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

Abstract:
Using the 1980 Groundwater Management Act as a starting point, this poster documents shifts in residential water conservation policy that have resulted from the implementation of the Act's three consecutive management plans in the Phoenix Active Management Area (AMA). 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. Information on residential water conservation policies and programs across municipalities is evaluated using GIS maps, a water conservation policy typology, qualitative information from interviews, and historical narrative. While GIS maps document chronological changes and geographic patterns in water conservation policy, the water conservation typology (created from municipal web pages and policy documents) summarizes policy efforts aimed at reducing regional water demand through regulations, incentives, and information-based approaches. Additionally, information obtained from eight interviews with water conservation specialists reveal the perceived success of these policy tools. Collectively, the typology, maps, interviews and historical research 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.

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Assessing Water Conservation Policy and Water Use In an Arid Metropolitan Region: Phoenix, Arizona

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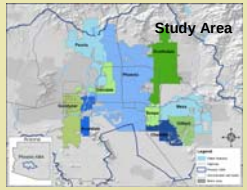
A Historical and Geographical Approach

Our research evaluates residential water conservation policies and programs in an arid metropolitan region using secondary data, GIS, interviews, and historical narrative. Collectively, these materials 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 efforts within the greater metropolitan region.

Among the 10 most populous cities in the Phoenix region (at right), this poster examines the relationship between municipal conservation programs and water consumption (in Gallons Per Capita per Day - **GPCD**). Do cities with a high number of conservation programs exhibit lower rates of water use? How has water use changed over time across the region, and why?



Timeline

Growth and Biophysical Events		Policy Events
1st Earth Day; beginning of modern environmental movement	1969	9 Valley cities create Arizona Municipal Water Users Association (AMWUA); 1st coordinated conservation effort
	1970	
Population of Maricopa County is over 1.5 million	1980	Groundwater Management Act (**GMA**): new regulatory conservation measures for municipal, agricultural, and industrial users
AZ Dept of Water Resources (**ADWR**) estimates that annual groundwater overdraft in the Phoenix Active Management Area (**AMA**) is over 1.3 million acre feet (**maf**)	1984	City of Phoenix produces 1st municipal water conservation plan in the metro area
	1986	
	1987	Large municipal providers must comply with total GPCD targets or face stiff fines from ADWR
1st of 3 consecutive years of above-average temperatures in Phoenix metro region	1991	
	1992	Due to lawsuit with city of Tempe, ADWR creates alternative to Total GPCD program called Non Per Capita Conservation Program (**NPCCP**)
Onset of significant drought in Phoenix metro regionÉcontinues to present	1997	Chandler, Tempe, and Scottsdale enter NPCCP ProgramÉeach adopt 12 Reasonable Conservation Measures (**RCMs**)
	1998	
Population surpasses 3 million and Maricopa is the 4th largest county in the U.S.	2000	
	2001	Gilbert enters NPCCP program and adopts 13 RCMs
Drought continues with driest year on record in state of Arizona	2002	
	2003	AZ Governor Janet Napolitano issues executive order for Drought Task Force
ADWR estimates that annual groundwater overdraft is over 340,000 maf	2005	

Acknowledgement

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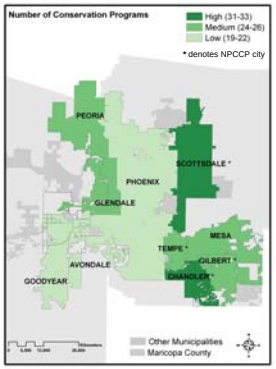
Current Number of Programs

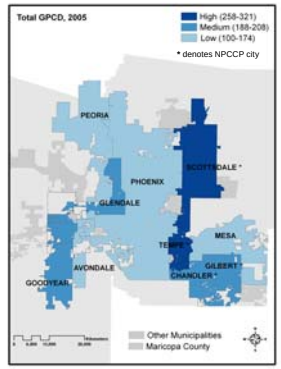


❖ Municipalities in the East Valley exhibit higher numbers of conservation programs than in the West Valley.

❖ The NPCCP program requires the adoption of 12 RCMs, about 40% of which target exterior residential water use.

❖ 3 of the 4 highest-ranking cities are in the NPCCP program: Scottsdale*, Chandler*, and Tempe*.

Total Water Use, 2005

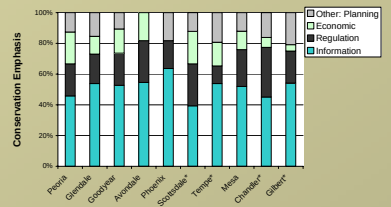


❖ Municipalities in the West Valley exhibit lower rates of water consumption than in the East Valley.

❖ Municipalities with the most conservation programs have high rates of water use (e.g., Scottsdale*), while those with fewer programs rank low in GPCD (e.g., Avondale).

❖ NPCCP cities (3 of 4) have a higher than average number of conservation programs *and* higher GPCD rates.

Types of Conservation Program and Policies



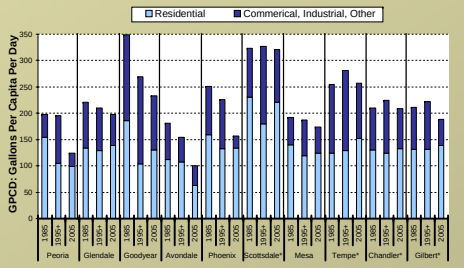
Policies are often characterized by factors such as the level of coercion (e.g., "command and control" regulatory programs) and their economic basis (e.g., financial incentives). Here we present conservation programs by 4 types.

• Information-based programs are the most prevalent type region-wide, despite the weak link between information and changes in conservation behavior.

•The City of Phoenix, encompassing the core urban area and the largest population, has no incentive-based economic programs for conservation.

•Avondale lacks water resource plans and a conservation web site, key indicators of institutional capacity, yet their population almost doubled between 2000 and 2005.

Changes in Water Use: 1985, 1995+, & 2005

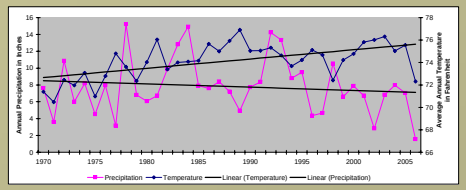


(Note: + denotes 1992 - 1996 average due to availability of data)

• Residential water use accounts for approximately 2/3rds of total water consumption in the Valley. In areas where the residential portion of water use have increased due to rapid population growth, total GPCD has declined.

• Between 1985 and 2005, non-NPCCP cities decreased GPCD by an average of 15% while the NPCCP cities only decreased by an average of 1.5%.

Temperature and Precipitation



• Over time, average temperature has increased and annual precipitation has decreased. These climatic conditions lead to increased water demand, especially among residential users in the summer and during times of drought.

• While low precipitation during drought periods increases water demand, interviews suggest that drought conditions increase the public's interest in water and affects willingness to conserve.

Impact of Urban Water Conservation Policy

Comparing the number conservation programs to rates of water consumption, the highest-ranking cities in both categories were cities that joined the NPCCP program in 1997. Because some municipal providers could not meet the GPCD targets required by the GMA, an alternative conservation program (NPCCP) was created in 1992 that focuses not on regulatory water use standards but on a suite of "reasonable conservation measures," most of which are non-regulatory, information-based programs.

Next, we will adapt the Lowi policy framework to further examine the evolution of different types of conservation policies over time and space given varying socio-political, economic and biophysical contexts. In a rapidly growing metropolitan region where municipal demand accounts for almost 40% of total demand, understanding urban and residential water use patterns and conservation policies is essential for managing a scarce resource.