This presentation premiered at WaterSmart Innovations

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INNOVATIONS

USING DESIGN TECHNOLOGY TO MEET WATER EFFICIENT LANDSCAPE REQUIREMENTS

ERIC GILBEY, PLA , ASLA, PROF MEMBER APLD

LEARNING OBJECTIVES

Attendees participating in this educational session will:

- learn how to quickly define hydrozones that report water needs and areas.

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- understand design strategies used to incorporate non-potable water collection elements.

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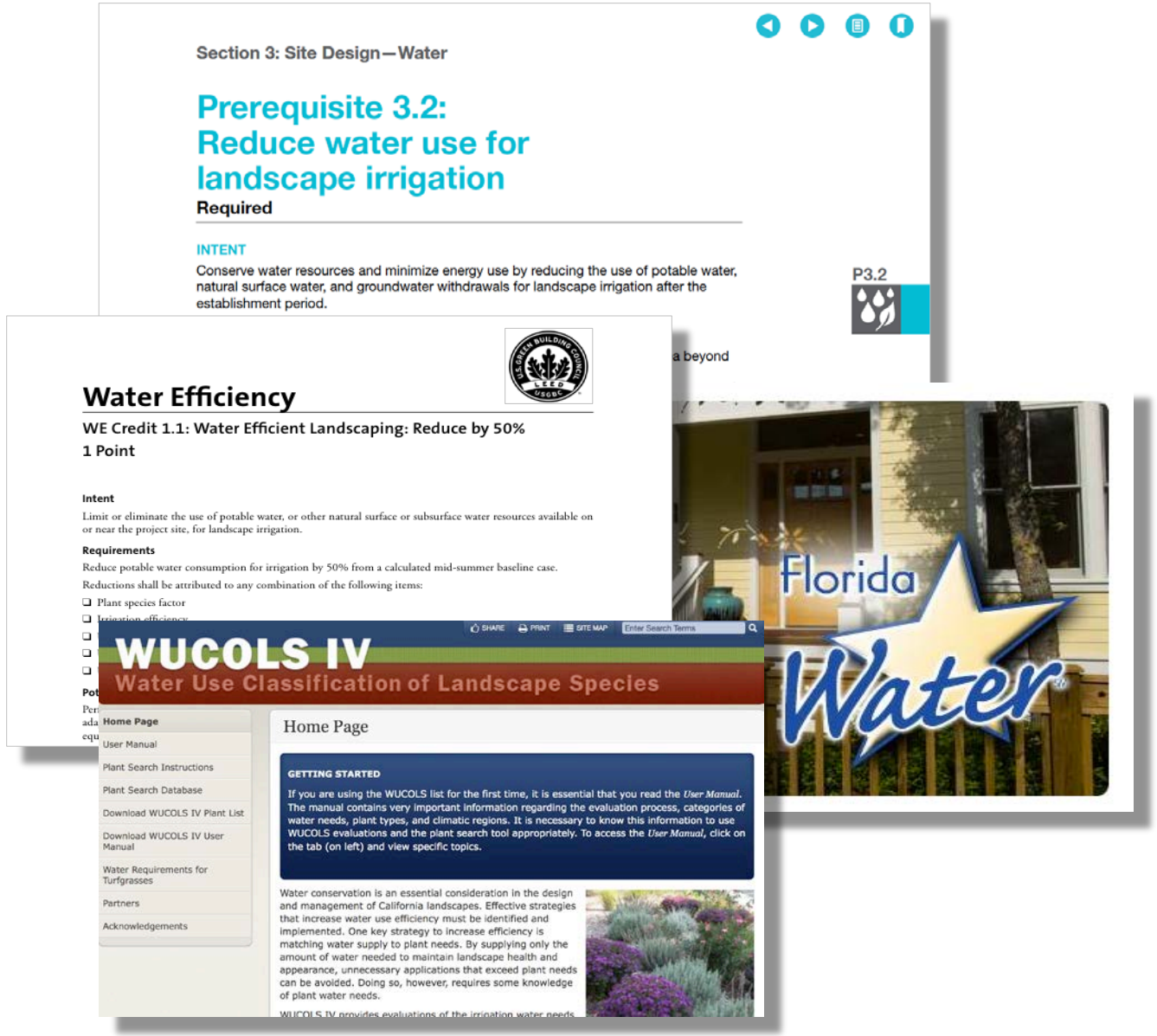
- understand design strategies used to incorporate non-potable water collection elements.
- recognize how water needs data can be appended to plant symbols, which can quickly fulfill your MWELO/LEED/SITES compliant proposed landscape plan.

WATER EFFICIENT LANDSCAPE DESIGN OVERVIEW



Designing landscapes with sustainability in mind is no longer a matter of preference…water efficient landscapes are expected.

- by the client
- by jurisdiction
  - ordinances (MWELO)
  - tax incentives

WATER EFFICIENT LANDSCAPE DESIGN OVERVIEW

HOW CAN DESIGN TECHNOLOGY HELP?

Charting hydrozones for proposed irrigation

WATER EFFICIENT LANDSCAPE DESIGN OVERVIEW

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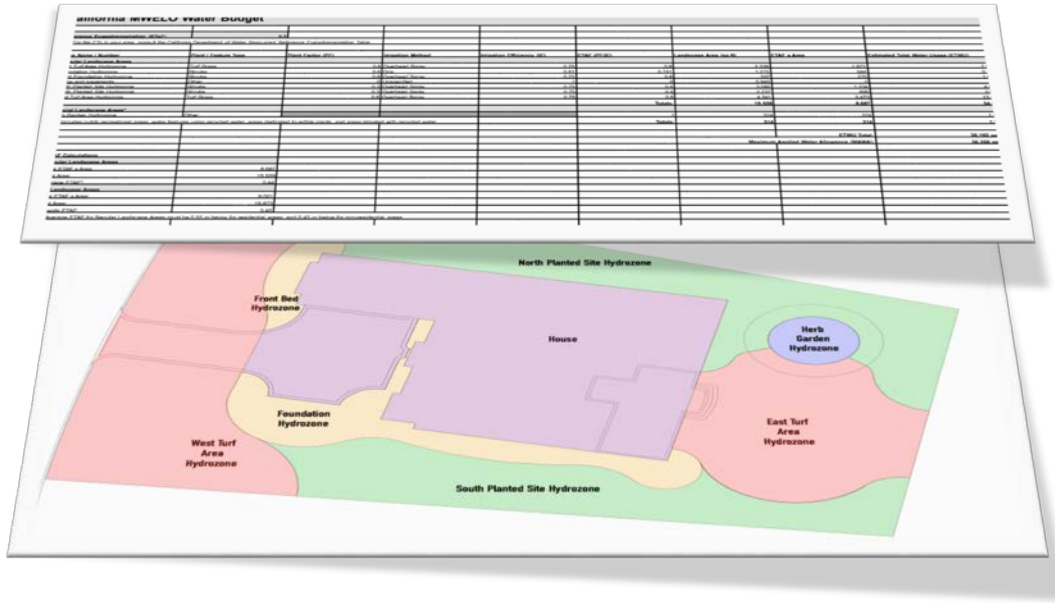

Performing water budget calculations

Charting hydrozones for proposed irrigation

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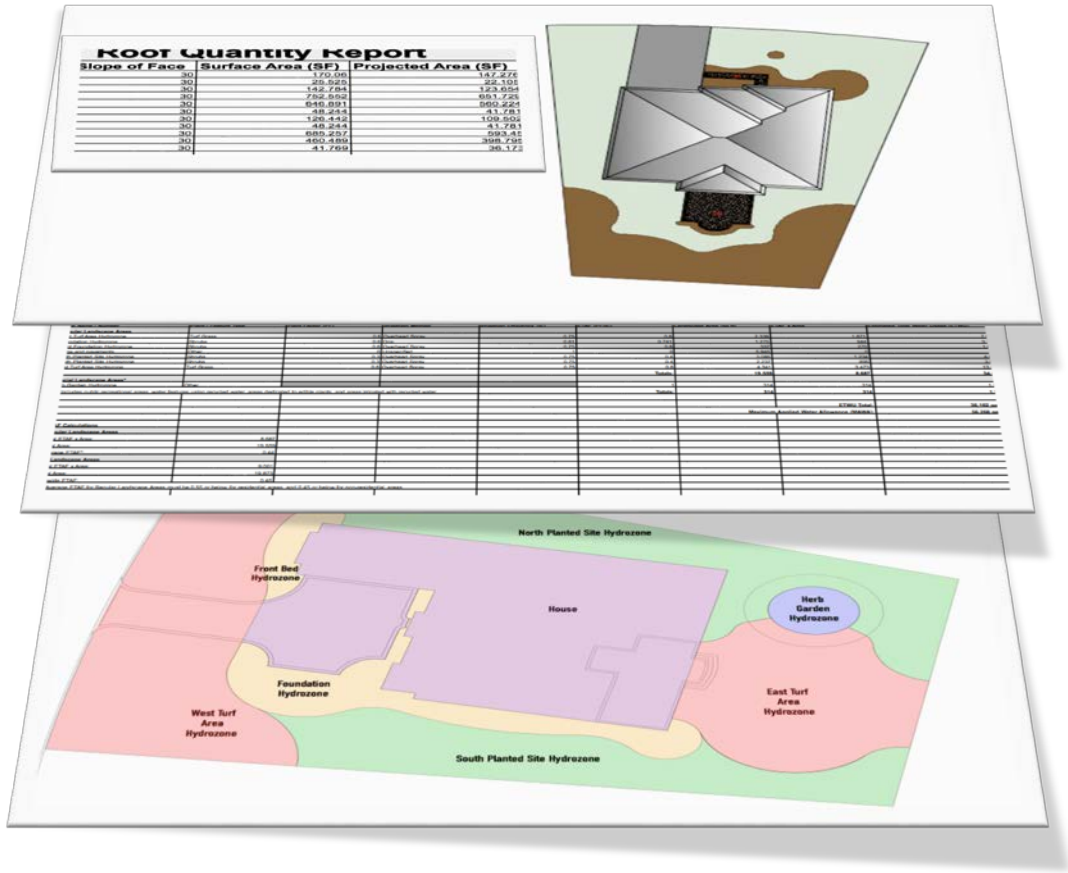


- Estimating for non-potable uses
- Performing water budget calculations
- Charting hydrozones for proposed irrigation

WATER EFFICIENT LANDSCAPE DESIGN OVERVIEW

HOW CAN DESIGN TECHNOLOGY HELP?

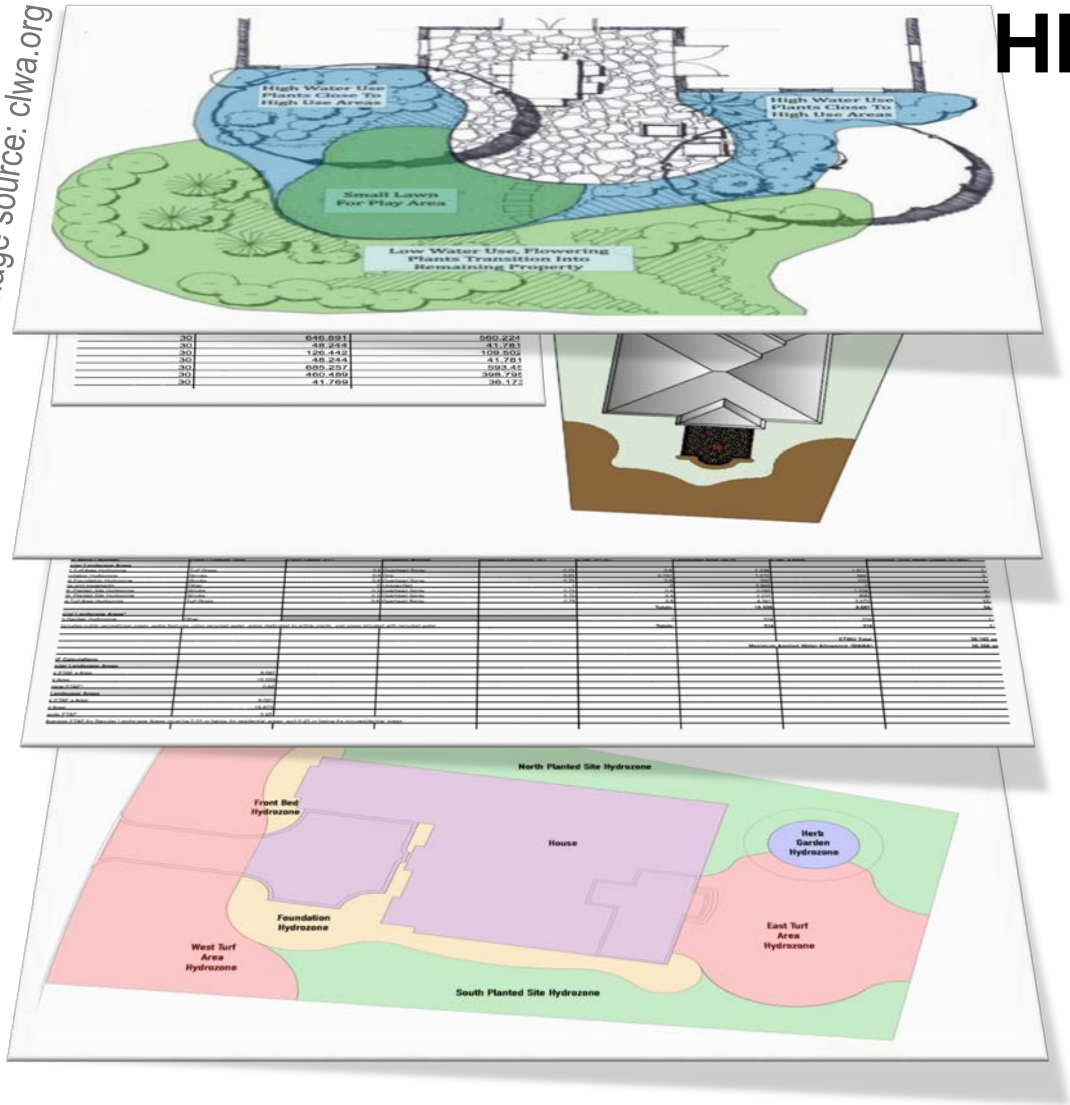
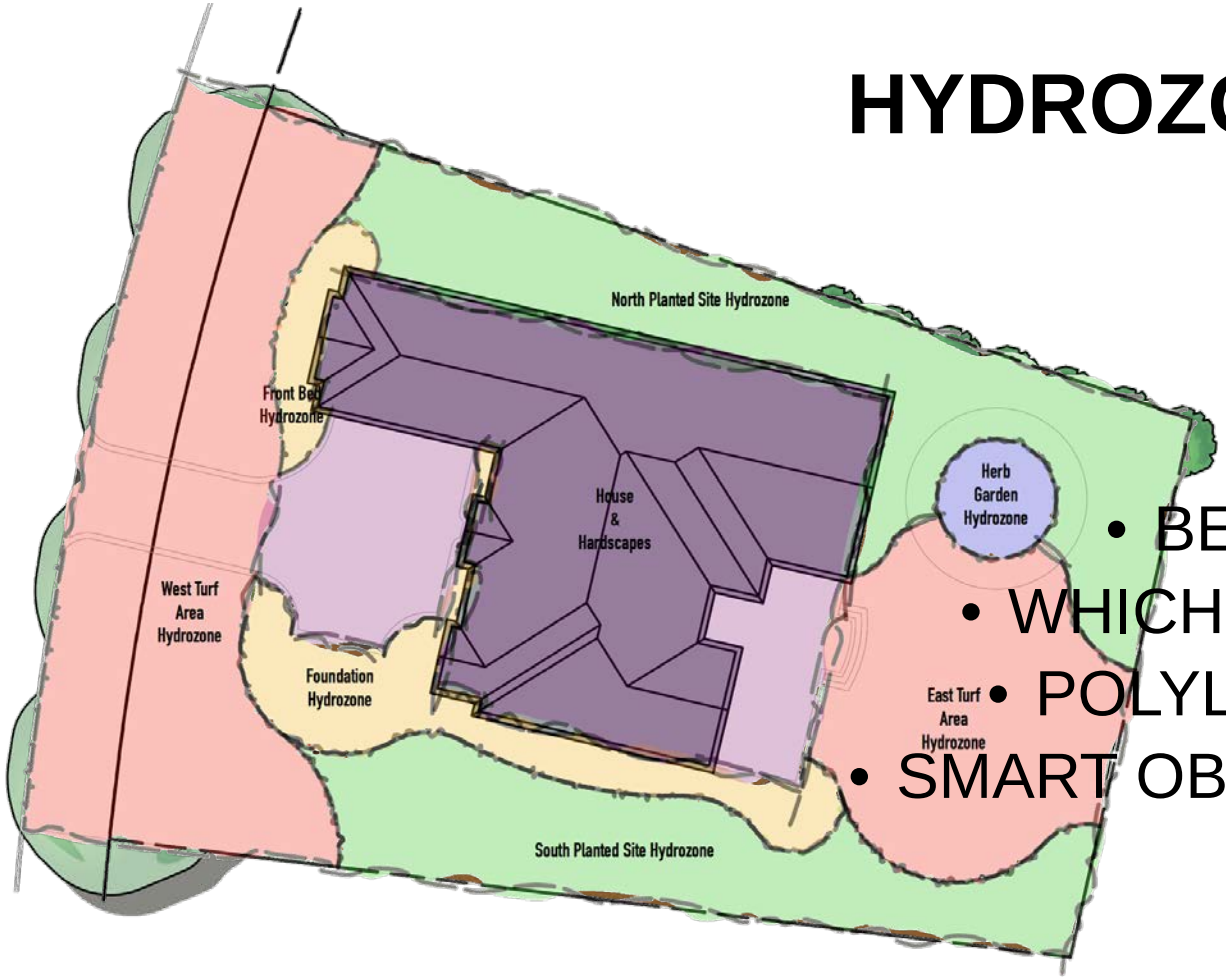


Image source: clwa.org

- Choosing the best plant based on water requirements factor
- Estimating for non-potable uses
- Performing water budget calculations
- Charting hydrozones for proposed irrigation

CHARTING INTELLIGENT HYDROZONES



HYDROZONES: ZONES OF SIMILAR WATER NEEDS

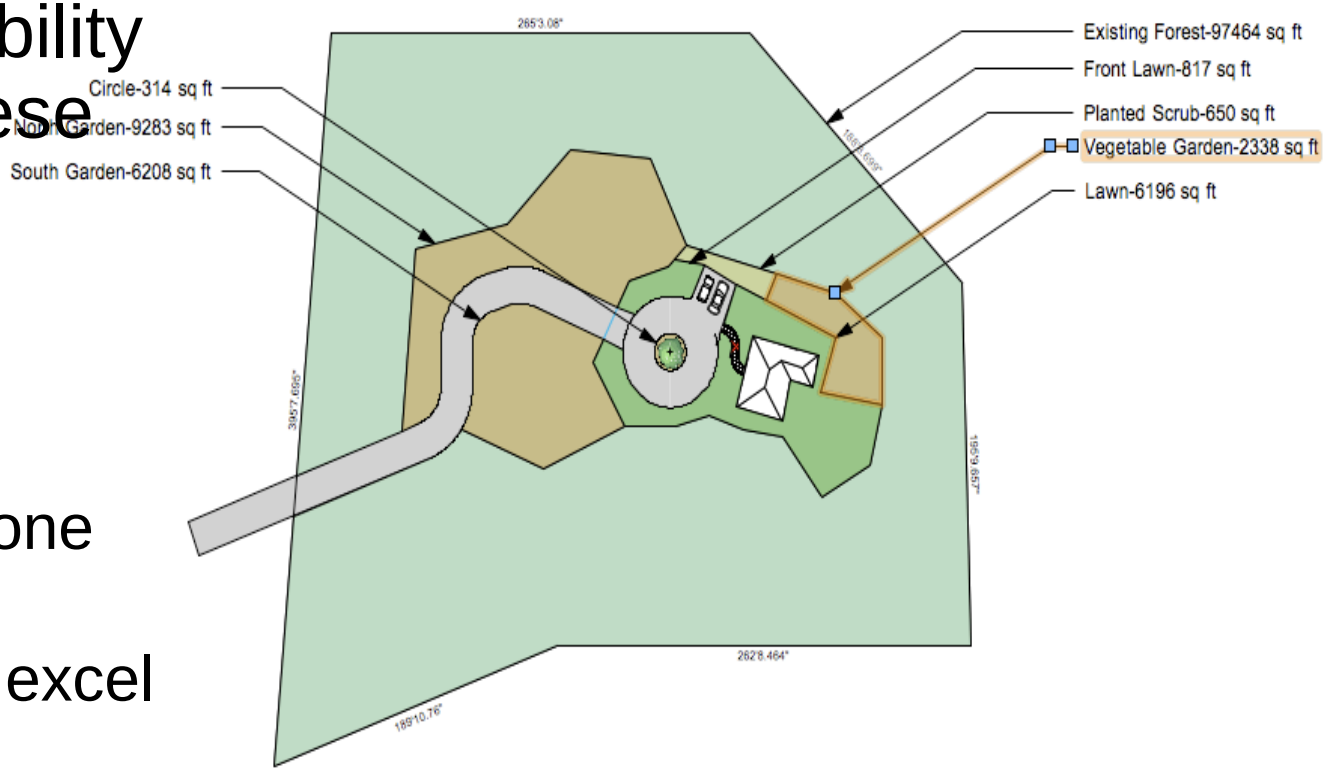
- BEFORE OR AFTER PLANTING PLAN?
- WHICH PROCESS IS EASIEST TO REVISE?
- POLYLINES IN CAD = QUICK AREA CALCS
- SMART OBJECTS = FASTEST WATER BUDGET

CHARTING INTELLIGENT HYDROZONES

Geometry is just half the process

Every CAD program has the ability to delineate areas, such as these hydrozones with polylines, or polygons.

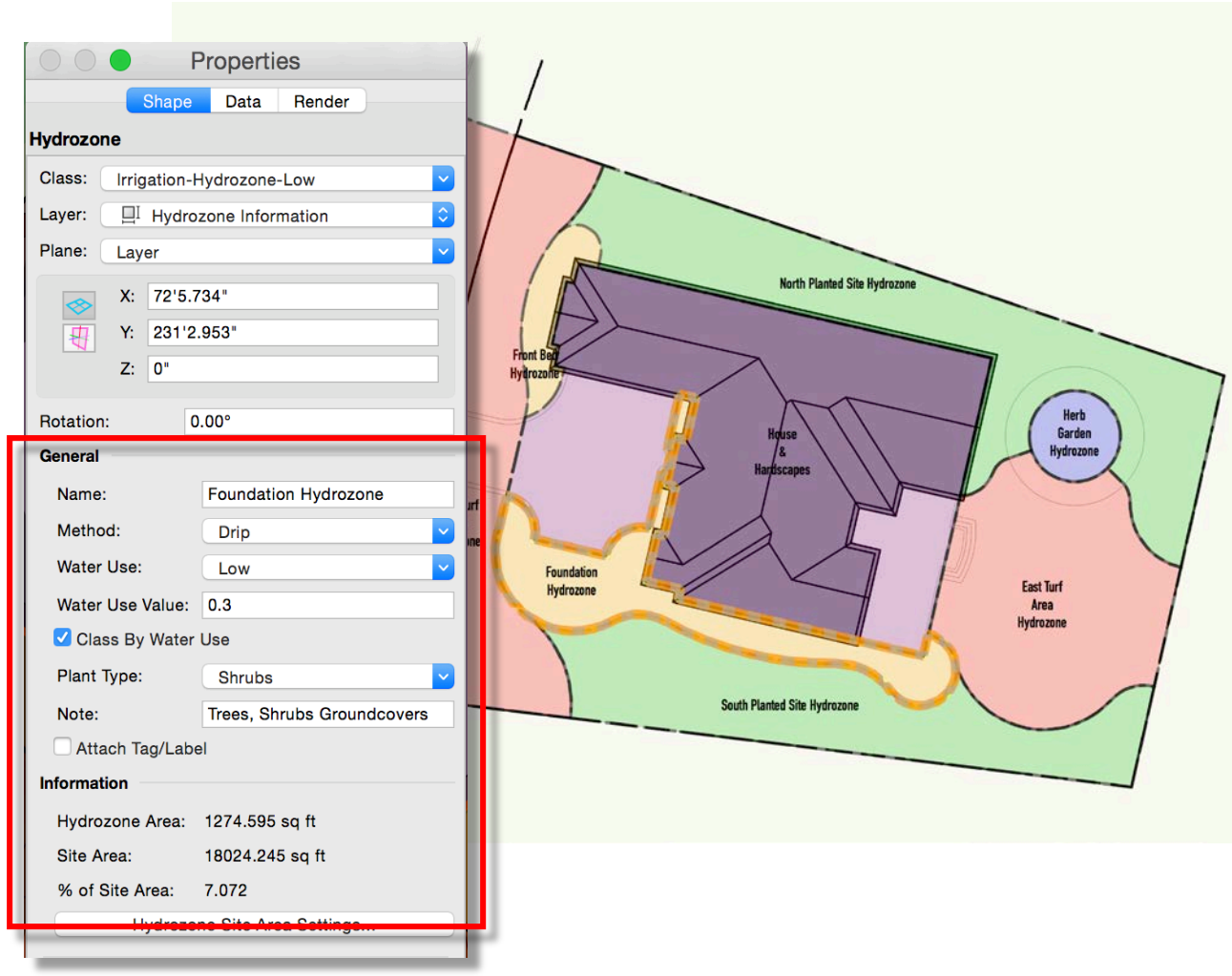
- Click on each shape
- Recognize the area
- Create a label with the hydrozone name and area
- Enter name and number in an excel spreadsheet
- Manually update when reconfiguring to meet budget



CHARTING INTELLIGENT HYDROZONES

HYDROZONES: SMART OBJECTS = LESS TIME

- Right click on shape
- Convert to Hydrozone object
- Populate with irrigation data needed for LEED, SITES or MWELO water budget.
- Built-in LEED, SITES or MWELO worksheet does the rest.



PERFORMING WATER BUDGET CALCULATIONS

Source: EPA WaterSense Water Budget Approach, December 2009

Just like **spreadsheets** and **databases** are to financial budgets, **worksheets built in to your design application** can be to complex calculations like water budgets.

Actually…they're even better!

PERFORMING WATER BUDGET CALCULATIONS

SPREADSHEETS AND WORKSHEETS:

When considering the complicated calculations…its no wonder some designers would prefer to either pass on water budgets, or use spreadsheets or built-in worksheets.

What is the advantage of **built-in** over **stand-alone**?

PERFORMING WATER BUDGET CALCULATIONS

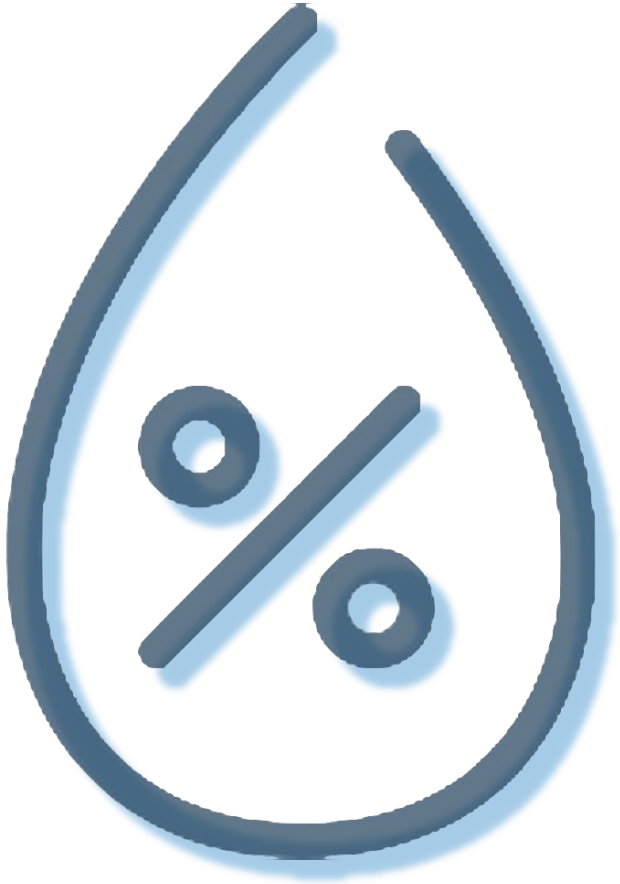
In some cases, a designer will find that water budgets start with a Baseline water requirement for a site.

Baseline:
the amount of water required by a site if the landscaped area is watered at 100 percent of local reference evapotranspiration (ETo).

ETo is representative of the amount of water lost from a well- maintained expanse of average-height green grass and the surrounding soil.

Source: EPA WaterSense Water Budget Approach, v 1.02 July 2014

PERFORMING WATER BUDGET CALCULATIONS

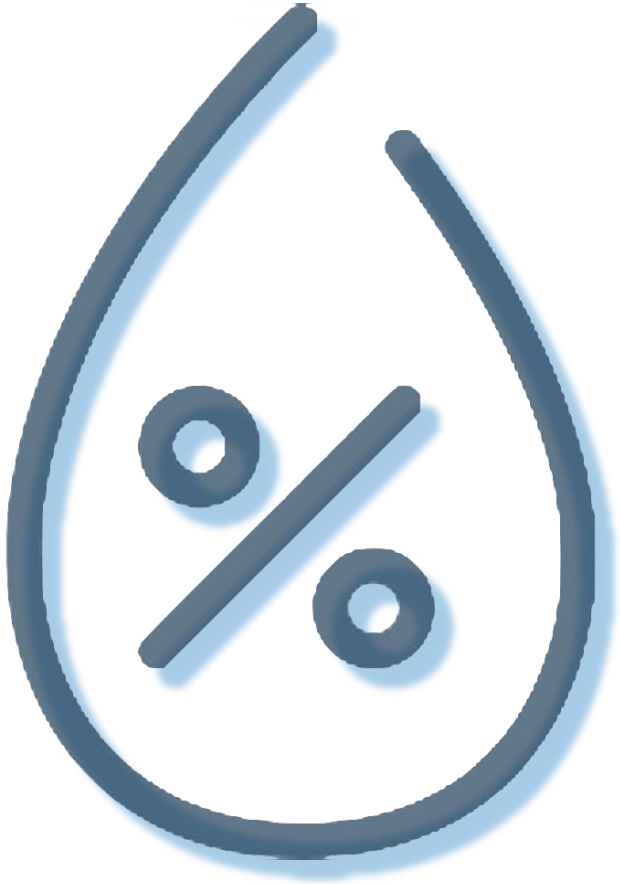


LWA (Landscape Water Allowance) is the target allowance for water usage on site typically 70% of the Baseline.

MAWA:
(Maximum Applied Water Allowance) is essentially the same thing as the LWA, for those in California utilizing the water budget calculations required by the Water Efficient Landscape Ordinance (WELO).

Source: EPA WaterSense Water Budget Approach, v 1.02 July 2014
& California's Updated Model Water Efficient Landscape Ordinance, July 2015

PERFORMING WATER BUDGET CALCULATIONS



The proposed LWR (Landscape Water Requirement) must fall within the calculated LWA.

ETWU:
(Estimated Total Water Use) is essentially the same thing as the LWR, for those in California utilizing the water budget calculations required by the Water Efficient Landscape Ordinance (WELO).

Source: EPA WaterSense Water Budget Approach, v 1.02 July 2014
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PERFORMING WATER BUDGET CALCULATIONS

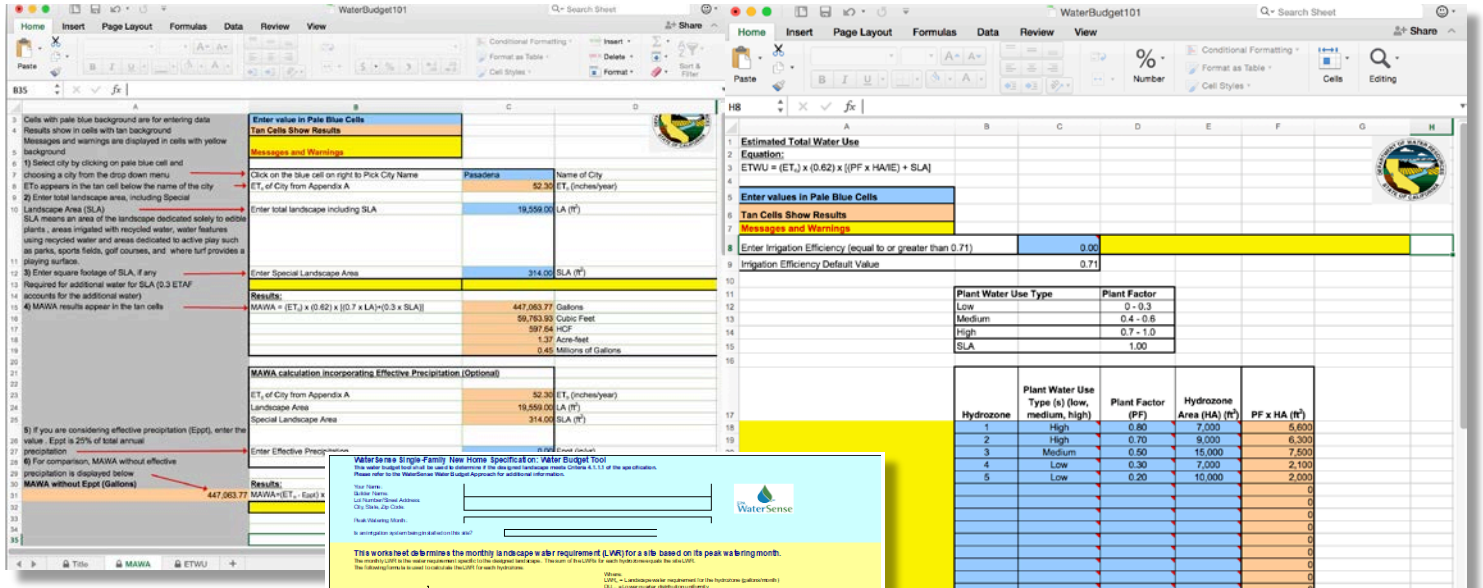


Image source: California Dept of Water Resources

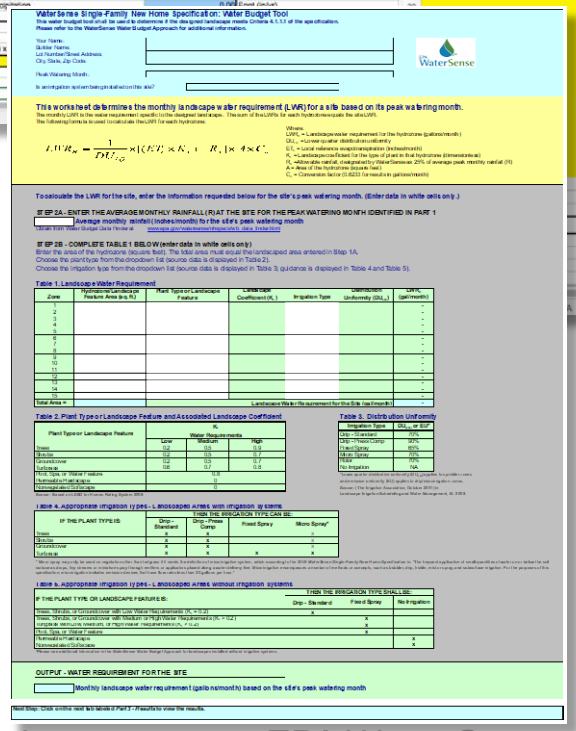


Image source: EPA Water Sense

Excel, Sheets or other **spreadsheets** solutions manage the calculations.

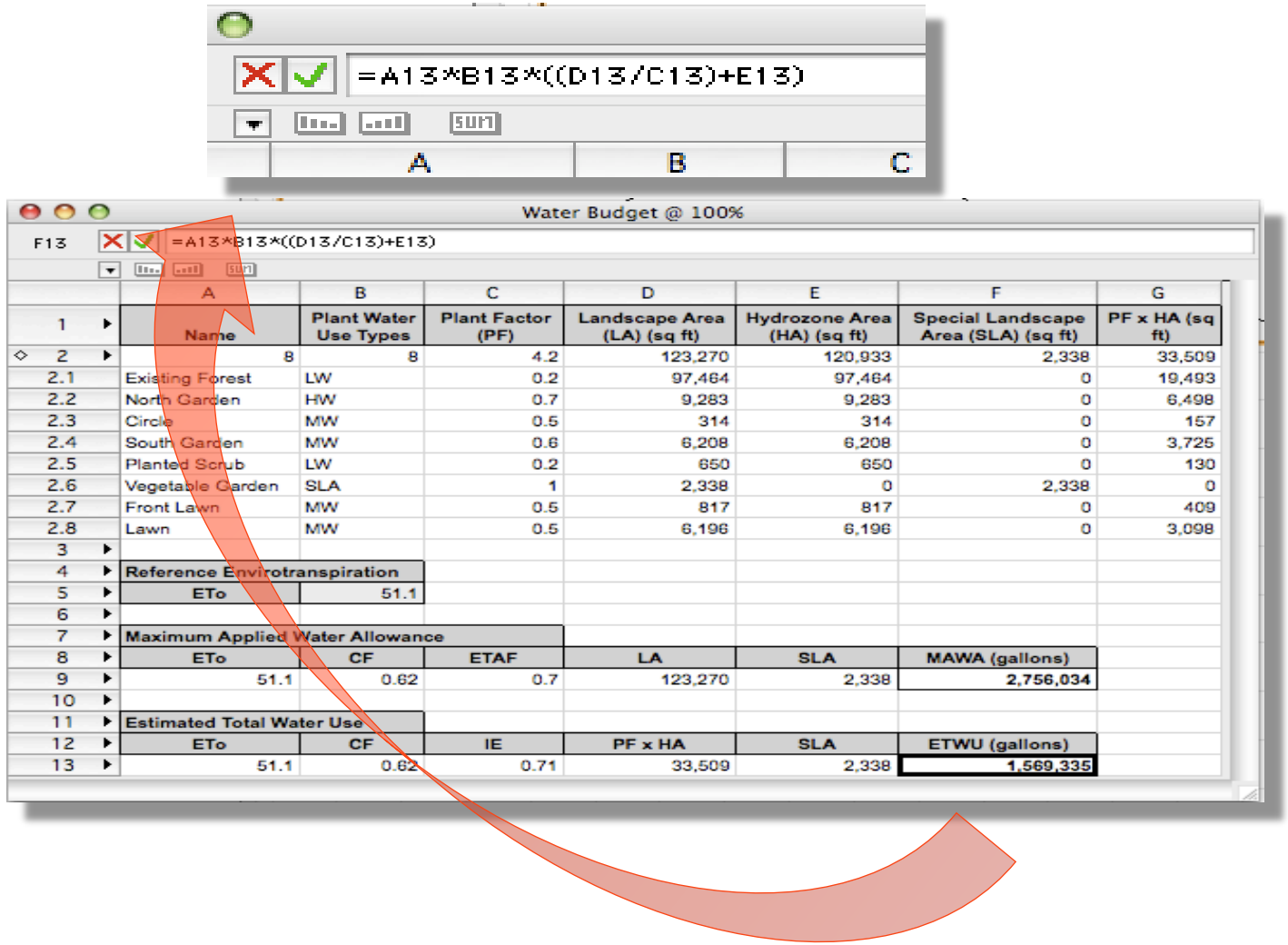
Pre-made spreadsheet files help reduce set-up time.

But… manually entering and revising the data takes time away from design.

PERFORMING WATER BUDGET CALCULATIONS

Also…
both **stand-alone spreadsheets** and **built-in worksheets**:

- calculate
- estimate
- document
- save as a template
- revise for future use



	A	B	C	D	E	F	G
1	Name	Plant Water Use Types	Plant Factor (PF)	Landscape Area (LA) (sq ft)	Hydrozone Area (HA) (sq ft)	Special Landscape Area (SLA) (sq ft)	PF x HA (sq ft)
2	8	8	4.2	123,270	120,933	2,338	33,509
2.1	Existing Forest	LW	0.2	97,464	97,464	0	19,493
2.2	North Garden	HW	0.7	9,283	9,283	0	6,498
2.3	Circle	MW	0.5	314	314	0	157
2.4	South Garden	MW	0.6	6,208	6,208	0	3,725
2.5	Planted Scrub	LW	0.2	650	650	0	130
2.6	Vegetable Garden	SLA	1	2,338	0	2,338	0
2.7	Front Lawn	MW	0.5	817	817	0	409
2.8	Lawn	MW	0.5	6,196	6,196	0	3,098
3							
4	Reference Envirotranspiration						
5	ETo	51.1					
6							
7	Maximum Applied Water Allowance						
8	ETo	CF	ETAF	LA	SLA	MAWA (gallons)	
9	51.1	0.62	0.7	123,270	2,338	2,756,034	
10							
11	Estimated Total Water Use						
12	ETo	CF	IE	PF x HA	SLA	ETWU (gallons)	
13	51.1	0.62	0.71	33,509	2,338	1,569,335	

PERFORMING WATER BUDGET CALCULATIONS

Both also enable reuse.

A **Hydrozone Table** can be reused as a foundation for the **Water Budget**.

Name	Plant Water Use Types	Plant Factor (PF)	Landscape Area (LA) (sq ft)	Hydrozone Area (HA) (sq ft)	Special Landscape Area (SLA) (sq ft)	PF x HA (sq ft)
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Reference Envirotranspiration	
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Maximum Applied Water Allowance						
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ETo	CF	IE	PF x HA	SLA	ETWU (gallons)	
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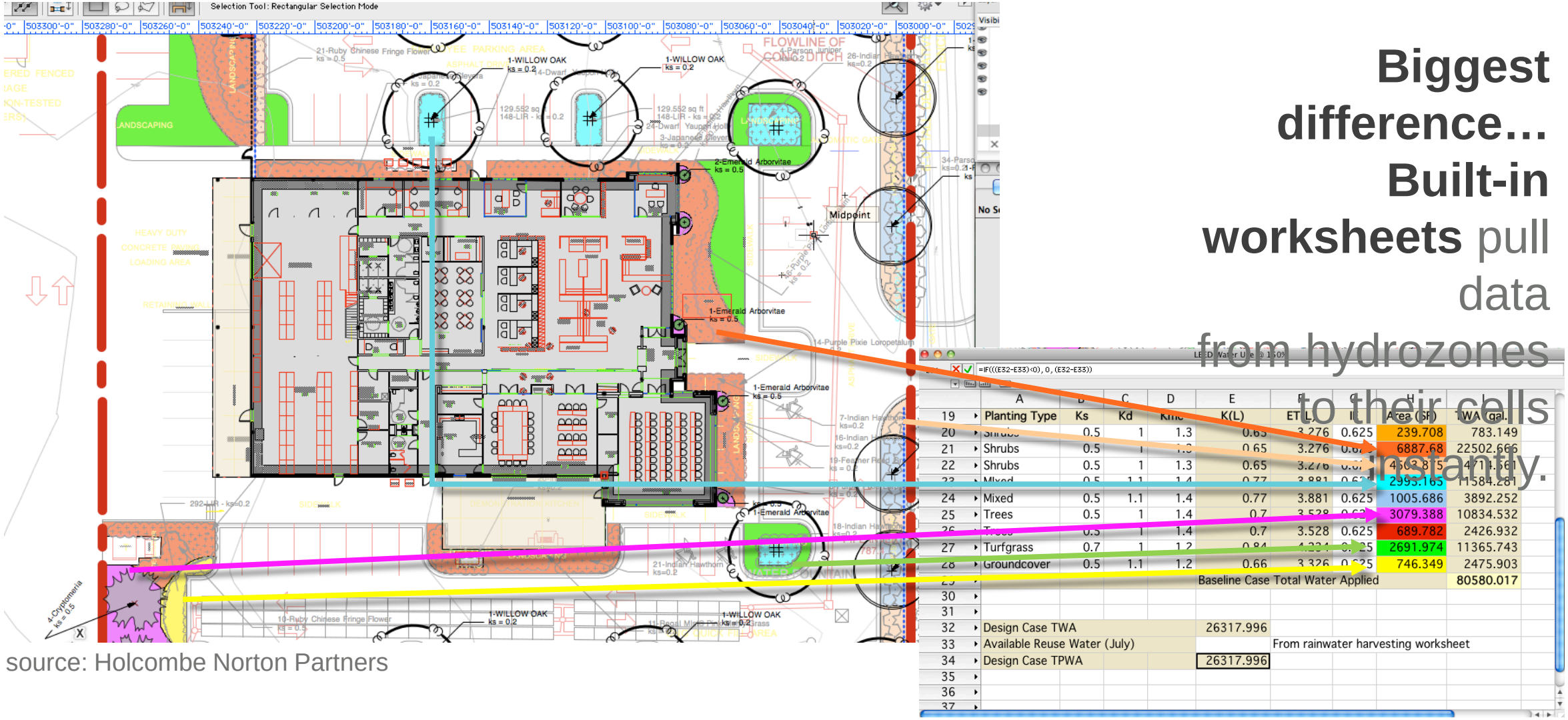
PERFORMING WATER BUDGET CALCULATIONS

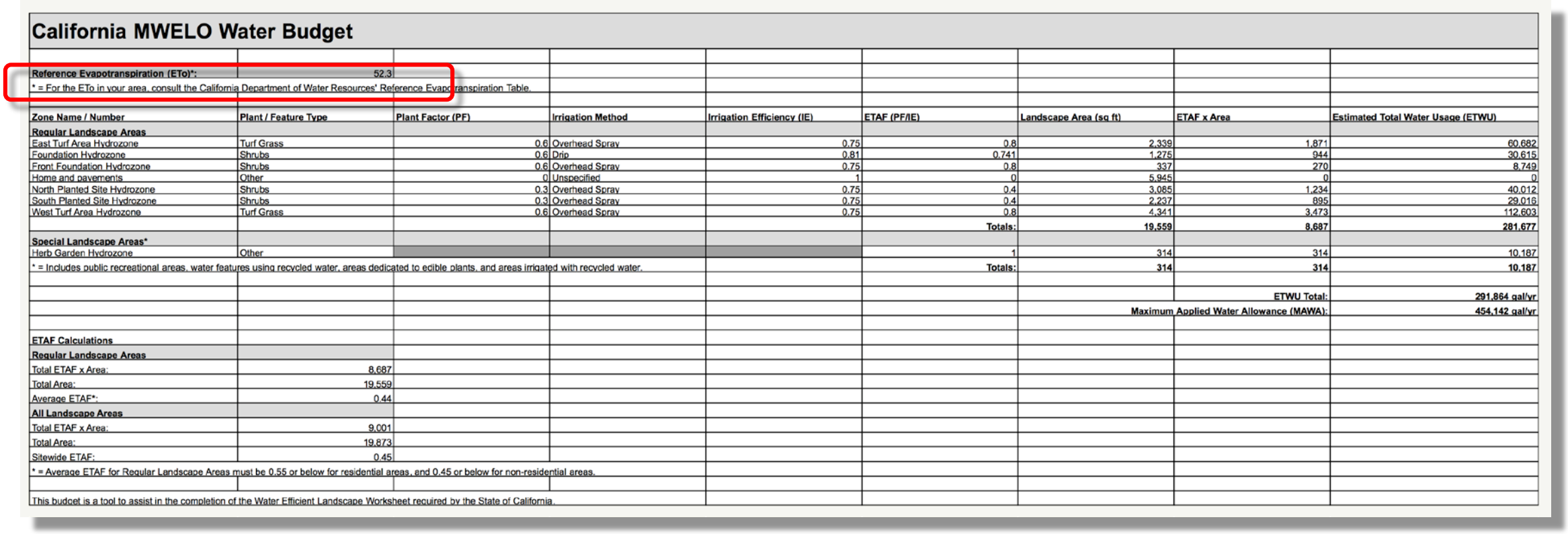


	A	B	C	D	E	F	G	H	I
19	Planting Type	Ks	Kd	Kmc	K(L)	ET L		Area (SF)	TWA (gal.
20		0.5	1	1.3	0.65	3.276	0.625	239.708	783.149
21	Shrubs	0.5	1	1.3	0.65	3.276	0.625	6887.68	22502.666
22	Shrubs	0.5	1	1.3	0.65	3.276	0.625	2993.165	9778.375
23	Mixed	0.5	1.1	1.4	0.77	3.881	0.625	2993.165	11584.281
24	Mixed	0.5	1.1	1.4	0.77	3.881	0.625	1005.686	3892.252
25	Trees	0.5	1	1.4	0.7	3.528	0.625	3079.388	10834.532
26	Trees	0.5	1	1.4	0.7	3.528	0.625	689.782	2426.932
27	Turfgrass	0.7	1	1.2	0.84	4.234	0.625	2691.974	11365.743
28	Groundcover	0.5	1.1	1.2	0.66	3.326	0.625	746.349	2475.903
29					Baseline Case Total Water Applied				80580.017
30									
31									
32	Design Case TWA				26317.996				
33	Available Reuse Water (July)					From rainwater harvesting worksheet			
34	Design Case TPWA				26317.996				
35									
36									
37									

Biggest difference… Built-in worksheets pull data from hydrozones to their cells instantly.

Image source: Holcombe Norton Partners

PERFORMING WATER BUDGET CALCULATIONS



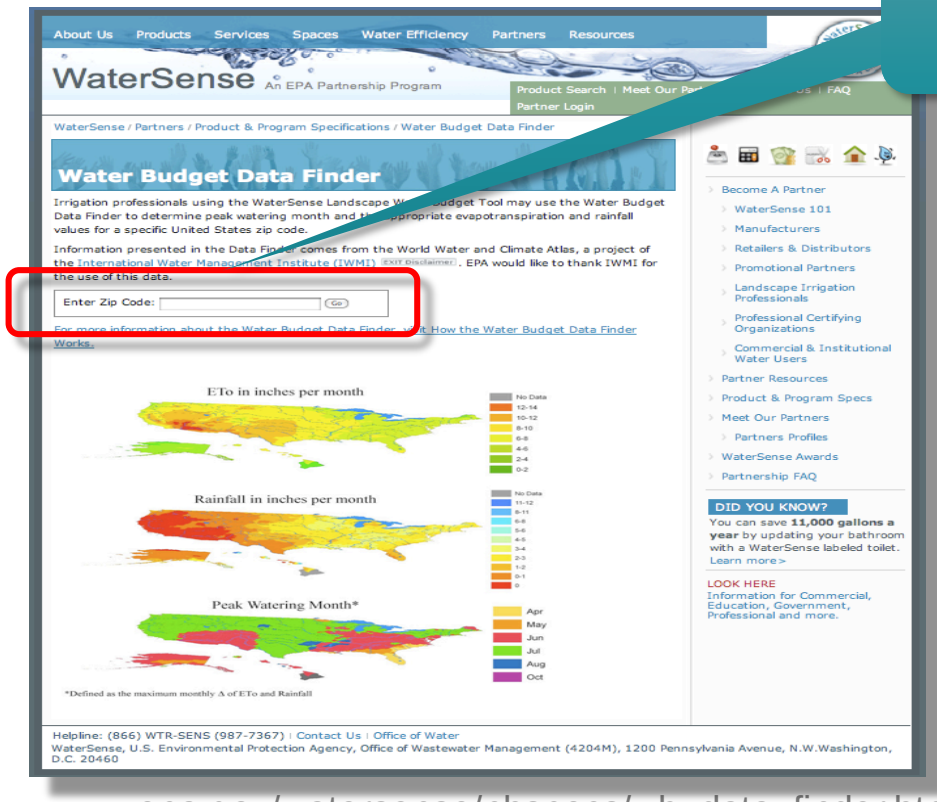
California MWELO Water Budget

Reference Evapotranspiration (ETo)*:	52.3							
* = For the ETo in your area, consult the California Department of Water Resources' Reference Evapotranspiration Table.								
Zone Name / Number	**Plant / Feature Type**	**Plant Factor (PF)**	**Irrigation Method**	**Irrigation Efficiency (IE)**	**ETAF (PF/IE)**	**Landscape Area (sq ft)**	**ETAF x Area**	**Estimated Total Water Usage (ETWU)**
Regular Landscape Areas								
East Turf Area Hydrozone	Turf Grass	0.6	Overhead Spray	0.75	0.8	2,339	1,871	60,682
Foundation Hydrozone	Shrubs	0.6	Drip	0.81	0.741	1,275	944	30,615
Front Foundation Hydrozone	Shrubs	0.6	Overhead Spray	0.75	0.8	337	270	8,749
Home and pavements	Other	0	Unspecified	1	0	5,945	0	0
North Planted Site Hydrozone	Shrubs	0.3	Overhead Spray	0.75	0.4	3,085	1,234	40,012
South Planted Site Hydrozone	Shrubs	0.3	Overhead Spray	0.75	0.4	2,237	895	29,016
West Turf Area Hydrozone	Turf Grass	0.6	Overhead Spray	0.75	0.8	4,341	3,473	112,603
					Totals:	**19,559**	**8,687**	**281,677**
Special Landscape Areas*								
Herb Garden Hydrozone	Other				1	314	314	10,187
* = Includes public recreational areas, water features using recycled water, areas dedicated to edible plants, and areas irrigated with recycled water.					**Totals:**	**314**	**314**	**10,187**
							ETWU Total:	**291,864 gal/yr**
							Maximum Applied Water Allowance (MAWA):	**454,142 gal/yr**
ETAF Calculations								
Regular Landscape Areas								
Total ETAF x Area:	8,687							
Total Area:	19,559							
Average ETAF*:	0.44							
All Landscape Areas								
Total ETAF x Area:	9,001							
Total Area:	19,873							
Sitewide ETAF:	0.45							
* = Average ETAF for Regular Landscape Areas must be 0.55 or below for residential areas, and 0.45 or below for non-residential areas.								
This budget is a tool to assist in the completion of the Water Efficient Landscape Worksheet required by the State of California.								

Worksheets can still accept custom data provided by the designer…
Site-specific factors, such as $\mathbf{ET_o}$ can be incorporated with assigned information from these hydrozones and the other equations to help make the numbers calculate.

PERFORMING WATER BUDGET CALCULATIONS

information about
rainfall
evapotranspiration



www.epa.gov/watersense/nhspecs/wb_data_finder.html

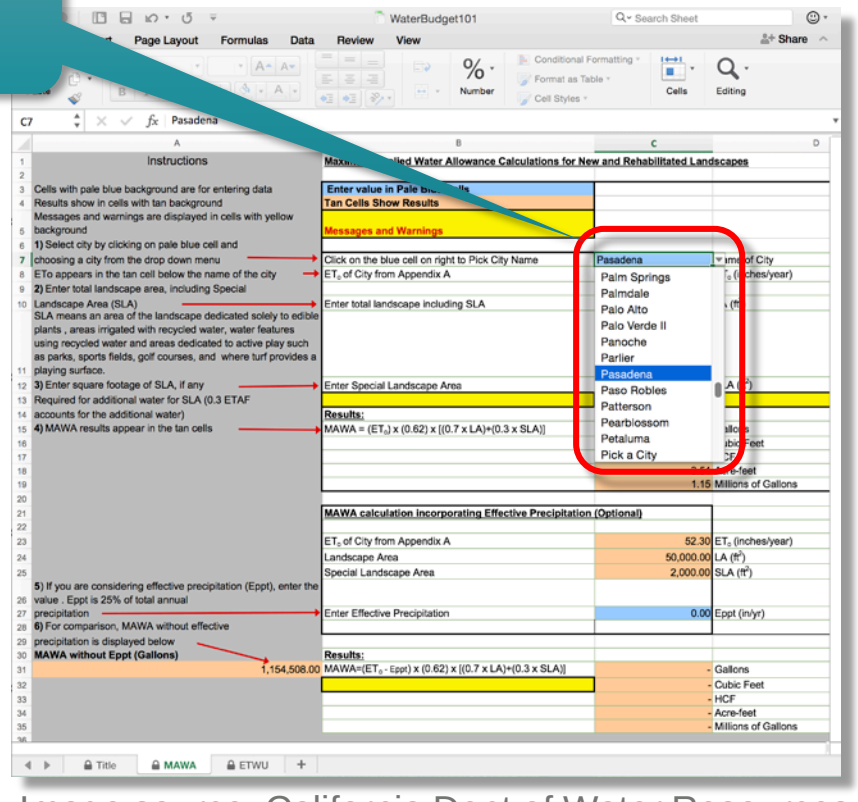


Image source: California Dept of Water Resources

ESTIMATING NON-POTABLE SOURCES

Non-potable Sources (NPS) of water

- can help significantly in reducing the potable water estimated for landscape water use
- valuable in earning LEED and SITES water efficiency credits
- managed differently in MWELO (considered for Special Landscape Areas)

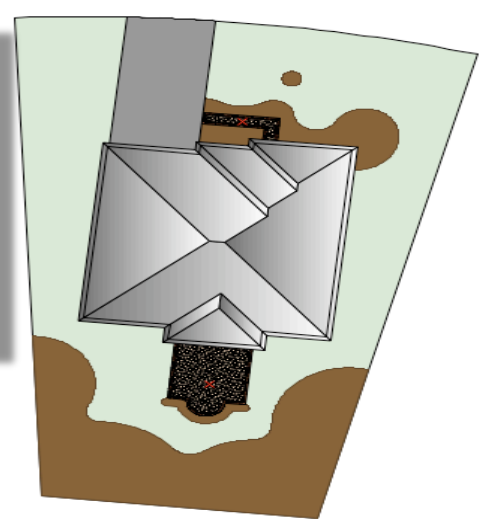
NPS may not be relied on in all Catchment Areas (CA), though…

- salinity and other contaminants
- substantial rainwater may be a

ESTIMATING NON-POTABLE SOURCES

Roof Quantity Report

Slope of Face	Surface Area (SF)	Projected Area (SF)
30	170.06	147.276
30	25.525	22.105
30	142.784	123.654
30	752.552	651.729
30	646.891	560.224
30	48.244	41.781
30	126.442	109.502
30	48.244	41.781
30	685.257	593.45
30	460.489	398.795
30	41.769	36.173



$$\text{Harvested water (gal)} = \text{catchment area (ft}^2\text{)} \times \text{rainfall depth (in.)} \times \text{0.623 conversion factor}$$

Within CAD applications, the data associated with polygonal objects, such as roofs or other catchment features, helps to accurately and quickly calculate potential rainfall collection.

Calculated with regional rainfall amounts and other related data, rainwater catchment and storage systems can be properly sized.

ESTIMATING NON-POTABLE SOURCES

For Holcombe Norton Partners, seeking LEED credits required them to use NPS to go beyond pre-required potable water reductions.

They used a separate worksheet in the same file to generate this volume calculation.

The water budget for LEED and SITES provides for the NPS

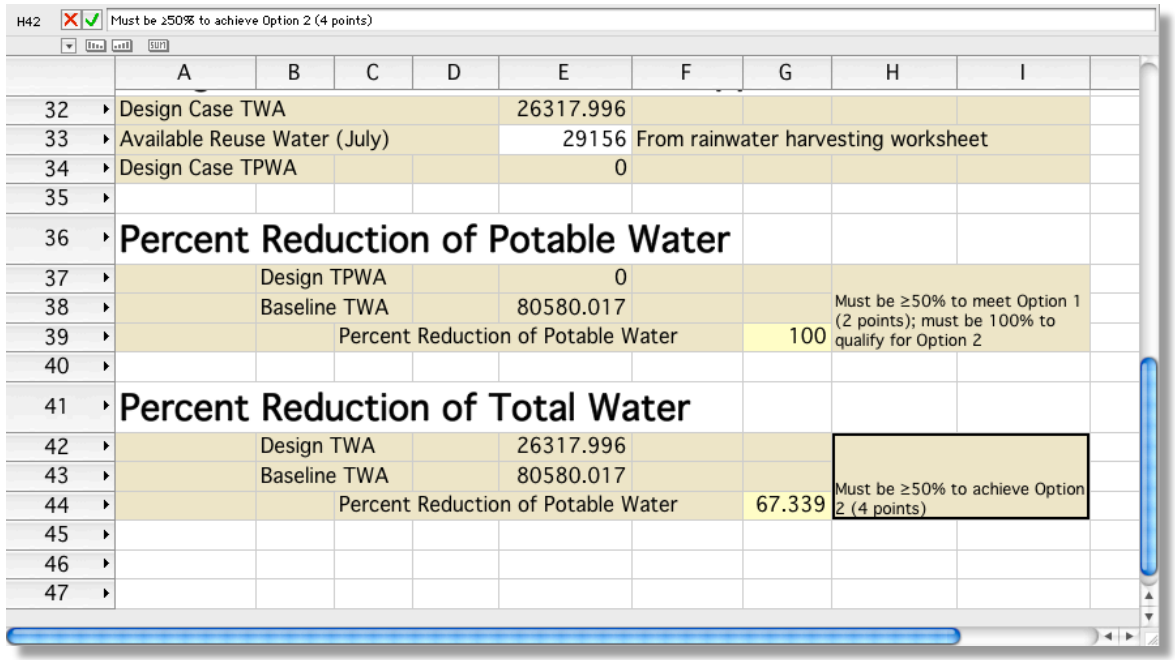


Image source: Holcombe Norton Partners

ESTIMATING NON-POTABLE SOURCES

POC 'D' - PRIVATE IRRIGATION
WATER EFFICIENT LANDSCAPE WORKSHEET

PROJECT NAME: Westview Village
PROJECT TYPE: Residential
PROJECT LOCATION: Ventura, CA
REFERENCE ETo: 43.5
TOTAL IRRIGATED LANDSCAPE AREA: 17,125 sf

Maxium Applied Water Allowance (MAWA)

MAWA = (ETo) (0.62) [(ETAF x LA) + ((1 - ETAF) x SLA)]

MAWA= Maximum Applied Water Allowance
ETo = Reference Evapotranspiration (inches per year)
0.62 = Conversion factor (to gallons per square foot)
ETAF = Evapotranspiration Adjustment Factor = 0.45 for Non-residential Areas
LA = Landscaped Area including SLA (sq ft)
SLA = Portion of Landsape Area identified as Special Landscape Area - see Definitions (square feet)

Applicant to fill in boxes below:

17,125 Irrigated Landscape Area including Special Landscape Area/SLA (square feet)
0 Portion of Landscape Area identified as Special Landscape Area (square feet)

	ETo		ETAF		AREA (sf)		Conversion	MAWA
MAWA for Total LA	43.5	x	0.55	x	17,125	x	0.62	254,019
MAWA for SLA*	43.5	x	0.45	x	0	x	0.62	0
Total MAWA								**254,019** ***(gallons per year)***

Estimated Total Water Use (ETWU)
ETWU = (ETo) (0.62) [(PF x HA) / IE + SLA)]

ETWU = Estimated Total Water Use
ETo = Reference Evapotranspiration (inches per year)
0.62 = Conversion factor (to gallons per square foot)
PF = Plant Factor from WUCOLS (see Table A)
HA = Hydrozone Area (square feet)
IE = Irrigation Efficiency (see Table B)
SLA - Portion of Landsape Area identified as Special Landscape Area - see Definitions (square feet)

ETAF Calculations

Regular Landscape Areas	
B - Total ETAF x Area	*9,128*
A - Total Area	*17,125*
Average ETAF (B / A)	***0.53***
All Landscape Areas	
Total ETAF X Area	*9,128*
Total Area	*17,125*
Sitewide ETAF	*0.53*

Average ETAF meets requirement for this site type.

ETWU arrived from Hydrozone Table below = 246,170 gallons per year **ETWU meets MAWA requirement.**

HYDROZONE TABLE

hydrozone	plant water use	plant factor (PF)	irrigation method	irrigation efficiency (IE)	ETAF (PF/IE)	hydrozone area (HA) (sf)	ETAF X Area	% of landscape area	Hydrozone ETWU
POTABLE WATER IRRIGATED LANDSCAPE AREAS									
6 - Park Edible	mod	0.5	dripline	0.85	0.59	405	238	2%	6,425
					Regular Landscape Area Subtotal	*405*	*238*	*2%*	*6,425*
GREYWATER IRRIGATED LANDSCAPE AREAS									
3 - Park Shrubs	low	0.3	dripline	0.85	0.35	1,423	502	8%	13,542
4 - Park Trees	low	0.2	dripline	0.85	0.24	226	53	1%	1,435
5 - Park Orchard Trees	high	0.7	ECO-mat	0.89	0.79	254	200	1%	5,398
7 - Park Turf	high	0.8	ECO-mat	0.89	0.90	4,878	4,384	28%	118,247
8 - Park No-mow Turf	mod	0.5	ECO-mat	0.89	0.56	1,300	731	8%	19,704
10 - Private Shrubs	low	0.3	dripline	0.85	0.35	8,384	2,959	49%	79,805
12 - Private Trees	low	0.2	dripline	0.85	0.24	254	60	1%	1,615
					Greywater Landscape Area Subtotal	*16,720*	*8,889*	*97%*	*239,745*
SPECIAL LANDSCAPE AREAS (SLA) - GREYWATER IRRIGATION									
					Special Landscape Area Subtotal	*0*	*0*	*0%*	*0*
					Total	**17,125**	**9,128**	**99%**	**246,170**

Table A - PF (Plant Factor)

Cool Season Turf*	0.8	
Warm Season Turf**	0.6	
High Water Using Plants	0.8	can be between 0.7 - 0.9
Moderate Water Using Plants	0.5	can be between 0.4 - 0.6
Low Water Using Plants	0.2	can be between 0.1 - 0.3
Very Low water Using Plants	0.1	below 0.1

** species include tall fescue, ryegrass, bentgrass and kentucky bluegrass*
*** species include bermudagrass, zoysiagrass, st. augustinegrass*

Table B - IE (Irrigation Efficiency)

Overhead Spray	0.75
Drip	0.81
*Dripline	0.85
*ECO-mat	0.89

**note: adjustment can be made based on exact type of equipment, see irrigation legend*

POC 'D' - POTABLE VS. GREYWATER USE

HZ#	HYDROZONE	ESTIMATED WATER USAGE PER MONTH (gallons)												
		JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL
DEMAND - POTABLE SYSTEM STATIONS														
6	Park Edible	325	384	473	561	679	694	812	724	606	502	369	295	6,425
DEMAND - GREYWATER SYSTEM STATIONS														
3	Park Shrubs	685	809	996	1,183	1,432	1,463	1,712	1,525	1,276	1,058	778	623	13,542
4	Park Trees	73	86	106	125	152	155	181	162	135	112	82	66	1,435
5	Park Orchard Trees	273	323	397	472	571	583	682	608	509	422	310	248	5,398
7	Park Turf	5,960	7,068	8,699	10,330	12,504	12,776	14,951	13,320	11,145	9,242	6,796	5,437	118,247
8	Park No-mow Turf	997	1,178	1,449	1,721	2,084	2,129	2,491	2,219	1,857	1,540	1,132	906	19,704
10	Private Shrubs	4,036	4,770	5,871	6,971	8,439	8,623	10,090	8,989	7,522	6,238	4,586	3,669	79,805
12	Private Trees	82	97	119	141	171	174	204	182	152	126	93	74	1,615
SUPPLY - GREYWATER LAUNDRY COLLECTION*														
96	Block D Occupants	29,760	27,120	29,760	28,800	29,760	28,800	29,760	29,760	28,800	29,760	28,800	29,760	
SURPLUS														
	Greywater Surplus	17,635	12,790	12,124	7,857	4,408	2,897	-553	2,754	6,203	11,021	15,022	18,737	
	Potable Water Backup	0	0	0	0	0	0	553	0	0	0	0	0	
ESTIMATED WATER USE														
	TOTAL POTABLE USE	325	384	473	561	679	694	1,365	724	606	502	369	295	**6,978**
	% OF TOTAL USE	*3%*	*3%*	*3%*	*3%*	*3%*	*3%*	*4%*	*3%*	*3%*	*3%*	*3%*	*3%*	***3%***
	TOTAL GREYWATER USE	12,125	14,330	17,636	20,943	25,352	25,903	29,760	27,006	22,597	18,739	13,778	11,023	**239,192**
	% OF TOTAL USE	*97%*	*97%*	*97%*	*97%*	*97%*	*97%*	*96%*	*97%*	*97%*	*97%*	*97%*	*97%*	***97%***

*Assumed a daily wastewater generation rate of 50 gallons per day per person, based on typical text book generation rates (Metcalf and Eddy, 2014). The daily per capita generation rate of greywater that is only collected from washing machines would be approximately 20% of total wastewater generation (AWWA, 1999; EMBUD, 2010; DeOreo, 2011), or approximately 10 gallons per person per day.

For Pacific Coast Land Design used built-in worksheets for the MWELO, and the potential non-potable water (greywater), which was used to recognize the potential reduction of potable water use in the landscape.

Calculations identified only 3-4% water used would be from a potable source.

Images source: Pacific Coast Land Design

MANAGING PLANT WATER NEEDS DATA

In a water budget, this need for water is considered its **Plant Factor (PF)**…aka:

- **Landscape Coefficient (K_l or K_S)**
- water requirement
- water needs factor

In general terms, water needs are represented as **Low**, **Medium** and **High**…

MANAGING PLANT WATER NEEDS DATA

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*

Table 2. Plant Type or Landscape Feature and Associated Landscape Coefficient

Plant Type or Landscape Feature	K_L Water Requirements		
	Low	Medium	High
Trees	0.2	0.5	0.9
Shrubs	0.2	0.5	0.7
Groundcover	0.2	0.5	0.7
Turfgrass	0.6	0.7	0.8
Pool, Spa, or Water Feature	0.8		
Permeable Hardscape	0		
Nonvegetated Softscape	0		

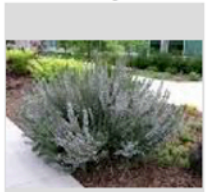
Source: Based on LEED for Homes Rating System 2008.

…while in water budgets, the **Plant Factor/Landscape Coefficient** is the factor assigned to plants **(or other landscape objects)** to recognize its typical need for water.

MANAGING PLANT WATER NEEDS DATA

Vectorworks® Landmark **Plant Database**

IMAGES
Plant Form Image



Detail Image

Misc. Image

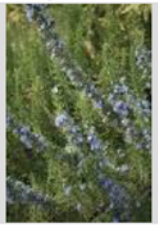


Image Credits
Proven Winners

NAMING

Latin	Rosmarinus officinalis 'Barbeque'
Common	Barbeque Rosemary
Category	Shrubs
	☐ Mark as favorite item
Variety	
User Notes	
Used in Project	

GENERAL INFORMATION

Growth Habit	Narrow
Persistence	Evergreen
Height	3 - 5 ft
Spread	24 - 36 ft
Price	
Size Notes	Moderate growing 4 to 6 ft. tall, 2 to 3 ft. wide.
Native Region	
Native Notes	

HARDINESS/CLIMATE ZONE
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6
☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11
Value: 4-24, 26-32

LEAVES

Characteristic	
Color	Green
Autumn Color	

USES
☐ Border ☐ Low Maintenance
☐ Container ☐ Rock Garden
☐ Decorative Bark ☐ Screening
☐ Decorat. Fruit/Seeds ☐ Shade Garden
☐ Erosion Control ☐ Specimen
☐ Ground Cover ☐ Street Tree
☐ Hedge ☐ Wildlife Habitat
Other Edible

FLOWER
Season: ☐ Year Round ☐ Spring ☐ Autumn ☒ Summer ☐ Winter
Season Notes: Blue flowers in summer
Characteristic:
Color: Purple

TOLERANCE
☐ Deer ☐ Moist Location
☒ Drought ☐ Pollution
☐ Heat ☐ Rabbits
☐ Humidity ☐ Salt
Other

FRUIT
Color
Type

SOIL
Type
pH

LIGHT RANGE
☐ Shade ☐ Sun/Part Shade
☐ Shade/Part Sun ☒ Sun

WATER NEEDS
☐ Arid ☐ Moist
☐ Dry ☐ Wet
☐ Normal
Value: .2

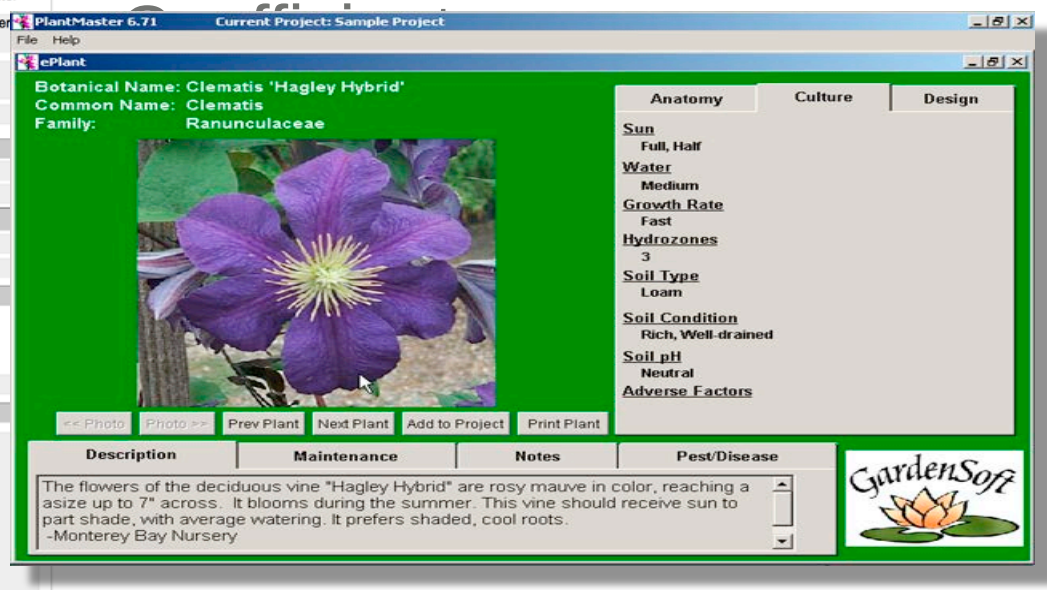
COMMENTS 1
Foliage of this selection has especially good flavor and aroma for cooking. Quickly forms an upright hedge of aromatic needle-like foliage. Profuse, clear blue flowers add to the effect. Takes to pruning well, perfect for screens. Evergreen.

COMMENTS 2
Follow a regular watering schedule during the first growing season to establish a deep, extensive root system. Feed with a general purpose fertilizer before new growth begins in spring. For a tidy, neat appearance, shear annually to shape.

COMMENTS 3
Tree & Shrub Food

Data Source: Proven Winners

PROVEN WINNERS®
The #1 Plant Brand®



PLANT DATABASES

Built-in or Stand-alone… designers should seek to make use of the fields that report an individual plant's water needs as this is becomes its Plant Factor/Landscape

Source: www.gardensoft.com

MANAGING PLANT WATER NEEDS DATA

Finding data that is **regionally relevant** will be crucial…

Alabama's extension service is a great resource to aid in properly choosing plants based on their tolerances.

Table 3. Noncanopy Trees

Scientific name	Common name	Native*
	Deciduous	
Acer buergerianum	trident maple	n
Acer truncatum	Shantung maple	n
Amelanchier spp. and cultivars	juneberry	y
Asimina triloba	pawpaw	y
Cercis canadensis	eastern redbud	y
Chilopsis linearis	desert willow	y
Clethra pringlei	Mexican sweetspire	n
Cotinus coggygria	common smoketree	n
Cotinus obovatus	American smoketree	y
Crataegus crus-galli	cockspur hawthorn	y
Crataegus marshallii	parsley hawthorn	y
Crataegus mollis	downy hawthorn	y
Cydonia oblonga	fruiting quince	n
Erythrina ×bidwillii	hybrid fireman's cap	n
Ilex verticillata	winterberry	y
Koelreuteria paniculata	goldenraintree	n
Lagerstroemia fauriei	Japanese crapemyrtle	n
Lagerstroemia indica	crapemyrtle	n
Magnolia ×soulangeana	saucer magnolia	n
Nyssa sylvatica	black gum	n
Oxydendrum arboreum	sourwood	y
Prunus americana	American plum	y
Prunus angustifolia	Chickasaw plum	y
Prunus 'Okame'	Okame cherry	n

ALABAMA COOPERATIVE Extension SYSTEM

ALABAMA A&M AND AUBURN UNIVERSITIES

Drought-Tolerant Landscapes for Alabama

ANR-1336

Some plants perform well with only occasional irrigation.

Introduction

A well-designed and managed landscape can reduce the amount of water needed for home landscape irrigation. This conservation of water becomes increasingly important as municipal governments impose broad watering bans in response to drought situations that create water shortages and strained water supplies. Overhead landscape irrigation is usually the target of these water conservation policies because it ed as noncritical consumption. oughtfully planned, attractive pes are important because ovide environmental benefits d value and beauty to homes. vironmental benefits include g soil erosion and storm water providing wildlife habitats, g carbon dioxide and pollut- m the atmosphere while oxygen, and keeping homes in the summer and protecting om cold winds in the winter. meowners can ensure a able landscape by planning er conservation, choosing riate plants, improving the tablishing plants properly, g, fertilizing correctly, and g efficiently.

Planning for Efficient Use of Water

It is important to plan a design for the landscape. The types of plants used and their location, the condition of the soil, and other factors all affect how much water must be used to maintain the landscape.

Hydrozoning is locating plants according to a landscape's differing levels of shading, soil evaporation rates, and exposure to ambient weather conditions. Early in the design process, divide the landscape into low-, moderate-, and high-water-use areas, or hydrozones. Walk around the landscape and identify places where the soil stays moist longer and separate them from the areas fully exposed to the sun where the soil tends to dry quickly.

Low-water-use hydrozones should comprise as much of the landscape as possible when water conservation is desired. Generally, low-water-use hydrozones are located away from the most traveled areas of the landscape, but this is not a requirement. Moderate-water-use hydrozones should include established plants that only require

www.aces.edu

Drought-Tolerant Landscapes for Alabama | Alabama Cooperative Extension System

MANAGING PLANT WATER NEEDS DATA

Region 1
North-Central Coastal (California Climate Zones 14, 15, 16, and 17) (CIMIS ET_o Zones 1, 2, 3, 4, 6 and 8)[2]

Region 2
Central Valley (California Climate Zones 8, 9 and 14), (CIMIS ET_o Zones 12, 14, 15, and 16)

Region 3
South Coastal (California Climate Zones 22, 23 and 24), (CIMIS ET_o Zones 1, 2, 4 and 6)

Region 4
South Inland Valleys and Foothills (California Climate Zones 18, 19, 20 and 21), (CIMIS ET_o Zone 9)

Region 5
High and Intermediate Desert (California Climate Zone 11), (CIMIS ET_o Zones 14 and 17)

Region 6
Low Desert (California Climate Zone13), (CIMIS ET_o Zone 18)

In California, **regionally relevant** is even more crucial…
WUCOLS has become the go-to publication for plant water needs by region

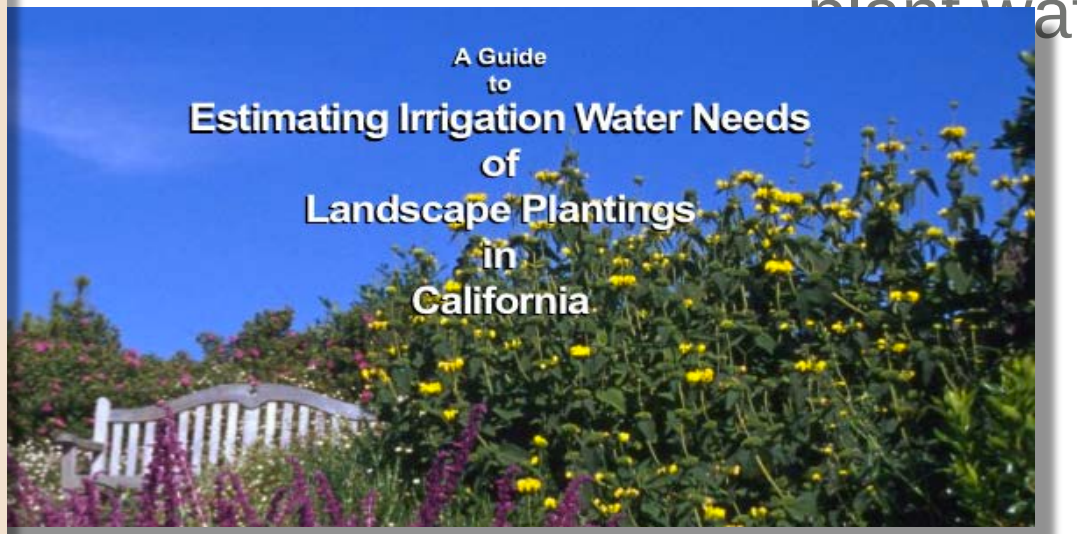
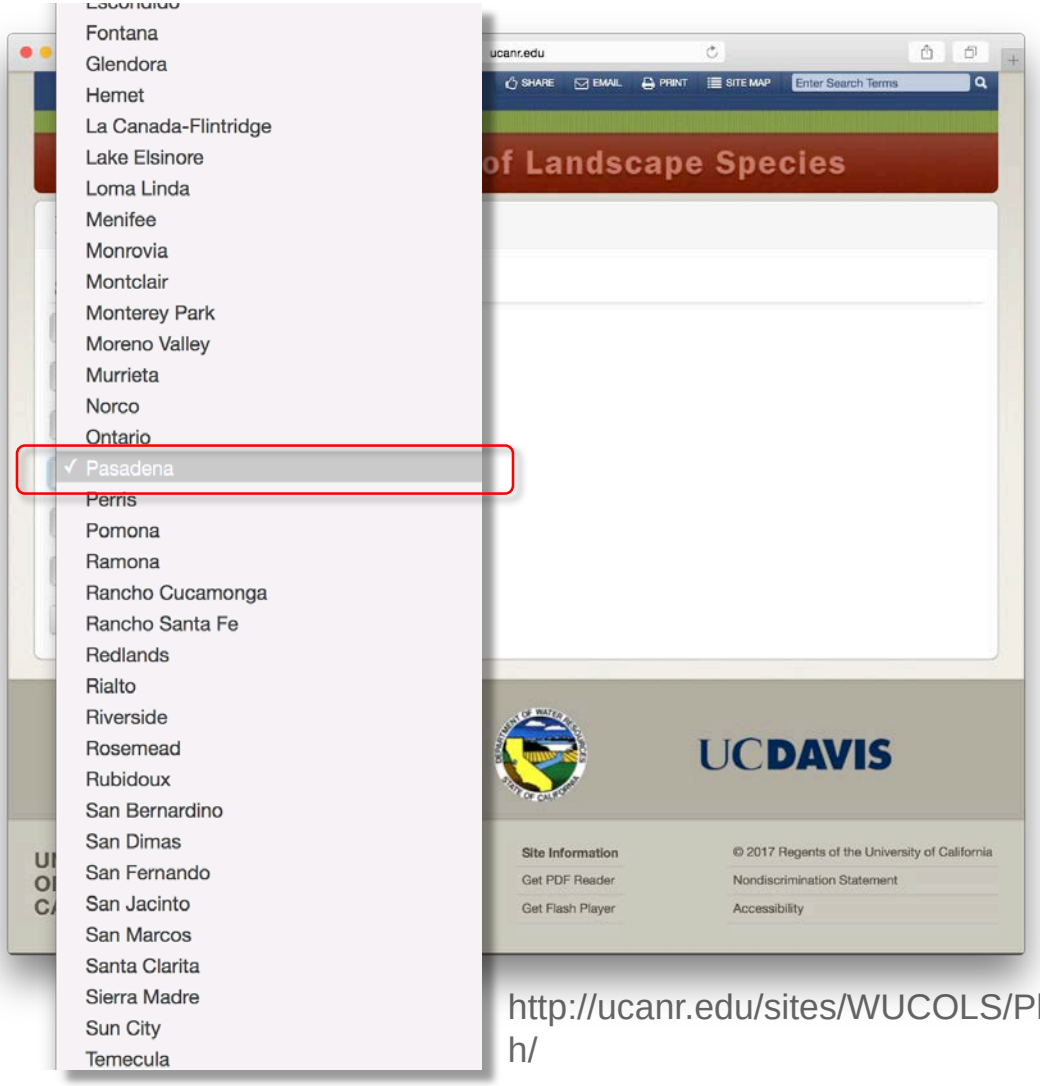


Image source: WUCOLS III

MANAGING PLANT WATER NEEDS DATA

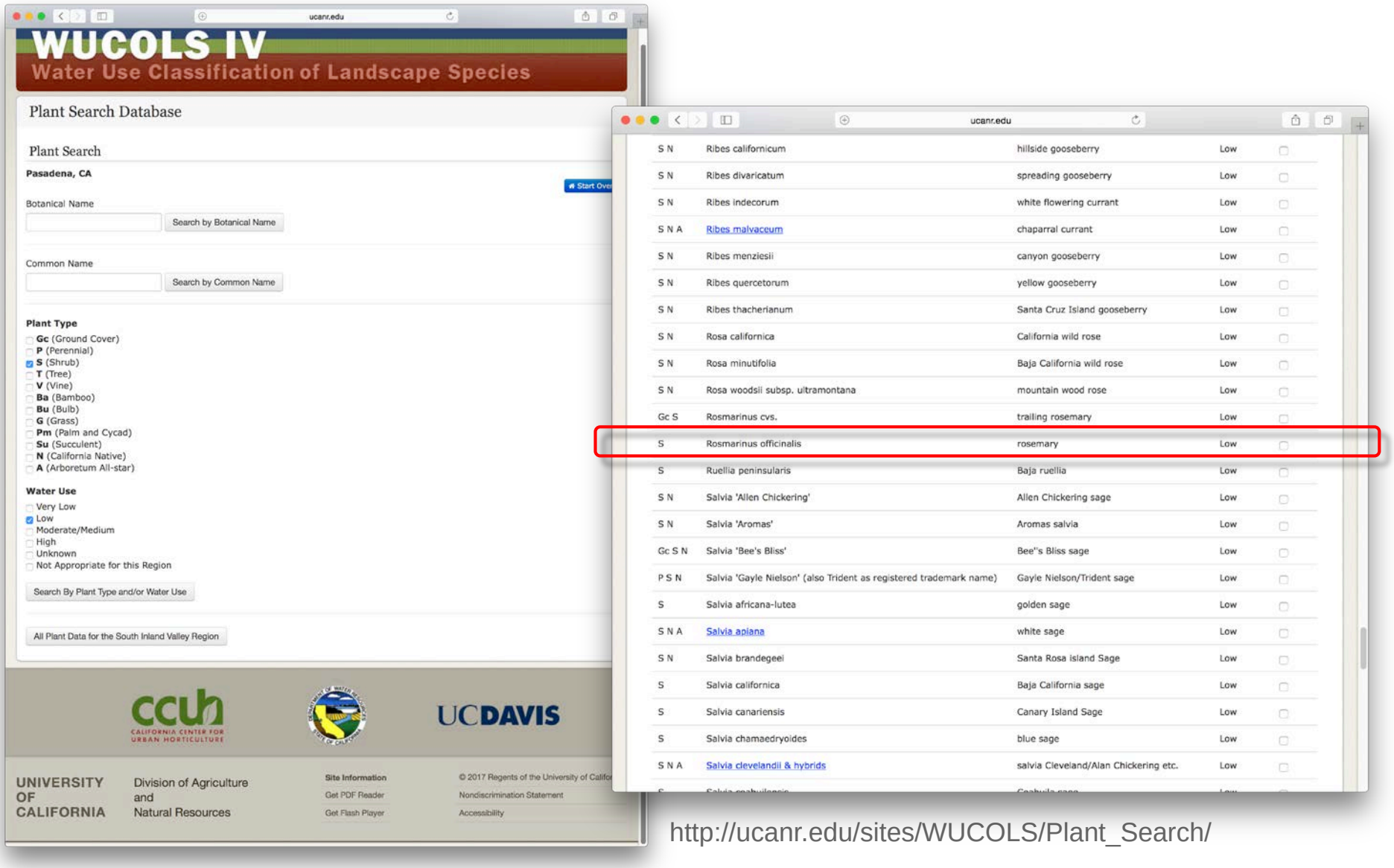
And…if you thought WUCOLS I, II and III was great…

Check out the online **WUCOLS IV** searchable database to gain quicker knowledge of the plant water needs for the region in which your design project is located.



http://ucanr.edu/sites/WUCOLS/Plant_Search/

MANAGING PLANT WATER NEEDS DATA



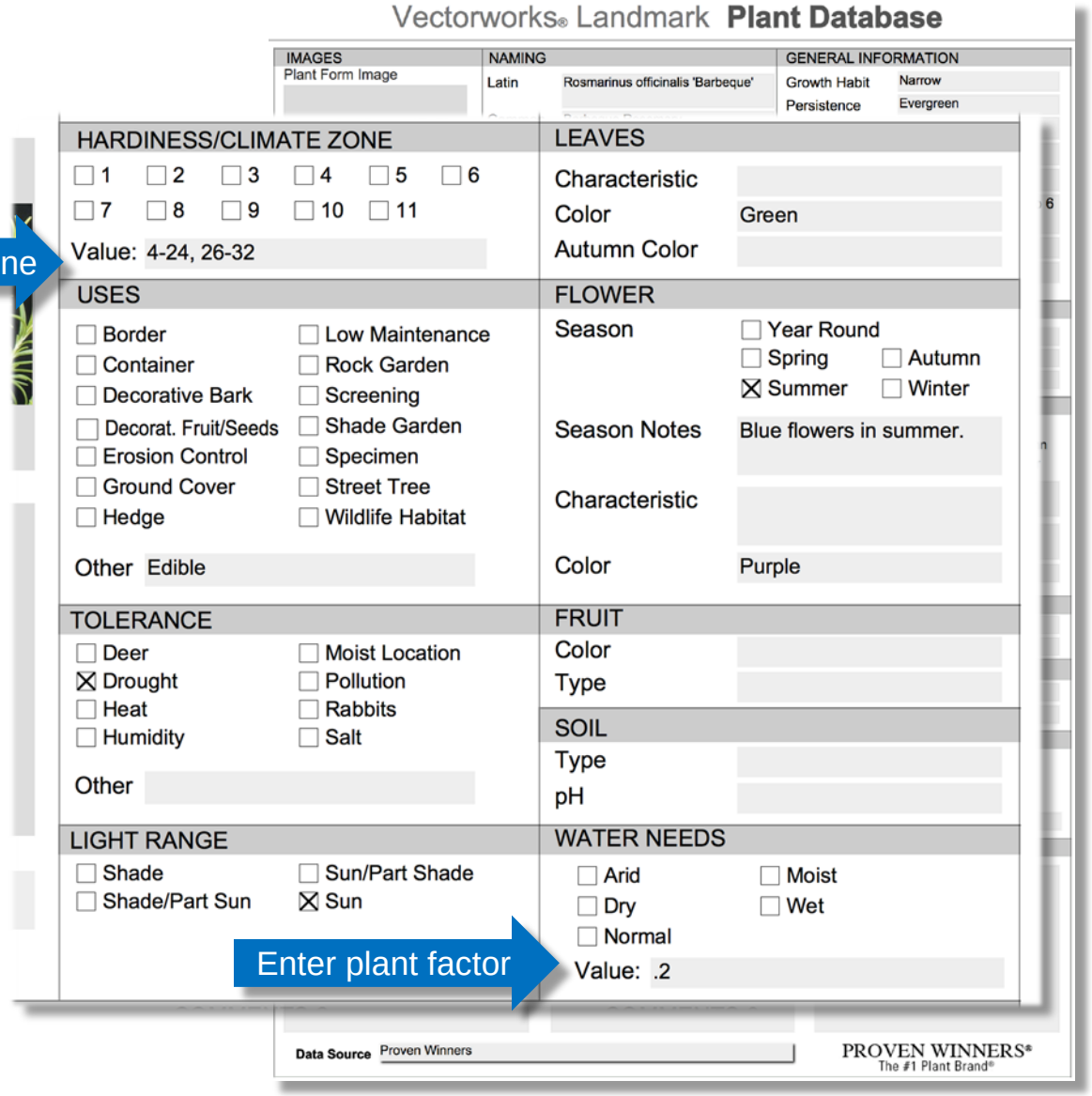
http://ucanr.edu/sites/WUCOLS/Plant_Search/

Technology like this can really speed up the process of getting plant water needs for the plants you did not already have experiences with.

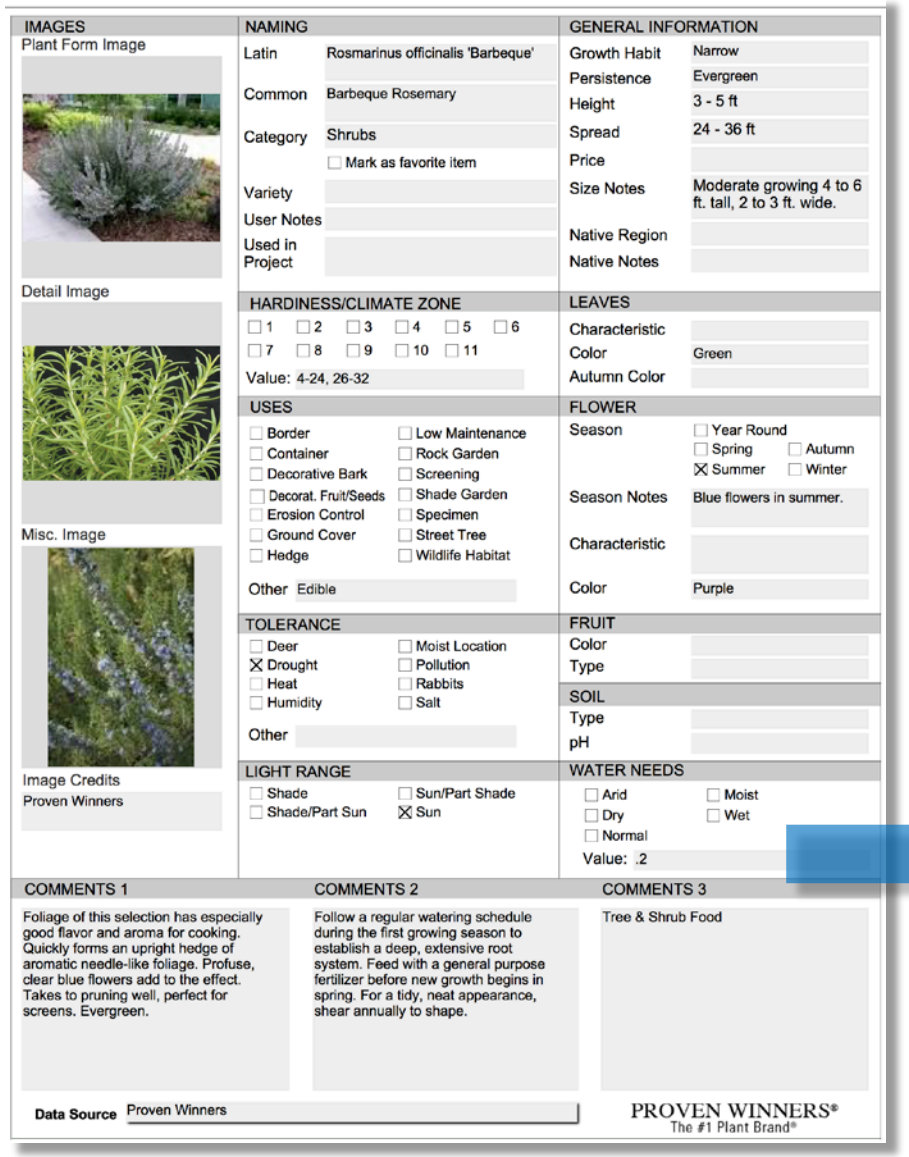
MANAGING PLANT WATER NEEDS DATA

Getting this data in the searchable plant database is next…

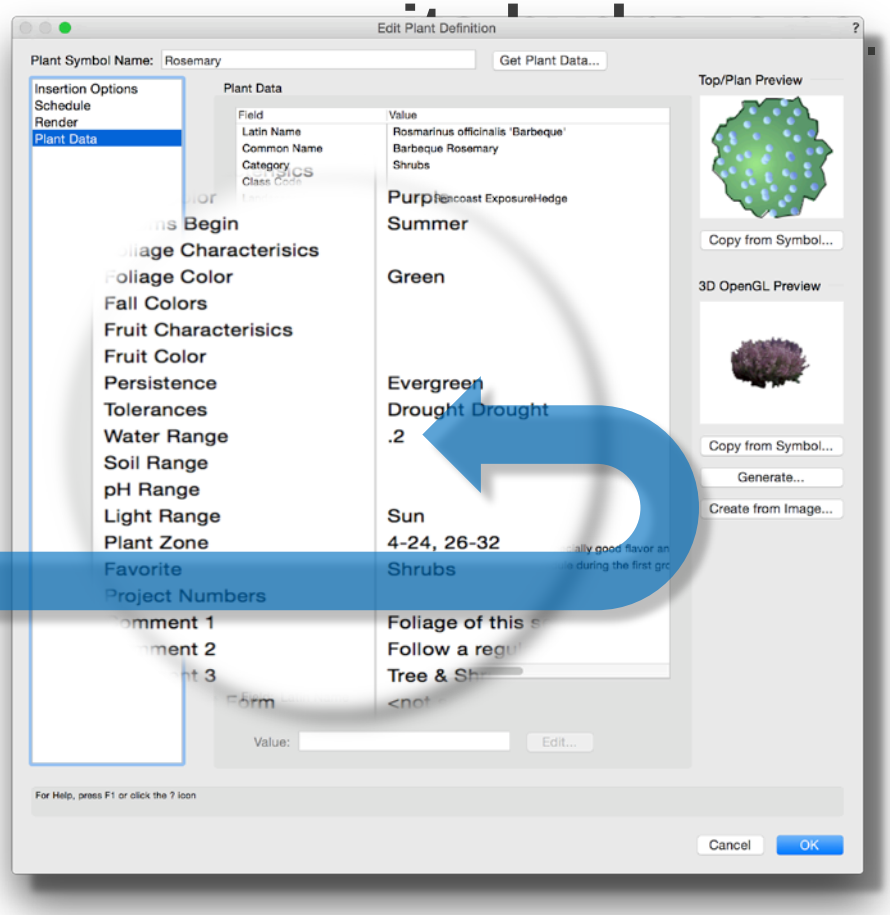
In order to sort for the plants with desired **water needs/climate zones**, the values will need to be entered in searchable fields.



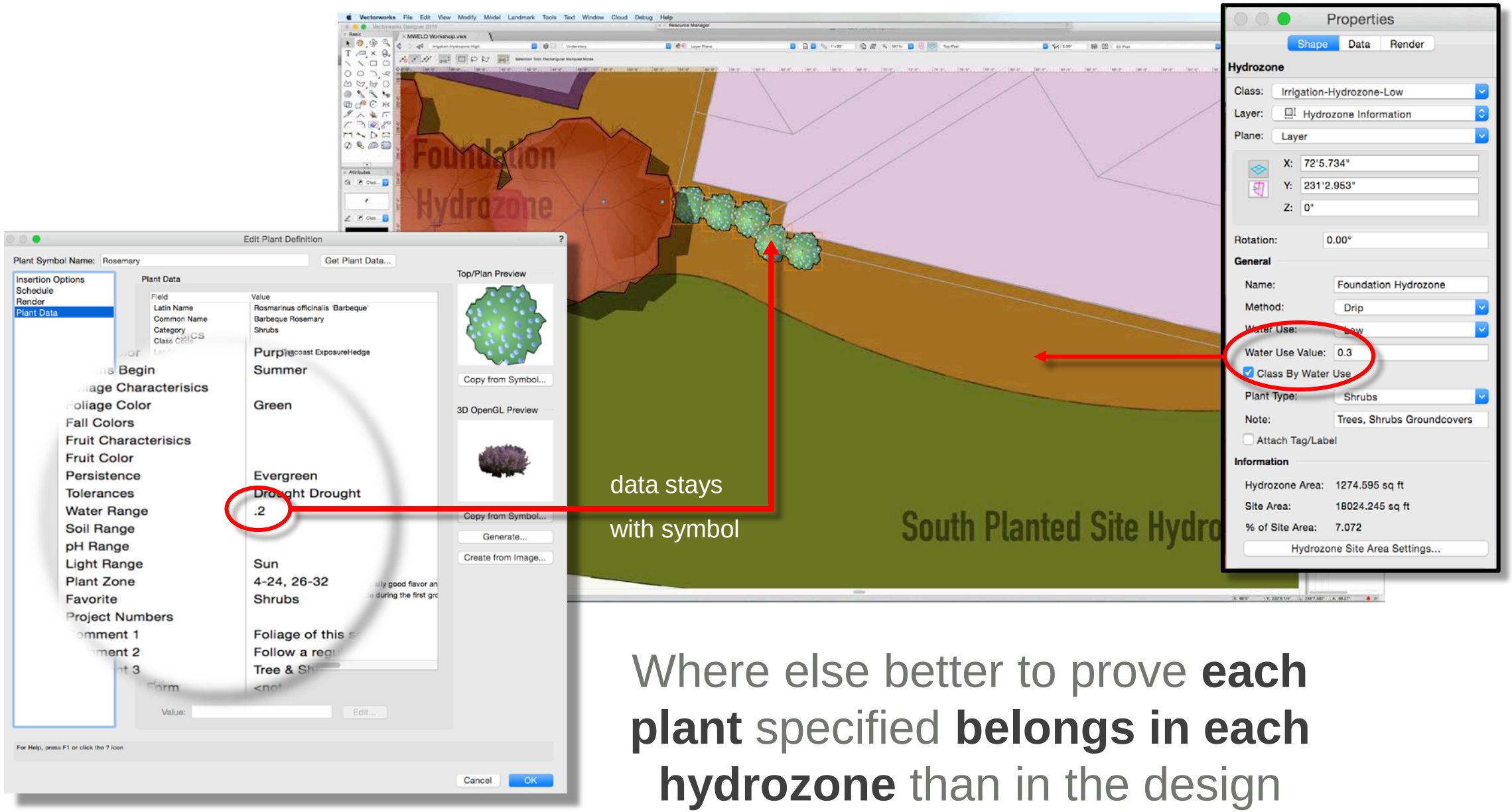
MANAGING PLANT WATER NEEDS DATA



The ultimate goal is to get the **water needs data** to a place where **each plant** specified can prove **it belongs in**



MANAGING PLANT WATER NEEDS DATA



Where else better to prove **each plant** specified **belongs in each hydrozone** than in the design itself?

WATER EFFICIENT LANDSCAPE DESIGN REVIEW

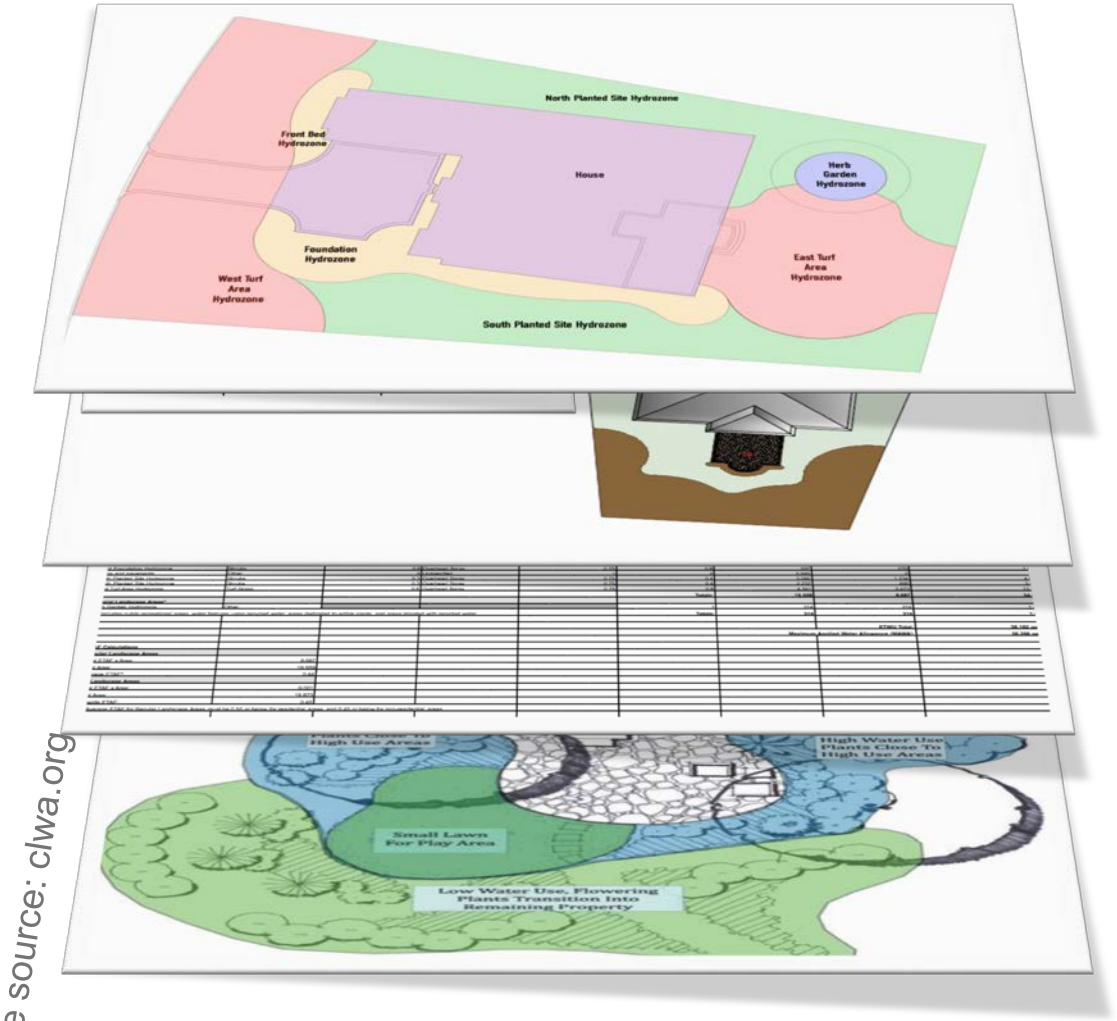


Image source: clwa.org

- Charting hydrozones for proposed irrigation
- Estimating for non-potable uses
- Performing water budget calculations
- Choosing best plant based on plant factor

This specific order is not required…

- planting plan first?
- non-potable determined first?

WATER EFFICIENT LANDSCAPE DESIGN REVIEW

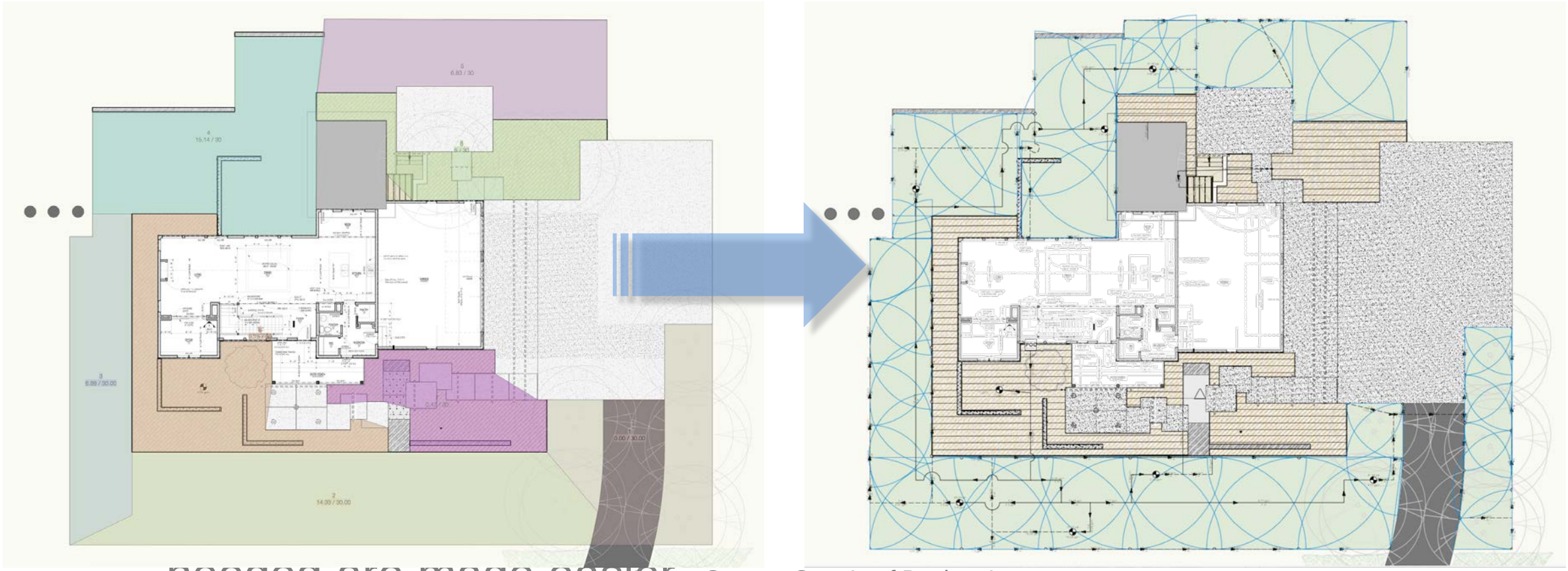


Image Source: Grey Leaf Design, Inc.

needed are made easier.

The hydrozone plan can be the same zoned plan that **continues on in the irrigation layout phase**, whether the irrigation design is performed by you, or another professional.

QUESTIONS

OTHER SOURCES:

Evapotranspiration Data:
www.iwmi.cgiar.org/WAtlas/Default.aspx

MWELO Excel File:
www.water.ca.gov/wateruseefficiency/docs/WaterBudget101.xls

California Landscape Coefficients:
http://ucanr.edu/sites/WUCOLS/Plant_Search/

Precipitation Data:
www.epa.gov/watersense/nhspecs/wb_data_finder.html

EPA WaterSense Water Budget Excel File:
https://www.epa.gov/watersense/water-budget-tool

THANK YOU!

ERIC GILBEY, PLA , ASLA, PROF MEMBER APLD