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Managing Water in the West

Weather and Soil Moisture Based Landscape Irrigation Scheduling Devices

August 2007 Technical Review Report



U.S. Department of the Interior
Bureau of Reclamation

Purpose

Document the overall status of emerging weather and soil moisture based landscape irrigation controller technology primarily for water agencies to assist in their efforts to promote this technology as a means of conserving water and reducing irrigation runoff induced pollution.

Background

- **Southern California Area Office**
 - Water Conservation Field Services Program
 - Municipal Water Conservation Support
 - Cooperation with Other Agencies
 - Metropolitan Water District of Southern California, Municipal Water District of Orange County, Irvine Ranch Water District, and others
 - Support of Early Studies
 - 2001 Irvine Ranch ET Controller Study
 - 2004 Irvine Ranch Residential Runoff Reduction (R3) Study
 - MWDOC Request of SCAO for Additional Study
- **Previous Reclamation Smart Controller Reports**
 - 2004 Report Prepared by SCAO for MWDOC
 - 2006 Report Significantly Expanded from 2004

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Managing Water in the West

Weather Based Technologies for Residential Irrigation Scheduling

Technical Review Report

Prepared for Municipal Water District of Orange County



U.S. Department of the Interior
Bureau of Reclamation
Lower Colorado Region
Southern California Area Office

May 2004

2004 Report

- 7 Companies' Products
- Residential Products Only
- Weather Based Products Only

2006 Report

- 26 Companies' Products
- Residential and Commercial Products
- Weather and Soil Moisture Based Products

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Managing Water in the West

Weather and Soil Moisture Based Landscape Irrigation Scheduling Devices

Technical Review Report – 2nd Edition



U.S. Department of the Interior
Bureau of Reclamation
Lower Colorado Region
Southern California Area Office

August 2007

August 2007 Report

- 27 Companies' Products
- Information Current Through June 2007
- Expanded Introduction
- Misc. Revisions

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Introduction and Smart Irrigation Technology Overview

- Background
- Basic Operation Principles
- Types of Products
- SWAT Testing
- EPA WaterSense Program
- Reported Water Savings

Weather Based Irrigation Control System Principles

- Evapotranspiration (ET) Based
- On-site Sensors vs. Remote Real-time Weather Data
- Historic ET or Weather Data
- Fully-automatic Versus Semi-automatic Devices

Weather Based Control Product Features and Comparison Criteria

- Installation
- Stand-alone Versus Add-On Controller
- Irrigation Schedules and Run Time Calculation and Adjustment
- Application and Distribution Uniformity (or Efficiency) Rates
- Rain Sensors and Gauges
- Other Sensors
- Power Supply and Surge and Lightning Protection
- Station Circuit Rating, Wiring and Terminal Wire Sizes
- Clock Mode Operation
- Non-volatile memory and Batteries
- Warranties and Reliability

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Weather Based Product Descriptions

- **Manufacturer Information**
- **Type of Device**
- **Models**
- **Operation**
- **Features**
- **Accessories**
- **Dimensions**
- **Costs**
- **Testing and Track Record**

Accuwater



- **Stand-alone Controller/Receiver**
- **Since 2004**
- **16-48 Stations**
- **Computer Interface**
- **\$549-\$2,999 plus annual signal cost**

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Alex-Tronix Smart Clock and Enercon Plus



- Stand-alone Controller
- Since 2005
- 4 to 24 Stations
- Temperature Sensor
- Does Not Use ET
- Battery Powered
- \$995-\$2695

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Aqua Conserve ET and Ultimo Series



- Stand-alone Controller
- Since 1998
- 6-66 Stations
- Temperature Sensor and Historic ET Data
- \$240-\$5,630

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Calsense ET 2000e

- Stand-alone Controller
- Since 1993
- 8-48 Stations
- Historic ET, Evaporation Type ET Sensor, weather station or CIMIS
- \$1,290-\$3,680



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Cyber-Rain XCI



- Stand-alone Controller
- Since 2007
- 8 Stations
- Weather forecasts from internet and historic weather data
- \$295

ECO Research ECO 100



- Add-on Scheduler
- Since 2005
- Temperature Sensor and Historic Solar Radiation Data
- \$198

ET Water System

- Stand-alone Controller/Receiver
- Since 2005
- 1-48 Stations
- \$419-\$2,399 plus annual signal cost



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Hunter ET System

- Add-on Scheduler
- Since 2/2006
- Only Compatible with Hunter Controllers
- On-site Weather Station
- \$429



HydroPoint WeatherTRAK

- Stand-alone Controller/Receiver
- Since 1997
- 6-48 Stations
- \$449-\$3,675 plus annual signal fee



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WCS Hydrosaver



- Stand-alone Controller
- Since 1994
- 12-56 Station
- Historic ET Data and On-site ET Sensor
- \$1,800-\$2,800

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Irrisoft Weather Reach

- Add-on Scheduler/Receiver
- Since 2002
- Some Public Weather Reach Signal Providers
- \$795 plus annual service fee for users where no Public signal is available



Rainbird ET Manager



- Add-on Scheduler/Receiver
- Since 4/2006
- Weather Reach Signal
- Some Public Weather Reach Signal Providers
- \$741 plus annual service fee for users where no Public signal is available

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Toro Intelli-Sense and Irritrol Smart Dial

- Stand-alone Controller/Receiver
- Since 2005
- 6-24 Stations
- WeatherTRAK ET Everywhere Signal
- \$399-889 plus annual fee



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Tucor PROCOM

- Stand-alone Controller
- Since 1995
- 50-500 Stations
- Requires Computer Connection
- On-site Weather Station
- 2-wire Valve Wiring Only
- \$20,150-\$23,750



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Water2Save System

- Add-on Scheduler/Receiver
- Since 1996
- 12-64 Stations on up to 4 Controllers
- Hardware/Service Package
- \$527-\$1,598 plus annual service fee



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Rain Master RME Eagle

- Stand-alone Controller
- Since 2002
- 6-36 Stations
- Historic ET and
Optional CIMIS via
Internet or On-site
Weather Station
- \$640-\$4,264 plus annual
fee for Internet service



Weathermatic SmartLine

- Stand-alone Controller
- Since 2004
- 4-24 Stations
- On-site Temperature and Rain Sensors with Historic Solar Radiation Data
- \$300-\$817



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Accurate WeatherSet Smart Timer

- Stand-alone Controller
- Since 1994
- 8-48 Stations
- On-site Solar and Rain Sensors
- \$220-\$1,440



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Soil Moisture Based Irrigation Control System Principles

- On-site Soil Moisture Measurement
- One or More Soil Moisture Sensors
- Trigger Irrigation at Percentage of Field Capacity
- Most Require Base Schedule
- Constant Schedule with Automatic Irrigations Days

Soil Moisture Based Control Product Features and Comparison Criteria

- **Soil Moisture Sensor Types**
- **Installation**
- **Stand-alone Versus Add-on Controller**
- **Irrigation Schedules and Run Time Calculation and Adjustment**
- **Single Versus Multiple Soil Moisture Sensors**
- **Soil Temperature and Conductivity Measurement and Display**
- **Power Supply and Surge and Lightning Protection**
- **Station Circuit Rating, Wiring and Terminal Wire Sizes**
- **Warranties and Reliability**

Soil Moisture Based Product Descriptions

- **Manufacture Information**
- **Type of Device**
- **Models**
- **Operation**
- **Features**
- **Accessories**
- **Dimensions**
- **Costs**
- **Testing and Track Record**

Acclima RS, SC and CS Series

- Stand-alone Controllers and Add-on Device
- Since 2002
- 1-36 Sensors
- Digital TDT Sensor
- 2-Wire System Option
- \$265-\$3,078



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Agrilink AquaBlu

- Add-on Device
- Since 2006
- One Sensor per device
- FDR Sensor
- \$139



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Baseline WaterTec and BL Series

- Stand-alone Controllers and Add-on Device
- Since 2002
- 1, 6 and 25 Sensors
- TDT Sensor
- 2-Wire System Option
- \$149-\$10,120



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Calsense ET2000e

- Stand-alone Controller
- Since 1993
- 1-48 Sensors
- Tensiometer
- \$999-\$3,760



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Dynamax Moisture Clik and Moisture Switch

- Add-on Devices
- Since 1999
- Single Sensor
- FDR Sensor
- \$395-\$475



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Irrrometer WaterMark and WaterSwitch

- Add-on Devices
- Since 1985
- 1-8 Sensors
- Electrical Resistance Granular Matrix Sensor
- \$100-\$3,040



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LawnLogic LL Series



- Add-on Devices
- Since 2004
- 1-32 Sensors
- Electrical Conductivity Sensor
- \$380-\$2,149

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Waternomics WW1



- Add-on Device
- Since 2001
- Single Sensor
- Electrical Conductivity Sensor
- \$199

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Most Recent and Future Efforts

- Research Water Savings and Report of Findings
- Plan to Update Reports Every 2 Years or As Needed

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Managing Water in the West

Technical Memorandum 86-68210-0801

Summary of Smart Controller Water Savings Studies

Literature Review of Water Savings Studies for Weather and Soil
Moisture Based Landscape Irrigation Control Devices

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Water Savings Studies

- Study Types
- Study Designs and Considerations
- 14 WB Controller Studies
- 9 SMS Controller Studies
- 2 Studies with Both Types

Study Types

- Science Based Actual Irrigation
- Science Based Virtual Irrigation
- Field Studies

Study Designs & Considerations

- Historical Water Use
- Control Sites Water Use
- Adjust Water Use for Weather
- Irrigation Runoff
- Installation & Programming
- Site Conditions
- Public Acceptance

Thank You



Contact:

**Southern California Area Office at
951-695-5310**

**Mark Spears, Denver Technical
Service Center at 303-445-2514**

mspears@do.usbr.gov

Download report at:

**[www.usbr.gov/waterconservation
/docs/SmartController.pdf](http://www.usbr.gov/waterconservation/docs/SmartController.pdf)**

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