



Comparison of Per Capita Water Use in Southwestern Counties

This paper presents a view into per capita water use (Gallons per Capita Daily – GPCD) in several counties in the southwestern United States. The work is built on data collected from the United States Geological Survey (USGS) and matched with U.S. Census population data. First a straight GPCD comparison is presented, then with adjustments for seasonal residents, then consideration of seasonal differences, and finally adjustments for visitors. It appears that all water suppliers in the compared counties report the same data “total water supplied” data to the USGS.

Conclusion: Washington County residents use considerable more water than comparable southwest communities. The charge that comparisons between these counties is not equitable, that is, they are based on an “apples to oranges” comparison, appears to have no foundation.

1. GPCD Comparisons by county

Table 1: Demographic and Water Supply Data by Area								
1	2	3	4	5	6	7	8	9
County	Permanent Population	Seasonal Households	Average Household Size	Seasonal Population	Seasonal Population as a % of Permanent	Total Population	Total Water Supplied (Mgal/day)	GPCD
Washington, UT	138,115	7,201	2.94	21,171	15%	159,286	44.25	278
Clark, NV	1,951,269	22,002	2.70	59,405	3%	2,010,674	439.43	219
Maricopa, AZ	3,817,117	63,938	2.67	170,714	4%	3,987,831	805.74	202
Pima, AZ	980,263	14,862	2.46	36,561	4%	1,016,824	168.08	165
Bernalillo, NM	662,564	1,774	2.45	4,346	1%	666,910	98.26	147

Demographic Data Source: U.S. Census, Table DP-1, Profile of General Population and Housing Characteristics 2010
Water Supply Data Source: U.S. Geological Survey National Water Information System Web (NWISWeb)

Column 1: counties compared

Columns 2 through 4: U. S. Census estimates for the areas’ permanent populations, number of seasonal households and average household sizes.

Column 5: seasonal population estimates as the product of the number of seasonal households times the average household size.

Column 6: seasonal population as a percent of the permanent population, showing that Washington County has a disproportionate share of seasonal households.

Column 7: total population as the sum of the permanent and seasonal populations.

Column 8: U.S. Geological Survey reporting of publicly supplied water for domestic, commercial and industrial use.

Column 9: the metric Gallons of water use Per Capita per Day (GPCD), dividing the total population data in Column 7 into the water supply data in Column 8

Conclusion: Washington County uses considerably more water than comparable counties - 27% more than the next highest user, 90% more than the best.

2. Consideration of Seasonal Residents

Seasonal households will use less water on average than permanent populations because they only use the residence for part of the year. As a result, it is appropriate to reduce seasonal household usage by a fraction representing the fact that outdoor water would be constant but indoor water (e.g. for washing and food preparation) would be used only when the residence is physically occupied. Table 1A applies a factor of 75% to seasonal residents' water usage to account for this reality.

1	2	3	4	5	5 A	6 A	7 A	8 A	9 A
County	Permanent Population	Seasonal Households	Average Household Size	Seasonal Population	Adjusted Seasonal Population (X 75%)	Seasonal Pop as % of Permanent	Adjusted Total Population	Total Water Supplied (Mgal/day)	GPCD
Washington, UT	138,115	7,201	2.94	21,171	15,878	11%	153,993	44.25	287
Clark, NV	1,951,269	22,002	2.70	59,405	44,554	2%	1,995,823	439.43	220
Maricopa, AZ	3,817,117	63,938	2.67	170,714	128,036	3%	3,945,153	805.74	204
Pima, AZ	980,263	14,862	2.46	36,561	27,420	3%	1,007,683	168.08	167
Bernalillo, NM	662,564	1,774	2.45	4,346	3,260	0%	665,824	98.26	148
Demographic Data Source: U.S. Census, Table DP-1, Profile of General Population and Housing Characteristics 2010									
Water Supply Data Source: U.S. Geological Survey National Water Information System Web (NWISWeb)									

Additionally, it can reasonably be expected that seasonal household sizes are somewhat smaller than permanent residents' household sizes given that seasonal households are likely substantially comprised of retirees. Table 1B applies a conservative additional factor of 80% to the household size values in Table 5A to account for this household size difference.

1	2	3	4	5	5 B	6 B	7 B	8 B	9 B
County	Permanent Population	Seasonal Households	Average Household Size	Seasonal Population	Adjusted Seasonal Population (5A X 80%)	Seasonal Pop as % of Permanent	Adjusted Total Population	Total Water Supplied (Mgal/day)	GPCD
Washington, UT	138,115	7,201	2.94	21,171	12,703	9%	150,818	44.25	293
Clark, NV	1,951,269	22,002	2.70	59,405	35,643	2%	1,986,912	439.43	221
Maricopa, AZ	3,817,117	63,938	2.67	170,714	102,429	3%	3,919,546	805.74	206
Pima, AZ	980,263	14,862	2.46	36,561	21,936	2%	1,002,199	168.08	168
Bernalillo, NM	662,564	1,774	2.45	4,346	2,608	0%	665,172	98.26	148
Demographic Data Source: U.S. Census, Table DP-1, Profile of General Population and Housing Characteristics 2010									
Water Supply Data Source: U.S. Geological Survey National Water Information System Web (NWISWeb)									

Conclusion: Seasonal residency does not explain Washington County's high water use.

3. Consideration of Climate Differences

Washington County is located in a particularly arid region so it might be argued that its climate requires more water use than elsewhere. To evaluate this notion for the areas being considered here, average annual measures of temperature and precipitation compiled by the National Oceanic and Atmospheric Administration's (NOAA) National Center for Environmental Information are presented in Table 2. The data in the Table show that Las Vegas, Phoenix and Tucson register higher average temperatures than St. George while Las Vegas and Phoenix also have lower precipitation levels. Given the GPCD measures presented in Tables 1, 1A and 1B for these areas it seems that aridity alone does not explain water use levels. Further, the data in Table 2 indicate Bernalillo county is 10% cooler and 8% wetter than Washington county. Thus, Bernalillo's relatively advantageous climate positions it to use water more excessively. However, Bernalillo's GPCD measures 50% less than Washington county's GPCD measure indicating it is a leader in recognizing water's true value and ways to use water economically.

Table 2: Climate Annual Normals		
	Average Annual Temperature (F)	Average Annual Precipitation (Inches)
St George	63.9	8.8
Las Vegas	69.4	4.2
Phoenix	75.1	8.0
Tucson	69.4	11.6
Albuquerque	57.2	9.5
Source: NOAA National Center for Environmental Information http://www.ncdc.noaa.gov/cdo-web/datatools/normals		

Conclusion: climate differences do not account for the relatively high water usage in Washington County.

4. Consideration of Visitors

Visitors' use of water is difficult to quantify. It is probably somewhat proportional to the number of people serving in the hospitality industry. The following table shows a comparison of that statistic in the counties being addressed.

2010 Leisure and Hospitality Employment Comparisons Per Capita

	County Population *	Annual Average Monthly Employment in the Leisure and Hospitality Industry	Leisure & Hospitality Employment Divided by Population
Washington County, UT	159,286	6,522	4.1%
Maricopa County, AZ	3,987,831	168,300	4.2%
Pima County, AZ	1,016,824	38,077	3.7%
Clark County, NV	2,010,674	253,367	12.6%
Bernalillo County, NM	666,910	32,220	4.8%

* Population data is the sum of permanent and seasonal population values

Employment data source: Bureau of Labor Statistics

Population data source: U.S. Census Bureau

Conclusion: Washington County does not have disproportional use of water by visitors.