FROM INVISIBLE TO INVALUABLE

- Presented by Richard Restuccia, Master Gardener, Class 2018

Water Management

- Today
    - Water Awareness
    - How Long and How Much to Water
    - Smart Controllers
    - Irrigation Basic

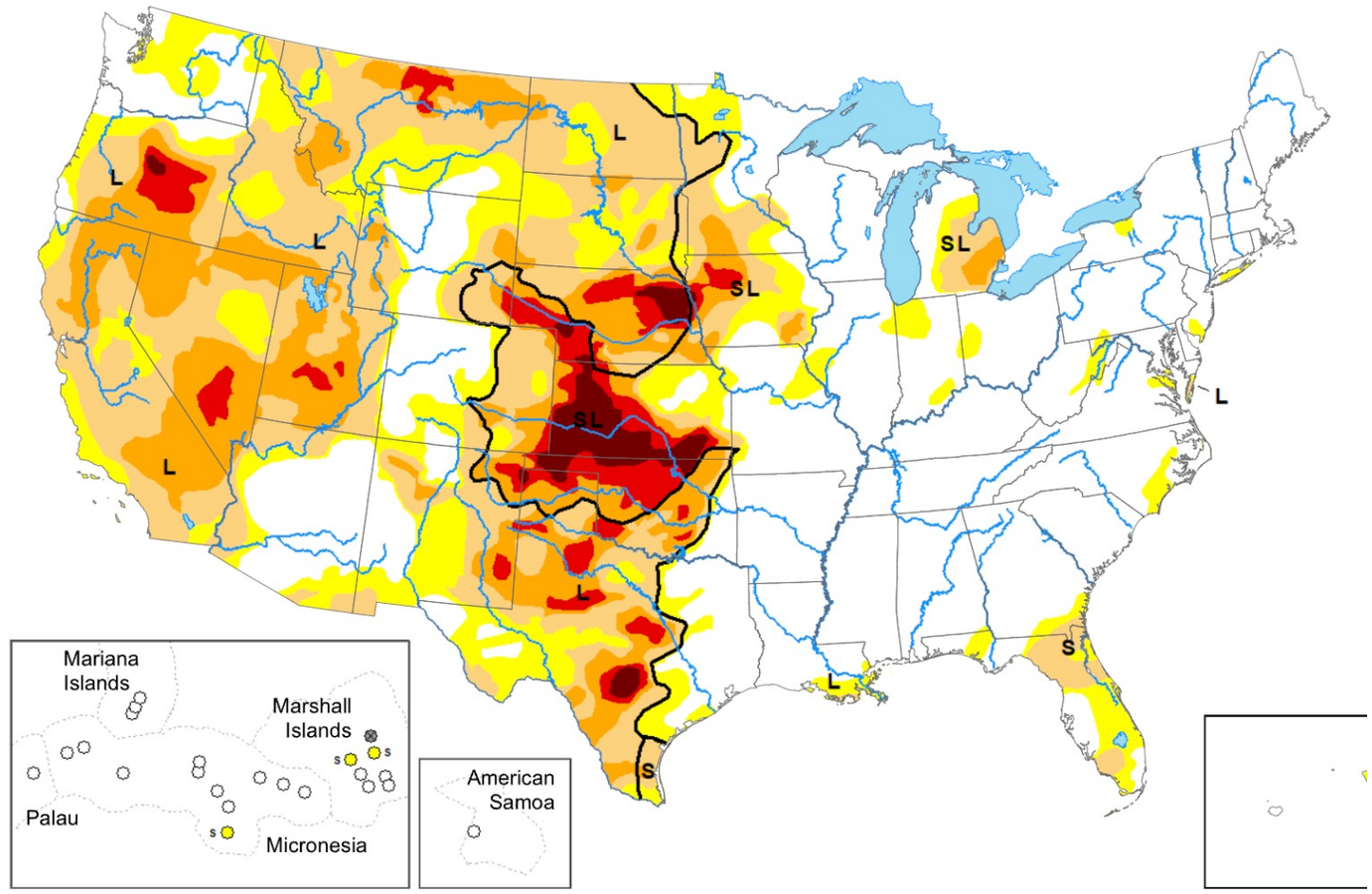
WHY SMART IRRIGATION NOW

- Irrigation no longer just a tool to keep plants alive
- New issues are forcing changes on all water use
- Increasing water and fuel costs
- Water fines
- Property damage
- Shifting requirement to resource management
- Focus on technology and best practices to meet new requirements

ENVIRONMENTAL DRIVERS

Map released: February 16, 2023

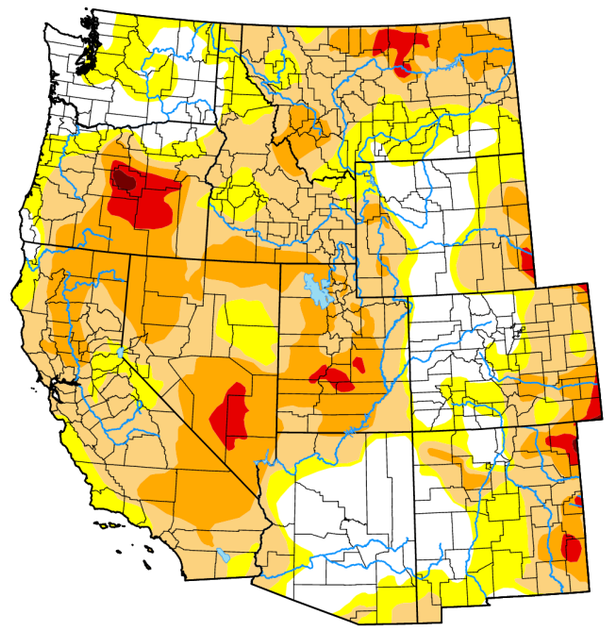
Data valid: February 14, 2023



ENVIRONMENTAL DRIVERS

- **Map released: Thurs. February 16, 2023**

West



Intensity:

- None
- **D0** (Abnormally Dry)
- **D1** (Moderate Drought)
- **D2** (Severe Drought)
- **D3** (Extreme Drought)
- **D4** (Exceptional Drought)
- No Data

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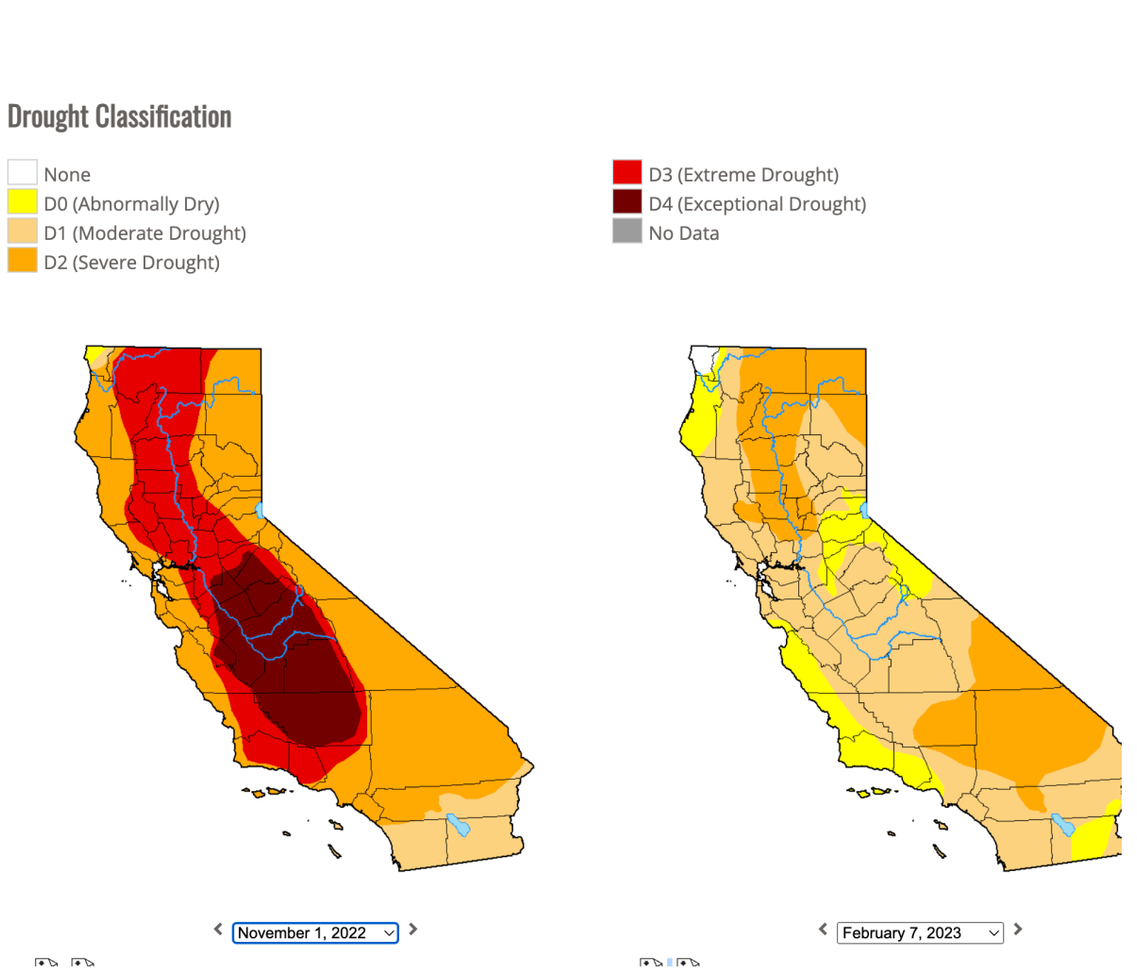


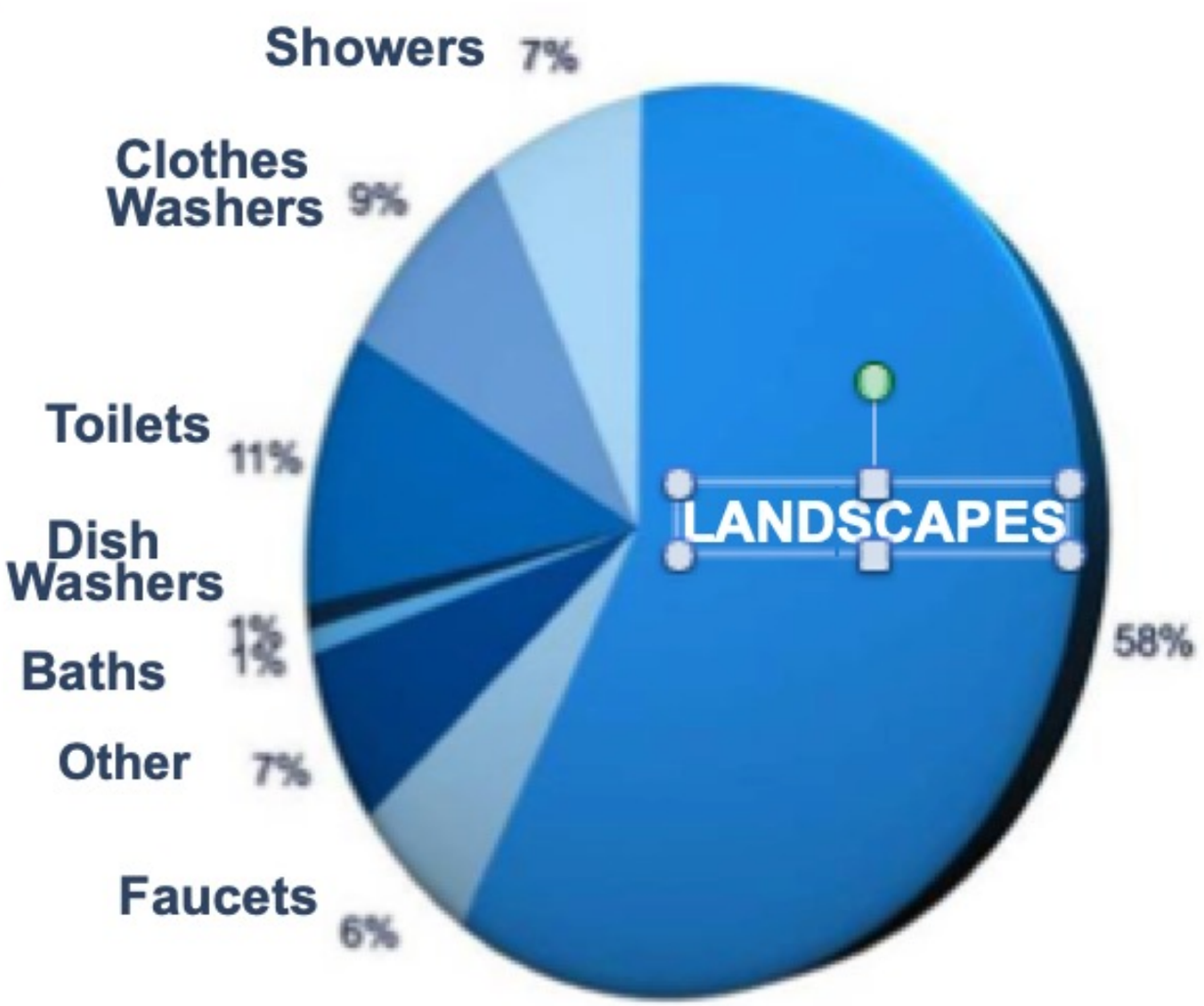
TRIVIA QUESTION #1

What is the largest irrigated crop in the U.S.?

- A: **TURF GRASS**

  According to a report published in the journal *Environmental Management,* about 40 million acres of America are covered in lawns, making turf grass our largest irrigated crop.

OUTDOOR WATER MANAGEMENT



- 58% of urban water goes to landscapes
  - Largest use by factor or 5x
- Landscapes over-watered by 30-300%
  - Limitations of ‘old’ technology
- Water waste costs more than high water bills
  - Damages and liabilities equal to 5-10x cost of wasted water

Water Use California

80% of Water Used for Agriculture

This equal approx. 34 million acre feet

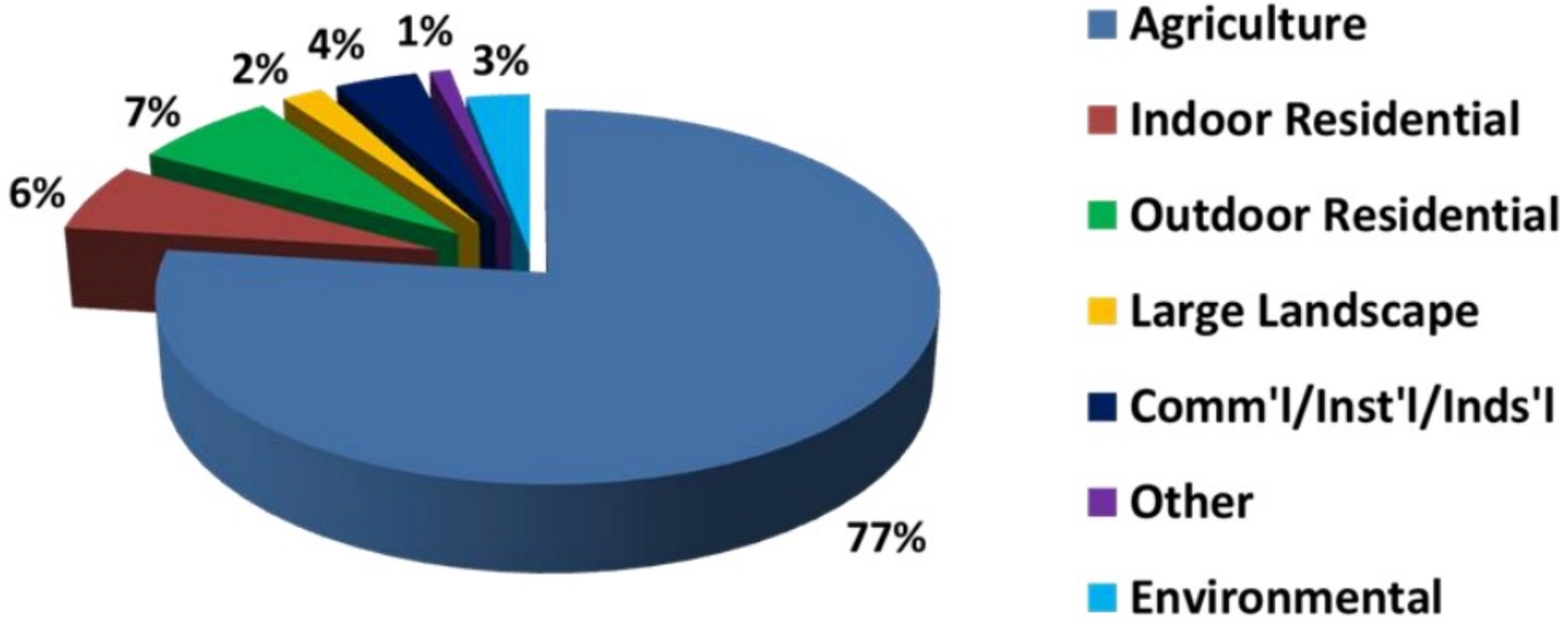
Urban Water Use – 9 million acre feet

Landscape Water Use = 9% of the total

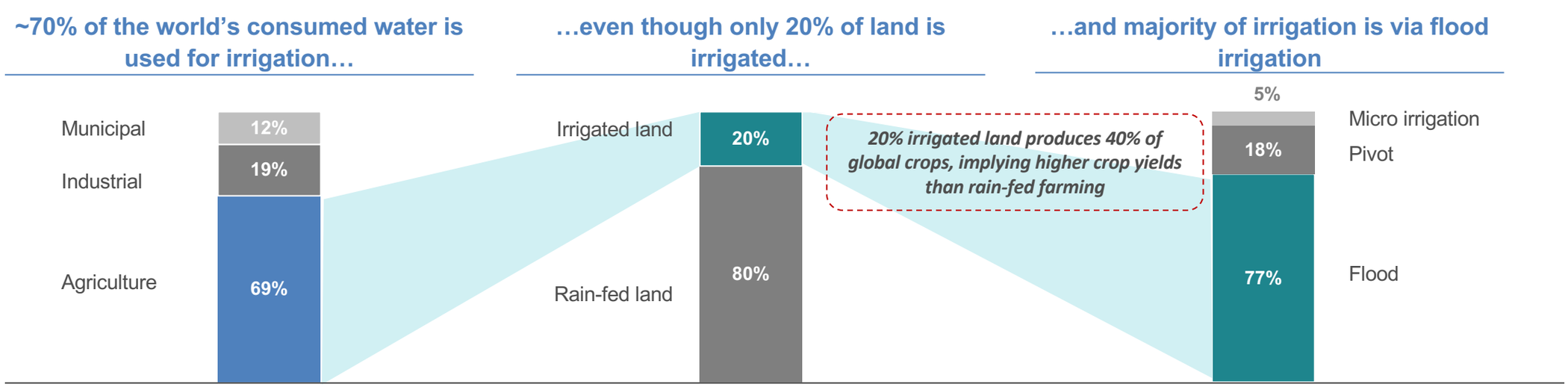
3.5% -4% for Lawns

- Data for Lawns and Landscape – Hodel and Pittenger – UCCE- May 2015

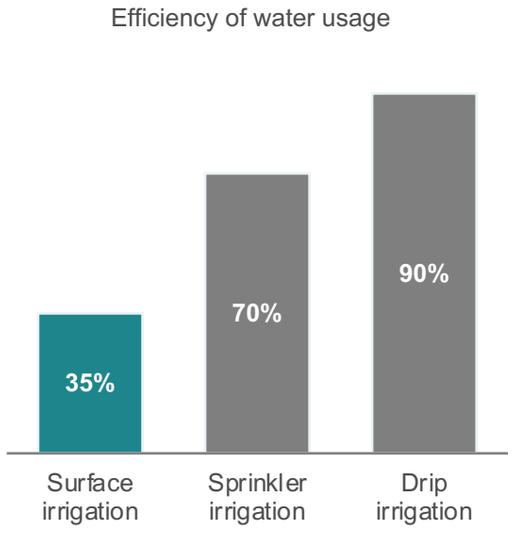
Figure 1. Average percentages of developed water use in California during a non-drought year (*Sources:* Calif Dept. of Water Resources, 2013 California Water Plan Update Chapter 3. UCLA Institute of Environment and Sustainability, So. Calif. Environmental Report Card, Fall 2009).



… And yet we are highly inefficient with our Agriculture Water



Flood irrigation waters the land, not the crop



- Extensive surface and sub-surface drainage networks needed to avoid waterlogging and to improve soil aeration in areas with abundant rainfall
- Flood irrigation is labor intensive and causes difficulty in moving across crops because of furrows
- Rarely used for fertigation and chemigation
- Furrows lead to 30 - 40% loss of applied water
- Low control of water quantity as flow is unknown at times
- Leads to soil degradation through soil erosion, soil compaction, loss of soil structure, nutrient accumulation and soil salinity
- Pollution of water sources through leaching of farm chemicals
- GHG (Green House Gas) emissions are highest due to inefficient use of water and energy with high methane emissions in flooded conditions

Source: OECD outlook, ICID data, Equity research

Better Ways?

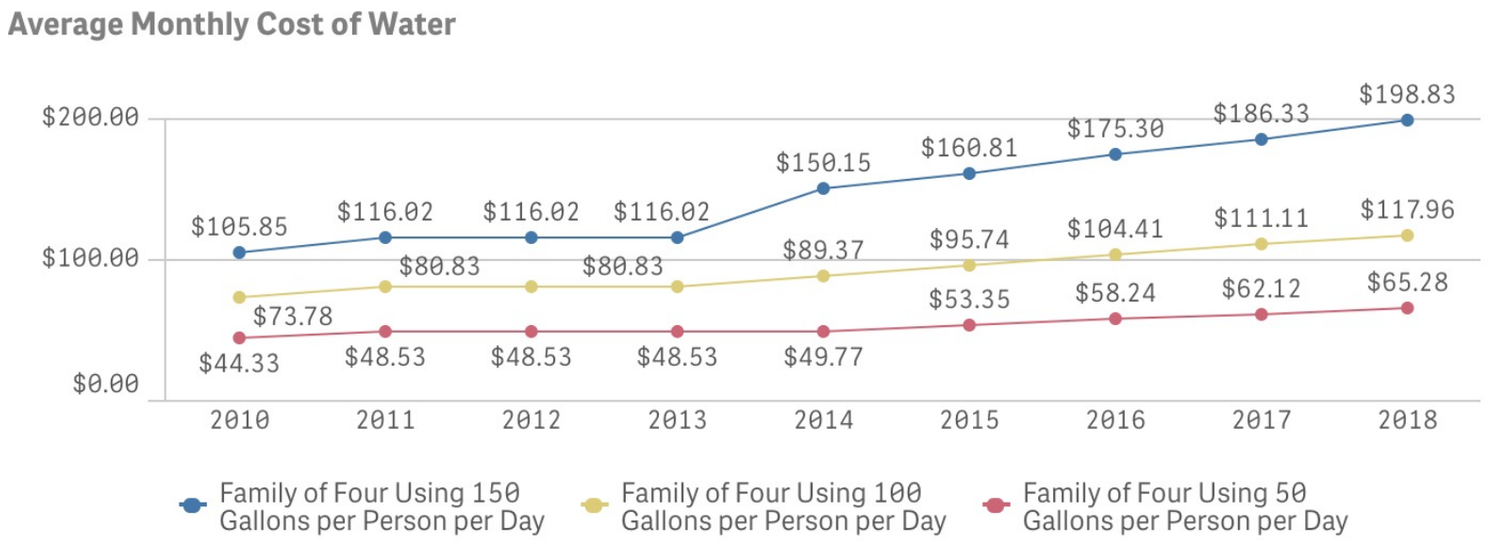
Better Ways?

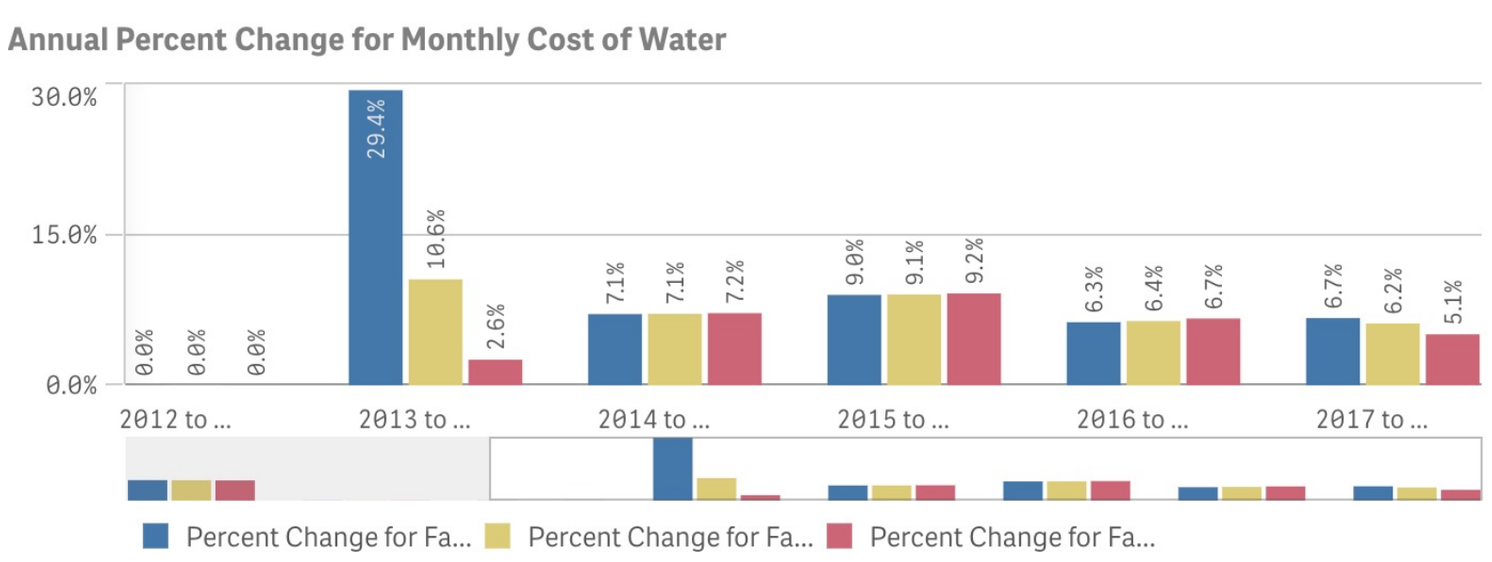
TRADITIONAL CENTER PIVOT

MOBILE DRIP IRRIGATION

ECONOMIC DRIVERS

Cost of Water San Diego





Where Does San Diego Water Come From

- 50% comes from the Colorado River
- 30% from Northern California
- 20% from local supplies

- Depending on the year 70% -90% is imported

The monthly charges for a typical single-family domestic customer are:

- Base fee: $27.77
- 0 - 4 HCF used are billed at $5.550 per HCF.
- 5 - 12 HCF used are billed at $6.217 per HCF.
- 13 - 18 HCF used are billed at $8.881 per HCF.
- Each HCF used after the initial 18 HCF is billed at $12.488 per HCF.

- Irrigation Customer pay $7.447 per HCF. Please see the chart below to find the meter base fee.

Phoenix
Boston
Las Vegas

Volume Charges In Excess of Use Included with Monthly Service Charge (Effective March 1, 2022)

Season	Inside City	Outside City
Low Season (Dec., Jan., Feb., March)	$3.49	$5.24
Medium Season (April, May, Oct., Nov.)	$4.07	$6.11
High Season (June, July, Aug., Sept.)	$4.47	$6.71

Consumption	Water	
(Cu.Ft./Day)	Per 1000 Cubic Feet	Per 1000 Gallons
First 19	$61.50	$8.222
Next 20	$65.68	$8.780
Next 50	$71.63	$9.576

Daily Service Charges, Water Rates and Thresholds

3/4"

Meter Size (inches)	Daily Service Charge	Tier	Daily Usage (gallons)	Monthly Equivalent (30 days)	Rate per 1,000 gallons
3/4	$0.4848 X 30 days = $14.54	1	First 167	First 5,000 gallons	$1.46
3/4	$0.4848 X 30 days = $14.54	2	Next 167	Next 5,000 gallons	$2.61
3/4	$0.4848 X 30 days = $14.54	3	Next 333	Next 10,000 gallons	$3.88
3/4	$0.4848 X 30 days = $14.54	4	Over 667	Over 20,000 gallons	$5.76

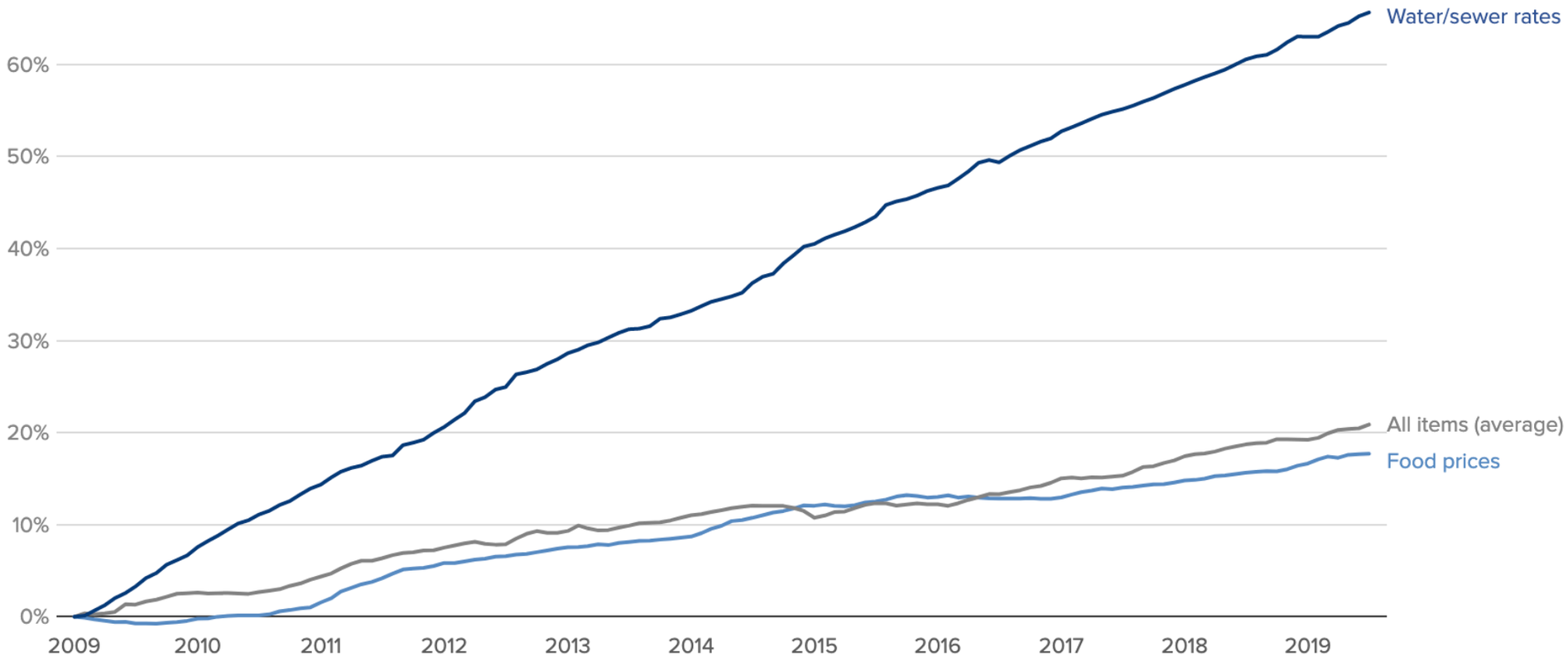
Where Does Your Water Go

- San Diego – Recycled Water = 6%
- Phoenix = 89%
- Las Vegas = 90%

- Somewhere between 25% and 45% leaks out of the system

Getting hosed

What Americans pay for water and sewer service has increased much faster than inflation or the price of food.



Source: Bureau of Labor Statistics—Consumer Price Index

TRIVIA QUESTION #2

What has been the best way to get people to save water?

- A: **RAISE PRICES**

Good Water Management

1. Reduce water use and fewer dollars spent on water
2. Improved landscape appearance
3. Reduction of runoff to streets and over sidewalks
4. Reduction of water lost below the root zone
5. Reduced fertilizer and chemical requirements.

How Long and How Often To Water

What Are We Trying To Do

- Imagine a shrub with a 12-inch root zone, 12 inches wide watered with a .62 gallon per hour emitter. The shrub needs one inch of water this week.
- How long and how often should we apply water?
- Answer – Depends
- **Key Concept** – Always give the same amount only the frequency changes

It’s Not What We Water It’s How We Water

It’s Not What We Water It’s How We Water

TRIVIA QUESTION #3

What percentage of the power used in California is used for moving water?

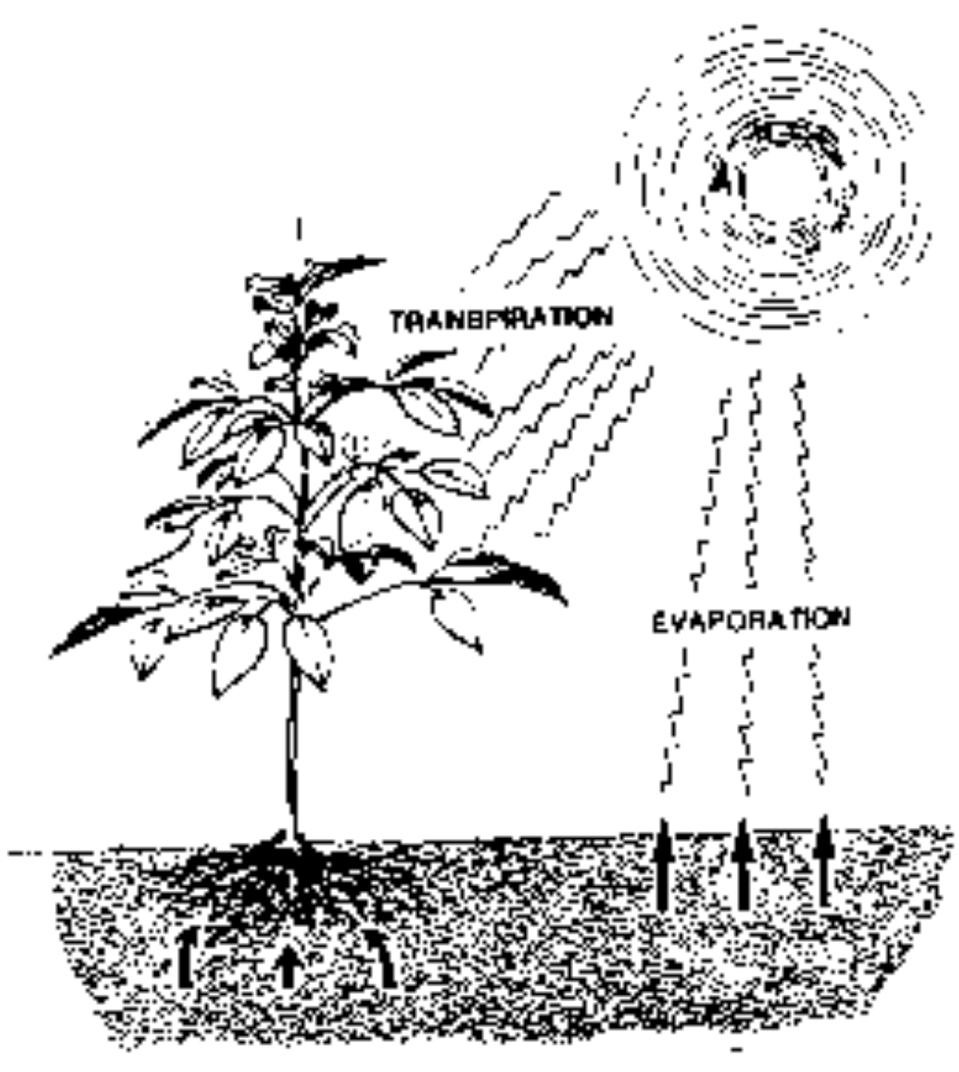
- A: **Almost 30%**

What Are Some Factor To Determine Watering Times

1. Irrigation method
2. Distribution uniformity
3. Plant type – root depth
4. New planting or established
5. Slope
6. Soil type
7. Precipitation rate

- Sprays = inches/hour
- MP rotators inches/hour
- Drip GPH

EVAPOTRANSPIRATION (ET)



Moisture lost through:

Evaporation

from the plant and soil surface

+

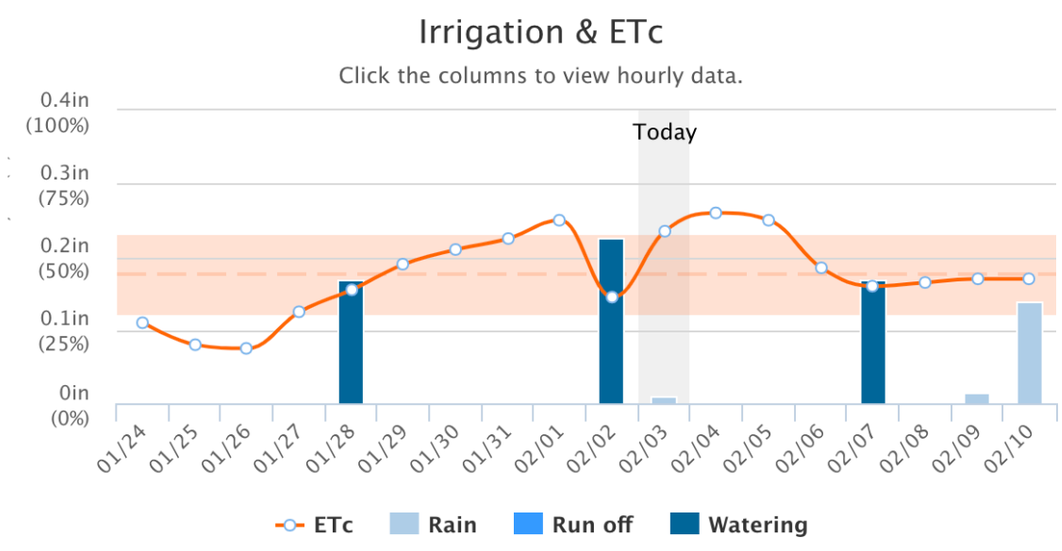
Transpiration

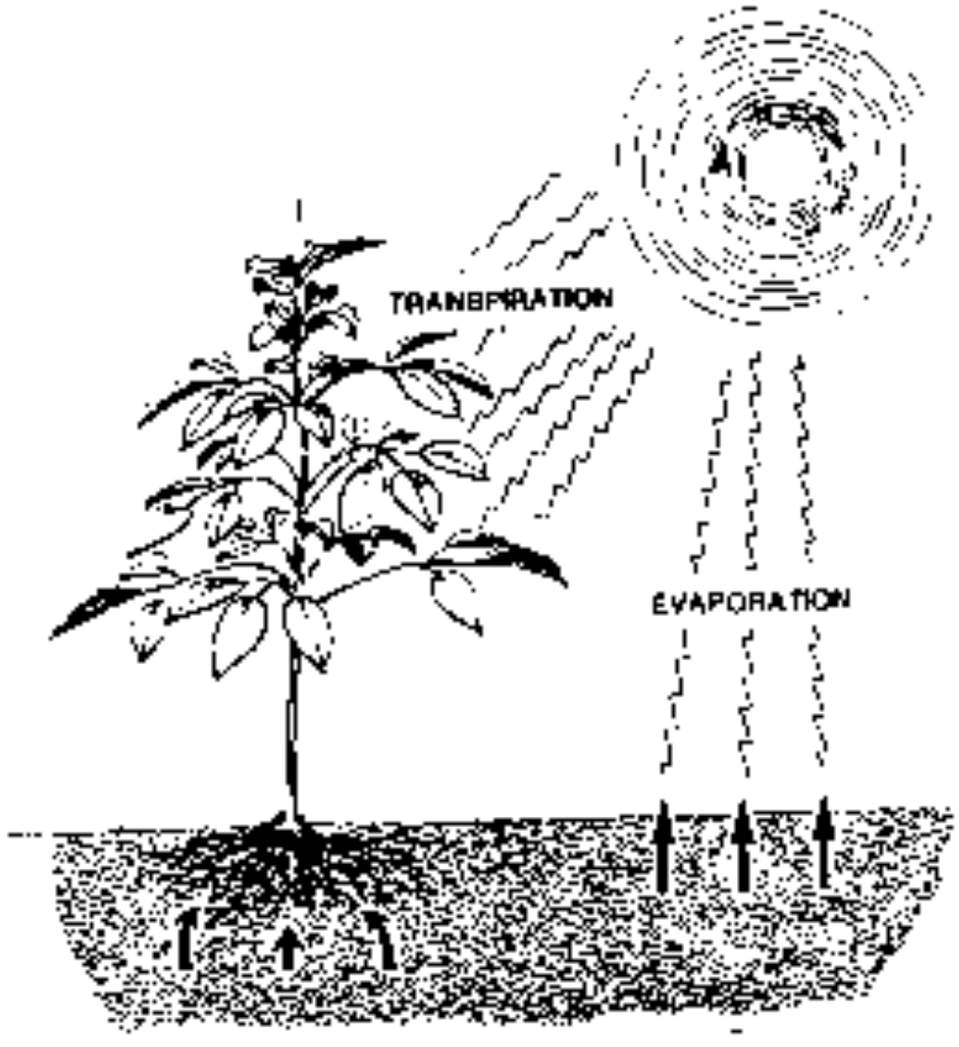
through the plant

Climate factors that affect ET

Temperature + Solar Radiation + Humidity + Wind Velocity

EVAPOTRANSPIRATION (ET)





Evapotranspiration Data

Historical ET data From The County

APPENDIX A

REFERENCE EVAPOTRANSPIRATION (ETO) DATA

County Classification	CIMIS Station/ Location	Annual ETo	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Coastal	Torrey Pines	46.4	1.8	2.2	3.4	4.5	5.3	5.7	5.9	5.6	4.5	3.4	2.4	1.8
Coastal	Oceanside	48.7	2.1	2.4	3.7	4.8	5.4	5.7	6.0	6.0	4.6	3.6	2.4	2.0
Coastal	Chula Vista*	44.2	2.2	2.7	3.4	3.8	4.9	4.7	5.5	4.9	4.5	3.4	2.4	2.0
Coastal Corridor	San Diego	46.5	2.1	2.4	3.4	4.6	5.1	5.3	5.7	5.6	4.3	3.6	2.4	2.0
Coastal Corridor	Miramar	46.4	1.8	2.2	3.4	4.5	5.3	5.7	5.9	5.6	4.5	3.4	2.4	1.8
Inland	Otay Lake	50.5	1.3	1.9	3.3	4.7	5.9	7.0	7.8	6.8	5.2	3.5	2.0	1.2
Inland	Santee*	51.1	2.1	2.7	3.7	4.5	5.5	6.1	6.6	6.2	5.4	3.8	2.6	2.0
Inland	Ramona	51.6	2.1	2.1	3.4	4.6	5.2	6.3	6.7	6.8	5.3	4.1	2.8	2.1
Mountain	Escondido	57.0	2.5	2.7	3.9	5.3	6.1	6.9	7.3	7.0	5.5	4.2	3.0	2.5
Mountain	Pine Valley*	54.8	1.5	2.4	3.8	5.1	6.0	7.0	7.8	7.3	6.0	4.0	2.2	1.7
Mountain	Warner Springs*	56.0	1.6	2.7	3.7	4.7	5.7	7.6	8.3	7.7	6.3	4.0	2.5	1.3
Desert	Borrego Springs	75.4	2.7	3.5	5.9	7.7	9.7	10.1	9.3	8.3	6.9	5.5	3.4	2.2

Evapotranspiration Data

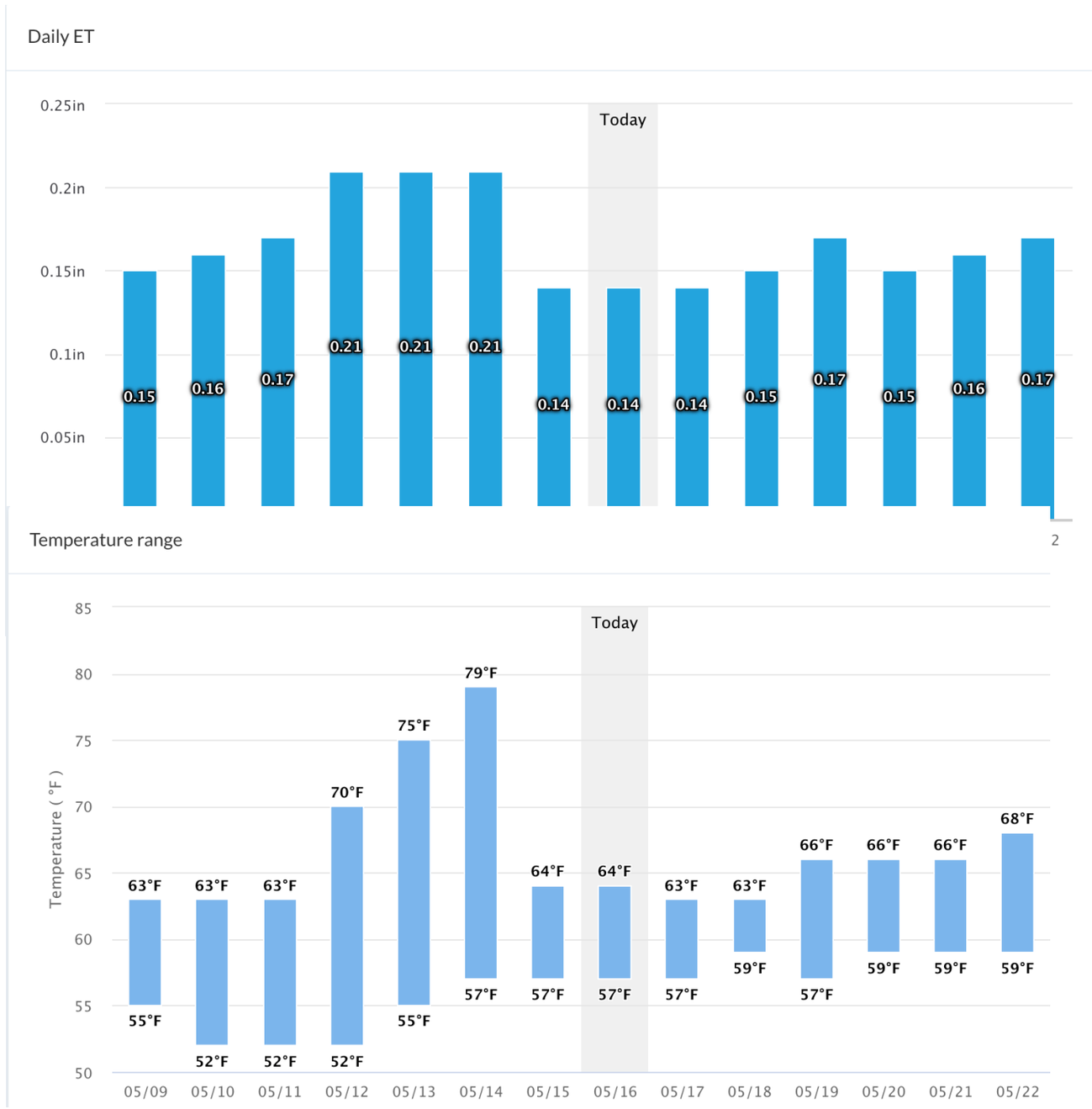
Daily ET data from CIMIS - https://cimis.water.ca.gov

Torrey Pines - South Coast Valleys - Station 173

Date	Hour (PST)	ETo (in)	Precip (in)	Sol Rad (Ly/day)	Vap Pres (mBars)	Air Temp (°F)	Rel Hum (%)	Dew Point (°F)	Wind Speed (mph)	Wind Dir (0-360)	Soil Temp (°F)
5/14/2022	0100	0.00	0.00	0	11.2	61.1	61	47.5	1.7	306	64.8
	0200	0.00	0.00	0	10.9	61.8	58	46.9	1.6	300	64.3
	0300	0.00	0.00	0	9.4	62.0	50	43.0	3.0	350	64.0
	0400	0.00	0.00	0	8.6	61.7	46	40.6	3.3	43	63.6
	0500	0.00	0.00	5	8.3	62.5	43	39.8	2.4	62	63.2
	0600	0.00	0.00	149	8.7	62.8	44	40.9	1.8	65	62.9
	0700	0.01 Y	0.00	576	9.5	68.0 Y	41 Y	43.2 Y	1.5	341	62.7
	0800	0.01 R	0.00	946	9.8	72.6 R	36 R	44.0 R	2.2	7	62.5
	0900	0.02 Y	0.00	1523	12.2	71.2 Y	47 Y	49.9 Y	2.8	253	62.7
	1000	0.02	0.00	1892	13.6	69.1	56	52.8	3.6	184	63.2
	1100	0.03	0.00	2046	13.9	68.4	59	53.3	4.0	242	63.8
	1200	0.03	0.00	2191	17.1	66.8	76	59.1	5.0	249	64.7
	1300	0.03	0.00	2032	16.6	67.3	73	58.3	5.2	258	65.5
	1400	0.03	0.00	2077	14.3	69.1	59	54.1	5.0	259	66.2
	1500	0.02	0.00	1739	11.1	72.5	41	47.3	5.0	262	66.9
	1600	0.02 Y	0.00	1355	9.9	75.4 Y	33 Y	44.2 Y	5.2	283	67.6
	1700	0.01 Y	0.00	886	11.5	72.8 Y	42 Y	48.3 Y	4.4	273	68.0
	1800	0.01 Y	0.00	414	12.1	71.5 Y	46 Y	49.6 Y	4.3	299	68.2
	1900	0.00 Y	0.00	55	9.5	70.5 Y	37 Y	43.2 Y	2.2	321	68.3
	2000	0.00 Y	0.00	0	9.7	67.2 Y	42 Y	43.6 Y	1.4	321	68.1
	2100	0.00	0.00	0	13.6	64.9	65	52.8	2.0	320	67.7
	2200	0.00	0.00	0	15.0	63.6	75	55.5	1.9	283	67.2
	2300	0.00	0.00	0	14.6	63.4	73	54.8	2.2	241	66.7
	2400	0.00	0.00	0	14.2	64.0	70	53.9	1.4	277	66.1
Tots/Avgs		0.24	0.00	745	11.9	67.1	53	48.6	3.0	241.6	65.4

Evapotranspiration Data

ET From Smart Controller



ETwater
a Jain Irrigation company

- ETc

Plant List

Botanical Name	Common Name	Type	Kc
Arctostaphylos	emerald carpet	GC	0.2
Acacia redolens	prostrate acacia	GC	0.2
Baccharis pilularais cvs.	dwarf coyote brush	GC	0.2
Baccharis ‘Centennial’	bentennial baccharis	GC	0.2
Lantana montevidensis	lantana	GC	0.2
Maleophora crocea	ice plant (Maleophora)	GC	0.2
Myoporum parvifolium	myoprum	GC	0.2
Rosemarinus ‘Prostratus’	trailing rosemary	GC	0.2
Teucrium chamaedrys	germander	GC	0.2
Abelia grandiflora prostrate	prostrate glossy abelia	GC	0.5
Arctotheca calendula	cape weed	GC	0.5
Berberis spp.	barberry	GC	0.5
Cerastium tomentosum	snow in summer	GC	0.5
Ceratostigma pumbaginoides	dwarf plumbago	GC	0.5
Cotoneaster spp. (ground covers)	coteneaster	GC	0.5
Fragaria chiloensis	wild strawberrry	GC	0.5
Gazania spp.	gasania	GC	0.5
Geranium incanum	cranesbill	GC	0.5
Hypericum calycinum	Aaron’s beard	GC	0.5
Juniperus conferta	shore juniper	GC	0.5
Lirope spicata	creeping lily turf	GC	0.5
Lotus corniculatus	birdsfoot trefoil	GC	0.5

PLANT TYPE

WUCOLS IV
Water Use Classification of Landscape Species

Plant Search Database

Geranium spp.

Start Over

Botanical Name	*Geranium spp.*
Common Name	cranesbill

Water usage

Region 1 North Central Coastal	Moderate/Medium
Region 2 Central Valley	Moderate/Medium
Region 3 South Coastal	Moderate/Medium
Region 4 South Inland Valley	Moderate/Medium
Region 5 High and Intermediate Desert	Moderate/Medium
Region 6 Low Desert	Moderate/Medium

Category	Abbreviation	Percentage of ET_o
High	H	70–90
Moderate	M	40–60
Low	L	10–30
Very Low	VL	< 10

PLANT TYPE

Table 1. Plant Factors (PF) for established landscape plants, turfgrasses, and garden crops to provide acceptable performance in California[1].

Plant Type	Plant Factor
Tree, Shrubs, Vines, Groundcovers (woody plants)	0.5
Herbaceous Perennial Plants	0.5
Desert Adapted Plants	0.3
Annual Flowers & Bedding Plants	0.8
General Turfgrass Lawns, cool-season (tall fescue, Ky. bluegrass, rye, bent)	0.8 [2, 3]
General Turfgrass Lawns, warm-season (bermuda, zoysia, St, Augustine, buffalo)	0.6 [2, 3]
Home Fruit Crops, Deciduous	0.8 [2]
Home Fruit Crops, Evergreen	1.0
Home Vegetable Crops	1.0 [2]
Mixed Plantings	*PF of the planting is that of the plant type present with the highest PF*

PLANT TYPE

Appendix B: Typical Plant Types and Root Depths

Plant Type	Samples	Root Depth
Cool Season Turf may vary by soil type	Bentgrass, Bluegrass, Fescue, Ryegrass	4 - 6"
Warm Season Turf may vary by soil type	Bermudagrass, Kikuyugrass, Paspalum, St. Autgustinegrass, Zoysiagrass	4 - 6"
Combined Turf may vary by soil type	(Combination of warm and cool season turf)	4 - 6"
Flowers	Seasonal Color (Pansies, Petunias, Marigolds, Impatiens, etc.)	3 - 4"
Trees	Birch, Magnolia, Pine, Pistache, Sycamore, Ficus, Willow	12 - 18"
	Eucalyptus	10 - 12"
	Fruit trees	12"
Shrubs-High Water Use	Calla	6"
	Hydrangea	6"
	Vinca	4 - 6"
Shrubs-Medium Water Use	Azalea	4 - 5"
	Agapanthus	6"
	Bougainvillea	8 - 10"
	Daylily	4 - 6"
	Escallonia	6"
	Ferns	4 - 6"
	Geranium	4″
	Holly	6 - 8"
	Hibiscus	6"
	Jacaranda Trees	8 - 10"

Crop	Depth in feet	Crop	Depth in feet
Alfalfa	4 to 6	Grapes	3 to 5
Almonds	2 to 4	Hops	3to 5
Apricots	2 to 4.5	Ladino clover and grass mix	2
Artichokes	2 to 3	Lettuce	1 to 2
Asparagus	6	Melons	3 to 4
Beans (dry)	2	Milo	4
Beans (green)	2	Oats	2-3
Beans (lima)	4	Olives	3-4
Beets (sugar)	3 to 5	Onions	1 to 2
Beets (table)	2 to 3	Pasture grasses (annual)	2
Broccoli	2	Pasture grasses (perennial)	2 to 3
Bush berries	3 to 5	Peas	1 to 2
Cabbage	2	Peaches	2 to 4
Cantaloupes	2 to 4	Pears	3 to 4
Carrots	2 to 3	Prunes	3 to 4
Cauliflower	2	Peppers	2 to 3
Celery	2	Potatoes (Irish)	2 to 3
Chard	3	Potatoes (sweet)	2 to 3
Cherries	2.5 to 4	Pumpkins	3 to 4
Citrus	2 to 4	Radishes	1
Corn (sweet)	3	Spinach	1
Corn (field)	2 to 4	Squash (summer)	1 to 2
Cotton	3.5	Strawberries	1 to 2
Cucumber	2	Sudan grass	3 to 4
Eggplant	2	Tomatoes	2 to 4
Figs	2 to 4	Turnips	1.5 to 2.5
Garlic	1 to 2	Walnut	5 to 7
Grain and flax	2 to 3	Watermelons	2 to 3

Terminology

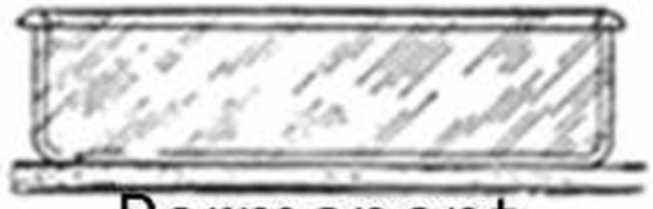
- **Soil Saturation Point** = Soil holds only water, no air.

Terminology

- **Field Capacity** – The amount of water content held in the soil after excess drained away.

Terminology

- **Permanent Wilting Point**– There is water in the soil, but the water is not available for plants, so the plants die.



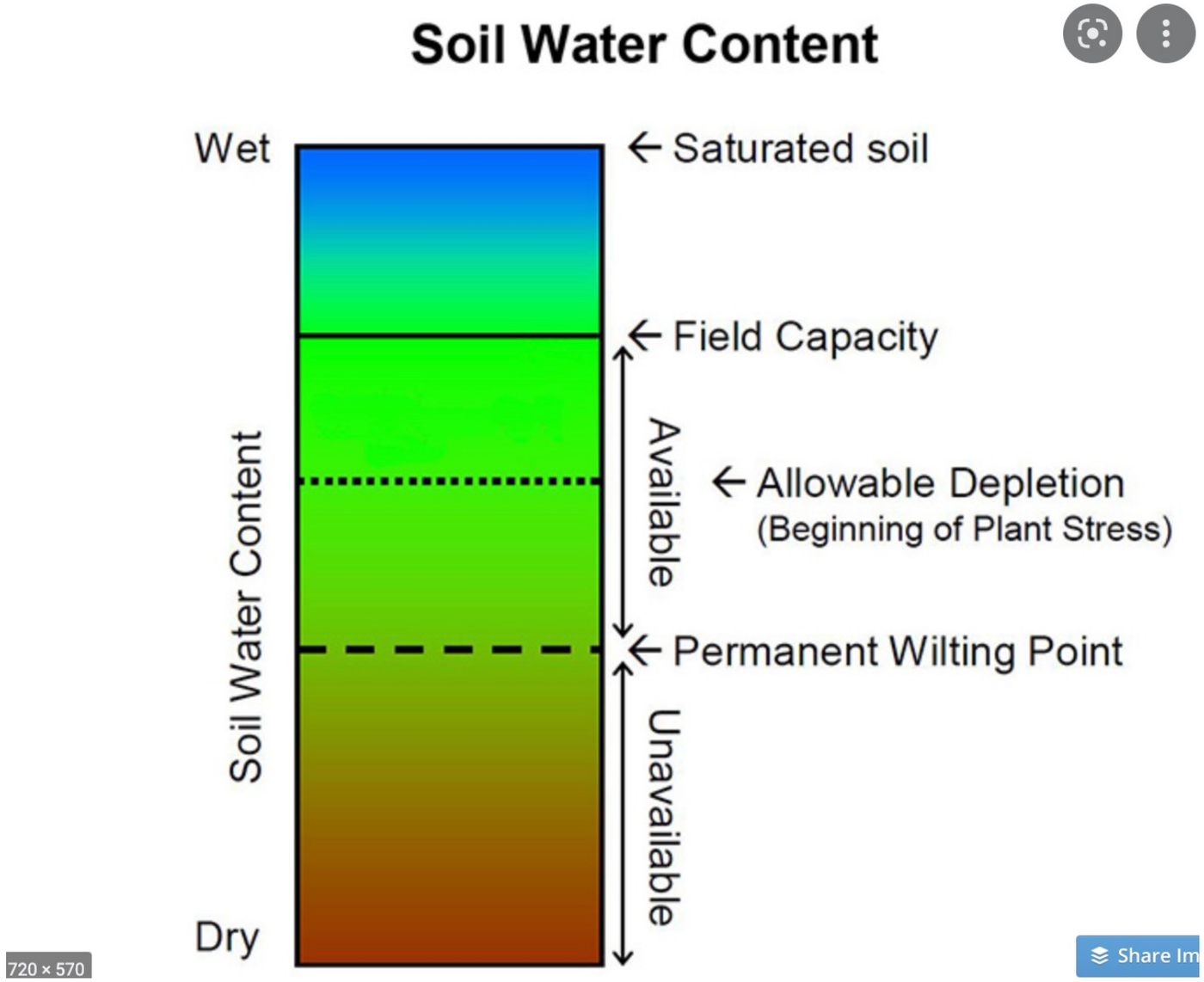
Permanent Wilting Point

Terminology

- **Oven Dry** – The opposite of saturation. Oven dry occurs when there is no water in the soil. Plants don’t live here either.

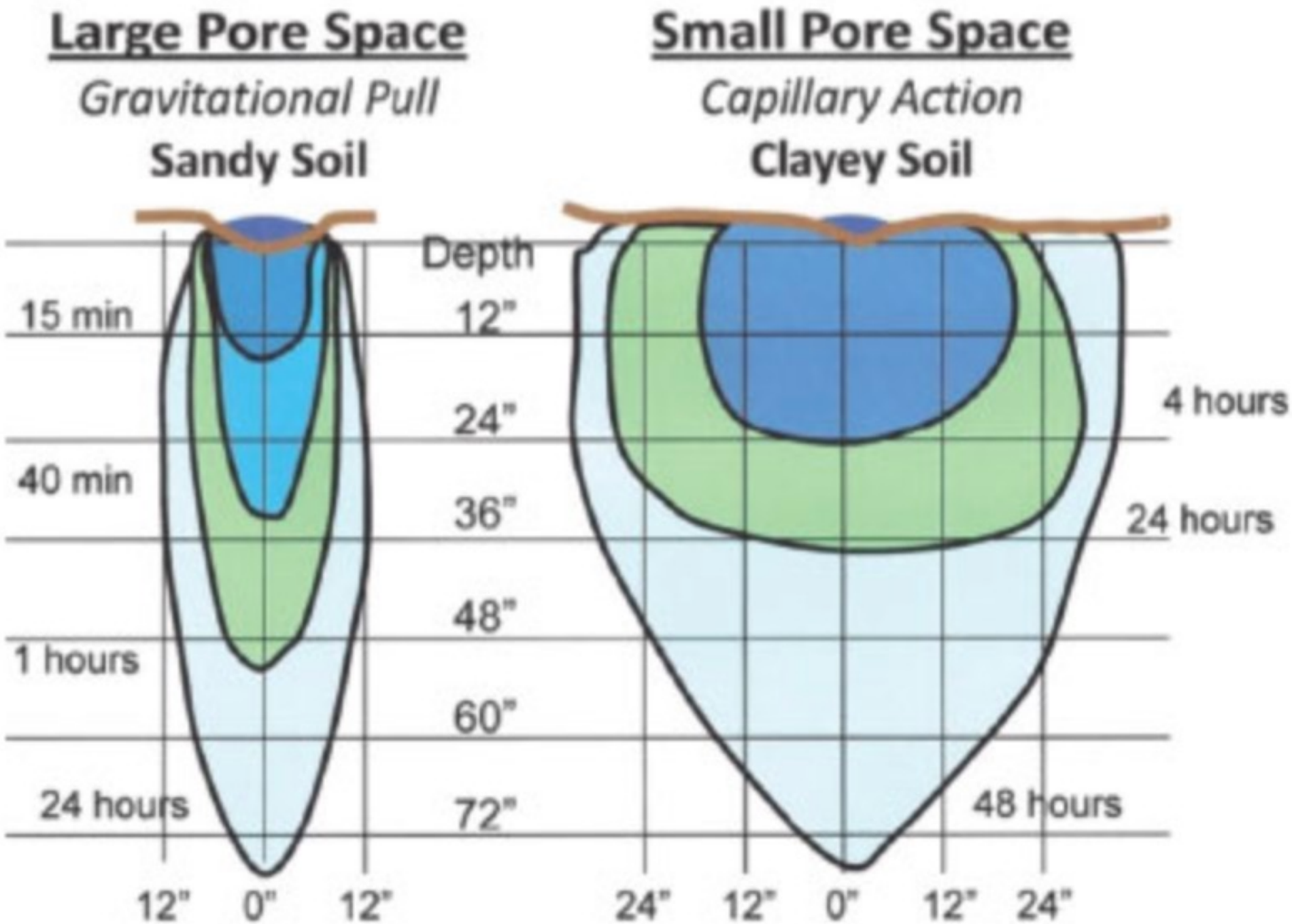
Terminology

- **Available Water Holding Capacity or Plant Available Water –** The difference between permanent wilting point and field capacity. This is the amount of water available to plants. This is the zone where plants thrive



Plant-available water holding capacities of various textured soil.

Soil Texture	Plant-Available Water Holding Capacity (inches of water per foot of soil)
Very coarse sands	0.4 - 0.75
Coarse sands, fine sands, loamy sands	0.75 - 1.25
Sandy loams, fine sandy loams	1.25 - 1.75
Very fine sandy loams, loams, silt loams	1.50 - 2.30
Clay loams, silty clay loams, sandy clay loams	1.75 - 2.50
Sandy clays, silty clays, clays	1.60 - 2.50


Large Pore Space
Gravitational Pull
Sandy Soil
Small Pore Space
Capillary Action
Clayey Soil
Depth
15 min
12"
24"
4 hours
40 min
36"
24 hours
48"
1 hours
60"
24 hours
72"
48 hours
12" 0" 12"
24" 12" 0" 12" 24"

DISTRIBUTION UNIFORMITY

Distribution Uniformity (DU) is a measure of
how evenly water is applied across a field during irrigation

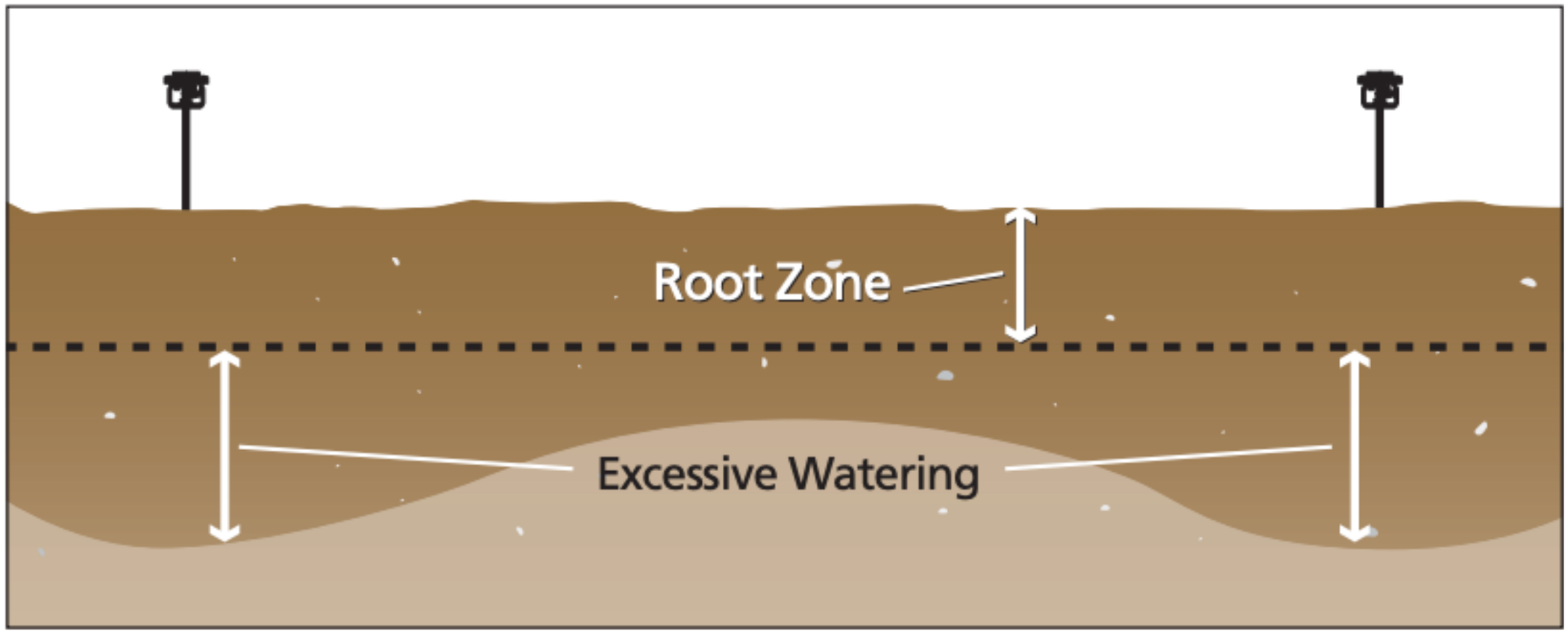


FIGURE 1: Depiction of irrigation resulting in poor DU and excessive watering

DISTRIBUTION UNIFORMITY

Distribution Uniformity (DU) is a measure of
how evenly water is applied across a field during irrigation

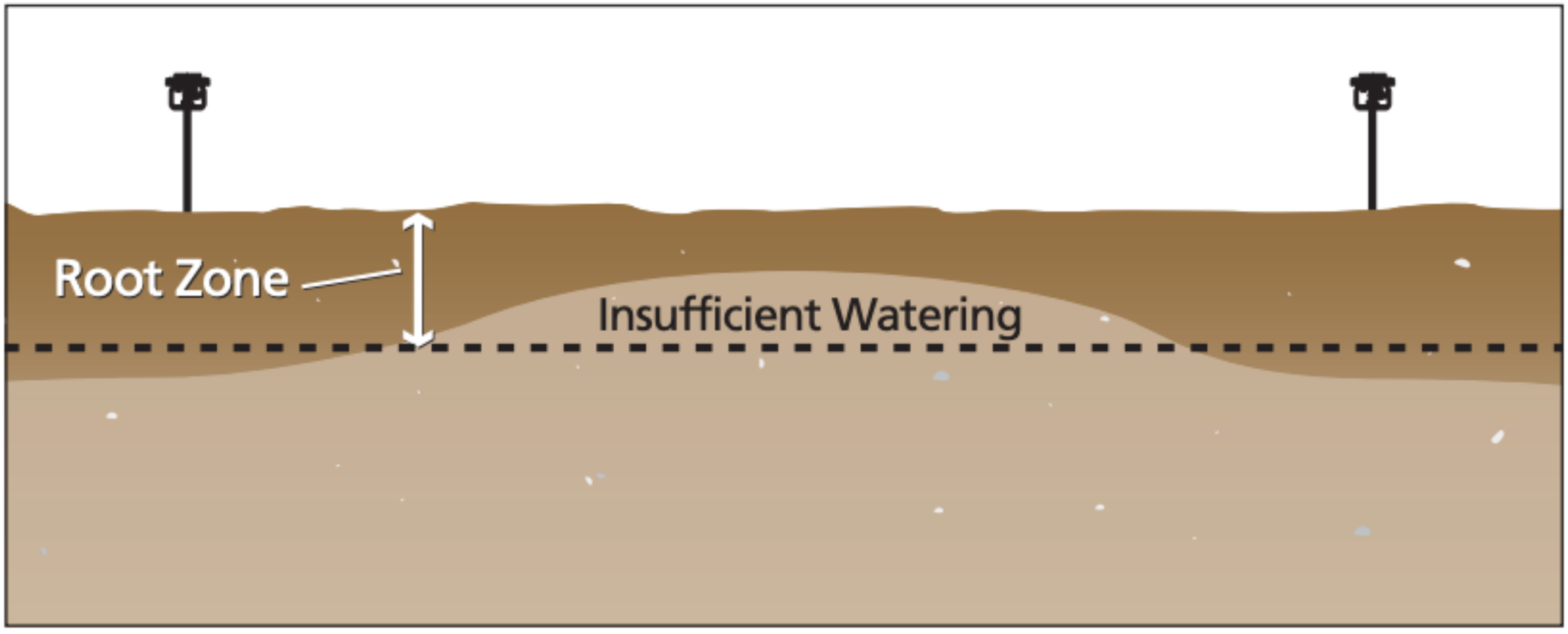


FIGURE 2: **Depiction of irrigation resulting in poor DU and insufficient irrigation in parts of the field**

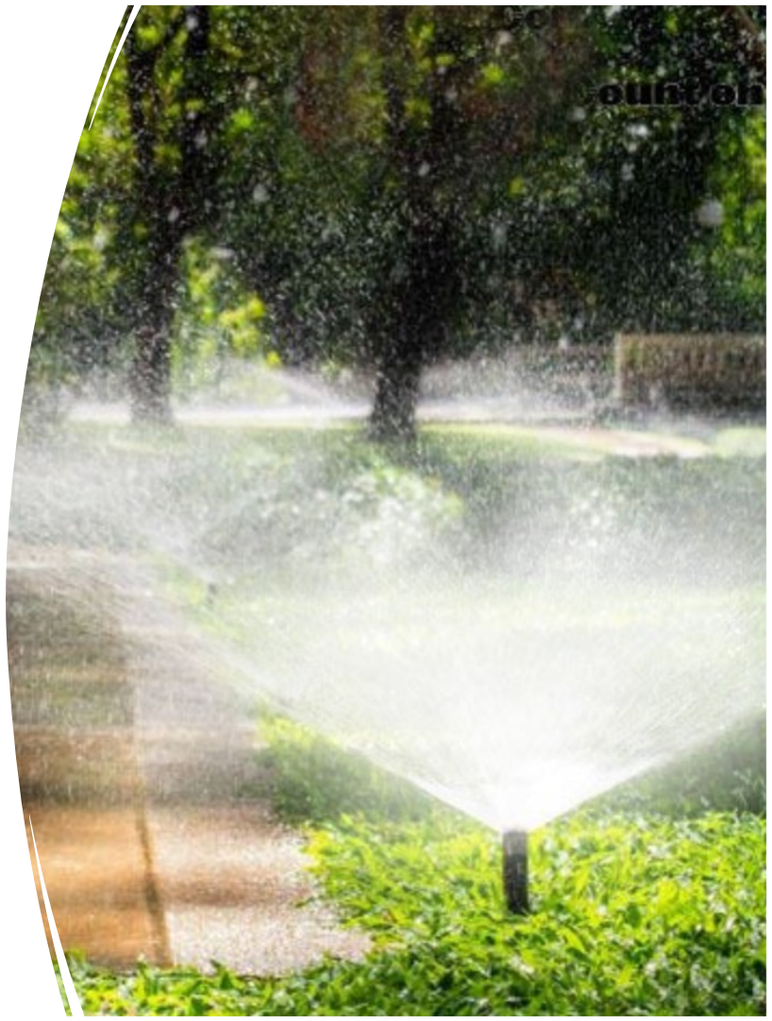
Emission Devices

- Spray Heads

  DU = 50%

  Precip rate – 1.6 inches per hour

  Gallons per min – 4 gpm



Rotors

DU = 65%

Precip rate – .5 iches per hour

Gallons per min – 8 – 20 gpm

Rotating Nozzles

1. DU – 71
2. Precip rate – 1 inches per hour
3. Gallons per minute – 2 gpm

Emitterline, Point Source Emitters

- DU – 93
- Precip rate – with .6 gph 1 inch
- GPH - .29 – 2

Schrubblers / Microsprays

- **DU – 90**
- **Precip rate – 6 inches per hour**
- **GPH - 4 GPH**

ETwater®
a Jain Irrigation company

PRECIPITATION RATE

How many inches per hour?

15 Series MPR					
30° Trajectory				■	▲
Nozzle	**Pressure psi**	**Radius ft.**	**Flow gpm**	**Precip In/h**	**Precip In/h**
15F	15	11	2.60	2.07	2.39
	20	12	3.00	2.01	2.32
	25	14	3.30	1.62	1.87
	30	15	3.70	1.58	1.83
15H	15	11	1.30	2.07	2.39
	20	12	1.50	2.01	2.32
	25	14	1.65	1.62	1.87
	30	15	1.85	1.58	1.83
15Q	15	11	0.65	2.07	2.39
	20	12	0.75	2.01	2.32
	25	14	0.82	1.62	1.87
	30	15	0.92	1.58	1.83

COMMON EMITTER-LINE SPACING CHART

Grid Layout (in Inches)	Line Size	Emitter Output (gallons per hour)	Applica-tion Rate (inches per hour)	Run Time (1/4" delivery)
12 x 12	17mm	.6	.96`	16 mm
12 x 12	17mm	.9	1.44	10 min
12 x 18	17mm	.6	.64	23 min
18 x 18	17mm	.6	.43	35 min
18x 24	17mm	.6	.32	47 min
12 x 12	18mm	.5	.80	19 min
12 x 18	18mm	.5	.53	28 min
6 x 12	12mm	.4	1.28	12 min

DISTRIBUTION UNIFORMITY

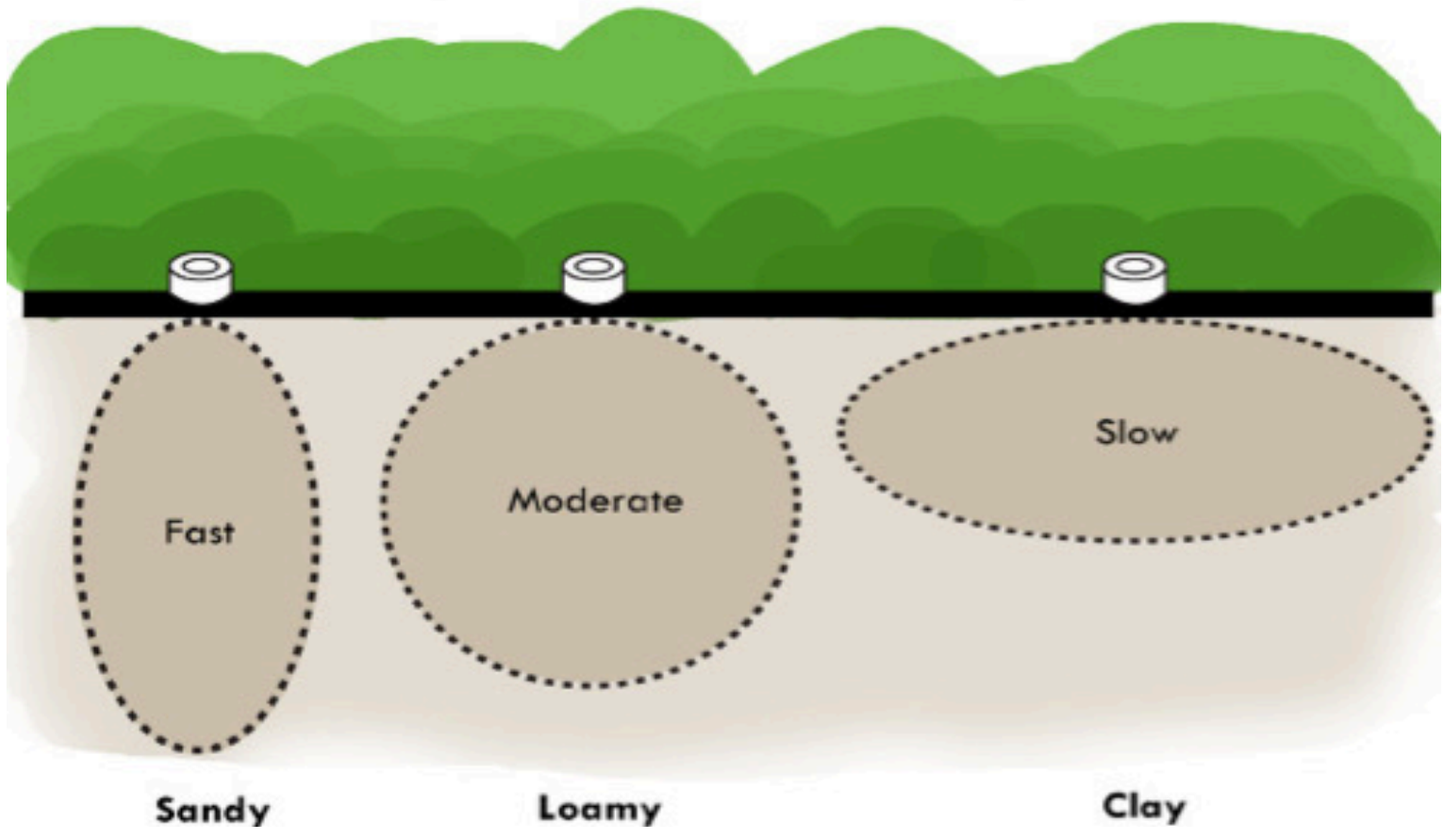
Distribution Uniformity (DU) is a measure of
how evenly water is applied across a field during irrigation

MP ROTATOR SYSTEM VS. SPRAY SYSTEM

MP Rotator System		Spray System	
ET Demand:	.5 in/wk	ET Demand:	.5 in/wk
DU:	71%	DU:	53%
Irrigated Area:	800 sq ft	Irrigated Area:	800 sq ft
Volume Demand:	250 gal/wk	Volume Demand:	250 gal/wk
Irrigation	352 gal/wk	Irrigation	472 gal/wk
Water Savings/Week: 120 gallons **Irrigation Weeks/Year: 35 weeks** **Annual Water Savings: 4,185 gallons**			

OTHER FACTORS

1. Slopes
2. Soil Type



Same run time every time. Frequency is what changes

Information To Gather

1. What type of plant are you watering
2. Irrigation method – sprays, drip, rotor
3. Maturity – newly planted, mature
4. Precipitation rate
5. Distribution uniformity
6. Root depth
7. Slope
8. How much sun or shade

Irrigation Calculator

$$T = \frac{60 \times Eto \times Kc}{Pr \times Ea}$$

Where:

T = Run time in minutes

Eto = Evapotransporation rate, in inches

Kc = Crop coefficient, percent

Pr = Precipitation rate of the area, in inches per hour

Ea = Application efficiency of the sprinkler system, percent

60 =Constant for conversion of area, flow, inches per hour, and inches per day into common units.

DESIGN ELEMENTS

HYDROZONING

- Plant water requirements (Turf, Trees, Shrubs, Color, Native, Riparian)
- Soil types (Sand, Loam, Clay)
- Exposure (Sun vs. Shade)
- Slope vs Flat

SCHEDULING HELP

Be Water Wise
http://www.bewaterwise.com/calculator.html

How to use the Watering Calculator:

- Answer the questions below for each yard area. You can create a watering schedule for up to 6 areas at one time.
- When complete, click on the button below to see your customized watering schedule.

Name this landscape area? (e.g. front yard) P. Flowers

zip code 92037

Moderate Water Use Plant

Sandy Loam

What type of watering system do you have?

- Sprinkler*
- Impact Rotor*
- Gear Rotor*
- Bubbler
- Micro-Spray*
- Drip

2.0 Gal/Min

.50 Gal/Hour

*If you are using a Sprinkler, Rotor, or Micro-Spray, and you know your application rate, please enter it here:

Application rate .97

Add another area

See watering schedule

Property zip code: 92037
This is as of 2/3/2020 12:58:55 PM

P. Flowers
Moderate Water Use | | Drip .50 Gal/Hour

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum Minutes per start time	31	31	31	31	31	31	31	31	31	31	31	31
Start times per week*	3	3	5	7	7	8	8	8	6	4	3	2
Total minutes per week	93	93	155	217	217	248	248	248	186	124	93	62

*Start times per week may not equal days per week. Multiple start times per day may be needed to avoid runoff.

SCHEDULING HELP

UC Page - https://ucanr.edu/sites/UrbanHort/Water_Use_of_Turfgrass_and_Landscape_Plant_Materials/Water_Demand_Calculators/Water_Demand_Calculators/index.cfm

Landscape Water Requirement Calculators

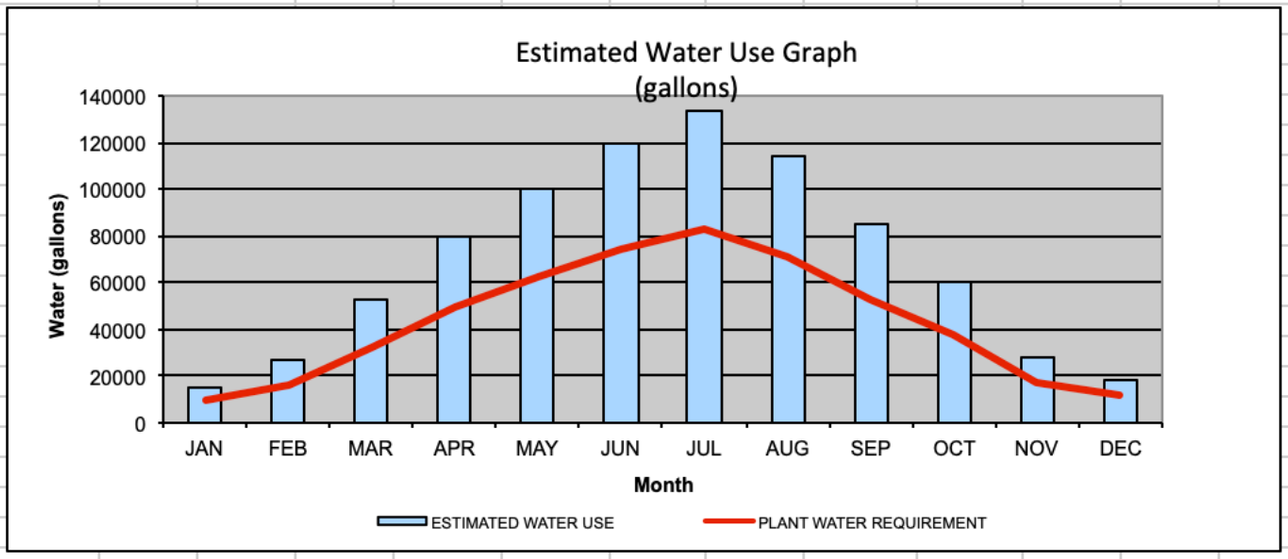
Groupings and Mass Plantings of Trees and Shrubs Water Demand Calculator 2.0

Area of Planting in square feet	100
Average ET_o inches per day	0.1 Enter estimated daily ET_o or select closest CIMIS station
Gallons Per Day	3.12 gallons / day
Gallons Per Week	21.82 gallons / week
Inches Per Week	0.35 inches / week
	Submit

SCHEDULING HELP

LANDSCAPE AREA		LANDSCAPE COEFFICIENT		EST. EFFICIENCY		PRECIPITATION RATES	
TURF SQ. FT.	10000	TURF K_L	1.0	TURF EFF.	50%	SPRAYS	1.7
SHRUB SQ. FT.	10000	SHRUB K_L	0.8	SHRUB EFF.	90%	DRIP	0.8

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
MONTHLY ETo	0.82	1.47	2.92	4.40	5.57	6.66	7.40	6.35	4.73	3.34	1.54	1.01	46.21
PLANT WATER REQUIREMENT	9195	16485	32745	49342	62462	74685	82984	71209	53042	37455	17270	11326	518199
ESTIMATED WATER USE	14758	26457	52554	79190	100248	119865	133184	114286	85129	60113	27717	18178	831677



Base Irrigation Schedule (ESTIMATED WEEKLY WATERING TIMES)

The following suggested watering times are general guidelines created using local historical Evapotranspiration (ET) rates and site assumptions. The weekly watering times listed below are general approximations. Your onsite Account Manager will walk the site and make the appropriate adjustmests to meet the specific needs of each zone.

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TURF	SPRAY	13	26	47	72	89	110	118	101	78	53	25	16
	ROTOR	28	55	99	154	189	233	251	215	166	113	54	34

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Shrub	SPRAY	6	12	21	32	39	49	52	45	35	24	11	7
	DRIP	12	25	44	68	84	104	111	96	74	50	24	15

What Are We Trying To Do

- Imagine a shrub with a 12-inch root zone, 12 inches wide watered with a .62 gallon per hour emitter. The shrub needs one inch of water this week.
- How long and how often should we apply water?
- Answer – Depends
- **Key Concept** – Always give the same amount only the frequency changes

TRIVIA QUESTION #4

What percent of the world's water is fresh water?

- A: **70% of the planet is covered in water with fresh water making up only 2.5% of water on the planet. The remaining 97% of the earth's water is salt water. About 1.6% of fresh water is in polar ice caps and glaciers.**

Get Smart with Smart Irrigation Controllers

Smart Controller

5 Reasons To Use A Smart Controller

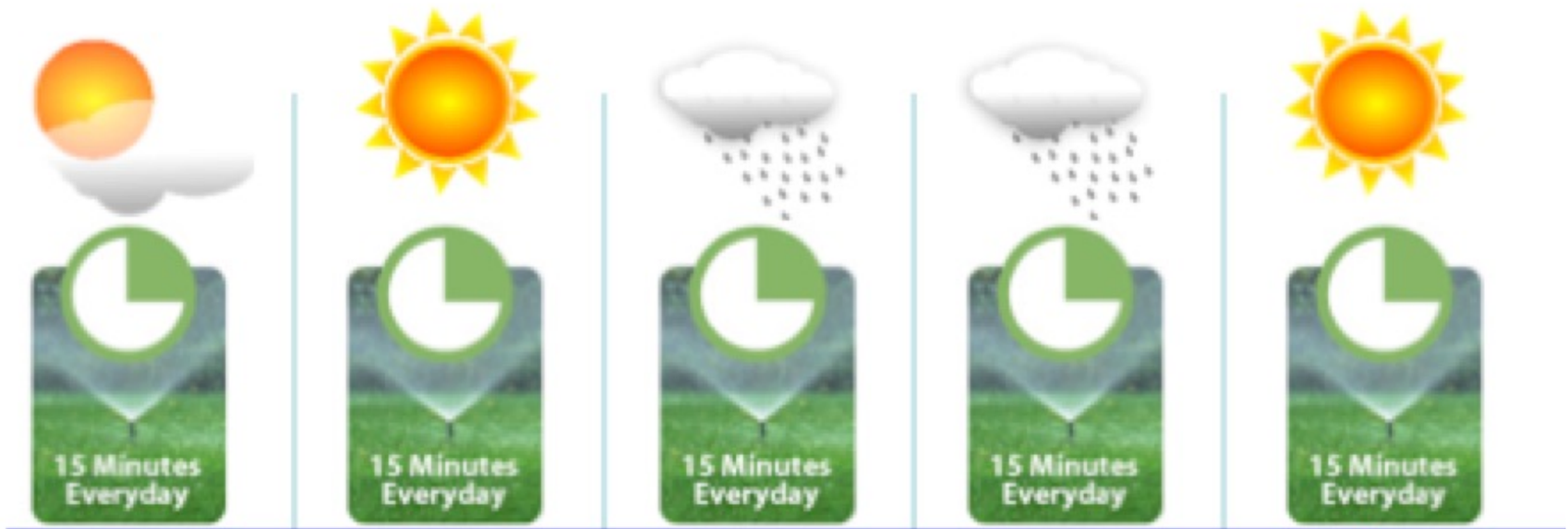
- Adjust run times daily
- Generate run time calculation for you
- Use rain to your advantage
- Stop leaks with alerts
- Generate Valuable Water Use Report

Smart Irrigation Controllers

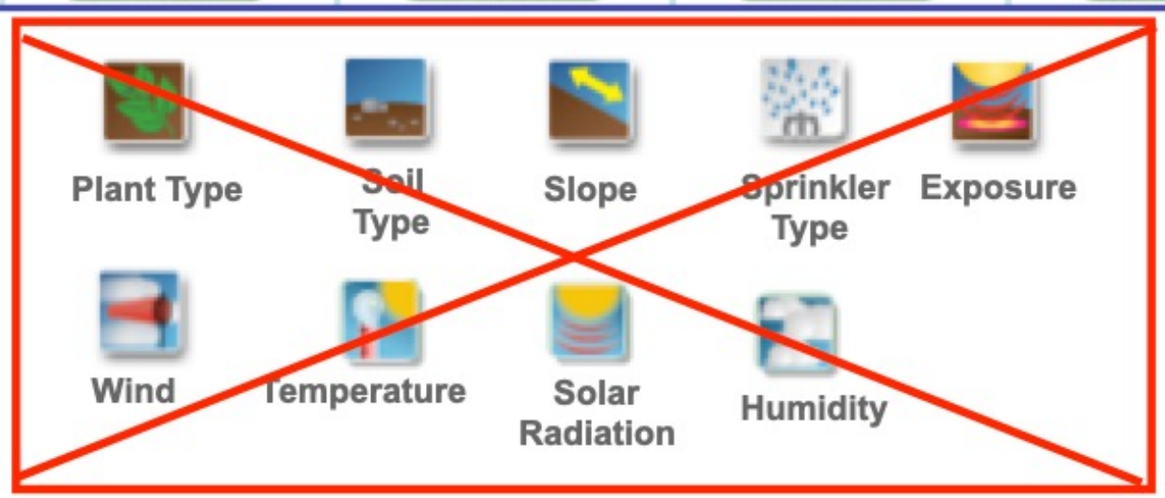
AUTOMATING LANDSCAPE WATERING

OLD CONTROLLER WASTE WATER

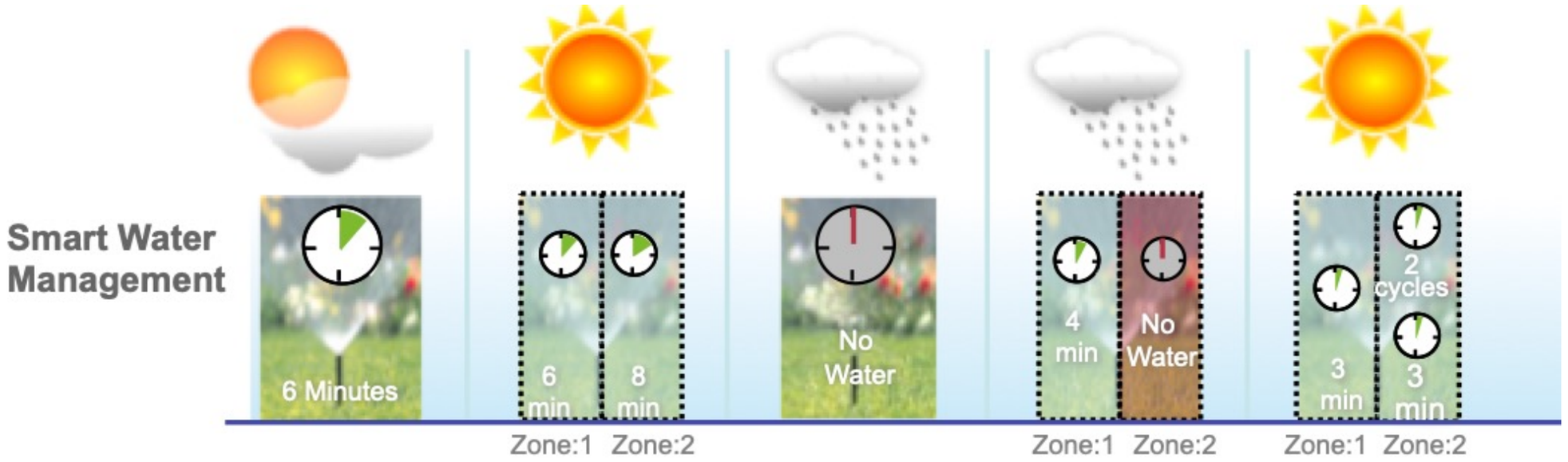
Old Timer



Fails to consider actual landscape needs that are based on:



SMART WATER MANAGEMENT



Optimizes water use with

site specific data
+
local weather data

TRIVIA QUESTION #5

On average, how many gallons of water does each person in the U.S. use per day?

- A: **123 GALLONS**

  Brushing teeth (water running) 1-2 gallons
  Flushing toilet 5-7 gallons
  Washing dishes in dishwasher 9-12 gallons
  Washing dishes by hand 20 gallons
  Shaving (water running) 10-15 gallons
  Shower 15-30 gallons

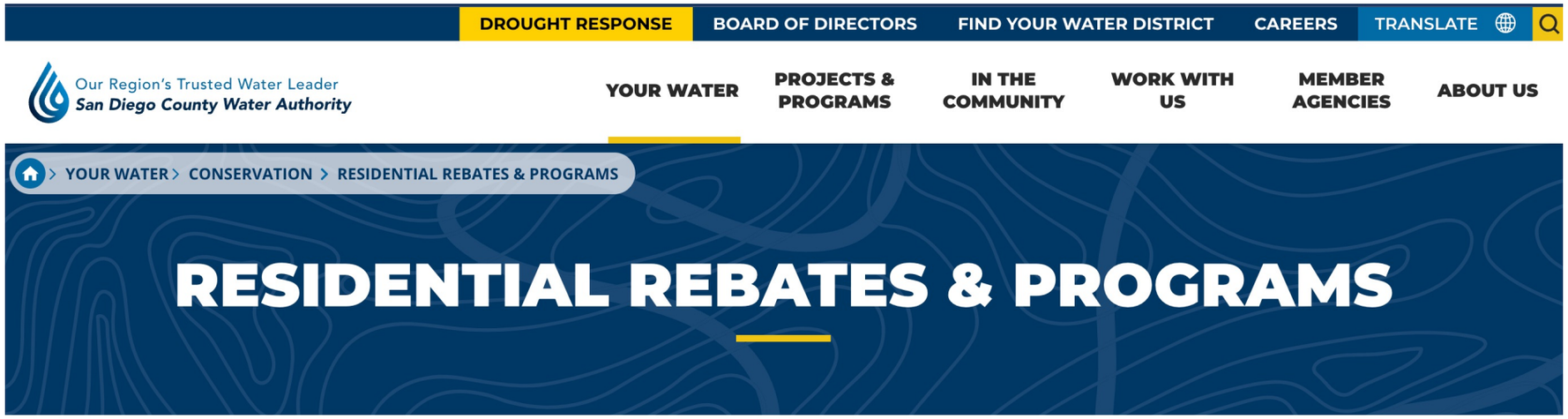

Model FSI-T10-001
creativesensortechnology.com
FLOW

WHAT MAKES A CONTROLLER SMART

1. Daily adjustment based on real time ET
2. Remote access
3. Flow sensing/flow control
4. Reports
5. Predictive analytics

Rebates

Here is a Sixth Reasons To Use A Smart Controller



Residents can take advantage of savings on a variety of water-saving technologies such as high-efficiency clothes washers and toilets, rain barrels and irrigation nozzles. Residents can schedule free WaterSmart Checkups to make their properties more water-efficient.

Water Cost

$31

Estimate cost of irrigation this site over last 30 days

Controllers

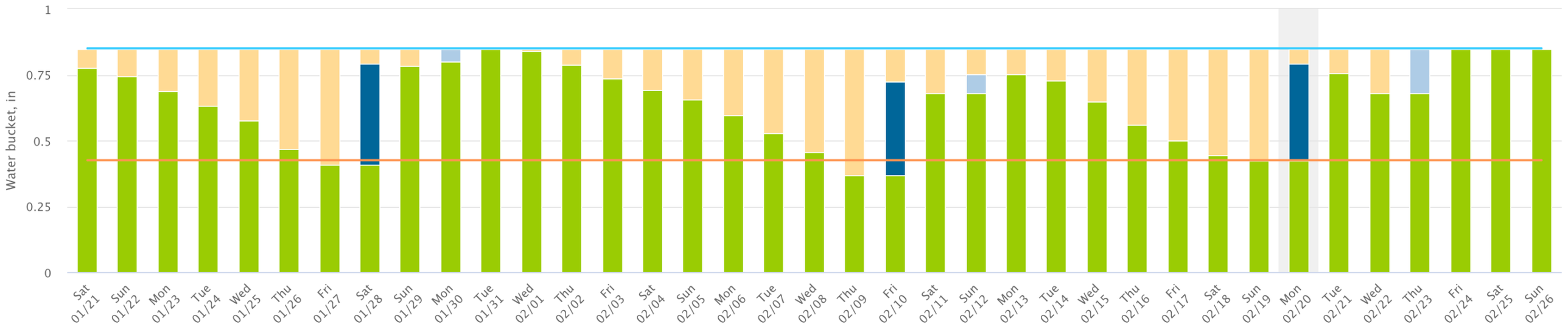
Name
Smart Controller 1

Temperature Forecast

MON	TUE	WED
48°F / 57°F	52°F / 54°F	48°F / 54°F

Name	Dec 10 - Dec 17	Dec 17 - Dec 24	Dec 24 - Dec 31	Dec 31 - Jan 07	Jan 07 - Jan 14	Jan 14 - Jan 21	Jan 21 - Jan 28
1. Turf and Olive trees	$0	$0	$2.28	$0	$0	$0	$2.28
2. Front Drive Sides	$0	$1.38	$0.65	$0	$0	$0	$1.3

Moisture Balance In A Zone



Leave this world better than you found it.

- Richard Restuccia – Rrestuccia@jainsusa.com
- 858 952-6038

Valve, Filter & Pressure Regulator

Components of a Drip Irrigation System

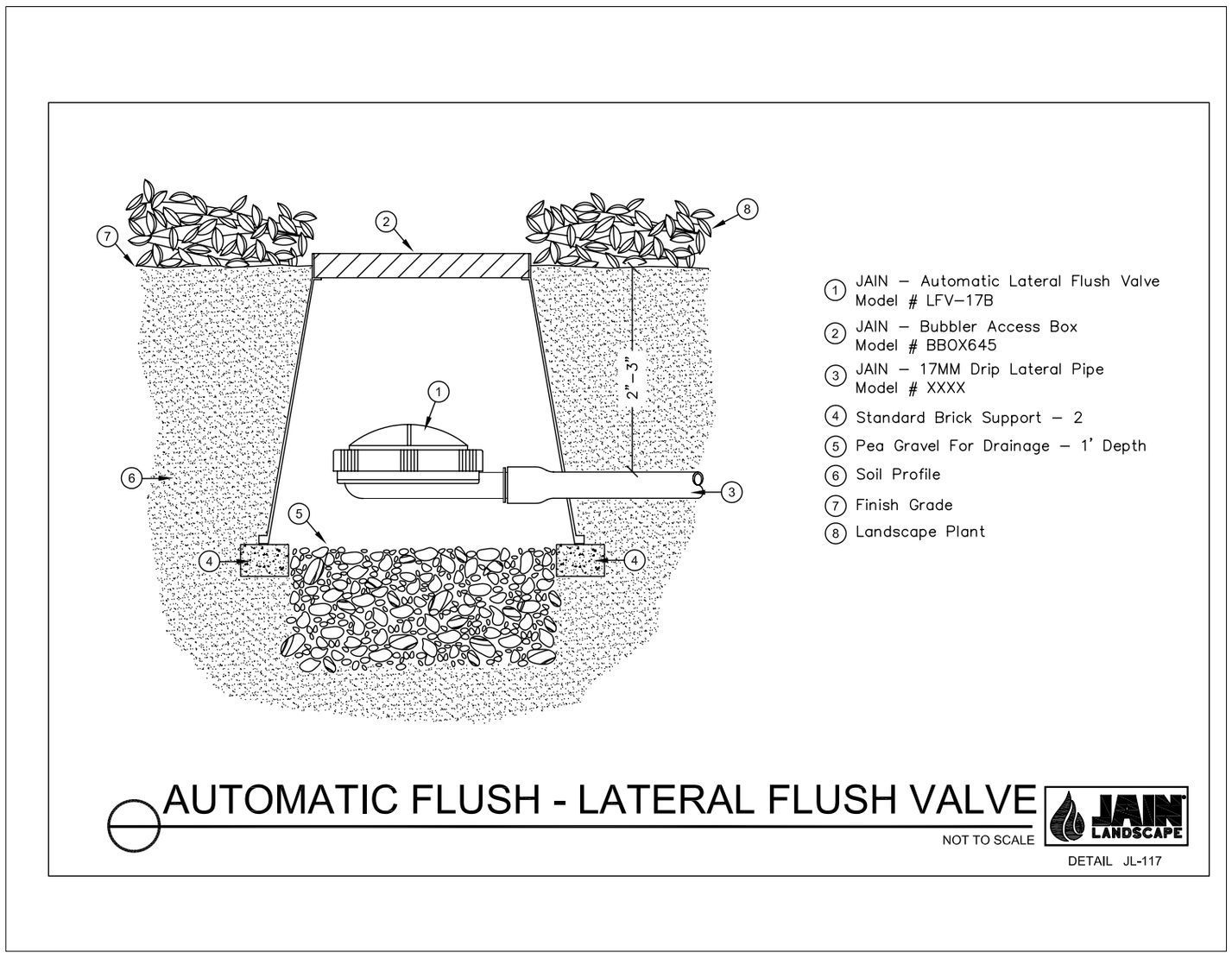
FILTRATION

- Acceptable mesh sizing (150 is most common)
- Disc or Screen?
  - Disc-Organic growth, algae
  - Screen-debris, sand or shell

JAIN Drip Control Kit

Components of a Drip Irrigation System

FLUSHING



1. JAIN – Automatic Lateral Flush Valve Model # LFV–17B
2. JAIN – Bubbler Access Box Model # BBOX645
3. JAIN – 17MM Drip Lateral Pipe Model # XXXX
4. Standard Brick Support – 2
5. Pea Gravel For Drainage – 1' Depth
6. Soil Profile
7. Finish Grade
8. Landscape Plant

AUTOMATIC FLUSH - LATERAL FLUSH VALVE

NOT TO SCALE

JAIN LANDSCAPE

DETAIL JL-117

Fundamentals of a Drip Irrigation System

EMISSION DEVICES

- Multiple applications
- Plant Spacing
- Flow by Emitter or Manifold
- Adjustable / Take Apart
- PC vs Non-PC

Fundamentals of a Drip Irrigation System

EMITTERLINE

- ¼” Mini-Pepline and ¼” Supply Tubing
- Emitter Spacing
- Flow by Emitter
- Root Barrier