Analysis of Water Rate Escalations across the United States

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Executive Summary

This document provides an overview of an analysis that examined changes in water rates across the country to develop a basic understanding of water rate escalations and how water rates are impacted from outside influences. The analysis investigated how water rates are influenced by the geographic region, water source, and drought tendencies. For example, one observation of the analysis found that cities located in regions of long term drought may have higher escalation rates than cities in water rich environments. Typical escalation rates were found to be between 4 and 8%. This information can be used to determine long term cost effectiveness of water-efficiency projects by understanding possible changes in future water rates.

Introduction

Water rates continue to rise across the nation, impacting Federal agencies' utility cost and therefore making water-efficiency improvements more economically justifiable. To properly estimate economic saving based on water reductions gained from water-efficiency projects, Federal agencies need to know the annual escalation rate of their water costs. Fuel escalation rates are published each year by the Energy Information Administration, which can be used in life-cycle cost analysis to determine the economic justification for implementation of the proposed of energy-efficiency measures. As fuel price increases over the life of the measure, agencies reap further savings based on this saved fuel and other cost savings.

A published national water escalation rate does not exist. Specific escalation rate information may be obtained from the local water utility if that information has been published by the provider. If that information is not available, agencies will have difficulty accurately determining the life-cycle cost effectiveness of proposed water-efficiency projects.

To predict possible water rate increases in the future, an analysis was performed to understand how water rates have increased in the past. Water rate data were gathered from the *Ernst & Young 1994 National Water& Wastewater Rate Survey* (Ernts & Young LLP, 1994), the *Raftelis Financial Consulting 2002 Water and Wastewater Rate Survey* (Raftelis Financial Consulting, PA, 2002) and the American Water Works Association (AWWA) *2008 Water and Wastewater Rate Survey* (American Water Works Association and Raftelis Financial Consultants, Inc, 2008). As part of these water rate surveys, water utilities reported data such as water rates, water source, and water sales for different customer classes to the survey proctors. For each water rate survey, the previous year's data was reported by the utility.

For example, for the 1994 survey, utilities reported data from 1993. Water rate data from 1993, 2001, and 2007 were analyzed to estimate an annual escalation rate for selected cities across the United States.

Cities in areas with large clusters of Federal installations were chosen for the study. Also, cities were chosen to ensure a relatively even distribution across the major regions of the nation. See Figure 1 for a map of cities included in this study.

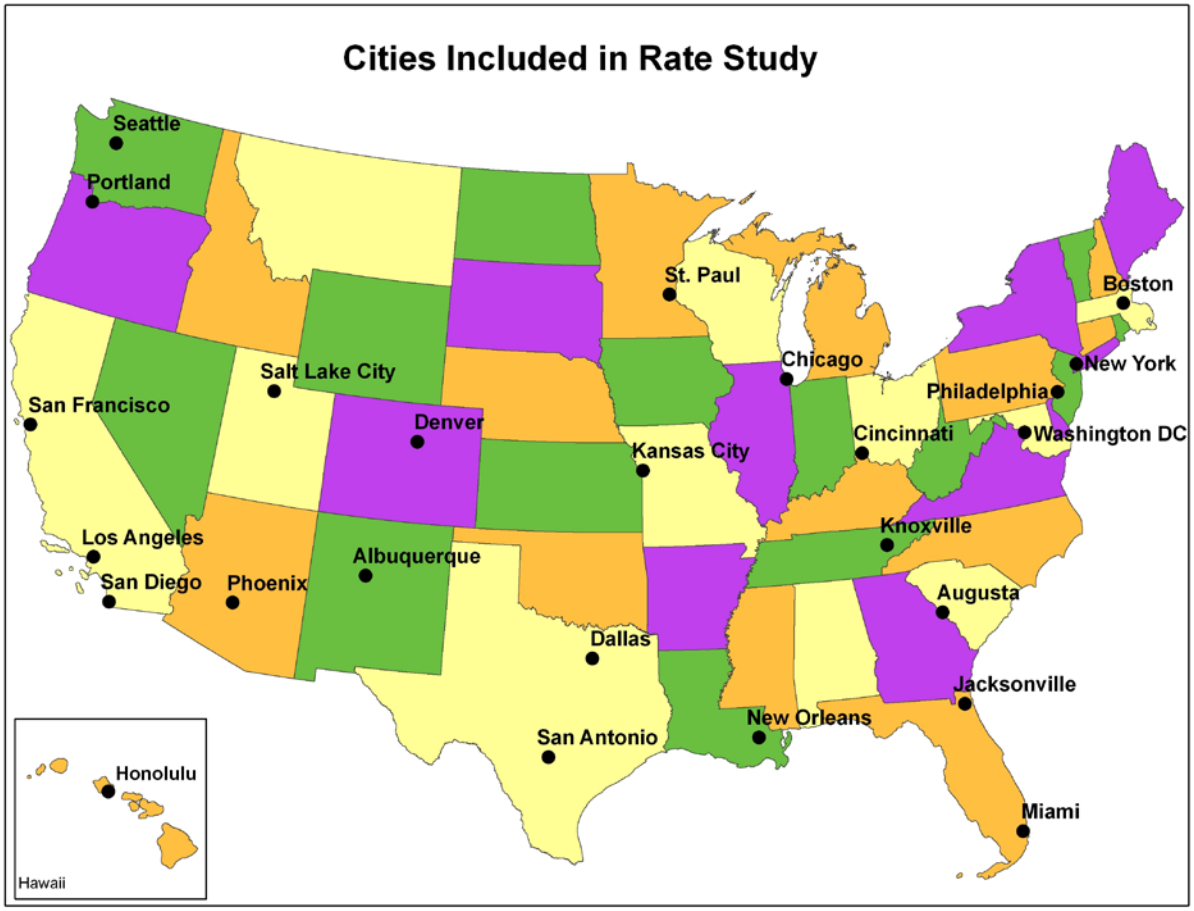


Figure 1: United States Map with Selected Cities

For each water rate survey, two data sets were examined, non-manufacturing/commercial customers and industrial customers. These rate sets were chosen because typically large Federal complexes receive their water through a single meter and are charged industrial rates, and smaller Federal facilities such as individual office buildings are typically charged a non-manufacturing/commercial rate. It was deemed unlikely that Federal facilities would be charged residential water rates, therefore only commercial and industrial rates were analyzed. Some Federal facilities produce their own water onsite; the escalation in these situations is beyond the scope of this analysis. The water rate surveys for each year were reported as a total utility cost based on a volume of consumption instead of the volumetric

water rate. Some water utilities charge different rates based on numerous factors, including consumption volume and meter fees. Comparing a single water rate between the survey cities would not provide an accurate comparison, and would not reflect the true cost of the water. This is why the survey questionnaire asks the cities to report how much it bills the customer for specific volumes of water. Table 1 provides the information on the meter size that was used to determine the customer classification along with the consumption volume reported for the customer classes that were analyzed in the study.

Table1: Customer Class Information

Customer Class	**Meter Size**	**Consumption Volume**
Non-manufacturing/Commercial	5/8 inches	3,000 cubic feet or 22,440 gallons
Industrial	4 inches	1,000,000 cubic feet or 7,480,000 gallons

Water rates from 2007 for non-manufacturing/commercial and industrial customers are shown in Figure 2 and Figure 3 in order of total cost. The Total Monthly Bill in these figures includes both the consumption volume costs and all other costs as reported in the survey questionnaire..

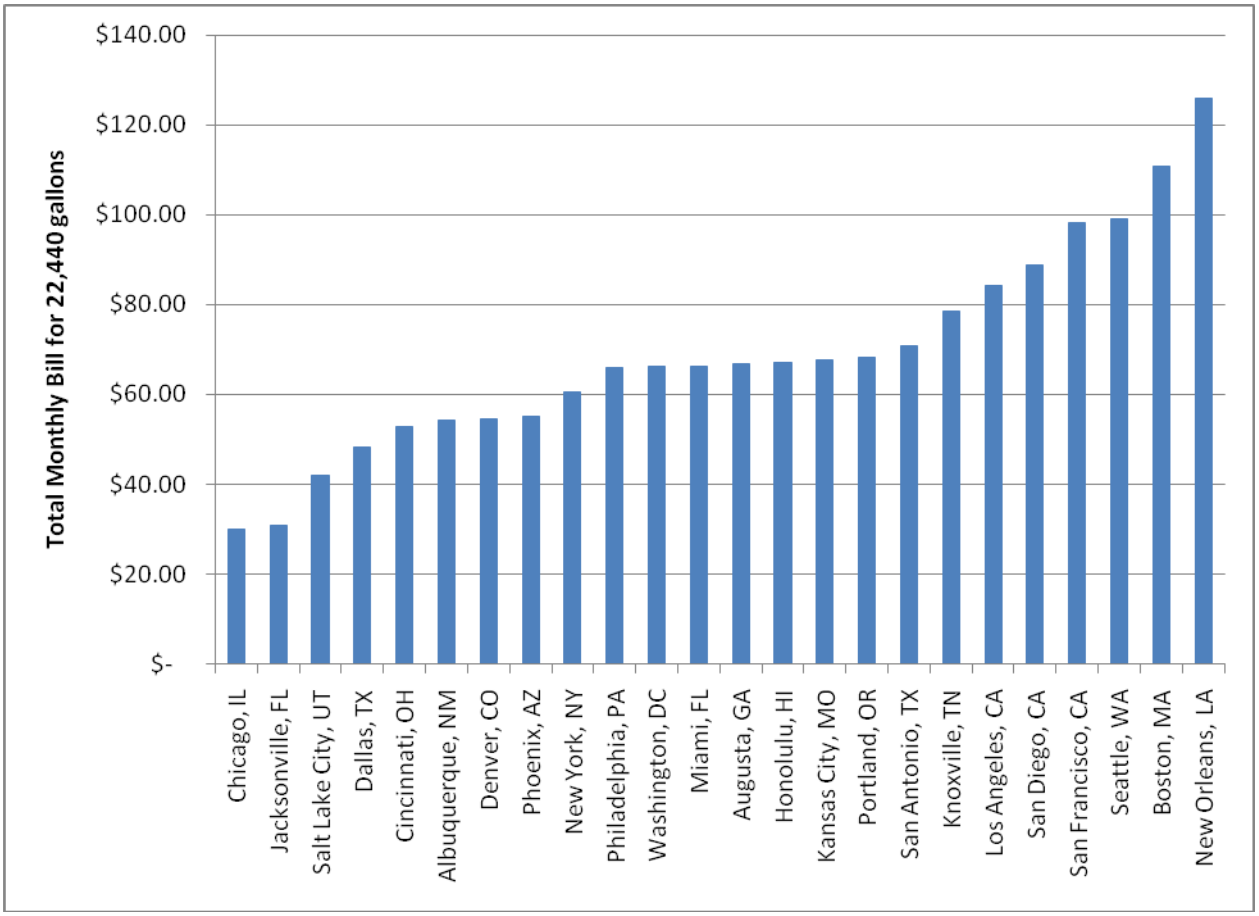


Figure 2: Non-manufacturing/Commercial Customer 2007 Rates

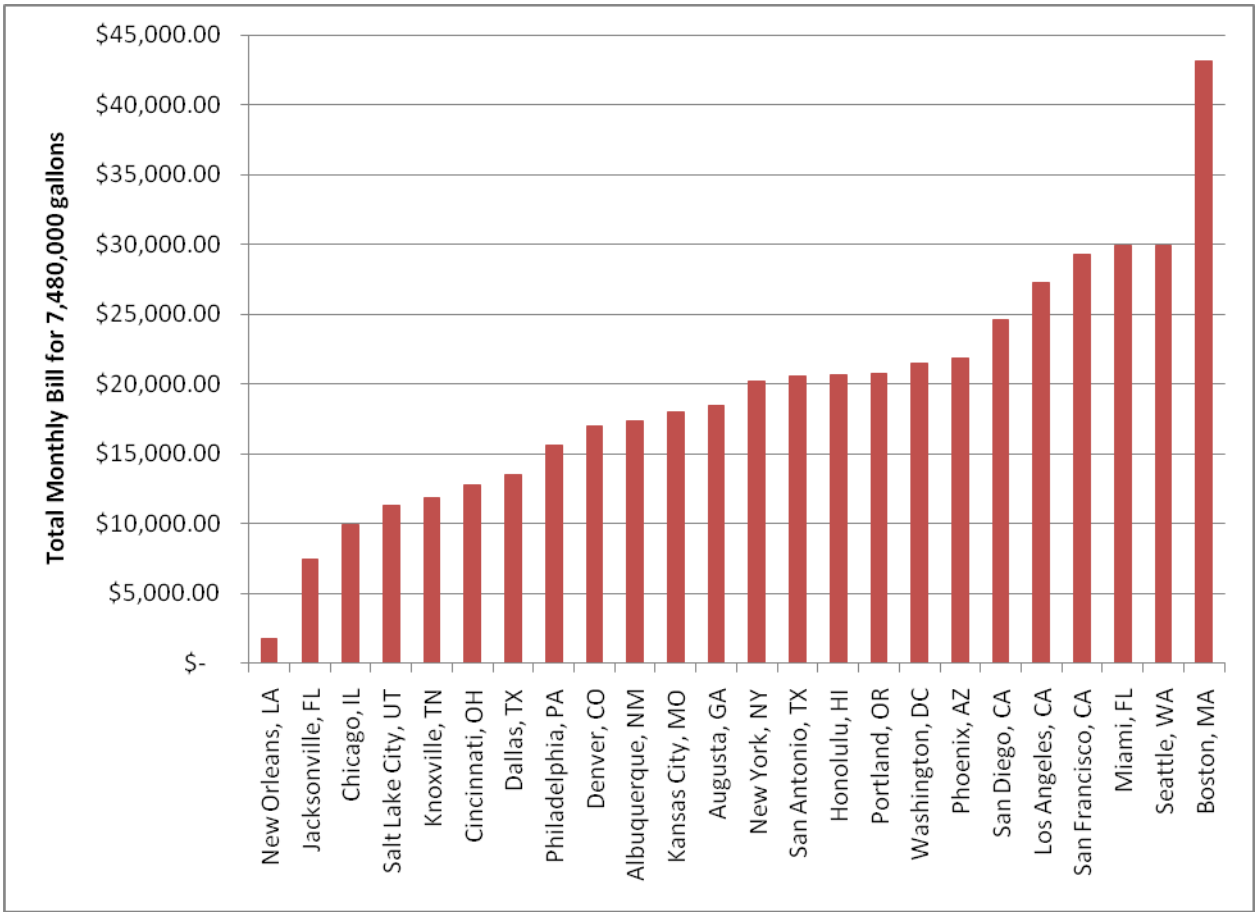


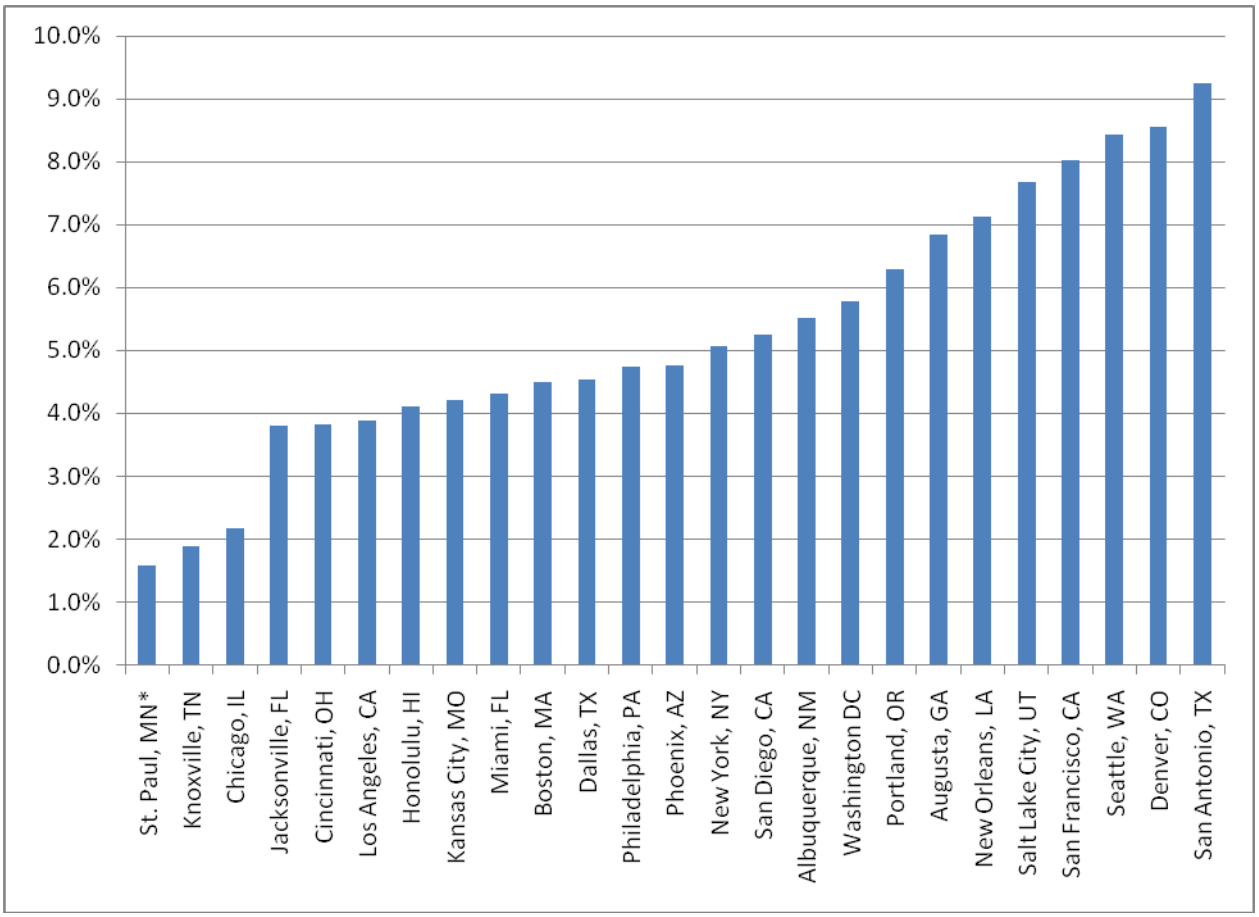
Figure 3: Industrial Customer 2007 Rates

Water Escalation Rates

Escalation rates for non-manufacturing/commercial and industrial water costs for each city were analyzed between 1993 rates and 2007 rates. The methodology used to calculate escalation rates was based on a similar methodology that is used to calculate inflation rates. In this case, the escalation rate is the rate that makes the nominal 1993 water cost equivalent to 2007 water costs[1]. In other words, the escalation rate reveals how much the water price has increased between the two time periods for purchasing the same amount of water. Escalation rates had a wide range. The lowest escalation rate was found in New Orleans, Louisiana, where the industrial water rate actually had a negative escalation rate of -12%. The largest rate escalation was found in San Antonio, Texas, where the industrial water rate grew nearly 10% between 1993 and 2007. But more typical escalation rates for the cities analyzed ranged between 4% and 8%.

[1] The formula used to calculate escalation rate between 1993 and 2007 was: Escalation Rate = $e^{(\ln(Y2/Y1)/n)}-1$ where Y1 is the nominal 1993 water cost, Y2 is the nominal 2007 cost, and n is the number of years between Y1 and Y2.

Figure 4 shows the non-manufacturing/commercial escalation rate for each city, and Figure 5 shows the industrial escalation rates for each city.



* St Paul, MN escalation rates reflect escalation between 1993 and 2001 because water rate data for 2007 was not available.

Figure 4: Non-manufacturing/Commercial Annual Escalation Rates between 1993 and 2007

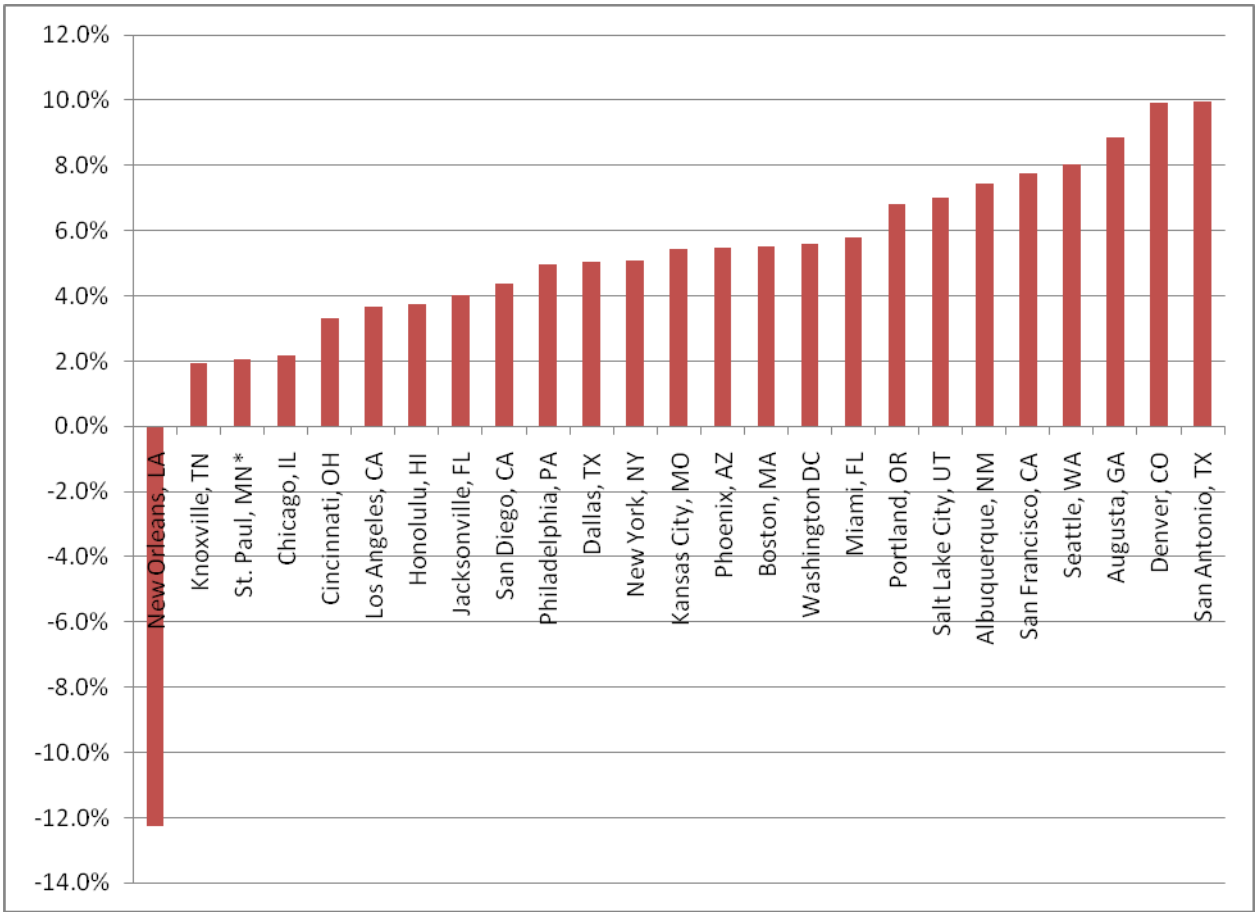


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Figure 5: Industrial Escalation Annual Rates between 1993 and 2007

Trends in Water Rates

To further the understanding of water rate escalation in the United States, water rates for each city were compared to three factors to look at the influences and impacts on water rate and possible future changes in rates:

- Geographic Region
- Water Source
- Drought Tendencies.

By understanding how each of these conditions influences water rates, it can shed insight on possible future water rate changes for similar conditions. Each of these conditions, and the trends uncovered in the analysis, are explained in the sections provided below. It should be noted that the number of cities

in this analysis is relatively small so the information provided below only reveals possible influences on water rates.

Geographic Regional Trends:

The cities that were part of the study were categorized into U.S. geographic regions based on existing groupings by the water rate surveys and based on general climate regions. There were seven generalized geographic regions chosen that best group the cities. This data was used to understand trends in water rates relative to where the city is located.

The following list shows each region and the cities categorized into that region:

- West Coast – San Francisco, CA; Portland, OR; Seattle, WA
- Southern California (So Cal): Los Angeles, CA; San Diego, CA
- Midwest: Chicago, IL; St. Paul, MN; Kansas City, MO; Cincinnati, OH
- Southwest: Phoenix, AZ; Denver, CO; Albuquerque, NM; Salt Lake City, UT
- Southeast: Jacksonville, FL; Augusta, GA; New Orleans, LA; Knoxville, TN; Dallas, TX; San Antonio, TX
- Northeast: Boston, MA; New York, NY; Philadelphia, PA; Washington DC
- Tropic: Miami, FL; Honolulu, HI.

In Figure 6, the chart shows that the cities located in the West Coast region experienced the biggest water rate increases over the study's time periods, with both commercial and industrial classes growing over 90% between 1993 and 2007. This comparison was done by inflating the 1993 and 2007 costs to equivalent 2009 dollars and then calculating the percent change by dividing the difference in prices by the cost from 1993. Cities located in the Southwestern U.S. also experienced high growth in water rates during this time period.

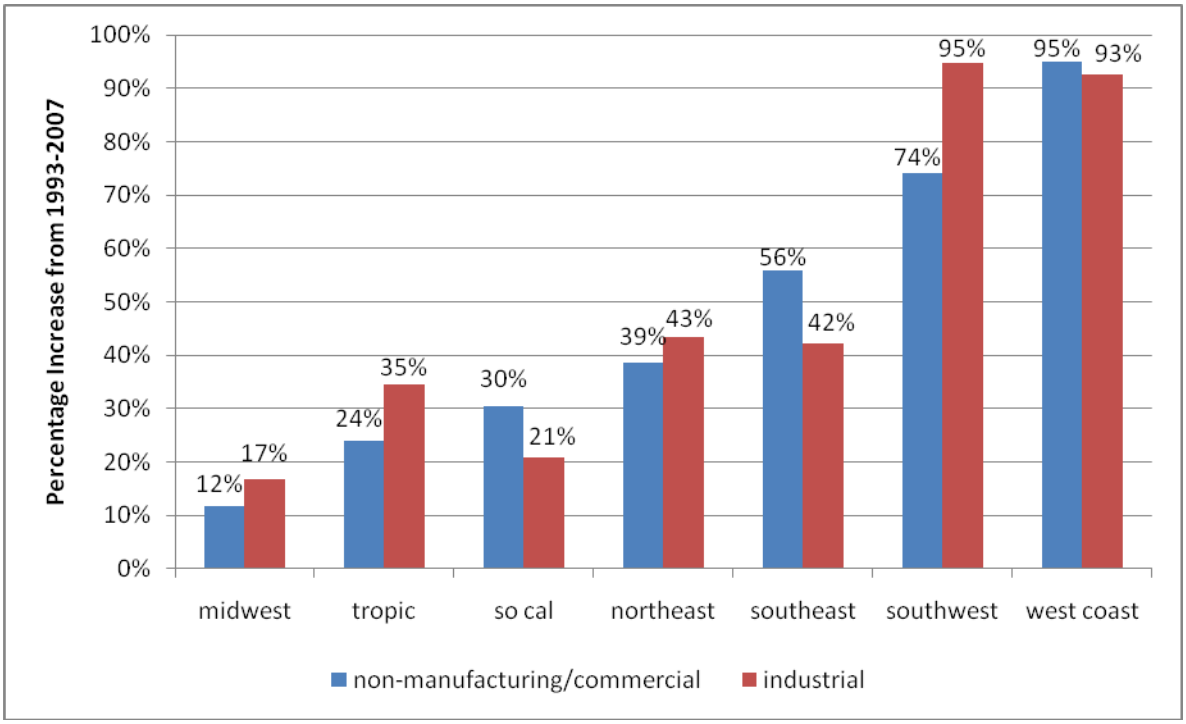

Figure 6: Trends in Water Rate Increases between 1993 and 2007 Based on US Region

Water Source Trends:

Water source information was gathered from the 2002 and 2008 water rate surveys. The water sources were divided into four categories based on the reported percentages: ground, surface, purchased, or mixed. For cities to be classified as ground, surface, or purchased, 100% of the water must come from that source. Cities that receive a combination of water sources are classified as "mixed".

Figure 7 shows the trends in water rate increases between 1993 and 2007 (inflated to equivalent 2009 dollars) based on water source. As the chart reveals, the largest rate increases were experienced by water utilities that provided water from mixed and surface sources. Surface sources likely have the biggest vulnerability to availability and scarcity issues, which may in turn drive water utilities to raise rates to encourage conservation.

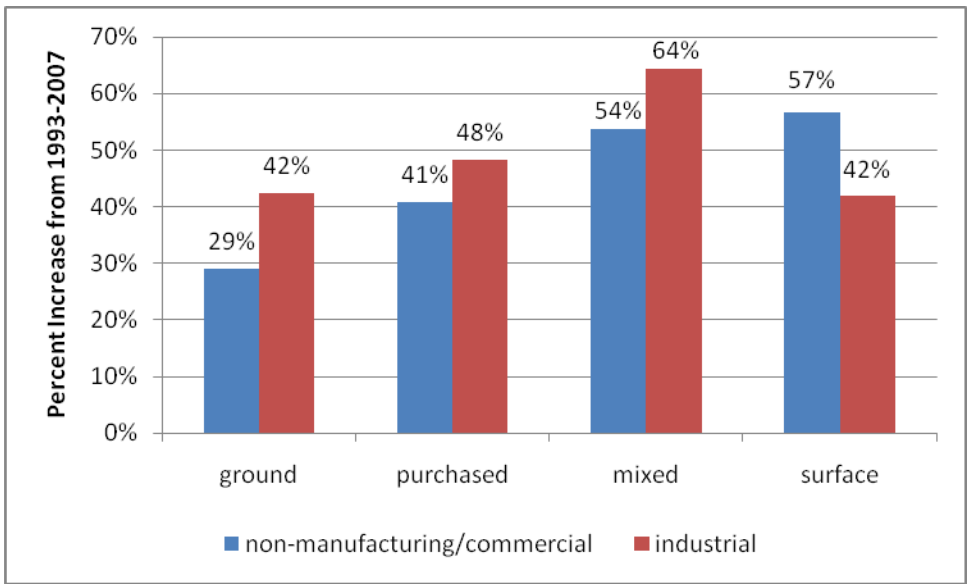

Figure 7: Trends in Water Rate Increases between 1993 and 2007 Based on Water Source

Drought Trends:

Rates for the each city were compared to the probability of drought for that particular area. The drought information that was used to analyze this trend was from the *Palmer Drought Severity Index of 1895-1995* prepared at the National Drought Mitigation Center, which is available online[2] (National Drought Mitigation Center, 2006). General Palmer Drought Index maps show long term meteorological moisture conditions (National Climatic Data Center, 2010) and was established as a way to compare meteorological moisture conditions of climate divisions. The 100-year time frame was chosen to understand long term patterns in drought trends which more accurately reveal drought vulnerability than shorter time periods.

Palmer Drought Index numbers range from -6 to +6, with negative numbers indicating conditions of water need and positive numbers indicating conditions of water excess. Using prearranged index numbers, Federal agencies and local government can trigger emergency and disaster area relief to affected regions. For the analysis, Palmer Index information was expressed as a percentage that reveals the amount of time the location experienced severe to extreme drought. For example, a city that has a Palmer Index rating range of 15 to20 means that between 15% and 20% of the analysis time frame, this area was in severe to extreme drought. The information was used to group each city to Palmer Index ranges and correlate it to the average water escalation rates. This information is detailed in Figures 8 and 9.

[2] Drought maps can be found at: http://www.ncdc.noaa.gov/oa/climate/research/prelim/drought/palmer.html

Figure 8 correlates the escalation rates between 1993 and 2007 to the percentage of the analysis time frame in drought. For example, cities that experienced drought conditions 15 to 20% during the years between 1895 and 1995 experienced water rates increases over 100%. As another example, cities that experienced drought conditions 10 to 15% during the years between 1895 and 1995 experienced water rates increases on average 60%. This may be caused by the fact that cities increase water rates to deter the use of the limited resource in addition to securing capital for future water sources development.

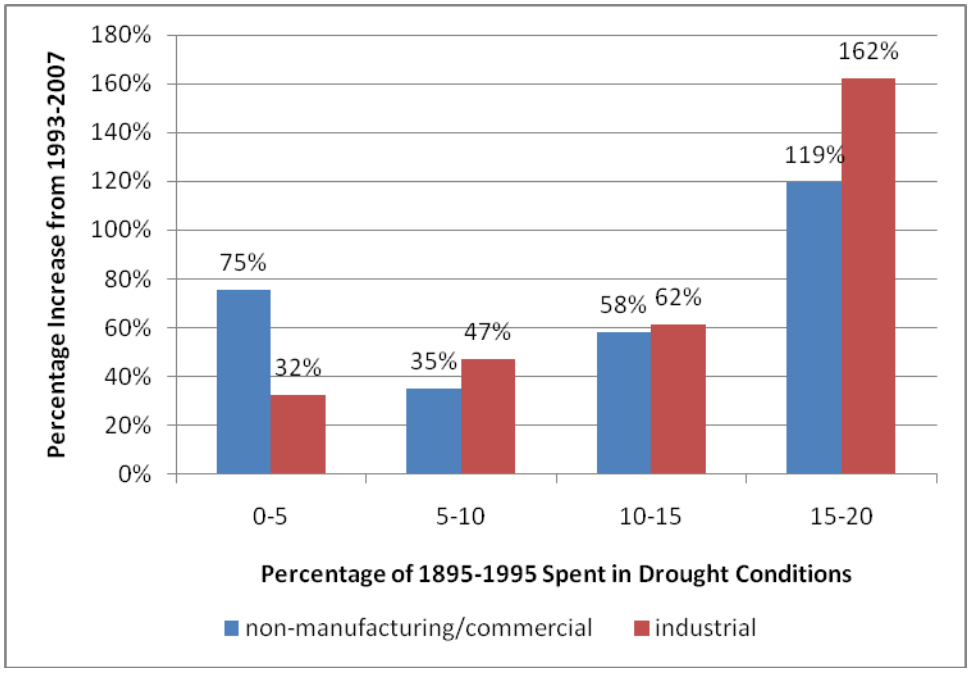

Figure 8: Trends in Water Rate Increase between 1993 and 2007 Based on Drought

Figure 9 cross-correlates three pieces of information from the analysis by mapping *Palmer Drought Severity Index of 1895-1995* and overlaying the survey cities water source and water escalation rates. This map may help to determine annual water escalation rates for other locations or regions in the U.S. that were not examined in the analysis. By locating a city in the same region with the same water source type or drought vulnerability as the non-surveyed city, the water escalation rate of the selected city could provide an approximate water escalation rate for the Federal facility in the non-surveyed city. For example, Idaho Falls, Idaho, home to the Idaho National Laboratory, obtains the city's water from 19 wells. Based on similar geographic regional and historical drought conditions to Salt Lake City, Utah, the Idaho National Laboratory could use Salt Lake City's escalation rates to forecast rate changes.

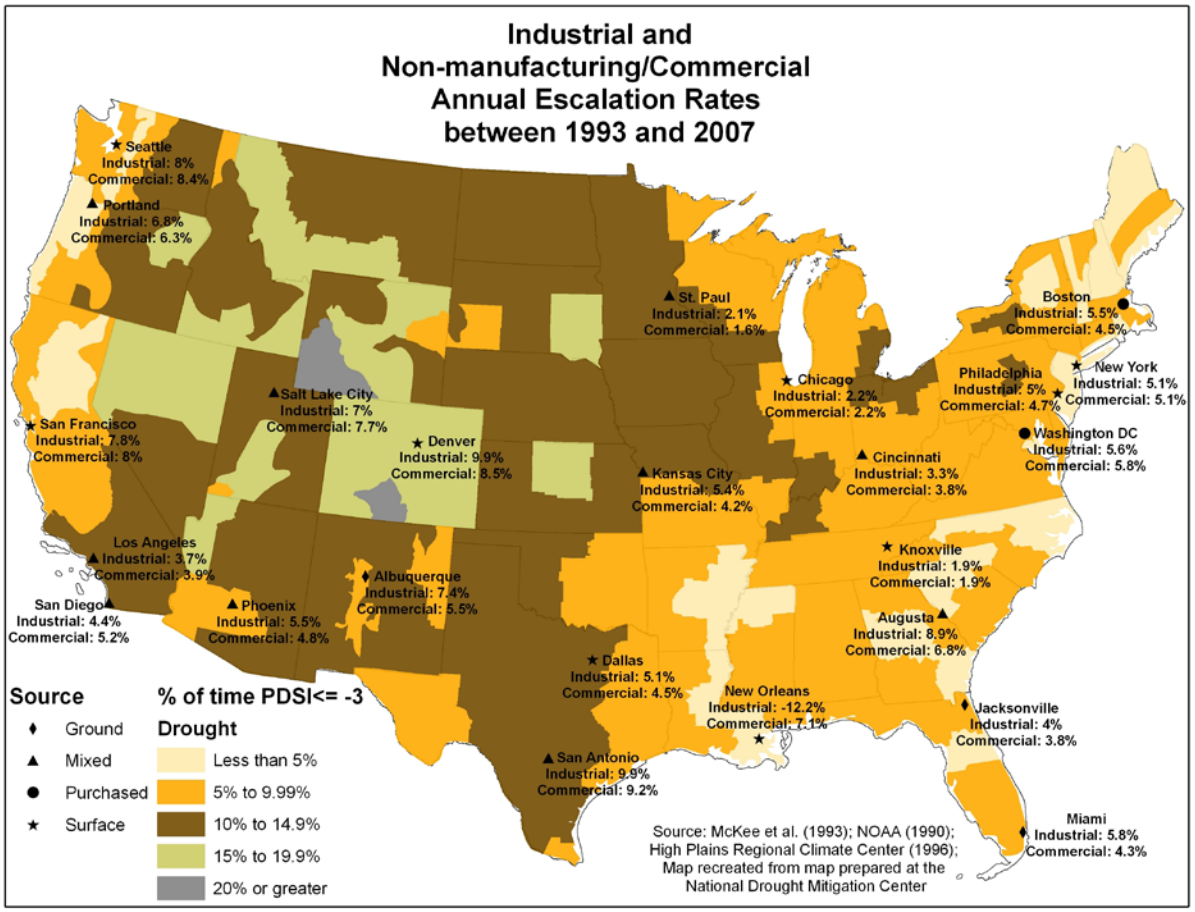

Figure 9: Industrial and Non-manufacturing/Commercial Annual Escalation Rates between 1993 and 2007 overlaid on the Palmer Drought Severity Index Map of 1885 - 1995

Table 2 provides a summary of information for each city; showing region, water source and drought tendency.

Table 2: Summary Table

City	State	Region	Source	Percent of 1895-1995 spent in drought
Phoenix	Arizona	Southwest	Mix of ground and surface waters	5-10
Los Angeles	California	So Cal	Mix of ground, surface, and purchased waters	10-15
San Diego	California	So Cal	Mix of surface and purchased waters	10-15
San Francisco	California	West Coast	Surface waters	5-10
Denver	Colorado	Southwest	Surface waters	15-20
Jacksonville	Florida	Southeast	Ground waters	5-10
Miami	Florida	Tropic	Ground waters	5-10
Augusta	Georgia	Southeast	Mix of ground and surface waters	5-10
Honolulu	Hawaii	Tropic	Mix of ground and surface waters	Unknown
Chicago	Illinois	Midwest	Surface waters	5-10
New Orleans	Louisiana	Southeast	Surface waters	0-5
Boston	Massachusetts	Northeast	Purchased waters	5-10
St. Paul	Minnesota	Midwest	Mix of ground and surface waters	10-15
Kansas City	Missouri	Midwest	Mix of ground and surface waters	10-15
Albuquerque	New Mexico	Southwest	Ground waters	5-10
New York City	New York	Northeast	Surface waters	0-5
Cincinnati	Ohio	Midwest	Mix of ground and surface waters	5-10
Portland	Oregon	West Coast	Mix of ground and surface waters	0-5
Philadelphia	Pennsylvania	Northeast	Surface waters	5-10
Knoxville	Tennessee	Southeast	Surface waters	5-10
Dallas	Texas	Southeast	Surface waters	10-15
San Antonio	Texas	Southeast	Mix of ground and purchased waters	10-15
Salt Lake City	Utah	Southwest	Mix of ground, surface, and purchased waters	10-15
Washington, DC		Northeast	Purchased waters	5-10
Seattle	Washington	West Coast	Surface waters	0-5

Summary:

Based on the historical data gathered from the sampled water rate surveys, several comparisons and interpretations on water cost have been compiled. Looking at trends based on regions, water source, and drought, Federal facilities that are not located in any of the survey cities can make inferences of the possible rate increase at that location. Using the trends from this study, Federal facilities can make informed choices on possible water escalation rates that will assist in perusing cost effective water-efficiency measures.

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