Water Conservation Policy in an Arid Metropolitan Region: A Historical and Geographical Assessment of Phoenix, Arizona

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Introduction & Overview

A combination of historical and geographical methods is used to examine water conservation policy trends in the ten most populous municipalities in the greater Phoenix region. Residential water conservation policies and programs across municipalities are being evaluated with a water conservation policy typology, GIS maps, interviews, and historical narrative. While the maps document geographic patterns in water conservation policy and changes over time in residential demand (**GPCD** – gallons per capita per day), the typology summarizes government efforts aimed at reducing regional water demand through regulations, economic, and information-based approaches (created from municipal web pages, policy documents and interviews). Interviews, still underway, will provide additional information on regional variation across conservation programs and how and why they have changed over time. Collectively, the typology, maps, interviews and historical research will document periods of greater and lesser attention to conservation, acknowledge shifts in the types of policy tools used to reduce water demand over time, and demonstrate geographic patterns in conservation policy within the greater metropolitan region.

Historical Timeline

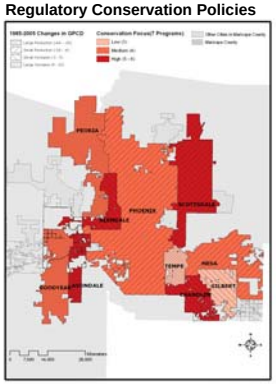
1945	AZ's 1st Groundwater Code adopted
1951	Critical Groundwater Code adopted
1963	AZ's 2nd groundwater study commission formed
1968	Construction of CAP authorized through CO River Basin Act.
1969	Arizona Municipal Water Users Association (AMWUA) established by cities of Chandler, Gilbert, Glendale, Goodyear, Mesa, Peoria, Phoenix, Scottsdale, and Tempe to coordinate regional conservation efforts.
1977	Amendments to the 1951 Groundwater Code.
1977	Carter releases a "hit list" of projects that will cease to receive federal support, including CAP.
1979	Cecil Andrus delivers threat to Bruce Babbitt: pass a comprehensive groundwater management code or lose the CAP…Babbitt forms "rump group" to draft code.
1980	Groundwater Management Act (GMA) adopted, creating the Arizona Department of Water Resources and "Active Management Areas" (AMA) to achieve "safe yield" by 2025.
1984	1st Management Plan (1984-1990) adopted in Phoenix AMA and municipal conservation requirements focus on reducing total GPCD over time by assigning targets to water providers.
1985	Arrival of CO River water in Phoenix from the four billion-dollar federally subsidized CAP canal.
1989	2nd Mgmt plan (1990-2000) adopted in Phoenix AMA. As an alternative to the total GPCD program, the Alternative Conservation Plan (**ACP**) is introduced. ACP Compliance is based on meeting residential-use GPCD numbers (not total GPCD use) and implementing educational programs and policies called Reasonable Conservation Measures (**RCMs**).
1991	City of Tempe files law suit challenging ADWR's Total GPCD requirements in 2nd mgmt plan.
1992	Creation of Non Per Capita Conservation Program (alternative to total GPCD program in the 1st and 2nd mgmt plans of the GMA). Compliance requires implementation of RCMs and the creation of a public water education program; there is no GPCD requirement.
1997	Chandler enters NPCCP program in January, Tempe enters in July, and Scottsdale enters in December.
1999	3rd Mgmt plan (2000-2010) adopted in Phoenix AMA. In contrast to the municipal component of the 1st and 2nd mgmt plans, ADWR did not calculate a total GPCD requirement for municipal providers. Instead, providers are assigned separate GPCD requirements for various users (such as single and multi family residential) that are calculated every year based on population growth within each provider's service area.
2000	AZ Gov. Jane Dee Hull announces formation of Water Mgmt Commission…final report examined feasibility of achieving "safe yield" by 2025 in three of the state's Active Management Areas (Phoenix, Tucson, Prescott).
2001	Gilbert enters NPCCP program, and is is the 4th city to join.

Sources consulted for timeline:

- *Arizona's Water Future: Challenges and Opportunities: 85th Arizona Town Hall* (Grand Canyon, AZ: October 31 to November 3, 2004), Appendix B.
- *"Interim Report," Governor's Water Management Commission, June 11, 2001.*
- ADWR, *Third Management Plan, 2000-2010,* (June 1999).
- http://www.amwua.org/about_amwua.htm, consulted December 7, 2006.
- http://www.srpnet.com/about/history/timeline.aspx, consulted December 8, 2006.
- http://www.cap-az.com/about/index.cfm?action=timeline&subSection=5, consulted December 16, 2006.

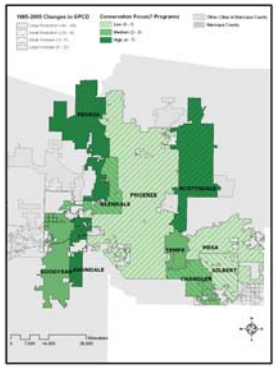
Conservation Program Emphases By Municipality and Changes in Residential GPCD, 1985-2005

Regulatory Conservation Policies



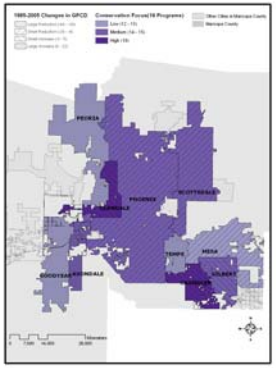
With regulatory approaches, water reduction is achieved via legally enforceable ordinances including requirements for landscaping and indoor plumbing fixtures, especially in new homes. Commercial and industrial uses are more heavily targeted for turf restrictions than their residential counterparts. Many ordinances specify that plant materials must come from ADWR's drought tolerant/low water use plant list.

Economic Conservation Policies

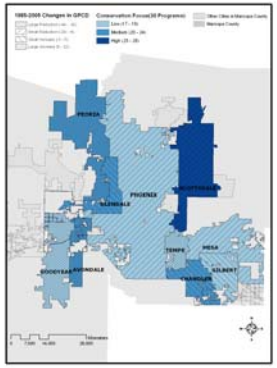


Economic-based conservation programs include pricing structures for water as well as rebates that provide a financial incentive to facilitate a reduction in water consumption. Rebates are prevalent, with a shift over time from replacing indoor appliances to outdoor water-saving devices. Whereas toilet rebates range from $50 to $75, xeriscape rebates range from $200 to $1,500.

Information-based Conservation Policies



Information-based conservation policies are implemented by city water conservation specialists, public school teachers, and non-profit organizations, emphasizing water conscious attitudes and behaviors. Information-based policies and programs are the most pervasive in our study area (outnumbering regulatory and economic measures 2:1), yet their impact is the hardest to measure in actual water savings.



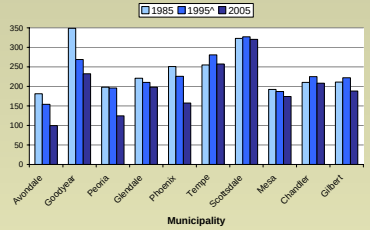
The four cities with the most conservation programs are Scottsdale (28), Chandler (24), Avondale (23) and Glendale (23), yet only Avondale has demonstrated significant reductions (44%) in residential GPCD between 1985-2005. As seen from above, no clear relationship exists between conservation programs and reductions in residential GPCD.

Map colors based on www.ColorBrewer.org, by Cynthia A. Brewer, Penn State.

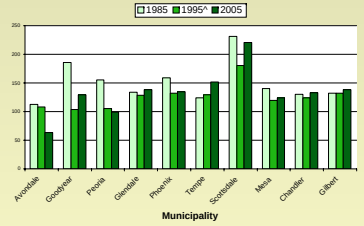
Changes in GPCD, 1985-2005:

The Most Populous Cities in Phoenix AMA

Total GPCD



Residential GPCD



Note: ^denotes 1992-1996 average. 1985 and 1995^ figures from ADWR's 1st and 2nd management plans for the Phoenix AMA. 2005 figures calculated using residential water deliveries from "schedule F" of municipal provider's annual reports, U.S. census data, and water use data from ADWR.

Conclusion & Next Steps

Avondale, Peoria, and Goodyear demonstrated the largest reductions in residential GPCD between 1985 and 2005, and each of these cities is located in the West Valley. Scottsdale, Tempe, Chandler, and Gilbert—all located in the East Valley— had the most difficulty maintaining compliance with ADWR's assigned GPCD targets and consequently joined the NPCCP program during the 2nd management period. A myriad of factors may influence patterns of residential water consumption and conservation programs including land-use history, water portfolios and infrastructure, population density and growth rates.

The next phase of this project is to adapt Lowi's policy framework to further examine the evolution of different types of conservation policies in the Phoenix AMA. In addition, interviews and archival research will help explain historical shifts and geographic patterns in water conservation and consumption. In a rapidly growing metropolitan region where municipal demand accounts for almost 40% of total demand, understanding residential water use patterns and conservation policies is essential for managing scarce resources.

Acknowledgment

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