This presentation premiered at WaterSmart Innovations

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Harvesting On-Site Water Sources For Sustainable Irrigation

Presenters

John R. Bauer, Water Harvesting Solutions

Mark Coopersmith, ET Water

Jim Davis, Landtech

Agenda

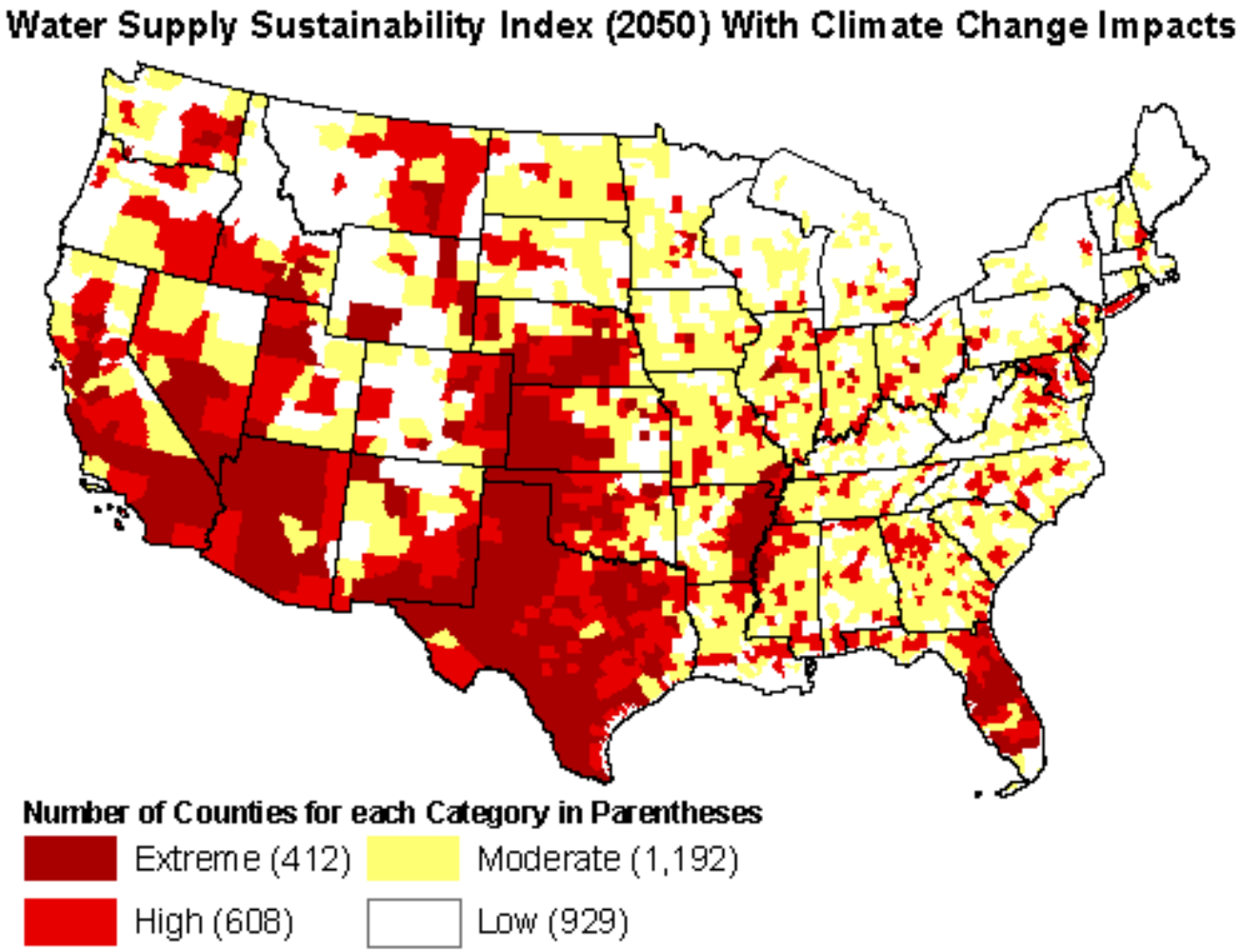
1. Learning Objectives
2. Irrigation and the Looming Water Crisis
3. Sustainable Irrigation Process
   - On-Site Water Reuse (Harvesting): John Bauer
   - Efficient Irrigation Control: Mark Coopersmith
   - WaterSmart Irrigation System Design: Jim Davis
4. Panel Discussion, Q&A

Learning Objectives

1. Understand the urgency of reducing the use of municipal water for irrigation
2. *Supply*: Learn how on-site water can be harvested for irrigation; Understand the major components of a harvesting system
3. *Controls*: Review state-of-the-art weather-based irrigation solutions, including ET-based self-adjusting systems and remote management
4. *Application*: Learn how efficient irrigation design and components complete the sustainable irrigation cycle

A Water Crisis on the Horizon

A Water Crisis on the Horizon



Irrigation Regulations & Restrictions On the Rise

Growing Demand and Limited Supplies Driving…

- Increased water harvesting
- Restrictions on irrigation:
  - When and How much

The 10 Biggest U.S. Cities That Risk Running Out of Water

NOV 10 2010, 6:00 PM ET | Comment

Some of the nation's largest metropolitan areas are in danger of running out of water in the next decades, according to a survey of studies conducted by 24/7 Wall St.

Sec. 6-182. Rainwater Harvesting Plan.

A. All commercial development and site plans submitted after June 1, 2010 shall include a rainwater harvesting plan. The rainwater harvesting plan shall include a landscape water budget and an implementation plan.

1. The landscape water budget shall calculate the estimated volume of water required yearly for all site landscaping detailed in the development and/or landscape plan.
2. The implementation plan shall show how any combination of capture, conveyance, storage, and distribution will be utilized on-site to harvest rainwater. Implementation plans shall comply with applicable Development Standards for water harvesting applications.

Tucson, AZ

South Florida faces tougher watering restrictions

Recommend 3

7 Tweet Submit

Drought concerns move all of South Florida to twice-a-week watering

March 22, 2011 | By Andy Reid, Sun Sentinel

Drought conditions Tuesday triggered emergency watering restrictions for all of South Florida, requiring more cutbacks for many residents already under year-round landscape watering limits.

All of South Florida now must limit landscape watering to twice a week, according to the South Florida Water Management District. Golf courses and agriculture also face new irrigation restrictions.

Sustainable Irrigation Process

Harvest

- Collection, Pre-filtration, Storage
- Stabilization & Sanitation
- Final Filtration & Pressurization

Control

- Monitor Weather Data
- Calculate Actual Plant Water Demand
- Apply Only as Much as Required

Apply

- Choice of Spray, Drip, Subsurface Applications
- Zone layouts
- Water-efficient Applicators

Water Harvesting for Sustainable Irrigation

Harvest

- Collection, Pre-filtration, Storage
- Stabilization & Sanitation
- Final Filtration & Pressurization

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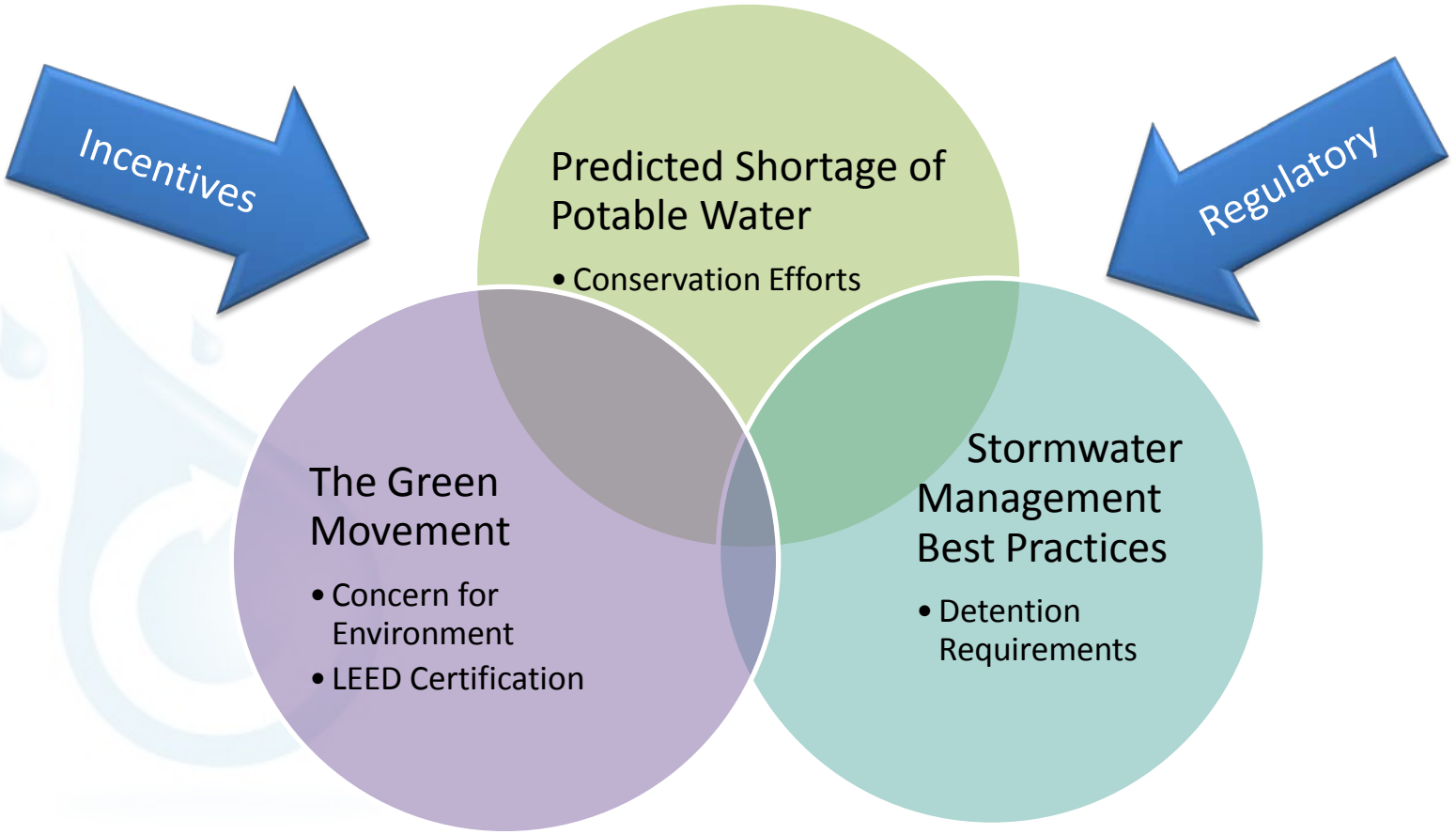
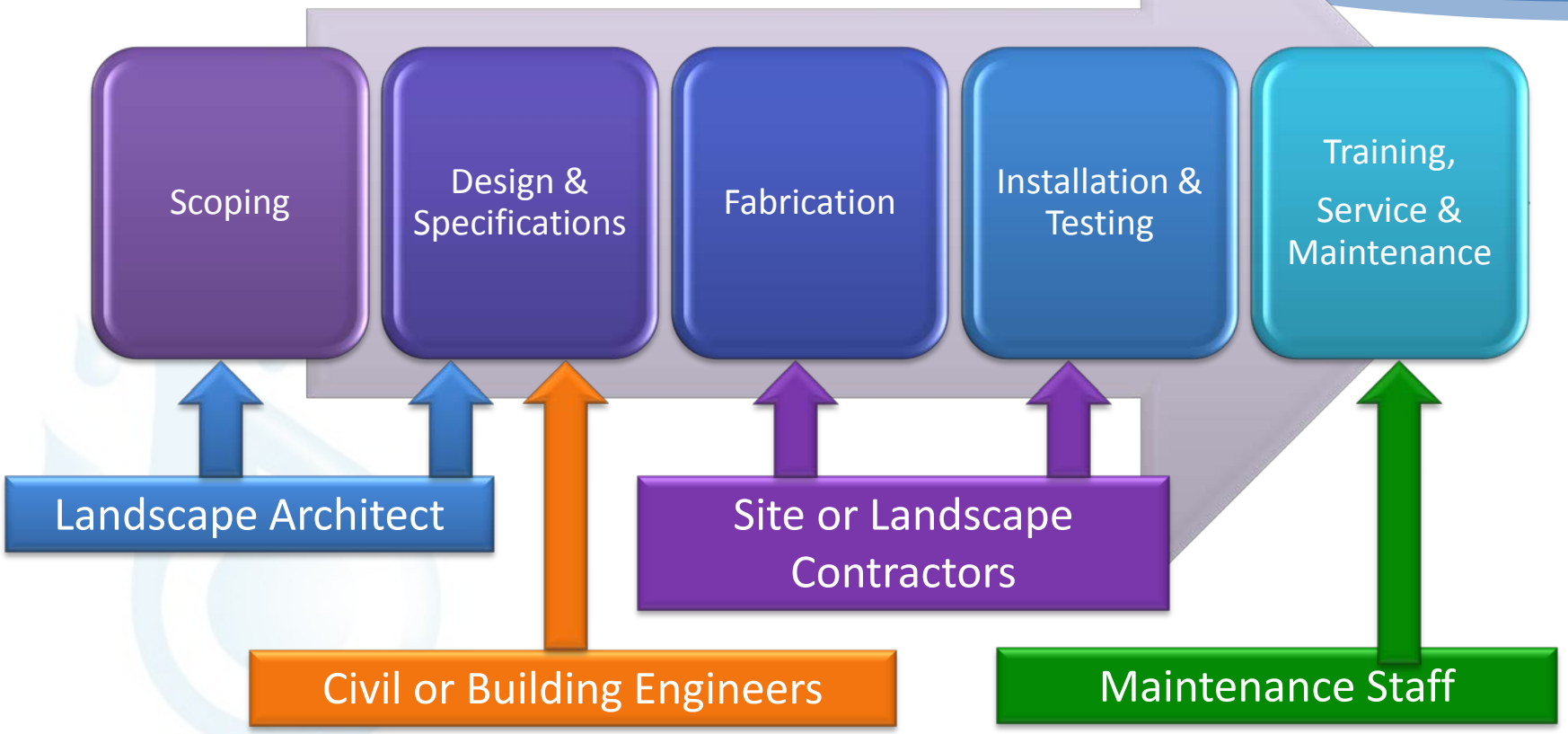
wahaso
WATER HARVESTING SOLUTIONS

Megatrends Support Water Harvesting



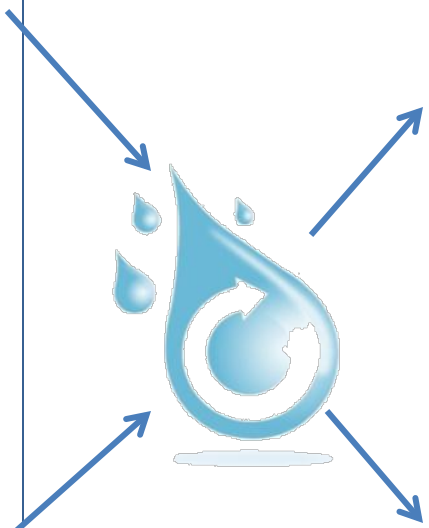
Harvesting System Process Touches Multiple Stakeholders



Scoping: Evaluating Water Sources & Applications

Potential Sources

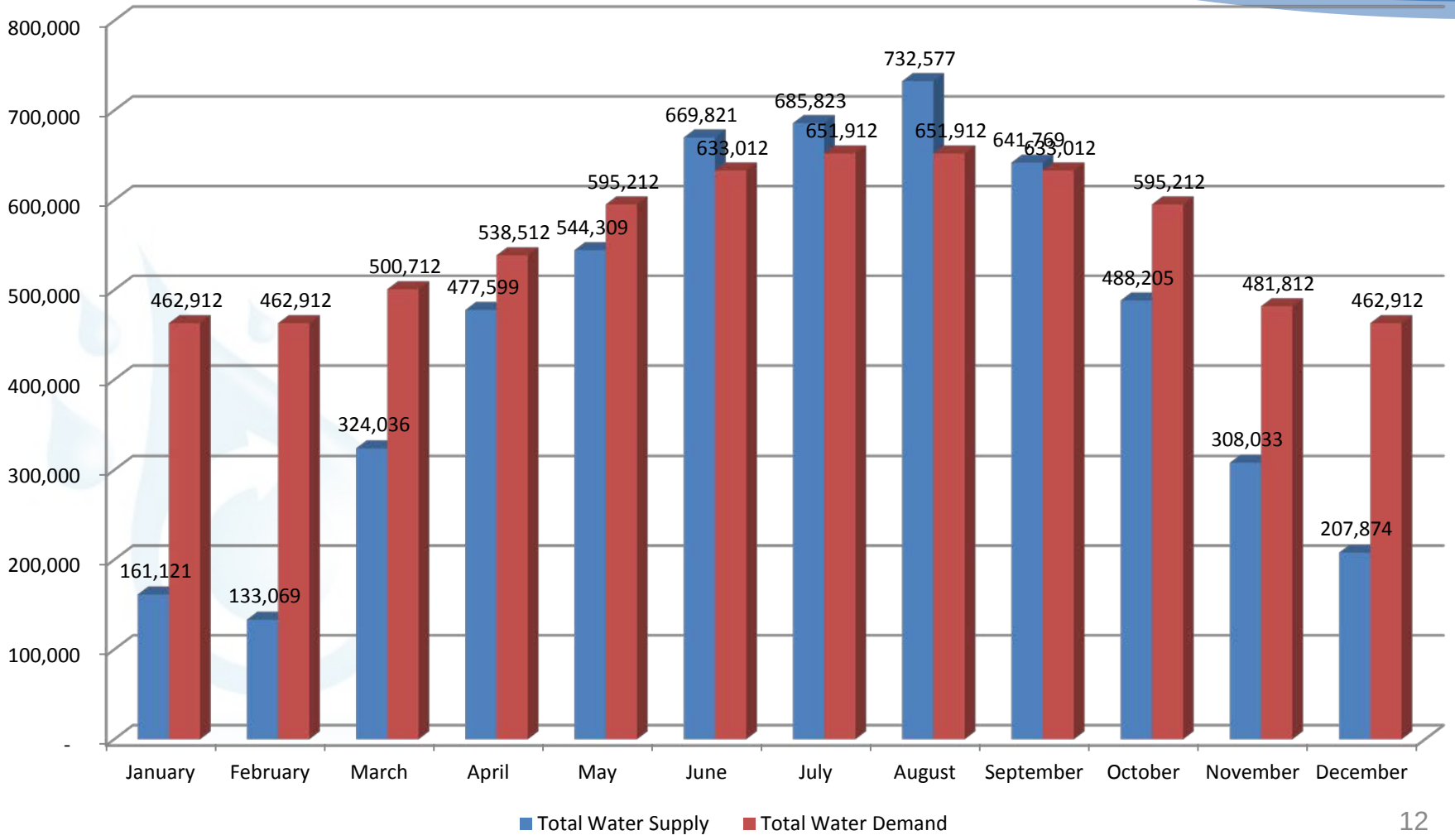
- Rooftop rainwater
- Surface stormwater
- Greywater from showers, sinks, washers
- Cooling condensate
- Steam condensate
- Groundwater ejectors
- Cooling tower “blow down”
- Process wastewater



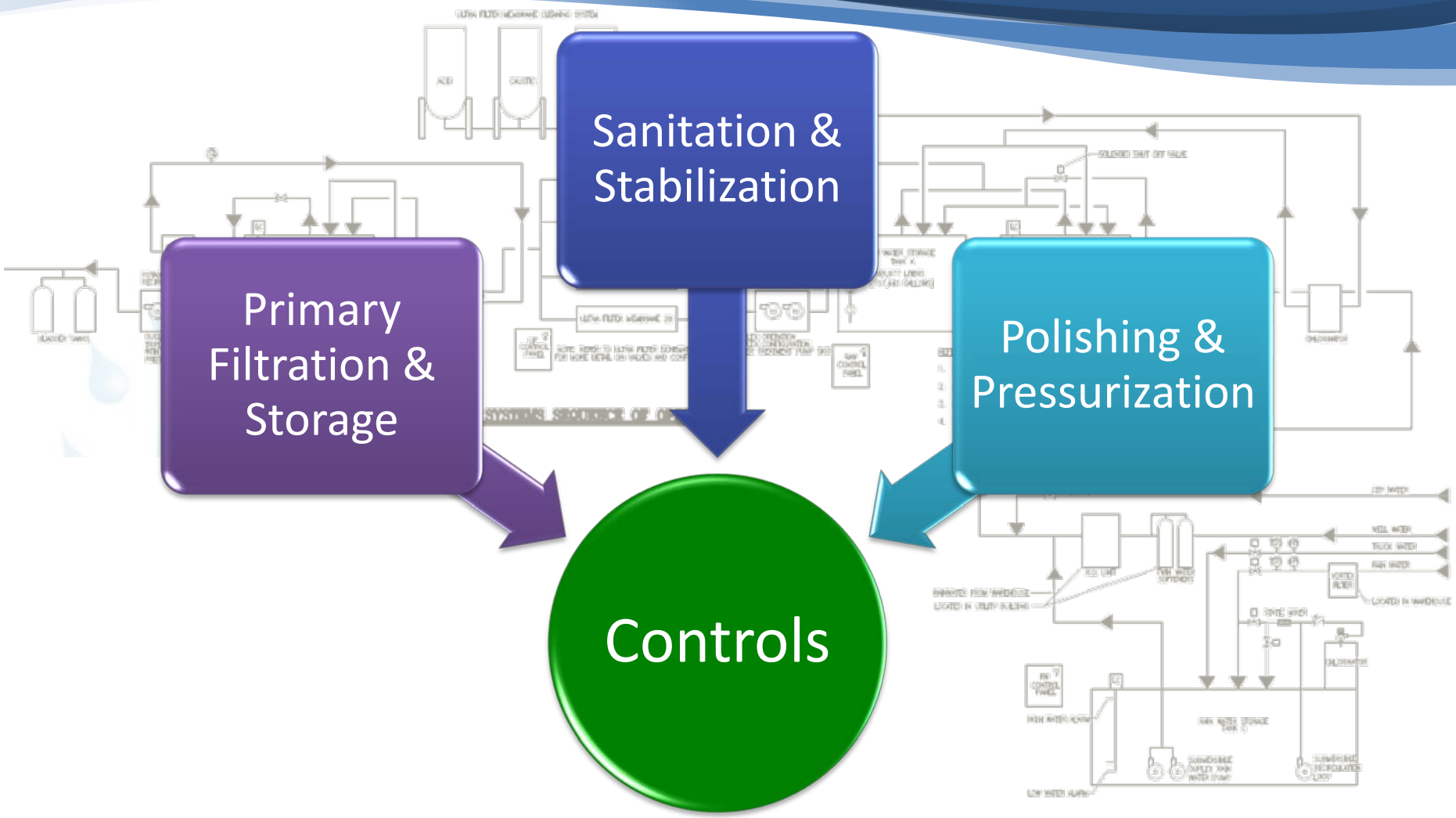
Potential Uses

- Landscape irrigation
- Toilet flushing
- Cooling tower “make-up”
- Green roof irrigation
- Boiler “make-up”
- Truck washing
- Washing machines

Scoping: Matching Supply to Demand

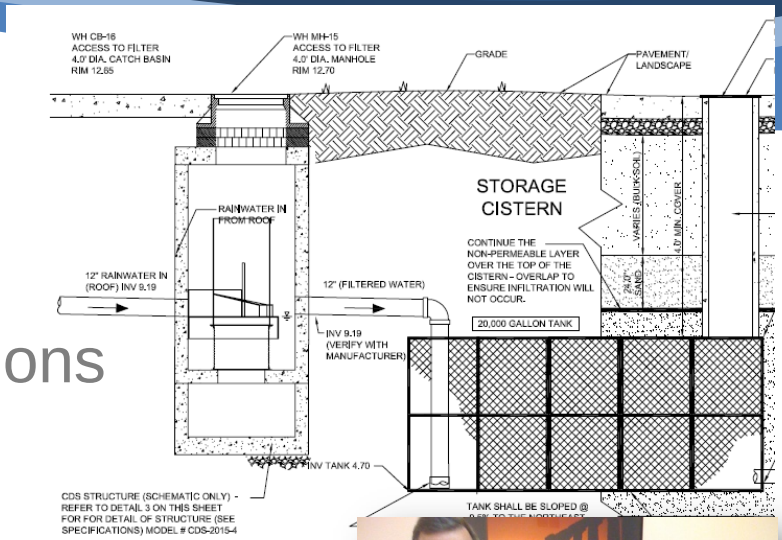


Basic Steps and Components are Common to All Systems



Proper Pre-treatment Protects Water Quality in Cistern

- Considerations
  - Water Sources
  - Flow Rates at Peak GPM
  - Mechanical vs. biological options

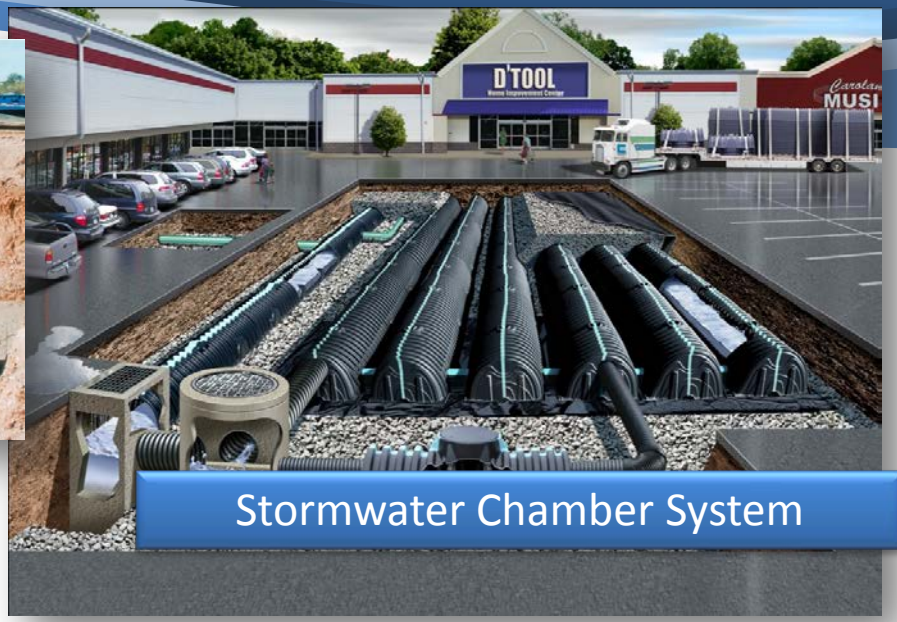


Natural Filtration Through Vegetated Swale

Mechanical Separators

Storage Methodology a Key Variable

Underground Fiberglass Tanks

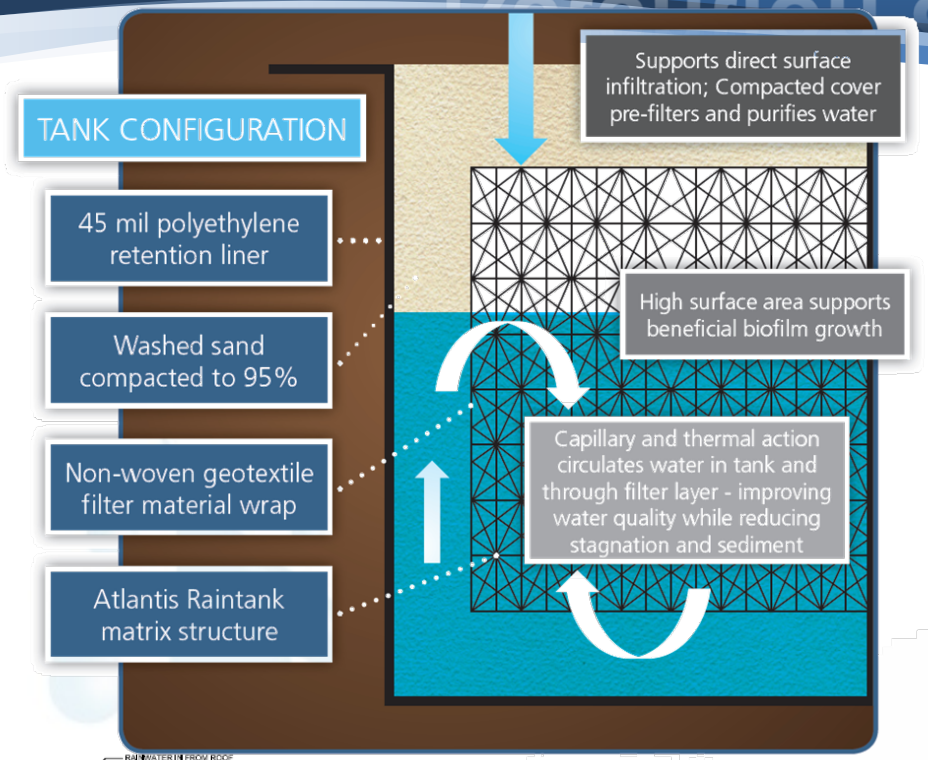


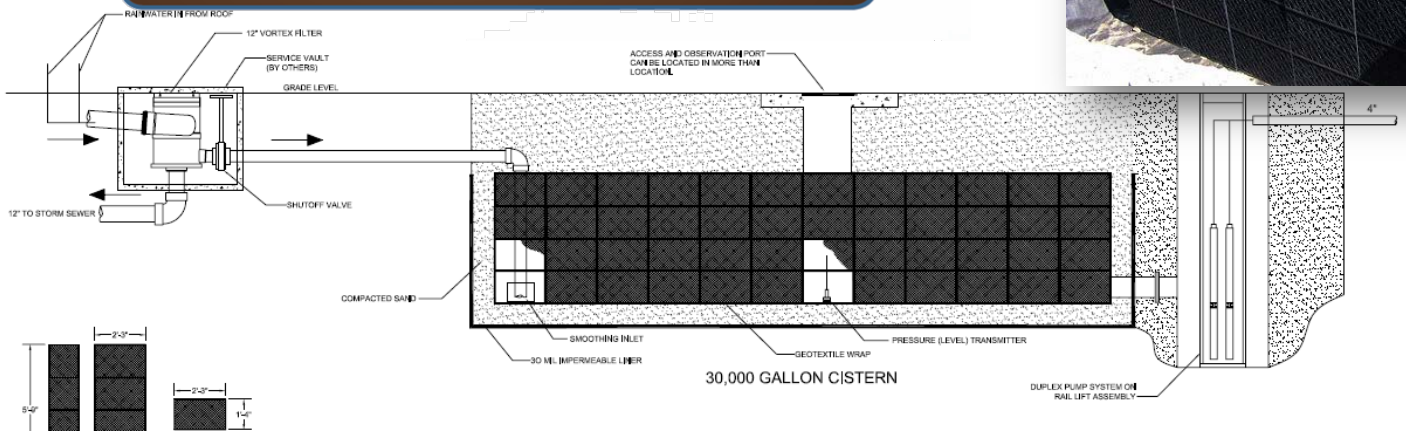
Stormwater Chamber System

Concrete Vaults

Steel Tanks

Polypropylene Structures Ideal for Retention & Reuse





Stored Water Must be Stabilized and Rendered Safe for Application

- Considerations
  - Water source quality
  - Methodology: UV, Chlorine, Chlorine Dioxide, Ozone
  - Plant sensitivity

Chlorine Dosing Systems

Ultra-Violet Sterilization

“Polishing” Completes Treatment Steps

- Filtration Considerations
  - Source and application of water
  - Cost vs. maintenance trade-off
  - Final filtration options: bag, sand, carbon, R/O

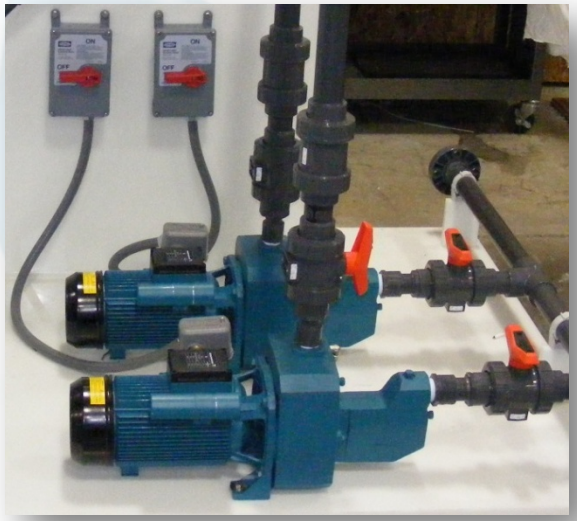
High Capacity Bag Filtration

Self-Cleaning Filters

Final Filtration and Pressurization

- Pressurization Considerations
  - Water use requirements – pressure & flow rates
  - Reliability importance – critical or non-critical use
  - Options: single – triplex; submersible; solar powered

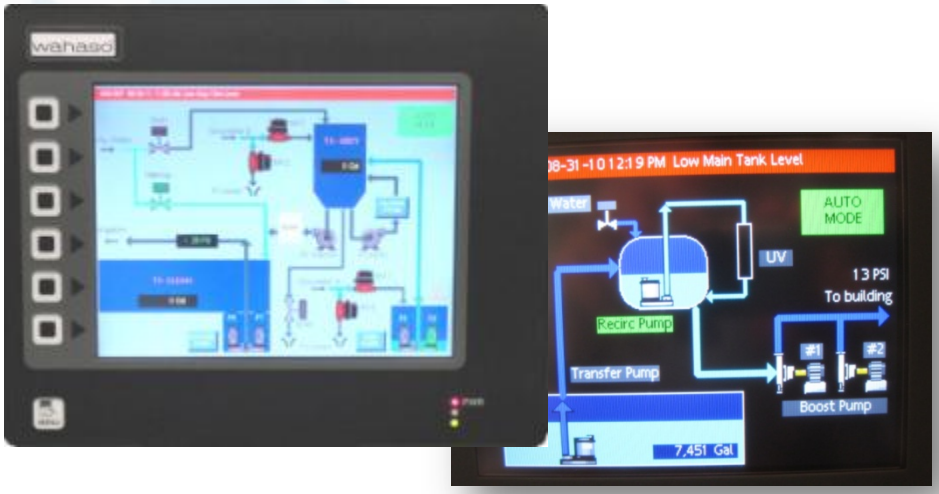
Lower Volume Systems



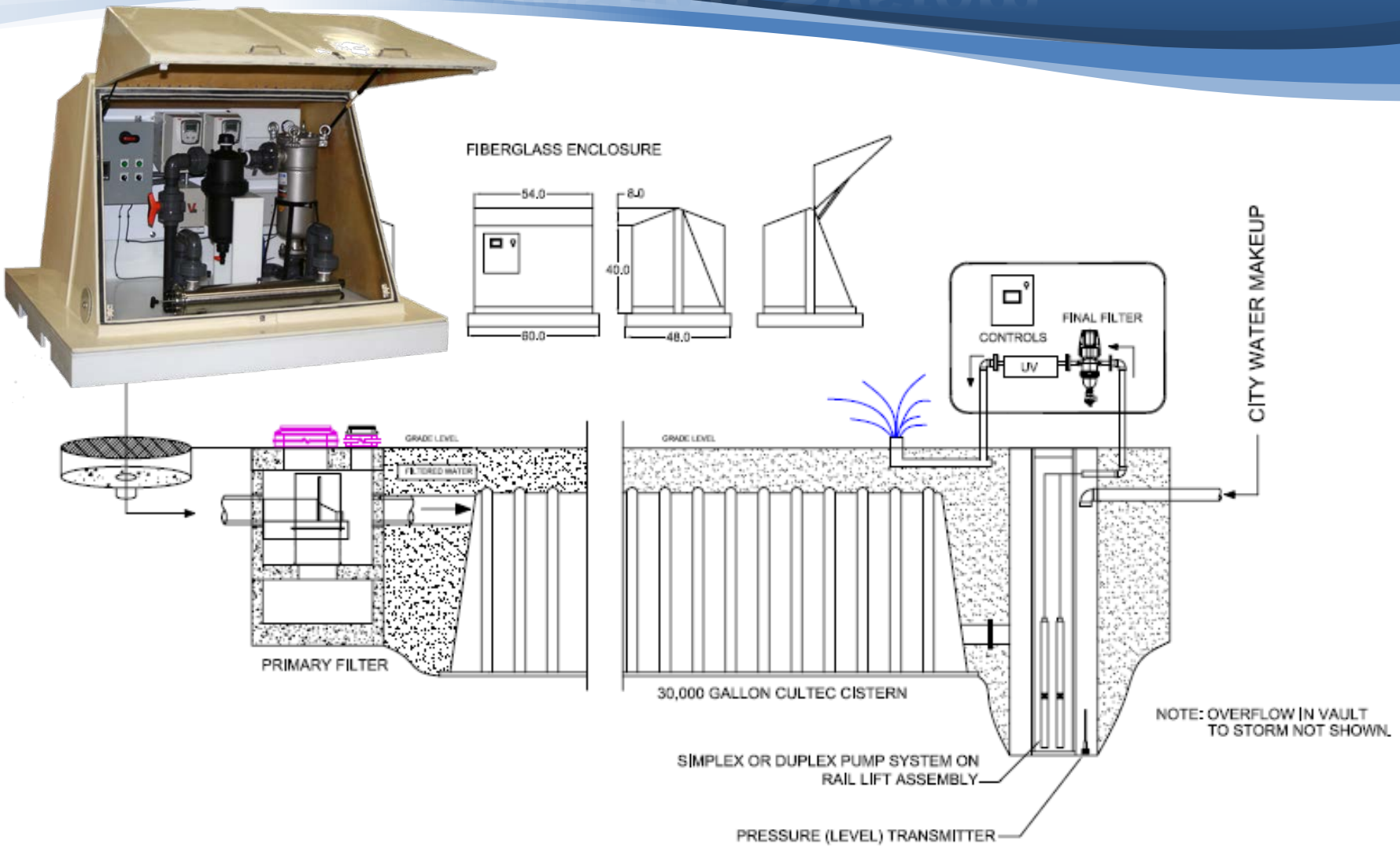
High Capacity Industrial-Grade Skid

Control System Monitors and Controls all System Activity

- Custom controls are designed and programmed for the needs of each system
  - Monitor all systems 24/7
  - Manage pressures, pumping, levels, filtration, cycling
  - Simple read-outs, color touch screen displays, web interface, building automation connectivity
  - Data-logging and reporting support Green communication and education



Typical Sustainable Irrigation Harvesting System



Intelligent Irrigation Control

Control

- Monitor Weather Data
- Calculate Actual Plant Water Demand
- Apply Only as Much as Required

ETwater™

Intelligent Water Management

Mark Coopersmith

mcoopersmith@etwater.com

www.etwater.com

A Brief Intro to ET Water

- Award-winning & sector-leading solution
  - Web-based - Real time weather
  - Wireless - Digital controllers
- Up to 50% savings in landscape water use
  - Typical payback within 2 years
- Consistent Sector Innovator
  - First to be “SWAT” certified
  - Strong IP/patent position
  - Smart-phone apps
  - New “Hermit Crab” plug ‘n play unit
- Made in the USA

Different Users/Segments Have Different Needs

PROPERTY OWNERS

- Save water and $$
- Improved compliance with water regulations
- Limit water-related property damage
- Enhance green branding

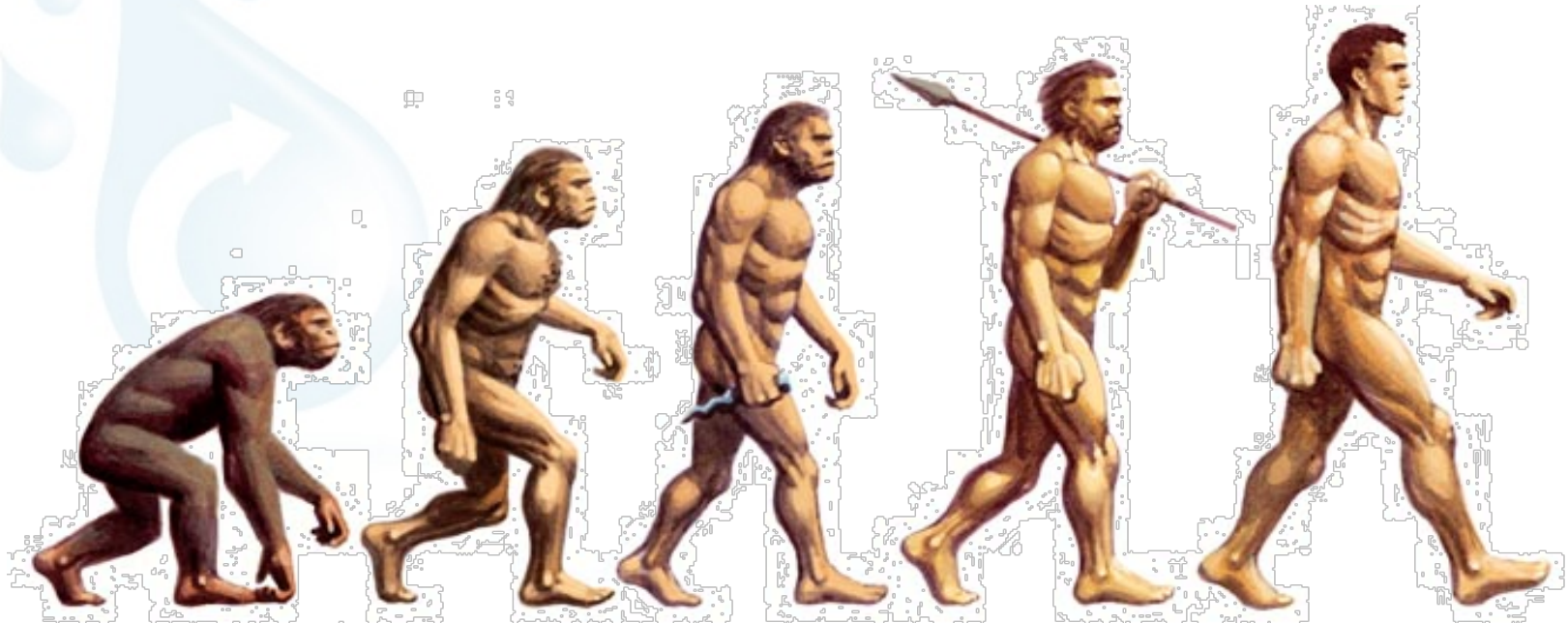
PROP/LANDSCAPE MGRS

- Labor savings (truck roll)
- Remote, online and wireless system access
- Onsite efficiency/tools
- Enhanced flow and system monitoring
- Robust reporting tools
- Improved compliance

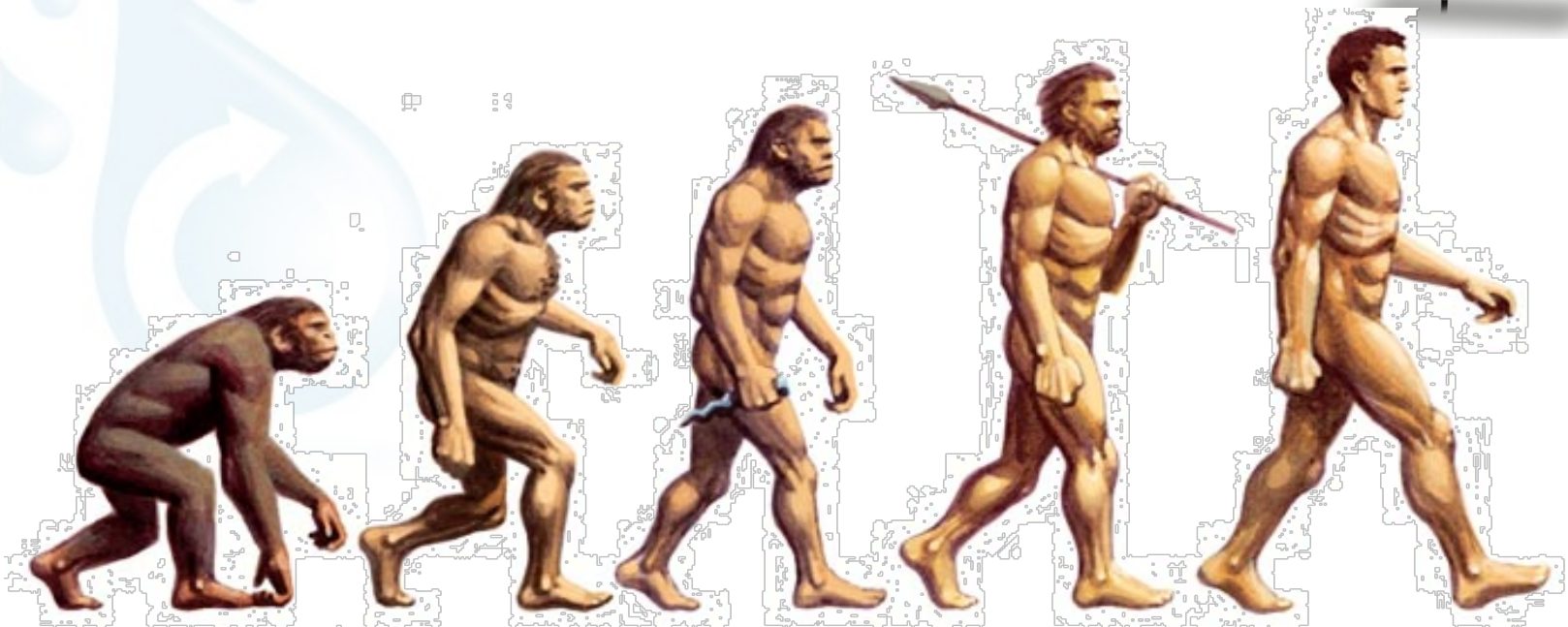
WATER SYSTEM OPERATORS

- Load management and system efficiency/utilization
- Peak shaving/shifting
- Capital redeployment
- On-demand conservation when needed

Evolution



Evolution of Irrigation Control



Site-based Controllers & Accessories

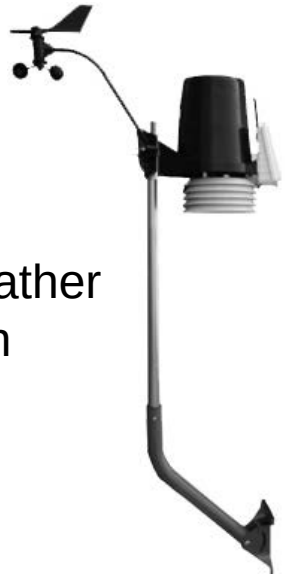
Clock-based Controller

Rain Sensor

Soil Moisture Sensor

Flow Meter

Onsite weather station



Weather-Based Controllers

Example: ET Water Systems

How the ET Water System Works

1. User enters landscape profile online, saved in cloud

User upload plant types, maturity, sun/shade, slope, soil type, sprinkler/drip type and rates, water windows, etc.

How the ET Water System Works

1. User enters landscape profile online, saved in cloud
2. **Local weather stations capture weather and rainfall data**

Access to thousands of weather stations nationwide.

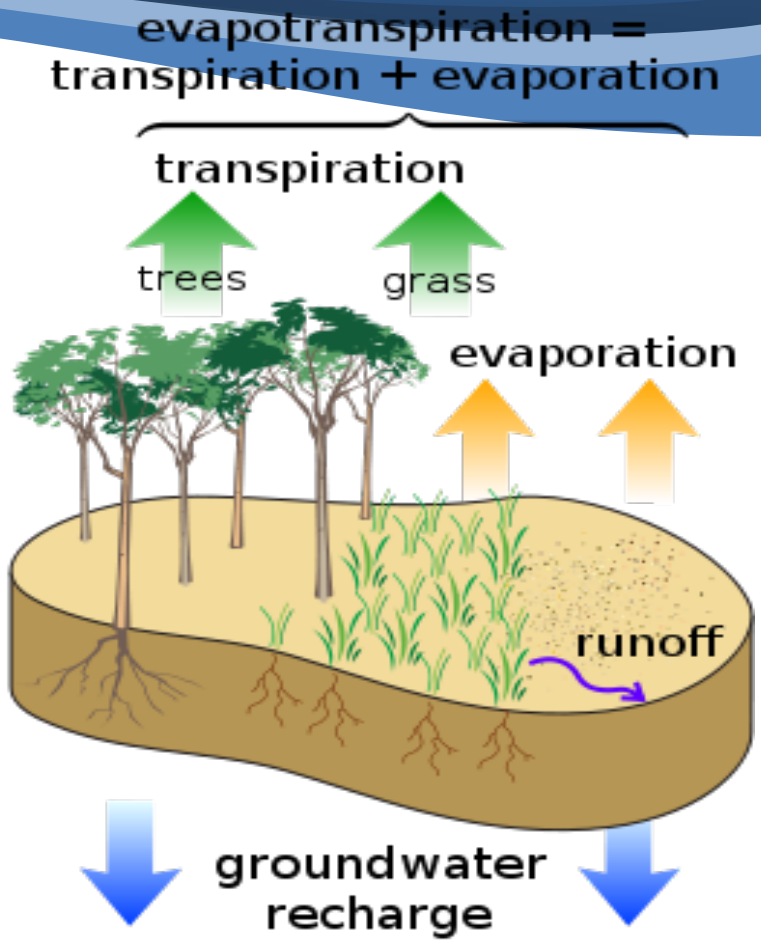
Real-time weather data from 10,000+ stations*

*** Exclusive 5 year contract with Earth Networks / WeatherBug**

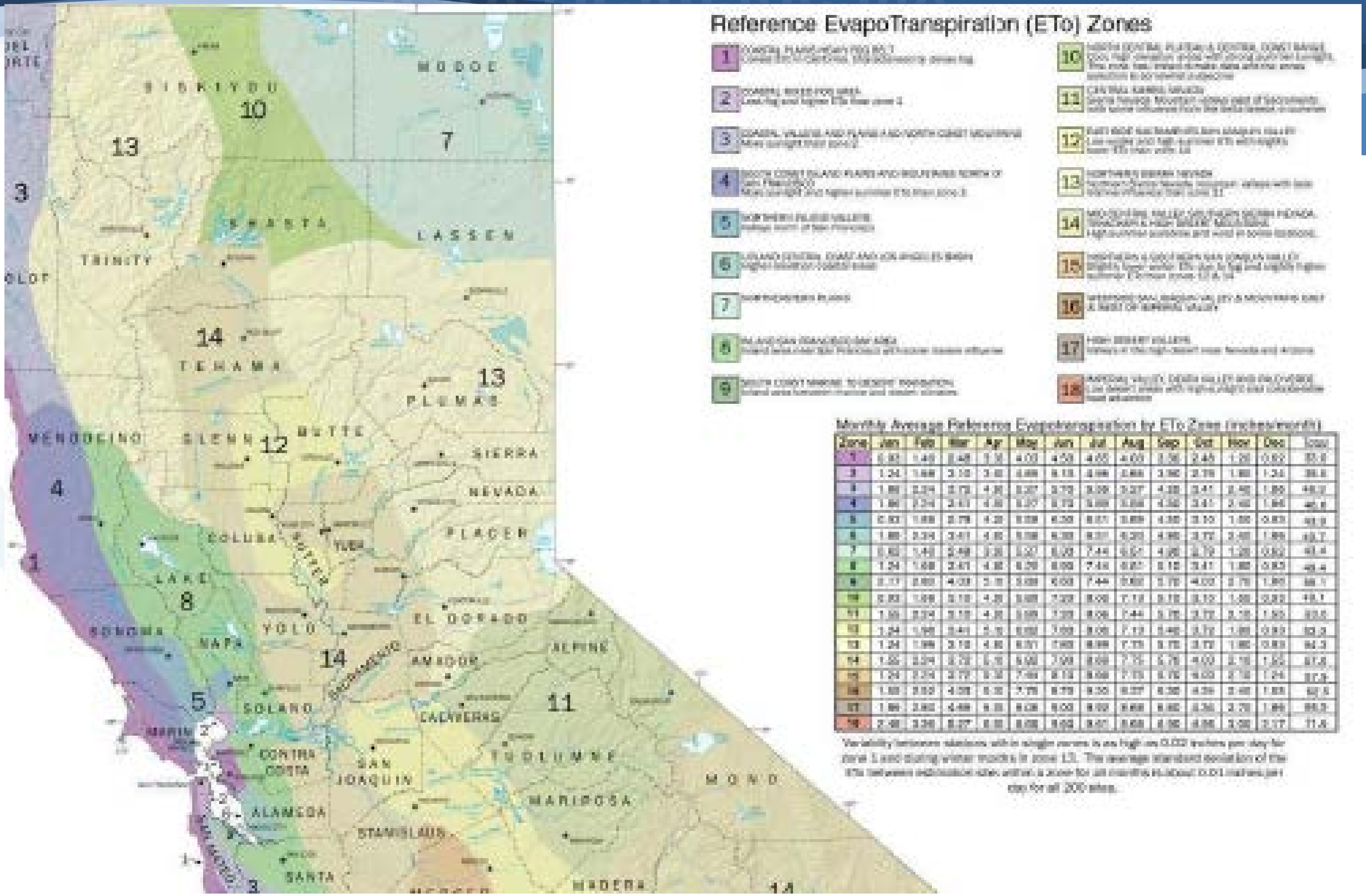
EvapoTranspiration

- ET is the loss of water from the earth & plants to atmosphere
  - Evaporation from ground
  - Transpiration from plants
- ET changes as weather changes
- Different plants = different ET

$$ET_o = \frac{\Delta R_n + \rho_a c_p (\delta q) g_a}{(\Delta + \gamma (1 + g_a / g_s)) \lambda_v}$$



EvapoTranspiration Rates Vary Dramatically



How the ET Water System Works

3.

1. User enters landscape profile online, saved in cloud
2. Local weather stations capture weather and rainfall data
3. **ET Water servers compute EvapoTranspiration and irrigation schedules daily**

How the ET Water System Works

1. User enters landscape profile online, saved in cloud
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3. ET Water servers compute EvapoTranspiration and irrigation schedules daily
4. **Field-based smart controllers connect wirelessly with servers to exchange schedules and data**

How the ET Water System Works

Can also use smartphone for real-time control

1. User enters landscape profile online, saved in cloud
2. Local weather stations capture weather and rainfall data
3. ET Water servers compute EvapoTranspiration and irrigation schedules daily
4. Field-based smart controllers connect wirelessly with servers to exchange schedules and data
5. **Smart controllers execute daily irrigation schedules**

Case Study: Mid America Apartments
Published in Water Efficiency Magazine, Sept/Oct 2010

- Mid-America owns/manages over 42,000 living units
- in 2010 ET Water participated in 3 smart-irrigation trials with Mid-Am.
- The average ROI on the ET Water trials was 230%

Table 1. 2009 ET Water Systems

2009 Projects	Capital Cost	YOY Water Exp Savings	Water Reduction (Gallons)	ROI
Boulder Ridge	$ 10,905	$ 34,357	7,131,656	315%
Grand Courtyards	$ 8,529	$ 14,636	5,251,999	172%
Los Rios	$ 7,041	$ 11,812	10,238,799	168%
	$ 26,475	**$ 60, 805**	**22,622,454**	**230%**

Source: ET Water

From the article: *"A big part of standardizing our whole operation is teaching our vendors environmental stewardship. We wouldn't use a system that was really expensive just for the sake of saving water if it couldn't reduce our expenses enough to offset that cost."*

- Josh White, Mid America Apartments, quoted in Water Efficiency Magazine

ET-Based Consumer Web Services

What it is:

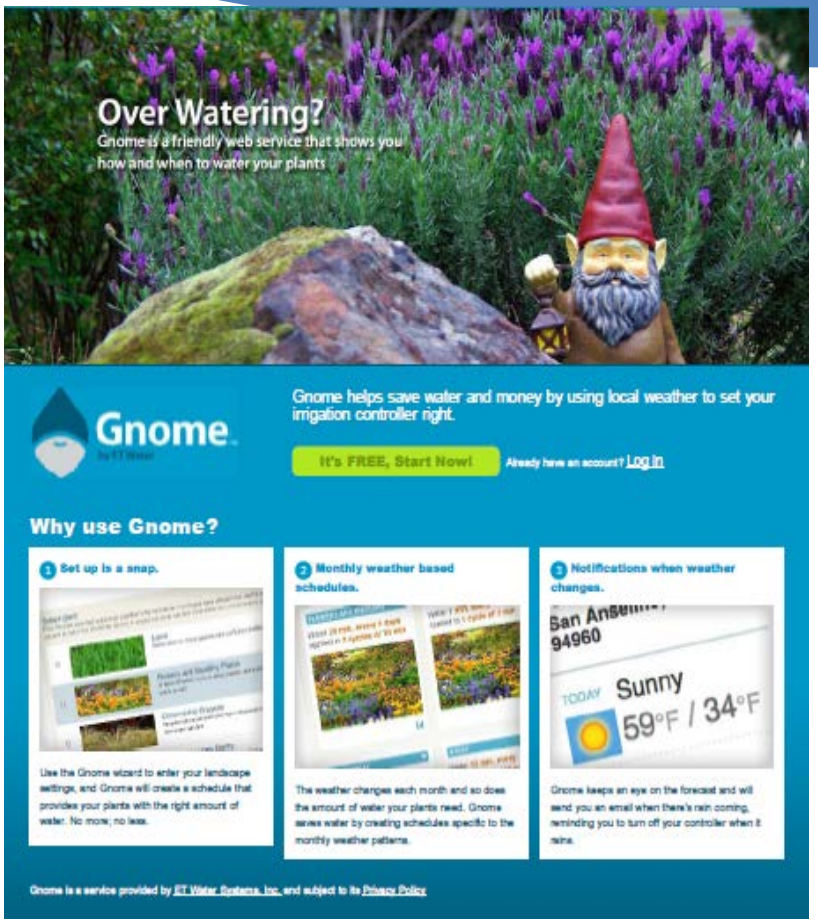
- A web-based tool that utilizes the ET Water scheduling engine and weather data to create customized watering schedules for users.

Utilizes:

- Historic weather and ET, along with
- Current weather and forecasts

Provides:

- Customized watering schedules
  - Tailored for different controllers
- Alerts when rain or significant weather changes are forecast



www.etwatergnome.com

Why Smart Controllers Make Sense?

Regulations and restrictions are increasing

- Calif AB 1881 requires efficient irrigation systems
- At least 36 states face water shortages by 2013*

A better user experience

- Easy to install and set up
- Online and smart-phone access and management
- Adjusts automatically

Excellent ROI for all stakeholders

- New products cost 70% less, often free with incentives
- Ongoing savings more than pay for subscription costs
- Water prices continue to rise
- Plus "Social ROI"

* US GAO 2008

Apply

- Choice of Spray, Drip, Subsurface Applications
- Zone layouts
- Water-efficient Applicators

LANDTECH IRRIGATION CONSULTANTS

Jim Davis,
General Manager

When Harvesting Water, Become "WaterSmart"

Commercial landscapes still require water to thrive…

- Use plants that require less supplemental water (less turf), but still provide environmental benefits.
- Strive to balance the landscape's water demand with the non-potable water available for irrigation.

The *New* Mission of Landscape & Irrigation Professionals

Commit to Using 'WaterSmart' Products…

1. Discharge less water (lower precipitation rates)
2. Apply water to plants more efficiently (below 70% is poor)
3. Use pressure-regulation to ensure optimum operation
4. Use rain-sensors that delay water-resumption after rain events
5. Rely on weather-based controllers that enable runtimes (& days) to be modified, based upon onsite conditions.



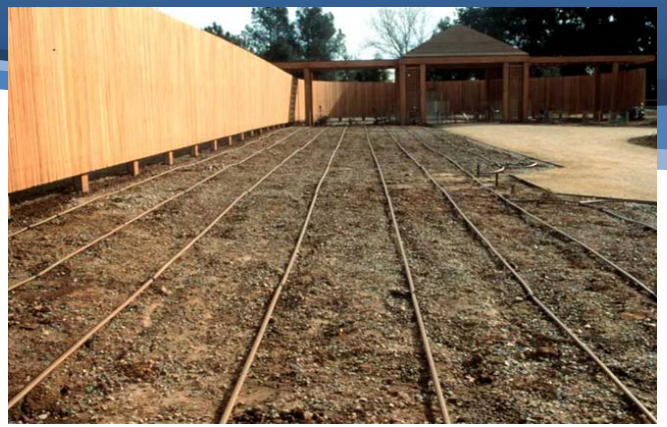

Designing Sustainable Irrigation

- Discuss water-efficient plant strategy with the design team

- Select from a palette of highly-efficient products:
  1. Drip-irrigation (low precip-rate; 92% efficient)
  2. With sprinklers, use low-volume/efficient nozzles
  3. Pressure-regulating valves for optimal operation
  4. Pump-stations with VFD configuration
  5. Use weather-based controllers
  6. Always use a rain-sensor! (preferably wireless)

‘WaterSmart’ Applications:

- Drip Irrigation
  - In-line drip-tubing (masses)
  - Point-source emitters (sparse clusters)
- Spray Heads
  - Lower gpm & precip-rate nozzles
  - Built-in pressure-regulation
  - Automatic ‘Shutdown’ feature
- Multi-stream Rotating Nozzles
  - Lower precipitation rates
  - Higher efficiency of application
- Rotors
  - Nozzle performance & adjustability
  - Pressure-regulation at-the-head



‘WaterSmart’ Control Methods:

- Control Valves
  - Flow-control
  - Pressure-regulation

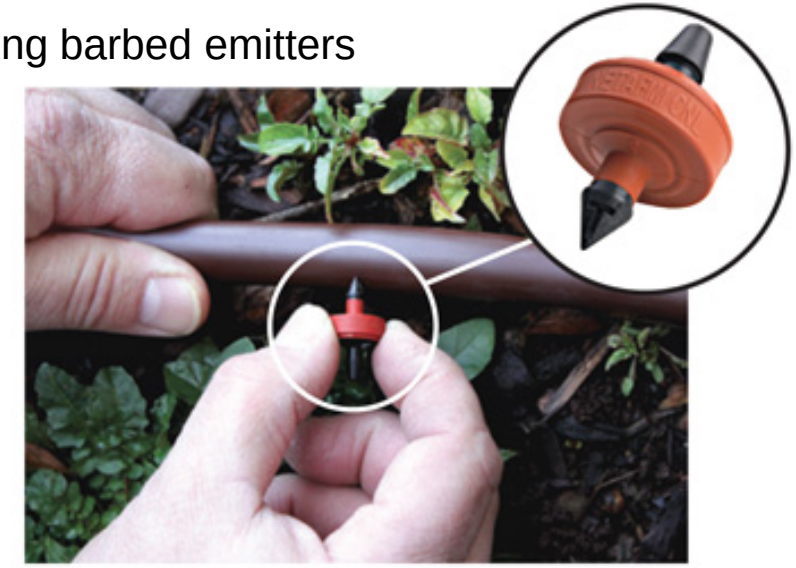
- Soil-Moisture Sensors
  - Actual onsite conditions
  - Soils & shade conditions
- Wireless Rain-Sensors
  - Variable sensor settings
  - Water-resumption delay

- Weather-based Controllers
  - Local ET conditions (evapotranspiration)
  - Zone-specific data entered for customization
  - Hand-held remotes for onsite system checks

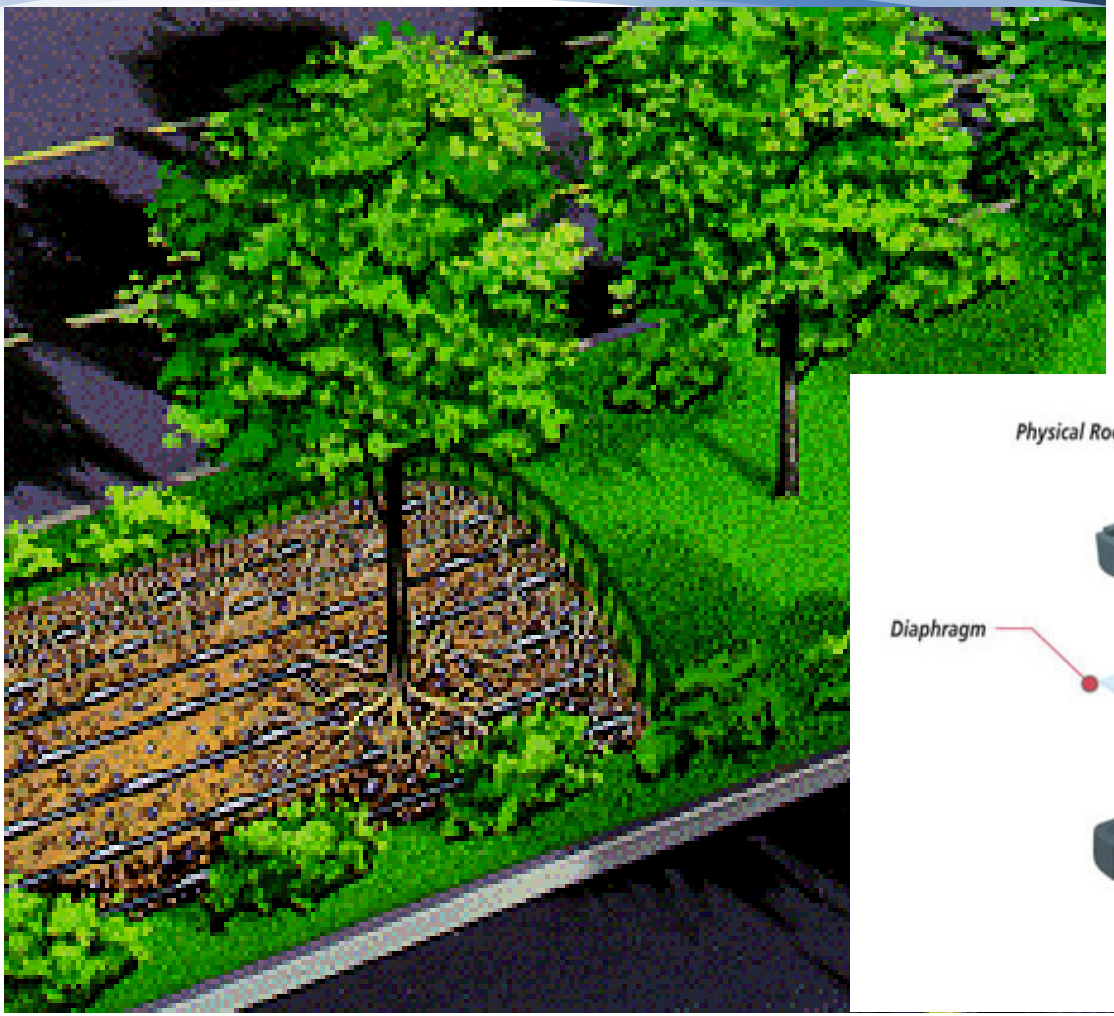
Micro/Drip Irrigation

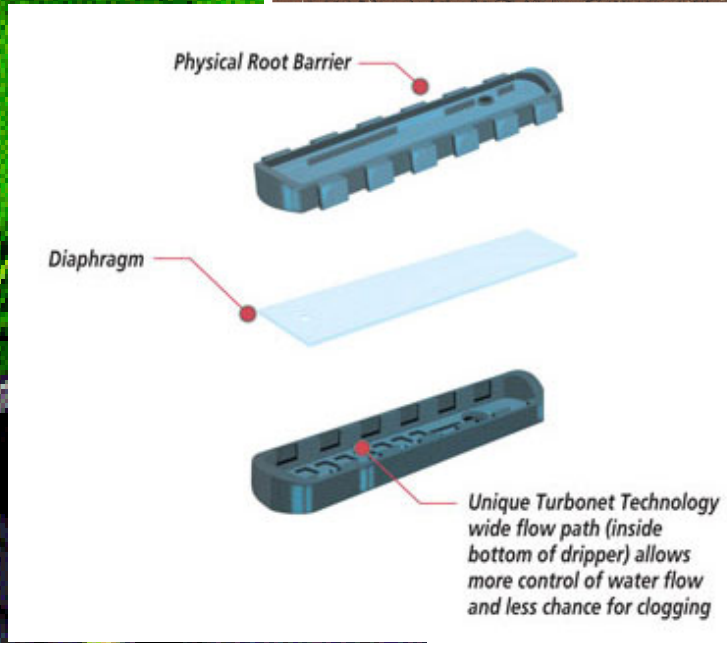
- Drip-emitters (varying outputs: 0.26 gph or 0.4, 0.6, or 0.9)
- Point-source emitters (0.5 gph or 1.0 gph or 2.0 gph)
- Most applications are 90%-95% efficient, and very capable of achieving the ‘water efficiency’ credit on LEED projects.

Self-piercing barbed emitters



Install Drip Tubing Directly in Root Zone

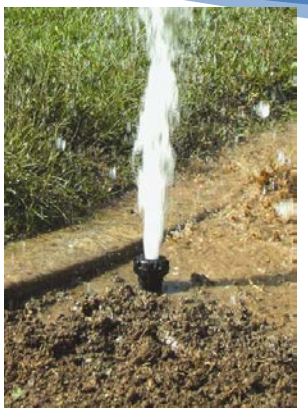




Sprays with Enhanced Features

With Shutdown Device

- When nozzle is removed, filter-basket lifts and device slips upward, seals off flow.



With PR & Shutdown

Two features combined…

- Pressure regulated at 30 psi. Prevents sprinklers from ‘fogging’, being carried away by wind drift.
- Shutdown device is also in place.

Use State-of-the-Art Nozzle Technology

- Compared to standard MPR nozzles, certain nozzles can discharge 30% less
- Precipitation rate is at 1.0 inch/hour
- Greater efficiency of application (72 vs 60)
- Additional arcs vs standard (60, 150, 210 deg)
- Male-threaded ***and*** female-threaded

Multi-Stream Rotating Nozzles

- Lower precipitation rates (Approx 0.4-0.5 inches/hour)
- Commonly used mid-range (17-25 ft.)
- Efficient application
- Flexible in design; adaptive to varying geometry of landscape edges.

“Green” Irrigation Systems do not *just happen*…

It takes…

Pre-planning,

Coordination,

Commitment

The Important Role of Specifiers

- Long-term savings potential of WaterSmart items
- Value-engineering usually brings only short-term savings
- Balance between water availability & demand
- Coordination of various components (special equipment & utilities)
- Help avoid unplanned patches & eyesores
- Incorporate the latest water conservation products… to save water ***<u>and</u>*** money… *(Note: water is the most expensive part of an irrigation system!)*

+

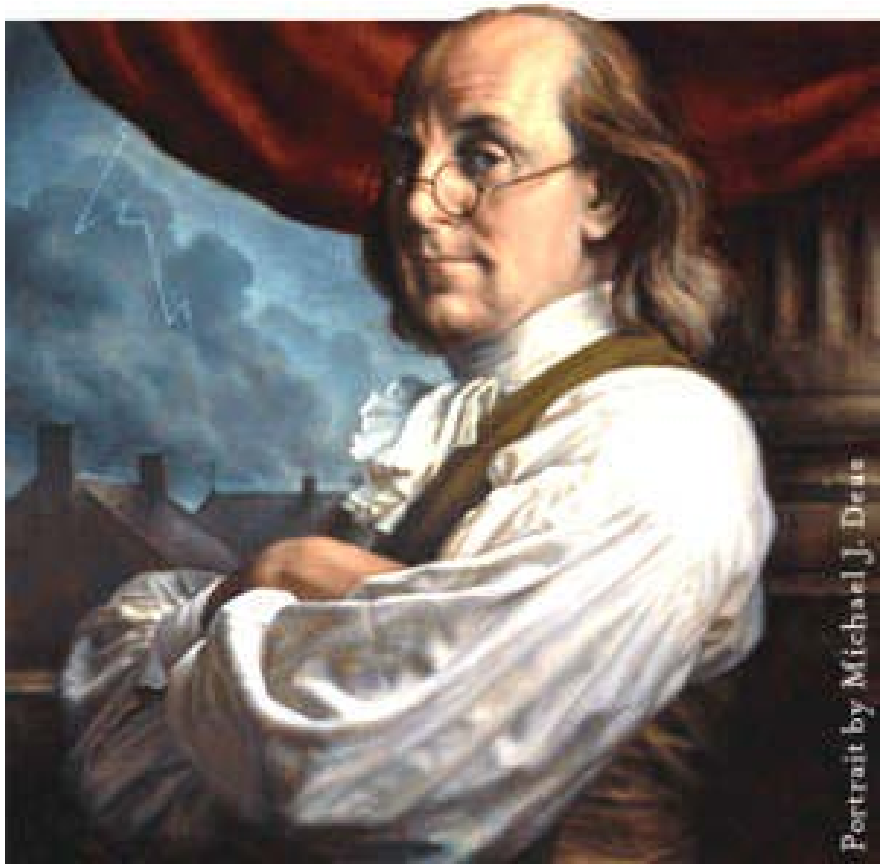
Not…

Make a Difference…

START SELLING 'WaterSmart' Systems!!

“When the well's dry, we know the worth of water.”

Benjamin Franklin
Poor Richard's Almanac
1746



Q & A

- Typical system costs?
- Regulatory Issues?
- LEED Value?
- Tax incentives or other off-sets?

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