/or HE or waterless urinals. To date, the Town of Payson is the only Arizona city that has adopted such a standard.

Restrictions on turf in new development are becoming more common, though still have not been widely adopted in Arizona and other states. In Arizona, the only city that prohibits turf in new residential development is Payson. However, Tucson, Mesa, and Tempe limit the amount of turf in new commercial development and Tucson and Tempe have placed limits on turf in new multifamily developments. Tempe limits turf in model homes. Among western cities, Albuquerque, New Mexico and the Las Vegas area cities are notable in the implementation of turf limitations in new single-family residential, multifamily, and commercial developments. ADWR regulations in AMAs currently prohibit turf within the right-of-way of public streets. ADWR's Third Management Plan Reasonable Conservation Measures (RCMs) list several types of turf limitation ordinances including:

- Limitation of 10 percent of landscapable area in common areas for new single family and multifamily developments.
- Limiting turf in multifamily to individual patio areas and actively used recreational areas.
- Prohibition of CCRs requiring turf in new subdivisions.
- Requirement that turf at new model homes be limited to 20 percent of landscapable area.

Ordinances requiring the installation of water harvesting equipment in new development have not yet been adopted in Arizona or elsewhere, though are under consideration in Albuquerque, New Mexico.

Requirements for hot water recirculation devices in new development have been implemented in several Arizona cities, including the City of Goodyear and the Town of Payson. These requirements apply if the home's hot water heater is located more than 40-50 feet from hot water fixtures. Other ordinances that are in place in a few localities and that could be considered for implementation in the Coalition area include:

- Requirements for hotels and motels to provide a water information card in guest rooms and requirements for hotels to provide daily linen and towel changes for guests staying multiple nights only upon request.
- Requirements for plant nurseries to provide customers with low-water use plant information and information on efficient irrigation practices.
- Model home landscape and design requirements.
- Commercial car wash water recirculation requirements.
- Prohibitions on restaurants serving drinking water except on request.
- Retrofit on resale requirements – such an ordinance has been successfully implemented in Monterey, California. This program is coupled with a comprehensive rebate program to help homeowners and business cover the costs of retrofits.

3.3.3 Current Programs and Additional Opportunities in the Coalition Area

Incentive Programs

Comprehensive programs to provide financial incentives to encourage existing homeowners and businesses to invest in conservation technology have been implemented in relatively few cities in Arizona. However, in other western states, several cities in areas approaching the limits of available water supplies have implemented significant incentive programs. As discussed in Chapter 2, incentive programs coupled with water rates structure changes and ordinances have resulted in significant water use reductions in several cities within the last decade. In the Coalition area, the City of Prescott recently implemented a financial incentive program that provides rebates for indoor fixture replacement as well as irrigation system investments and turf removal. No incentive programs currently exist for residential and commercial water users in the other Coalition area jurisdictions or for exempt well owners. This represents an opportunity for

development of a regional incentive program that would apply to domestic and commercial water users throughout the Coalition area to achieve water savings.

Conservation Ordinances

Coalition area water providers and Yavapai County have been proactive in requiring effluent use on new golf courses. In addition, time-of-day watering restrictions are in place in Prescott. The Town of Chino Valley is considering implementation of a comprehensive water conservation ordinance. Development of ordinances that would potentially apply to new and existing development on a regional basis could present an opportunity to achieve improvements in water use efficiency in new and existing development within the Coalition area, including homes supplied from domestic wells.

Public Education/Awareness and Conservation Education and Training Programs

Much good work has been done in the Coalition area over the past decade to promote water use efficiency in the region. Water conservation education, training and awareness is actively being promoted by each of the major cities, Yavapai County, ADWR, the University of Arizona Cooperative extension, the Yavapai-Prescott Tribe and other stakeholders in the Coalition Area. Several regional partnerships and committees are also in place to coordinate efforts and maximize program effectiveness. Notwithstanding these efforts, there exist additional opportunities to develop additional programs targeted at specific water use sectors and types of water use. The results of the regional water conservation opinion survey, discussed in Chapter 4, provide helpful information and direction useful in formulating a regional approach to education and awareness programs.

Chapter 4 – Results of Regional Water Conservation Opinion Survey

4.0 Survey Background and Description

The opinion survey was sponsored by the Central Yavapai Water Conservation Partnership. It was distributed widely throughout the Coalition area through newspapers, direct mail to water customers, Town, City and County websites, and was made available at water bill pay stations and community fairs. The survey was also advertised over the radio. A total of 2,925 homeowners responded to the survey (about 7 percent of the total housing units in the survey area). The survey consisted of over 50 questions regarding irrigation water use habits, housing and lot characteristics, landscaping type, preferences regarding how people receive conservation information, and opinions regarding the area's water resources issues. The findings were tabulated by the City of Prescott and provided to Larson and Associates for further analysis as part of this project.

4.1 Survey Results and Key Findings – A Summary

Several key findings of the survey results are summarized below.

1. Eighty-eight percent responding are served by a city or private water company. This indicates water providers are a key avenue for communication of conservation programs (Question 2)

2. Sixty-two percent live in homes older than 10 years, indicating a significant potential in the area for indoor plumbing retrofits. (Question 6)

3. Almost 50 percent of respondents live on lots larger than 10,000 sq. ft. (Question 8)

4. Seventy-eight percent responded they had no turf on their lot and only 4 percent said they had more than 1000 sq. feet of turf. (Question 9)

5. Thirteen percent responding said they irrigated daily (Q. 12). This clearly indicates a need for education concerning efficient watering techniques. Further analysis of the data submitting on watering times and the # of days of watering is also revealing. This data is summarized in Table 4.1. About 22 percent are irrigating more than 3 days per week, which is clearly not efficient and can result in significant over-watering. In keeping with the overall response, 8.5 percent said they watered daily. Of those responding, 35.5 percent reported watering times of 30 minutes or more. Among those watering 4 times per week, 28 percent had run times exceeding 45 minutes. Among those watering 2-3 times per week, between 5 and 11 percent exceed either 90 or 60 minutes respectively. This data indicates that a high percentage of respondents to this question (perhaps as many as 20 to 25 percent) appear to be significantly over-irrigating. Even more striking is that homeowners that responded to the survey can be assumed to be more concerned with the region's water issues than the average citizen.

Table 4.1
Irrigation Watering Time - Response Summary

Times per Week	Number of Repond.	Percent of Total	Range of Minutes	Standard	Homes that Exceed	Percent that Exceed
1	87	6.7	5 to 240	>180	1	1.1
2	357	27.7	10 to 300	>90	40	11.2
3	573	44.5	10 to 180	>60	30	5.2
4	117	9.1	5 to 180	>45	33	28.2
5	39	3.0	10 to 90	>30	5	12.8
6	6	0.5	1 to 60	>=30	1	16.7
7	110	8.5	5 to 60	>=30	39	35.5
Total	1289					

Note: Based on partial tabulation of respondents (1289 respondents)

6. About 28 percent responding do not have automatic timers. Of the 72 percent that do, only 54 percent reset timers seasonally or monthly. Fourteen percent never reset their timer or do not know how to. Clearly, targeted information and education on when and how to reset timers would yield water conservation dividends. (Q. 13)

7. Ninety-seven percent responding said they water either in the morning or the evening. The message of not watering in the heat of the day has clearly been heard. (Q. 14)

8. Direct mail (48.2%), utility bill insert (70.8%), and newspaper (44.4%) were by far the preferred method to receive water conservation information. Website, Email, Television and Radio all scored low in comparison (at 11.9 %, 17.0 %, 11.5% , and 8.9% respectively. (Q. 17a)

9. Lawn areas on parks, ball parks, and schools were preferred (85.2%, 56.7%, and 42.2% approval respectively). Turf areas at businesses and public buildings received low approval ratings (2.7% and 10.6% respectively). Turf at private homes received a 26.4 % approval rating, which corresponds approximately to the number of respondents that say they water turf at home. These results have applicability when considering possible ordinances and city policies (Q. 17b).

10. News articles (60.8%) and retail Nursery 43.9%) were rated highest for ways of obtaining information on outdoor irrigation and design. (Q. 17c)

11. Overall, responses indicated respondents as a whole are very highly informed and motivated about implementing water conservation and concerned about the region's water resources. (Q. 17e, 18b, 18c, 18g are examples)

12. In spite of being motivated to conserve, 41 percent said they do not know how much water to "Budget" for indoor and outdoor use. This indicates a significant educational opportunity exists regionally with regard to efficient irrigation practices. (Q. 18d,). Fifty seven percent said they would like to learn more on how to conserve water outdoors. (Q. 18i)

13. Only 5 percent responding said their children bring home information from school on water conservation. Adjusted for the 65 percent that did not respond (presumably because they do not have children in the home) this is about 12 percent that responded positively to this question. This indicates that school programs should probably be considered long-term investments in educating the next generation and probably will not produce significant near-term (next five years) reductions in water use.

14. Respondents were split evenly on support for ordinances restricting turf at private residences. There was more support for turf restrictions at public buildings. Sixty – three percent were in favor of higher water rates for those that don't conserve. Twenty-three percent responded that it is too expensive for them to replace high water use toilets and appliances. Forty-five percent responded that limiting growth is the way to preserve the region's water supplies. Thirty-five percent said water conservation efforts will only benefit new growth and development (Q. 19).

15. Exempt Well Users – A subset of the data was obtained to see how exempt wells users responses (335) compared with the respondents as a whole. Some interesting differences were noted: The average persons per household in slightly higher than survey respondents as a whole (2.2 pph for 123 respondents). Only 3% live on standard size lots as opposed to 50%. Sixty-five percent reported having no turf as opposed to 78 % for all respondents and 11% have over 1000 s.f. of turf as opposed to 4% for all respondents. A conclusion that can be reached from this data is that overall per residential water use is likely higher for exempt well users than for those receiving water from a city or private water company and that a relatively high conservation potential exists for exempt well users in the Coalition area.

16. There were many written comments among well owners regarding the growth issues related to water supply

17. The general location of exempt well owner respondents was as follows, according to Zip Code: 67 % Chino Valley, 9% Prescott, 8% Paulden, 3% Prescott Valley, 10% Dewey-Humboldt, and 3% other.

18. Thirty-two percent of responding said they water native vegetation at least monthly. This fact coupled with the fact that more than 50 percent live on lots larger than 10,000 sq. ft. indicates a significant conservation potential in educating the public on the minimal irrigation needs of native vegetation.

4.2 Opinion Survey Conclusions and Recommendations

Results of the survey provide several important insights regarding how future regional conservation program efforts should be targeted to maximize program effectiveness. These recommendations include, but are not limited to the following:

1. A significant portion of respondents, though motivated to conserve water, are over-irrigating because they do not have knowledge of proper irrigation techniques and how much water is needed by their landscape. More intensive education and awareness programs targeted at these water uses would help increase outdoor water use efficiency in the Coalition area. Approximately 20 to 30 percent of users appear to be significantly over-irrigating, either by watering too frequently or setting timers for an excessive number of minutes, or both.

2. The best method of providing conservation program information, according to respondents, is print media, including newspapers, magazines, direct mail, bill inserts. Regional programs of this nature could be effective in educating more water users on efficient outdoor irrigation techniques and other conservation program initiatives.

3. Exempt well users live on larger lots and irrigate significantly more turf than the average survey respondent. This suggests a significant conservation potential exists for conservation programs targeted at homeowners supplied from wells.

4. Sixty-two percent of respondents live in homes older than 10 years, indicating there is a significant potential for regional water savings though indoor fixture retrofit and/or replacement programs, including financial incentive programs. The percentage of homes older than 10 years among respondents is approximately equal to that for the Coalition area as a whole.

5. Sixty-six percent of respondents support turf restrictions for public buildings, while 42 percent favor limitations on private lawns. Any consideration of regional conservation ordinances regarding landscaping restrictions should consider these results.

Chapter 5 - Analysis of Residential and Commercial Customer Financial Incentive Programs

5.0 Overview - Methods

This Chapter provides an analysis of potential costs, benefits, estimated annual water savings, and implementation issues related to several water conservation financial incentives program alternatives. Many of the assumptions regarding potential water savings and implementation issues presented here are based on research findings of the ECoBa Study, conducted in 2004 by the Water Conservation Alliance of Southern Arizona. This study looked at water use over a two-year period (2002-2003) for individual residential customer accounts that had conservation devices installed as part of rebate and retrofit programs, or had audits conducted. Water use was compared to a control group for the utility. If no control group was available, pre- and post-retrofit data was compared for each account where conservation activities occurred. Other references used in developing the assumptions include:

- BMP Cost and Savings Study – A Guide to the Data and Methods of Cost Effectiveness Analysis of Urban Water Conservation Best Management Practices, July 2000; California Urban Water Conservation Council
- Hot Water Recirculation Rebate Savings Study, 2002; Oak Ridge National Laboratory
- Calculations based on assuming per device savings, persons per household and customer behavior.

The analysis presented in this Chapter, along with input from Coalition area water conservation stakeholders during workshops held on June 11 and July 14, 2008, forms the basis of the program recommendations. The financial incentive programs evaluated included:

- Toilet rebates – Ultra low-flow (ULF - 1.6 gallons per flush [gpf]), High Efficiency Toilets (HET – 1.3 gpf), and Dual Flush Toilets (0.6 gpf and 1.6 gpf)
- Toilet distribution programs for each of the three types of toilets
- High efficiency washing machine rebates (22 gallons per load or less)
- Hot water recirculation equipment rebates
- Landscape conversion rebates (turf to xeriscape)
- Commercial waterless urinal rebates
- Rain water harvesting equipment rebates (rain barrels)
- Device Giveaways (showerheads, hose nozzles, and faucet aerators)
- Other potential incentives, such as customized commercial rebates and Et-based irrigation controllers

A spreadsheet was developed that calculated the potential program costs and benefits for each incentive program listed above. The following statistics and parameters impacting program cost-effectiveness were either assumed or calculated for each alternative:

- Assumed cost for each device to either the consumer or the Utility/Coalition
- Device installation cost
- Incentive amount provided
- Annual water savings per customer account
- Potential regional customer base eligible to participate
- Expected annual market penetration percentage and total annual participants
- Customer payback period in years assuming $4.00/1000 gallon cost of water
- Cost per acre-foot of water saved (to the Utility/Coalition)
- Total potential annual program cost within Coalition area
- Total potential annual water savings after 5 years of program implementation.

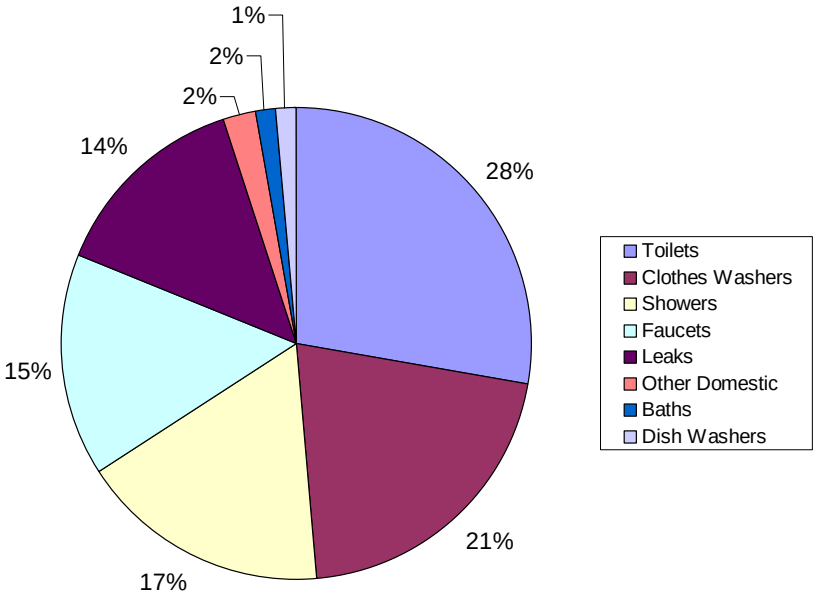
Several other assumptions were made for some of the program alternatives where appropriate. These assumptions are discussed below. Additional considerations impacting each program are also discussed, such as expected participation rates and "Free Ridership." Free Riders are people who receive a financial incentive even though they would have made the investment in the conservation technology had they not received the incentive. Table 5.1 presents the results of the cost-effectiveness analysis.

5.0.1 Interior Single Family Residential Water Use Characteristics and Potential Water Savings

Conservation program design is influenced by how and where within the home people use water. Figure 5.1 illustrates the proportion of interior water use for various purposes inside older homes (pre-1994) that are not equipped with low-flow showerheads and Ultra-low-flow toilets (1.6 gallon per flush), low-flow faucets, and high efficiency washing machines (Source: WaterWiser – 1999 American Water Works Association). As indicated, toilets, clothes washers, and showers account for the majority of interior use. Interior conservation efforts should therefore focus on these areas.

Figure 5.1

Typical Single Family Indoor Residential Water Use Without Conservation (72.5 GPCD)



5.0.2 Exterior Single Family Water Use within the Coalition Area

Residential outdoor water use for landscaping needs and conservation potential in the Coalition area was estimated by comparing total single-family water use and subtracting estimated interior water use based on the above estimates of single family interior use. This was done as follows:

- Total Single Family 2007 use was approx. 12,000 AF, which includes Prescott, Prescott Valley, Exempt Well use, and the area's small providers, including Chino Valley
- Next, assume 2.3 persons per household x 72.5 gpcd interior use x 47,000 homes = total interior use of 8,600 af
- Approximate exterior water use = 12,000 – 8,600 AF = 3,400 AF
  (28% of total Single Family use or 23,600 gal./year/home)

This should be considered a conservative estimate of Coalition area outdoor usage because the average interior use rate is likely lower because approximately 40 percent of homes in the area are estimated to be built post-1994. However, outdoor use is the largest single component of residential use and therefore, any regional conservation effort should address this sector.

5.1 Toilet Rebate and Toilet Distribution Programs

Toilet rebates and distribution programs are the most common type of incentive offered by water providers in Arizona and other western states. Some cities that, in the past, offered rebates for ULF toilets now offer incentives only for HET toilets or Dual Flush toilets. Rebates range from $50 per toilet to $200 per toilet, with most cities offering incentives in the range of $100 to $130. For this financial analysis, it is assumed that rebates of $100 would be offered for ULF toilets and $130 for HET and Dual Flush toilet installations.

Toilet distribution programs have several advantages over rebate programs: 1) Distribution programs can be targeted to specific areas, 2) specific toilet models that are the most efficient and cost-effective can be chosen by the utility, and 3) program costs can be reduced significantly through bulk purchases of toilets.

5.1.1 Projected Savings per Installation, Market Penetration, and Overall Potential Savings

The ECoBa study found that average savings for ULF toilets rebates were 7,440 gallons per year (gpy) per account. This was only 63 percent of the amount predicted by calculations based on device characteristics and assumptions regarding daily usage and persons per household. Possible reasons for the discrepancy are that toilets were replacing, in many cases, 3.5 gallon toilets and not 5 or 7 gallon models. Based on this research finding it is assumed here that toilet replacements on average will be replacing an average of 4.0 gpf per toilet, which is a composite of 3.0 flush and 5.0 gallon flush toilets. Very few 7.0 gallon flush toilets are assumed to still be in use.

It is assumed that rebate or distribution programs would be targeted to homes built 1994 or earlier, prior to the effective date of the national plumbing code requiring 1.6 gpf toilets. Based on ADWR annual report data, there are approximately 25,000 single family homes and 6,400 multifamily homes within the Coalition area of that age or older.

Toilet distribution programs, in the ECoBa study, were shown to exhibit significantly higher per account water savings than toilet rebate programs (average savings of 26,890 gal./year per account). This was attributed to: 1) better program targeting to older areas of low income and larger family sizes where less previous remodeling of bathrooms had likely been done, and 2) toilet selection advantages.

For this analysis, the following assumptions were used to calculate toilet rebate savings:

- Average of five flushes per day per person
- Average 2.2 persons per household
- Average retrofitted toilet flush volume of 4.0 gallons

Toilet distribution programs, for each type of toilet, were assumed to save 1.5 times the calculated savings for rebate programs for a similar toilet. This resulted in expected savings that were about 75 percent of the average found in the ECoBA study. The ECoBa study average savings was not used because not enough was known about the characteristics of the service areas in which these programs were implemented to assume that level of savings could be achieved within the Coalition area, where many retired people reside and family sizes are generally lower than in many other areas of the country.

Natural replacement rates for older non-efficient toilets are an important factor in deciding whether or not to implement an incentive program to encourage earlier replacement. Approximately 1,400 existing older homes per year are sold in the Coalition area. If the bathrooms in all homes sold each year were remodeled and toilets replaced, it could require as long as 18 years to replace all older toilets within the Coalition area with efficient models, assuming approximately 25,000 pre-1994 homes with older toilets now exist within the Coalition area. However, it is unlikely that all bathrooms are remodeled at time of sale and unlikely that all those remodeled involve replacing the toilet. A 25-year toilet life assumed in some literature or a 4% natural replacement, though this is not well substantiated. Homes in low income areas may have much longer average toilet life than toilets in high income areas where more frequent remodeling is likely to occur.

5.2 High Efficiency Washing Machine Rebates

Numerous models of front loading high efficiency washing machines are now on the market. These models generally use 23-28 gallons per load versus an average of about 38 gallons per load for non-efficient older models. Several studies have looked at actual water savings at customer accounts that have installed efficient washers. The ECoBa study found an average savings of about 3,300 gallons per year per customer. The THELMA study (1997), found an average savings of 4,200 gallons per year. For this analysis, 4,200 gallons per year per customer was assumed.

Both of these studies indicated actual savings that were somewhat less than what would be calculated based on assumptions of 1 full load per day per household. Factors that result in actual savings less than projected include fewer loads washed and partial loads washed.

Other factors to consider with this type of rebate include: 1) Free Ridership - Since costs of new efficient machines can easily exceed $600, a rebate offered at $100 or $200 may not impact the buying decisions of a large percentage of those applying for rebates; 2) the lengthy payback for customers purchasing these machines (8+ years including energy savings) may lend itself again to high rates of Free Ridership. High rates of Free Ridership relative to other programs may be expected.

5.3 Hot Water Recirculation Equipment Rebates

Rebates for hot-water recirculation equipment have become popular in the last 6-7 years. However, the annual water savings per rebate is relatively small compared to other incentive programs. A study conducted in 2002 by Oak Ridge National Laboratory found an average savings of 2,000 gallons per year. This program also has a customer payback of almost 10 years (including energy savings), so Free Ridership percentage may also be relatively high compared to other programs. Customers installing hot water recirculation devices will receive other "lifestyle" benefits in the form of fast access to hot water and may make decisions largely on these benefits rather than on water and monetary savings.

5.4 Landscape Conversion Rebates

Financial incentives to encourage the removal of turf and installation of xeriscape plant material has been shown in studies to be among the most effective in reducing customer water use. The average water savings shown in ECoBa study for these programs was almost 22,000 gallons per year per customer. For this analysis, the following assumptions were used to calculate the potential water savings per customer within the Coalition area.

- Average turf conversion of 1,000 square feet.
- Pre-conversion water use of 5 acre-feet/acre/year
- Post-conversion water use of 1 acre-feet/acre/year
- Incentive provided - $0.50 per square foot of turf converted (same as currently offered by the City of Prescott)

Based on these assumptions, the potential per rebate water savings would be 28,675 gallons per customer per year. It was further assumed that 20 percent of existing single family homes currently have some turf and are therefore candidates for this incentive program. Homes that have turf use considerably more water outdoors than homes that do not. It is estimated that on the average, single family homes within the Coalition area use approximately 23,600 gallons per year in outdoor uses. It is obvious from the above numbers that in order to significantly reduce outdoor use at existing homes, it will be necessary to influence home owners with turf to remove some percentage of existing turf. Incentive programs have been shown to be an effective means of encouraging this type of conversion.

5.5 Commercial Waterless Urinal Rebates

Commercial waterless urinals are becoming more commonplace in Arizona and other areas. Most major manufacturers of urinals now offer one or more models of these water conserving devices. The assumptions used in this analysis include:

- Average cost of new waterless urinal $450
- Installation cost $75

- Average rebate offered $200
- Annual water savings based on 1.3 Gallon per flush savings x 40 flushes per day x 310 work days per year.

Based on these assumptions the average savings per device installed would be 16,120 gallons per year. Urinals that use only 0.125 gallons/fulsh are another alternative to consider to reduce commercial urinal use. Water savings would be about 90 percent of the waterless urinal installations.

5.6 Rain Water Harvesting Rain Barrel Rebates

A number of companies now offer 55-gallon plastic rain barrels in different shapes and colors. Several utilities offer rebates toward the purchase of barrels and associated equipment and accessories. The following assumptions were made in this analysis:

- Cost to customer to purchase barrel and accessories $150
- Rebate amount $25
- Average water savings of 825 gallons per year based on filling the barrel 20 days per year and utilization factor of 75 percent. (There are 63 days of measurable precipitation per year in Prescott on average).

Based on these assumptions, the payback period to the customer is extremely long (approximately 37 years). Rain barrel installation also has aesthetic and lifestyle impacts to those choosing to install these devices. For these reasons, it is likely that those making this choice are highly motivated to conserve water and it is questionable whether a small incentive of $25 or even $50 will encourage homeowners not already motivated to install these devices, therefore, the Free Ridership percentage can be expected to be high

5.7 Device Giveaways

Device giveaways include low-flow shower heads, hose nozzles, and faucet aerators. In theory, these devices, if installed and used by customers should result in water savings. However, for the device giveaway programs evaluated in the ECoBa study, no savings or negative water savings were shown. These programs, therefore, appear not to be cost-effective. Possible reasons for these results are that most showerheads now in use should be of the low-flow variety since the standard of 2.5 gallons per minute has been in place for about 15 years. Even if showerheads are of the very old variety, hard water deposits can, over time, significantly reduce flow levels. Faucet aerator replacements are also not that effective because most faucet use is volume-based and older aerators tend to become clogged over time. In addition, there is no way to verify how many of the devices given away are actually installed. Because of these implementation issues, device giveaways are not recommended for inclusion in the Coalition area regional program.

5.8 Evapotranspiration (Et) - Based Irrigation Controllers

Evapotranspiration-based irrigation controllers have been in use for about 12 years. Several manufactures now offer various models of these controllers for residential and commercial users. Several studies of residential applications of Et-based controllers conducted in California indicated a reduction of from 13,000 to 16,000 gallons per home per year with the installation of these devices. Savings will of course vary widely from user to user, depending on the amount and type of outdoor water use prior to installation and whether proper programming and management of the controller is carried out. The cost of these devices for residential uses ranges from about $250 to $500, depending on the programming features and the number of stations the device can control. Large commercial unit prices can exceed $1,000. For this analysis, it was assumed that homeowners installing these devises would have an average of 1,000 sf. of irrigated turf and would reduce water use from 6 AF/AC to 4.8 AF/AC with installation of this device, resulting in a savings of 9,000 gallons per year. This assumes an after-installation irrigation system efficiency of 75 percent, which is considered good to excellent. This degree of savings is considered a conservative estimate. Maximum effectiveness and water savings will be associated with installations at commercial and residential accounts having irrigated turf. Drip systems irrigating only low water use plants will be difficult to manage using an ET-based controller due to variations in plant water requirements and irrigation system variations from station to station.

Those homeowners installing these controllers are likely to be highly motivated to conserve because installation, programming and management of the device may be beyond the capabilities of most homeowners. For this reason, market penetration for this type of incentive program is likely to be low compared to other programs and corresponding overall program water savings are also expected to be low.

5.9 Custom Commercial Facility Rebates

Another incentive program alternative is to provide custom rebates to commercial customers and water users based on the annual volume of water saved through conservation efforts. The rebate provided is based on a dollar amount per acre-foot saved (actual verified savings). Custom rebates can provide incentives for industrial process improvements, cooling tower improvements, and large landscape irrigation improvement projects. The following are examples of cities providing custom rebates and the amount provided: Southern Nevada Water Authority ($3,250/AF), Denver ($4,500/AF), and Metropolitan Water District of Southern California ($2,500/AF). A portion of the funds annually available to a Coalition regional incentive program could be reserved for custom commercial rebates within each water provider service area or jurisdiction. The number of custom rebates and the water savings that would be issued under such a program is difficult to estimate. However, there are several commercial users in the Coalition area that use over 10-20 acre-feet of water per year (or more). If several users under this program saved 2-3 acre-feet of water per year, the annual savings could become significant over time. Therefore, if a financial incentive program for water conservation device installation is developed for single family and multifamily customers, as well as

toilet and urinal installations at commercial customers, it would be prudent to make available some money for custom commercial rebates as well.

5.10 Incentive Program Implementation Consensus Recommendations

A workshop with the Technical Advisory Committee (TAC) and other stakeholders was held on June 11, 2008 to discuss financial incentive program options and arrive at a consensus regarding which programs to include in a balanced Phase 1 water conservation program. The costs, benefits, and implementation issues of various programs were presented and discussed. Table 5.2 shows the estimated per installation and annual costs, market penetration, water savings, customer payback period, and cost per acre-foot of water saved annually for each program alternative.

Based on this analysis, the consensus of the TAC and other stakeholders was that the Phase 1 regional incentive program should include the incentives listed in Table 5. 1. The table shows the projected 5-year program savings from each element, cost per acre-foot of water saved, the expected number of participants, and the total annual program budget estimate. It is recommended that these programs be made available to all residents and businesses within the Coalition area, including well owners and those served by private water companies or small community water systems.

Table 5.1
Financial Incentive Programs Recommended for Phase 1 Implementation

Phase 1 Incentive Program Element	Program 5-Year Savings Goal (AF/YR)	Annual Program Budget	Projected Annual # Particip.	$/AF Water Saved
Incentive Programs				
Single Family Toilet Distribution or Rebate (HET, 1.3 gal./flush, or dual flush)	184	$84,600	564	$2,300
Multifamily Toilet Distribution or Rebate (HET, 1.3 gal./flush, or dual flush)	68	$24,000	192	$2,300
Single Family Turf Conversion Rebate @ $0.50/s.f. of turf removed	62	$70,500	141	$5,700
Nonresidential Waterless Urinal Rebate	22	$18,000	90	$4,000
Custom Commercial/Industrial Rebates @$4,000/AF Saved	20	$16,000	2	$4,000
Total Recommended Incentives	**356**	**$213,100**	**989**	

Table 5.2
Estimated Financial Incentive Program Alternative Costs and Benefits

	Single Family Residential Toilet Rebate - ULF (1.6 gal.)	Single Family Residential Toilet Rebate - HET (1.3 gal.)	Single Family Residential Toilet Rebate - Dual Flush (DF)(06/1.6 gal.)	Single Family Residential Toilet Distribution - ULF (1.6 gal.)	Single Family Residential Toilet Distribution - HET (1.3 gal.)	Single Family Residential Toilet Distribution - Dual Flush (DF (0.6-1.6 gal)
Planning Cost per device	$250	$250	$250	$150	$150	$150
Installation Cost	$75	$75	$75	$75	$75	$75
Incentive Range - other prog.	$50-$175	$50-$175	$50-$175	$50-$175	$50-$175	$50-$175
Incentive Provided	$100	$130	$130	$150	$150	$150
Cost to customer after rebate	$225	$195	$195	$75	$75	$75
Annual Water Savings per Customer	13,030	14,180	15,330	19,545	21,270	22,995
Customer Payback (Years)	4.3	3.4	3.2	1.0	0.9	0.8
Utility Cost per Acre-Foot Saved	$2,501	$2,987	$2,763	$2,501	$2,298	$2,126
Potential Customer Base	28,200	28,200	28,200	28,200	28,200	28,200
Annual Market Penetration (%)	1.00%	1.00%	1.00%	2.00%	2.00%	2.00%
Annual Participants	282	282	282	564	564	564
Annual Coalition Program Cost	$28,200	$36,660	$36,660	$84,600	$84,600	$84,600
AF/YR Savings after 5-Years	56	61	66	169	184	199

Table 5.2
Estimated Financial Incentive Program Alternative Costs and Benefits

	Residential HET Washing Machine Rebates	Turf Conversion Rebate	Hot Water Recirculation Rebate	Water Harvesting Rain Barrel Rebate	Commercial Waterless Urinal - Rebate	ET Based Irrigation Controllers (Residential)
Planning Cost per device	$600	$1,500	$200	$150	$450	$250
Installation Cost	$0	$0	$75	$0	$75	$75
Incentive Range - other prog.	$100 to $250	0.5	$100-$200	$25 to $50	$50 to $400	$75 to $150
Incentive Provided	$100	$0.50	$50	$25	$200	$150
Cost to customer after rebate	$500	$1,000	$225	$125	$325	$175
Annual Water Savings per Customer	4,200	28,675	2,000	825	16,120	9,000
Customer Payback (Years)	8.8	8.7	9.8	37.9	5.0	4.9
Utility Cost per Acre-Foot Saved	$7,758	$5,682	$8,146	$9,874	$4,043	$6,336
Potential Customer Base	47,000	9,400	47,000	47,000	3,000	9,400
Annual Market Penetration (%)	0.50%	1.50%	0.50%	0.50%	3.00%	0.50%
Annual Participants	235	141	235	235	90	47
Annual Coalition Program Cost	$23,500	$70,500	$11,750	$5,875	$18,000	$7,050
AF/YR Savings after 5-Years	15	62	7	3	22	6

Table 5.2
Estimated Financial Incentive Program Alternative Costs and Benefits

	Multifamily Toilet Rebate ULF (1.6 gal.)	Multifamily Toilet Rebate HET (1.3 gal.)	Multifamily Toilet Rebate - Dual Flush (DF)(06/1.6 gal.)	Multifamily Toilet Distribution - ULF (1.6 gal.)	Multifamily Toilet Distribution - HET (1.3)	Multifamily Toilet Distribution - Dual Flush (DF (0.6-1.6 gal)
Planning Cost per device	$250	$250	$150	$150	$150	$125
Installation Cost	$75	$75	$75	$75	$75	$75
Incentive Range - other programs						
Incentive Provided	$100	$100	$150	$150	$150	$125
Cost to customer after rebate	$225	$225	$75	$75	$75	$75
Annual Water Savings per Cust.	13,030	14,180	15,330	19,545	21,270	22,995
Customer Payback (Years)	4.3	4.0	1.2	1.0	0.9	0.8
Utility Cost per Acre-Foot Saved	$2,501	$2,298	$3,188	$2,501	$2,298	$1,771
Potential Regional Customer Base	6,400	6,400	6,400	6,400	6,400	6,400
Annual Market Penetration (%)	2.00%	2.00%	2.00%	3.00%	3.00%	3.00%
Annual Participants	128	128	128	192	192	192
Annual Coalition Program Cost	$12,800	$12,800	$19,200	$28,800	$28,800	$24,000
AF/YR Savings after 5-Years	26	28	30	58	63	68

Table 5.2
Assumptions

- Turf conversion assumes avg. 1,000 s.f. of turf conversion, reducing water application from 5 AF/AC to 1.0 AF/AC, assuming $0.50/s.f. incentive.

- Hot Water Recirculation Rebate savings based on 2002 Study by Oak Ridge National Laboratory.

- Rain Barrel Savings based on 55 gal. barrel filled average of 20 days per year x 75% utilization (63 days of measurable precipitation).

- HET Washing Machine rebate savings based on average between ECoBa Study results and THELMA study (1997).

- Commercial waterless urinal savings based on 1.3 gal./flush savings x 40 flushes/day x 310 work days.

- Residential Audit savings based on ECoBa study findings, 10,000 customers based on top 20 % of 50,000 homes.

- Rainwater Harvest Ordinance Modeled after Santa Fe Requirement for > 2,500 s.f. or larger homes to install 1.15 gal/s.f. storage tank - cost of buried tank, filter, pumps, piping, installation.

- Potential single family regional customer base for toilet rebate = 60% total estimated 2008 units.

- Potential single family regional customer base for turf rebate = 20% total estimated 2008 units.

- Potential Multifamily regional customer base from Prescott and P. Valley MF unit counts in 1994.

- ET Controller Savings Based on 20% reduction in water use for 1000 s.f. turf area from 6 AF/Ac to 4.8 AF/AC.

5.11 Incentive Programs Lacking TAC Consensus for Implementation in Phase 1

Several programs were analyzed but not selected for implementation in the Phase 1 program because either: 1) the program has a high cost per acre-foot of water saved, 2) the anticipated water savings per installation is small compared to other programs, or 3) the programs have high expected rates of "Free Ridership." Incentive programs not selected for implementation in Phase 1 but that could be implemented at a later time by the Coalition if additional water savings are desired include: Hot-water recirculation equipment rebates for single family residences ($8,000/AF cost), high-efficiency washing machine rebates ($7,800/AF cost), Et-based irrigation controller rebates for residential use (the high complexity of use is problematic for most homeowners), and rain water harvesting barrel rebates ($10,000/AF cost).

Providing rebates for rain water shutoff devices for irrigation controllers was discussed at the Board meeting held on August 27, 2008. The TAC will research this potential incentive and may add this to the list of incentives to be offered in the future. Several western cities offer rebates of $25 for installation of this device.

Chapter 6 – Evaluation of Potential Regional Water Conservation Ordinances

6.0 Overview

Water conservation ordinances that influence water use in new development and use by existing customers can be an effective tool in a balanced water conservation program. New population growth is projected to remain strong within the Coalition area, with as many as 71,000 new single family units and 22,000 new multifamily housing units expected to be built though the year 2050. This residential unit growth and the corresponding increase in commercial water users represents a water conservation opportunity if landscape and internal building plumbing designs can be influenced though ordinances. This chapter discusses potential ordinances that could be implemented on a regional basis and the potential water savings that could be achieved over time from each approach. Potential costs and other impacts to new development are also discussed. Table 6.1 indicates the estimated water savings over time from the potential ordinances discussed in this Chapter.

A regional approach to water conservation ordinance adoption can eliminate issues of competition and fairness between the different jurisdictions within the Coalition area that arise with varied approaches to requirements for new development and existing customer water use regulations. Another advantage of a regional approach is that a consistent message regarding the need for efficient use of the Coalition area's water supplies is conveyed to all citizens in the region.

Putting a regional conservation ordinance into effect could be accomplished through the development of a model ordinance developed through the Coalition water conservation program effort. Each Town and City within the Coalition area, and Yavapai County, could then adopt the model ordinance or some close variation of the ordinance to suit its unique situation. Jurisdictions would be free to adopt more stringent ordinances if warranted by water resources conditions within their service area.

6.1 Time-of-Day and Day-of-Week Irrigation Restrictions

Several communities in Arizona and other western states have implemented these types of irrigation restrictions to reduce residential and commercial outdoor uses. Another benefit of restrictions of this nature can be a reduction in peak-day water demands, thereby delaying water production and storage system expansion costs for the utility. These ordinances are also often part of short-term drought management programs. While the effectiveness in reducing overall annual per capita water use is difficult to quantify, time-of-day and day-or-week ordinances can be an effective public education tool, emphasizing to the public the importance of efficient outdoor water use.

Certainly, customers that irrigate more than three times per week or during the middle of the day could see a significant reduction in use. The regional conservation opinion survey indicated approximately 13 percent of respondents water daily. However, it

should be noted that some customers having automatic irrigation systems will simply increase watering times on the permitted days and may not achieve the desired reductions.

The City of Prescott currently is the only provider in the Coalition area that has in place time-of-day watering restrictions. Flagstaff and Payson, Arizona also have similar ordinances in place. The cities of Albuquerque and Santa Fe have adopted time-of-day ordinances. These apply only to spray irrigation. It is interesting to note that during the winter months, Albuquerque requires that spray irrigation occur during the middle of the day to encourage timely repair of water leaks and broken irrigation heads. The City of Las Vegas has in place a three-day-per-week restrictions and time-of-day restrictions during the summer (that also apply to drip systems).

Time-of-day water restrictions could present an opportunity for standardized regional approach. To be most effective, these programs should be accompanied by an enforcement program that issues fines or citations to violators. Albuquerque fines violators $20 for the first violation and fines increase for multiple violations up to $1000. Santa Fe's restrictions are in place only during the summer months. Fines increase from $20 for the first violation to $200 for the fourth violation. Day-of-week restrictions are no longer in effect. Time-of-day and day-of week ordinances can effectively communicate to residential and commercial customers the importance of efficient water use to the region. For this reason, it is recommended that time-of-day and day-or-week water restrictions be considered for inclusion in a regional water conservation ordinance.

6.2 Ordinances Restricting Turf in New Development

Limiting the amount of turf in new residential and commercial development is an effective way of reducing future irrigation demand in developing communities. Restrictions for new single family residential development are somewhat controversial and therefore have not been widely implemented, while ordinances restricting turf in new commercial and multifamily residential development are more common. ADWR regulations currently prohibit turf within the right-of-way of public streets. More aggressive restrictions can take many forms. ADWR's Reasonable Conservation Measures (RCMs) in the Third Management Plan list several types of turf limitation ordinances including:

- Limitation of 10 percent of landscapable area in common areas for new single family and multifamily developments.
- Limiting turf in multifamily to individual patio areas and actively used recreational areas.
- Prohibition of CCRs requiring turf in new subdivisions.
- Requirement that turf at new model homes be limited to 20 percent of landscapable area.

Turf restriction ordinances have been implemented in several Arizona cities. The Town of Payson prohibits <u>any</u> turf in new commercial or residential development. It should be

noted that Payson has been subject to potential water shortages over the last decade and has been able to justify this aggressive approach. Other cities limiting turf in new commercial development included Tempe, Glendale, Tucson, Mesa, Scottsdale, and Goodyear.

Turf restrictions, if implemented in one community but not in nearby communities may create inequities related to development potential. Therefore, this type of restriction on new development lends itself well to a regional approach to eliminate equity issues between communities.

The Las Vegas area water providers through the Southern Nevada Water Authority have taken a regional approach to turf restrictions. These are as follows:

- SF Residential – 50 percent of front yard, no restriction in back yard
- MF Residential – 30 percent of landscapable area not including parking lots
- Non-Residential – 10 percent of landscapable area
- During declared drought – no new turf in front yards.

The Town of Chino Valley currently prohibits new units approved based on imported water to use water for outdoor irrigation. The Town is now in the process of reviewing a proposed ordinance that would prohibit all new development from using town-provided water for outdoor landscaping purposes, with some exceptions.

6.2.1 Potential Savings from Residential Turf Limitations

An estimate was made of potential water savings that could result from restricting turf in new residential units to 600 square feet within the Coalition area. This estimated is based on the following assumptions:

- 20% of new homes have turf of at least 1,000 square feet that would be limited in the future to 600 square feet.
- Average water use currently is 6 acre-feet per acre (60 percent efficiency)
- New home growth rates based on population projections developed by the Yavapai County Water Advisory Committee in 2006

Based on these assumptions, this ordinance could save the following amount of outdoor water use in new single family residential units: 150 AF/YR by 2015, 255 AF/YR by 2020, and 501 AF/YR by 2030.

6.3 Water Waste Ordinances

Ordinances designed to prevent the obvious waste of water are among the most common type of conservation ordinance. These ordinances receive more community support and therefore may be easier to implement. Water waste prohibitions have taken the following forms in the ordinances of other Arizona and western cities:

- No water leaving the property and running down streets in gutters.
- No use of hoses to clean sidewalks and driveways.
- Car washing and other water use only with use of hose nozzles.
- Restaurants may provide water only on request (Santa Fe, Albuquerque).
- Limitations on hotels providing clean linen for guests staying more than one night (Santa Fe).
- Prohibit spray irrigation during daylight hours (e.g. City of Prescott).
- Require that new multifamily units be individually metered.
- Car washing and other outdoor water uses allowed only with hose nozzle shutoff.
- Water recycling requirements for new commercial car washes.
- Require hotels/motels to post water conservation information.
- Require nurseries to provide conservation literature to customers.
- Require model homes to provide conservation literature to buyers
- Model home turf restrictions

Civil citations for violations are often issued to encourage compliance with this type of ordinance.

6.4 Building Codes for Interior Fixtures in New Residential and Commercial Buildings

Building codes have been amended in some communities to require new homes and commercial buildings, and retrofits of existing structures requiring a building permit install one or more of the following:

- Hot water recirculation or hot water on-demand systems. A variation on this is to require hot water fixtures to be located no more than 40 feet from the hot water heater (e.g. Payson, Arizona ordinance)
- Ultra-low flow fixtures that reduce water use beyond the national or state of Arizona plumbing codes (e.g. 1.3 gallon per flush [HET] or dual flush toilets, and waterless or 0.125 gallon/flush urinals in new commercial buildings).
- Rainwater harvesting equipment requirements for new development.

The potential water savings and possible implementation issues of these requirements are discussed below.

6.4.1 Potential Savings From Hot Water Recirculation Requirement

Hot water recirculation devices have been shown in research studies to save approximately 2,000 gallons per year per home. Based on this figure, an ordinance requiring these devices on all new homes within the Coalition area is estimated to save the following amount of water annually: 86 AF/YR by 2015, 152 AF/YR by 2020, and 316 AF/Y by 2030. The added cost to each new home of this requirement is estimated at $250 to $300 per home.

6.4.2 Potential Savings from Requirement for 1.3 Gallon (HET) Toilet in New Single Family and Multifamily Development

Current national and state plumbing codes require the installation of 1.6 gallon toilets (ULF). If an ordinance was passed requiring 1.3 gallon (HET) or Dual Flush toilets, significant water savings could be achieved over time. Projected annual water savings for new single family and multifamily housing units are: 66 AF/YR by 2015, 117 AF/YR by 2020, and 244 AF/YR by 2030. It should be noted that currently there are fewer models of HET toilets offered by manufacturers than for the standard 1.6 gallon toilet. Therefore, requiring HET toilets would limit the choices of consumers within the Coalition area until such a time as more HET models are offered by manufacturers.

6.4.3 Potential Savings - Requirement for Waterless Urinals in New Commercial Development

The Town of Payson requires all new and renovated commercial establishments to install waterless urinals. Waterless urinals are now widely found in commercial buildings throughout Arizona and other states. Most manufacturers now offer one or more models of these water conserving products. It is estimated that adopting a similar requirement in the Coalition area would result in the following water savings over time: 47 AF/YR by 2015, 83 AF/YR by 2020, and 173 AF/YR by 2030. Waterless urinals are more expensive than water flush models (approximately $100 differential), but the money saved in water reductions should achieve a payback for the commercial facility within 2 to 3 years. Another alternative is to allow 0.125 gallon/flush urinals, which would result in water savings of approximately 90 percent of the figures shown above.

6.5 Retrofit-on-Resale Requirements

A few communities in California (Monterey, City of San Diego, and City of Los Angeles) require that buyers and/or sellers of all residential or commercial properties certify the building has been retrofitted with ULF toilets, showerheads, aerators, or other water conservation devices. All of these communities offer financial assistance to property owners in making the required improvements. The Monterey Peninsula Water Management District (California) has had this requirement in place for approximately 10 years. This type of program has been very effective in Monterey, where a large percentage of the housing stock is pre-1994 and has high water use plumbing fixtures. If a retrofit-on-resale requirement were implemented within the Coalition area, an entity (or entities) would need to enforce and administer the requirement. Legal research may be required to determine whether each Town and City has the legal authority to administer the requirement within its borders, whether the County could be the administrator, or whether a new legal entity would need to be created.

Table 6.1
Estimated Water Savings of Potential Ordinances for New Development

Potential Ordinance	AF/YR Saved 2013	AF/YR Saved 2020	AF/YR Saved 2025	AF/YR Saved 2030	AF/YR Saved 2050
Retrofit on Resale (AF/YR) Savings					
Ann. Savings per SF Unit (gallons)					
15,400 gal./Yr./home	397	728	1,059	1,333	1,333
Ann. Savings per MF Unit (gallons)					
15,400 gal./Yr./home	128	255	383	501	501
HET Toilet Requirement					
Ann. Savings per SF Unit (gallons)					
1,205 gal./Yr./home	36	91	139	190	266
Ann. Savings per MF Unit (gallons)					
1,205 gal./Yr./home	10	26	39	54	75
Turf Restricted to 600 s.f.					
Ann. Savings per SF Unit (gallons)					
3,500 gal./Yr./home	103	265	403	553	771
No New Residential Turf Permitted					
Ann. Savings per SF Unit (gallons)					
8,750 gal./Yr./home	258	663	1,007	1,383	1,928
Hot Water Recirculation					
Ann. Savings per SF Unit (gallons)					
2,000 gal./Yr./home	59	152	230	316	441
Rainwater Harvesting Requirement					
Ann. Savings per SF Unit (gallons)					
15400 gal./Yr./home	454	1,167	1,772	2,434	3,393
Waterless Urinals - New Comm/Ind					
Annual Savings per Unit (gallons)					
18,250 gal./Yr./unit	32	83	126	173	241

Assumptions

- Retrofit on resale assumes ULF (1.6 gal.) Toilet replaces 4 gallon toilet for 13,030 GPHUD savings
- Shower/aerator savings of 2.9 gpcd based on AWWA studies
- 2,600 existing homes sold/year and 60% of homes pre-1994 (1,400 homes/yr retrofitted)
- Turf restriction - assumes 20% new units have avg. of 1000 s.f. of turf, reduced to 600 s.f. and ann. use of 6 AF/AC (60% efficiency)
- HET Toilet requirement assumes savings of 0.3 gallons per flush x 5 flushes x 2.2 pph
- Rainwater Harvesting - Assumes avg. single family roof area of 2500 s.f. , Prescott Valley long-term avg. rainfall used as basis
- Commercial Waterless Urinals - savings of 1.0 gpf x 50 flushes per day. Commercial unit = 6% of new SF Units built
- Reduce Current Outdoor Single Family Use Rate by 20 %: 23,600 gal./yr/home x 0.2 = 4720 gal./ home savings
- New Housing units based on WAC 2006 Population Projections totaled for Prescott, P. Valley, Chino V. and Dewey-Humboldt
  Avg. of 2.2 pph assumed, and 78/22 percent split between single family and multifamily units.

6.5.1 Potential Savings and Costs – Retrofit on Resale Requirement

There currently are approximately 28,200 single family homes and 10,600 multifamily units within the Coalition area built prior to 1994 that could be retrofitted though such an ordinance. At current rates of sales of existing homes in the area, the maximum estimated water savings from retrofitting these units with 1.6 gallon toilets and low-flow shower heads would be as follows: 525 AF/YR by 2015, 983 AF/YR by 2020, 1,834 AF/YR by 2030. The potential annual cost of providing financial incentives to help defray the cost to property owners within the Coalition area is estimated at approximately $500,000 per year, based on providing an average of $400 for toilet retrofits to each pre-1994 property sold each year in the Coalition area.

6.6 Requirements for Conservation Education through Real Estate Closings – Model Home Landscape Requirements

A requirement for the distribution of water conservation literature at the time of closing of real estate transactions has also been included in some conservation ordinances. Some communities require that model homes limit turf landscaping or provide xeriscape information to prospective buyers at model homes.

6.7 Establishment of Irrigation Efficiency Standards for Commercial and Residential Customers

This type of requirement involves developing a landscape water budget for large commercial customers. If water use exceeds the target, a water rate surcharge is applied to the amount the customer exceeds the target. This type of program is very staff-intensive and requires ongoing management. The Irvine Ranch Water District in Southern California has implemented this approach for commercial and residential water users and achieved significant reductions in water use since it was implemented. Such programs, while effective in reducing water use, require large staff and computer resources to develop and administer effectively.

6.8 Conservation Rate Structure (Tiered and/or seasonal rates)

The use of aggressively tiered rate structures has been a key strategy used by several utilities in western states to achieve significant reductions in per capita water use within a relatively short period of time. Examples of highly tiered rates can be found in Monterey, CA, Santa Fe, NM, and Aurora, CO. In 2007, the City of Prescott implemented a highly tiered structure.

Conservation rate structures should be tailored to the water use patterns of the community in order to provide a significant financial incentive to conserve to the highest water users in each customer class. Increased revenue generated by new conservation "surcharges" in the higher blocks can be used to fund rebate programs, education and outreach (audits) and other aspects of the utility's conservation programs. The tiered rate structures of the

utilities mentioned above are shown below in Table 6.2 in comparison to the current rate structures of the City of Prescott, Town of Prescott Valley, and the Town of Chino Valley. There are some similarities in the approaches but also some significant differences in how price signals are communicated and at what levels of water use. The City of Prescott rate structure, like those of the out-of-state utilities highlighted, sends a significant price signal to single family users above 20,000 gallons/month.

Table 6.2
Single Family Residential Water Rate Structures

		Price/1000 gal				
	Base	**Block 1**	**Block 2**	**Block 2**	**Block 4**	**Block 5**
City	**Charge**	0-10,000	>10,000			
Santa Fe, NM		$4.09	$14.64			
		0-1,000	1-2,000	2-3,000	3-4,000	>4,000
Monterey, Ca		$1.68	$3.36	$5.04	$6.72	$13.44
		0-4,000	4-20,000	20-30,000	>30,000	
Aurora, Co		$3.60	$4.50	$8.25	$10.75	
		0-11,000	11-30,000	31-40,000	>40,000	
Denver, Co		$1.81	$3.62	$5.43	$7.24	
		0-3,000	3-10,000	10-20,000	>20,000	
City of Prescott		$2.86	$4.30	$6.45	$12.90	
		0-8,000	8-20,000	>20,000		
Prescott Valley		$2.90	$3.48	$4.52		
		0-8,000	8-20,000	>20,000		
Chino Valley		$3.94	$4.93	$6.90		

6.8.1 Potential Water Savings Associated with Conservation Rate Surcharges

The amount of potential reduction in water demand with each percent increase in water price is defined as the "Elasticity of Demand." For example, a price elasticity of -0.35 within a user group or service area would mean that if monthly water bills increase 20 percent, theoretically, monthly demand would decrease by 7 percent (0.35 x 20). Water price elasticity will vary from community to community, depending on socio-economic factors, how water is used, and pre-rate increase price levels. Research in California and other western states has shown that single family residential price elasticity generally ranges from -0.25 to about –0.65. If one assumes that price elasticity within the Coalition area is -0.35, it is possible to estimate the potential water demand reduction resulting from various rate surcharges on high usage blocks.

Any reduction in demand would also decrease the additional revenue generated by the surcharge. Calculating the potential annual water demand reduction and impact on overall Coalition area water usage within large provider services areas is complex and beyond the scope of this report.

6.9 Rainwater Harvesting Requirements for New Development

The Town of Chino Valley is developing a draft ordinance that would prohibit the use of Town-supplied water for most outdoor irrigation uses. In effect, this ordinance would require new homes and businesses to install rainwater harvesting equipment to provide for all irrigation needs. The City of Santa Fe, NM requires that all new homes design landscaping to provide for maximum capture of rainwater for irrigation uses. Homes greater than 2,500 square feet must install rain water harvesting equipment capable of storing at least 1.15 gallons per square foot of roof area (2,875 gallons for a 2,500 S.f. home) including pumping equipment. To evaluate the costs and benefits of implementing an ordinance similar to the City of Santa Fe for residential construction, calculations were made based on the following assumptions:

- Cost of a buried storage tank, pumping/filtration equipment and installation - $7,500
- Usable rainwater capture of 15,400 gallons/year based on long-term monthly rainfall totals for Prescott Valley, monthly turf grass consumptive use, and average home outdoor water use of 27,000 gallons per year based on 1,000 sf. of turf irrigated (Yavapai County Cooperative Extension), considering monthly carryover of unused storage. (See Table 6.3)

Based on these assumptions, the cost/AF of installing rainwater harvesting equipment is an order of magnitude higher than other conservation program alternatives ($159,000/AF). The payback to the residential customer is 122 years. It should be noted that some homes having more landscaping water use could utilize more harvested water. However, on the average, based on this analysis, rainwater harvesting using residential storage and pumping systems does not appear to be cost-effective compared to other water conservation alternatives.

6.10 Technical Advisory Committee (TAC) Consensus Recommendations Regarding Development of a Model Regional Water Conservation Ordinance

Two workshops were held with the TAC and other stakeholders on June 11, 2008 and July 14, 2008 to discuss potential elements of a model regional water conservation ordinance. Several concepts were discussed by the TAC related to development of regional water conservation ordinances. The concept for which there was consensus was the development of a model conservation ordinance to be brought to the Coalition Board

Table 6.3
Usable Water Storage for 2,875 Gallon Water Harvesting Tank

Month	Prescott Valley Avg. Month Precip.	Max. Runoff to Storage	Turf CU Gal. Require. after Precip. (inches)	1000 SF Turf CU Gal. Require. after Precip.(gallons)	Unused Water Storage (gallons)	Usable Storage (gallons)	Average Home Usable Storage (gallons)
Jan	1.15	1,797	0.62	386	1,411	386	336
Feb	1.37	2,127	0.76	474	1,653	474	411
Mar	1.39	2,172	2.15	1,340	832	1,340	1,164
Apr	0.55	864	4.33	2,699	0	2,205	1,914
May	0.47	728	5.85	3,647	0	728	632
June	0.29	455	7.12	4,438	0	455	395
July	2.10	3,264	6.52	4,064	0	3,264	2,835
Aug	2.39	3,730	5.61	3,497	0	3,730	3,239
Sept.	1.51	2,354	4.76	2,967	0	2,354	2,044
Oct	0.93	1,456	3.7	2,306	0	1,456	1,264
Nov	0.91	1,422	1.53	954	468	954	828
Dec	0.93	1,456	0.65	405	1,051	405	352
Total	14.01	21,826	44	27,177	5,414	17,751	15,415

of Directors for adoption. Through adoption of a regional model ordinance by the Board, each Coalition member agency would agree to adopt the ordinance (or a variation of the ordinance) in its City, Town, or County Code. Individual Coalition members would be able to adopt more stringent conservation ordinances if desired to deal with its unique water resources situation.

Several ordinance approaches adopted by cities in Arizona and other western states were evaluated and discussed. Each ordinance was evaluated based on the following decision parameters:

- Costs and Benefits to homeowners
- Implementation and enforcement issues
- Success of ordinances enacted in other Arizona and western cities
- Coverage of existing and new development
- Coverage of indoor and outdoor uses

Based on these discussions, the elements of the model ordinance for which there was consensus among the TAC members and other stakeholders, and the projected water savings for each element after five years of implementation are shown in Table 6.4. Annual water savings from these ordinances would continue to increase beyond 2013 as more new homes and businesses are constructed with water conserving landscapes and interior plumbing.

Table 6.4
Recommended New Development Ordinances

Recommended Ordinance Element	Water Saved by 2013 (AF/YR)
HET Toilet Requirement New Residential and Nonresidential	
Ann. Savings per SF Unit (gallons)	
1,205	36
Ann. Savings per MF Unit (gallons)	
1,205	10
Turf Restricted to 600 s.f. in New Single Family Residential Units	
Ann. Savings per Unit (gallons)	
3,500	103
Turf Restrictions for New Commercial, Industrial, and Multifamily Develop.	Unknown
Hot Water on Demand Requirement for New Single Family Units	
Ann. Savings per SF Unit (gallons)	
2,000	59
Waterless or 0.125 Gal/Flush Urinals in New Commercial/Industrial	
Annual Savings per Unit (gallons)	
18,250	32
Total Coalition Area Savings (AF/YR)	**240**

6.10.1 Water Waste Prohibitions and Other Elements of the Recommended Model Conservation Ordinance

The water waste prohibitions and education-oriented ordinance components for which there was consensus among the TAC and other stakeholders include:

1. Prohibition on fugitive water leaving the property and running in streets and gutters.

2. Prohibition on spray irrigation during the daylight hours to reduce evaporation losses (currently in place in City of Prescott).

3. Requirement that new multifamily units be individually metered.

4. Car washing and other outdoor water uses allowed only with use of a hose nozzle shutoff.

5. Water recycling requirements for new commercial car washes.

6. Requirements for hotels/motels to post water conservation information in guest rooms.

7. Requirements for restaurants to post water conservation table tents informing customers that water is served only upon request.

8. Requirements for nurseries to provide water conservation literature to customers.

9. Requirements for model homes to provide water conservation literature to prospective buyers.

10. Model home turf restrictions.

More detailed ordinance language will need to be developed in conjunction with the TAC and will be brought back to the Board for consideration and adoption. The language adopted by the Board could then be modified by individual entities as needed.

6.11 Ordinances Evaluated but Lacking TAC Consensus Recommendation for Implementation as Part of the Phase 1 Water Conservation Program

The following ordinance approaches were evaluated and discussed by the TAC, but no consensus recommendations were arrived at by the committee and stakeholders. However, the ordinances described below could be implemented in the future within the Coalition area. The projected water savings of several ordinances not recommended for implementation as part of the Phase 1 program are shown in table 6.5 below. These potential ordinances are:

1. Retrofit on Resale Requirement for all residential and commercial properties. While a retrofit on resale requirement is projected to result in a high degree of conservation savings, this requirement is not recommended for implementation at this time due to high administrative costs, potentially high retrofit costs to existing property owners in the absence of a financial incentive program to defray costs.

2. A prohibition on any new installation of high-water-use turf grass in residential or nonresidential development (with certain exceptions). The projected water savings shown below are for single family residential units only. No consensus could be reached among TAC members regarding an absolute ban on turf in new residential development. It should also be noted that when ordinances were discussed with the Board on August 28, 2008 the Board directed the TAC to evaluate further rain water harvesting requirements for new commercial development during the ordinance development effort.

3. A requirement that all new single family homes install a large rainwater collection, storage, and pumping system (policy currently in place in Santa Fe, NM). This approach is not recommended due to the extremely high cost to new

homeowners ($7,500 estimate per home) and the extremely high cost per acre-foot of water saved ($158,000/AF).

Table 6.5
Projected Water Savings for Ordinance Lacking a Consensus Recommendation

Ordinances Lacking a Consensus Recommendation	Water Saved by 2013 (AF/YR)
Retrofit on Resale Requirement	
Ann. Savings per SF Unit (gallons)	
15,400	397
No New Residential Turf Permitted	
Ann. Savings per SF Unit (gallons)	
8,750	258
New Residential Rainwater Harvesting Requirement	
Ann. Savings per SF Unit (gallons)	
15,400	454

As shown in Table 6.5, the potential water savings associated with these approaches is significant. If the Coalition partners desire a higher level of water savings beyond that provided by Phase 1 programs, these potential ordinances could provide a higher level of water savings.

Chapter 7 – Customer Outreach (Audit) Programs

7.0 Overview

Providing free audit services to residential and commercial customers is often part of utility comprehensive water conservation programs. Audits have been shown in several studies to be a cost-effective way of achieving water savings in both residential and commercial sectors. An added advantage of audit programs is that they create customer goodwill by providing free assistance to customers while helping them to reduce water use and monthly water bills. Audit programs are included in the Arizona Department of Water Resources' Modified Third Management Plan Best Management Practices and the state of California's Best Management Practices for municipal water providers. This Chapter presents the results of several studies regarding the costs and benefits related to residential and commercial customer audits and describes the audit program recommended for implementation as part of the Phase 1 Regional Conservation Program.

7.1 Single Family Residential Audit Cost-Effectiveness

The ECoBa study looked at 8 audit programs of 4 utilities that involved a total of 2,217 audits. The average water savings from audit programs varied considerably. This variation was attributed to: 1) the degree to which audits were targeted at high users, and 2) the skill of the auditor. The average savings among programs varied from 2,000 gal./yr/home to over 30,000 gal./yr/home, with average savings being 8,690 gal./yr/home. In California, the Contra Costa County Water District conducted indoor and outdoor audits of 2,216 homes from 1989 to 1993. The average water savings from these audits averaged 16 percent of total annual water use. This study found that water savings fell off after 3-4 years by about 50 percent.

Studies conducted by the American Water Works Association suggest that, on average, 12-13 percent of interior use is due to leaks. This leakage is concentrated in the 10-20 percent of homes having leaking toilets. Therefore, to maximize the effectiveness of home audits (particularly indoor audits), it is recommended that a regional audit program be initially targeted to homes having winter usage greater that 400 gallons per day (12,000 gal./month). However, customers having high summer use can also benefit from audits focused on irrigation systems and outdoor water savings. Residential audits could also be targeted initially to users in the top 5 percent of summer residential water users.

The cost to conduct an audit varied considerably among programs studied, from $55 to $159 per audit. For the cost-effectiveness analysis conducted for this report, it was assumed that the cost of each audit would be $125 and the average savings resulting from the audit would be 8,500 gal./yr/home. These figures correspond to the averages found in the ECoBa study. This level of water savings assumes audits are well targeted to high users and involve both indoor and outdoor irrigation audits at each residence. Based on these assumptions, the average cost per acre-foot of water saved would be $4,792 per acre-foot.

7.1.1 Potential Scope of Residential Audit Services

Residential home surveys involve examining both indoor and outdoor uses. A site visit is typically made by trained staff to gather information on current water use practices, search for water leaks, and make recommendations for improvements. A written report is then provided to the homeowner. In some cases, indoor plumbing retrofit devices (e.g. showerheads, toilet dams, toilet flapper valves, and faucet aerators) are installed. The outdoor portion of the survey can vary from conducting a turf audit catch can test and providing written recommendations for irrigation scheduling or irrigation system changes to providing brochures on efficient outdoor watering and xeriscape practices. The scope of the audit can be tailored to the water use circumstances at the individual residence.

7.2 Commercial/Industrial Audits

Audits of large commercial and industrial customers typically involve evaluation of water use for cooling towers, industrial processes, outdoor irrigation, or kitchen use. Audits are conducted by trained staff, sometimes using consultants specializing in water use efficiency studies. The average cost of an audit of a commercial facility ranges from $1,500 to $2,500 if done by consultant. A comprehensive water use efficiency study can cost much more. Studies of audits of large commercial/industrial facilities indicate median water savings of about 20 percent of overall facility water use if the audit recommendations are implemented. Based on the cost of the audit to the utility, water savings are very cost-effective, generally less than $300 per acre-foot. However, this assumes the recommendations. (Reference: BMP Costs and Savings Study, California Urban Water Conservation Council, July 2000)

Compared with other more urban service areas in Arizona, there are not currently a lot of large commercial/industrial users within Coalition area. A review of large commercial users and the potential water savings from a commercial audit program is beyond the scope of this program development. However, the individual Coalition water providers could study customer records to analyze the water savings potential of commercial audits within their respective service areas.

7.3 Recommended Customer Outreach (Water Audit) Program

Based on the analysis of audit program cost-effectiveness, it is recommended that the Phase 1 Regional Conservation Program make available indoor and outdoor water use audits targeted to high water use customers. Audits would be conducted by trained auditors employed as staff of the Coalition, by staff of the Coalition members, or by outside vendors. To target the programs to high water use accounts, each Coalition City would be responsible for the analysis of customer account data to identify high water use accounts that would be offered audit services. Letters could be sent out to those accounts informing them of the availability of audit services on a voluntary basis. It is recommended that audits also be provided to other customers in response to requests for this service.

Auditors would examine residences and businesses for leaking toilets and leaking faucets, repair leaks (e.g. install new toilet flapper), install low-flow shower heads and faucet aerators, and review outdoor irrigation uses and make recommendations regarding irrigation scheduling. Table 7.1 indicates the recommended level of funding of the audit program, the projected number of customer accounts audited and the projected water savings after five years. Anticipated water savings from commercial audits is not predicted here and would be in addition to the estimated savings shown below.

Table 7.1
Audit Program Costs and Projected Water Savings

Audit Program Element	Program 5-Year Savings Goal (AF/YR)	Annual Program Budget	Projected Annual # Participants
Customer Audits			
Residential Audits	26	$25,000	200
Commercial/Industrial Audits	Unknown	$4,000	4
Total Audit Program	26	$29,000	204

Chapter 8 – Public Education and Information Programs

8.0 Overview

Public education and information programs are the backbone of a comprehensive, balanced utility water conservation program. The education and information component serves several important functions, including:

- Communicating to all water use sectors the need for conservation in the region to motivate water users to make conservation efforts.
- Informing water users of the availability of financial incentive and audit programs to maximize program participation.
- Communicating specific water conservation goals to the public.
- Educating water users regarding appropriate xeriscape landscaping techniques and irrigation system design.
- Communicating specific outdoor landscape irrigation water budgeting information to achieve savings in outdoor water use.

8.1 Recommended Phase 1 Public Information and Education Program

The regional water conservation survey data collected in 2007 and discussed in Chapter 4 clearly indicated that many homeowners are not irrigating outdoor landscapes efficiently. Many water users (20 to 30 percent) are probably over-irrigating by as much as 50 to 100 percent. This is true whether users are irrigating turf, xeriscape landscapes, or native plants. To address outdoor water use, it is recommended that the key objectives of the regional public information and education element include the following:

- Provide detailed seasonal information on irrigation budgeting to reduce outdoor water use to homeowners and landscape professionals.
- Provide information on landscape and irrigation design to homeowners and landscape design and maintenance professionals. Work with the nursery and landscape profession in developing appropriate irrigation scheduling information and messaging.
- Publicize the availability of financial incentives to water users in the region.
- Communicate specific regional water savings goals, the need for conservation in the region, and other aspects of the program (such as the availability of audits and ordinances).
- Utilize one regional conservation program "branding slogan," such as the "Water Smart" brand currently in use by the City of Prescott.

The use of a single conservation brand and a cohesive information and messaging program will be more effective in achieving behavioral changes within the community than having individual conservation programs implemented by Coalition members. Individual programs that differ in content can lead to confusion among water users as to the need for water use efficiency and how to achieve reductions in water use. Respondents to the survey indicated they prefer to receive information via print media

(newspapers, bill inserts, and direct mail) rather than through email and websites. Therefore, the recommended education program will focus on the use of print media to publicize irrigation water budgeting and other information.

8.2 Education and Information Program Water Conservation Savings Goal

A primary objective of the information and education effort is to reduce annual outdoor water use among single family residences by an average of 10 percent. Achieving this goal would result in approximately 340 AF/YR of water savings based on estimated 2007 average single family unit outdoor water use within the Coalition area of approximately 23,600 gallons per home. Additional water savings would occur through reductions in nonresidential landscape water use and indoor conservation efforts as a result of the education campaign.

8.3 Program Implementation Recommendations

The proposed media and communications strategy for conveying conservation messages to all water users in the region includes:

- Develop print material for regional direct mail distribution, bill inserts, and distribution at pay stations, government buildings and community fairs.
- Advertise monthly irrigation water budgets in local newspapers and regional magazines (i.e. guidelines for number of times per week, and number of minutes for both drip irrigation and turf (spray) applications).
- Focus messaging on specific outdoor irrigation budgeting information appropriate to the season, irrigation system management, and xeriscape design.
- Use the above media to advertise incentive programs.
- Utilize at least quarterly messaging geared to the primary irrigation seasons: Spring/early summer, Monsoon, fall, winter (onset of rains).
- Use radio spots to communicate seasonal irrigation scheduling guidelines, etc.
- Develop a conservation packet to be sold at a nominal cost (e.g. $10) to homeowners within the area. This packet would include items such as low-flow showerheads, faucet aerators, information on irritation budgeting, xeriscape design, and rainwater harvesting.

The estimated budget for the information and education program is approximately $60,000 per year (does not include program development and administration costs). This is based on the example budget shown in Table 8.1. If the Education and Information element is implemented alone, estimated program development and administration costs are $35,000 per year assuming outside consultant services are used. The actual mix of the media used may vary from that presented here and may include other education elements.

Table 8.1
Example Education Program Elements and Estimated Costs

Education Program Element	Items per Year	Approximate Cost/Item	Annual Cost
Newspaper Ads (3 papers)			
Daily Courier	8	$834.00	$6,672
Prescott Valley Tribune	8	$382.80	$3,062
Chino Valley Review	8	$306.90	$2,455
Smart Card Printing (Glossy)	60,000	$0.12	$7,200
Smart Card Printing (non-Glossy)	258,000	$0.02	$5,160
Smart Card Production - 6 cards	6	$650.00	$3,900
Mailing Costs to Exempt Wells	54,000	$0.18	$9,720
Radio Ads	600	$22.00	$13,200
Radio Ad Production	6	$1,000.00	$6,000
Conservation Packets	300	$10.00	$3,000
Education Program Totals			$60,370

(Note: Media outlet used and costs may vary from that shown here)

In addition to using print media and radio advertising, it is recommended that irrigation budgeting and other conservation information be made available online on either a new website maintained by the Coalition and/or the websites currently maintained by the Coalition members. The website should also include information on Coalition incentive and audit programs, xeriscape and landscape design information, and links to other conservation websites, such as:

WaterSense (U.S. EPA) at www.epa.gov/watersense/
California Urban Water Conservation Council at www.h2ouse.net/
Water Use it Wisely at www.wateruseitwisely.com/
WaterWiser – Water Efficiency Clearinghouse at www.awwa.org./resources/content/
Arizona Department of Water Resources Conservation page at www.azwater.gov/dwr/Conservation/ConservationHome/

Chapter 9 – Recommendations for Phase 1 Conservation Program Implementation

9.0 Overview

The review of other cities' and regions' conservation programs summarized in Chapter 3 indicates areas that have reduced water use rates significantly through conservation efforts have done so as a result of implementing a balanced program. Figure 9.1 summarizes the components of a balanced conservation program approach. A "Balanced Program" is defined here as one that addresses all water use sectors (residential and nonresidential), provides financial incentives for the installation of water saving technology and landscape conversions, includes public education and information elements, provides customer audits, and includes ordinances that require water-efficient plumbing and landscapes in new development. Finally, highly-tiered conservation rate structures are commonly a key component of a balanced program.

Figure 9.1

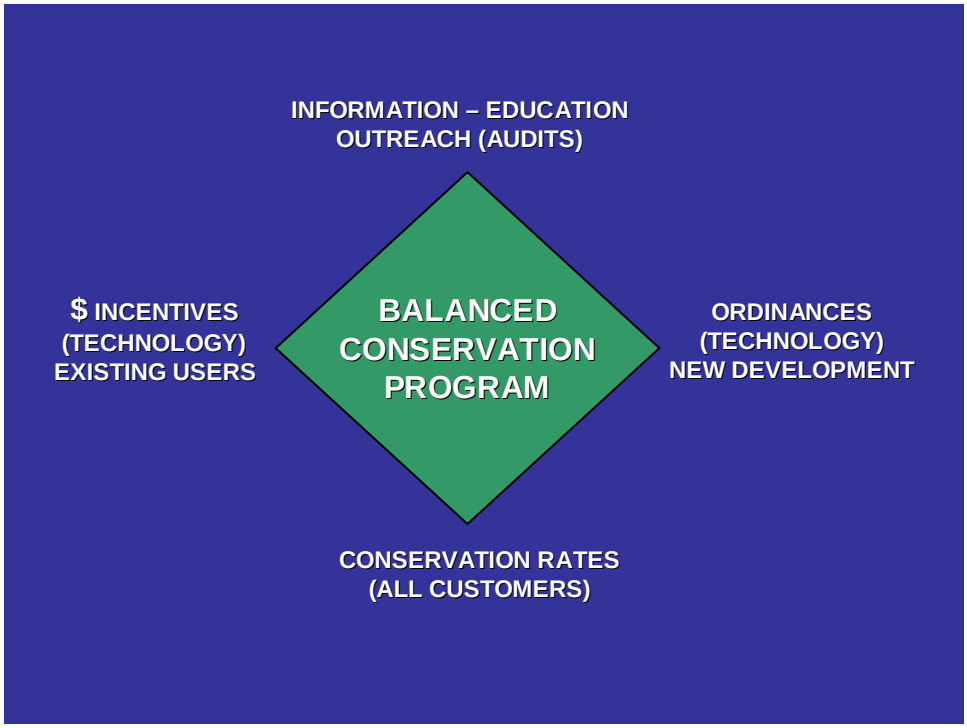


Table 9.1 indicates all of the program elements recommended for implementation as part of the Phase 1 Regional Conservation Program. The table shows the projected water savings after five years of program implementation within the Coaltion area, and the annual cost of each program element. The total cost of all Phase 1 programs is projected at $382,000 per year. Total estimated water savings after five years of program implementation is 962 AF/YR.

Table 9.1
Phase 1 Regional Conservation Program – Full Funding and Implementation

Regional Program Summary	Program 5-Year Savings Goal (AF/YR)	Annual Program Budget
Financial Incentives	356	$213,000
Customer Outreach – Audits	26	$29,000
Information and Education	340	$60,000
Ordinances	240	N/A
Program Administration (1 staff position or consulting fees)	-	$80,000
Conservation Program Totals	**962**	**$382,000**

However, implementation by the Coalition of Phase 1 regional conservation program elements will depend on the availability of funding. Therefore, this Chapter provides a phased implementation plan based on guidance received from the Coalition Board at the August 27, 2008 meeting. At that meeting, the Board recommended making $100,000 available for program implementation funding in 2009 from the Coalitions annual operating budget of approximately $200,000. Accordingly, two program implementation alternatives are provided here: 1) A conservation program costing $100,000 per year (which assumes limited or no Federal grant matching funds are obtained), and 2) A program budget of $200,000 per year, assuming matching Federal grants of $100,000 per year are secured.

9.1 Regional Conservation Program Administration Alternatives

Several alternatives for program administration and implementation were evaluated and presented to the TAC. There are advantages and disadvantages to each of the approaches, as described briefly below:

1. Coalition executes an MOU with the Yavapai County Cooperative Extension to implement for program administration.
   Advantage: Extension is already providing Project WET services in the area through funding provided by the Water Advisory Committee (WAC).
   Disadvantage: Lack of control by the Coalition Members.

2. Coalition funds a Yavapai County staff position to be managed through the Water Advisory Committee (WAC) process.
   Advantage: County already has a Water Resources Coordinator position funded in part though WAC.
   Disadvantage: County and WAC responsibilities go beyond the Coalition area.

3. Coalition hires full time staff position to be managed by the TAC.

Advantage: Provides for direct control by the Coalition management.
Disadvantage: Office space, computer and vehicle would have to be provided for the position through one of the Coalition member offices. (Could be provided as in-kind services toward that member's share of program costs.)

4. Burgess and Niple administers the program as part of overall program manager responsibilities. Outside vendors could be used to process rebates or perform customer audits. Use of rebate processing vendors would add approximately 15-20 percent to the cost of financial incentive programs.
   Advantage: Provides for direct control by the Coalition. Allows for seamless program adjustments should grant funding sources decrease or increase.
   Disadvantage: Potentially higher costs than other alternatives.

5. Individual Coalition members agree to implement the agreed upon regional conservation programs within their jurisdictions.
   Advantage: Allows for customization of programs in different areas within agreed-upon regional program guidelines.
   Disadvantage: The economies of scale associated with a regional effort are lost. In addition, it may be easier to obtain grant funds for a regional program rather than for several individual entities. The advantage of having one regional water conservation program brand and messaging is lost.

6. Some aspects of the regional program could be administered by individual Coalition members while other aspects of the regional program could be administered on a regional basis. For example, financial incentive programs could be funded and administered by each individual Coalition member within their jurisdiction, while public information and education efforts and ordinances could be implemented regionally.
   Advantage: Provides flexibility to deal with funding issues of Coalition members without losing regional program identity.
   Disadvantage: Some economy of scale advantages are lost.

7. Administration by the Central Yavapai Metropolitan Planning Organization.
   Disadvantage: Organization's charter would have to be modified through state legislature to include water-related functions.

Based on the advantages and disadvantages of these approaches, it is recommended that either Alternative 3 or Alternative 4 above be utilized to administer the Phase 1 conservation program. If only the Education and Information element is implemented initially, hiring a full-time staff person is not warranted. In this case, it is recommended that the Burgess and Niple team provide program development and implementation services. A proposed Year 1 program administration budget by task is provided later in this chapter.

9.2 Alternative 1 – Program Budget of $100,000 per Year

If the total program budget in 2009 is limited to $100,000, it is recommended that only the public education and information component be implemented (see Chapter 8). Of the $100,000 budget, approximately $60,000 would be allocated to printing, media buys, and mailing costs. Approximately $40,000 would be allocated to consulting services to provide program development and implementation. The estimated budget for Year 1 consulting services by the Burgess Niple team is allocated by task as follows (Note: tasks need not occur in the order listed):

Task 1 – Develop and submit grant aplication to U.S. Bureau of Reclamation Phoenix office (for Field Services conservation grant program).
Estimated Level of Effort: 30 hours

Task 2 – Develop monthly irrigation budgeting and irrigation system management messages in conjunction with the TAC and local landscape professionals.
Estimated Level of Effort: 35 Hours

Task 3 – Develop Radio spots and execute media buys.
Estimated Level of Effort: 35 Hours

Task 4 – Develop "Smart Card" text and graphics, oversee printing, distribute materials to water providers for mailings to customers.
Estimated Level of Effort: 45 Hours

Task 5 – Develop mailing list for exempt well owners and those served by private water companies; execute direct mailing of conservation information to home owners.
Estimated Level of Effort: 25 Hours

Task 6 – Develop text and graphics for newspaper and print media advertising, make media buys.
Estimated Level of Effort: 35 Hours

Task 7 – Develop database of City and County facilities that use water. Identify facility name, address, 2008 water use, and type of facility. Develop ranking of facilities for potential water use audits.
Estimated Level of Effort: 20 Hours
(with most work to be done by TAC members for their jurisdiction)

Task 8 – Develop draft model regional ordinance.
Estimated level of effort: 45 Hours

Task 9 – Develop Coalition Conservation Web Pages
Estimated level of effort: 20 Hours

9.3 Alternative 2 – Program Budget of $200,000 per Year

If Federal matching grant funds of $100,000 are secured and a total of $200,000 per year are available in Year 1, the following program elements and budget levels are recommended for implementation.

1) Public Education and Information Element - $60,000
2) Customer Outreach (Audit) Element (Partial) - $19,000 ($125/audit)
3) Financial Incentive Program (Partial) – $71,000
4) Program Development and Implementation Consultant Costs - $50,000 (Includes Alternative 1 Tasks and incentive and audit program development and implementation)

Under this alternative, all program elements would be implemented. However, the Financial Incentive program would be implemented at only about one-third of the full Phase 1 program level of $213,000 per year and the customer audit program would be implemented at about 70 percent of the full program level. Device installation rebates would be administered through a third-party vendor at an approximate cost of $20 to $25 per rebate. With this limited level of funding, incentives would be limited to toilet rebate or replacement programs. Program development and management would be provided by the Burgess and Niple team under the direction of the TAC.

9.3.1 Federal Water Conservation Grant Programs

The U.S. Bureau of Reclamation (USBR) provides water conservation program grants through two different programs. The first program, managed through the USBR's Phoenix office, is referred to as the Arizona Field Services Program. This program provides grants ranging from $10,000 to $50,000. In recent years, the program has provided a total of about $600,000 per year in funding to various entities. These grants are 50/50 cost share grants.

The second USBR program is the Water 2025 or "Challenge" grant program managed out of the Bureau's Denver, CO office. This program has provided from $3 to $5 million dollars per year in grants to entities thoughout the western states. Grants range in size from $100,000 to $300,000 and require a 50/50 local cost share.

Appendix 1 – Existing and Planned Conservation Programs in the Coalition Area

Existing and Planned Conservation Programs in the Coalition Area

Program Type	Prescott	Prescott Valley	Dewey Humboldt	Chino Valley	Yavapai County	Yav. P. Tribe	U of A Coop. Ext.	ADWR
Annual Program Budget	$205,000	$35,000		$25,000	40,000			
Conservation Program Manager	x				(WET)			x
Number of Paid Staff FTEs	1	0.2		0.5	0.2			
Volunteer Assistance								
Conservation Plan?		Under dev.			Under dev.			
Program Logo or Slogan	W. Smart							
Public Education/Awareness								
Radio Messaging	730							
TV Messaging	3	x		730		Tribal		
Direct Print Mailings						Members		
Utility Bill Messages	x			Planned		Cust.		
Newspaper/Magazine Ads	2			x		Of		
Literature at pay stations	x	x		x		Prescott		
Information at Comm. Events	8	x					5-10/yr	
Regional Messaging Programs	Survey	Survey		Survey				
Inform. through homebuilders	x							
Inform. Through Nurseries	x						x	
Restaurant Table Tents	x	x						
Hotel/Motel Infor. Programs								
Conduct Market Surveys	x	x		x	x			
Maintain Conservation Website	x			x				x

Program Type	Prescott	Prescott Valley	Dewey Humboldt	Chino Valley	Yavapai County	Yav. P. Tribe	U of A Coop. Ext.	ADWR
Conserve./Ed. Training Prog.								
Workshops- Landscape Design	2					x	2/yr	
Demonstration Garden		Planned						
Speakers Bureau	x					x	x	
School Education Programs	WET	WET		WET	WET		5/yr	
Provide Teacher Education Mat.	x	x		x	X		WET	WET
							M. Gardener	
Customer Outreach Programs								
Provide Self Audit Kits	500						AZMET St.	
Residential Staff Audits	120						Turf	
Large Turf Facility Audits	2	Planned		Town parks			Manager	
Commercial Facility Audits.	5						Training	
Targeted or Avail. On Request	Req.						Co. chair	
New Homeowner info. packet							Yav. Drought	
							Imp. Group	

Program Type	Prescott	Prescott Valley	Dewey Humboldt	Chino Valley	Yavapai County	Yav. P. Tribe	U of A Coop. Ext.	ADWR
Device Giveaways	$10 kit							
Showerheads	115							
Faucet Aerators	Sell							
Hose Nozzles	Sell					Hotel		
Toilets						Toilet		
Urinals						Retrofit		
Irrigation Controllers	Sell							
Pre-Rinse Spray Valves	Free	Free						
Other								
Rain Gauge	Free							
Flow Rate gauges	Free							
Does Utility Install Devices?	No							
Other	Die Tabs							
	Audit Kit							

Program Type	Prescott	Prescott Valley	Dewey Humboldt	Chino Valley	Yavapai County	Yav. P. Tribe	U of A Coop. Ext.	ADWR
Ordinances								
Limitations on turf/xeris. Req.								
Single Family Residential				Planned				
Multifamily Residential				Planned				
Commercial				Planned				
Common Area Landscape				Planned				
Effluent Req. for Large Turf		Golf C. Req.			Golf C.Req.			
Turf in Public ROW	x			Planned				
Water Harvesting				Planned				
Graywater								
Car Wash Recycling				Planned				
Time of Day/Day of Week Rest.	8PM-8AM			Planned				
Waterless Urinals in Comm.				Planned				
Hot Water Recirc. In New Dev.	x			Planned				
Fixture Retrofit on resale								
Irr. Efficiency standards (Com)				Planned				
Reclaimed Use - Large Turf	x							
Conservation Rates	Tiered	Tiered	Tiered					
Other								

Program Type	Prescott	Prescott Valley	Dewey Humboldt	Chino Valley	Yavapai County	Yav. P. Tribe	U of A Coop. Ext.	ADWR
Financial Incentives (Rebates)								
ULF Toilets or Dual Flush	x							
Amount of Rebate	$100/$130							
Number of Rebates Issued	219							
HE Clothes Washers	x							
Amount of Rebate	$100							
Number of Rebates Issued	287							
ULF Dishwashers								
Amount of Rebate								
Number of Rebates Issued								
Commercial Facility Urinals	x							
Amount of Rebate	$125	Pilot						
Number of Rebates Issued	14							
Hot Water Recirc. Devices	x							
Amount of Rebate	$50							
Number of Rebates Issued	84							
Graywater Systems								
Amount of Rebate								
Number of Rebates Issued								
Water Harvesting Equipment	Planned							
Amount of Rebate	$200-500							
Number of Rebates Issued								
Irrigation Controllers (Et)	x							
Amount of Rebate	$150	Pilot						
Number of Rebates Issued								
Rain Sensor	Planned							
Amount of Rebate								
Number of Rebates Issued								

Program Type	Prescott	Prescott Valley	Dewey Humboldt	Chino Valley	Yavapai County	Yav. P. Tribe	U of A Coop. Ext.	ADWR
Financial Incentives (Rebates)								
Turf Conversion to Xeriscape	x							
Amount of Rebate	0.50/s.f.-$800							
Number of Rebates Issued	85							
Conversion to Drip System	x							
Amount of Rebate	$150							
Number of Rebates Issued	48							
Leak Repair	x							
Amount of Rebate	$50							
Number of Rebates Issued	120							
Custom Commercial ($/AF)		Market Based						
Model Home Efficiency Rebate								
Pool Covers								
Commercial Ice Makers								
Low Interest Loans								

Program Type	Prescott	Prescott Valley	Dewey Humboldt	Chino Valley	Yavapai County	Yav. P. Tribe	U of A Coop. Ext.	ADWR
Regional Partnerships	CYWCP	CYWCP		CYWCP	CYWCP		WAC	CYWCP
					WAC			
Reclaimed Water Use								
Golf Course Irrigation	x	x						
Parks, Schools, Common Area								
Groundwater Recharge	x	x		x				
Agricultural Irrigation								
% Effluent Beneficially Used	100	100						
Leak Detection Programs								
System Water Loss Audit								
Ongoing Leak Detection	x	x		Plan				

Appendix 2 – Tables of Historical Annual Water Use and Water Use Rates for Prescott and Prescott Valley

City of Prescott - Historical Water Use and Usage Rates

	Total GPCD Use	Resid. Use (AF)	SF Use (AF)	MF Use (AF)	Tot.Res. Units	SF Units	MF Units	MF Res. GPHUD	Total Res. GPHUD	Total Non-Res. Use	Non Res. Use Percent
1993	148	3249	2748	501	16148	11420	4728	95	254	1923	37
1994	143	3305	2799	506	16686	11856	4830	94	249	1867	36
1995	139	3499	2994	505	17204	12308	4896	92	254	1713	33
1996	153	3836	3327	510	17573	12611	4962	92	272	1813	32
1997	153	3820	3302	518	18040	12933	5107	91	264	2196	37
1998	143	3742	3255	487	18512	13339	5173	84	250	1816	33
1999	147	3871	3381	490	19236	13769	5467	80	251	2066	35
2000	154	4269	3760	509	19827	14294	5533	82	267	2259	35
2001	153	4348	3851	497	20398	14812	5586	79	262	2290	34
2002	160	4928	4415	513	21155	15442	5713	80	285	2699	35
2003	161	4925	4411	514	22006	16088	5918	78	273	2336	32
2004	155	4896	4283	613	22758	16763	5995	91	261	2437	33
2005	145	4706	4117	589	23591	17427	6164	85	241	2312	33
2006	143	4839	4059	780	24220	18040	6180	113	239	2638	35
2007	146	5066	4251	815	24778	18623	6155	118	243	2733	35

Town of Prescott Valley - Historical Water Use and Usage Rates

Year	Total Pumped (AF)	Total GPCD Use	Resid. Use (AF)	SF Use (AF)	MF Use (AF)	SF Units	MF Units	MF Res. GPHUD	Total Res. GPHUD	Total Non-Res. Use (AF)	Non-Res Percent of Total
1993	2,232	108	1,715	1,591	124	6,267	1,100	101	244	393	19
1994	2,615	113	No data	No data	No data	6,949	1,283	No data	No data	No data	No data
1995	3,010	118	1,996	1,796	200	7,631	1,466	122	234	572	22
1996	3,439	127	2,293	2,070	223	8,163	1,480	135	251	613	21
1997	3,354	119	2,223	1,988	235	8,541	1,555	135	232	656	23
1998	3,517	120	2,364	2,102	262	8,849	1,642	142	238	616	21
1999	3,597	111	2,341	2,135	206	9,784	1,834	100	214	699	23
2000	3,912	115	2,925	2,589	336	10,164	1,962	153	257	1,047	26
2001	4,073	116	2,655	2,369	286	10,547	2,004	127	225	1,009	28
2002	4,672	125	3,072	2,763	309	11,388	2,004	138	241	1,250	29
2003	4,713	122	3,189	2,848	341	11,770	1,986	153	242	1,152	27
2004	5,229	126	3,350	2,986	364	12,786	2,072	157	234	1,190	26
2005	4,944	107	3,433	3,035	398	13,833	2,700	132	222	1,141	25
2006	5,601	115	3,596	3,181	415	14,417	2,928	127	223	1,115	24
2007	5,899	113	3,915	3,507	408	15,372	3,224	113	227	1,419	27