# This presentation premiered at WaterSmart Innovations

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# RECLANATION 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

#### RECLAMATION 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

#### RECLAMATION Managing Water in the West

#### Weather and Soil Moisture Based Landscape Irrigation Scheduling Devices

Technical Review Report – 2<sup>nd</sup> Edition-



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

### August 2007 Report

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

August 2007

• Misc. Revisions

#### 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

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- Clock Mode Operation
- Non-volatile memory and Batteries
- Warranties and Reliability

## Weather Based Product Descriptions

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

#### Accuwater



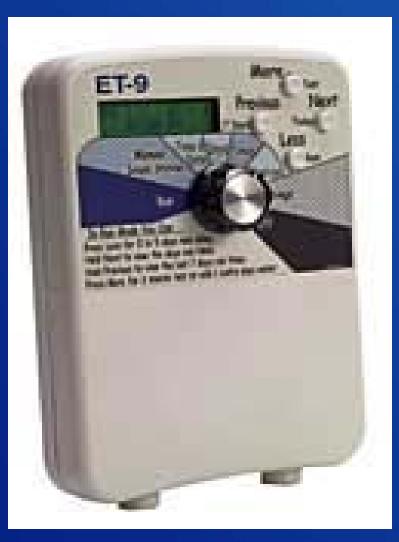
- Stand-alone Controller/Receiver
- Since 2004
- 16-48 Stations
- Computer Interface
- \$549-\$2,999 plus annual signal cost

#### 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

#### **Aqua Conserve ET and Ultimo Series**



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

#### 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



#### **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



#### 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



#### **WCS Hydrosaver**



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

#### **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

#### **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



#### **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



#### 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



#### **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



#### **Accurate WeatherSet Smart Timer**

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



#### 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



## **Agrilink AquaBlu**

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



#### **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



#### **Calsense ET2000e**

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



#### Dynamax Moisture Clik and Moisture Switch

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



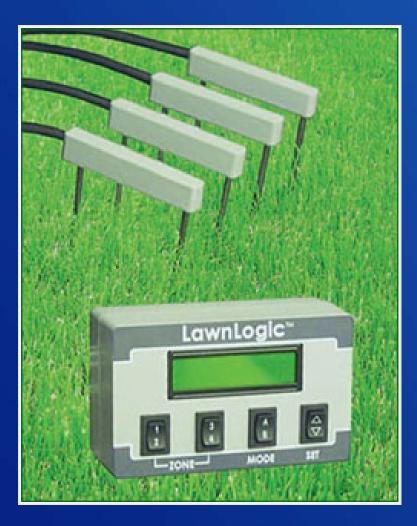
#### Irrometer WaterMark and WaterSwitch

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





#### LawnLogic LL Series



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

#### Waternomics WW1



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

# Most Recent and Future Efforts

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

# RECLANATION 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

# 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

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- 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