

Palm Beach Civic Association Report Smart Irrigation Studies and Pilot Tests

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July 27, 2009*

Executive Overview

Controlling irrigation for water conservation and quality has been a major focus of governments, businesses, environmental groups, and universities for over 20 years. Two main technologies have emerged to replace the clock-timer based controller which was invented in the 1960's.

- Soil Moisture Measurement Based Smart Controllers
- Weather/Climate Based Smart Controllers

Smart controllers (commonly referred to as ET controllers, weather-based irrigation controllers, smart sprinkler controllers, and water smart irrigation controllers) are a new generation of irrigation controllers that utilize prevailing weather conditions, current and historic evapotranspiration (ET), soil moisture levels, and other relevant factors to adapt water applications to meet the actual needs of plants.

Dozens of studies and pilot tests have been completed by independent organizations, universities, and government agencies in the last 10 years since smart controllers have been on the market. The results show that weather/climate based smart controllers are more accurate and provide the best water savings.

This report is a summary of the most significant studies and pilot tests for weather/climate based smart controllers. The smart controller products that have the most test results and are available in the South Florida area with adequate irrigation company and manufacturer support are [Alphabetical Order]:

- **Hunter**
- **HydroPoint WeatherTRAK**
- **Rain Bird**
- **Toro Intelli-Sense**

Please Note: The Civic Association never endorses one product or company over another. It is our goal to present the facts as we have researched them so officials in the Town of Palm Beach, businesses, and residents can direct their water conservation and smart irrigation efforts toward a solution that meets their individual needs.

Overall Results

The range of water savings is 2% – 86% based on these studies with an average between 20%-40%.

Looking into the details, it appears the lower water savings levels were a function of not programming the controllers adequately, fine tuning, and maintaining the programming so they perform for maximum savings.

Note: The irrigation controller is important, but only one piece of the puzzle. Even the best, most water efficient controller cannot make up for poor system design, installation, and maintenance. The focus of this report is on irrigation controllers, but a holistic approach to smart irrigation systems and landscape design and maintenance is required to achieve the full potential of water savings.

Currently, Palm Beach households use a median of 1,343 gallons per day compared to the rest of Palm Beach County where water usages averages a mere 515 gallons per day.

The Civic Association water analysis, confirmed by local irrigation companies, determined that Palm Beachers over-water, using an average 6 million gallons per day, down from 8.4 million gallons in FY05-06, after water restrictions were imposed.

It has been suggested, by the irrigation companies that do business on the island and the smart controller manufacturers, that since Palm Beach residents have on average a larger property area with unusual irrigation needs compared to the average property size that was included in the studies, coupled with the fact that we over-water, the water savings should be much greater than 40%.

By implementing smart irrigation, which uses controllers and other techniques to conserve water, the potential savings could be 40% - 60%, or 2.4 million – 3.6 million gallons per day town wide.

Innovations in any field involve risk. In the case of this new irrigation technology, organizations and residents across the nation have invested their time, money, and expertise to explore the possibility of improving the efficiency of water use for landscaping. As this report demonstrates, the risks have been justified and the investments are resulting in significant water savings.

Study Reports

[Reports in Chronological Order, Latest Study First]

California: This study report released July, 1, 2009 is for 3,112 smart controllers installed at 2,294 sites in northern and southern California. These sites met the fundamental data requirements established for inclusion in this study – 1 full year of pre- and post-installation billing data, corresponding climate data, a measurement of the landscape area at the site, and basic information about the site, controller, and installation. Of the 3,112 controllers installed, 44 were Hunter, 537 were HydroPoint, 37 were Rain Bird, and 68 were Toro. 87% were single-family residential and 13% were multi-family and commercial. The study reported only a 6.1% water savings. However, **CAUTION**, the savings may have already been in the pre-installation data. In other words, California has been under such drought and water restrictions for so long that the amount of water used prior to installation of smart controllers was lower than previous years. People have been under-watering. That was not calculated in this study. The data showed that smart controllers actually increased watering in under-watering conditions which is not surprising. Tests from years ago in California, shown below, have smart controller water saving results in the 21%, 50%, and 70% range before public awareness and water restrictions were clamped down.

California: A letter dated June 12, 2009 from Pacific Gas and Electric Company to the California Energy Commission gave an example of a side benefit to using smart controllers for irrigation: For example, if a home Southern California that currently uses 134,000 gallons of water each year for landscape irrigation, saves 15% on its outdoor water use by installing a smart controller, the energy-saved through reduced water use (222 kWh, estimated embedded energy savings) would be greater than the increase in site energy use (18 kWh, increased standby load). As a result, there would be a net annual energy savings of roughly 205 kWh.

Florida: An American Society of Agricultural and Biological Engineers 2007 paper title: Smart Water Application Technology (SWAT) Evaluation in Florida, results have shown that controllers can cut irrigation as much as 90% during rainy periods and 41% during dry periods while maintaining turfgrass quality. The paper summarizes the research carried out in Florida, regarding the use of ET controllers, soil moisture sensor controllers and rain sensors on turfgrass/landscape irrigation; and evaluates their effectiveness for irrigation water conservation.

Gainesville, FL: This science-based study was conducted during 2006 at the University of Florida, Plant Science Research and Education Unit in Citra, Florida. The study evaluated soil moisture based systems by LawnLogic® (Alpine Automation, Inc.) and Acclima, Inc., weather based systems by Toro (Intelli-Sense) and Rain Bird (ET Manager), and clock-type controllers with and without rain sensors. The systems were tested with actual irrigation systems on plots of turf grass. Reported results include water savings relative to a clock-type control without rain sensor and reference ET-based plant water demand. Reported soil moisture based water savings range from zero to 63% and reported weather based savings range from 25% to 63%. As reported by the U.S. Dept. of Interior Bureau of Reclamation

Santa Clarita, CA: In a six-month pilot program conducted by the Newhall County Water District through March, 2006; 19 participants, who used the weather-based timers, saved 776,000 gallons of water. For the past year, the utility has required developers to install the weather-based controllers in landscape medians, Cole said. Studies show that runoff is reduced by 71 percent when the devices are installed.

Tucson, AZ: Data were collected at 27 residential sites in during August 2004 to July 2006. The weather based controllers included in the study were products by Hydropoint WeatherTRAK and WeatherMiser. The participants consisted of volunteers and high water usage was not a selection criteria. Reported average water savings are 25% for Hydropoint WeatherTRAK, 3.2% for WeatherMiser. Water savings calculations were based on 2 years of historic water usage and all data were adjusted for weather conditions. As reported by the U.S. Dept. of Interior Bureau of Reclamation

City of Bend, Oregon: Public Works included installation of weather based smart controllers at 29 city owned and study partner-owned commercial sites. The summary document does not indicate the type of controllers used. A water savings analysis was done using post-installation water usage data collected during April to October 2005 compared to pre-installation data from 2004. It is reported that based on a comparison of ET data, weather conditions were similar for these 2 years. Average water savings are reported to be 41%, with a range of savings from 2% to 86% for the individual sites. As reported by the U.S. Dept. of Interior Bureau of Reclamation

Los Angeles, CA: The Department of Water and Power chose a total of 25 sites with roughly 83 acres of landscape (35 acres planted with turf, the rest with shrubs) for this study. Selected sites included homeowner associations, schools, commercial sites, public parks, and so on. Dedicated irrigation meters supplied water to roughly 60 of the total 83 acres. These were retrofitted with weather-based irrigation technologies from the two vendors participating in the study. Two types of weather-based irrigation scheduling technologies were evaluated over a one year period: HydroPoint's WeatherTrak and Water2Save. The estimate was that weather based irrigation technologies reduced outdoor consumption by 27%. Water savings were determined through statistical models that compare two years of pre-retrofit to one year of post-retrofit consumption accounting for weather. The estimate across all the test sites, weather based controllers reduced outdoor consumption by roughly 17 inches per year for pure turf landscapes (and by assumption half of this for pure shrub landscapes since shrubs normally need only half as much water as turf).

Las Vegas, NV: The study included 17 residential sites where Hydropoint WeatherTRAK controllers were installed by the study entity and 10 control sites with conventional controllers where participants received irrigation scheduling recommendations. The sites were selected based on landscape and irrigation system conditions, and water usage was not a selection criteria. Water savings were calculated based on historic water use. Landscape, soil moisture and soil salinity conditions were also monitored. The average water savings for all smart controller sites is reported to be approximately 20%. It is discussed that landscape conditions were maintained or improved at all sites. As reported by the U.S. Dept. of Interior Bureau of Reclamation

Municipal Water District of Orange County and Irvine Ranch Water District, CA: This study, known as the R3 Study, evaluated water savings, runoff reductions, runoff water quality and public acceptance associated with ET controller installations combined with education efforts and education efforts only. Hydropoint WeatherTRAK controllers were professionally installed and water usage data were collected from 97 residential sites and 15 commercial sites (irrigation only use at condominiums, HOAs and street corridors). Residential participants volunteered for the study and there was no effort to target high water users. The reported average reduction in residential water usage is 10% of total household water use and the reported commercial water savings is 21%. The report discusses the apparent increase in savings potential for larger landscapes. The reported runoff reduction results include an approximate 50% reduction from limited pre-installation measurements (4-

months) and a **statistical reduction of approximately 70%** relative to control area measurements. *As reported by the U.S. Dept. of Interior Bureau of Reclamation*

Denver Water, Denver, CO; the City of Sonoma, CA; and the Valley of the Moon Water District, CA: Water usage data for **74 residences** was collected during the 2001 irrigation season. The data were analyzed to determine outdoor water savings resulting from the use of weather based Aqua Conserve controllers provided and installed by the manufacturer. Total savings of 7.64 acre-feet are reported, with **average individual residence savings ranging from 7% to 25%** for the three study areas. *As reported by the U.S. Dept. of Interior Bureau of Reclamation*

Santa Barbara, CA: Initial data from a trial of climate-based "smart" controllers in Santa Barbara County found that **historically high water usage customers reduced their monthly water use by approximately 26%** through the use of climate-based "smart" controllers, with some customers saving as much as 59%. *Irrigation Association www.irrigation.org*

Irvine, CA: In a field trial, forty climate-based "smart" controllers were installed in the homes of high water users (the top **23% of all residential water users**) in the Westpark Village community of Irvine, California. Results showed that the climate-based "smart" controllers **reduced outdoor water usage by an average of 16%, and have the potential to reduce it by as much as 24%**. *Irrigation Association www.irrigation.org*

Puget Sound, WA: A test of climate-based "smart" controllers conducted in Washington among **"very high" water users** (those that use an average of 375 gallons of water more per day during the peak summer season than they do during the winter) **reported average annual water savings of up to 20,735 gallons (or 27.7 CCF) per customer.** *Irrigation Association www.irrigation.org*

Boulder, CO: Studies comparing water usage at both **residential and business sites** before and after installation of a climate-based "smart" controller found an average savings of **35,000 gallons of water per site, per year** (based on an average landscape size of .2 acres). *Irrigation Association www.irrigation.org*

Smart Water Application Technology (SWAT) Reports from the Irrigation Association

Testing Agency was the Center for Irrigation Technology, CaliforniaWater.org

A testing protocol was setup by the Irrigation Association to check smart irrigation systems. The fundamental measurements are:

- Irrigation Adequacy: 100% means the plant and turfgrass quality did not degrade and in fact thrived (watering was completely adequate) using the smart irrigation system in the test.

- Irrigation Excess: 0.0% means no excess water was deployed to keep the plants and turfgrass in the best shape. 7.55% means that there was that much more water than necessary deployed.

[Alphabetical Order]

Hunter Solar Sync Connected to Hunter Pro-C Conventional Controller

Avg. Irrigation Excess = 7.55%, Irrigation Adequacy = 100%

Hunter ET System with Pro-C 300 Controller

Avg. Irrigation Excess = 0.5%, Irrigation Adequacy = 100%

HydroPoint WeatherTRAK [Report 2006]

Avg. Irrigation Excess = 0.0%, Irrigation Adequacy = 100%

Rain Bird ESP-SMT Smart Control System [Report 2008]

Avg. Irrigation Excess = 1.5%, Irrigation Adequacy = 100%

Rain Bird ET Manager with ESP-TM Controller [Report 2006]

Avg. Irrigation Excess = 0.0%, Irrigation Adequacy = 100%

Toro Intelli-Sense

Avg. Irrigation Excess = 0.0%, Irrigation Adequacy = 100%



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About Palm Beach Civic Association

Palm Beach is known throughout the world for its exquisite beauty and elegance. The Palm Beach Civic Association is dedicated to ensuring the town retains that special quality of life. Founded in 1944, the Palm Beach Civic Association provides timely news, publications, bulletins, and updates; stimulating forums, receptions, and community-wide events; and meetings with elected officials, consultants, and town staff. The Palm Beach Civic Association plays an important role in preserving and enhancing this exceptional island community.

www.palmbeachcivic.org