This presentation premiered at WaterSmart Innovations

watersmartinnovations.com

watersmart
INNOVATIONS

Advancing Landscape Irrigation Efficiency

SWAT

Jenna Smith

Irrigation Water Conservation
Program Manager

Seattle Public Utilities & the
Saving Water Partnership

Chair, SWAT Promotions Working Group

The Challenge

- Improving irrigation efficiency is difficult
- Supply (and other) issues related to landscape water waste
- Irrigation efficiency is crucial
- SWAT: Advancing landscape irrigation efficiency

SmartWater APPLICATION TECHNOLOGIES™

SWAT

- Smart Water Application Technologies
- Mission Focus – Advancing Landscape Irrigation Efficiency to Save Water
- Water Provider & Irrigation Industry Partnership – Our success relies on your support

Smart Water APPLICATION TECHNOLOGIES™

A Partnership for Change

- Water providers – suppliers, water districts
- Irrigation and landscaping industry: manufacturers, distributors, designers and specifiers, contractors, developers and related professional industry associations
- Residential and light commercial customers

SmartWater APPLICATION TECHNOLOGIES™

Volunteers Drive SWAT Efforts

- **Technology Working Group**
  - Testing protocols
- **Promotions Working Group**
  - Marketing & Fundraising
  - SWAT Administration
- **Executive Committee**
  - Oversight
  - Communication with EPA & other groups

SmartWater APPLICATION TECHNOLOGIES™

What SWAT Does:

- **Technology**
  - Identify Irrigation technology categories – issues
  - Developing benchmark technology testing

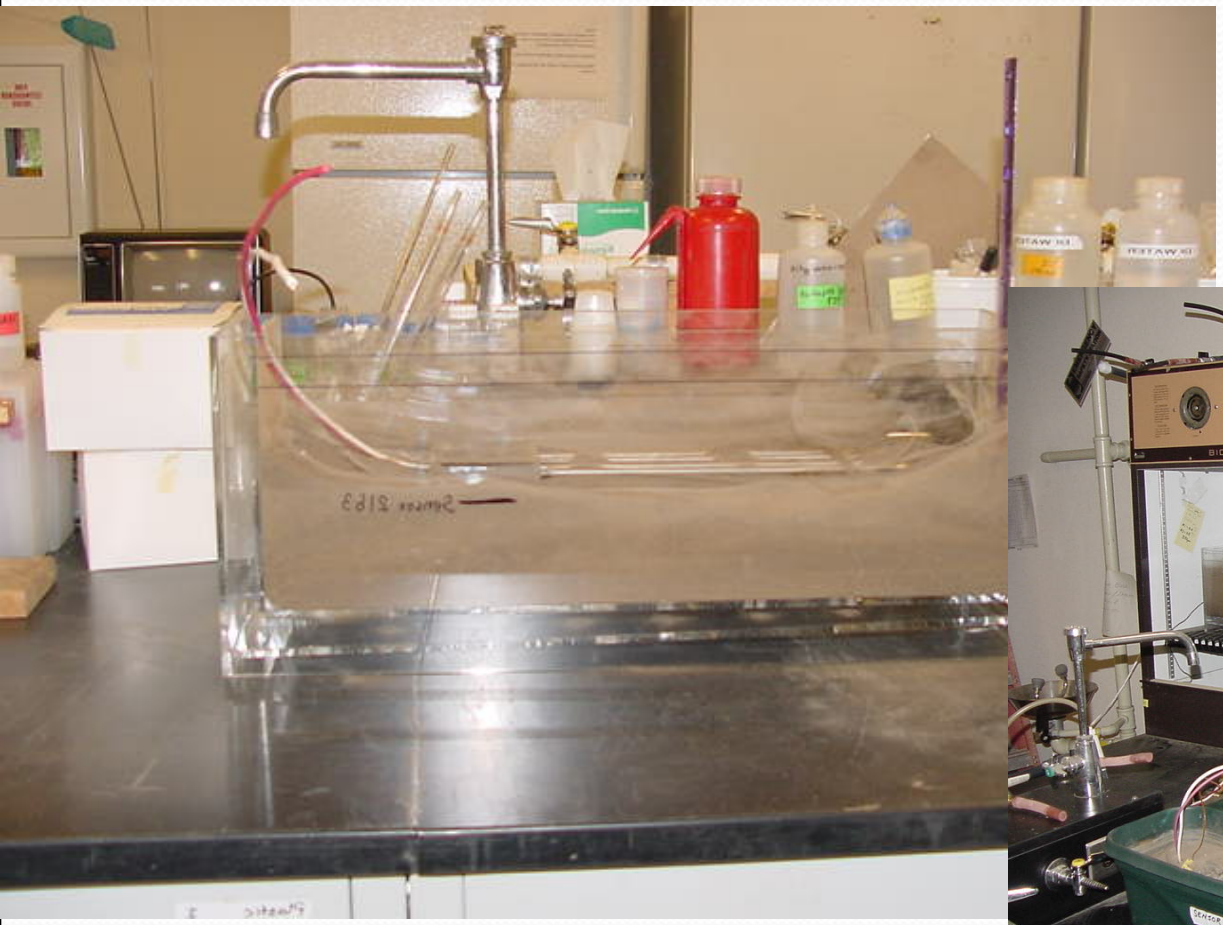
- **Promotions**
  - Research market & stakeholder barriers to develop outreach materials
  - Promotions
    - Performance reports
    - Technologies with marketing materials
    - Collaborations – IA and EPA
  - Provides all administration and management of SWAT activities

SmartWater APPLICATION TECHNOLOGIES™

Climate-based Controllers

Smart water
APPLICATION TECHNOLOGIES™

Soil Moisture Sensors



SmartWater APPLICATION TECHNOLOGIES™

Rain Sensors

SmartWater APPLICATION TECHNOLOGIES™

SWAT Testing Updates

- **Smart climate-based controllers - CIT**
  - Weather-based or ET controllers
  - 15 controllers tested, posted online

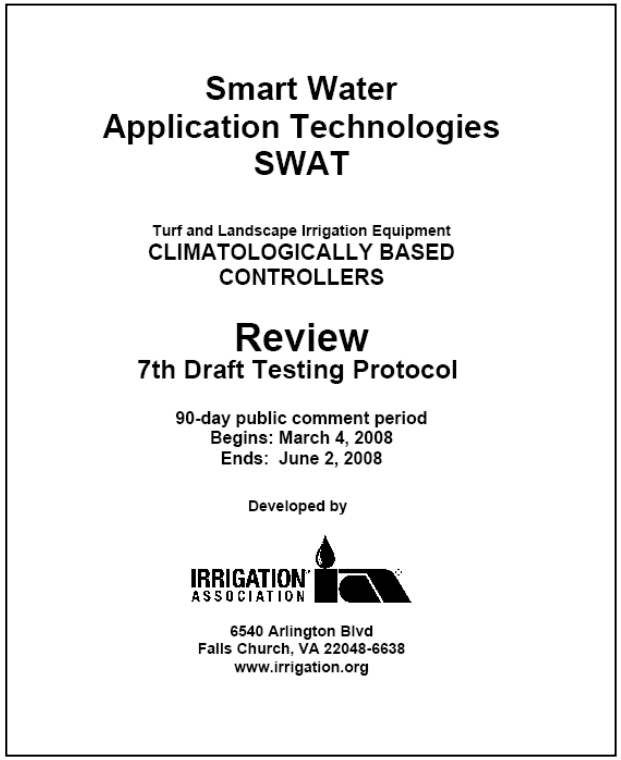
- **Soil moisture sensor-based controllers - CIT**
  - Phase 1, 6th draft (sensor performance)
  - Phase 2, 3rd draft (sensor regulation of controller)

- **Rain sensors (rain-shutoff devices) – UF**
  - Phase 1 draft

SmartWater APPLICATION TECHNOLOGIES™

SWAT Protocols

- Standard
- Developed by the IA, public and independent testing agency
- Public review every three years



Smart Water
Application Technologies
SWAT

Turf and Landscape Irrigation Equipment
CLIMATOLOGICALLY BASED
CONTROLLERS

Review
7th Draft Testing Protocol

90-day public comment period
Begins: March 4, 2008
Ends: June 2, 2008

Developed by

IRRIGATION ASSOCIATION

6540 Arlington Blvd
Falls Church, VA 22048-6638
www.irrigation.org

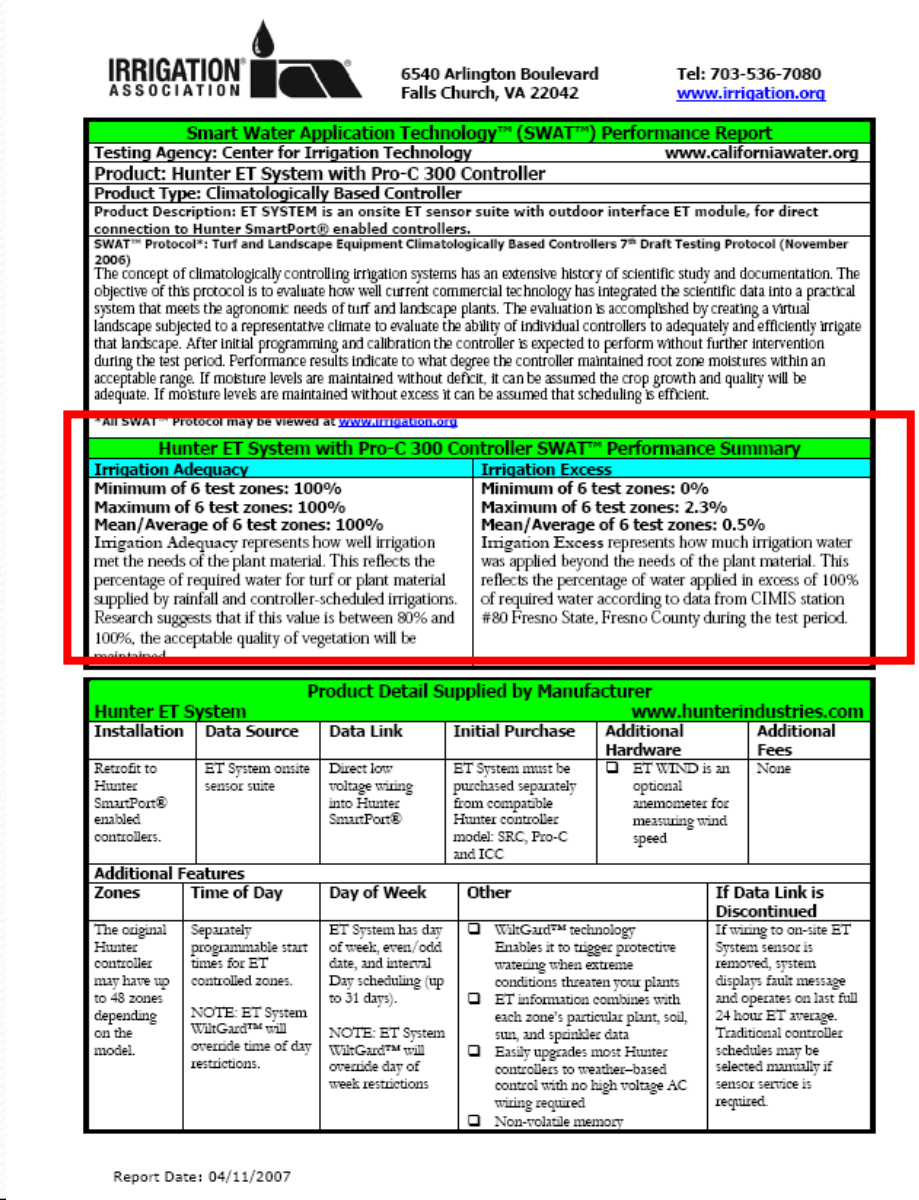
SmartWater
APPLICATION TECHNOLOGIES™

SWAT Protocol Example

- Climatological controller “bench” test
  - Using real-time weather data should produce efficient irrigation schedule for a variety of hypothetical soil types, slopes and plant materials
  - Test must meet requirements including time period, minimum rainfall and ETo
  - No pass or fail score – only performance results
  - Test is confidential between lab and manufacturer until manufacturer releases results to SWAT

SmartWater APPLICATION TECHNOLOGIES™

Reporting Format



IRRIGATION ASSOCIATION

6540 Arlington Boulevard
Falls Church, VA 22042

Tel: 703-536-7080
www.irrigation.org

Smart Water Application Technology™ (SWAT™) Performance Report

Testing Agency: Center for Irrigation Technology www.californiawater.org

Product: Hunter ET System with Pro-C 300 Controller

Product Type: Climatologically Based Controller

Product Description: ET SYSTEM is an onsite ET sensor suite with outdoor interface ET module, for direct connection to Hunter SmartPort® enabled controllers.

SWAT™ Protocol*: Turf and Landscape Equipment Climatologically Based Controllers 7th Draft Testing Protocol (November 2006)

The concept of climatologically controlling irrigation systems has an extensive history of scientific study and documentation. The objective of this protocol is to evaluate how well current commercial technology has integrated the scientific data into a practical system that meets the agronomic needs of turf and landscape plants. The evaluation is accomplished by creating a virtual landscape subjected to a representative climate to evaluate the ability of individual controllers to adequately and efficiently irrigate that landscape. After initial programming and calibration the controller is expected to perform without further intervention during the test period. Performance results indicate to what degree the controller maintained root zone moistures within an acceptable range. If moisture levels are maintained without deficit, it can be assumed the crop growth and quality will be adequate. If moisture levels are maintained without excess it can be assumed that scheduling is efficient.

*All SWAT™ Protocol may be viewed at www.irrigation.org

Hunter ET System with Pro-C 300 Controller SWAT™ Performance Summary

Irrigation Adequacy	Irrigation Excess
Minimum of 6 test zones: 100% **Maximum of 6 test zones: 100%** **Mean/Average of 6 test zones: 100%** Irrigation Adequacy represents how well irrigation met the needs of the plant material. This reflects the percentage of required water for turf or plant material supplied by rainfall and controller-scheduled irrigations. Research suggests that if this value is between 80% and 100%, the acceptable quality of vegetation will be maintained.	**Minimum of 6 test zones: 0%** **Maximum of 6 test zones: 2.3%** **Mean/Average of 6 test zones: 0.5%** Irrigation Excess represents how much irrigation water was applied beyond the needs of the plant material. This reflects the percentage of water applied in excess of 100% of required water according to data from CIMIS station #80 Fresno State, Fresno County during the test period.

Product Detail Supplied by Manufacturer

Hunter ET System www.hunterindustries.com

Installation	Data Source	Data Link	Initial Purchase	Additional Hardware	Additional Fees
Retrofit to Hunter SmartPort® enabled controllers.	ET System onsite sensor suite	Direct low voltage wiring into Hunter SmartPort®	ET System must be purchased separately from compatible Hunter controller model: SRC, Pro-C and ICC	❑ ET WIND is an optional anemometer for measuring wind speed	None

Additional Features

Zones	Time of Day	Day of Week	Other	If Data Link is Discontinued
The original Hunter controller may have up to 48 zones depending on the model.	Separately programmable start times for ET controlled zones. NOTE: ET System WiltGard™ will override time of day restrictions.	ET System has day of week, even/odd date, and interval Day scheduling (up to 31 days). NOTE: ET System WiltGard™ will override day of week restrictions	❑ WiltGard™ technology Enables it to trigger protective watering when extreme conditions threaten your plants ❑ ET information combines with each zone's particular plant, soil, sun, and sprinkler data ❑ Easily upgrades most Hunter controllers to weather–based control with no high voltage AC wiring required ❑ Non-volatile memory	If wiring to on-site ET System sensor is removed, system displays fault message and operates on last full 24 hour ET average. Traditional controller schedules may be selected manually if sensor service is required.

Report Date: 04/11/2007

- One page - Performance Summary

Reporting Format

- Irrigation adequacy and excess section

Smart Water Application Technology™ (SWAT™) Performance Report	
Irrigation Adequacy	**Irrigation Excess**
Minimum of 6 test zones: 100% **Maximum of 6 test zones: 100%** **Mean/Average of 6 test zones: 100%** **Irrigation Adequacy** represents how well irrigation met the needs of the plant material. This reflects the percentage of required water for turf or plant material supplied by rainfall and controller-scheduled irrigations. Research suggests that if this value is between 80% and 100%, the acceptable quality of vegetation will be maintained.	**Minimum of 6 test zones: 0%** **Maximum of 6 test zones: 2.3%** **Mean/Average of 6 test zones: 0.5%** **Irrigation Excess** represents how much irrigation water was applied beyond the needs of the plant material. This reflects the percentage of water applied in excess of 100% of required water according to data from CIMIS station #80 Fresno State, Fresno County during the test period.

SmartWater APPLICATION TECHNOLOGIES™

Reporting Format

- Full Technical Report

IRRIGATION ASSOCIATION

6540 Arlington Boulevard
Falls Church, VA 22042

Tel: 703-536-7080
www.irrigation.org

Smart Water Application Technology™ (SWAT™) Performance Report

Testing Agency: Center for Irrigation Technology	**www.californiawater.org**
Testing Date: October-November 2005	**Weather Station: CIMIS 75 Irvine, Orange**
Product Type: Climatologically Based Controller	**Reference #: 100588**
Product: Toro Intelli-Sense [Model Number TIS-12-OD, Serial # 100588]	
Product Description: Toro Intelli-Sense climatological adjustment uses WeatherTRAK ET Everywhere™ ET/rainfall data and WeatherTRAK Scheduling Engine™ to provide custom schedules.	

SWAT™ Protocol*: Turf and Landscape Equipment Climatologically Based Controllers 6th Draft Testing Protocol (Dec 3, 2005)

The concept of climatologically controlling irrigation systems has an extensive history of scientific study and documentation. The objective of this protocol is to evaluate how well current commercial technology has integrated the scientific data into a practical system that meets the agronomic needs of turf and landscape plants. The evaluation is accomplished by creating a virtual landscape subjected to a representative climate to evaluate the ability of individual controllers to adequately and efficiently irrigate that landscape. After initial programming and calibration the controller is expected to perform without further intervention during the test period. Performance results indicate to what degree the controller maintained root zone moistures within an acceptable range. If moisture levels are maintained without deficit, it can be assumed the crop growth and quality will be adequate. If moisture levels are maintained without excess it can be assumed that scheduling is efficient.

***All SWAT™ Protocol may be viewed at www.irrigation.org**

Toro Intelli-Sense Full Technical SWAT Performance Report

Input Data: CIMIS #75 reference crop is turfgrass using the Penman-Monteith formula
For more information: wwwcimis.water.ca.gov

Parameters: For field installation, these values would normally be collected during a landscape audit.	**Zone #1**	**Zone #2**	**Zone #3**	**Zone #4**	**Zone #5**	**Zone #6**
Soil Type: Affects how water is absorbed and amount of water storage in the soil reservoir	Loam	Silty Clay	Loamy Sand	Sandy Loam	Clay Loam	Clay
Vegetation: Determines the crop coefficient and therefore the water required for healthy plant growth	Fescue 75% Shade	Bermuda Full Sun	Ground Cover Full Sun	Woody Shrubs 50% Shade	Trees & Ground Cover Full Sun	Bermuda Full Sun
Crop Coefficient: Defines water required for healthy plant growth (see detail on last page of report)	0.45	0.57	0.55	0.40	0.61	0.57
Slope,%: Affects run-off potential	6%	10%	8%	12%	2%	20%
Root Zone Working Storage (inches): Affects water available to plant and watering intervals	0.85	0.55	0.90	2.00	2.25	0.55
Precipitation Rate (inches/hour): Affects duration of watering time	1.60	1.60	1.40	1.40	0.20	0.35
Application Efficiency,%: The percent of water applied by irrigation distribution system that is absorbed in to the root zone working storage and is not lost due to spray drift and pattern loss	55%	60%	70%	75%	80%	65%
Area (square feet): Frames a virtual yard. Is not used in efficiency calculations.	1000	1200	800	500	650	1600
Soil Intake Rate (inches/hour): Affects watering duration & soak intervals of watering time	0.35	0.15	0.50	0.40	0.20	0.10
Allowable Surface Accumulation (inches): Affects watering duration & soak intervals of watering time	0.25	0.16	0.26	0.24	0.26	0.10
Maximum Allowable Run Time (minutes): Limits run time options to avoid potential runoff	12.0	6.6	17.3	14.4	N/A	24.0

Performance results are only valid if the controller must make adjustments for varying weather conditions such as rain and evapotranspiration (Eto). Therefore actual time undergoing testing may be longer than one month. Valid performance data is then downloaded from the 30 consecutive day period exhibiting the required minimum 0.40 of gross rainfall and minimum 2.50 inches of ETo.

Reporting Format

- Full Technical Report

IRRIGATION ASSOCIATION
6540 Arlington Boulevard
Falls Church, VA 22042
Tel: 703-536-7080
www.irrigation.org

Toro Intelli-Sense Controller Full Technical SWAT Performance Report

Overall Irrigation Efficiency Evaluation

The efficiency of an irrigation system is a function of four considerations: efficient irrigation controls, efficient application hardware, well-designed irrigation installation, and consistent maintenance. If all considerations are optimal in these four areas the irrigation system can be considered to be efficient over all.

Scheduling Efficiency is the only criteria tested by the Climatologically Based Controller protocol. This value is listed in the Performance Parameters part of this report.

Application Efficiency listed in the input parameter takes into account application hardware, installation and maintenance. This value is listed in the Input Parameters part of this report. These values are generally representative of industry norms and do not relate directly to any specific manufacturers product.

Overall Efficiency,% = [Schedule Efficiency,% x Application Efficiency, %]

Performance Parameters: Total inches for the test period are listed for each zone/crop	Zone #1	Zone #2	Zone #3	Zone #4	Zone #5	Zone #6
Schedule Efficiency,%: Reflects how well irrigation cycles avoided direct, soak runoff and exceeding the root zone working storage capacity. Scheduling Losses (in.) = Direct Runoff (in.) + Soak Runoff (in.) +Surplus (in.) $Sch.eff\ (\%) = \left(\frac{Irr.(Net,in) - Sch.losses\ (in.)}{Irr.(Net,in)}\right) 100$	100%	100%	100%	100%	100%	100%
Application Efficiency,%: The percent of water applied by irrigation distribution system that is absorbed in to the root zone working storage and is not lost due to spray drift and pattern loss	55%	60%	70%	75%	80%	65%
Overall Irrigation Efficiency,%:	55%	60%	70%	75%	80%	65%

Details on Crop Coefficients

The crop coefficient defines water required as a percent of total evapotranspiration rate downloaded from the data source. Water requirements have been thoroughly researched for many years. More information regarding this research is available from the Irrigation Association.

The WeatherTRAK scheduling engine used by Toro Intelli-Sense has default crop coefficients listed as plant names in the scheduling engine. Custom crop coefficients may be programmed into any station. Appropriate schedule development includes assessment of the plants within the zone to be watered and selecting from a list of default values based on the plant type, or if preferred, entering the crop coefficient for that plant material.

Tested Technology Benefits

- **To water purveyor**
  - First step in identifying technologies
  - Rebates or other incentives
- **To manufacturers**
  - Validate product claims
- **To EPA WaterSense**
  - Technologies for product labeling
- **To irrigation industry**
  - Tools for efficient irrigation

SmartWater APPLICATION TECHNOLOGIES™

SWAT Outreach Tools

- Market Research: barriers to change
- Identify target audience
- Create and test tools
- Deliver message
- Raise funds and repeat for new category

SmartWater APPLICATION TECHNOLOGIES™

SWAT Tools for Water Providers

- **Marketing toolkit**
  - Smart controller statement stuffers
  - Homeowner smart controller direct mail package, self-mailer and jumbo postcard
  - Contractor smart controller self-mailer and jumbo postcard
- **Customizable web template**
  - Web pages to promote smart technologies
  - Website resources – www.swatirrigation.org

SmartWater APPLICATION TECHNOLOGIES™

SWAT Tools for Water Providers

Statement Stuffer

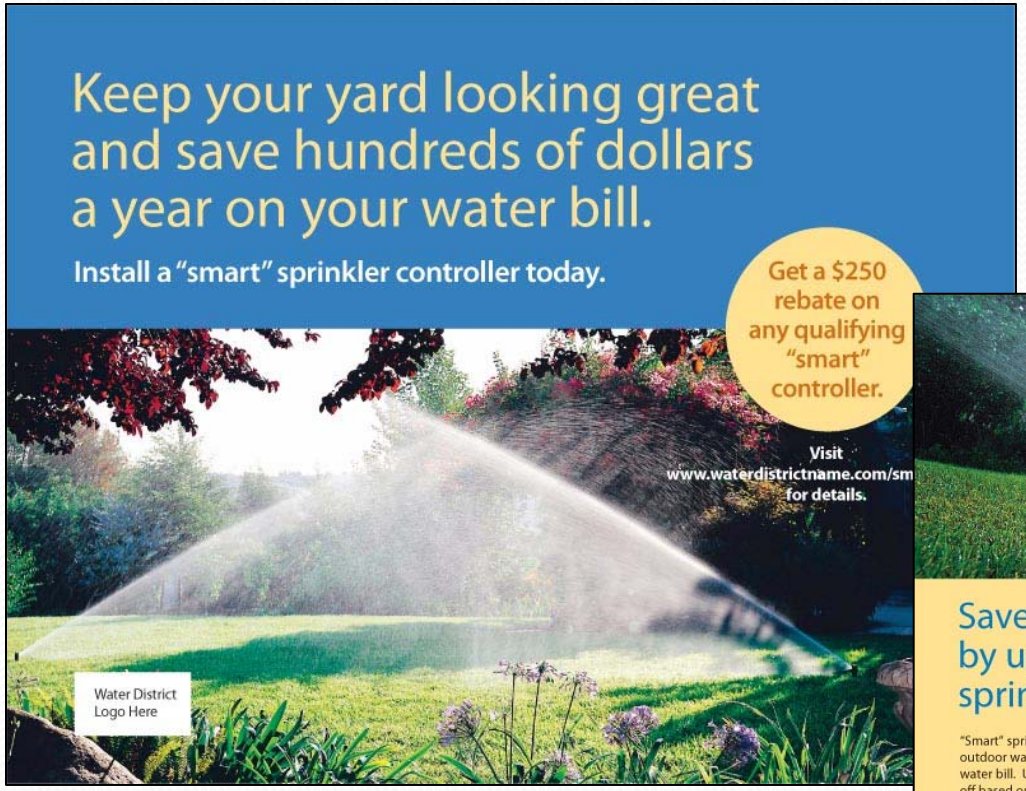
Homeowner

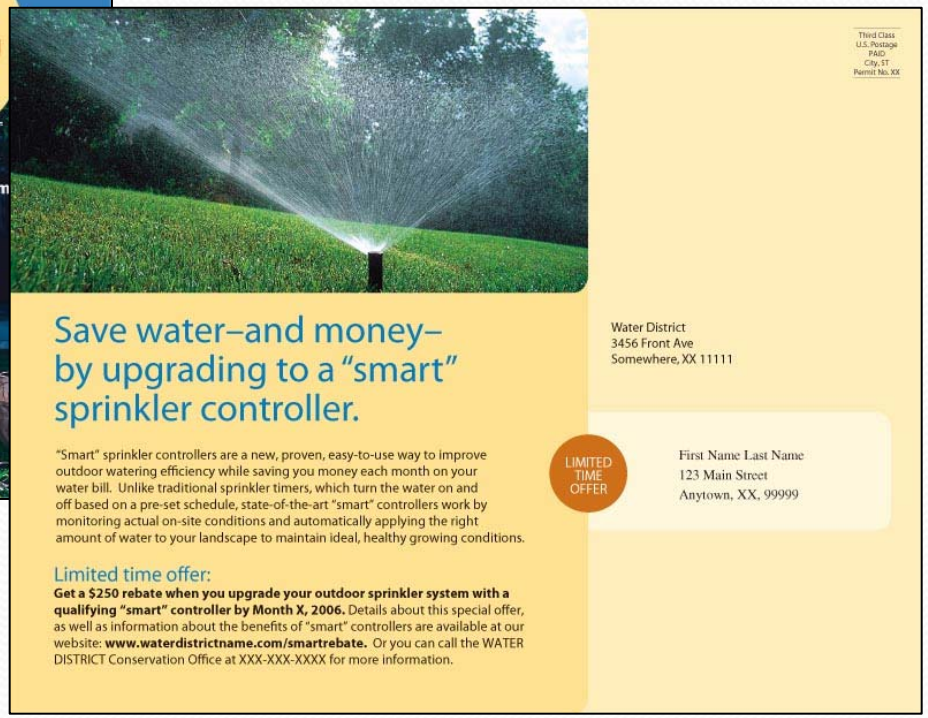
SmartWater APPLICATION TECHNOLOGIES™

SWAT Tools for Water Providers

Jumbo Postcard

Homeowner





SmartWater APPLICATION TECHNOLOGIES™

SWAT Tools for Water Providers

Self-mailer

Contractor

SmartWater APPLICATION TECHNOLOGIES™

SWAT Tools for Water Providers

Sample: Municipal Water District of Orange County

Smartwater APPLICATION TECHNOLOGIES™

IRRIGATION ASSOCIATION

smartwater APPLICATION TECHNOLOGIES®

HOMEOWNERS | BUSINESSES

Save money and water with "smart" sprinkler controllers

Did you know that more than 50% of the water used by households goes to maintaining landscapes and lawns? You can help reduce your outdoor water use, keep your landscape more attractive and healthy—and save money every month on your water bill—by upgrading your landscape sprinkler system with a "smart" controller.

What makes smart controllers so "smart"?
➡ learn more

Homeowners

"Smart" sprinkler controllers can keep your yard looking great and save you hundreds of dollars a year on your water bills.

➡ learn more

Businesses

Maintain the appearance and enhance the value of your property with "smart" controllers.

➡ learn more

Did you know?

>> Increasing population density and unpredictable weather patterns are putting ever-increasing demands on limited water resources.

Sample Web Template

SWAT Tools for Water Providers

Sample:

Seattle Public Utilities

Smartwater APPLICATION TECHNOLOGIES™

SWAT Benefits

- Benchmark tested irrigation technologies
- National standard
- Effective water conservation tools
- Outreach and marketing materials
- Partnerships – direct access to the industry

SmartWater APPLICATION TECHNOLOGIES™

Your Support Will Help

- Encourage water efficiency
- Reduce outdoor water use
- Promote conservation partnerships
- Increase environmental awareness among customers

SmartWater APPLICATION TECHNOLOGIES™

SWAT Support

- Add new product categories to its testing program
- Evolve irrigation market behaviors and attitudes
- Get the word out
- Accelerate the move from traditional irrigation components to smart water application technologies

We're off to a great start …

SmartWater APPLICATION TECHNOLOGIES™

What you can do …

- Annual donations
- Volunteer
- Participate in meetings or protocol review activities

Learn more and find a donations form at:
www.swatirrigation.org

SmartWater APPLICATION TECHNOLOGIES™

Questions

jenna.smith@seattle.gov

SmartWater APPLICATION TECHNOLOGIES™

SWAT History

- SWAT began in 2001
- 2002 – Smart controller meeting at CIT
- 2003 – IA Show, Smart Controller Protocol
- 2004 – IA Show, Smart Controller Protocol and $100,000 donation from Hillsborough, Fl.
- 2005 – Smart Controller Market Research & IA Show
- 2006 – SWAT Website Launched and IA Show, Rain Sensors Selected
- 2007 – Rain Sensor Meeting in Gainesville, Florida and EBMUD tests SWAT Marketing Materials (1,500 rebates processed)
- 2008 – Soil Moisture Sensor Meeting at CIT

SmartWater APPLICATION TECHNOLOGIES™