

Apartment Complexes and Water Conservation in the City of Davis

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Abstract

Our project analyzes the water use of apartment complexes in the City of Davis. We compared this data to the total water use of Davis. After that, we made predictions about the reduction of water use for the city due to the drought. Recently, the State Water Resources Control Board (SWRCB) proposed mandatory standards of water reduction for all cities and municipalities in California. Davis is in the 7th tier and is required to reduce its water use by 28%. We estimated that Davis would have to reduce their total water use from 50,721 gallons per person per year to 36,519 gallons per person per year. We compared this finding to what we calculated for apartment complex reductions and realized that apartments would also have to reduce their water use by 28%. Yet, it was difficult to make any broad comparisons and assumptions because we were limited by the amount of apartment complexes responded to our request for data. Most likely due to the drought and strict water regulations, apartment managers were hesitant to release information to us.

Introduction

Davis is a unique city in many ways. Largely due to the location of UC Davis, 43% of housing units in the City of Davis are in multi-unit complexes; this is much higher than the national average of 26% (according to the American Community Survey data at [census.gov](https://www.census.gov)). More than half of Davis residents live in rental units. Because apartment complexes account for such a large portion of the Davis population's housing accommodations, and because it is potentially easier to reduce water use among apartment complexes than among homeowners, we have decided to focus on apartment water usage in Davis.

We assume that it would be easier to implement water reductions among apartment complexes than among homeowners for several reasons. Primarily, the complex manager

represents dozens of individuals, and it is easier for city officials to convey a program to a limited number of individuals (complex owners) than the entire population. Additionally, apartment complexes more carefully maintain their landscaping, laundry, and other “overhead” water systems than homeowners, so it may be easy to make cuts in these areas. Finally, apartment complexes are a business, so if they see benefit in reducing their water consumption (monetary or image-based) then they will, whereas homeowners have less motivation.

Apartment complex water use is a part of urban water use. Urban water use is defined as “the use of water for [all] urban purposes, including residential” (by the California Department of Water Resources) and is comprised of both indoor use (showers, toilets, laundry, etc) and outdoor use (primarily landscaping irrigation). Urban water use accounts for 10% of California’s total water usage (Lecture, Sandoval, April 2015). It is important for residents and property owners to understand how much water they are consuming so that changes can be made to conserve water with the onset of climate change (leading to droughts and a limited water supply).

Objective

The main goal of our project is to predict how apartment complexes in Davis will change their water use in response to the drought. Our objectives to achieve our goal is as follows:

- Determine urban water use of apartment complexes in Davis
- Compare that water use to the City of Davis’ water use
 - WUPC, Total Urban Water Use
- Estimate future reduction of water use based on information from the State Water Resources Control Board

To achieve the first objective, we contacted various apartment complexes in Davis via email and phone. In doing this, we asked the apartment managers for their water use data. Only two apartment complexes responded to us and willingly gave us the requested information. The

remaining complexes we contacted either didn't respond or refused to give us information. Next, we compiled our data in an excel spreadsheet. Then, we calculated the WUPC and Total Water Use for the complexes and compared our results to the City of Davis. Finally, to achieve our main goal, we gathered mandatory water use reduction data for the City of Davis from the State Water Resources Control Board. The SWRCB determined that the City of Davis had a mandatory reduction of 28% of their total water use for conserving water in the drought. With this standard, we were able to estimate how much apartment complexes in Davis would have to reduce their water use by (in proportion to how much water they consume compared to Davis as a whole).

Hypothesis

As long as population increases, demand will always increase. However, we believe that the supply of water will decrease in Davis due to the state enforcing mandatory water conservation regulations. Based on the State Water Resources Control Board regulations, we expect Davis apartments to reduce water use in the future by 5%. So if population continues to increase and the drought causes further reductions in water use, then Davis will have to find a way to efficiently support water demand.

Data Sources

We collected data via phone calls and emails from various apartment complexes in Davis. Out of 144 complexes, only two were willing to release information to us. In addition, we found information about Davis' water use online. Our collected data is as follows:

- City of Davis
 - Total population 66205
 - Total water use 3358 million gallons per year
- Apartments

- The Colleges at La Rue
 - 197 Units
 - 10,080,000 gallons per year
- Russell Park Apartments
 - 200 Units
 - 4,140,000 gallons per year
- Total Apartment Complexes in Davis
 - 144 apartment complexes
 - 710,000,000 gallons per year

Unfortunately, we were only able to receive data from two complexes in Davis. We did, however, contact multiple apartment complexes (listed below) to try to receive data.

Apartment	Response
Aggie Square	none
Almondwood	none
Alvarado Parkside	none
Alvarado Sunset	none
Casitas	none
Chaparral	Managed by Tandem...provided data for other properties but not this one
Chautauqua	Managed by Tandem...provided data for other properties but not this one
The College	Managed by Tandem, data provided
Fountain Circle	Managed by Tandem...provided data for other properties but not this one
LaSalle	none
Russell Park	Managed by Tandem, data Provided
West Village	None

Methods and Assumptions

The following is a step-by-step process of our project:

- Step 1: phone interviews/emails to apartment complexes
- Step 2: compile data

- Step 3: using excel, similar to Exercise #1, calculate WUPC and Total Water Use and compare to the City of Davis
- Step 4: estimate future reduction in water usage based on SWRCB standards

After compiling all of our data we used excel to calculate WUPC, total water use, and to estimate water reduction amounts. First, we calculated water use per capita per year by dividing the total water use by the expected total population. Then, we multiplied the result by 0.72 to get the expected water consumption after the 28% water use. For these calculations, we assumed that there were two people per unit (apartment) for both apartment complexes. We also assumed that the average apartment complex has about 200 units per complex.

Calculation/Results

- Water per capita for entire Davis City:
 - $3,358,000,000(\text{gallons/year})/66205 = 50721 \text{ gallons per person per year}$
- Water use per capita in The Colleges
 - $10,080,000(\text{gallons/year})/(197*2) = 25583 \text{ gallons per person per year}$
- Water use per capita in Russell Park
 - $4,140,000(\text{gallons/year}) / (200*2) = 10350 \text{ gallons per person per year}$
- Average Water use per Capita in Davis Apartment Complexes
 - $710,000,000 \text{ (gallon/ year)} / 144 \text{ (total \# of apartments)} / 400 \text{ (expected resident / apartment site)} = 12326 \text{ gallons per person per year}$
- WUPC after 28% deduction
 - Davis City: $50721*(1-.28) = 36519 \text{ gallons per person per year}$
 - The Colleges: $25583*(1-.28) = 18420 \text{ gallons per person per year}$
 - Russell Park: $10350*(1-.28) = 7452 \text{ gallons per person per year}$

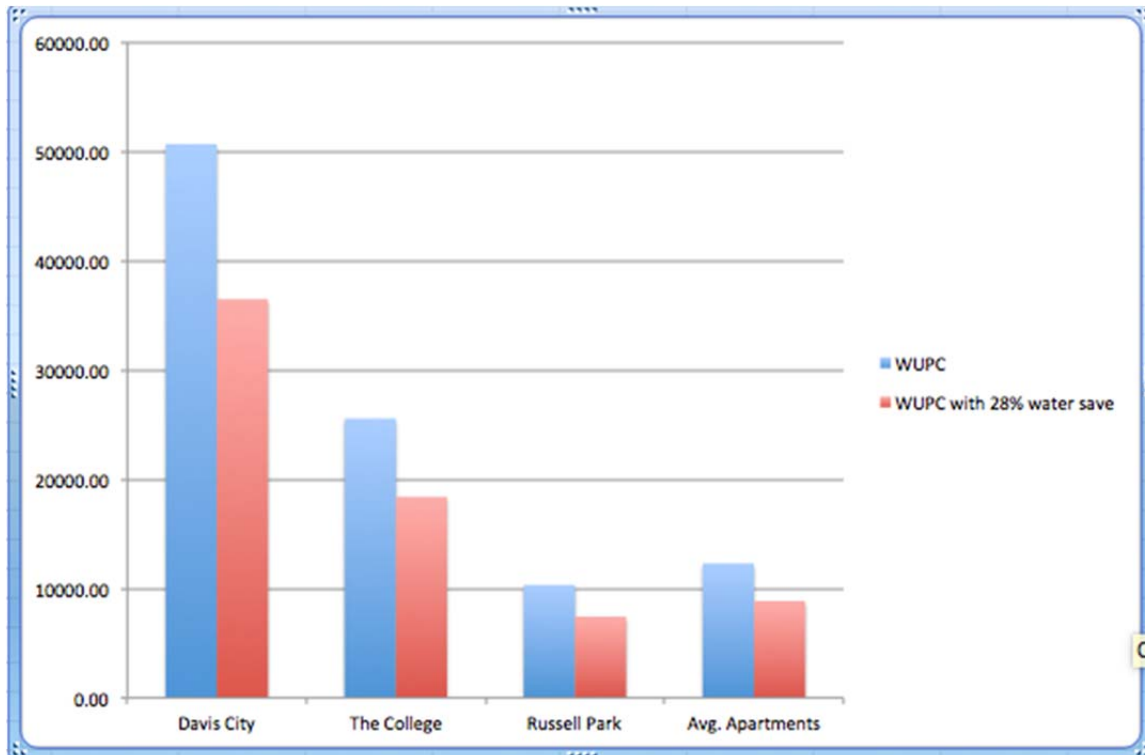


Figure 1, showing the comparison of each categories water usage with and without the 28% mandatory deduction.

Conclusions

We were unable to gather enough relevant data to accept or reject our hypothesis, however we did notice some trends among the data. The average resident at the Colleges and Russell Park uses half as much water as an average Davis resident. We had hoped to be able to separate inside and outside data, to analyze whether this difference is due to landscaping or residents' habits, however not enough data was provided for this analysis.

From the data we did receive, we were able to make predictions about the amount of water use reduction that apartment complexes and the City of Davis need to implement. Overall, Davis needs to reduce its water use by 36,519 gallons per person per year. We hypothesized that apartment complexes would have to reduce their usage by a fraction of the 28% standard based on the proportion of water use of apartments in Davis. We estimated this amount to be 5%, however, this is not the case. If the city of Davis as a whole wants to reduce their total water use

by 28%, everyone in Davis - businesses, homeowners, agriculture, and apartment complexes - has to also make a reduction in their water use by 28%. Therefore, we estimated that The Colleges and Russell Park have to reduce their water use by 18,420 gallons per person per year and 7,452 gallons per person per year, respectively. Because we only found data from two out of the 144 total complexes in Davis, we cannot make any assumptions about total apartment complex water reduction as it would likely be inaccurate.

Recommendation/Limitations

During our data collection process we experienced many difficulties. Although we contacted dozens of apartment complexes within Davis, ultimately we only heard back from one property management company (who only provided data for two of their many locations). Data was difficult to gather for several reasons: those at the reception desk often did not know the answer to our questions, and would pass our question on; after this we would not hear back.

It is likely that apartments did not report their data to us because our questions got lost in the communication chain, or our inquiry was deemed unimportant to respond to, however it is also possible that some apartments do not collect or monitor their water use data (and did not respond because there was no data available), or it is possible that apartment complexes did not want this data to be made public (if they feared that they used a disproportionately high amount of water). Apartment complexes that did respond to our request only released total water use for the property, however use per unit may be useful to measure, as well as maintenance water use, and indoor vs. outdoor use; it is likely that apartment complexes do not record this data, or place high value on it.

Whatever the reason for these responses (or lack thereof), this lack of data is somewhat alarming. Because the city water department cannot give out data on individual users, and

because individual users will not self-report, minimal data is available for researchers (and thus, minimal data is available for use in policy formation).

We would recommend a better public database for water use provided by the city. If the city could further break down water use by other factors (such as single vs. multi family homes, rental units versus owned units, area of Davis, etc.) then more analysis could be done to determine differences between these factors. As of now water use data is only available for the city as a whole. Additionally, we would recommend that the water board make clear to consumers that tracking of your own water use is a vital step to reducing water use, especially for apartment complexes who may be able to initiate programs to help residents reduce if they were to determine that they use a substantial amount of water.

If we were to conduct further analysis in the future it would be useful to contact homeowners as well as apartment complexes. We had originally chosen apartment complexes because we know a large percentage of the Davis population lives in apartments, and because we hypothesized those apartments would more diligently track their water use and initiate reduction programs than homeowners. Our assumption does not seem to be the case, however. Additionally, single-family homes use more water per capita than an apartment unit, so collecting data on these users would be valuable. We had determined that there were too many houses in Davis to get an accurate sample size surveyed in the time allotted for this project, however we may have had more success surveying homeowners than relying on apartment complexes.

References

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