PANEL 2A – EMERGENCY REGULATIONS AND THE DROUGHT

MODERATOR: EUNICE ULLOA – GENERAL MANAGER, CHINO BASIN WATER CONSERVATION DISTRICT

- RICHARD KRUMWIEDE - PRESIDENT, ARCHITERRA DESIGN GROUP
- JANET HARTIN - ENVIRONMENTAL HORTICULTURIST, UC COOPERATIVE EXTENSION
- COUNCILMEMBER WILLIAM RUH, CITY OF MONTCLAIR AND CHAIR, SANTA ANA REGIONAL WATER QUALITY BOARD

ARCHITERRA
DESIGN GROUP

Department of Water Resources
Model Water Efficient Landscape Ordinance

In 2010, The State Of California Implemented **AB-1881** in its Continuing Effort to Conserve Water in our Drought Prone State. In 2015, Unprecedented Drought has Forced the State to Make the Ordinance more Severe.

Projects Subject to the Ordinance

- New Development with 500 sq.ft. of Landscape Area
- Residential, Commercial, Industrial & Institutional Projects that Require Permit, Plan Check or Design Review
- Rehab of Existing Landscapes Remains at 2,500 sq.ft.

Deadlines for Projects Subject to Ordinance

- Local Agencies have until 12/1/15 to comply
- Multi-agency regional groups have until 12/1/16
- Reporting requirements for all on 12/1/15

More Efficient Irrigation Systems

- Dedicated Water Meters or Sub-Meters Required for Residential Landscapes +5000 Sq.Ft. & Non-Residential Landscapes +1000 Sq.Ft.
- Pressure Regulators & Master Shut-off Valves Required.
- Emission Devices Must Meet National Standard to Ensure High Efficiency Sprinklers are Installed.
- Flow Sensors That Detect & Report High Flow Conditions due to Breakage Required for Landscape Areas + 5000 Sq.Ft.
- Minimum Width of Areas for Overhead Irrigation Increased to 10’ Wide
- Areas Less Than 10’ Wide Must be Irrigated by Subsurface Drip or Other Technology that Produces No Overspray or Runoff.

Challenges and Opportunities

As Xeriscaping becomes The New Normal, Our Challenge is to Design Both New & Retrofitted Landscapes in ways that are Attractive – Adding Value without Resorting to a “Trailer Park” Vibe.

Current State Of Landscape Design

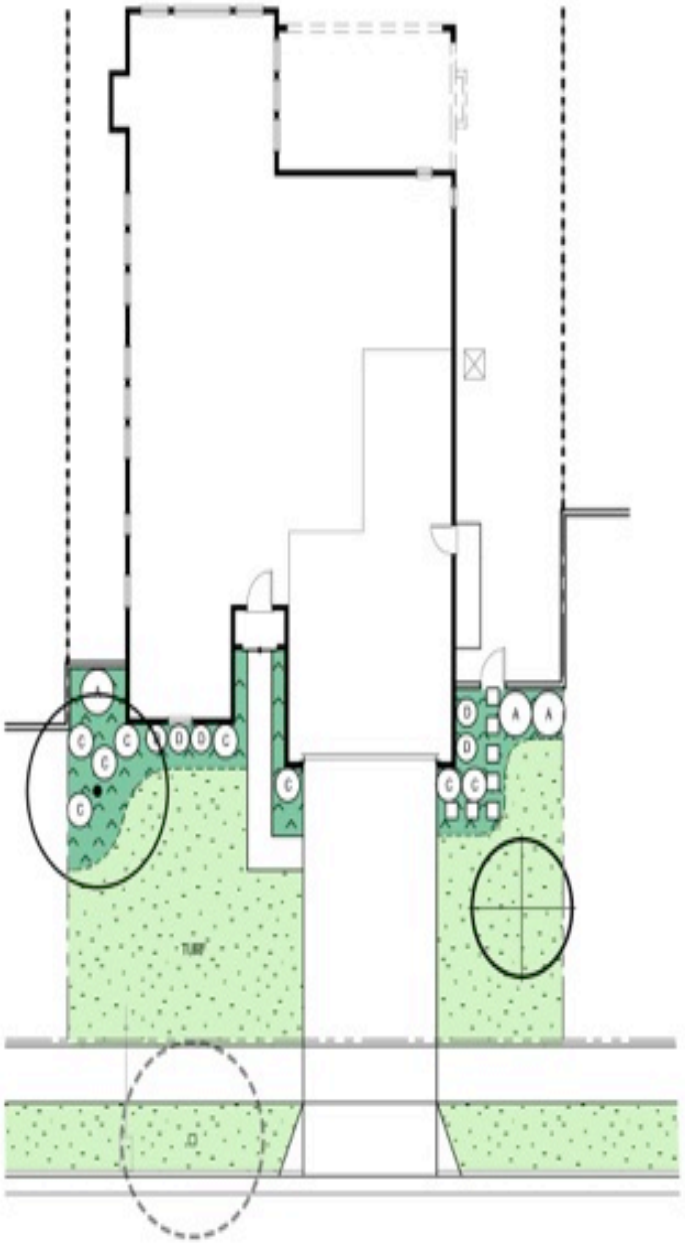
TYPICAL COMMERCIAL CENTER

Current State Of Landscape Design

WHERE WE ARE GOING

A Typical Front Yard Design Pre & Post AB-1881

EVOLUTION OF DROUGHT TOLERANT DESIGN



A PRE 2010

SCALE: 1" = 10'

Landscape Water Use Calculations

Project Information

This is an example of a typical landscape from prior to implementation of Landscape and Water Conservation Guidelines

Project Data

Total square footage of Landscape Area **LA=** 5,704

Hist. ETo for the area **ETo** = 54.6

Maximum Annual Water Allocation (MAWA)

MAWA is calculated using the following formula: (Eto) (.62) [(0.7 x LA) + (0.3 x SLA)]

MAWA = 40,379 gallons / yr

Estimated Applied Water Use (EAWU)

EAWU is calculated using the following formula: (Eto) (.62) [(PF x HA / IE)+ SLA]

Hydrozone 1: Mixed Shrubs Dripline **HZ1**
Plant Factor **PF=** 0.4
square footage of hydrozone **SLA=** 348 (HA=0)
hydrozone irrigation efficiency **IE=** 0.9
HZ1 EAWU = 5,236 gallons / yr

Hydrozone 2: Turf **Spray** **HZ3**
Plant Factor **PF=** 0.8
square footage of hydrozone **SLA=** 1,296 (HA=0)
hydrozone irrigation efficiency **IE=** 0.71
HZ3 EAWU = 49,433 gallons / yr

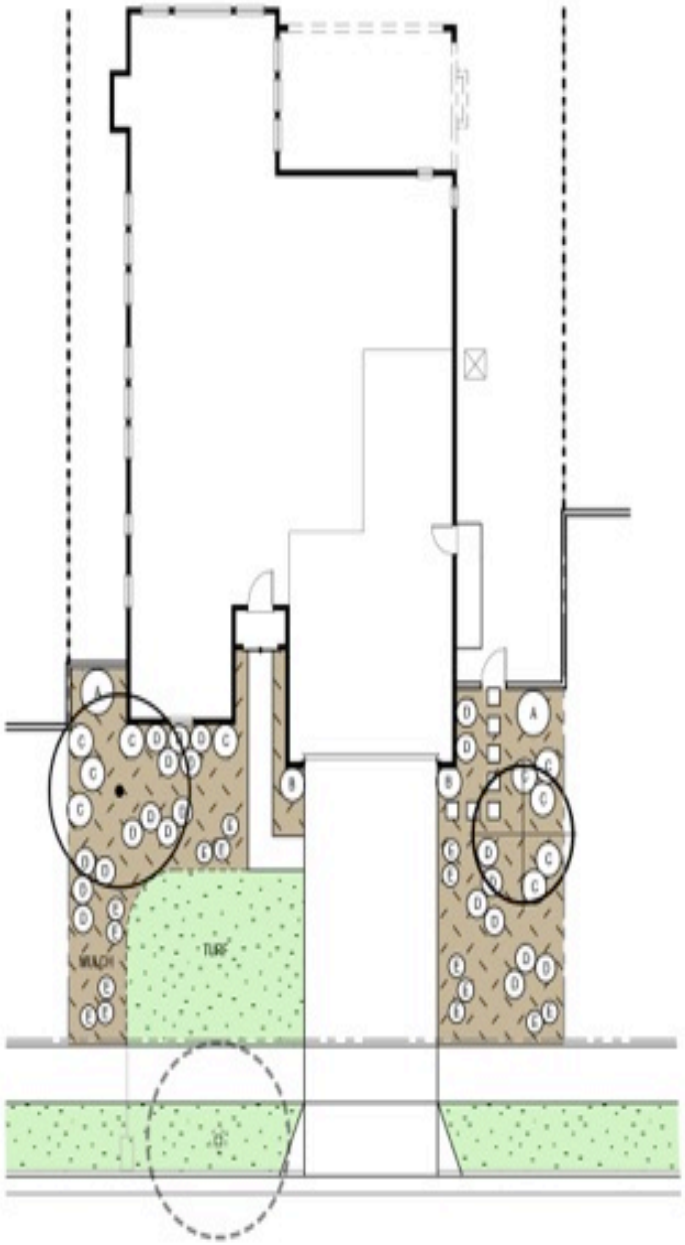
Hydrozone 4: Trees **Rws Bubblers** **HZ4**
Plant Factor **PF=** 0.4
square footage of hydrozone **SLA=** 60 (HA=0)
hydrozone irrigation efficiency **IE=** 0.85
HZ4 EAWU = 956 gallons / yr

Total EAWU = 55,625 gallons / yr

MAWA - EAWU = -15,246 gallons / yr

Pre-AB1881 Total Water Usage: 55,625 gallons / year

- No restrictions on turf
- Overhead sprinklers okay for shrub and turf areas
- Drip irrigation not required



B 2010 - AB1881 COMPLIANT

SCALE: 1" = 10'

Landscape Water Use Calculations

Project Information

The entire landscape area is irrigated with recycled water. In accordance with the City's Chapter 16.07, Landscape and Water Conservation Guidelines, the total square footage of LA is then considered a Special Landscape Area. The following calculations reflect those determinations.

Project Data

Total square footage of Landscape Area (including Special Landscape Area) **LA=** 1,704

Total square footage of Special Landscape Area **SLA=** 0

Hist. ETo for the area **ETo=** 54.6

Maximum Annual Water Allocation (MAWA)

MAWA is calculated using the following formula: (Eto) (.62) [(0.7 x LA) + (0.3 x SLA)]

MAWA = 40,379 gallons / yr

Estimated Applied Water Use (EAWU)

EAWU is calculated using the following formula: (Eto) (.62) [(PF x HA / IE)+ SLA]

Hydrozone 1: Mixed Shrubs	**Dripline**	Plant Factor **PF=**	0.4	
HZ1		square footage of hydrozone **SLA=**	941	(HA=0)
		hydrozone irrigation efficiency **IE=**	0.9	
		HZ1 EAWU =	14,156	gallons / yr
Hydrozone 2: Turf	**Dripline**	Plant Factor **PF=**	0.8	
HZ2		square footage of hydrozone **SLA=**	335	(HA=0)
		hydrozone irrigation efficiency **IE=**	0.9	
		HZ2 EAWU =	10,080	gallons / yr
Hydrozone 3: Turf	**Mprotators**	Plant Factor **PF=**	0.8	
HZ3		square footage of hydrozone **SLA=**	368	(HA=0)
		hydrozone irrigation efficiency **IE=**	0.75	
		HZ3 EAWU =	13,286	gallons / yr
Hydrozone 4: Trees	**Rws Bubblers**			
HZ4		Plant Factor **PF=**	0.4	
		square footage of hydrozone **SLA=**	60	(HA=0)
		hydrozone irrigation efficiency **IE=**	0.85	
		HZ4 EAWU =	956	gallons / yr

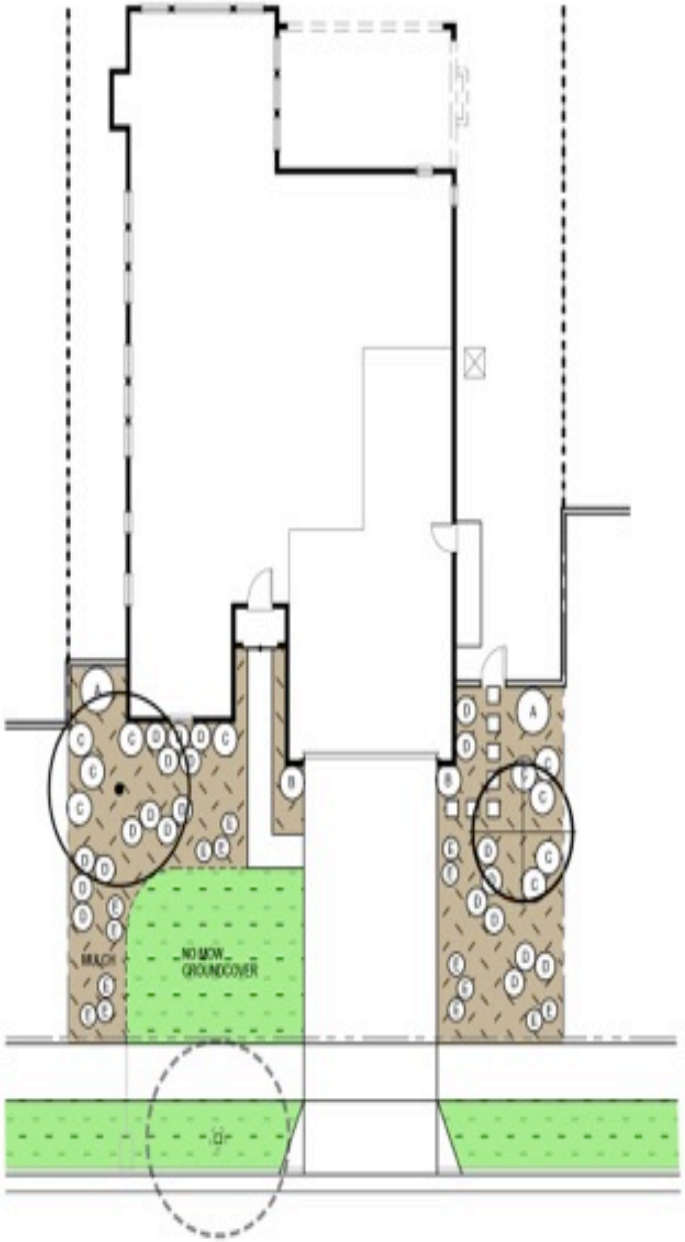
Total EAWU = 38,482 gallons / yr

MAWA - EAWU = 1,897 gallons / yr

AB1881 Total Water Usage: 38,482 gallons / year

Compared to Pre-AB1881: 31% water savings

- 46% Less turf
- Overhead sprinklers in turf areas only
- Drip irrigation in shrub areas
- Drip irrigation in turf that is within 2 feet of pavements



C 2015 - DROUGHT MANDATED REQUIREMENTS

SCALE: 1" = 10' TRADITIONAL STYLE, NO TURF

Landscape Water Use Calculations

Project Information

The entire landscape area is irrigated with recycled water. In accordance with the City's Chapter 16.07, Landscape and Water Conservation Guidelines, the total square footage of LA is then considered a Special Landscape Area. The following calculations reflect those determinations.

Project Data

Total square footage of Landscape Area (including Special Landscape Area) **LA=** 1,704

Total square footage of Special Landscape Area **SLA=** 0

Hist. ETo for the area **ETo=** 56.6

Maximum Annual Water Allocation (MAWA)

MAWA is calculated using the following formula: (Eto) (.62) [(0.5 x LA) + (0.3 x SLA)]

MAWA = 28,842 gallons / yr

Estimated Applied Water Use (EAWU)

EAWU is calculated using the following formula: (Eto) (.62) [(PF x HA / IE)+ SLA]

Hydrozone 1: Mixed Shrubs Dripline — **HZ1**

Plant Factor **PF=** 0.2

square footage of hydrozone **SLA=** 941 (HA=0)

hydrozone irrigation efficiency **IE=** 0.9

HZ1 EAWU = 7,079 gallons / yr

Hydrozone 2: Groundcover Dripline — **HZ2**

Plant Factor **PF=** 0.5

square footage of hydrozone **SLA=** 703 (HA=0)

hydrozone irrigation efficiency **IE=** 0.9

HZ2 EAWU = 13,221 gallons / yr

Hydrozone 4: Trees Rws Bubblers — **HZ4**

Plant Factor **PF=** 0.4

square footage of hydrozone **SLA=** 60 (HA=0)

hydrozone irrigation efficiency **IE=** 0.85

HZ4 EAWU = 956 gallons / yr

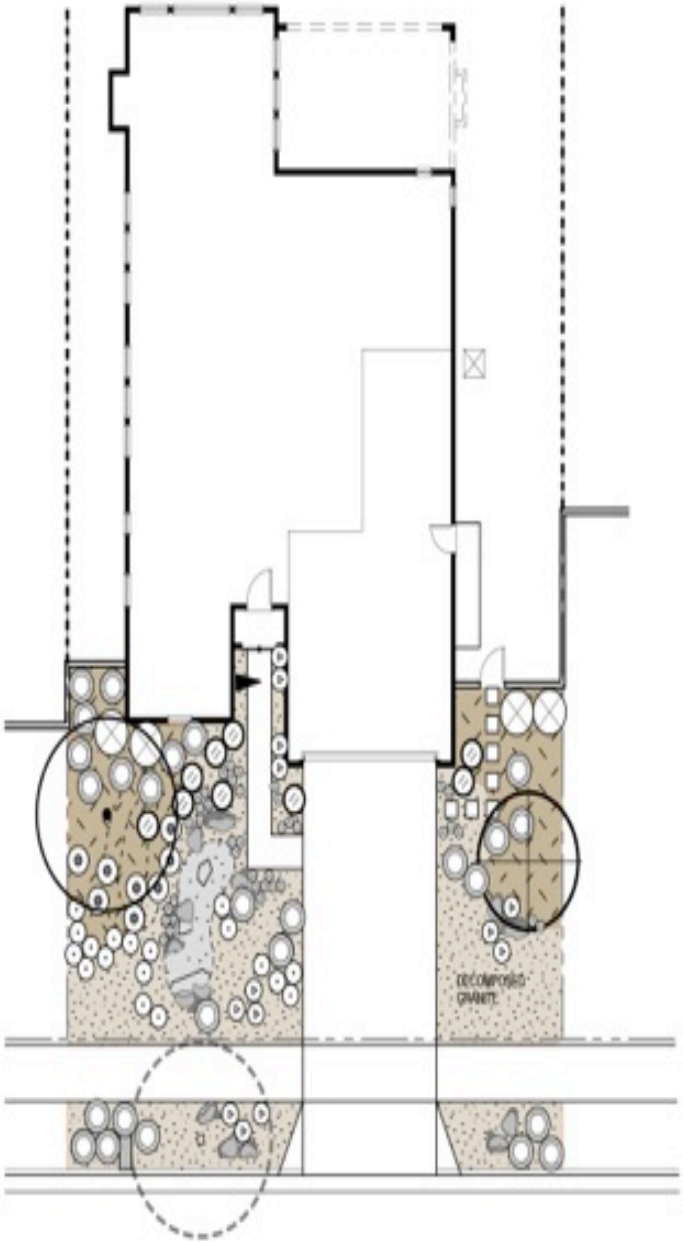
Total EAWU = 21,256 gallons / yr

MAWA - EAWU = 7,586 gallons / yr

AB1881 Total Water Usage: 21,256 gallons / year

Compared to Pre-AB1881: 62% water savings
Compared to AB1881 with turf: 45% water savings

- Replace turf with low growing groundcover
- Drip irrigation only in all planted areas



D 2015 - DROUGHT MANDATED REQUIREMENTS

SCALE: 1" = 10' CALIFORNIA NATIVES STYLE, NO TURF

Landscape Water Use Calculations

Project Information

The entire landscape area is irrigated with recycled water. In accordance with the City's Chapter 16.07, Landscape and Water Conservation Guidelines, the total square footage of LA is then considered a Special Landscape Area. The following calculations reflect those determinations.

Project Data

Total square footage of Landscape Area (including Special Landscape Area) **LA=** 985

Total square footage of Special Landscape Area **SLA=** 0

Hist. ETo for the area **ETo=** 54.6

Maximum Annual Water Allocation (MAWA)

MAWA is calculated using the following formula: (Eto) (.62) [(0.5 x LA) + (0.3 x SLA)]

MAWA = 15,318 gallons / yr

Estimated Applied Water Use (EAWU)

EAWU is calculated using the following formula: (Eto) (.62) [(PF x HA / IE)+ SLA]

Hydrozone 1: Mixed Shrubs Dripline — **HZ1**

Plant Factor **PF=** 0.2

square footage of hydrozone **SLA=** 485 (HA=0)

hydrozone irrigation efficiency **IE=** 0.9

HZ1 EAWU = 3,640 gallons / yr

Hydrozone 2: DG Dripline — **HZ2**

Plant Factor **PF=** 0.2

square footage of hydrozone **SLA=** 360 (HA=0)

hydrozone irrigation efficiency **IE=** 0.9

HZ2 EAWU = 2,708 gallons / yr

Hydrozone 4: Trees Rws Bubblers — **HZ4**

Plant Factor **PF=** 0.4

square footage of hydrozone **SLA=** 80 (HA=0)

hydrozone irrigation efficiency **IE=** 0.85

HZ4 EAWU = 956 gallons / yr

Total EAWU = 7,312 gallons / yr

MAWA - EAWU = 8,006 gallons / yr

Drought Ready Total Water Usage: 7,312 gallons / year

Compared to Pre-AB1881: 87% water savings
Compared to AB1881 with turf: 81% water savings

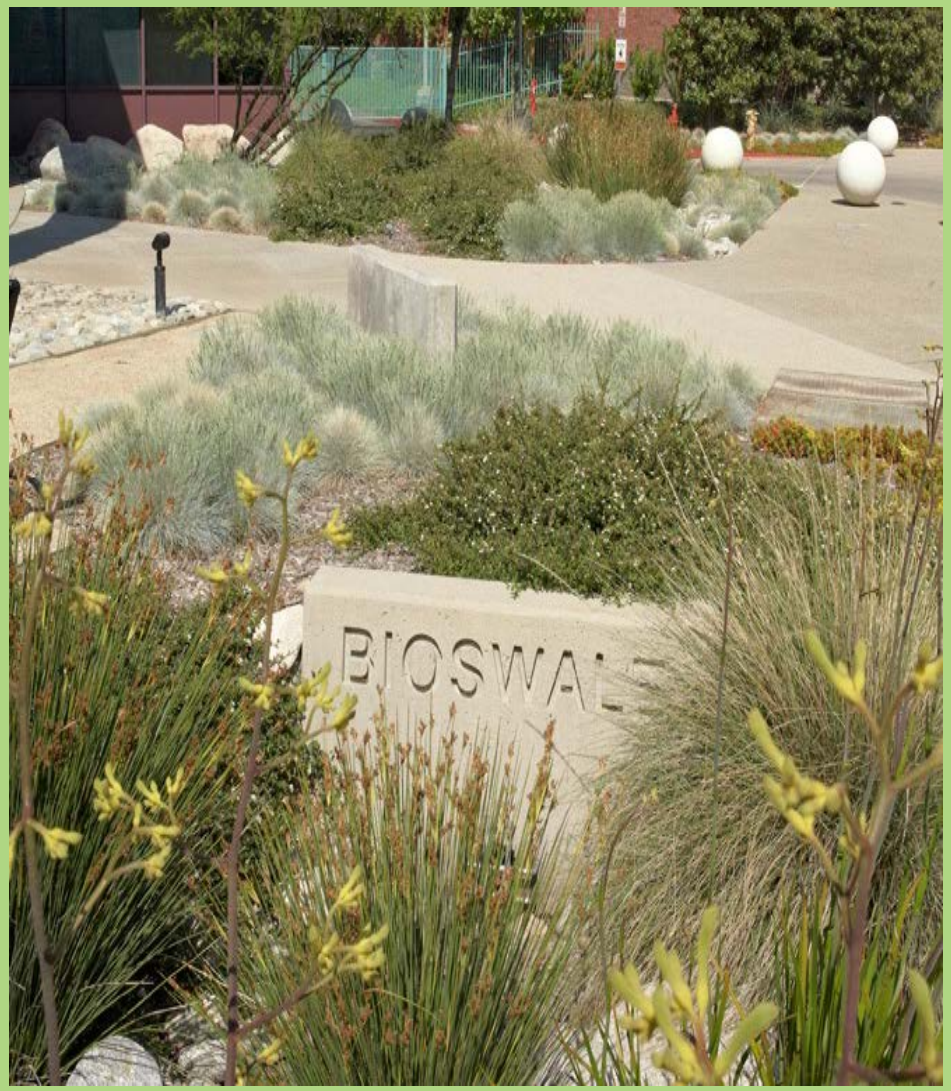
- Replace groundcover areas with decomposed granite
- Reduce drip irrigation to strictly adjacent to plant clusters

Cucamonga Valley Water District

COMMERCIAL OFFICE CAMPUS RE-DESIGN & RETROFIT

Before and After

Before and After



Before and After

Before and After

MILLION AIR FBO

FORWARD BASE OPERATIONS FOR SAN BERNARDINO INTERNATIONAL

ARCHITERRA
DESIGN GROUP

MILLION AIR FBO

FORWARD BASE OPERATIONS FOR SAN BERNARDINO INTERNATIONAL

ARCHITERRA DESIGN GROUP

CITRUS TOWER CORPORATE OFFICE COMPLEX

DOWNTOWN RIVERSIDE

ARCHITERRA
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MARTHA STEWART LIVING

OLIVE GROVE MODELS | PERRIS, CA

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MARTHA STEWART LIVING

OLIVE GROVE MODELS | PERRIS, CA

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THANK YOU

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UC ANR Drought Resources

Janet Hartin
Environmental Horticulture Advisor
San Bernardino, Riverside, and Los Angeles Counties
University of CA Cooperative Extension

Free downloadable publications including 'Sustainable Landscaping in California' and 'Lawn Watering Guide'

http://ucanr.edu/Publications

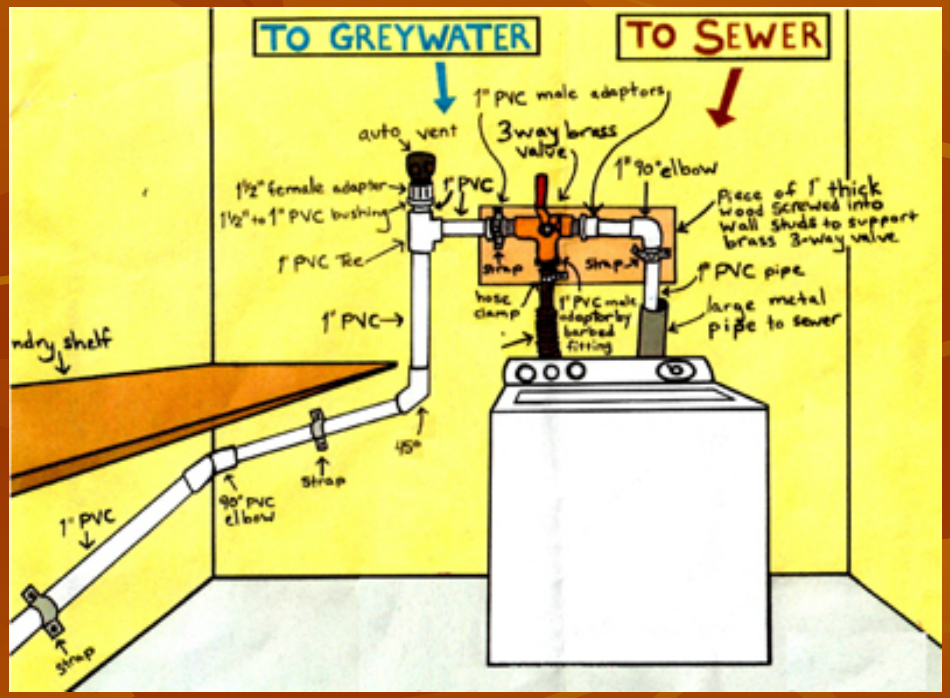
Graywater Use in California

The California Health and Safety Code defines graywater as….

"untreated wastewater that has not been contaminated by any toilet discharge, has not been affected by infectious, contaminated, or unhealthy bodily wastes, and does not present a threat from contamination by unhealthful processing, manufacturing, or operating wastes."

Graywater includes, but is not limited to, wastewater from bathtubs, showers, bathroom washbasins, clothes washing machines, and laundry tubs, but does not include wastewater from kitchen sinks or dishwashers.

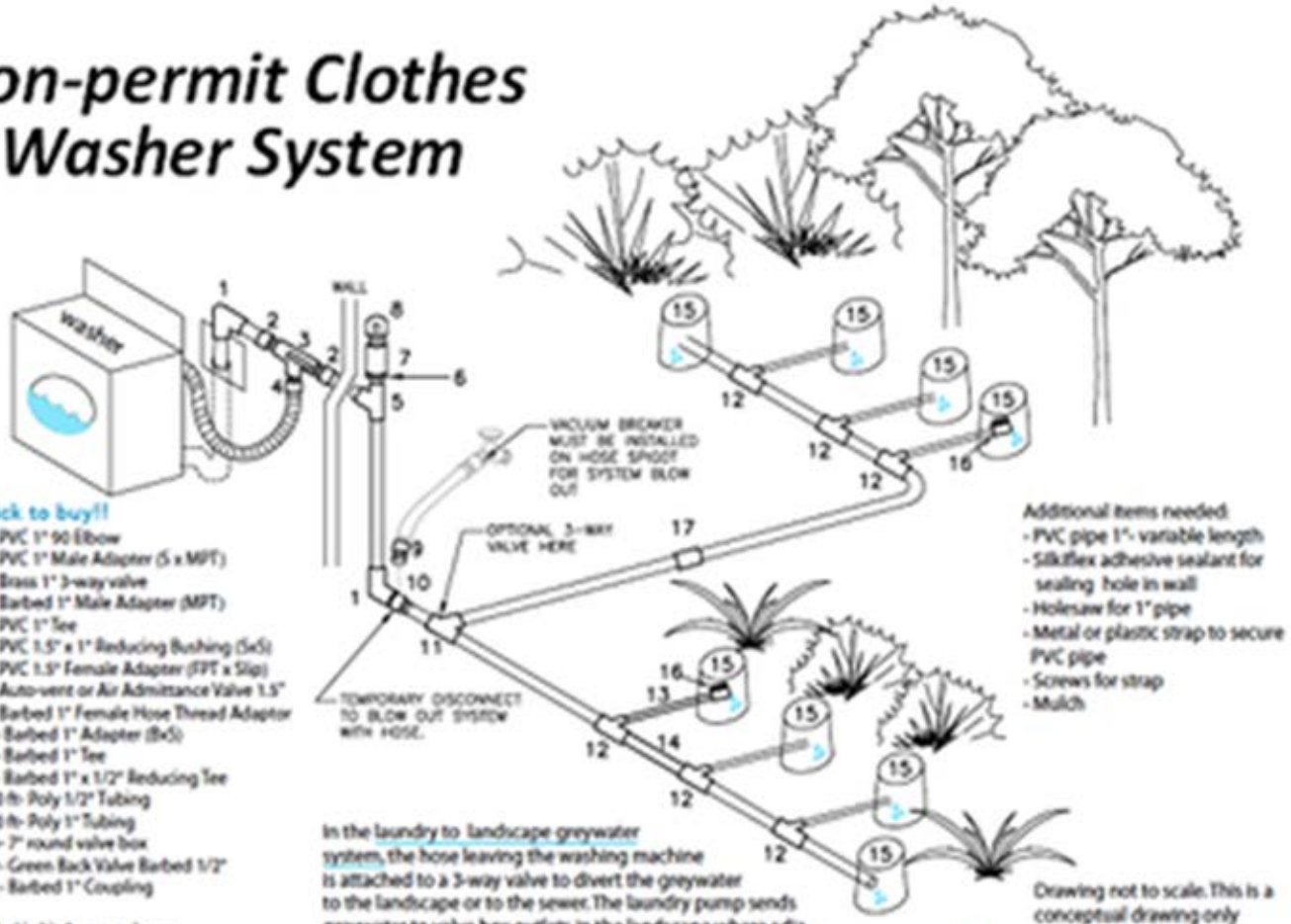
A permit is not required for the installation of a single-family or two-family residential graywater irrigation systems from a simple clothes washing graywater system as long as it does not require cutting of the existing plumbing piping.



- A typical household (2.6 people) produces about 90 gallons of graywater each day (including about 39 gallons of graywater daily from clothes washers).

- ‘Laundry to landscape’ sytems can supply about ¼ of the water necessary to irrigate a typical landscape.

Non-permit Clothes Washer System



Click to buy!!

(1) 4- PVC 1" 90 Elbow
(2) 2- PVC 1" Male Adapter (S x MPT)
(3) 1- Brass 1" 3-way valve
(4) 1- Barbed 1" Male Adapter (MPT)
(5) 1- PVC 1" Tee
(6) 1- PVC 1.5" x 1" Reducing Bushing (SxS)
(7) 1- PVC 1.5" Female Adapter (FPT x Slip)
(8) 1- Auto-vent or Air Admittance Valve 1.5"
(9) 1- Barbed 1" Female Hose Thread Adaptor
(10) 1- Barbed 1" Adapter (BxS)
(11) 1- Barbed 1" Tee
(12) 6- Barbed 1" x 1/2" Reducing Tee
(13) 10 ft- Poly 1/2" Tubing
(14) 50 ft- Poly 1" Tubing
(15) 8- 7" round valve box
(16) 2- Green Back Valve Barbed 1/2"
(17) 1- Barbed 1" Coupling

Included in kit but not shown:
20- U-shaped wire hold-downs (stakes)
1- PVC Cement - Gorilla 4 ounce
1- Teflon tape 1/2"

In the laundry to landscape greywater system, the hose leaving the washing machine is attached to a 3-way valve to divert the greywater to the landscape or to the sewer. The laundry pump sends greywater to valve box outlets in the landscape where adjacent plants are watered. This system is low cost, easy to install, and gives great flexibility for irrigation. In most situations this is the number one place to start when choosing a greywater system! Read more here.

Additional items needed:
- PVC pipe 1"- variable length
- Silkiflex adhesive sealant for sealing hole in wall
- Holesaw for 1" pipe
- Metal or plastic strap to secure PVC pipe
- Screws for strap
- Mulch

Drawing not to scale. This is a conceptual drawing only and not to be used for construction

clean water components

Due to low but potential health risks, graywater should not be used to irrigate - or come into contact with - edible plants.

Home landscape irrigated with a graywater system

Large landsdcape in Los Angeles (Casa Domingues) irrigated with a large, complex graywater system

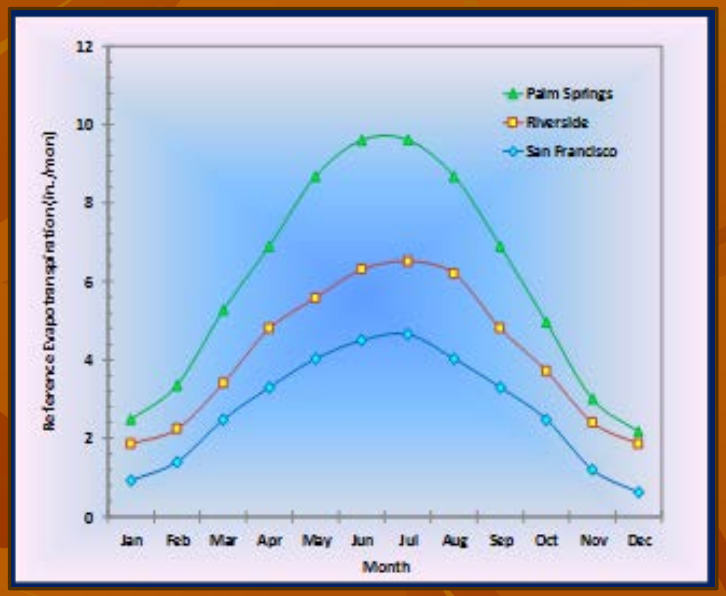
‘Keeping Plants Alive Under Drought and Water Restrictions’ publication includes:

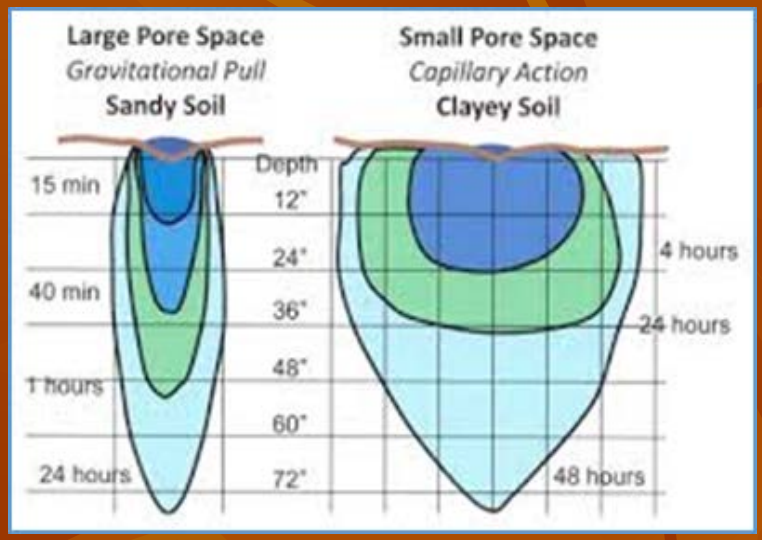
- Symptoms of drought
- Keeping different types of plants alive
- Designing water-efficient landscapes

Symptoms of drought can mimic other biotic and abiotic disorders

Drought (left) vs salt damage (right)

Irrigate based on evapotranspiration, plant water use, and soil type





What about Lawns?

- Poor distribution uniformity of applied water often waste 1/3 – 1/2 or more of water applied
- Warm-season grasses require 25% less water than cool-season grasses

The UC ‘Lawn Watering Guide for California’

lists minutes to irrigate based on climate and grass type (free download)

http://ucanr.org/freepubs/docs/8044.pdf

Trees

- Most homeowners wisely choose to use whatever water is available to save their fruit and landscape trees.
- One or two deep irrigations with a garden hose several weeks apart in spring and summer will often keep these valued plants alive through summer, especially if roots are relatively deep.

Vegetables

- Vegetables are difficult to maintain during a drought. Know the critical watering periods for vegetables and you can target the timing and amount of water to add.
- As a rule of thumb, water is most critical during the first few weeks of development, immediately after transplanting, and during flowering and fruit production.

What Else Can Be Done Without Starting Over?

Mulch

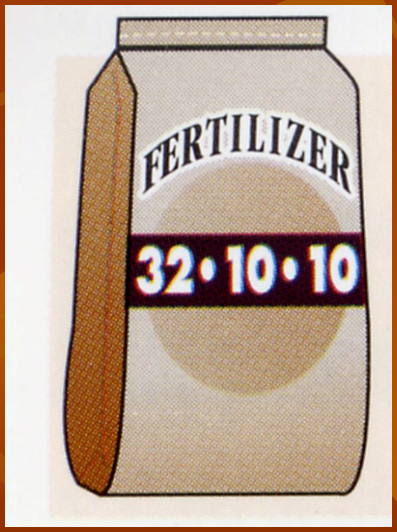
- Apply 2-3” of mulch around garden plants and trees to hold water in and reduce soil evaporation.
- Keep it several inches away from tree trunks!
- Make sure to water beneath the mulch.

Avoid Planting New Plants in Heat of Summer

- Young plants require frequent irrigation until established and should not be planted during a drought or under water restrictions.
- Even native plants require continually moist root zones during establishment.

Avoid Overfertilizing

- Too much nitrogen results in lush, weak new growth, and increases the need for even more water.
- Too much fertilizer can lead to pollution of waterways.



Water early in the morning when evaporation is low

Keep Weeds Out

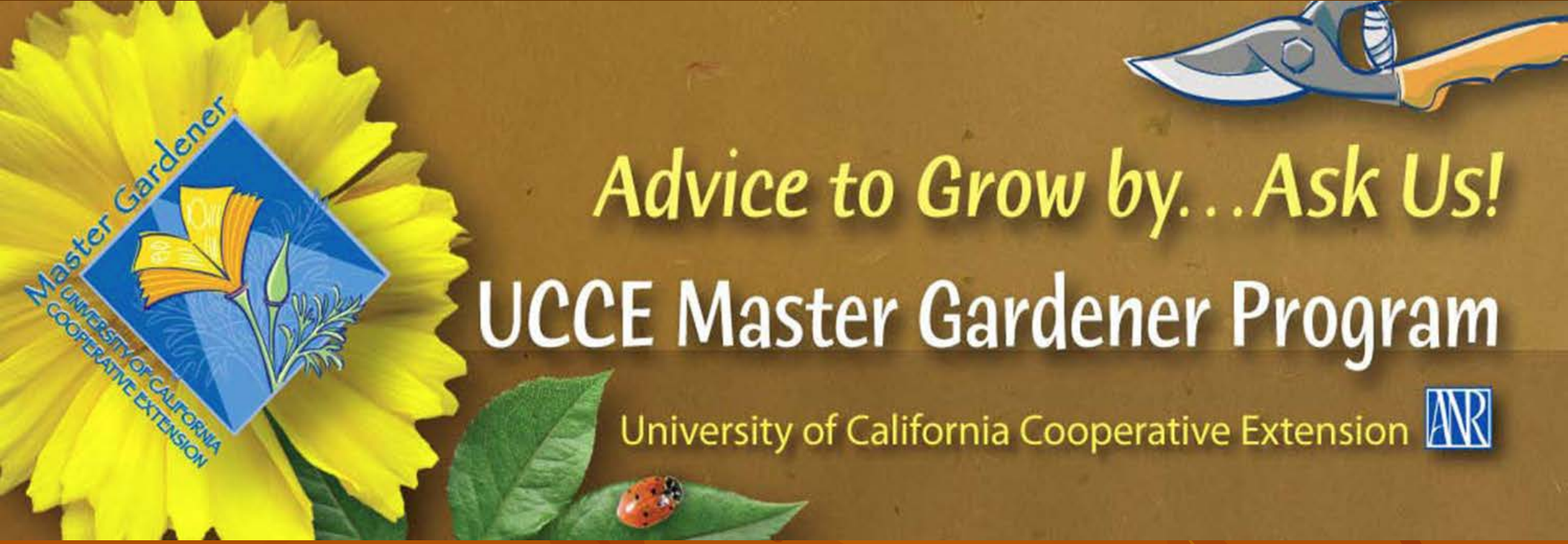
- Weeds often outcompete garden plants and trees for water.
- Avoid using chemical herbicides; hand-weed instead. Overuse of pesticides can lead to waterway pollution.

Use a Broom Instead of a Hose to Clean up After Gardening/Pruning

- Save water and avoid polluting waterways.
- Get some exercise!

What about Long-Term Solutions?

- Once water restrictions are lifted consider replacing all or a portion of your lawn with drip-irrigated water-efficient ornamentals.
- Hydrozone: place plants with similar water needs together.
- Before planting, mix compost evenly several inches into the soil to improve water holding capacity and decrease the chance of waterway pollution



Homeowners can Contact a Trained Master Gardener for More Information

Master Gardener Program
San Bernardino County


BONSAI FOR
BEGINNERS: BASI
OUTSIDE
THE BOX

Areas of Emphasis:

- Sustainable Landscapes
- Food Production
- Healthy Communities

Helplines:

E-mail: mgsanber@ucdavis.edu

Phone: (909)387-2182

Thank you!

Water Quality in the Santa Ana Region

Bill Ruh

RWQCB, Santa Ana Region

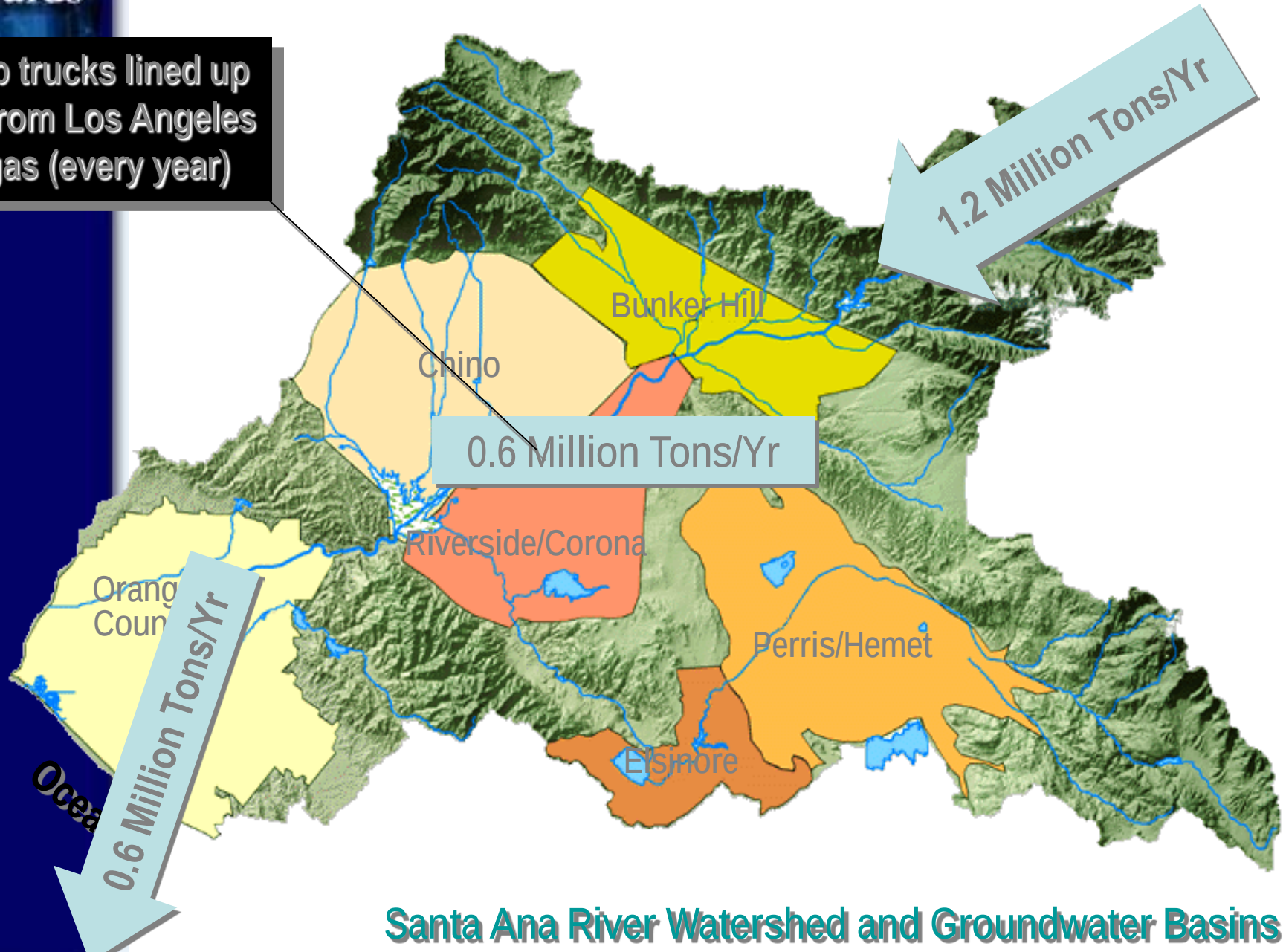
Santa Ana Region

- 70% local supply
- Groundwater important, but some areas rely on imports
- Water quality challenges

Watershed Salt Accumulation

Water Boards

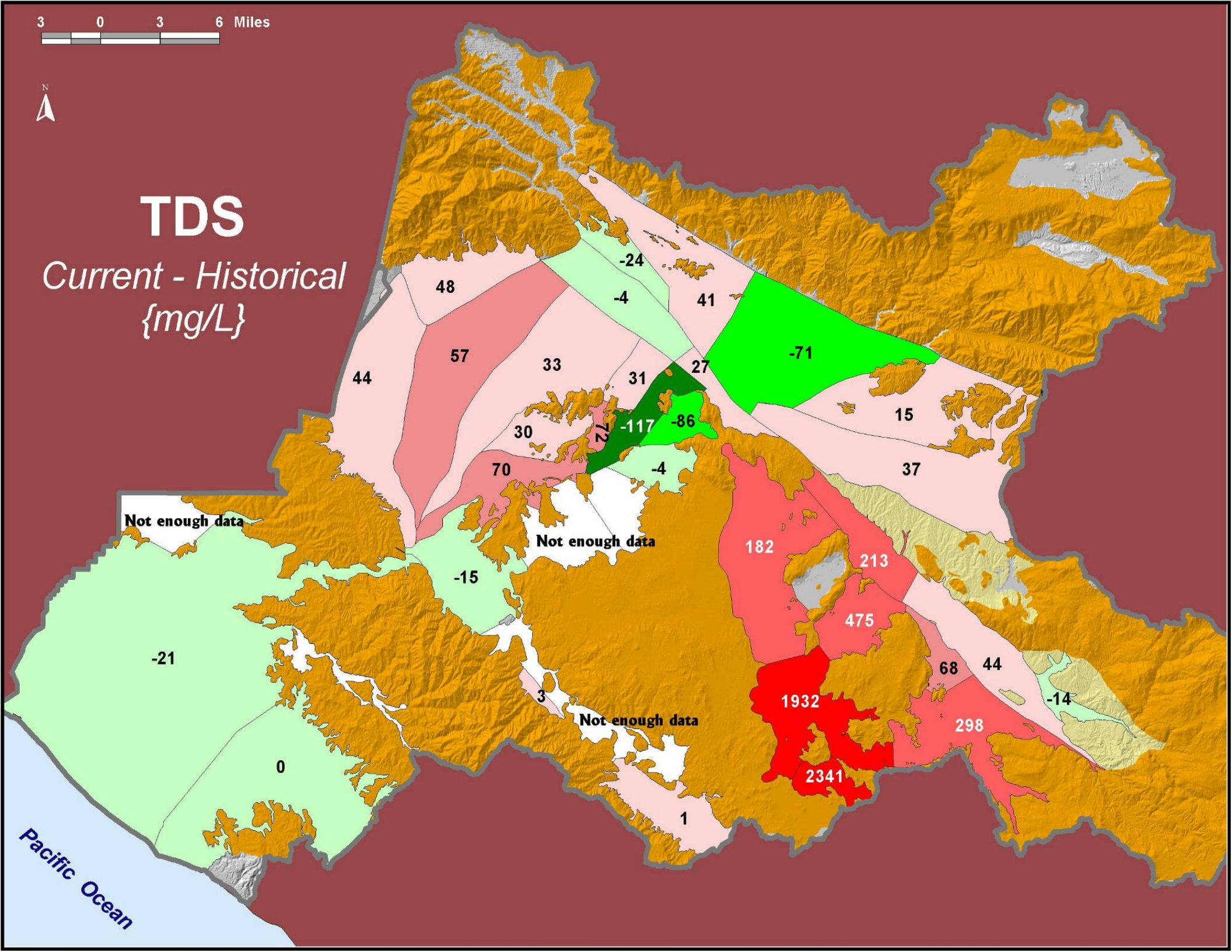
37,000 dump trucks lined up end-to-end from Los Angeles to Las Vegas (every year)



Santa Ana River Watershed and Groundwater Basins

Salt Management

- Regulatory program in Basin Plan
- Regional desalters
- Salt export through Brine Line
- Recalculation of ambient quality
- Provide for use of recycled water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TDS
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33
44
31
27
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30
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15
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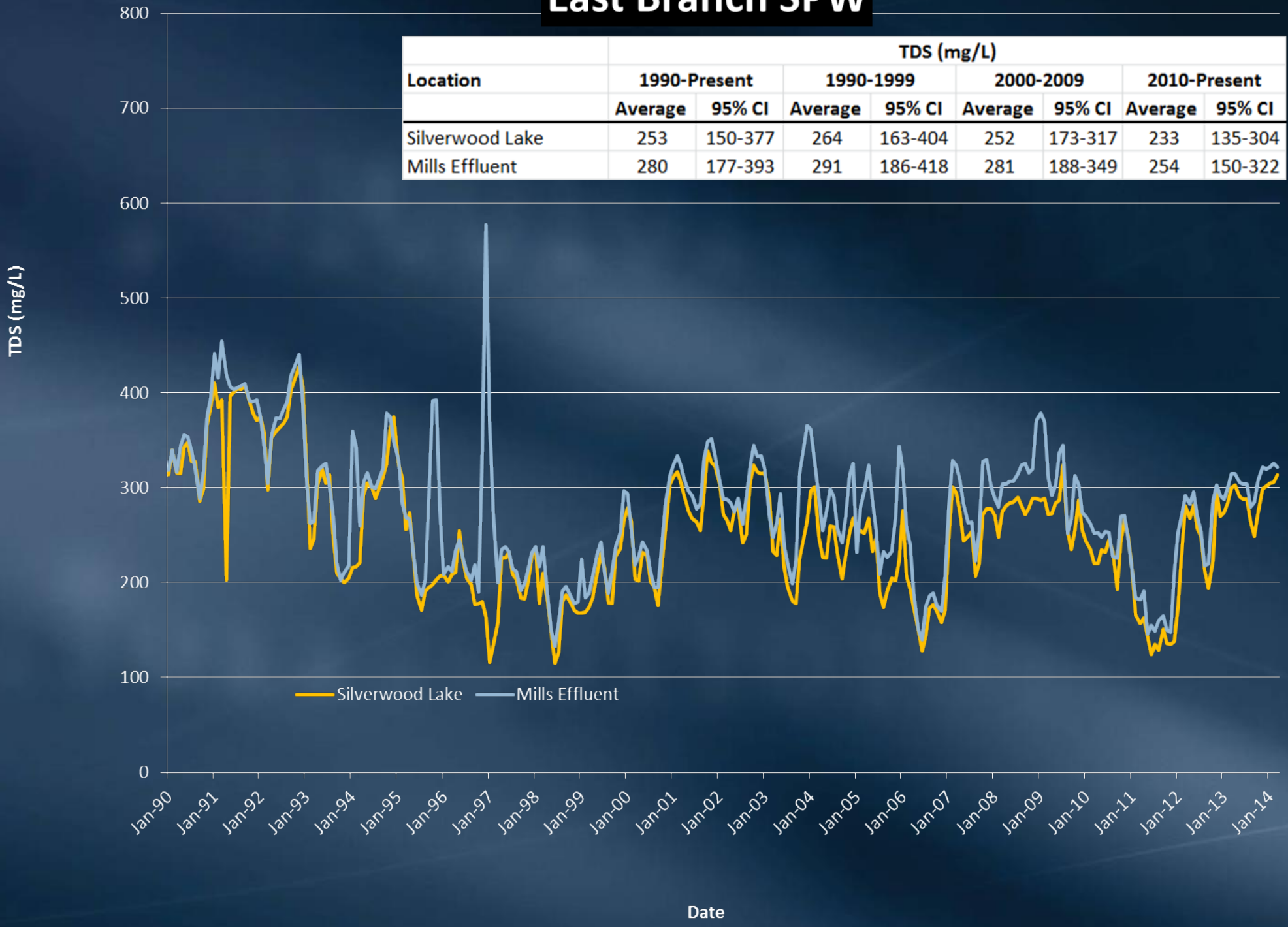
37
Not enough data
Not enough data
182
213
-15
475
-21
68
44
3
1932
-14
Not enough data
298
2341
0
1
Pacific Ocean

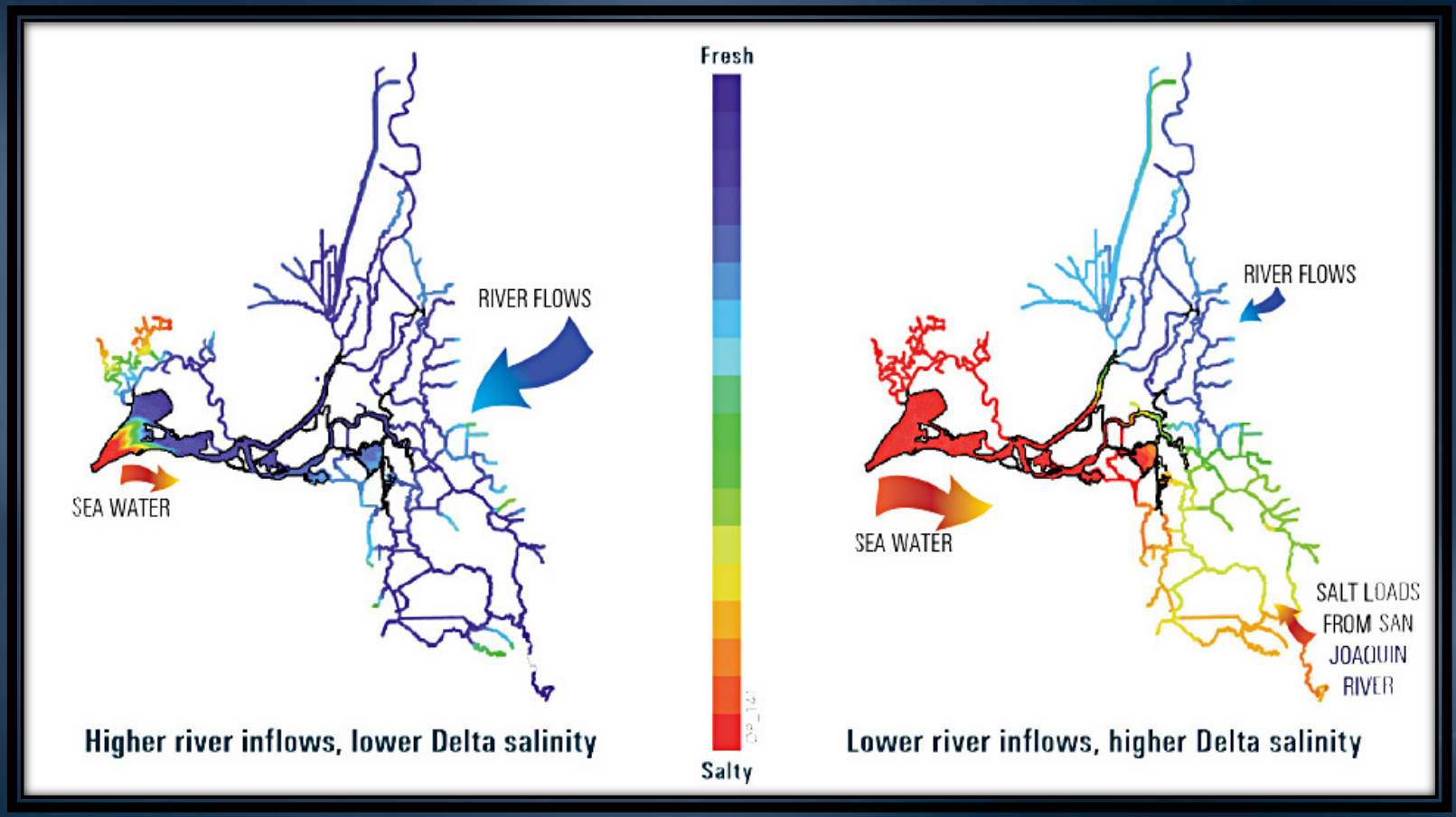
East Branch SPW

Location	TDS (mg/L)							
	1990-Present		1990-1999		2000-2009		2010-Present	
	Average	95% CI	Average	95% CI	Average	95% CI	Average	95% CI
Silverwood Lake	253	150-377	264	163-404	252	173-317	233	135-304
Mills Effluent	280	177-393	291	186-418	281	188-349	254	150-322



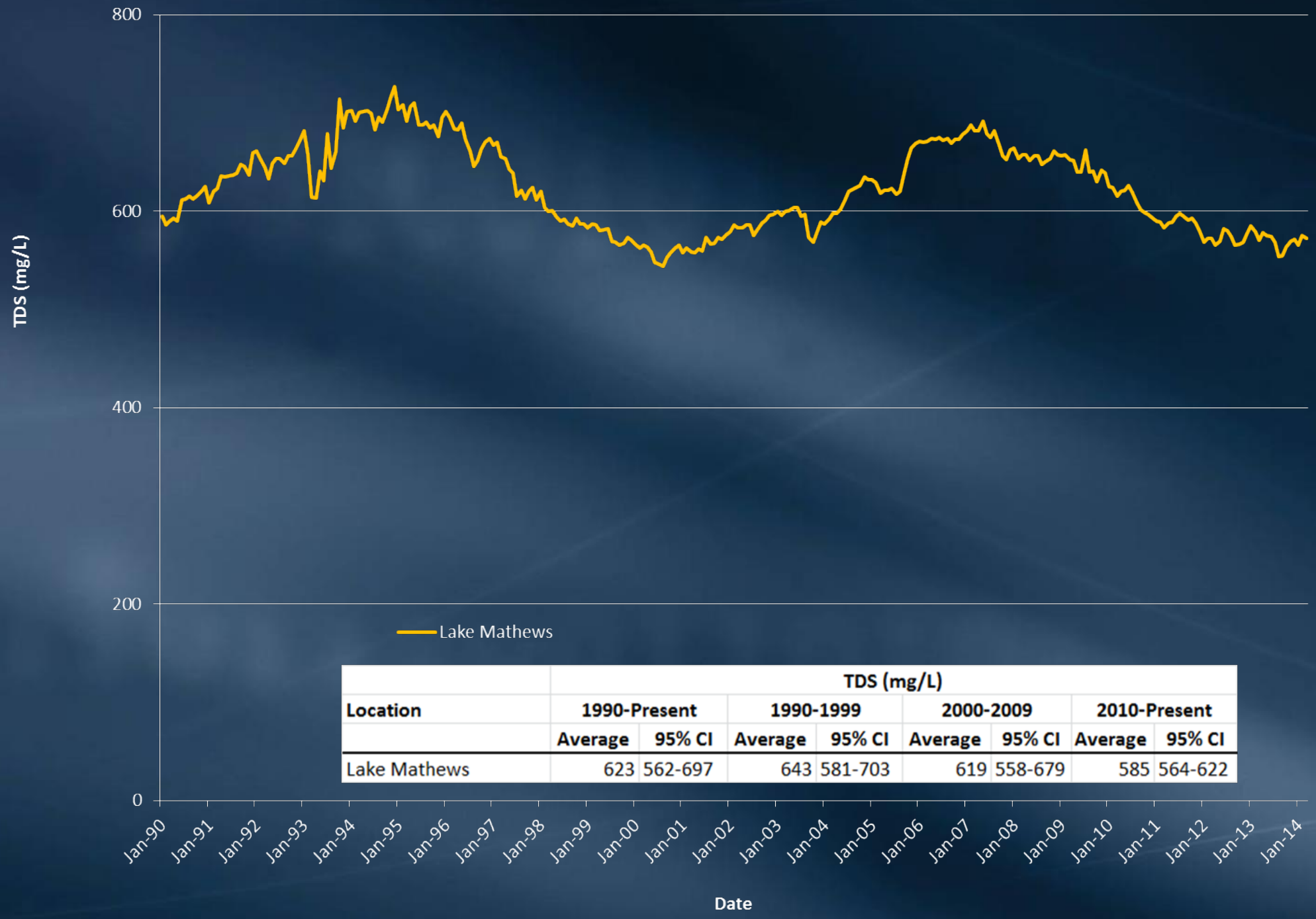
Drought Impacts on Water Quality

- Low Delta outflows
- High salinity near pumps



July 2014

Colorado River Aqueduct (TDS)



	TDS (mg/L)							
Location	1990-Present		1990-1999		2000-2009		2010-Present	
	Average	95% CI	Average	95% CI	Average	95% CI	Average	95% CI
Lake Mathews	623	562-697	643	581-703	619	558-679	585	564-622

Recycled Water

- "Purple pipe" systems
- Indirect potable reuse (IPR)
  - Currently practiced in Orange County
- Direct potable reuse (DPR)
  - Feasibility being studied by State Water Board

Investments In Water Reliability

GWRS
GROUNDWATER REPLENISHMENT SYSTEM

- Joint project of OC Sanitation District and OC Water District
- Operational since January 2008
- 70 million gallons day advanced water purification facility
- Provides 23 billion gallons per year new water
- Takes treated wastewater that otherwise would flow to ocean and purifies it to near-distilled quality

GWRS Purification Process

- Purifies highly-treated wastewater using microfiltration, reverse osmosis, and ultraviolet light with hydrogen peroxide. Once purified, minerals are added to stabilize the water
- 30 million gallons injected into Orange County's seawater barrier each day
- Remaining water is piped to recharge basins in Anaheim

Microfiltration

Reverse *Osmosis*

Ultraviolet Light with Hydrogen Peroxide

Comparison of Salt Load in GWRS & Colorado River Water