

Components of Landscape Water Use Efficiency

Melissa Baum-Haley, Ph.D.

Water Use Efficiency Programs Specialist

Municipal Water District of Orange County

December 5, 2013

Components of Landscape Water Use Efficiency

- What is being watered
 - Plant material
- How it is being watered
 - Irrigation equipment
- When and how often it is being watered
 - Management and water application technology
- Where is the water going
 - Infiltration vs. runoff prevention
- Where is the water from
 - Water source
- Functional use



What is being
watered

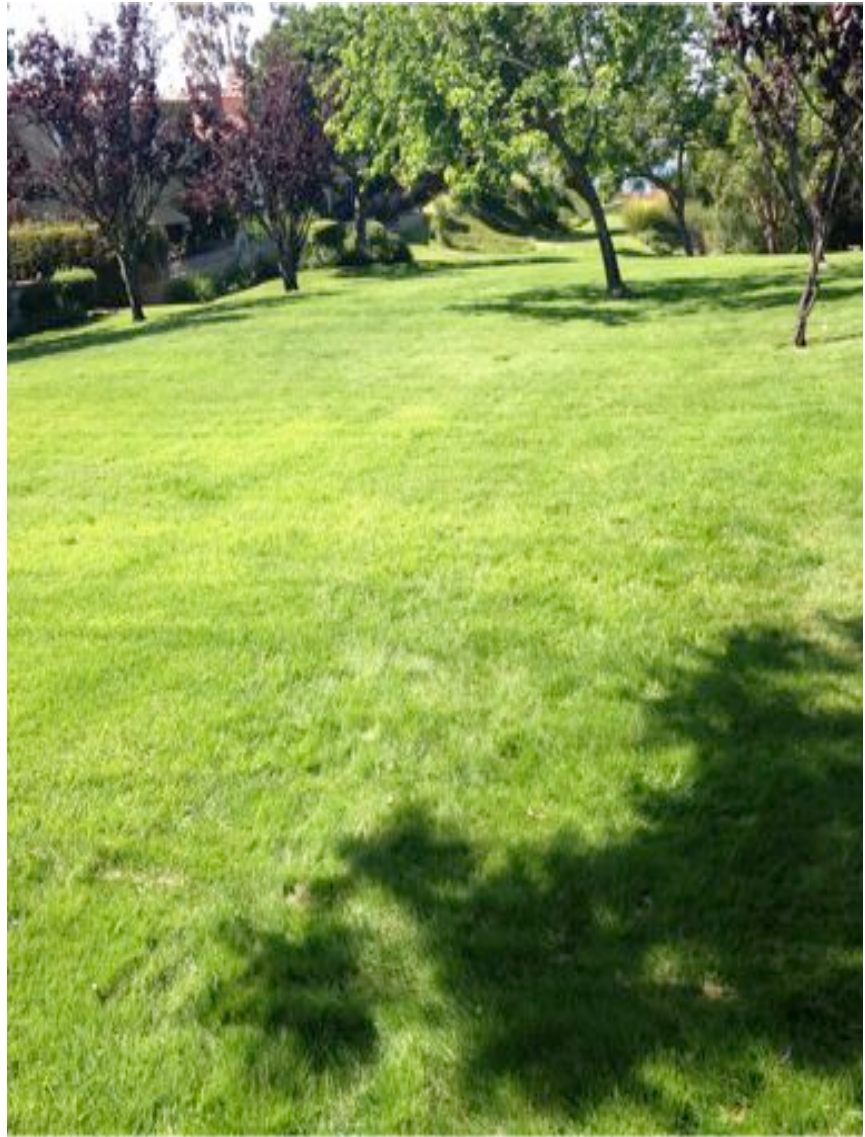
Plant material



VS.



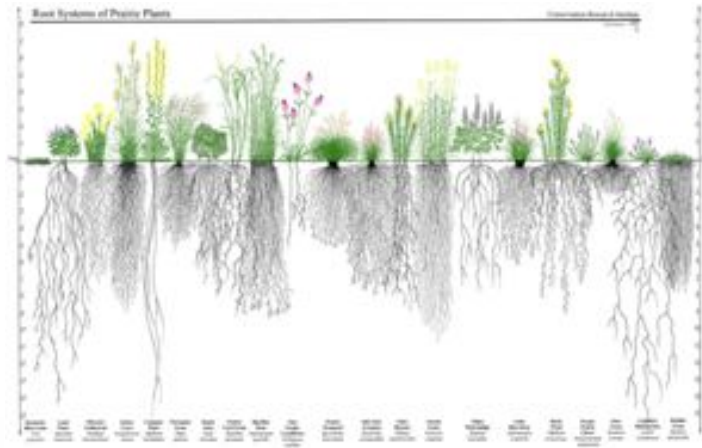
Considerations of landscape conversion



How to Remove Turfgrass



Erosion Control



Runoff Control



Photo credit: www.gsd.harvard.edu



Photo credit: City of La Habra

Hardscape Area

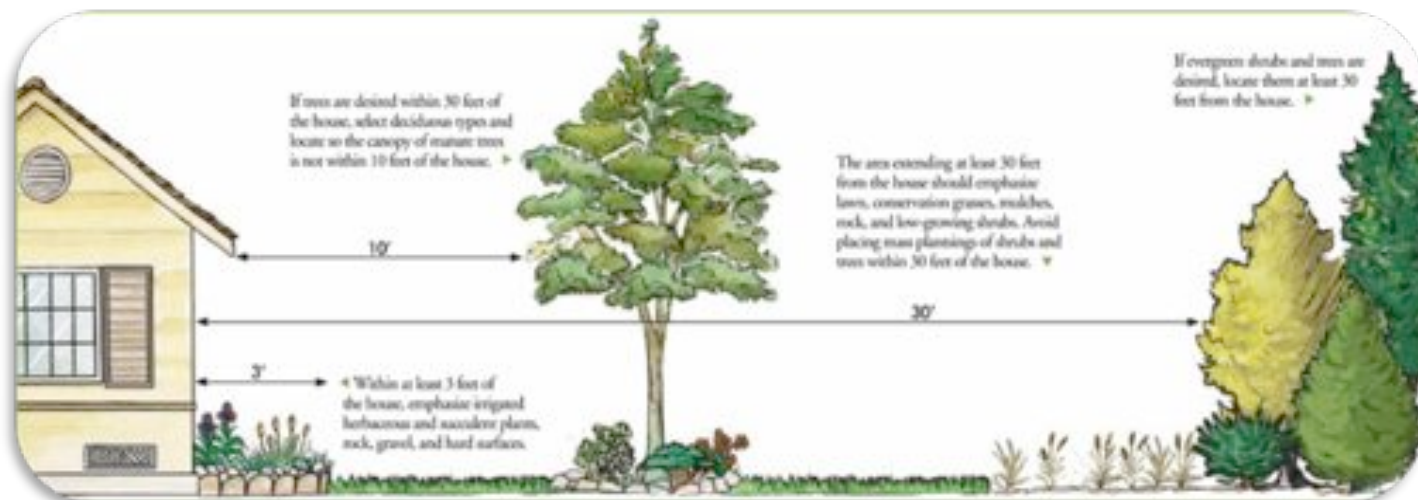
Permeable pavers are not advisable in the following cases:

- **Slopes greater than 5%**
- **Areas with high wind erosion rates**
- **Soils that have a rising water table or saline conditions**
- **Dispersive clay or low hydraulic conductivity soils**



Fire Control

- **Proximity to structures**
- **Plants with high oil content**
- **Plants that act as latter fuels**



Graphic credit: Kirah Van Sickle

Turf Alternatives

- Synthetic
- Turf-like grasses

Real ?



Watering habits and perceptions relating to Plant-water needs

Low Water Requirement \neq Low Water Use
Drought Tolerant \neq No Irrigation Need



Photo credit: Municipal Water District of Orange County

VS.



Socio-Behavioral Influence

Attitudes that result in behavior change in relating to landscape conversion include:

1. Intensifying the regularity of newly acquired practices to reduce water consumption
2. Expanding water saving behavior to include other water conservation practices
3. Showing greater concern for environmental protection by reduced outdoor chemical and water use
4. Promoting the benefits of the non-turfgrass intensive landscape to others

Economic Influence

Maintenance Costs

- Post conversion the maintenance costs will decrease
- Overtime they will increase



Irrigation equipment & management

- Without changes to the irrigation system water savings will likely NOT be realized!



Key to Management

- Setting up a budget
 - How much water is needed
 - How much water is applied



Why is drip irrigation recommended?

- Drip Irrigation works in concert with Landscape Conversion projects.



Photo credit: Houzz.com



Photo credit: Landscapingnetwork.com

Irrigated Area



How Drip/Micro-Irrigation Works

- Lower application rate
- Applies water directly to the root zone
- Slowly over a long time



Photo credit: Rain Bird

Wetted Soil

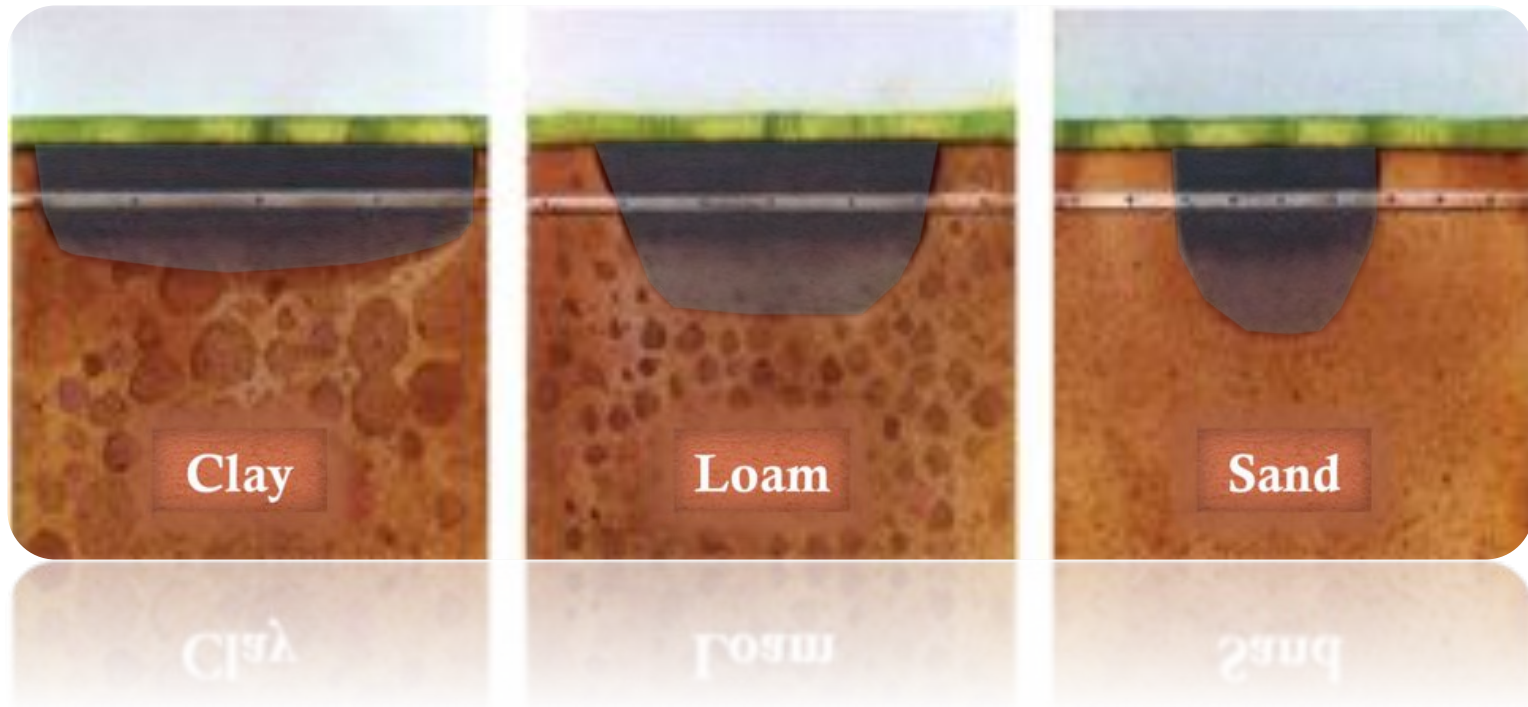


Photo credit: Netafim

System Components: Points of Connection

From Valve



From Spray Body



From Hose Bib



From Rain Barrel



Emitter Placement

- Emitter placement will determine whether salts are pushed away from the root zone or concentrated within it.
- Salts will tend to be concentrated at the perimeter of the wetted zone.
- Place the emitter near the center of the root zone, rather than between root zones of multiple plants, and upslope when applicable.



Water Savings Potential: Design & Installation

The high efficiency results from four primary factors:

- The water is slowly applied directly to the root zone
- Only the root zone or the partial root zone is irrigated
 - As opposed to sprinkler irrigation where the entire field area is wetted
- Soil and plant surface evaporative losses (including water lost to wind) are minimized or eliminated
- Water lost to surface runoff and deep percolation is minimized or eliminated
- Adaptable to changing landscapes

Benefit:
Runoff Reduction



Benefit:

Reduced Application Rate



Benefit:
Conforms to Irrigated Area



Benefit:

Extreme Soil Types & Terrain



Benefit: Operating Costs & Energy Conservation



Benefit: Chemical Application



vs.



Benefit: Improved Tolerance to Salinity

Frequent applications of water at the root zone push the salts to the perimeter of the wetted area. Using drip irrigation as a process to prevent the combination of harmful soil salinity levels and maintain soil moisture is referred to as *micro-leaching*.



Benefit:
Plant Quality and Growth



Disadvantages

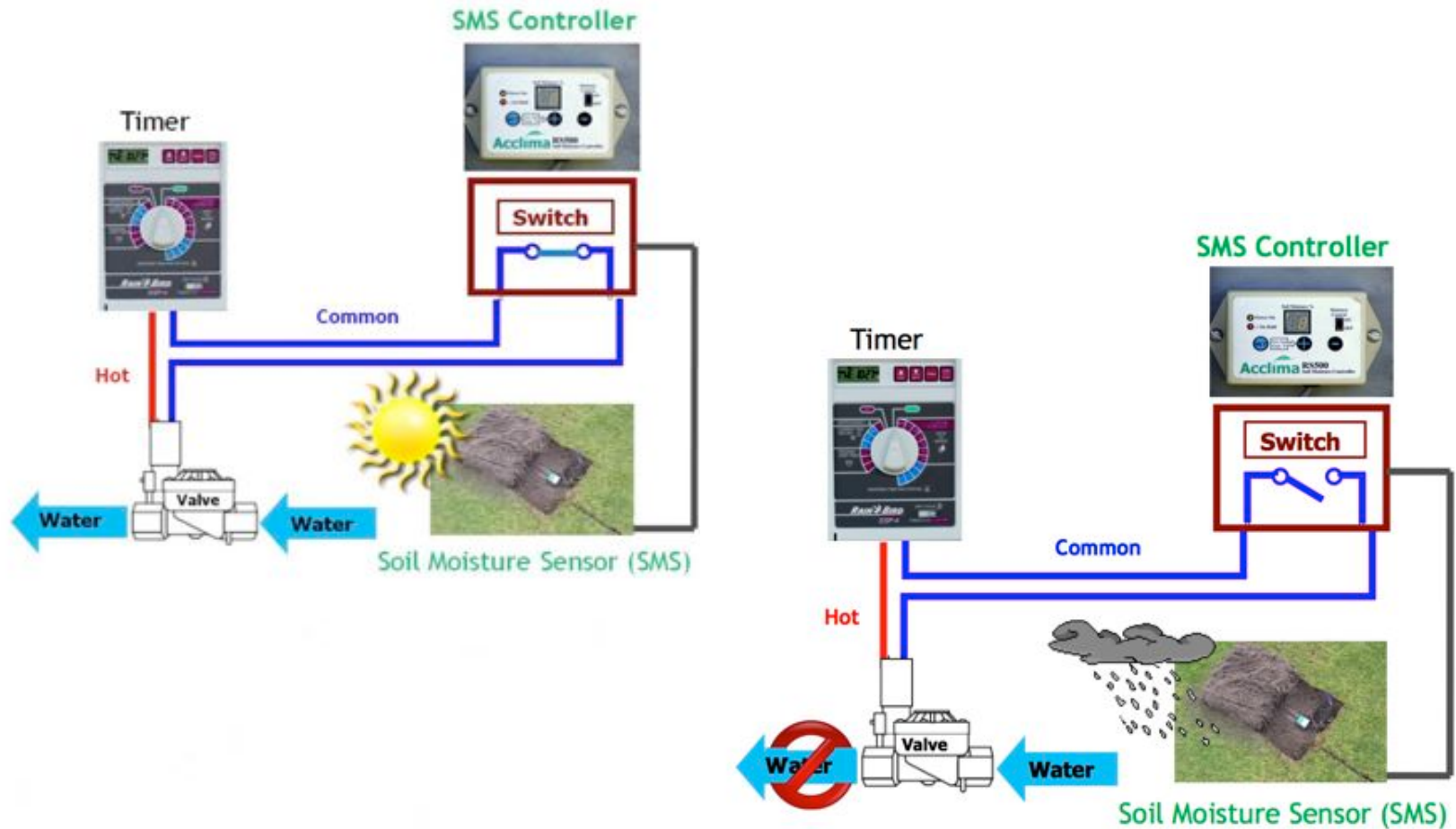
- Root and pest damage
- Vandalism
- UV concerns
- Dust build up
- Salt Build up



Smart Water Management

- “Smart” irrigation controllers such as soil moisture sensor (SMS) controllers offer the opportunity to optimize irrigation based on measured plant demand in the irrigated system.
- “Smart” irrigation controllers such as weather-based irrigation controllers (WBIC) controllers offer the opportunity to optimize irrigation based on changing weather needs.

SMS System Components



Sensor Technology

Granular Matrix Sensors
(GMS)

Time Domain Transmissometry
(TDT)

Frequency Domain Reflectometry
(FDR)



Single vs. Multiple Sensors

- For Small Residential Sites
 - One is usually enough
- For Large Residential and Commercial Sites
 - Multiple sensors recommended



SMS as Irrigation Governors

- Effectively bypasses unnecessary as well as superfluous irrigation events
 - This is a benefit that other devices do not offer.



Considerations

- There are three fundamental behavioral barriers to irrigation conservation potential when considering the use of “smart” technologies.
- The first two are behavioral and the second is non-behavioral:
 - How to use the equipment
 - When and how long to water
 - System efficiency

High Efficiency Nozzles

- Relatively new technology
- Increased uniformity compared to spray heads



What is an MSMT Rotating Nozzle

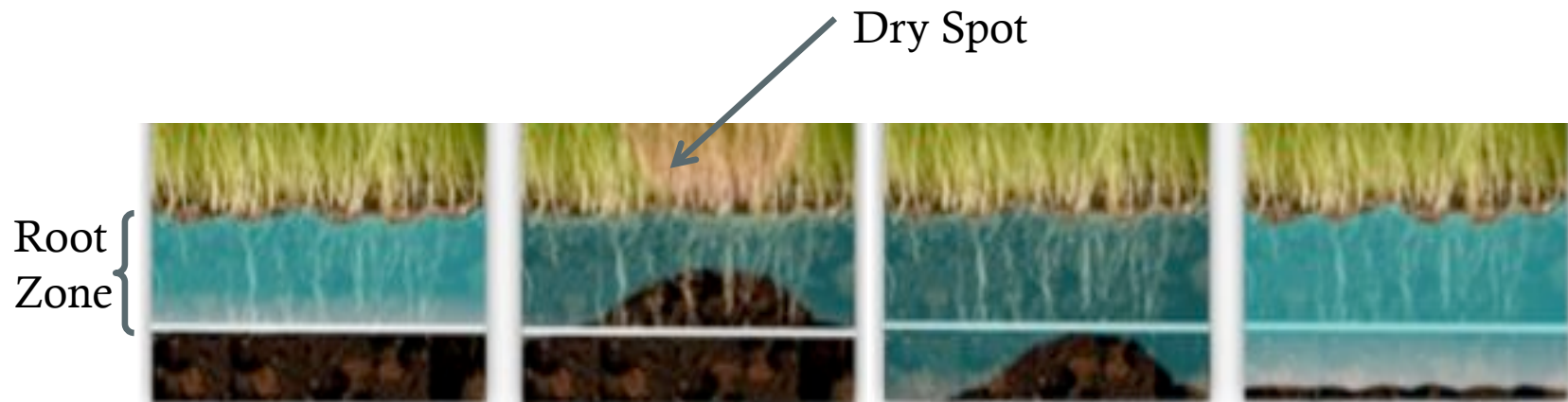


Multi-stream, multi-trajectory
(MSMT) rotating nozzle

A variation is the oscillating design



Benefit: Increased Uniformity



Benefit: Overspray Reduction



vs.



Benefit: Reduction of Wind Effects



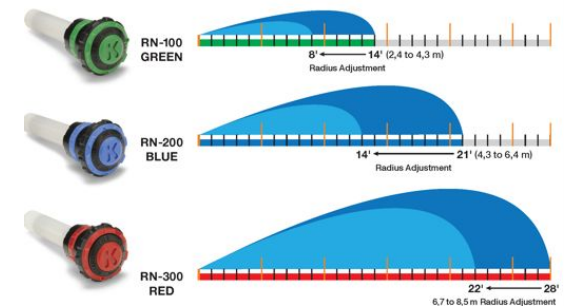
vs.



Considerations: Design & Installation

- In many cases, the benefit potential, by the proxy of an increase in uniformity, is enhanced by the system maintenance that occurs at the same time as the sprinkler retrofit.
- A truncated throw makes a difference.

Three Nozzle Radius Options



Considerations: Scheduling

- Increased uniformity yields a lower run time multiplier (RTM)
- Lower application rate
 - Influence of schedule change
 - Influence of no schedule change



Considerations: Labor & Cost



Water Source

- What is available?
 - Municipal water
 - Well water
 - Surface water
 - Recycled water
 - Rain water



Water Savings Potential

- When looking at the water savings potential, the intended use of the landscape is key
- Submeters for monitoring



What could you implement?

- Plant material
- Irrigation equipment
- Management and water application technology
- Runoff prevention
- Alternative water source





Melissa Baum-Haley, Ph.D.
mbaum-haley@mwdoc.com
714-593-5016