

A Comprehensive Strategy for Improving Water Management in Parks

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ABSTRACT. *As a result of severe budget constraints that jeopardized the health of the City's parks, Colorado Springs Utilities developed a comprehensive water strategy to help maintain a healthier and more sustainable parks system, short and long term. The strategy is a holistic approach to irrigation management that includes: a budget-based rate to encourage efficiency and appropriate management practices; irrigation system evaluations, retrofits, and replacements designed to improve the system's aging infrastructure and incorporate new technologies; and a customized education program that provides the information and tools necessary to ensure effective resource use and initiate a lasting culture of efficiency.*

This paper highlights the key elements and results of the program. It also provides a valuable case study for other irrigators, business, and homeowners.

Keywords. Water conservation, irrigation efficiency, sprinkler retrofit, conservation water rate, irrigation water management, municipal park irrigation, holistic irrigation management

BACKGROUND: The Economic Downturn Hits City Hard

Largely as a result of the economic downturn, 60 miles south of Denver, the citizens of Colorado Springs, experienced severe cuts in basic municipal services which most Americans take for granted. The national media outlets represented Colorado Springs as a poster child of government cutbacks, with reports of brown park grass, dark street lights, shuttered police helicopters and buses sold or on scaled-down schedules.

The deep recession bit into Colorado Springs sales-tax collections forcing drastic budget cuts. The city spent \$19.6 million on parks in 2007, and 3.1 million in 2010.

Through early retirement and layoffs, the City reduced headcount by nearly 200 employees, and refrained from filling public safety jobs from 2007 to 2010. More than a third of the city street lights were shut off.

City recreation centers, indoor and outdoor pools, and a handful of municipally-funded museums closed or found private funding to stay open.

ABC News Anchor Diane Sawyer said in one broadcast, “The parks department removed trash cans (Figure 1), and residents are being asked to bring their own lawnmowers if they want the lawns trimmed in the park, but there may not be much to trim. Water is being cut off to the parks, too.”



Figure 1: P&R staff remove trash can due to budget cuts.

Municipal Entities

Colorado Springs Utilities (Utilities) and the City of Colorado Springs Parks and Recreation and Cultural Services (P&R) are municipally owned yet uniquely funded and operated enterprises; each governed by City Council. More than 50% of Parks funding is a result of sales tax revenues, while Utilities budget is primarily funded by ratepayers.

PROGRAM DEVELOPMENT

At the direction of City Council, Utilities entered into two water conservation pilot programs with P&R on May 1, 2010: the Water Conservation Rate Pilot Program and the Pilot Irrigation Efficiency Program.

The collective program goals are to:

- Provide a short-term solution to keep parks more attractive and healthier under tough budget constraints.
- Make available more water through a budget-based rate structure which encourages proper watering and discourages over watering.
- Implement parks efficiency audits, evaluations, and retrofits that assure long-term sustainability of parks irrigation infrastructure.
- Promote a lasting culture of efficient irrigation management.

The programs were designed as a test over a two-year period with the intent to determine the costs associated with program administration and operations, and to analyze and promote “lessons learned” from these programs with other large potable irrigators.

PART I: Water Conservation Rate Pilot Program

The rate pilot program is a budget-based approach that provides a water allocation for each park according to its irrigated turf acreage and historical weather conditions. Water is priced according to use, relative to the allocation so that reasonable and efficient use is encouraged.

Historically, 24 inches of irrigation water is considered “ideal” to manage a healthy stand of turf in a park setting in Colorado Springs. Prior to implementation of the rate pilot program, the 2010 P&R budget allowed for an average of 12 inches of supplemental irrigation to be applied to parks (Table 1). The 2011 Parks budget allows for 16 inches of supplemental irrigation. Early in 2010, P&R leadership determined that not all parks would receive an identical irrigation allocation. Several high-use and priority parks were identified to receive higher allocation amounts, while other lower priority parks would receive less.

Seasons	2010	2011
# of parks on the rate	132	153
Total park and median acreage covered by rate	725	753
Parks budgeted irrigation	12”	16”

Table 1

Table 1 shows the number and acreage of parks on the Rate, and P&R’s 2010/11 budgeted irrigation amounts for the parks.

The rate pilot program has the following intent:

- Provide a significant short-term financial benefit to P&R for watering within generous parameters, while penalizing excessive use (Figure 2).
- Provide more irrigation water to parks during severely constrained budget years to keep parks greener and healthier.

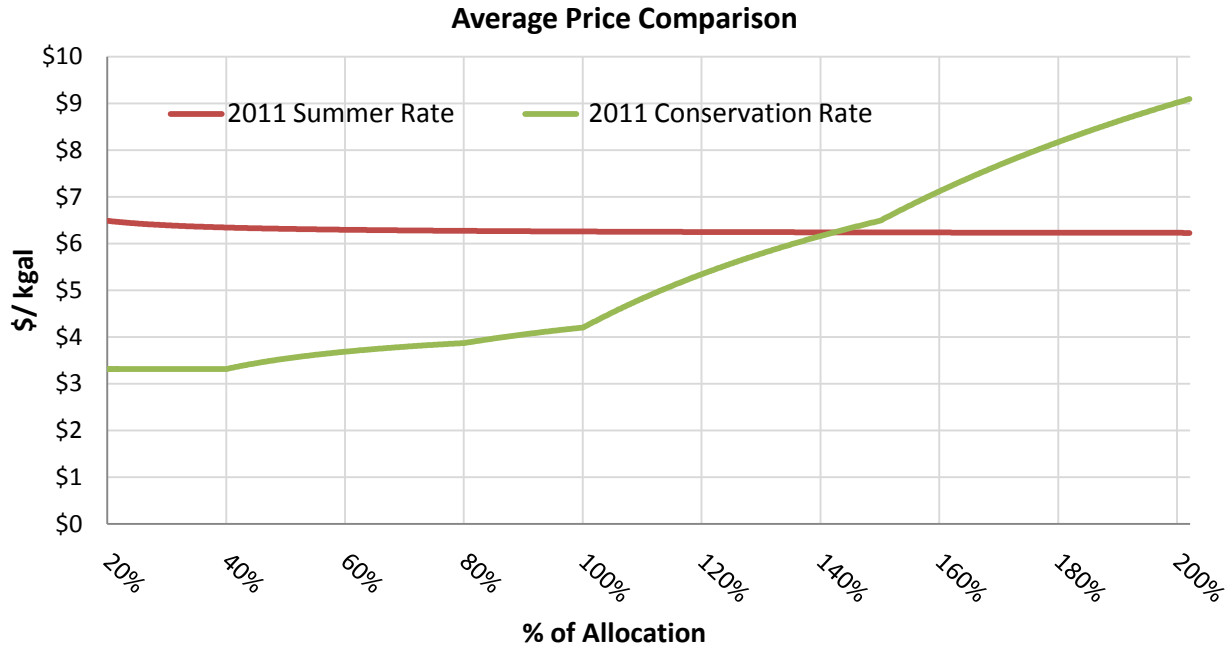


Figure 2: Compares the former P&R summer rate, to the current conservation rate.

Water Conservation Rate Pilot Results

Overall the Water Conservation Rate (Rate) worked as intended. In 2010, P&R was able to apply an average of about 16 inches of supplemental irrigation to parks from May through October. While this is still about a third less than ideal, it is four inches more than would have been possible without the Rate. The results through August of 2011 are slightly better. The parks are on schedule to receive about 17 inches of supplemental irrigation which is about 70% percent of ideal and about 1 inch more than was budgeted for. Overall the program has saved P&R 31%. A complete overview of the pilot results are shown in Table 2.

	2010 Total	2011 Total Through August	Program Total Through August, 2011
# of parks & medians on the rate	132	153	153
Total park and median acreage covered by rate	725	752	752
Total water allocation for participating parks & medians (CF)	65,998,481	51,721,729	169,441,939
Total consumption of participating parks (CF)	41,571,351	36,083,002	113,737,355
Percentage of total water allocation used in parks and medians	63.0%	69.8%	67.1%
Total billed on conservation rate (\$)	\$1,323,281	\$1,109,690	\$3,542,661
Would-be bill without conservation rate (\$)	\$1,760,556	\$1,691,789	\$5,144,134
Parks and Rec savings due to rate (\$)	\$437,275	\$582,099	\$1,601,473
Parks and Rec savings due to rate (%)	24.8%	34.4%	31.1%

Table 2

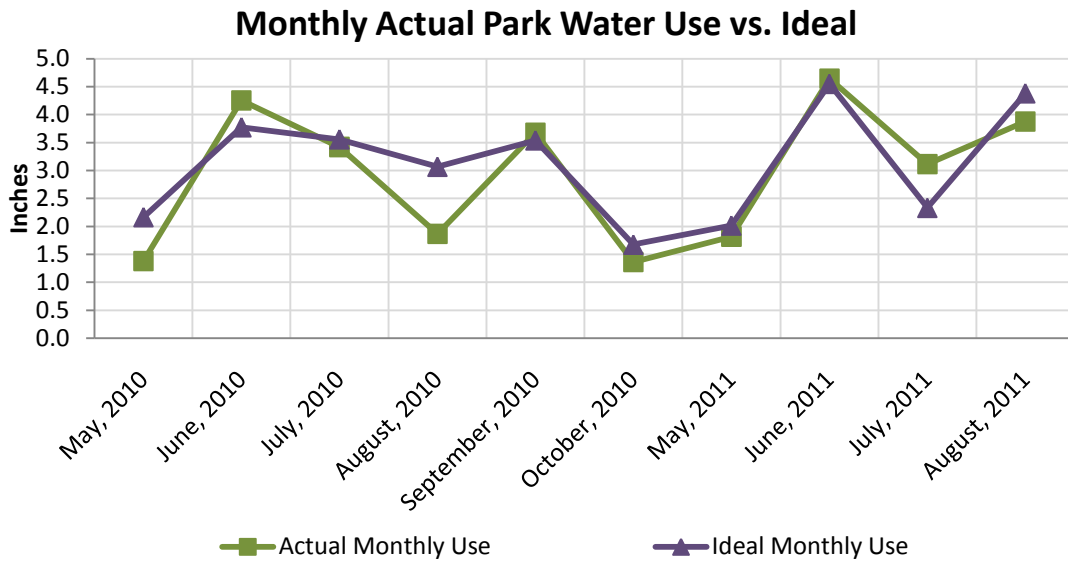


Figure 3

Figure 3 shows average monthly park use compared to what is considered optimal accounting for budget constraints and weather conditions. This figure indicates that Parks irrigated within 20% of ideal in every month but three. May of 2010 was explained by late irrigation start-up, August 2010, was driven by increased budget concern, and July 2011 was likely P&R taking advantage of an increased budget to oversee parks.

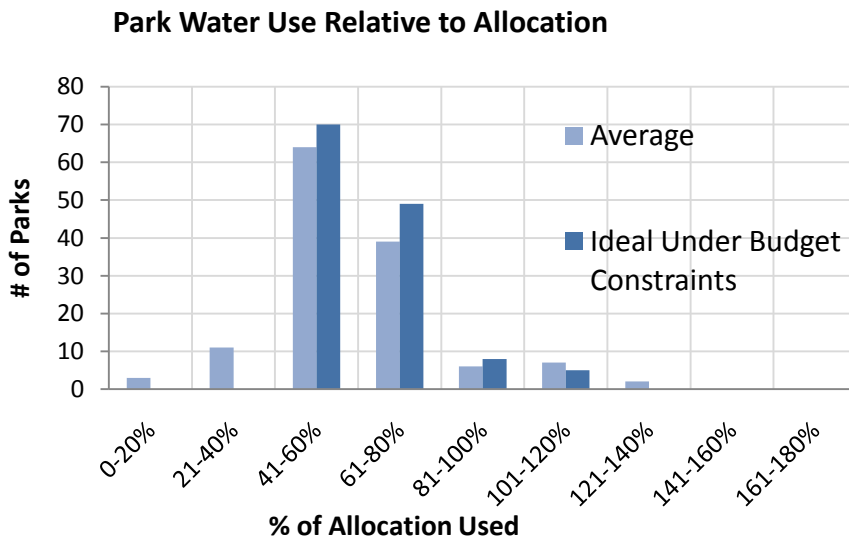


Figure 4

Figure 4 represents the average seasonal park water use distribution relative to assigned allocations for May through October 2010 compared to a theoretical “ideal” distribution given the City’s budget constraints and park watering priorities. This figure indicates that, on average, Parks watered very near ideal ranges in 2010 - which is what the Rate is designed to encourage.

PART II: Parks Efficiency Pilot Program

The Parks Efficiency Pilot Program is a comprehensive program designed to work with P&R to help improve the efficiency of park irrigation systems and initiate a lasting culture of efficiency. Many park irrigation systems are 20-30 years old and have not been updated or maintained for optimal irrigation efficiency.

The program is designed to:

- Conserve water through increased irrigation efficiency
- Allow Parks to take full advantage of the conservation rate
- Help manage limited budget dollars more effectively
- Influence long-term water savings and sustainability of the Park's System
- Encourage efficient irrigation practices and efficiency-oriented culture

Additionally, the program is designed to determine the benefit and potential water savings of a holistic approach to water management, which in turn, provides better informed water management decisions for both P&R and our community.

Efficiency Program Implementation

The services of a full-time Irrigation Specialist, four part-time staff, and five area contractors work in cooperation with Parks staff to identify areas that provide the greatest water and dollar savings potential.

A combined 2010/11 program budget of \$700,000 has been fully utilized the last two seasons to complete a variety of work (Table 3), ranging from park evaluations, audits, and rain sensor installation (Figure 5), to full irrigation system replacements (Figure 6).

2010-2011 Parks Efficiency Program Summary			
Work Performed	2010 Season	2011 Season (Through Aug.)	Program Total (Through Aug. 2011)
Evaluations	43	13	56
Audits	39	21	60
Park Retrofit/Replacements	(20) parks - 91 acres	(13) parks - 48 acres	33 parks - 139 acres
Rain sensors installed	35	77	112
Controllers installed	14	2	16
Pressure regulators installed	14	3	17
Remote control adapters	4	170	174
Irrigation system designs	4	1	5

Table 3 lists the majority of the work completed from May 2010 through August 2011



Figure 5: Rain sensor installation



Figure 6: Installation of new irrigation system

Irrigation system audits (Figure 7) are performed prior to and following system retrofits (Figure 8) and replacements. The results of these audits show significant improvement in overall irrigation system uniformity resulting from retrofits and system replacements (Table 4).



Figure 7: Irrigation audit



Figure 8 shows old impact sprinkler being replaced with new more efficient sprinkler.

Park Efficiency Pilot Results

Parks Efficiency Pilot Program Retrofit Results	
Average irrigation uniformity prior to retrofit	59%
Average irrigation uniformity following retrofit	77%
Total acres retrofitted	139
Total cost per acre retrofitted	\$2,926
Estimated year-one year return on investment	39%
Estimated annual CF allocation for retrofitted parks	12,956,335
Estimated year-one CF savings	\$4,726,234
Total retrofit cost	\$406,792
Estimated overall savings potential	36%
Estimated five-year dollar savings	\$571,939
Estimated project payback period (years)	2.97
Estimated 5-year return on investment	141%

Table 4

Table 4 shows that retrofits and replacements result in an average increase in uniformity of nearly 20%. The addition of a rain sensor brings water and monetary savings potential to 36%. Fully utilized, these savings lead to an average project payback of about three irrigation seasons (an estimated annual water savings decrease of 20% is assumed in these results and can be mitigated by ongoing system maintenance). Water savings results are theoretical, and only will be realized through the promotion of a lasting “culture of efficiency.”

LESSONS LEARNED: Parks Efficiency - Creating a Culture of Efficiency

To realize consistent water/monetary savings from this program requires an ongoing commitment and investment to a culture of efficiency. The potential 36% savings from retrofits and replacements are largely a function of system operation which is dependent on the following comprehensive factors:

- **Leadership Buy-in** is key to any successful organizational initiative. Leaders are likely more willing to invest time, energy, and the necessary resources if they understand and accept the potential benefits of a program, including long-term economic value.

- Regular **irrigation system maintenance** is essential to efficient water use and water savings. Routine system checks and maintenance are necessary for optimum efficiency and reliable irrigation delivery.
- **Proper scheduling** perhaps offers the greatest opportunity for water savings. Its purpose is to maximize irrigation efficiencies by applying the appropriate amount of water needed to replenish the soil moisture to the desired level without waste.
- **Adequate funding** is necessary to allocate personnel appropriately and provide other necessary resources.
- Irrigation efficiency is improved when pursued in conjunction with a comprehensive **turf maintenance program**.
- The use of **new technology** improves the ability to manage water, labor and energy more efficiently.
- Providing **training for employees** (Figure 9) helps develop their skills and knowledge, and is also a motivational building block to organizational success.
- Finally, culture change begins and ends with **individual accountability**. Staff must be accountable for efficient and effective water use.



Figure 9 an off-season training program for P&R staff. Staff training is a critical component of the Parks Efficiency Program.

SUMMARY

The Water Conservation Rate Pilot Program met its goal of providing an average annual financial benefit of \$500,000, and 25-30% more water to neighborhood parks. The program has helped keep city parks greener and healthier. And, the increased price for water in the highest tiers of use helped decrease previous over-watering by nearly an average of 40%. The true conservation potential of this rate structure is yet to be evaluated - analysis over a longer period of time and the absence of significant budget constraints would assure reliable results.

The Parks Efficiency Pilot Program has the potential to save P&R water and money far into the future. Efficiency upgrades and improved uniformity achieved from irrigation system retrofits and replacements indicate the potential for an average payback of three irrigation seasons. Program findings will help P&R and other customers make better-informed water decisions now and in the future. Looking forward, much of the success of this program depends upon the extent to which P&R staff embrace and commit to a long-term cultural change in water conservation and improved water management practices. With such a change, a long-term future of sustainable healthy parks system is assured.

The recent economic downturn in Colorado Springs provided an opportunity for the City to get creative to find ways to help bridge the economic gap while maintaining and restoring basic services. The resulting Parks Rate and Parks Efficiency Pilot programs indicate that a comprehensive and proactive approach to park water management can provide a tremendous benefit to both P&R and the community.

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