Water Efficient Irrigation Study
Final Report

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The Saving Water Partnership

A Coalition of Water Purveyors in the Puget Sound Region that Sponsor Cost Effective Water Conservation Efforts to Extend the Existing Water Supply

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EXECUTIVE SUMMARY

The purpose of the Water Efficient Irrigation Study was to determine whether state-of-the-art irrigation devices and related practices could save water compared to conventional automatic irrigation approaches. Conventional automatic controllers for in-ground irrigation systems can be major contributors to inefficient watering because they are often set to water on a constant schedule, instead of being adjusted to reflect daily or seasonal weather changes. The study was conducted in 2002 to test the savings potential and customer satisfaction of the following devices and practices:

- An irrigation controller programmed to adjust to historical evapotranspiration rates combined with a rain sensor (ET controller and sensor)
- A wireless and hardwired rain sensor
- The controller without a rain sensor (ET controller)
- An irrigation scheduling service

	# of Participants	Average Gallons saved per year per customer	Savings Life	Costs (includes inflated program admin costs of $100)	Highest Cost effective level[1]	Confidence Level
ET Controller and Sensor	20	20,735	10	$700.00	$880.00	87.7%
Rain Sensor – Wireless	21	Inconclusive	10	$370.00	Inconclusive	Inconclusive
Rain Sensor – Hardwired	27	Inconclusive	10	$370.00	Inconclusive	Inconclusive
ET Controller	15	10,071	10	$425.00	$425.00	50.4%
Irrigation Scheduling Service	23	14,119	2	$325.00	$130.00	75.4%

Participant selection was based on a customer's potential to save water. The study participants (including controls) used an average of 375 gallons per day during the peak season above their average daily winter use and are considered very high users. Historical consumption of participants and controls between 1998 and 2001 was used with meter read data for evaluation.[2] Each participant and control had their meter read three times (once before the measure was installed, and twice after) to provide more data for evaluation and to eliminate waiting until the following year's irrigation season had passed to perform the evaluation.

The effects of weather on the study results varied by measure. During the irrigation season of 2002, precipitation rates were only 53% of the historical average. May through July started the season off relatively normal, but August only received .04 inches compared to the average of 1.02 inches. Temperatures were normal for this time of year, but from August to November it rained 59% less than normal. The dry weather particularly affected the test of the rain sensors which, in order to save water, must have rain.

The study revealed average water savings of up to 20,735 gallons or 27.7 CCF per account for the irrigation season from installing the ET controller and sensor. Of the devices, the ET controller and sensor had the strongest effect on reducing consumption, with the highest

[1] The value of the water saved over the life of the measure is greater than the total cost of the measure, including measure delivery, program and installation cost.
[2] Impact of Irrigation Devices on Water Consumption. Seattle Public Utilities, Forecasting and Evaluation Section. Tiva Brown, May 1, 2003.

confidence level. Though an ET controller does not alter irrigation runtimes with real-time weather data, an accompanying rain sensor can provide the necessary input to more closely follow daily weather changes. The 20 participants who received the controller with a rain sensor saved 414,691 gallons or 554 CCF combined. This high level of water savings was possible because these customers had a high savings potential.

Due to the lack of precipitation during the 2002 irrigation season, it was not a good year to test rain sensors. However, a theoretical analysis designed to compare how often a conventional controller, set to run every three days, would be running when it has rain over ¼ inch in a normal year, shows that rain sensors could potentially reduce watering by 20%.

The ET controller tested without a rain sensor produced water savings, but the analysis was not conclusive about whether the water savings were due to the installation of the controller or other factors. It's interesting to note that the ET controller and sensor produced a lot more savings than the ET controller alone, when the sensor alone seemed to have no impact on water savings. One possible reason the devices combined produced more savings may be because this particular controller has a 24 hour rain delay, which keeps the controller from coming back on for 24 hours after the sensor signals it to stop. If the sensor was set low at a 1/8 inch and easily triggered by rain or humidity, the ET controller could continue to be off over many days and consequently use less water. Sensors tend to reflect a landscape's water needs better if they are set between ¼ to 1 inch.

The irrigation scheduling service was designed to test the potential for water savings from providing a customer with recommended irrigation run times for each month of the irrigation season. Customers were given an irrigation schedule by a professional irrigation contractor for each month and asked to manually adjust their conventional controllers. No prompts were given throughout the season. This measure produced significant water savings, but compared to the costs is not a cost-effective alternative. The reason it is not cost-effective is because the estimated savings life is only two years. The most beneficial feature of the ET controller and sensor compared to the irrigation scheduling service is that it works automatically. Asking customers to adjust their irrigation run times weekly or monthly without using prompts is not an affective alternative to automatic run time adjustments.

The potential impact of utilizing the ET controller and sensor are great. In Seattle and purveyor service areas there are about 315,000 single-family accounts and approximately 15-20% have in-ground automatic irrigation systems. Of the 315,000 customers, 5% or about 15,750 customers, have a total peak differential[3] of over 44,880 gallons or 60 CCF. About 50% of those customers have automatic irrigation systems. If the estimated 7875 customers, who have the 44,880 gallon differential and an automatic irrigation system, installed the ET controller and sensor, the Saving Water Partnership could potentially save 1.2 million gallons per day or 3 billion gallons during the peak season.

[3] The total peak differential is the total amount of water used from May 15 – September 15 (123 days) above the average winter use. Average winter use is considered "indoor" use and constant throughout the year, so increases during the peak season are labeled "outdoor" or irrigation use.

WATER EFFICIENT IRRIGATION STUDY
DESIGN AND IMPLEMENTATION

Overview

In the summer of 2002, the Saving Water Partnership (SWP)[4] designed and implemented the Water Efficient Irrigation Study. Improving the efficiency of irrigation scheduling has been identified as an important strategy in reaching the 18 MGD regional water savings goal for 2010 as outlined in the SWP's 1% Conservation Program plan. The 1% savings goal was based on the conservation measures identified in the 1998 Conservation Potential Assessment (CPA), which assessed the potential of water conservation measures that could be implemented without any impact to service or customer satisfaction.

This research focused on four of the more promising types of irrigation scheduling changes. The goals of the research study were:

1) To quantify water savings resulting from four types of watering schedule changes for 106 existing single family homeowners with in-ground irrigation systems;
2) To evaluate the costs, implementation barriers, customer responses, and related issues for each of the four scheduling methods; and
3) To develop recommendations for improving customer irrigation scheduling.

The study analyzed the water saving potential of adjusting irrigation[5] schedules with system devices or manual programs for single-family residential customers with high peak season use.[6] Peak season water uses are targeted for two reasons: typically this region has the least amount of supply during the time of year demand is at its highest, and infrastructure capacity is designed to meet only peak season demand. If demand increases past capacity, the utility would be forced to build additional costly infrastructure and find new sources of water.

The SWP provides financial incentives for measures that are cost-effective when compared to more traditional water supply options. This means the value of the water saved over the life a measure must be greater than the total cost of the measure, including measure delivery, program, and installation costs.

Opportunities to use water more efficiently in the landscape are varied and in many cases a combination of behaviors and technical problems lead to inefficiencies. For example, most conventional automatic irrigation system controllers are only programmed once a year for the hottest and driest time of the year, even though the weather and the amount of water plants need changes throughout the season.

Creating a good watering schedule for a plant is based on the plant's water needs, the water holding ability of the soil, and the precipitation rate of the irrigation heads in each zone. Any

[4] Seattle Public Utilities and 23 local water providers
[5] "Irrigation" refers to underground watering systems connected to controllers, programmed to automatically turn zones on and off according to a set schedule.
[6] Customers were selected to participate if their average peak use was 60 CCF or 375 gallons per day over their average winter use. Peak season is considered May 15 – September 15 (123 days).

water applied that doesn't reach or runs past the plants root zone, or runs off the soil is wasted. The base irrigation schedule created using the plant-soil-precipitation rate is very important for efficient irrigation, but requires expertise most homeowners and landscape maintenance staff lack. However, adjusting *any* irrigation schedule as the weather changes can achieve considerable water savings. New irrigation technologies that automatically adjust watering schedules to weather data have the potential to reduce peak season water use without affecting the health or appearance of a landscape. In fact, a plant's health would improve if it were only getting the water it needed.

Two types of mechanical conservation measures were considered desirable for testing. Initial technical review and recommendations of new irrigation technologies with self-adjusting capabilities concluded that a controller, which adjusts according to historical evapotranspiration (ET)[7] and a rain sensor, would be suitable for testing.[8]

Another type of conservation measure was select for the study. In order to determine whether customers would adjust their irrigation schedule on their own without a prompt, an irrigation scheduling service was designed. Customers were asked to manually adjust their conventional controllers on a monthly basis, after a professional irrigation specialist audited their system and produced recommendations for monthly run times.

There were a couple of reasons for testing devices in a residential setting, rather than commercial or public. First, most residential customers don't regularly adjust their irrigation schedules to reflect seasonal changes, therefore watering more than necessary in the cooler and wetter months of the irrigation season. Second, finding groups of customers with similar household characteristics and consumption patterns is much easier in the residential sector. Using a similar control to compare to the participant is the basis for valid research. Thirdly, this sector's water use during peak season increases by 30%.

There are an estimated 47,000-63,000 residential customers with irrigation systems in the SWP service territories. 80% of the increase that occurs during the peak season comes from the residential sector. An implicit benefit from testing residences is that the savings results could be applied to a more difficult group to test—small commercial and retail. Though small commercial and retail makes up a much smaller percentage of total water being used during peak, it tends to get much more savings per customer than residential.

Water efficiency upgrades to irrigation systems have the potential to save water without a negative impact to the customer or their valuable landscapes. If the measures save enough water to be cost-effective to install, the SWP may decide to establish a program that would encourage implementation among appropriate customers.

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[7] ET is the rate at which water evaporates from the soil and transpires through the plant; ET is the amount of water that must be replaced either through precipitation or irrigation.
[8] Landscape Irrigation Control Conservation Devices Pilot, Potential Customer Selection and Device Installation Scenarios, and Residential 1% Landscape Product Assessment: Recommended Secondary Trials, Technical Product Field Test, Saving Water Partnership. Stenn Design, January, 2002.

Automatic Irrigation Systems and Plant Water Needs

Automatic irrigation systems are responsible for significant water use in both commercial and residential settings. While automatic irrigation systems can reduce labor costs, they often increase resource costs. In the best of cases, the maximum total efficiency of an irrigation system is only about 70%. This means that, of the water that comes out of the heads, no more than 70% makes it to the plant's root zone. At least 30% and more often over 50% of the water applied is lost to a wide variety of factors including wind, evaporation, the system's design and how it was installed, maintained and scheduled to run. It is common for a single system to have problems with all these factors.

Of the factors that lead to inefficient irrigation, scheduling is one of the most prominent. During a recent focus group[9] about automatic irrigation systems, participants were asked how they developed an irrigation schedule. When pushed to describe the methodology, including exactly how they determine the number of minutes and days per week, none were able to provide any detail about how they calculate their schedules. Efficient irrigation scheduling is best done by a professional who is experienced with irrigation systems and their components, plus knowledgeable about site-specific conditions, such as soil types, and plant water needs.

Plants need the amount of water that is lost through ET and ET needs vary with plant type. Historically, the irrigation season in the Pacific Northwest is May through September, with a small amount of water needed in October. July and August are the months of highest ET, with water needs in May, June or September amounting to less than half the water needed in July or August.

In order for efficient watering to occur, the system must be programmed to apply the amount of water <u>needed</u> – which as explained above is the amount of ET replacement – in an even distribution pattern. This involves at least approximate tracking of the weather (actual ET is calculated according to five weather-related variables, including temperature, wind speed, solar radiation)**.** The plant root zone must also <u>receive</u> the water applied. If water is applied mid-day, for example, or if soil is compacted or heavy, much of the water applied may evaporate before it reaches the roots, or even the soil surface.

Often, a system is turned on at the first sign of good weather and turned off again when fall rains begin, with the irrigation schedule unchanged during this time. In such cases, much of the water applied during the "shoulder" months of May or June and September would be wasted since the base watering schedule is usually set to what is needed to keep the landscape green during the hottest summer weather. Similarly, if the water distribution pattern is not uniform, the entire landscape may be over-watered to ensure no brown spots occur in problem areas in the lawn.

Customer Selection

Customers were identified and targeted for invitations to participate in the study with the help of Seattle Public Utilities' (SPU) WaterBIRD database, which tracks customer water consumption. First, outdoor water consumption was estimated by subtracting average daily winter[10] use from average daily peak (May 15-September15) season use for all SPU residential customers, then

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[9] High Water User Focus Groups Barriers and Benefits Analysis Research, Saving Water Partnership. Dethman & Tangora LLC, January 14, 2003.

[10] November 15 – March 15

selected those that had fairly consistent high outdoor water consumption for the previous four years. It was estimated that customers who use an average 375 gallons per day above their normal indoor use over the 123 day peak season (estimated 61.6 CCF differential for the season) had the potential to save enough water to justify the estimated cost of scheduling method. The premise being that regardless of the type of scheduling method, it must ultimately be cost-effective.

This produced a list of about 2,000 customers. Half of these customers were invited to participate in the study and the other half would be used to select controls. To qualify, customers were required to have an automatic in-ground irrigation system. Factors that would disqualify a customer included manual use of the irrigation system, homes with swimming pools, fountains or other water features, and a change in the number of residents living in the home over the last 4 years or during the summer of 2002.

Each qualified participant was matched to three controls with similar attributes; these included quantity of peak season consumption, lot size, and geographical proximity. Of the three controls selected, each was contacted until one met the same qualifying criteria used to select participants. The controls were only told that the information being collected would be used to determine the need for customer service programs and not that they would be used as controls in a study.

Initially, 110 participants were chosen to participant in the study, but problems that occurred during installation required changes that resulted in fewer participants for some measures and more for others.

Participation Totals

	Participants
ET controller and sensor	20
Rain Sensor - Hardwired	27
Rain Sensor - Wireless	21
ET controller	15
Irrigation scheduling service	23
Totals	**106**

Devices and Services Provided

Each participant was assigned one of five scheduling methods. The measures were implemented or installed by a professional irrigation contractor. Twenty-seven customers got a hardwired *MiniClicks* rain sensor, which interrupts the irrigation schedule when it has rained a preset amount. Twenty-one customers got a wireless *Hunter* rain sensor, similar in function to the MiniClicks. Fifteen customers received the *Aqua Conserve controller without a rain sensor,* an irrigation controller that automatically adjusts the base watering schedule according to historical weather information for the Puget Sound area. Twenty customers received the *Aqua Conserve controller with a rain sensor*, which combines the ET controller and sensor. Rather than a device, 23 customers were given a customized irrigation schedule by a professional irrigation contractor and asked to make manual monthly scheduling changes as per instructions from the contractor.

Description of Installation and Services

Customers were assigned one of the five measures depending on their system design and age, with adjustments made to accommodate specific circumstances. For example, customers with many irrigation zones were assigned rain sensors because the scheduling service and controller installation is more expensive as the number of zones rises. Also, customers with new controllers were less likely to want to replace their controllers. The following is a list of the measures and a description of the installation and service:

- *ET controller and sensor*: Install and adjust scheduling for each zone and set sensor to appropriate amount.
- *Sensors:* Install and set sensor to appropriate amount, make no recommendations for scheduling.
- *ET controller*: Install and adjust scheduling for each zone.
- *Irrigation Scheduling Service:* Adjust scheduling for each zone and collect information to develop an annual irrigation schedule. Customer sent hard copy of irrigation schedule to manually adjust throughout the season.

Study Schedule - 2002

May 3	• Potential participants and controls identified. • Customer Service notified about the study and sent the invitation letter and information about the process.
May 6	• 1100 letters mailed to customers inviting participation. • Interested customers called in and were screened for eligibility. Depending on their situation, customers were assigned a measure.
May 6 – Mid-June	• Qualified customers assigned devices and scheduled for installation. • Customers sent Participation Agreement and study description. • Controls matched to participants.
Mid June	• Meters read of participants and controls. If the reader couldn't find the meter or the site turned out not to be single family residential, then another control was selected and meter read.
June 1 - June 15	• Devises installed. • Irrigation consultant given the list of names to call to schedule the installation of the devices and the irrigation scheduling. • Estimated maximum installation time at 4 hours to install and adjust scheduling.
Mid summer	• Meters read.
End of season	• Meters read.
November 2	• Customer satisfaction survey conducted.
December	• Evaluation of meter reads and satisfaction survey.
January – March 2003	• Study reporting.

Customer Satisfaction Survey

As part of the research effort, analyzing the participants' satisfaction with the device or service provided insight into how a program might be designed to best meet the needs of our customers. 102 surveys were returned by customers and used to develop the Survey Report. The survey included a group of questions all participants were asked. They included: how satisfied they were with the study and the contractor, whether their water-use patterns had changed because of non-study reasons, what they learned, and how the study could be improved. Each group of customers was also asked specific questions tailored for the device(s) or service they received.

Description of Evaluation

In addition to the comparison between the participant and control, a linear regression analysis was performed on the data by comparing the participant and control's historical (1998-2001) summer consumption to their 2002 (the study year) consumption. The historical analysis gave the most recent data context, but also brought in factors of seasonal weather changes and drought. The dependent variable analyzed in this evaluation was average daily water consumption during the summer season (CCF/DAY). The 2002 summer consumption data was collected by special meter reads taken specifically for this study. The period analyzed for the 2002 consumption was slightly different from the May 15 – September peak season. The first reads were taken around June 8 and the final reads were taken October 18.

Historical consumption of participants and controls was also included for the 1998 and 2001 peak season. This number was calculated by prorating consumption for June 8 – October 18 using the billing data available. Single family residential accounts are typically billed (and therefore their meters are read) every two months. The prorated consumption calculation, consequently, was influenced by consumption on the shoulders of this period.

Using a combination of seasonal temperature and rainfall for the region, a weather index was developed to account for demand shifts due to weather. Dummy variables were created for each study measure, applied to all years for both participants and control customers. These measure dummies were applied to the control customers based on the measure applied to their matched participant. The purpose of these dummies was to distinguish differences between the groups that were selected for each measure. They also measure the previously existing differences in consumption between the control group and participants, which varied significantly by measure. Measure implementation dummy variables were applied to participants for the year 2002. Finally, dummy variables were created for the years 2001 and 2002. The primary reason these variables were necessary was to account for the effect of the 2001 drought. Drought messaging significantly dropped overall consumption in 2001 and the effect appears to have carried over to 2002. Another dummy variable was created for control customers in 2002, to check the interaction between the control group and the year 2002.

SUMMARY OF STUDY RESULTS:

Customer Satisfaction Survey, Lessons Learned from Consultant (Contractor) and Costs

Overall reasons customers participated in the study were to reduce their water bills and use water more efficiently.

Device Costs and Savings Potential

	Peak ratio	Measure savings Life	Costs (includes inflated program admin costs of $100)	Gallons per year savings per customer	Highest cost effective dollar amount compared to actual measure savings	Lowest possible cost-effective savings for actual program costs (gallons per year)
ET Controller and Sensor	2.77	10	$700.00	20,735	$880.00	17,000
Rain Sensors (Wireless and Hardwired)	2.77	10	$370.00	Inconclusive	Inconclusive	Inconclusive
ET Controller	2.77	10	$425.00	10,071	$425.00	10,000
Irrigation Scheduling Service	2.77	2	$325.00	14,119	$130.00	3,100

ET Controller and Sensor:

<u>Data and costs:</u>

- This measure had the most savings with about 20,735 gallons per year or 27.7 CCF per year.
- With this amount of savings it would be cost effective to spend up to $880.
- Device and labor costs (without study costs): $600

<u>Overall satisfaction: Important responses to general questions</u>

Most customers were either very satisfied or somewhat satisfied with their participation in the study because they felt the equipment worked and was more convenient. Of those who were not satisfied in the study it was because they cited their landscapes or lawns turned brown or the equipment didn’t work. A greater number than for the other devices reported learning about how much water their landscape needs and how to use less water, and that they could use less water. However, more felt that the system wasn’t easier to manage.

<u>Measure specific questions</u>

Controller

Most were satisfied with the controller. About a third thought the equipment worked well and was more convenient, while almost half found the equipment hard to operate or that the equipment didn’t work. Overall participants were positive about the characteristics of the controller. Most customers didn’t adjust the controller’s schedule, but of those that did it was to reduce watering because of rain or to use more water because it was dry.

Rain Sensor
Most people were satisfied with their rain sensor because the equipment worked, but many felt that there wasn't much rain for testing. A few said that the device didn't work. No participants reported adjusting the setting on the sensor but about 20% said they used the override button to increase the amount of water their landscape was getting.

People were more often just as satisfied with their landscape after they participated than before, though about 10% were more satisfied and 15% were less satisfied.

<u>Consultant's comments: Important lessons learned about the ET controller and sensor:</u>
Controller
- # of controllers increased installation time.
- Controller required a 110VAC plug-in within 6' of controller location or had to run extension cord.
- Equipment and installation time increased when mounted to masonry surfaces.
- Not enough amps for valves-needed more than .5 amp in many instances. Didn't know until controller was mounted and running the test. If solenoid draw was in excess of .5 amps got a fuse error message, and had to remove controller and reinstall original controller.
- Because the display was not back-lit it was hard to see in dark areas.
- People were intimidated by electronic controls.
- Needed to have a protective box or area for exterior mounted controllers.
- One station space is taken if there is a master valve and/or a pump but most homes did not have a pump or master valve.
- Need to understand better how % ET adjusts the base schedules; frequency of change and how % adjustment affects runtimes.
- The controller has a 24-hour delay after rain sensor is activated. This caused some problems if the sensor was set to 1/8 of an inch because sometimes you would have days with enough moisture to activate the sensor and cause the controller to remain off for days.
- Needed a jumper (included with controller) in the sensor location on the terminal strip if a sensor was not used.
- The controller's manual didn't have all info needed for trouble shooting; some people had trouble finding info on programming.
- Terminal strips were undersized for heavier wire, so the installer had to convert to a smaller dial wire and bundle splices on outside of controller.
- Communicating controller programming was an issue; some people didn't understand the automatic weather adjustment concept.
- Spring-loaded terminal strips could be stretched out when using larger wire.
- Wiring not easy with design of box, not much room, tight space to work in.

Rain Sensor – See Important Lessons Learned about Rain Sensors below

Rain Sensors:
<u>Data and costs:</u>
- Lack of rainfall made 2002 a poor year to test rain sensors.

- The average cost of installing a sensor for these customers was about $270. The higher cost may be due to the trouble the contractor had with assessing which kind of sensor to use during installation and location of controllers.
- Device and labor costs (without study costs): $270

<u>Overall satisfaction: Important responses to general questions</u>
The rain sensor participants were mostly satisfied with their involvement in the study even though the irrigation season of 2002 was abnormally dry and consequently not a very good year for testing a rain shutoff device. It was about 50/50 on whether they gained any information from the installation of the sensor about irrigation efficiency. About a third of the participants wanted more information on how to use the equipment. About half of the participants reported having higher water bills during the testing year, which could be an effect of the hot dry summer that continued late into fall.

<u>Measure specific questions</u>
Overall satisfaction with the rain sensor was not very high. Many of the negative responses were probably due to the poor year for testing the rain sensor, but some customers felt that the sensor didn't work at all. Participants didn't adjust the settings on the sensors but some did override the sensor to increase the amount of water their landscape was getting. More may have done this, but the hardwired sensor didn't have a by-pass switch, which would allow the customer to manually override the triggered rain sensor. Most people were as satisfied with their landscape's appearance as they were before they participated.

<u>Consultant's comments: Important lessons learned about rain sensors:</u>
Wireless Observations
- Some wireless sensors had signal problems if there was something dense enough to block single in path to receiver.
- Wireless had to be installed in the controller before it could be tested to be sure signal could reach receiver, if it didn't you were far into installation and had to remove the previously installed equipment.
- Sometimes even after it was tested the signal wasn't strong enough or would be intermittent; some would go out or perform sporadically after you left.
- Masonry or metal walls and roofs made signal communication difficult for wireless.
- Receiver was not waterproof so need to be mounted indoors or inside a NEMA4 cabinet.
- Wireless rain sensors allowed more customers to participate and cut down on the need to find new contact and controls.

Hardwired Observations
- If the sensor could be hardwired, it was more reliable, less confusing for the customer.
- Drawbacks include the wire's length and attachment of wires to house.
- Some surfaces such as masonry or metal were difficult to attach wires to.
- House overhangs and plants made locating the sensor difficult.
- Siting the device could be difficult sometimes because the controller might be closer to an area that has a harsh environment or a mild one.

- It was difficult to find the best setting for sensor and depends on many variables; the contractor's experience was critical in finding the right location and installation of the sensor in a reasonable amount of time.
- Rain sensors should have a by-pass switch with the installation.
- Though few were encountered, installation of rain sensors on exterior mounted controllers would have been easier because of difficulties associated with running wire.

ET Controller:

<u>Data and costs:</u>

- Water savings were estimated at about 10,071 gallons or 13.46 CCF per year.
- With this amount of savings it would be cost effective to spend up to $425.
- Device and labor costs (without study costs): $325

<u>Overall satisfaction: Important responses to general questions</u>

About two-thirds of the customers who received the controller were satisfied with their involvement in the study. It was about 50/50 on whether they gained any information from the installation of the sensor about irrigation efficiency. About a 40% of the participants wanted more information on how to use the equipment and 25% thought the controller needed more features. 40% said their bill was higher, 25% lower and 33% about the same. About half of the participants reported higher water bills this year, which may be caused by the hot dry summer that continued late into fall.

<u>Measure specific questions</u>

Overall satisfaction with the controller was high for the relatively small group. They thought the equipment worked well and made adjusting their schedules easier. It was about split on rating the controller attributes. More people didn't adjust their controller than those that did. Participants were more often equally satisfied with the appearance of their landscape during the study.

<u>Consultant's comments: Important lessons learned about the ET controller</u>

See- Important Lessons Learned about the Controller with a rain sensor, "Controller" above.

Irrigation Scheduling Service:

<u>Data and costs:</u>

- This measure had the second highest level of savings, with about 14,119 gallons per year or 18.87 CCF per year.
- With this amount of savings it would be cost effective to spend up to $130.
- Device and labor costs (without study costs): $225

<u>Overall satisfaction: Important responses to general questions</u>

Overall satisfaction was not exceptionally high with this measure. About 10 participants felt that the advice didn't work, but most were satisfied with the contractor. Though, compared to the other measurers, a higher percentage felt that they learned more about how much water their landscape needed and they learned how to use less water, they didn't feel their irrigation system was easier to use. Many felt that more help with implementing the recommendation would improve the service or adding new technology that automatically adjusted would be better. No one's household size increased but a few had leaks during the study. Just under 45% thought their summer water use increased, 17% said their use decreased and 40% said their use stayed the same. People felt that one of the main reasons their use increased was because of less rain. Of those that had their use decrease, they felt it was because of the scheduling changes.

Measure specific questions

Though most participants reported receiving their customized irrigation schedule in the mail, only about half actually used it to adjust their watering times throughout the summer. Of those that did adjust their schedules, many of them did it more than once.

About two-thirds had some satisfaction with the customized schedule but of those that were not satisfied they stated it was because the schedule didn't work. Most said it was easy to adjust their schedule with the new customized one. No one was more satisfied with their landscape than before they participated and quite a few were less satisfied.

Consultant's comments: Important lessons learned about the Irrigation Scheduling Service

- Applied an average of typical precipitation rate and distribution uniformity (DU) coefficient by looking at the system because there wasn't enough time to go through all zones.
- Many single zones had both turf and shrubs, therefore shrubs and grass were watered pretty much the same.
- It was critical that the contractor be able to assess the control features.
- It was difficult to do a thorough scheduling job if the customer didn't have multiple start times.
- This was pretty easy, just a matter of assessing site and equipment.
- Performing a catchment test to determine distribution uniformity would have provided more precise information but the primary goal was educating people on how weather, soils, irrigation system performance and plant characteristics influenced irrigation run times.

RELATED RESEARCH: IRRIGATION SYSTEMS

Barriers Analysis[11]

In an effort to gain insight into some of the reasons behind behaviors that lead to over-watering, SWP conducted six focus groups. Two of the groups focused on issues related to having automatic irrigation systems.

Key findings from the barriers analysis revealed: not many participants had rain shut-off devices or seasonally adjust their irrigation scheduling; many were unaware of how much water their landscape needs and how much water they are using in their landscape; many believed they water efficiently. Also, people like to have control over their landscapes, but seem to lack the ability to adjust and maintain their systems themselves and the costs of making changes are high or seem high. Another barrier is that people need proof they are using more water than the average household or more than they need to use. People also have trouble getting good guidance about how to water better and avoiding watering in the rain.

Personal Water Savings Program[12]

Additional information was gained about customers with automatic irrigation systems through the survey evaluation of the 2002 Home Water Savings Program, a pilot program that provided free residential indoor and outdoor water-use assessments to customers with high peak water use. The survey was developed from recommendations given to the customer at the time of the visit so that we could assess the likelihood of implementing the recommendations.

Key findings from the survey evaluation show that of those who received a recommendation to either adjust their irrigation schedule during the season or reduce watering in the late summer, many did. A very small amount of people who received a recommendation to install a rain sensor did, with some saying it would be too expensive or not giving a reason why. Of those who received a recommendation to installer a new controller, none did and most said they didn't plan to do it.

The Program provided 100 customers with free site visits by a trained "water auditor" to assess both indoor and outdoor water use and to recommend changes that would improve water efficiency. After the site visit, each household received written recommendations for water efficiency improvements.

While auto-irrigators were interested in having an automatic rain sensor, they were concerned about whether their costs justified their installation (especially in light of "no rain" last summer); whether their landscapes would still get enough water; and whether the sensors are compatible with their systems. They were receptive to utilities providing incentives to install the sensors.

[11] High Water User Focus Groups Barriers and Benefits Analysis Research, Saving Water Partnership. Dethman & Tangora LLC, January 14, 2003.

[12] Personal Water Savings Program Participant Survey Results, Saving Water Partnership. Dethman & Tangora LLC, December 18, 2002.

Conclusions:

- Customers are interested in easier, more flexible controllers that would help them adjust their watering schedules to weather conditions.
- Customers reactions were mixed on the usefulness of a certified list of irrigation professionals; underlying their reactions appeared to be a distrust of companies providing the services.
- Customers were interested in getting more tailored information and analysis about their water use and would pay a nominal fee for this information. They would like a way to compare their usage with other like households, and said they would support more personal, one-on-one, neighborhood approaches.