

# Water Conservation in Pima County

Sonoran Desert Conservation Plan  
March, 2001



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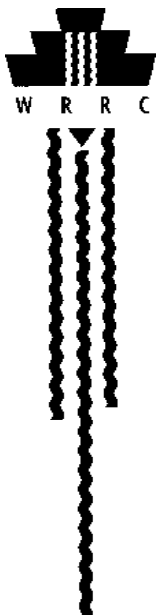
Chuck Huckelberry



# **Water Conservation in Pima County**

**A Report Prepared for the  
Pima County Board of Supervisors for the  
Sonoran Desert Conservation Plan**

*“There was a whole folklore of water. People said a man had to make a dipperful go as far as it would. You boiled sweet corn, say. Instead of throwing the water out, you washed the dishes in it. Then you strained it through a cloth into the radiator of your car, and if your car should break down you didn’t just leave the water to evaporate in its gullet, but drained it out to water sweet peas.” Wallace Stegner. Wolf Willow, a History, a Story and a Memory of the Last Plains Frontier 1962.”*



**Water Resources Research Center,  
College of Agriculture  
University of Arizona**

**January 2001**



## **Acknowledgments**

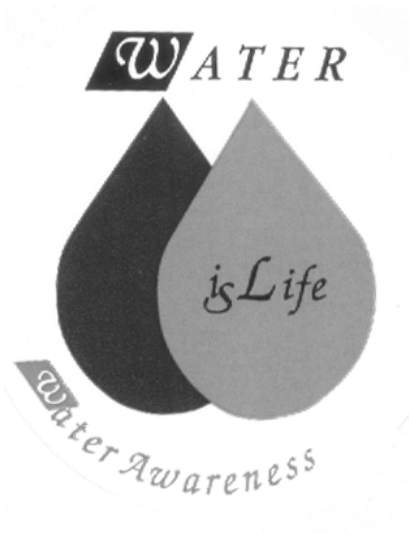
The cover photos are by Barbara Tellman and show some possibilities for beautifying a landscape with low water use plants.

The maps on pages 9, 10, and 18 are by Pima County Graphics Division.

The maps and charts on pages 8, 12, 13, and 17 are from *Water in the Tucson Area: Seeking Sustainability*.

The remaining charts and tables are based on information from the Tucson Active Management Area's Draft Third Management Plan.

Thanks to Val Little and members of Water CASA for reviewing a draft of this report.



# Water Conservation in Pima County

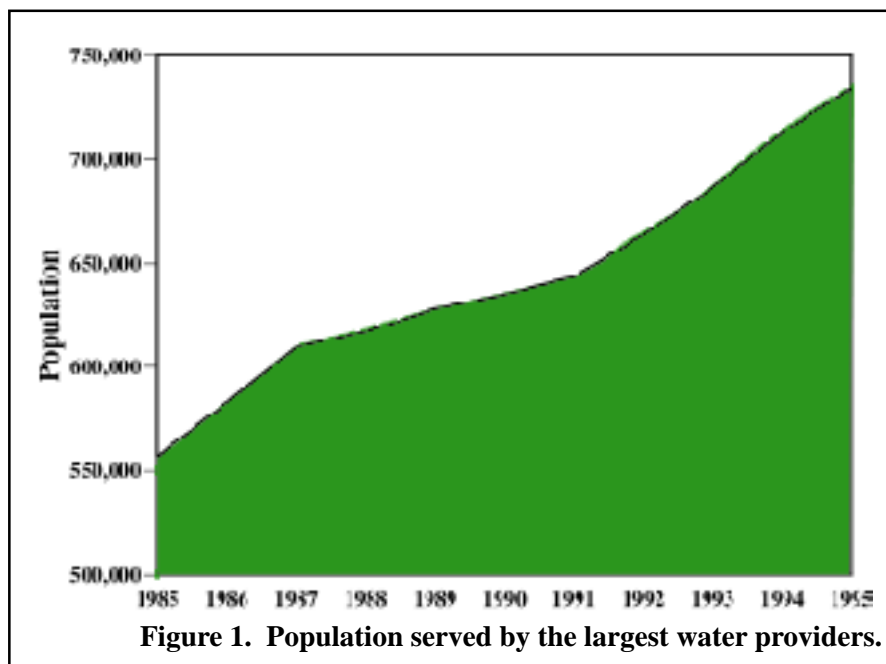
Many people voluntarily conserve water throughout Pima County today with the help of educational programs. Since the 1970s, Pima County residents have led the state in reducing per capita use of water, although in recent years per capita use has remained relatively steady. Low water use landscapes are more common in the Tucson urban area than are water guzzling landscapes. New construction must include low-flow toilets and showers.

Continued population growth, however, has meant that overall we are using more water every year. Many new homes have swimming pools or other outdoor water features, especially in the higher income areas. Golf courses use more and more water each year because new golf courses continue to be built and because of the desire to maintain high quality greens throughout the year.

After a steady drop in agricultural water use, that usage has begun to rise again relatively rapidly, almost entirely due to the introduction of Central Arizona Project (CAP) water, much of which will be used by the Tohono O’odham under the Southern Arizona Water Rights Settlement.

Our groundwater supply continues to be depleted, although CAP water will slow that depletion in the short term. If the population continues to grow at the projected pace, even CAP will not be enough to keep us from depleting the groundwater to the point where subsidence will cause problems. When and where subsidence occurs depends both on how much pumping takes place in an area and on the underlying geology.

*“No one thing has done more to advance the permanent stability of Tucson than the introduction of water. It moved the people to beautify their home surroundings by planting trees, shrubbery, lawns and flower spots. There can not be a genuine home, one in which we feel an attachment for, unless it has its association, trees and shrubbery. They become part and parcel of the home ties, and are a strong indication of the permanency of those who rear them. ... This is what the introduction of water has done for Tucson.” Star Feb. 5, 1885*



Water conservation is important to the Sonoran Desert Conservation Plan because of the importance of preserving scarce water resources. Conservation is especially important in areas where excessive water use threatens the few remaining surface water flows and shallow groundwater areas. Conservation is only a small part of the total water resources picture, but it is a vital part. Other aspects of the water picture will be discussed in a subsequent report dealing with the water resources element of the Pima County Comprehensive Land Use Plan.

## Conservation and Water Use in the Past

In the days before Arizona became a territory, water use was limited by technology. People lived near a dependable supply of water and either used it at the river or spring or carried it, often in pots on their heads. The native people dug ditches to divert water from the stream to water crops in monsoon season, as did the Spaniards. After the Spaniards introduced burros and horses, small amounts of water could be carried on the back of an animal or in a cart. Wells were dug by hand and were relatively shallow. Under such conditions, per capita use was quite low and little water was wasted. Many people used their water more than once. Father Kino once gave the opinion that there was plenty of water for a large city of up to 10,000 souls.

In the early Territorial days, water distribution was by donkey cart. A water seller delivered water to Tucson residents, collecting it from a spring south of where the Community Center now stands. Shallow wells often produced good water at first for some residents, but after a few months wells often had to be abandoned when they became brackish. The City

### ***“Notice to Water Customers from the Water Works***

*Consumers of water will take notice that they are prohibited from allowing other parties to take water from their hydrants, for any purpose whatever, as the license granted each consumer is for water for his use only. Parties so offending are liable to have their license revoked without further notice.” Jos. R. Watts, Manager, Parker and Watts. Star July 1, 1890.*

*“The water mains yesterday were shut off by order of Mayor Maish in the parks on account of the low state of the city water.” Star. Aug. 8, 1892.*

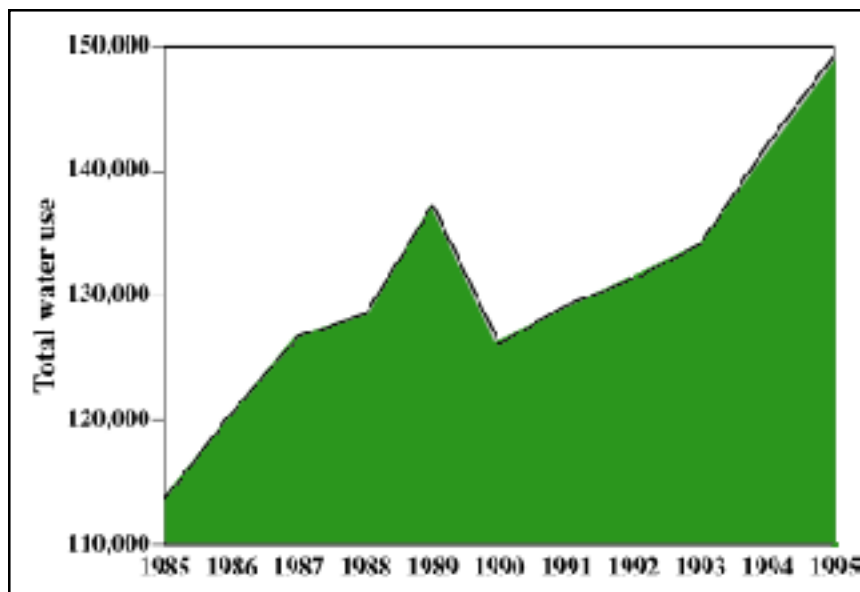


Figure 2. Water sold by the largest water providers.

offered a reward to anyone who could locate a good source of artesian water, but none was found. Water was scarce at times, but plentiful at others.

The first water city distribution systems were privately owned, but the City of Tucson purchased the leading company in 1900 and developed a municipal system. The city gradually went farther and farther to obtain water. The first long distance water supplies came through a pipe from the Santa Cruz River around 29th Street. The next long distance pipe brought water to town from San Xavier. From the 1960s on, the city has pumped water from the Avra Valley and eventually in the 1990s got water from the Colorado River through the Central Arizona Project (CAP).

But in 1900 the water system was providing plenty of water for the population of a few thousand and city residents embarked on a beautification program which involved planting lush gardens and many kinds of non-native trees such as eucalyptus and saltcedar.

Alternately over the years the residents sometimes had plenty of water and sometimes experienced times when water was scarce. As seen in the quotes, efforts were made to discourage water use a peak times, to prohibit waste, and to limit outdoor watering. In the early days, the problem tended to be that the water system was inadequate for a growing population and temporary shortages occurred until the residents provided funds through increased water rates and bond issues to expand the system. By the 1950s, however, it became clear that even with enlarged water systems, existing water supplies would not last forever.

In the 1950s, the City formed the Water Conservation Committee, whose purpose was to find ways to harvest water flowing down the rivers. City Council members envied the dams in the Salt River Valley which retained flood waters to prevent flood damage and keep water for use when it was needed, ignoring the fact that a significant percentage of that water

*“It has been suggested that some plan should be adopted by which all irrigation of gardens, lawns and trees in Tucson should be done from six o’clock in the evening to four o’clock in the morning. This plan would be much better for the gardens and lawns and would make the water supply ample during the dry season of the year.” Star. Feb. 15. 1893.”*

*“Complaints against the water company are becoming numerous. Many people say there has been no water to be had before eight o’clock for several days past, and yesterday morning it was an hour later than that when water began to flow through the pipes.” Star. June 11, 1893.”“*

**Figure 3. Water Use Data for Selected Large Municipal Providers.**

<b>Provider</b>	<b>Single-family (GPCD)</b>	<b>Multi-family (GPCD)</b>	<b>Turf (AF/YR)</b>
Arizona Water Co.	72	35	0
City of Tucson	124	90	874
David-Monthan	125	40	224
Forty-Niner WC	291	171	478
Green Valley WC	125	n/a	1,433
Metropolitan DWIC	157	94	43
Oro Valley	117	40	1,639

evaporated from the lakes. Attempts had been made as early as 1880 to find places to build dams, but the answer in the 1950s was the same as it had been previously - there are no good dam sites in the Santa Cruz Basin. "Conservation" would have to come by other means.

### The Tucson Recall Election

In 1976, the Tucson City Council was faced with a need to finance a growing water system, development of new water sources in the Avra Valley, and the need to increase the capacity to serve water at peak times. They voted to increase the water rates and to radically restructure those rates to promote conservation especially at peak times. Three major structural changes were made:

- Rates would be higher in summer (when peak use occurs) than in winter
- The domestic per gallon rate would increase with higher use, so that individuals who used a lot of water would pay more for their use above a certain level.
- The rates for people living at higher elevations would be increased to cover the additional cost of delivering water to those areas ("lift charges").

Because of lengthy debate over the details, the rate increases were instituted in late spring just before the peak use season started, so the new water bills arrived at the time when people were using the most water just before the monsoon season began. Community outrage was enormous, especially among high water users who had to pay the lift charges. These areas included the Catalina Mountain foothills which were outside city limits so those users could not vote for city officials. It also, however, included city residents on the east side of town who did live within city

*Notice to Water Consumers - Owing to the consumption of water at present being far in excess of all reasonable demands, it becomes necessary for the department to call your attention to ordinance No. 143, which says that all irrigation shall be done between the hours of 5 and 8 o'clock am and 5 and 8 o'clock p.m., and that under the supervision of some person on the premises. Persons allowing faucets to run during other house than those specified in this section ... upon conviction shall be subject to a fine not exceeding (\$50.00) fifty dollars ... All leaky plumbing fixtures must at once be repaired, and if found still leaky by inspectors, after proper notice, ordinance will be enforced. Respectfully, City of Tucson Water Department." Star June 24, 1906.*

*"Water Department will shortly begin campaign against consumers who are unnecessarily extravagant and cause waste." Star. April 10, 1909.*

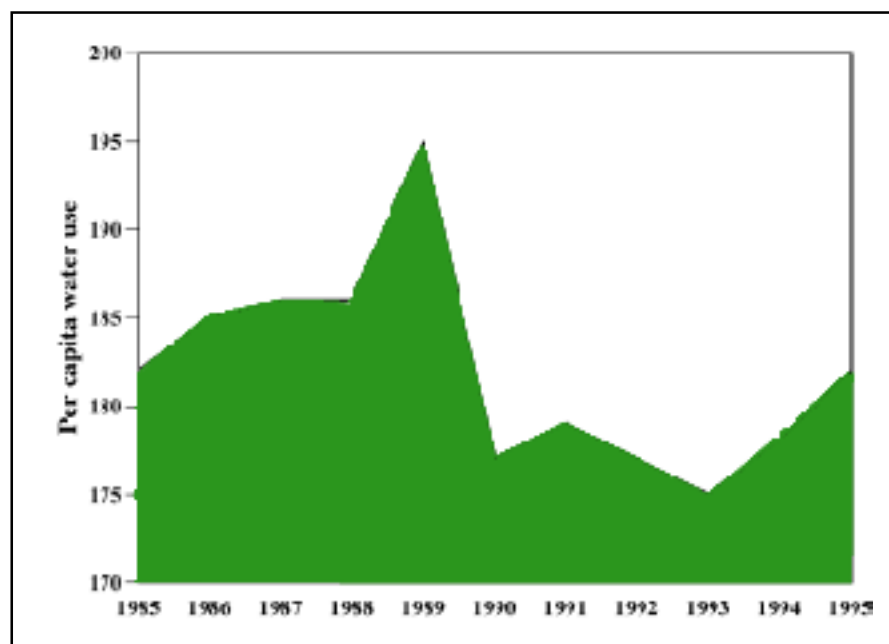


Figure 4. Per capita water use of the major water providers.

limits. A recall effort succeeded in ousting three council members while a fourth resigned. The new city council members rescinded the lift charges but basically retained the other structural changes and even increased the rates again. This time the public did not revolt but appeared to accept the need for money to improve the system.

The new council implemented a water conservation program which had been recommended by the former council. "Pete the Beak" entered the community to help people "Beat the Peak." Pete remains active in city water conservation programs today. The thrust of the program was to encourage people to use less water at peak usage times of day in the summer. The unexpected but welcome impact, however, coupled with a new awareness of the cost of water, was to lower total per capita water use about 25 percent. One long-term impact of the recall election has been a reluctance to tamper with the water rates other than in small ways. Gradually the difference between costs per gallon for large users and for small users has diminished.

In 1980, a "Slow the Flow" publicity campaign began, aimed directly at conservation and delay the need to build new wastewater systems. Both city and county amended their codes to require low water use devices in new construction.

Per capita water use increased dramatically in 1989 during an especially hot and dry period and has now leveled off to about what it was in 1985, but still considerably below the use level of more than 200 gpcd before the recall election. In 1991-1992, Tucson had a toilet rebate program which encouraged people to replace old high water use toilets with new low water use ones. The Water Resources Research Center and the City of Phoenix demonstrated in a study conducted in 2000 that some of these older toilets actually use more water as they age because of problems with maintenance and difficulty in getting the right replacement parts. This appears to be much less of a problem with the newer models.

Water use varies dramatically today in the community from a low for single family units of 72 gpcd in the Arizona Water Company's area to 291 in the Forty-Niner area. It is also interesting to note that water delivered by water providers for turf usage is highest in Green Valley and Oro Valley.

***"People Must Stop Wasting Water.***  
*Unless something is done by the people to stop the wasting of water, the city water department will have to make regulations such as were made last summer in regard to irrigating of lawns. ... In comparing with other cities much larger than Tucson it has been found that this city is using a great deal more water per capita than there is any need of using ..."* Star. June 7, 1912.

***"Warning Issued on Wasting Water***  
*- City Engineer Ruthrauff States Pressure Needed During the Night to Fight Fires With. The lowest pressure is between 4 o'clock in the afternoon and 8 in the evening and in the case of a fire between those hours the department would be seriously handicapped unless private water users aid the department by shutting off water on their premises. ... after the fire whistle blows it is the signal for water users to stop irrigation. I believe the city should supply a loud siren whistle to signal the stopping of the water flow on private premises."* Star. May 17, 1913.



## Consumptive Water Uses

Water is used both indoors and outside for many purposes such as drinking, washing, and watering plants. Water used indoors generally is available for later reuse or recharge, while water used outdoors or for evaporative cooling generally is used by plants or evaporates and thus is not available for reuse in the local area, although it will eventually fall as rain somewhere else. The uses that don't result in potential local recovery are called "consumptive uses" while the uses where local recovery is likely are "nonconsumptive uses." The greatest net benefit to the community, then, is lowering consumptive use. Lowering nonconsumptive use, is primarily effective in lowering the need for and costs of pumping and delivering groundwater, in treating and delivering the wastewater, and in preserving high quality groundwater. Lowering consumptive water use has a greater effect on the total water balance.

### Golf courses

Golf courses use approximately ten percent of all the water used in the urban area (not including agricultural water use). Approximately ten percent of urban water use is also for golf courses in the Phoenix and Prescott AMAs, although the total amounts of water used are quite different.

In TAMA's Third Management Plan, golf courses appear in two separate categories, industrial and municipal, depending on their water source. The graph below combines golf course water uses from both categories. Water use on individual golf courses has increased in recent years. The first golf games in Scotland were played in rough territory, not lawns. In the early days Tucson golf courses did not have grass. Roy Drachman Sr. described how golf was played before 1940. The El Rio Golf Course (then a private course) was the first to have extensive grassy areas, followed by the Randolph (now Reid) Park and the Tucson County

*"The fairways were scraped out of the desert, and the greens, which were about sixty feet in diameter, were made of fine sand soaked with oil. They were black with a hole right in the middle, and were coated with a fine sand the golfer had to sweep from the ball to the hole with a special kind of sweeper. ... One of the player's necessary skills was the ability to sweep the sand so that it was smooth and even, without any large deposits of sand to slow the ball down. The secret, they used to say, was in the drag. ... The tees were essentially large boxes of dirt, held in by two-by-six boards. They usually were six or so feet deep and ten to twelve feet wide.*

*"Beside every tee was a tin box about forty inches high, divided into two sections. One contained sand, the other water. The player would throw a handful of water into the sandbox, take up a bit of wet sand, and fashion it into his tee. ... The normal golf tees, as we know them today, were available, but the ground was so hard you couldn't possibly use one. ..." Roy P. Drachman. 1999. From Cowtown to Metropolis. Whitewing Press.*

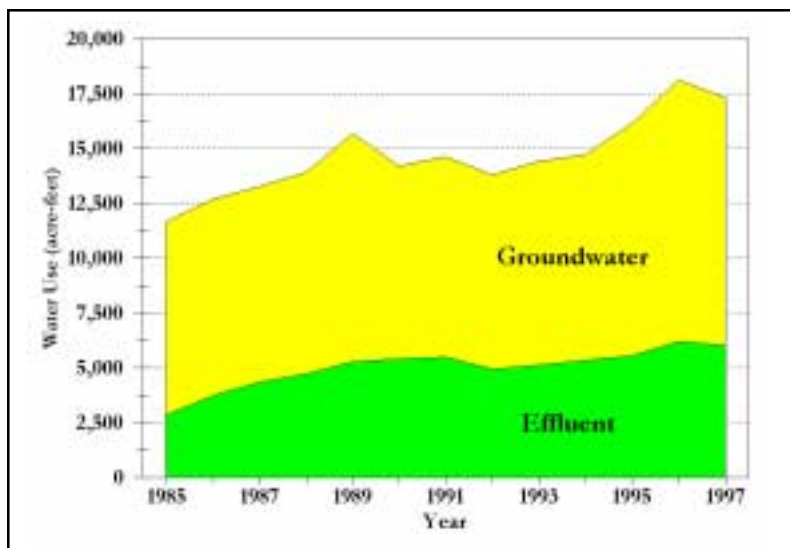
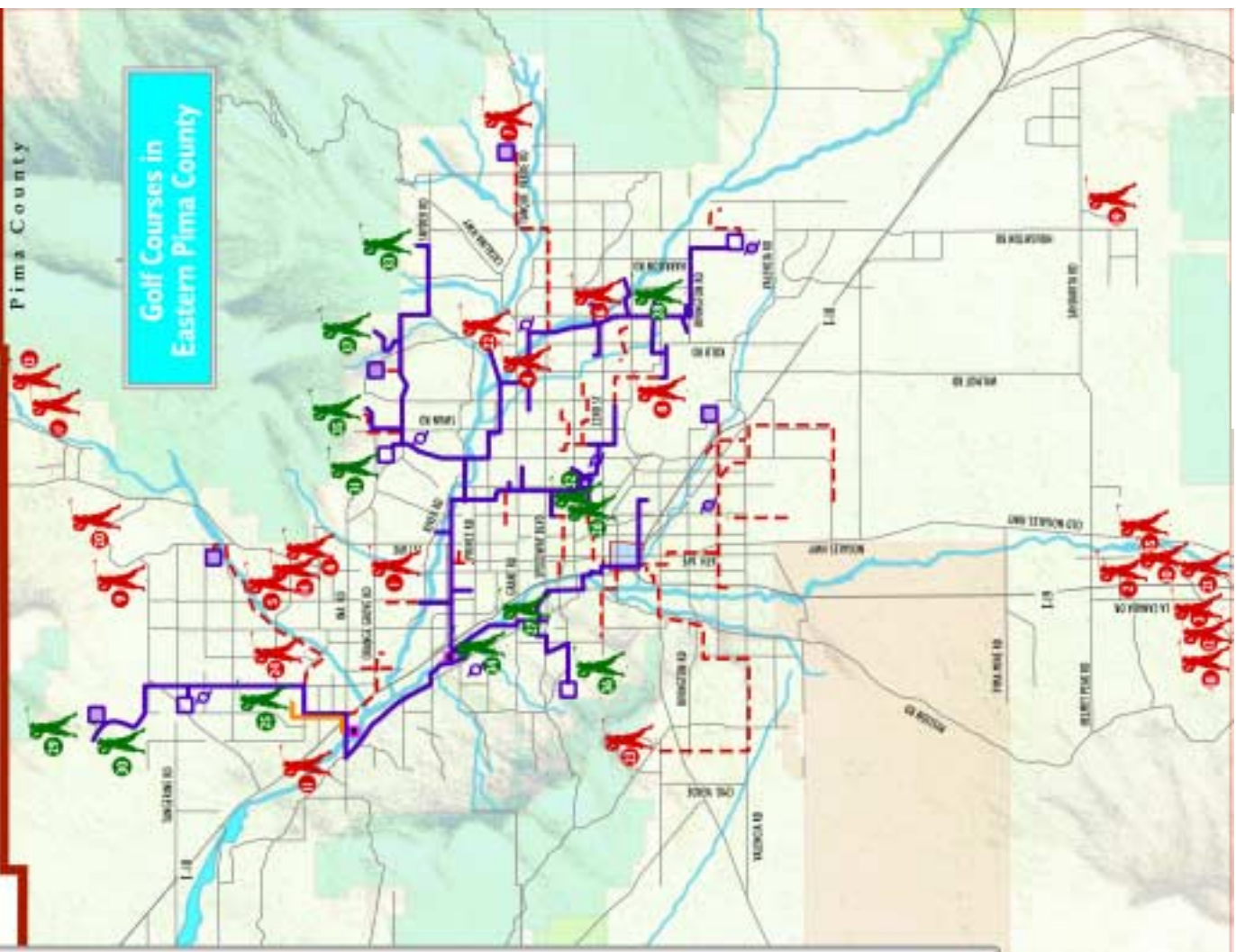


Figure 5. Water used for golf courses in Pima County.

Golf Courses in Eastern Pima County



GOLF COURSES ON GROUNDWATER

NAME	WATER SOURCE	WATER SUPPLY	ESTIMATED USE (af / yr)
1. USF Valley CC	Type 2 GWR	Groundwater	70.6
2. CC of Green Valley	Green Valley WC	Groundwater	527.2
3. Desert Hills CC	Type 2 GWR	Groundwater	248.3
4. Emerald CC	Type 2 GWR	Groundwater	95.1
5. El Compadre CC	San of Our Valley	Groundwater	288.8
6. El Compadre Resort CC	Trinity-River WC	Groundwater	588.7
7. Fanny-Brown CC	Desert-River A/B	Groundwater	412.6
8. Fox, Wm. Stouffer CC	San of Our Valley	Groundwater	497.7
9. The Golf Club at Pecos	Type 2 GWR	Groundwater	411.9
10. River CC	Type 1 GWR	Groundwater	625.6
11. The Links at Greenwood Ranch	Green Valley WC	Groundwater	342.4
12. Phoenician Pines CC	Groundwater	Groundwater	217.1*
13. On Valley CC	Groundwater	Groundwater	586.6
14. Grand Grand CC	Groundwater	Groundwater	588.4
15. Rolling Hills CC	Groundwater & Effluent	Groundwater	281.8 gm
16. Saddlebrook CC	Groundwater	Groundwater	655.4
17. Sun Valley CC	Groundwater	Groundwater	411.8
18. Sun Spicco CC	Groundwater	Groundwater	487.2
19. San City Village CC	Type 1 GWR / City of Tucson	Groundwater & Reclaimed	565.5
20. Desert Bluffs CC	City of Tucson	Groundwater	105.9
21. Tucson CC	Type 2 GWR	Groundwater	107.8
22. Tucson Estates CC	Type 2 GWR	Groundwater	107.8
23. Tucson National CC	Type 2 GWR	Groundwater	107.8

**TOTAL 11,092 (af / yr)**

\*af/yr is from additional sources

GOLF COURSES ON EFFLUENT / RECLAIMED WATER

NAME	WATER SOURCE	WATER SUPPLY	ESTIMATED USE (af / yr)
24. Silver Falls CC	Pinal County	SRP	608
25. El Estero CC	Reclamation	SRP	608
26. El Estero CC	City of Tucson	SRP	608
27. El Estero CC	City of Tucson	SRP	608
28. The City of Our Valley	City of Tucson	SRP	608
29. The City of Our Valley	City of Tucson	SRP	608
30. The City of Our Valley	City of Tucson	SRP	608
31. La Paloma CC	City of Tucson	SRP	608
32. Rancho CC	City of Tucson	SRP	608
33. River CC	City of Tucson	SRP	608
34. Silver Falls CC	City of Tucson	SRP	608
35. Silver Falls CC	City of Tucson	SRP	608
36. Silver Falls CC	City of Tucson	SRP	608
37. Silver Falls CC	City of Tucson	SRP	608
38. Silver Falls CC	City of Tucson	SRP	608
39. Silver Falls CC	City of Tucson	SRP	608
40. Silver Falls CC	City of Tucson	SRP	608

**TOTAL 6,567.5 (af/yr)**

CURRENT TOTAL 17,660 (af / yr)  
 YEAR 2025 PROJECTED ADDITIONAL NEED 9,856 (af / yr)  
 PROJECTED TOTAL UTILIZATION 27,516 (af / yr)

**Legend**

- Blue line: Existing Reclamation Pipeline
- Red dashed line: Proposed Reclamation Pipeline
- Yellow line: Secondary Reclamation Pipeline
- Blue square: Existing Reservoir
- Red square: Existing Reservoir
- Blue square: Proposed Reservoir
- Red square: Proposed Reservoir

Figure 6. Golf Courses in Eastern Pima County

Club. When golf began to be covered by national television, local golf course owners felt a need to have lush manicured lawns all year long so now they water both winter and summer grasses. New golf course design has shifted somewhat to desert-like courses and the total acres of turf per hole decreased from 5.9 in 1985 to 4.8 in 1997. Reductions in water use, however, resulting from these changes have been offset by a large increase in the percentage of golf course turf overseeded with winter rye grass, from 21 percent in 1985 to 66 percent in 1997.

The total number of holes of golf has also increased 35 percent since 1985. Many developers believe that adjacent golf courses significantly increase land values of the nearby residences. Thus, Green Valley, for example, has seven courses and Oro Valley five adjacent to subdivisions.

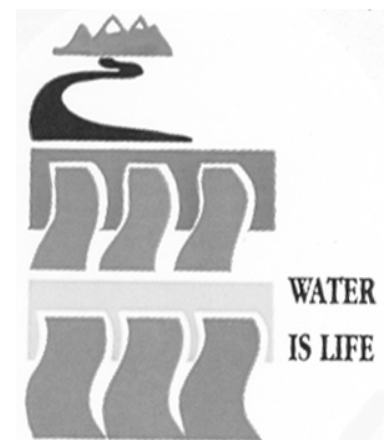
TAMA sets specific conservation goals for golf courses based on the number of holes and the type of golf course. TAMA does not have the authority to reject construction of new golf courses if they get their water from a provider that has a dependable supply or if they have grandfathered water rights.

Less than a third of the golf courses use reclaimed water. The rest pump groundwater. The City of Tucson has a reclaimed water system (See map) which takes water treated to a tertiary level to some courses on the central, north, and east parts of the community. See figure seven. There are currently no designs for piping CAP water for use on golf courses. If untreated CAP water were used, separate pipelines would have to be built to get it to its destination. The reclaimed system could be used for that purpose but doing so would not extend the number of golf courses on renewable supplies because it would just substitute CAP for reclaimed water, not changing the water balance. If treated CAP water were used and taken out of the general Tucson Water distribution system, more CAP water could be used for golf courses, but the additional cost of unneeded water treatment would add to the cost of water.

In general, if a golf course has a non-renewable water supply, the cost is less than buying renewable supplies, so there is little incentive for the business to use a more expensive supply. It costs much less to pump groundwater (when it is legally available) in most cases than to pay for delivery of renewable supplies. Golf courses that buy water of drinking water quality from water providers would pay less of a difference to get reclaimed water if they are near a distribution line. Tucson, Pima County, Marana, and Oro Valley have ordinances that require the use of reclaimed water on new golf courses where feasible. Because of the cost of building distribution lines for an expanded reclaimed water system, few of the new golf courses have switched to reclaimed water.

**“Water is Wasted in Irrigating Lawns.** *That water is shamefully wasted on lawns in Tucson is very evident to anyone who observes the overflow of water from yards into the streets in the residence sections. Also many residents, perhaps a majority of them, irrigate their lawns and trees daily.” Star. May 21, 1916.*

**“Mayor is Going after Those Who Waste Water.** *Police officers have been notified by acting Mayor Bernard to keep a keen watch for all leaks of water and unnecessary waste and to report such to the water department on blanks furnished for the purpose. ... Policemen were especially instructed to report residents who allow water to run into the streets Star. Aug. 4, 1916.”*



## Domestic Consumptive Uses

The major consumptive domestic uses are for landscaping, swimming pools, evaporative cooling, and spas and garden pools and fountains. From a peak installment rate in the 1970s, swimming pool installation in new construction has declined. In many cases, however, the pool is installed several years after the home is built. Swimming pool water use is shown below for an average 400 square foot home pool.

Construction of community pools in new developments and neighborhoods can reduce the demand for individual pools considerably as the total water used for one large pool is much less than for many small pools. Swimming pool covers can reduce evaporation by more than 6,400 gallons per year.

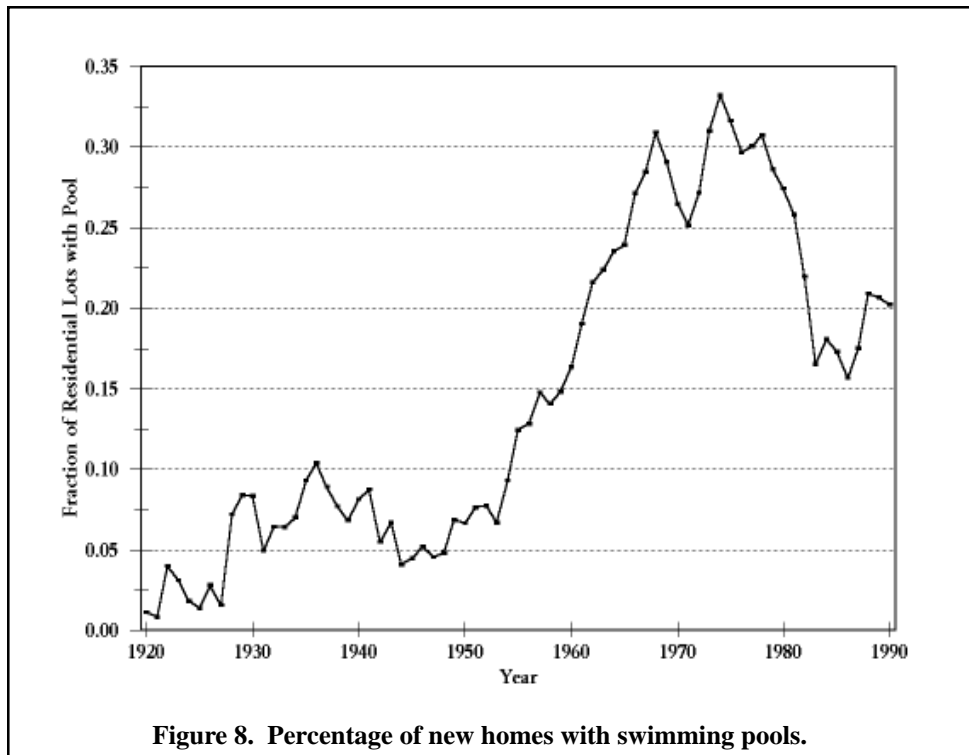
Spas have a much lower annual water use, less than 6,000 gallons per year. Evaporative coolers use almost 16,000 gallons of water in an average summer season, or 4.5 gallons per housing unit per day

Landscaping uses vary greatly depending on the type of landscaping and irrigation. ADWR calculates that 453 sq. feet of turf will use about 20,000 gallons of water per year. A small garden might use 2,500 gallons, and large nonnative trees use up to 12,000 gallons per year. Native species can survive on no supplemental water once established.

*“At the present time the total water use in the Tucson area is more than three times the average annual recharge. ... Depletion of a natural resource such as our groundwater supply is a serious problem which concerns us all. Conservation of resources to ensure their availability for our own use as well as for future generations is an ethic which has long been a part of our American heritage. ...”*  
University of Arizona 1977.

**Figure 7. Typical Water Use for Home Swimming Pools (gallons)**

Initial fill	17,952
Maintenance refill	1,795 per year
Backwash	3,450 per year
Evaporation	16,630 per year



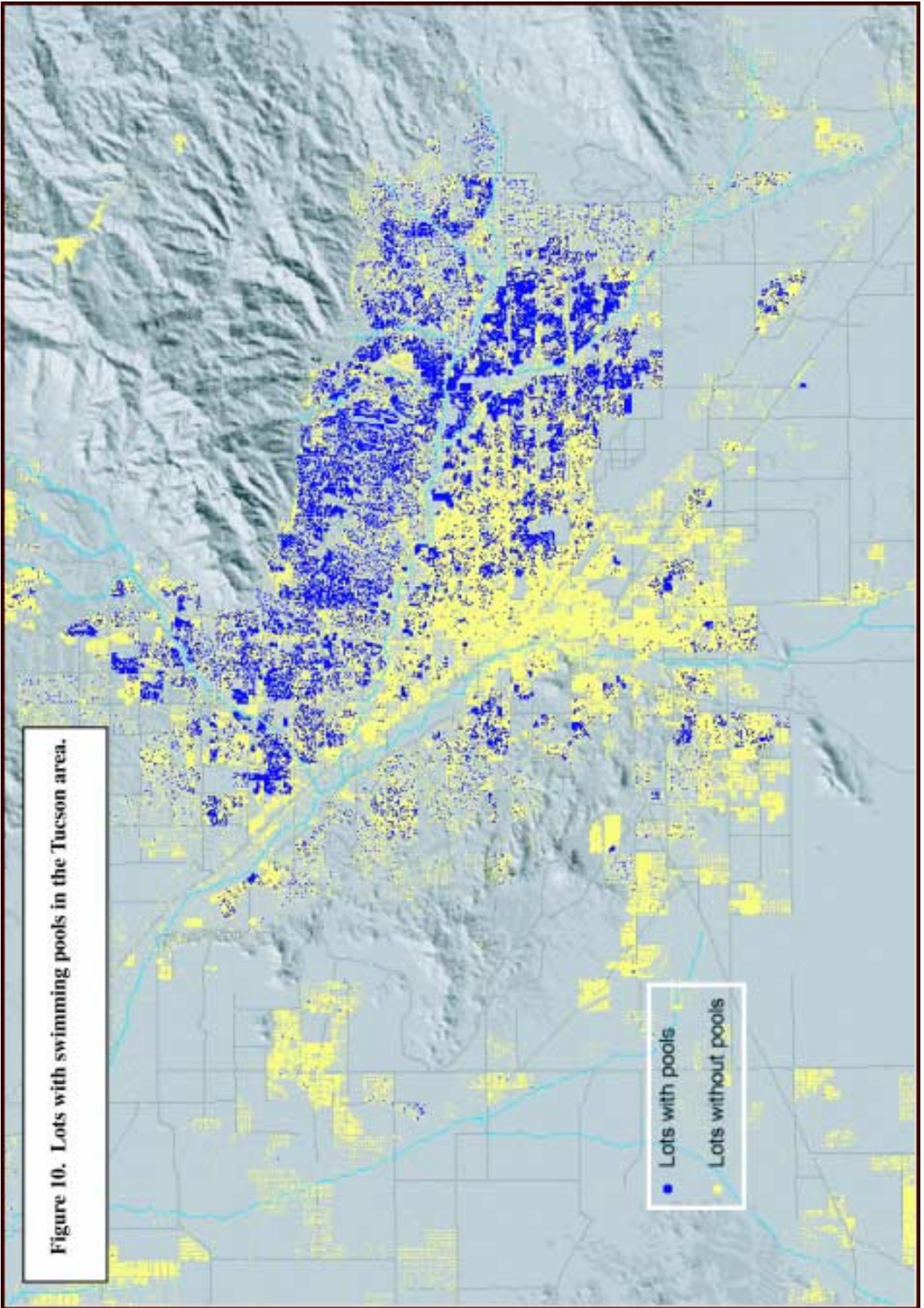


Figure 10. Lots with swimming pools in the Tucson area.

## Types of water conservation programs

Programs to reuse indoor water range from individual greywater (water from showers, washing machines, but not toilets) systems to Tucson’s Reclaimed Water System which transports purified water for use on turf in places such as golf courses and cemeteries. Recharge programs range from passive recharge when the wastewater is discharged to the Santa Cruz River to large man-made recharge basins.

Incentives to conserve water vary. Many people voluntarily conserve water for more than one reason.

The major reasons are:

- Prolong the water supply for the long term, reduce total annual use.
- To prevent subsidence.
- Reduce use during peak hours or seasons to reduce strain on the infrastructure and costs of building new infrastructure.
- Allow for population growth.
- Reduce costs.
- Because it is the right thing to do.

There are eight major approaches to persuading people and businesses to conserve water:

- Raise the cost, especially for more consumptive users or at peak water use times.
- Discourage waste and leaks.
- Provide education programs about leak repair and conservation methods along with voluntary compliance.
- Provide new devices, such as through a low-flow toilet rebate program or new shower heads.
- Have laws that limit types of landscaping/irrigation or high water-use amenities such as swimming pools or misting systems.
- Require low water use devices in new construction or when the house changes owners.
- Encourage or require wastewater reuse and water harvesting.
- Conserve by switching from one use to another - e.g., change agricultural use to urban use.

*“Tucson is a desert city just beginning to confront the limits of its water resource base. As a virtual oasis at present completely dependent on fast-dwindling groundwater supplies, it have been riven by fundamental conflicts for advantage and sometimes for survival, among the user groups competing for those supplies. ....”*

*“Are these steps enough, or will they only delay slightly the tide of water problems? Are they even the right steps and what is their monetary and social cost? And finally, will they enable Tucson to come to grips with the basic issue of shaping the growth which is so central a part of its future? ...”*

*Philip Metzger. 1984.*

**Figure 10. TAMA Exterior single family dwelling low water use model (Gallons per housing unit per day)**

Pool	12
Spa	3
Evaporative cooler	5
Landscaping	73
Total	93

Some reasons given for not wanting to conserve water are:

- Why should I when so much water is used on golf courses and they keep building new ones?
- Why should I conserve water just so we can have more people move here?
- I have some very important water use I am not willing to give up, such as vegetable garden or pool.
- I have no incentive. I can afford all the water I want. I have a right to use it.
- I don't know how to use less than I do.
- I consider my water use normal.

One thing that complicates the effectiveness of water conservation programs is that there are so many water providers in the area. Tucson Water serves about three-fourths of the population. Nineteen other large water providers serve most of the rest of the population, but there are more than a hundred small water providers of various types and more than 20,000 people have their own wells. Among the large water providers are institutions such as the State Prison, Davis-Monthan Airforce Base and the University of Arizona. Many of the small providers are individual mobile home parks, small water cooperatives, and small private water companies. Only Tucson, Oro Valley, and Marana are municipal water providers with authority to pass ordinances. And in each of these cases, the water utility lines and the municipality boundaries are different. Within the City of Tucson are Flowing Wells Irrigation District, for example, and Tucson provides water to many customers outside city limits.

## Laws, Regulations, and Programs Dealing with Water Conservation

### State regulation

#### *Groundwater Management Act (GMA)*

Under the GMA, the Arizona Department of Water Resources (ADWR) has the authority to use mandatory conservation strategies in order to reach Active Management Areas (AMA) goals. In its sequence of 5-year plans, ADWR mandated conservation goals for agriculture, industry, certain large water users such as the University of Arizona, and water providers. ADWR has not, however, assumed authority to mandate water conservation for individual domestic water users. That is, while ADWR mandates that water providers meet specific per capita conservation goals, neither ADWR nor the water provider has the authority to require water conservation. ADWR can penalize the water provider if the average per capita use exceeds the goal, but no one can penalize the individual domestic user. This was the subject of a recent legal case (see below) the outcome of which was in favor of the water company which argued that since they could not enforce conservation rules, they should be not penalized for failure to meet the per capita goals. This program is currently being reviewed.

The GMA is designed to prolong the supply of groundwater by various measures beyond the scope of this report. It does not deal with preserving surface water in flowing streams, except for CAP water from the Colorado River. On the contrary, it

**Figure 11. TAMA Interior Single Family Water Use Model**  
(Gallons per capita per day)

Toilet	9
Shower/bath	21
Dishwasher	2
Clotheswasher	9
Faucets	10
Other (leaks, etc.)	7
Total	57

This is considered the minimum reasonable use.

**Figure 12. Conservation Potential of Large Municipal Providers**

(not including institutional providers)

<b>Provider</b>	<b>Indoor potential</b>	<b>Outdoor potential</b>
Arizona Water Co.	none	none
Avra Water Co-op.	none	minimum
City of Tucson	moderate	minimum
Comm. Water Co. of Green Valley	minimum	none
Farmers Water Co.	none	maximum
Flowing Wells Irrig. Dist.	moderate	minimum
Forty-Niner Water Co.	maximum	maximum
Green Valley Water Co.	maximum	maximum
Hub Water Co.	minimum	moderate
Lago del Oro Water Co.	none	moderate
Las Quintas Serenas Water. Co.	none	moderate
Marana Municipal Water System	minimum	moderate
Marana Water Service	maximum	maximum
MDWID	minimum	minimum
Town of Oro Valley	minimum	moderate
Ray Water Co.	minimum	moderate

promotes the use of surface water (a renewable supply) rather than groundwater (a basically nonrenewable supply).

ADWR is responsible for administering the law. The Tucson Active Management Area (TAMA) is the division of ADWR responsible for planning and implementation in the area. TAMA has issued its draft Third Management Plan which outlines the current water supply and demand status in the area, demonstrates how the TAMA intends to reach the goal of Safe Yield (balance of supply and demand), and deals with other issues.

The water conservation parts of the law require the Active Management Areas (AMAs) to set conservation goals and delineate ways of meeting those goals. Different programs are designed to deal with conservation in agriculture, industry, turf, large users, and domestic users. TAMA has the authority to set specific conservation goals for agricultural water users, based on crops grown, past history, and other factors. It also has the authority to set specific conservation goals for big users, such as the

University of Arizona, and recommends ways to meet those goals, such as requiring the use of reclaimed water or reducing the amount of outdoor irrigation.

The sections of the conservation requirements relevant to this report deal with domestic users. TAMA does not require that individual users conserve water, but requires that water providers meet per capita goals for their service areas. The per capita goal for each water provider is calculated according to housing type, previous water use, and other factors. Mobile home parks, for example, typically use less water than do single family dwellings with yards. Since per capita use includes all uses in the area, including industry and golf courses, the expectations for those users are taken into consideration. The annual averages also take into consideration that water use will be higher in drought years than in years with above normal rainfall. Water providers have a choice of being regulated through per capita goals or through other programs in which the provider agrees to implement specified conservation programs.

**Figure 13.  
How Conservation Potential is Calculated**

Category	Average Interior Use GPCD	Average Exterior Use GPHUD
None	<66	<93
Minimum	67-73	94-138
Moderate	74-81	139-184
Maximum	>81	>184

The greater the existing water use, the higher the potential for conservation.

The rules and methods of calculation of water conservation requirements have become very complicated over the years. TAMA has models for the water use expected in different circumstances. The table below illustrates part of the TAMA model for new residential indoor use.

All of these figures are based on assumptions such as type of fixture and how often people bathe. The total daily model water use for a family of two in the above example would be more than 200 gallons.

TAMA has calculated that the greatest potential for water savings is in areas where personal water use is highest. Areas where daily use is about 159 gpcd (66 indoors and 93 outdoors per housing unit - gphud) have little or no potential for further savings, while areas where the indoor use is more than 81 gpcd and outdoor use more than 184 gphud have high potential for reducing water use.

TAMA can penalize water providers that do not meet their goals, but cannot fine individual homeowners, although it can penalize certain large users, such as individual industrial users. A recent lawsuit, however, has caused ADWR to take another look at this policy. (*Arizona Water Company v. Arizona Department of Water Resources*) A water provider sued ADWR on the grounds that it was not legal to penalize water providers who do not have to ability to enforce conservation goals for their

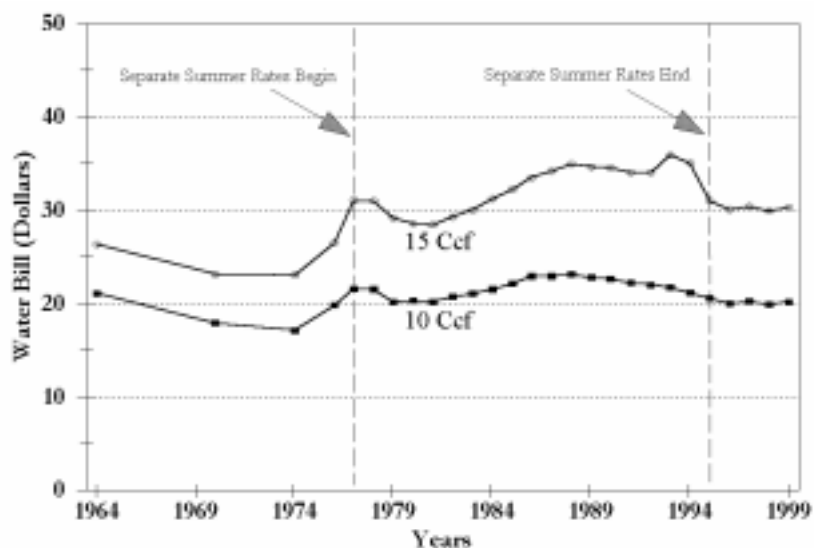
customers. In a preliminary ruling, the water provider won the case, so the penalties are now on hold until ADWR decides how to proceed. A final ruling is pending.

TAMA also provides funds for water conservation educational activities, using money gathered through taxes on all water users. It funds research projects as well as production of brochures, videos, and other projects.

#### *Arizona Corporation Commission (ACC) Rules*

Some of the mandates under which ACC must operate are in direct conflict with the water conservation mandates of ADWR. ACC regulates service areas of water providers. The rules require that water companies provide service within their assigned service areas. This includes hooking up to new customers, even if the company does not have the capacity to serve all the needs, although it may declare a moratorium on hookups if there is a severe capacity problem. The overlying philosophy is that water providers must serve their customers on a demand basis.

The ACC has authority to regulate private water companies, but not irrigation districts or municipal water providers. ACC approves rate changes for the water companies after a lengthy process, including public participation. This is a costly process and many water companies, especially the smaller ones,



Average Winter Single Family Residential Use = 10 hundred cubic feet (ccf), Average Summer Use = 15 ccf

**Figure 14.** Water bills for Tucson Water customers have remained nearly steady since 1964 when the amount is adjusted for inflation. Some people argue that water should be more expensive to encourage conservation.

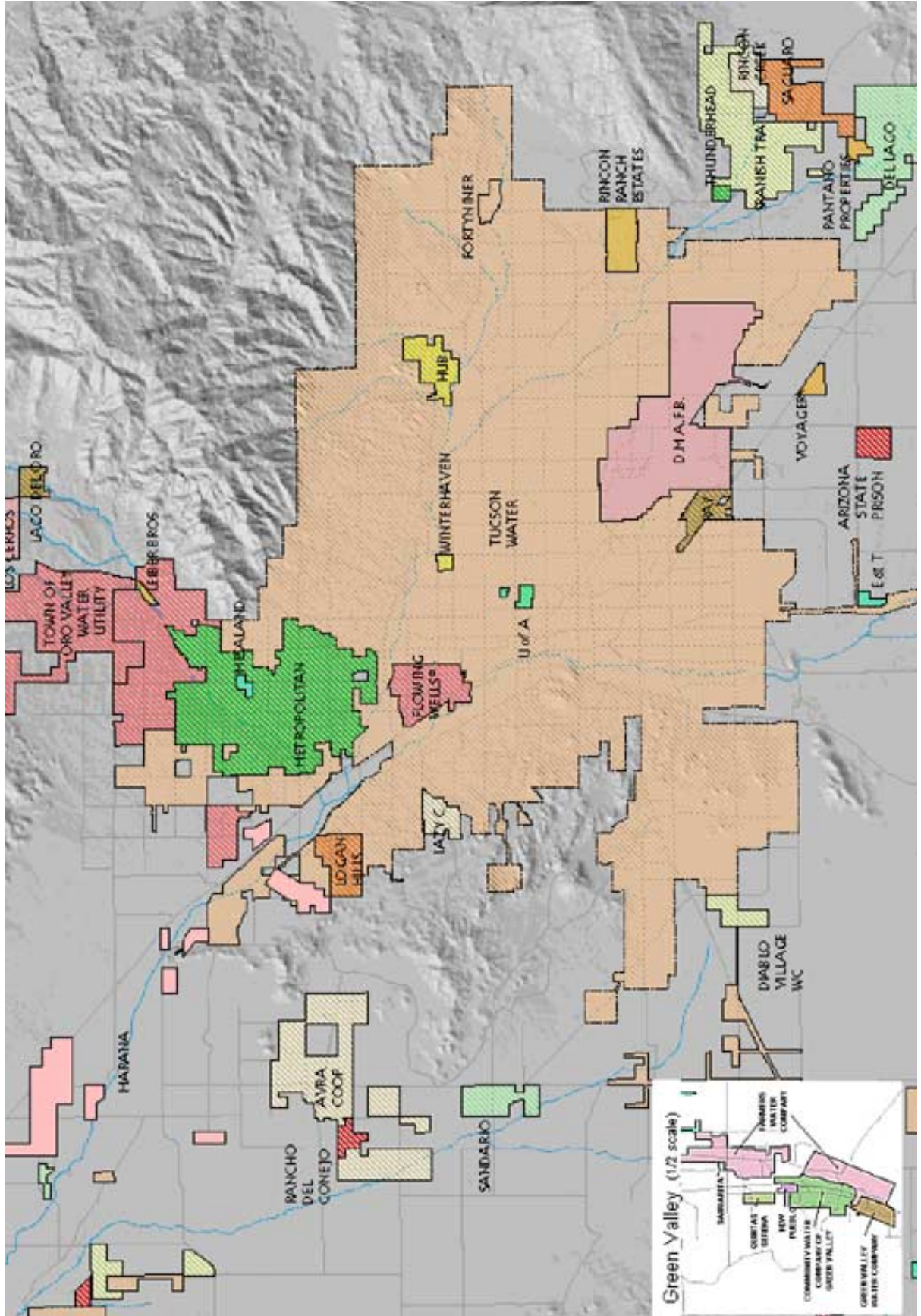


Figure 15. Water Providers

are reluctant to go through it. Rates can be structured to recover the costs of conservation programs, but only after the programs are in place and the cost can be justified. This makes it difficult for water companies to adjust their rate structures to encourage water conservation, even if the total net revenue does not change. It also makes it difficult for a small water company to pay for conservation education programs.

### **Local water conservation ordinances**

In general, the city and town ordinances apply within city limits. The county ordinances apply to unincorporated areas. ADWR requires that the governments pass ordinances requiring low water use devices in new construction. It also sets basic criteria for those devices. All the incorporated areas in the TAMA as well the county have such ordinances. None of them, however, requires low water use devices in older housing, or when houses change ownership. ADWR also has basic standards for low water use landscaping and a list of approved plants. Tucson, Marana, Oro Valley and Pima County all have landscape ordinances that encourage the use of low-water use plants. All these ordinances use the basic TAMA-approved low water use plant list.

Tucson has an ordinance prohibiting waste of water, which is defined roughly as allowing water from the tap to leave the property and flow down the street. It does not apply to rain water. This ordinance is generally enforced when people repeatedly waste water or waste it knowingly in large amounts. In a situation, for example, where a commercial user has a sprinkling system that is poorly designed and waters the sidewalk, the city may consider this a waste and enforce the ordinance. Pima County, however, which does not have authority to have a water utility, probably does not have the authority to pass such an ordinance. Other incorporated areas could do so, however.

Tucson has an ordinance that sets strict requirements for water use at times when the city declares a water emergency. A water emergency primarily includes situations where the water reserves are so low that fire fighting is imperiled. The Mayor and Council must declare the emergency and set the temporary limitations. This provision has never actually been used.

### **Conservation Education Programs**

All major water providers have water conservation education programs of some type. Tucson Water provides customers information about low water use devices and low water use landscaping. It provides information about reducing commercial water use through grants to Cooperative Extension. It also helps fund xeriscape workshops for homeowners. As indicated above, ADWR provides support and funding for water conservation programs. In 2001 ADWR is funding a major media campaign to tell people how to conserve water.

Water CASA is an organization that serves the water conservation needs of Metropolitan Domestic Water Improvement District, Avra Valley Water Co-op the Flowing Wells Irrigation District and water providers in Oro Valley, Marana, and Green Valley. Pima County Wastewater Management and the U.S. Bureau of Reclamation also belong to Water CASA and participate in its programs. CASA not only provides water information and low water use devices for the providers to distribute to customers, but also conducts research into water conservation topics specifically targeted towards the needs of its members. It attempts to find out about water use patterns so programs can be directed to where they will do the most good. CASA also conducted research into use of greywater in homes that led to changes in the state regulations making it easier to reuse that water legally. Its latest project involves installing two meters in each home in a new development. One measures outdoor water use and the other indoor use. The information gathered will be useful in seeing how water use changes over time as the house ages, and what percentage of water is used for various purposes. If the major use is for landscaping, for example, conservation programs could be targeted towards more efficient use of irrigation water.

Cooperative Extension provides information about harvesting water from rooftops for use on landscaping which can reduce the homeowner's water bill and help reduce flooding problems since water does not leave the property.



## **Opportunities for Additional Home and Commercial Water Conservation**

As indicated above, the potential for more water conservation is greatest in the areas where water use is highest, often in the higher income parts of town. Most of these high water use areas are outside city limits. These customers are less likely to respond to price incentives than are lower income customers. Throughout the community there is potential for conservation both indoors and outdoors and both domestic and commercial.

### **Golf Courses**

Another major area where water use could be reduced is in turf irrigation, especially golf courses. Most existing golf courses have established water rights or contracts, some use reclaimed water, and many have reduced water use to a degree through TAMA programs. Additional restrictions could be placed on the amount of the course in turf, with requirements for more desert landscaping. The greatest potential for reducing the growth in water use for golf courses, however, is in the new golf courses. Restrictions can be much greater. New golf courses could, for example, be required to use CAP water or reclaimed water as a condition of approval. All new courses could have strict turf limitations.

### **Swimming pools**

Water use could also be reduced in all new residential developments if community swimming pools were included in the design, minimizing the demand for private pools.

### **Waste**

Other municipalities could follow Tucson's lead and enact water waste ordinances. Pima County may not have the authority to enact such an ordinance.

### **Water Amenities**

New restrictions could be placed on the use of misting systems, decorative fountains, and other water features, especially in commercial uses.

### **Water Harvesting and Reuse**

Incentives could be offered to encourage people or businesses to harvest rainwater or use their graywater, including incentives for developers to install such facilities in new homes.

## **Plumbing Fixtures**

While new construction generally includes low water use fixtures, older homes and businesses do not. New rules could require that when houses or commercial buildings change ownership the plumbing must be upgraded to new construction standards. The cost would be in the \$200 to \$500 range, depending on the number of fixtures. The county could subsidize the retrofit through hookup fees. Similarly, landscaping standards could be enforced when the multi-family and commercial facilities change owners.

## **Landscaping**

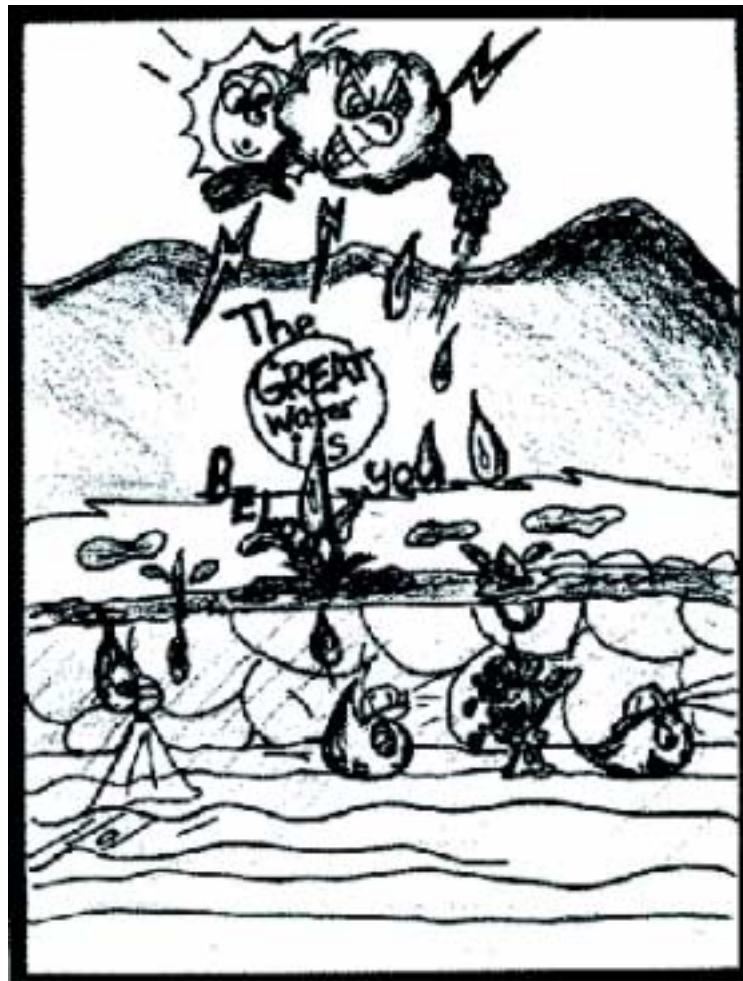
Water use for landscaping of new nonresidential and multi-family developments could be significantly reduced by setting limits on the areas using water intensive landscaping. Similarly model homes in new residential development could have limits on water intensive landscaping. Standards for systems irrigating such landscaping would also improve efficiency and reduce consumption. For large nonresidential developments a water use plan could be required (approved by ADWR), dealing with a wide range of conservation matters, including appropriate irrigation, water reuse, possible use of renewable supplies, and conservation fixtures and employee training in conservation. A retrofit program to convert high water use landscaping in commercial and multi-family conservation of ownership would also result in water savings. This could be required of commercial users, for example, possibly with assistance as in the plumbing fixture program described above.

## **Education**

Other water users can benefit from additional educational programs and distribution of conservation devices. Newcomers to the area can benefit from programs such as the one conducted by Water CASA which provides information and materials in welcome kits for new customers of the member water companies. CASA is starting a new pilot program in the Green Valley area whereby customers can go to the Web and find out how their water use compares with general water use in their area as well as get water conservation information. Similar programs could be implemented elsewhere. Other creative approaches to conservation education could be initiated.

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**The Great Water is Below You, by Danny Handke, Fifth Grade, National Water Education Calendar Poster Winner 1994-5.**