

Progress Report: Evaluation of ET (Smart) Controllers

End-user Satisfaction Survey for the 2006 San Antonio Program

Prepared for Task 2 of the Rio Grande Basin Initiative

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By

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SUMMARY

In 2005-2006, the San Antonio Water System (SAWS) and BexarMet Water District (BexarMet) initiated programs in which four (4) different brands of evapotranspiration (ET) controllers ("smart controllers") were provided to utility customers at no charge. Approximately 19 controllers (from 4 different companies) were distributed by the two utilities.

In cooperation with these utilities, the Irrigation Technology Center (ITC) initiated a program to study the performance of the controllers as a part of our efforts in support of Task Two of the *Irrigation Conservation in the Rio Grande Basin Initiative*. This report presents our first year's (2006) evaluations which were focused primarily on conducting an end-user satisfaction survey of these customers (program participants) and identification of problems encountered.

Due to several factors beyond our control, we were only able to interview and/or receive survey results from ten (10) program participants. We also conducted interviews with a site manager and a homeowner who had also installed ET Controllers on their own (i.e., not a part of the pilot programs). Thus, this report is based on only 12 survey responses: 10 end-users and two (2) contractors.

The most common problems reported were

- communication difficulties
- software failure
- controllers that failed to operate on a on a particular day
- inability/difficulty in adjusting for operation under water restrictions

In spite of these problems, five (5) out of six (6) who responded to the question, would recommend an ET Controller to a friend or neighbor

There was no consistency in the reported effectiveness of the controllers in reducing water use:

- three (3) participants reported a decrease
- one (1) reported an increase
- one (1) reported no change
- five (5) did not know

Additional details are provided in this report along with recommendations on how the utilities can improve the program in the future.

The report also briefly reviews the draft SWAT (Smart Water Application Technology) testing protocol. The testing protocol is a good first step but does not provide information on the long-term performance of controllers, or their dependability and ability to reduce water use.

A more detailed survey is currently being conducted for end-users experiences with ET controllers during 2007. The survey forms are provided in the Appendix and are posted at <http://itc.tamu.edu>.

INTRODUCTION AND OVERVIEW

In 2005-2006, the San Antonio Water System (SAWS) and BexarMet Water District (BexarMet) initiated programs in which four (4) different brands of evapotranspiration (ET) controllers ("smart controllers") were provided to utility customers at no charge. The goals of the programs were to promote the adoption of the technology in order to reduce water use in landscape irrigation. Approximately 19 controllers (from 4 different companies) were distributed by the two utilities.

Initially, each water utility envisioned large pilot programs with many participants. Due to various factors, they ended up having a small number of participants. We were successful in receiving responses from only eight (8) participants in the SAWS program and two (2) in BexarMet's. With the two independents, this report is based on 12 interviews. Thus, the results are not statistically valid, and only provide a qualitative assessment of the experiences with ET Controllers in San Antonio during 2006.

However, the results have proven very helpful in designing a more extensive program to evaluate this technology. More detailed surveys have been developed based on the 2006 results and are currently being distributed. Copies of the surveys are included in the Appendix and are posted at <http://itc.tamu.edu>. Separate surveys have been developed for contractors and for end-users.

PROGRAM DESCRIPTIONS

SAWS Pilot Program description

SAWS offered a free ET controller (*Weathermatic Smartline* or *HydroPoint WeatherTRAK*) and rain sensor to qualifying residential and commercial customers. To qualify, program participants had to have an existing irrigation system and conventional controller, and complete an application form. SAWS contracted installation services during the spring/summer of 2005.

BexarMet Pilot program description

BexarMet contacted residential customers and, if interested, were asked to complete a survey to receive a free controller. Each program participant was sent \$100 to cover the costs of installation. Participants were given either a *Weathermatic Smartline* or *ET Water* brand controller and were then assigned a contractor to install the ET controller. The controllers were installed during the fall of 2005.

ITC Evaluation Program

Support for this project is through the Task 2 of the Irrigation Water Conservation in the Rio Grande Basin Initiative. This initiative is funded by the US Congress to help address water supply issues in the Rio Grande Basin Region of New Mexico and Texas. Additional details on the initiative are at <http://riogrande.tamu.edu>.

For the 2006 survey, we developed a list of questions for interviews (phone or in-person) with SAWS' participants and the two independents. BexarMet collected the survey information themselves from two of their program participants.

CONTROLLER DESCRIPTIONS

Four (4) different brands of ET Controllers were distributed by SAWS and BexarMet as part of their pilot programs:

1. *Weathermatic Smartline (SL1600)*

The *Weathermatic Smartline* ET controller uses the Hargreaves equation to calculate ET. An onsite temperature sensor is installed to record high and low temperatures. The zip code of the site is entered into the controller to obtain the longitude, latitude, and elevation, which in addition to the calendar date, is used to "look-up" typical solar radiation values. An on-site rain gage is used to adjust for rainfall and may be hard-wired or connected by wireless. No outside communication devices are used with the controller.

2. *HydroPoint Data Systems Weather TRAK*

The *Weather TRAK* system uses weather data to calculate ETo using the standardized Penman-Monteith equation. ETo data is wirelessly transmitted everyday to the controller through three satellite servers.

3. *Irritrol Smart Dial*

The *Irritrol Smart Dial* is marketed by *Toro* and the product description is identical to the *HydroPoint WeatherTRAK*.

4. *ETwater Smart Controller 100*

The *ET Water* system accesses weather stations and computes daily ETo using a proprietary method which is transmitted to the controller by phone or wireless.

SURVEY RESPONSES

Problems and/or complaints Reported by Controller Type¹

(Note: the survey only included a small number of units, and results may not be representative of the performance of the products)

Weathermatic – (Used in both the SAWS and BexarMet Pilot Programs)

Did not automatically adjustment for drought restrictions, had to be manually adjusted
Was complicated to program and adjust.

Hydro Point Data Systems Weather TRAK – (Used in the SAWS Pilot Program)

Did not work downtown due to poor communications
Did not work downtown due to erroneous weather data
Did not automatically adjust for drought restrictions, had to be manually adjusted
Four of the controllers had software problems and had to be re-loaded with new software.
Controllers could only function under water restrictions with new software
Controller was complicated to program and adjust.

ET Water- (Used in the BexarMet Pilot Program)

BexarMet provided no information on problems with this controller; it was not reprogrammed during drought but was said to still function.

Irritrol – (Used by the two independents)

Had to be manually adjusted for water restrictions
Occasionally did not work at one location, performed well at other location
Difficult to program

Detailed Survey Response from Participants

San Antonio Water System Program

Hidden Forest HOA

- Installed 3 *Weathermatic* controllers to irrigate the entrance, median, common area, and around the pool and tennis court and maintained the controller operations.
- Water bill increased and the landscape appearance remained the same.
- Receiving a free controller was very important in installation, along with saving water and money.
- Would recommend an ET controller to others.

¹ Mentioning of brand names is done for informational purposes only and does not imply endorsement by the Texas AgriLife Extension Service or the Irrigation Technology Center

University United Methodist Church

- Installed 4 *WeatherTRAK* controllers to irrigate their landscape area. The church stated that they have too many water bills to determine any savings, but did cite that the landscape appearance remained the same.
- Receiving a free controller was very important in installation, along with saving water and money.
- They would recommend an ET controller to others.

Landscape Contractor

- Stated that the *WeatherTRAK* was somewhat easy to install but not customer friendly.
- A typical homeowner could not program these controllers and described the overall convenience and performance as adequate.
- The controller was only able to function under water restrictions with the new software.
- *HydroPoint* did not have anyone locally to help.
- Recommended that ET controller users should be provided a variance during water restrictions.

Whataburger

- Installed a *Weathermatic* controller.
- The store manager does not see the water bill but did note some decline in the landscape appearance.

Starbucks

- A landscape contractor installed a *WeatherTRAK* controller at this location and maintained its operation.
- Store manager did not know they had an ET controller.

Participants with no contact information or who did not receive their controller:

Bluffview Heights

Wells Fargo Bank

Don MacCauley

Linda Luttbeg

Great Northwest CIA

BexarMet Water District Program (as reported by the utility)

- Neither the *Weathermatic* or *ET Water* controller was reprogrammed from the first setting
- *ET Water* controller decreased their water bill and the landscape appearance had shown some improvements.
- The two homeowners reported that saving water, saving money, convenience, and free controller were all very important reasons for installing an ET controller.
- For both ET controllers, the overall usage was rated as convenient.
- For both ET controllers, the overall performance was good.
- Both ET controllers were able to function during water restrictions.
- The participants would recommended a controller to a friend or neighbor.

Independents

City of San Antonio

- An irrigation specialist with the city of San Antonio installed four *Irritrol Smart Dials* in the King William District. He reported that installation was somewhat difficult, but did get an *Irritrol* representative to help.
- Did not know if the water bill increased or decreased but did note a major improvement in the landscape appearance.
- Saving water and money, and convenience were very important reasons to install an ET controller.
- The performance of the *Irritrol* controller as very good and able to function under water restrictions once properly programmed.
- Would recommend an ET controller to others.
- Prefers a controller that can be accessed over the internet and is going to try another type.

Homeowner

- Landscape contractor installed an *Irritrol Smart Dial* at his residential
- He “loved” the controller when it was working properly
- Lowered his water bill by 33%, improved his landscape appearance, and he had no runoff.
- Disliked the controller when it did not function properly. Seriously considering pulling out the controller and manually controlling the irrigations.
- Would not currently recommend an ET controller to a friend or neighbor.

PILOT PROGRAM RECOMMENDATIONS

We recommend that the ET pilot programs of SAWS and BexarMet be continued with the following changes:

- 1) Evaluate the performance of ET controllers under bench testing conditions and identify technical and software problems.
- 2) Target the distribution of ET controllers to larger commercial and residential irrigation sites which provide the greatest probability of adaptation and opportunity for water savings per unit installed.
- 3) Have professional landscape and irrigation contractors more involved in targeting qualified participants for the pilot programs.
- 4) Ensure qualified landscape and irrigation contractors are available to install ET controllers, review the efficiency of the irrigation system, and determine the precipitation rate for each station to ensure proper set-up.
- 5) Include quantification of landscape appearance and the appropriateness of the irrigation schedules produced by the ET controllers.
- 6) Document the effectiveness of ET controllers through auditing, water record comparisons, and landscape quality assessment of selected program participants
- 7) Continue and expand research to determine/verify landscape crop coefficients.
- 8) Provide information to program participants that installation of an ET controller may not automatically assure landscape water conservation or acceptable landscape performance.

SWAT PROTOCOL REVIEW

The SWAT (Smart Water Application Technology) committee of the Irrigation Association has issued draft protocols for bench testing of ET Controllers. Currently all such testing is being performed by the Center for Irrigation Technology (CIT) in Fresno, California. Details on the protocol are provided on the IA's website (<http://irrigation.org>).

For the bench testing, the controllers are set up in a testing laboratory at CIT and are run for 30 days. The controllers are connected to a datalogger and evaluated on their ability to calculate runtimes using standard water balance equations for a hypothetical irrigation system. These calculations are simple and are based on inputted values for crop coefficients and other soil-water-plant parameters. Controllers must run a daily water balance and carry over soil water content to the next day.

Criticism of the testing protocol includes concerns about the duration of the tests and the testing location (Fresno, CA) which receives very little rainfall and where ET and weather parameters typically do not change significantly from day to day.

While a good first step, the testing protocol does not answer basic questions about the dependability of ET Controllers and their ability to reduce landscape water use. In addition, the default parameters used in the testing protocol, particularly the crop coefficients are high based on those used in Texas.

In order to be effective at reducing water use, controllers must be programmed correctly including the actual precipitation rate for each station and several factors defining the conditions of the site. Parameters defining the conditions at the site are subject to significant judgement; thus the laboratory tests may not be a good indication of their performance in the field. Installers of ET Controllers will likely need training to properly program the controllers for water conservation purposes.

Other comments on the testing of ET Controllers include:

- The minimum rainfall amount (0.4 inches) used in SWAT testing needs to be increased to levels more characteristic of Texas (8 to 40 inches).
- Testing should be done under conditions more characteristic of the major metropolitan areas and climatic regions of Texas, such as the Texas Coastal Plains (Houston), Central Texas (San Antonio/Austin/Dallas), and West Texas (Midland/El Paso).
- The testing duration should be longer than 30 days and encompass more of an irrigation season, different turf species, and the seasonal ET demand.
- Testing should evaluate the performance of the communication systems.
- The reference weather source for signal-based ET controllers during bench testing should not also be the data source for the controller (i.e., the onsite weather station should be used as a comparison and not as the data source).
- Controllers should be evaluated separately for their performance under imposed drought/watering restrictions.

APPENDIX - Surveys for 2007 Evaluations

CONTRACTOR

*Required Information**

If you installed more than one type of ET Controller, please submit a separate survey for each type.

Name: _____

Company/Agency: _____

Controller Brand*: _____

Number of this controller installed*: _____

City* _____ State _____

Please answer the following survey questions based on your experience with this ET Controller.

(1) How difficult was it at first to install this ET controller?

Easy Somewhat Easy Unsure Somewhat Difficult Difficult

(2) If applicable, how difficult was it to install onsite weather instruments associated with this ET controller?

Easy Somewhat Easy Unsure Somewhat Difficult Difficult

(3) How difficult was it at first to program this ET controller

Easy Somewhat Easy Unsure Somewhat Difficult Difficult

(4) How did you determine what precipitation rate (PR) to use when programming the ET controller?
(Check all that apply)

- catch can test
- water meter-type PR test
- manufacturer's tables based on nozzle size, spacing and pressure
- taken from original design/plans
- estimated based on best professional judgement

(5) Generally, have you had to adjust/re-program this ET Controller from the original setting?

No Yes

If Yes, how often did you adjust/reprogram this ET controller?

Once Weekly Monthly Seasonally

If adjustments were made, what type? (check all that apply)

- Increase runtime
- Decrease runtime
- Reprogram a single station
- Change start time or non-water day
- Other _____

(6) Could a typical homeowner install this ET controller?

No Yes

(7) Could a typical homeowner program this ET controller?

No Yes

(8) Rate the quality of the training and/or instructions your received for installation and operation of this controller

Very Good Good Adequate Poor Very Poor

(9) How would you rate the hardware features (controller box, display screen, knobs, buttons, dials, onsite weather instruments, etc.) of this ET Controller?

Very Good Good Adequate Poor Very Poor N/A

(10) How would you describe the overall convenience of this ET Controller? (user friendliness)

Very Convenient Convenient Adequate Inconvenient Very Inconvenient

(11) How would you rate the communication aspects (if a signal is received) of this ET Controller?

Very Good Good Adequate Poor Very Poor N/A

(12) On average, how often did this type of controller lose communications/automatic updating during the irrigation season?

Frequently Occasionally A few times Once or Twice Never N/A

(13) How would you rate the software or web interface of this ET Controller?

Very Good Good Adequate Poor Very Poor N/A

(14) How well does this ET Controller take into account rainfall?

Very Good Good Adequate Poor Very Poor N/A

(15) How well does this ET Controller function under water restrictions (if experience exists)?

Very Good Good Adequate Poor Very Poor N/A

(16) The most common problem(s) of this ET controller is(are): (check all that apply)

- Loss of signal
- Over waters
- Under waters
- Wrong date and time on the controller
- Wrong irrigation time
- No problems

(17) Pleased described any other problem(s) you had with this ET controller.

(18) How would you describe the overall performance of this ET Controller?

Very Good Good Adequate Poor Very Poor

(19) How would describe the technical support for this ET Controller?

Very Good Good Adequate Poor Very Poor

(20) Is there potential for these controllers to be an effective landscape water conservation tool?

No Yes

(21) Please add any other suggestions, opinions, or needed features of current or future ET controllers.

END-USER

*Required Information**

Name: _____

Address: _____

Zip Code* _____

Controller Brand*: _____

Date of Installation*: (month and year) _____

Water History

How many years have you resided at this address?

1 year 2 years 3 years more than 4 years

1) Have you made any major landscape changes in the previous three years (see examples)?

No Yes

Installed new irrigation system	month and year _____
Retrofitted irrigation system	month and year _____
Increased size of irrigation system	month and year _____
Decreased size of irrigation system	month and year _____
Increased irrigation area	
Ex. Decreased xeriscape	month and year _____
Other _____	month and year _____
Decreased irrigation area	
Installed pool or water garden	month and year _____
Installed deck or walking area	month and year _____
Increased xeriscape area	month and year _____
Other _____	month and year _____

Installation and Set-Up

2) Who Installed the Controller?

Myself Contractor

If yourself, how difficult was it to install?

Easy Somewhat Easy Unsure Somewhat Difficult Difficult

3) Who Programed the controller?

Myself Contractor

If yourself, how difficult was it to program?

Easy Somewhat Easy Unsure Somewhat Difficult Difficult

4) Did the Controller need to be re-programmed or have its program adjusted?

No Yes

If adjustments were made, please describe problem(s) or reason(s) for the adjustment

5) Has your water bill changed since installation of the ET Controller?

Increased No change Decreased Unknown

6) Has the appearance of your landscape changed since the installation of the ET Controller?

Major Improvement Some Improvement Same Some Decline Major Decline

7) Please use the following scale to rate the reasons you chose to install an ET Controller:

1 Very important 2 Somewhat important 3 Unsure 4 Somewhat unimportant 5 Unimportant

Saving water ----
Saving money ----
Convenient ----
Free controller ----
Other ----- ----

8) How effective was the ET Controller was in saving water?

Very Good Good Adequate Poor Very Poor

9) How effective was the ET Controller in saving you money?

Very Good Good Adequate Poor Very Poor

10) How would you describe the overall convenience of the ET Controller?

Very Convenient Convenient Adequate Inconvenient Very Inconvenient

11) How would you describe the overall performance of the ET Controller?

Very Good Good Adequate Poor Very Poor

12) Did your controller ever have communication/updating difficulties?

Frequently Occasional A few times Once or Twice Never

13) Did your controller ever stop working for no apparent reason?

Frequently Occasional A few times Once or Twice Never

14) Would you recommend an ET Controller to a friend or neighbor?

No Yes

15) What do you like best about the ET Controller?

16) What do you like least about the ET Controller?