

San Diego Farm and Nursery Expo

The East San Joaquin Ag Order: Nitrogen Applied and Removed in Nurseries and Greenhouses



UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

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What is the East San Joaquin (ESJ) Order?

...and why should you care?

EASTERN SAN JOAQUIN AGRICULTURAL ORDER PRECEDENTIAL REQUIREMENTS

The Central Valley Water Board adopted waste discharge requirements (WDRs) for agricultural discharges in the eastern San Joaquin River watershed in 2012. The State Water Board reviewed the Central Valley Water Board's order and subsequently adopted an order modifying the Central Valley Water Board's order in February 2018. This State Board order is referred to as the Eastern San Joaquin Order, or ESJ order (State Board Order WQ 2018-0002).¹ The State Water Board designated portions of the ESJ order as "precedential" and "direct[ed] the regional water boards to revise their irrigated lands regulatory programs within the next five years to be consistent with [the] precedential direction in [the ESJ order]" (p. 9).

Nitrogen Applied and Nitrogen Removed Reporting

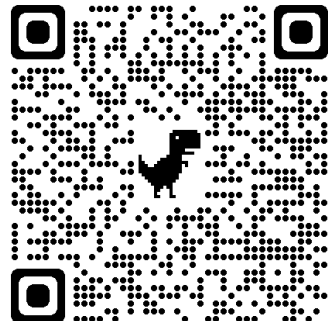
"The requirement for field-level AR data submission to the regional water board consistent with the data sets and analysis of those data sets described in this section shall be precedential for irrigated lands regulatory programs statewide. The regional water boards have the discretion to require additional data related to irrigation and nitrogen management. For third-party programs only, the AR data shall be submitted with anonymous identifiers." (p. 51).

*"The requirement for calculation of annual and multi-year A/R ratio and A-R difference parameters for each grower **by field** shall be precedential for irrigated lands regulatory programs statewide, except as described below. The regional water boards shall retain discretion as to the division of responsibilities among the growers, third parties, and regional water boards for determination of the values, provided that the values are known to both the growers and the third parties" (p. 40, emphasis added).*

Nitrogen applied (A) and removed (R) reporting at the field-level is precedential. Staff recommends reporting of this data directly to the regional board.

Removal Coefficients

"The requirement for use of coefficients for conversion of yield to nitrogen removed values shall be precedential for irrigated lands regulatory programs statewide. The regional water boards will have discretion to determine the number of crops to be analyzed and the timeline for development of the coefficients" (p. 42)



IRRIGATION AND NITROGEN MANAGEMENT PLAN (INMP) WORKSHEET

Member ID: _____ INMP Field or MU: _____ Crop: _____ Total Acres: _____

IRRIGATION MANAGEMENT				
1. Irrigation Method*		Pre-Season Planning		
(check one for Primary; if applicable, check one for Secondary) Primary Secondary ¹ <input type="checkbox"/> <input type="checkbox"/> Drip <input type="checkbox"/> <input type="checkbox"/> Micro Sprinkler <input type="checkbox"/> <input type="checkbox"/> Furrow <input type="checkbox"/> <input type="checkbox"/> Sprinkler <input type="checkbox"/> <input type="checkbox"/> Border Strip <input type="checkbox"/> <input type="checkbox"/> Flood		2. Crop Evapotranspiration (ET, inches)		
		3. Anticipated Crop Irrigation (inches)		
		4. Irrigation Water N Concentration (ppm or mg/L, as NO ₃ -N)		
		5. Irrigation Efficiency Practices* (Check all that apply)		
<input type="checkbox"/> Laser Leveling <input type="checkbox"/> Use of ET in scheduling irrigations <input type="checkbox"/> Water application schedule to need <input type="checkbox"/> Use of moisture probe (e.g. tensiometer)		<input type="checkbox"/> Soil Moisture Neutron Probe <input type="checkbox"/> Pressure Bomb <input type="checkbox"/> Other _____ <input type="checkbox"/> Other _____		
HARVEST / YIELD INFORMATION				
Harvest / Yield Information		Expected (A)	Actual (B)	
6. Production Unit (lbs, tons, etc.)		7. Harvested Yield*		
NITROGEN MANAGEMENT				
8. Nitrogen Efficiency Practices* (Check all that apply)		Nitrogen Sources	Recommended/Planned N (A)	Actual N (B)
<input type="checkbox"/> Split Fertilizer Applications <input type="checkbox"/> Irrigation Water N Testing <input type="checkbox"/> Soil Testing <input type="checkbox"/> Tissue/Petiole Testing <input type="checkbox"/> Fertigation <input type="checkbox"/> Foliar N Application <input type="checkbox"/> Cover Crops <input type="checkbox"/> Variable Rate Applications using GPS <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____		9. Soil – Available N in Root Zone (Annualized, lbs/ac)		
		10. N in Irrigation Water* (Annualized, lbs/ac)		
		11. Organic Amendments* (Manure/Compost/Other, lbs/ac estimate)		
		12. Dry/Liquid Fertilizer N* (lbs/ac)		
		13. Foliar Fertilizer N* (lbs/ac)		
		14. TOTAL NITROGEN (lbs/ac)	0	0

¹ A secondary irrigation system could be used for crop germination, frost protection, crop cooling, etc.

*(Bold Text) Data to be reported to the Coalition on the INMP Summary Report, based on Actual Yield and Actual N.

Plan Certifier Initials

The form to report nitrogen is the INMP worksheet

Grower reports applied nitrogen (A) and yield to Irrigated Land Group

Irrigated Land Group calculates removed nitrogen (R) from yield and reports it to the Regional Board

Regional Board is interested in A-R as a measure of nitrogen that can be lost to the environment by leaching or runoff

Example for field crops

Almond yield = 3500 lb/ac = 1.75 ton/ac

$R = 1.75 \text{ ton/ac} \times 136 \text{ lbs of N/ton} =$
 $= 238 \text{ lbs of N/ac}$

Table with removal coefficients

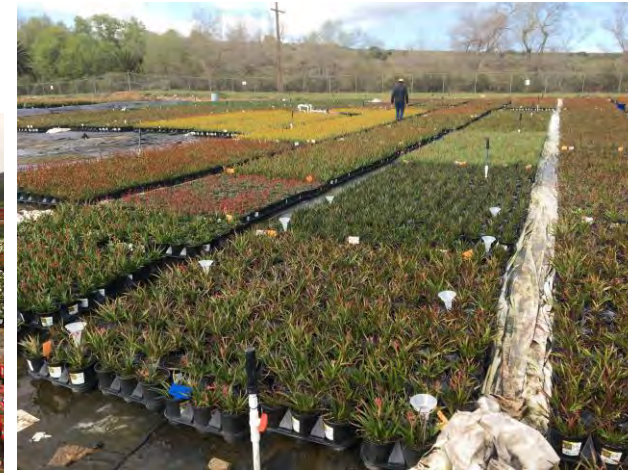
Table 3: Overview of N concentrations in harvested plant parts of tree and vine crops.

Commodity	N in harvested plant parts	# of observations		CV (%)	Page
		California	Total		
Almonds	136 lbs/ton of kernels	31	31	4.1	108
Apples	1.08 lbs/ton of fruits	1	132	35.1	110
Apricots	5.56 lbs/ton of fruits	1	22	114	112
Cherries	4.42 lbs/ton of fruits	1	24	19.8	114
Figs	2.54 lbs/ton of fruits	1	19	18.1	116
Grapefruit	2.96 lbs/ton of fruits	26	27	7.8	118
Grapes - Raisins	10.1 lbs/ton @ 15% moisture	16	19	5.8	120
Grapes - Table	2.26 lbs/ton of grapes	16	19	5.8	122
Grapes - Wine	3.60 lbs/ton of grapes	8	38	13.0	124
Lemons	2.58 lbs/ton of fruits	21	22	10.0	126
Nectarines	3.64 lbs/ton of fruits	31	41	27.1	128
Olives	6.28 lbs/ton of olives	6	29	22.8	130
Oranges	2.96 lbs/ton of fruits	26	82	10.9	132
Peaches	2.26 lbs/ton of fruits	5	25	20.7	134
Pears	1.29 lbs/ton of fruits	1	64	17.9	136
Pistachios	56.1 lbs N/ton dry yield (CPC)	11	11	3.5	138
Plums	2.83 lbs/ton of fruits	1	11	11.2	140
Pomegranate	15.2 lbs/ton of fruits	0	7	15.0	142
Prunes	11.2 lbs/ton of dried fruits	18	18	16.3	144
Tangerines	2.54 lbs/ton of fruits	1	2	29.2	146
Walnuts	31.9 lbs N/ton with shells	18	18	11.2	148

From: **Nitrogen concentrations in harvested plant parts - A literature overview, Dr. Daniel Geisseler, 2016**

Applicability to the nursery industry

1. Harvest is not (only) a part of a plant
2. No removal coefficients available



Only 10% of N was measured to run off or leach



Bruno Pitton

What we found

Use analytical results to estimate N amounts:

- In plant shoots ~5%
- Remaining in substrate ~55%
- In runoff water ~6%
- Leached into bed soils ~4%
- Lost from denitrification ~30%
 - $\text{N}_2\text{O-N}$ ~1.5%



In Nurseries and greenhouses harvest is not seasonal, it's continuous.

Reporting yearly A-R would be onerous accounting

ITEM #	BOTANICAL NAME	TRAY SIZE	BASE PRICE	AVAIL	TRAYS	ORDER PLANTS	PRICE TOTAL
Succulents							
AGA60-1	AGAVE 'ATTENUATA' (Fox Tail Agave) 4" (5 Gallon Shifting Stock- Full)	16	3.00	352			\$ -
BUL09	BULBINE FRUTESCENS 'HALLMARK' (Orange Stalked Bulbine)	50	0.72	24,000			\$ -
CAL52	CALANDRINA SPECTABILIS 'JAZZ TIME' (Rock Purslane)	32	0.69	3,250			\$ -
SEN01	SENECIO MANDRALISCAE (Blue Chalk Stick)	32	0.68	8,224			\$ -
SEN02	SENECIO SERPENS (Dwarf Blue Chalk Stick)	32	0.72	1,152			\$ -
TRA10	TRADESCANTIA PALLIDA (Purple Hearts)	32	0.70	2,720			\$ -
Shrubs							
ACA22	ACACIA REDOLENS 'DESERT RUG' (D.C. ACACIA)	32	0.75	2,688			\$ -
AGA50	AGAPANTHUS AFRICANTUS 'WHITE' (White Lily of the Nile) *2 PPP*	50	0.65	20,000		*Ready in 6 Weeks*	\$ -
ART40	ARTEMESIA 'POWIS CASTLE' (Wormwood)	50	0.68	4,600			\$ -
ASP90	ASPARAGUS DENSIFLORUS 'SPRENGERI' (Asparagus Fern) *5-9 PPP*	72	0.68	40,000			\$ -
AUC60	AUCUBA JAPONICA 'VAREGATA' (Gold Dust Plant)	32	0.75	3,456			\$ -
BAC50	BACCHARIS 'PIDGEON POINT' (Dwarf Coyote Brush)	50	0.68	25,000		*Ready 30 Days*	\$ -
CAL68	CALLISTEMON 'LITTLE JOHN' (Dwarf Bottle Brush) *SDG SELECTED STRAIN*	50	0.70	50,000		*Ready 6 Weeks*	\$ -
CAL69	CALLISTEMON VINIMALIS 'MACARTHUR' #25,011 (Dig Selection)	50	0.69	2,100		Royalty \$0.18	\$ -
CAL77	CALLISTEMON VINIMALIS 'SLIM' #24444 (Dig Selection)	50	0.69	5,850		Royalty \$0.18	\$ -
CAR65	CARISSA MACROCARPA 'GREEN CARPET' (Low Growing Natal Plum)	50	0.68	6,800			\$ -
CAR85	CARISSA MACROCARPA 'TUTTLE' (Dwarf Natal Plum)	50	0.68	3,250			\$ -
CEA05	CEANOTHUS 'CONCHO' (California Lilac)	50	0.70	19,800		*Ready in 4 Weeks*	\$ -
CEA40	CEANOTHUS GRISEUS 'HORIZONTALIS' (Carmel Creeper)	50	0.70	18,600		*Ready in 2 Weeks*	\$ -
CEA95	CEANOTHUS GRISEUS 'YANKEE POINT' (California Lilac)	50	0.70	13,200		*Ready in 2 Weeks*	\$ -
CES87	CISTUS 'SUNSET' (Magenta Rockrose)	50	0.68	1,100			\$ -
COT75	COTONEASTER DAMMERI 'LOWFAST' (Bearberry Lowfast)	50	0.68	3,200		*Ready in 4 Weeks*	\$ -
DIE20	DIEYES 'BICOLOR' (Fortnight Lily, Morea Bicolor, African Iris) *2-3 PPP*	50	0.65	27,700		*Ready in 6 Weeks*	\$ -
DIE22	DIEYES 'LEMON DROPS' (Fortnight Lily, Dietes Lemon Drop) *2PPP*	50	0.68	2,100			\$ -
DOD69	DODONAEA VISCOSA PURPUREA (Purple Hopseed Bush)	50	0.68	20,400			\$ -
DUR10	DURANTA ERECTA 'ALBA' (White Sky Flower)	50	0.60	10,200			\$ -
ERE10	EREMOPHYLLA GLABRA 'GREY HORIZON' (Grey Eum Bush) PP#29,275	32	0.75	896		Royalty \$0.25	\$ -
EUO70	EUONYMUS JAPONICA 'MICROPHYLLA' (Microphylla Box-Leaf Euonymus)	50	0.68	1,300			\$ -
FAT01	FATSIA JAPONICA (Aralia Sieboldii, Japanese Aralia) *6-9 PPP*	72	0.68	31,104			\$ -
GAL10	GALVEZIA SPECIOSA (Galvezia speciosa, Island snapdragon)	50	0.68	7,500			\$ -
GAL20	GALVEZIA SPECIOSA 'FIRECRACKER' (Galvezia Firecracker, Firecracker snapdragon)	50	0.68	4,700			\$ -
GEN10	GENISTA RACEMOSA (Cytisus x Spachianus, Sweetbroom)	50	0.68	10,350			\$ -
HEB11	HEBE 'VAREGATA' (Variegated Hebe, Veronica Variegated)	50	0.68	12,450			\$ -
HEM02	HEMEROCALLIS 'STELLA BELLA' (Evergreen, Dwarf Yellow Daylily, Bloom Six months!)	50	0.90	3,600			\$ -
HEM19	HEMEROCALLIS 'LITTLE BUSINESS' (Red Reblooming Daylily)	36	0.85	1,872			\$ -
HEM18	HEMEROCALLIS 'HAPPY RETURNS' (Yellow Daylily)	36	0.85	5,040			\$ -
HET10	HETEROMELES ARBUTIFOLIA *2-3 PPP* (Toyon- CA Native)	50	0.69	65,650			\$ -
HIB05	HIBISCUS 'AGNUS GAULT' (Single Pink Flower)	32	0.70	1,696			\$ -
HIB55	HIBISCUS 'SANTANA' (Single Orange with Yellow Center)	50	0.69	3,900			\$ -
HIB58	HIBISCUS 'VICE PRESIDENT' (Single Red)	50	0.69	1,800			\$ -
LAJ45	LANTANA 'NEW GOLD'	50	0.60	2,550			\$ -
LAJ65	LANTANA SELLOWIANA 'TRAILING WHITE'	50	0.60	6,500			\$ -
LAJ80	LANTANA SELLOWIANA 'PURPLE TRAILING'	50	0.60	7,650			\$ -
LAV53	LAVENDER 'GOODWIN CREEK' (Lavandula Goodwin Creek)	50	0.68	20,400			\$ -
LEUC25	LEUCOPHYLLUM FRUTESCENS 'COMPACTA' (Compact Texas Ranger)	50	0.68	7,800		*2 Weeks*	\$ -
LEO10	LEONOTIS LEONURUS (Lions Tail)	50	0.68	6,300			\$ -
LIG31	LIGUSTRUM JAPONICUM (Japanese Privet) *3 PPP*	50	0.68	17,400		*2 Weeks*	\$ -
MYO10	MYOPORIUM PARVIFOLIUM 'PUTAH CREEK' (Creeping Myoporum)	50	0.60	18,200			\$ -
NER38	NERIUM OLEANDER 'JANNOCH BRIGHT RED' (Jannoch Bright Red Oleander)	50	0.68	8,250			\$ -
PHL10	PHLOMIS FRUITICOSA (Jerusalem Sage)	32	0.70	5,760			\$ -
PIT49	PITTOSPORUM TENUFOLIUM (Pittosporum Nigrum)	32	0.70	23,808			\$ -

PLEASE NOTE WE HAVE NEW FAX NUMBERS THEY ARE LISTED ABOVE											
F/P = Full Plants Only			B/O = Bud Only		B/C = Bud Cracking		B/B = Bud & Bloom		WOW = Drop Dead Gorgeous		
Group	Name	Stage	QTY	Order	Group	Name	Stage	QTY	Order	Group	Name
12 SEL CACHE POT	12" Acanthus Whitewater	F/P	40		1G SELECT	1G Salvia Windwalker Royal Red Plant Select	B/O	8			
12 SEL CACHE POT	12" Begonia Dragon Wing Red	B/C	50		1G SELECT	1G Sedum Autumn Fire	B/C	5			
12 SEL CACHE POT	12" Cassia Popcorn	B/B	36		1G SELECT	1G Sedum Burrito	F/P	2			
12 SEL CACHE POT	12" Ornamental Millet Copper Prince	F/P	16		1G SELECT	1G Shasta Daisy Becky	F/P	20			
12 SEL CACHE POT	12" Ornamental Millet Purple Baron	F/P	53		1G SELECT	1G Shasta Daisy Carpet Angel Daisy	B/O	2			
12 SEL CACHE POT	12" Shasta Daisy Becky	F/P	14		1G SELECT	1G Sunflower Sunfinity	B/O	19			
12 SEL CACHE POT	12" Sunflower Sunfinity	B/B	60		1G SHOWCASE	1G Calamagrostis Karl Foerster	F/P	2			
8 SHOWCASE	8" Senecio Angel Wings	F/P	10		1G SHOWCASE	1G Mixi Retro Summer	B/B	5			
1G ANNUAL	1G Marigold Xochi Orange	F/P	15		1G SHOWCASE	1G Scabiosa Focal Scoop Lavender	B/O	18			
1G LIMITED	1G Kniphofia Poco Orange	B/B	3		1G SHOWCASE	1G Scabiosa Scoop Blackberry	B/O	15			
1G LIMITED	1G Kniphofia Poco Red	B/B	3		1G SHOWCASE	1G Scabiosa Scoop Candy	B/B	7			
1G LIMITED	1G Kniphofia Poco Sunset	B/C	1		1G SHOWCASE	1G Scabiosa Scoop Candy	B/O	15			
1G LIMITED	1G Kniphofia Poco Sunset	F/P	1		1G SHOWCASE	1G Scabiosa Scoop Cherry Vanilla	B/B	12			
1G SELECT	1G Arctotis Ravers Pink Sugar	B/B	15		1G SHOWCASE	1G Sempervivum SuperSemp Onyx	F/P	18			
1G SELECT	1G Arctotis Ravers Pink Sugar	F/P	8		1G SHOWCASE	1G Sempervivum SuperSemp Ruby	F/P	30			
1G SELECT	1G Canna Cannova Bronze Orange	F/P	8		1G SHOWCASE	1G Senecio Angel Wings	F/P	60			
1G SELECT	1G Canna Cannova Bronze Scarlet	F/P	6		4 ANNUAL	4" Begonia Brown Leaf Mix	B/B	10			
1G SELECT	1G Centranthus Red Valerian	F/P	18		4 ANNUAL	4" Begonia Brown Leaf Pink	B/B	25			
1G SELECT	1G Coreopsis Zagreb	B/B	5		4 ANNUAL	4" Begonia Brown Leaf Red	B/B	2			
1G SELECT	1G Cuphea Bat Face Red	B/B	7		4 ANNUAL	4" Begonia Brown Leaf White	B/B	30			
1G SELECT	1G Dahlia Mystic Spirit	B/O	8		4 ANNUAL	4" Begonia Green Leaf Pink	B/B	35			
1G SELECT	1G Echinacea Artisan™ Red Ombre	B/B	60		4 ANNUAL	4" Begonia Green Leaf Red	B/B	30			
1G SELECT	1G Echinacea Artisan™ Red Ombre	B/C	3		4 ANNUAL	4" Begonia Green Leaf White	B/B	30			
1G SELECT	1G Echinacea Artisan™ Red Ombre	F/P	25		4 ANNUAL	4" Begonia Tophat Mix	B/B	15			
1G SELECT	1G Echinacea Artisan™ Soft Orange	B/B	10		4 ANNUAL	4" Celosia Armor Mix	B/B	5			
1G SELECT	1G Echinacea Artisan™ Soft Orange	B/O	3		4 ANNUAL	4" Celosia Dracula Red	B/B	3			
1G SELECT	1G Echinacea Artisan™ Soft Orange	F/P	32		4 ANNUAL	4" Celosia Green Leaf Mix	B/B	15			
1G SELECT	1G Evolvulus Blue My Mind	B/B	40		4 ANNUAL	4" Celosia Green Leaf Orange	B/B	15			
1G SELECT	1G Evolvulus Blue My Mind	B/C	20		4 ANNUAL	4" Celosia Green Leaf Red	B/B	15			
1G SELECT	1G Evolvulus Blue My Mind	F/P	45		4 ANNUAL	4" Celosia Green Leaf Yellow	B/B	14			
1G SELECT	1G Foxglove Pink Panther	B/B	3		4 ANNUAL	4" Celosia Red Leaf Red	B/B	36			
1G SELECT	1G Gaillardia Arizona Sun	B/O	6		4 ANNUAL	4" Coleus Superfine Rainbow Mix	F/P	7			
1G SELECT	1G Gomphrena Truffula Pink	B/B	25		4 ANNUAL	4" Cosmos Intermediate Mix	B/B	33			
1G SELECT	1G Heliotrope Fragrant Delight	B/O	7		4 ANNUAL	4" Cosmos Intermediate Mix	F/P	12			
1G SELECT	1G Lavender Primavera	B/B	26		4 ANNUAL	4" Cosmos Intermediate Pink	B/B	8			
1G SELECT	1G Nepeta Little Trudy Plant Select®	B/B	4		4 ANNUAL	4" Cosmos Intermediate White	B/O	9			
1G SELECT	1G Penstemon Sunset Glow Plant Select	B/B	7		4 ANNUAL	4" Cosmos Sonata Carmine	B/B	6			
1G SELECT	1G Plectranthus Velvet Elvis	F/P	11		4 ANNUAL	4" Dahlberg Daisy Golden Fleece	B/B	9			
1G SELECT	1G Rudbeckia Annillo Gold	B/B	15		4 ANNUAL	4" Dianthus Intermediate Mix	B/C	11			
1G SELECT	1G Rudbeckia Autumn Colors	B/O	25		4 ANNUAL	4" Gazania Mix	B/B	10			
1G SELECT	1G Rudbeckia Denver Daisy Plant Select®	B/B	15		4 ANNUAL	4" Gazania Mix	B/C	9			
1G SELECT	1G Rudbeckia Goldsturm	B/C	8		4 ANNUAL	4" Gazania Orange	B/B	7			
1G SELECT	1G Rudbeckia Goldsturm	F/P	45		4 ANNUAL	4" Gazania Orange	B/C	8			
1G SELECT	1G Rudbeckia Indian Summer	B/O	5		4 ANNUAL	4" Gazania Orange Flame	B/B	6			
1G SELECT	1G Salvia Ember's Wish	B/O	13		4 ANNUAL	4" Gazania Orange Flame	B/C	17			
1G SELECT	1G Salvia Love And Wishes	B/C	12		4 ANNUAL	4" Gazania Red	B/B	8			
1G SELECT	1G Salvia Vermillion Bluffs Plant Select®	F/P	10		4 ANNUAL	4" Gazania Red	B/C	23			

4. The number of ornamental species grown in nurseries in San Diego county is above 1,000

From: County of San Diego, Department of Agriculture, Weights and Measures

Exports San Diego Origin	Agave isthmensis	Aloe nobilis	Banksia hookeriana	Capsicum frutescens	Commiphora sp	Dieffenbachia seguine	Echinopsis hybrid	Euphorbia trigona	Gibbaeum dispar	Hesperaloe parviflora	Leucadendron galpinii
Acacia aneura	Agave lophantha	Aloe peglerae	Banksia integrifolia	Capsicum sp	Coniogramme sp	Dieffenbachia sp	Elaeocarpus sp	Euphorbia x martinii	Gomphrena hybrid	Hesperozygis hybrid	Leucadendron sp
Acacia cultriformis	Agave macracantha	Aloe polyphylla	Banksia praemorsa	Carissa macrocarpa	Copiapoa cinerea	Dioscorea sylvatica	Elegia capensis	Evolvulus glomeratus	Gonolobus cyclophylla	Hibiscus rosa-sinensis	Leucadendron spp
Acacia sp	Agave macroacantha	Aloe rubroviolacea	Banksia sp	Carissa sp	Copiapoa humilis	Dioscorea elephantipes	Epipremnum aureum	Farfugium japonicum	Graptopetalum paraguayense	Hibiscus sp	Leuchtenbergia principis
Acorus gramineus	Agave Manfredii	Aloe sp	Bauhinia blakeana	Carpenteria californica	Copiapoa hypoga	Dischidia sp	Epipremnum sp	Fatshedera lizei	Graptopetalum sp	Hohenbergia correia-araujoi	Ligustrum japonicum
Adenia glauca	Agave mitis	Aloe speciosa	Bauhinia sp	Carya illinoensis	Cordylina sp	Discocactus placentiformis	Eriobotrya japonica	Fatshedera sp	Graptosedum rosa	Hohenbergia sp	Ligustrum sp
Adenia spinosa	Agave montana	Aloe squarrosa	Beaucarnea recurvata	Catasetum pileatum	Coryphantha corr	Dodonaea sp	Eriodictyon crassifolium	Fatsia japonica	Graptosedum sp	Hohenbergia vestita	Lithops aucampiae
Adenium arabicum	Agave ocahui	Aloe striata	Begonia sp	Catasetum sp	Coryphantha del	Dorstenia foetida	Eriosyce chilensis	Fatsia sp	Graptosedum sp	Homalocladium platycladum	Lithops sp
Adenium somalense	Agave ovatifolia	Aloe vanbalenii	Beta sp	Catasetum spitzii	Cotoneaster dam	Dorstenia gigas	Eriosyce crispa	Faucaria candida	Graptoveria sp	Howea sp	Livistona chinensis
Adiantum sp	Agave parrasana	Aloe variegata	Bignonia sp	Cattleya aurantiaca	Cotyledon ladism	Dracaena deremensis	Eriosyce heinrichiana	Faucaria sp	Grevillea gaudichaudii	Hoya kerrii	Macadamia sp
Adromischus cristatus	Agave parryi	Aloe vera	Bignonia tweediana	Cattleya guttata	Cotyledon orbicu	Dracaena draco	Eriosyce villosa	Faucaria species	Grevillea hookeriana	Huernia thuretii	Maihueiopsis glomerata
Adromischus maculatus	Agave pelona	Aloe zebrina	Billbergia amoena	Cattleya kerrii	Cotyledon sp	Dracaena fragrans	Eruca sativa	Faucaria tigrina	Grevillea robusta	Hylocereus sp	Malus domestica
Adromischus sp	Agave potatorum	Aloinopsis malherbei	Billbergia elegans	Cattleya leopoldii	Cotyledon tomen	Dracaena marginata	Espostoa guentheri	Faucaria tuberculosa	Grevillea sp	Hylocereus undatus	Malus sp
Aechmea caudata	Agave pygmaea	Aloinopsis rubrolineata	Billbergia nutans	Cattleya mossiae	Crassula alstonii	Dracaena sp	Espostoa lanata	Fenestraria aurantiaca	Grewia cafra	Hypericum sp	Mammillaria albicans
Aechmea nudicaulis	Agave salmiana	Aloinopsis schooneesii	Billbergia sp	Cattleya sp	Crassula arboresc	Drimsys lanceolata	Espostoa melanostele	Fenestraria sp	Guzmania sp	Ilex x altaclarensis	Mammillaria albilanata
Aechmea racinae	Agave scabra	Alpinia sp	Billbergia vittata	Cattleya walkeriana	Crassula arboresc	Dudleya brittonii	Espostoa ritteri	Fenestria sp	Gymnocalycium andreae	Impatiens sp	Mammillaria backebergiana
Aechmea recurvata	Agave sebastiana	Alostroemeria sp	Bismarckia nobilis	Cedrus sp	Crassula argentea	Dudleya hassei	Espostoa sp	Ferocactus chrysacanthus	Gymnocalycium baldianum	Ipomoea batatas	Mammillaria bocasana
Aechmea sp	Agave shawii	Amaranthus sp	Bombax sp	Celosia sp	Crassula capitella	Dudleya sp	Espostopsis dybowskii	Ferocactus emoryi	Gymnocalycium bruchii	Jacaranda mimosifolia	Mammillaria bombycina
Aechmea triangularis	Agave sp	Anacampseros sp	Bougainvillea sp	Cephalopentandra ecirrhosa	Crassula obliqua	Dudleya sp	Eucalyptus gunnii	Ferocactus glaucescens	Gymnocalycium denudatum	Jovibarba sp	Mammillaria carretii
Aeonium haworthii	Agave tequilana	Anagallis arvensis	Bowiea volubilis	Ceracidium sp	Crassula ovata	Duranta repens	Eucalyptus kruseana	Ferocactus gracilis	Gymnocalycium eurypleurum	Juncus sp	Mammillaria columbiana
Aeonium haworthii hybrids	Ananas sp	Brachychiton populneus	Cereus hildmannianus	Cereus hildmannianus	Crassula perforat	Duranta sp	Eucalyptus nicholi	Ferocactus hamatacanthus	Gymnocalycium hibotan X hylocereus undatus	Juniperus californica	Mammillaria compressa
Aeonium sp	Agave utahensis	Angelonia sp	Brachychiton rupestris	Cereus trigonodendron	Crassula sp	Dyckia marnier-lapostolle	Eucalyptus parvifolia	Ferocactus histrix	Gymnocalycium mesopotamicum	Juniperus chinensis	Mammillaria crinita
Aeonium arboreum	Agave variegata	Anigozanthos flavidus	Brashea armata	Ceropegia sp	Crassula tetragon	Dyckia sp	Eucalyptus polyanthemus	Ferocactus latispinus	Gymnocalycium mihanovichii	Juniperus sp	Mammillaria crinita subsp wildii
Aeonium sp	Agave victoriae-reginae	Anigozanthos sp	Brassica oleracea	Ceropegia woodii	Crassula ovata	Echeveria agavoides	Eucalyptus pulverulenta	Ferocactus macrodiscus	Gymnocalycium decipiens	Kalanchoe beharensis	Mammillaria decipiens camptotricha
Aeschynanthus micranthus	Agave weberi	Anthurium sp	Brassica oleracea var sabellica	Chamaedorea sp	Cremnosedum sp	Echeveria craigiana	Eucalyptus sp	Ferocactus pilosus	Gymnocalycium oenanthemum	Kalanchoe blossfeldiana	Mammillaria decipiens subsp camptotricha
Aeschynanthus sp	Agave xylonacantha	Apium sp	Bursera fagaroides	Chamaerops humilis	Cryptanthus sp	Echeveria elegans	Euonymus japonicus	Ferocactus schwarzii	Gymnocalycium pflanzii	Kalanchoe pumila	Mammillaria deherdtiana
Aeschynanthus spp	Ageratum houstonianum	Aralia sp	Bursera hindsiana	Chamaerops sp	Ctenanthe sp	Echeveria gibbiflora	Euphorbia abyssinica	Ferocactus wislizeni	Gymnocalycium saglionis	Kalanchoe sp	Mammillaria densispina
Agave albopilosa	Aglaonema sp	Archontophoenix cunninghamiana	Butia capitata	Chamaelaucium uncinatum	Cucurbita sp	Echeveria laui	Euphorbia ammak	Ferocactus emoryi covillei	Gymnocalycium schickendantzii	Kalanchoe species	Mammillaria dixanthocentron
Agave americana	Ajuga reptans	Archontophoenix sp	Butia sp	Cheiridopsis denticulata	Cuphea hybrid	Echeveria lilacina	Euphorbia anoplia	Ficus benjamina	Gymnocalycium sp	Kalanchoe thyrsiflora	Mammillaria duwei
Agave applanata	Alluaudia procera	Arctotis x hybrida	Butiagrus nabonnandii	Chlorophytum comosum	Cuphea micropet	Echeveria sp	Euphorbia bupleurifolia	Ficus carica	Gymnocalycium spegazzinii	Kalanchoe tomentosa	Mammillaria elongata
Agave attenuata	Alluaudia sp	Areca sp	Buxus microphylla	Chlorophytum sp	Cuphea sp	Echeveria spp	Euphorbia cylindrifolia	Ficus elastica	Gymnocalycium stenopleurum	Kalanchoe Species	Mammillaria formosa
Agave bovicornuta	Aloe	Ariocarpus retusus	Buxus microphylla	Chondropetalum sp	Cupressus glauca	Echeveria subrigida	Euphorbia fasciculata	Ficus lyrata	Gymnocalycium uebelmannianum	Kennedia nigricans	Mammillaria geminisipina
Agave bracteosa	Aloe "Crosby's Prolific"	Artemisia californica	Buxus sp	Chorisia speciosa	Cupressus sp	Echinocereus adustus	Euphorbia leucodendron	Ficus nitida	Gymnocalycium Sp	Kleinia sp	Mammillaria glassii
Agave celsii	Aloe aculeata	Artemisia douglasiana	Cactaceae	Chrysanthemum sp	Cupressus macro	Echinocactus platyacanthus	Euphorbia ingens	Ficus palmeri	Haageocereus multangularis	Kunzea ambigua	Mammillaria glochidiata
Agave celsii x Agave ocahui	Aloe aristata	Asparagus asparagoides	Cactaceae sp	Cinnamomum camphora	Cupressus sempe	Echinocactus sp	Euphorbia lactea	Ficus pumila	Haageocereus pseudomelanostele	Lactuca sativa	Mammillaria guelzowiana
Agave colorata	Aloe bainesii	Asparagus plumosus	Cactus sp	Cipocereus bradei	Cupressus sp	Echinocereus adustus	Euphorbia leucodendron	Ficus repens	Hakonechloa macra	Laelia anceps	Mammillaria haageana
Agave ferdinandii-regis	Aloe barbadensis	Asparagus sp	Caesalpinia sp	Citrus aurantifolia	Cyathea cooperi	Echinocereus laui	Euphorbia loricata	Ficus sp	Hardenbergia violacea	Laelia milleri	Mammillaria hahniana
Agave ferox	Aloe brevifolia	Asplenium antiquum	Caladium bicolor	Citrus limon	Cycas revoluta	Echinocereus pulchellus	Euphorbia mammillaris	Fockea edulis	Haworthia cooperi	Laelia pumila	Mammillaria hamata
Agave filifera	Aloe capitata	Asplenium polyodon	Calandrinia caespitosa	Citrus paradisi	Cynochos chloro	Echinocereus reichenbachii	Euphorbia meloformis	Fouquieria leonilae	Haworthia fasciata	Laelia purpurata	Mammillaria heyderi
Agave geminiflora	Aloe ciliaris	Asplenium sp	Calibanus hookeri	Citrus reticulata	Cyphostemma cir	Echinocereus viridiflorus	Euphorbia milii	Fouquieria macdougalii	Haworthia magnifica	Laelia sincorana	Mammillaria huitzilopochtli
Agave gentryi	Aloe claviflora	Aster sp	Calibrachoa parviflora	Citrus sinensis	Cyphostemma qu	Echinopsis ancistrophora	Euphorbia milii Hybrid sp	Fouquieria splendens	Haworthia retusa	Laelia tenebrosa	Mammillaria karwinskiana
Agave ghiesbreghtii	Aloe compressa	Astrophytum capricorne	Calibrachoa sp	Cleistocactus acanthurus	Dahlia sp	Echinopsis aurea	Euphorbia obesa	Fraxinus sp	Haworthia sp	Lagenaria siceraria	Mammillaria klissingiana
Agave gigantensis	Aloe confiera	Astrophytum myriostigma	Calibrachoa x hybrida	Cleistocactus samaipatanus	Dasylirion sp	Echinopsis cinnabarina	Euphorbia perrieri	Fuchsia x hybrida	Haworthia species	Lagerstroemia sp	Mammillaria longiflora
Agave gracilipes	Aloe deltoideodonta	Astrophytum ornatum	Callistemon sp	Cleistocactus strausii	Dasylirion wheel	Echinopsis formosa	Euphorbia pubiglans	Furcraea sp	Haworthia venosa	Lamium maculatum	Mammillaria magnimamma
Agave guadalajarana	Aloe dichotoma	Austrocylindropuntia cylindrica	Callistemon viminalis	Cleistocactus winteri	Daucus carota	Echinopsis haematantha	Euphorbia pulcherrima	Gardenia jasminoides	Hechtia tillandsioides	Lantana sp	Mammillaria marksiana
Agave gypsophila	Aloe distans	Austrocylindropuntia cylindrica	Calocedrus decurrens	Clowesia rosea	Davallia sp	Echinopsis huascha	Euphorbia resinifera	Gasteria glomerata	Hedera canariensis	Lapidaria margaretae	Mammillaria matudae
Agave havardiana	Aloe ferox	Austrocylindropuntia sp	Calothamnus quadrifidus	Codiaeum sp	Delosperma coop	Echinopsis pentlandii	Euphorbia sp	Gasteria sp	Hedera helix	Laurus nobilis	Mammillaria melanocentra
Agave horrida	Aloe fragilis	Austrocylindropuntia subulata	Calothamnus villosus	Coffea catura	Delosperma sp	Echinopsis saltensis	Euphorbia stenoclada	Gelsemium sempervirens	Hedera sp	Lepismium cruciforme	Mammillaria microhelia
Agave impressa	Aloe harlana	Bambusa oldhamii	Camellia sp	Coleocephalocereus aureus	Dianella sp	Echinopsis schieliana	Euphorbia tirucalli	Genista sp	Heliotropium arborescens	Leptospermum rotundifolium	Mammillaria muelhlenpfordtii

Mammillaria nejapensis	Neoraimondia herzogiana	Parodia scopa	Polystichum sp	Rosa rugosa	Stapelia sp	Tillandsia capillaris	Tillandsia hamaleana	Tillandsia narthecioides	Tillandsia somnians	Vriesea sagasteguii
Mammillaria nivosa	Neoregelia bahiana	Parodia warasii	Portulaca sp	Rosa sp	Stenocactus multicostratus	Tillandsia capitata	Tillandsia hammeri	Tillandsia neglecta	Tillandsia sp	Vriesea sp
Mammillaria parkinsonii	Neoregelia kautskyi	Parodia werdermanniana	Portulacaria afra	Rosmarinus officinalis	Stenocactus ochoteranus	Tillandsia caput-medusae	Tillandsia heteromorpha	Tillandsia nidus	Tillandsia stellifera	Washingtonia filifera
Mammillaria petterssonii	Neoregelia punctatissima	Parthenocissus tricuspidata	Portulacaria sp	Rosmarinus sp	Stenocactus phyllacanthus	Tillandsia carrilloi	Tillandsia hildae	Tillandsia novakii	Tillandsia straminea	Washingtonia robusta
Mammillaria plumosa	Neoregelia sp	Pelargonium sp	Portulacaria sp	Rubus sp	Stenocactus vaupellianus	Tillandsia castellanii	Tillandsia hondurensis	Tillandsia nuptialis	Tillandsia streptocarpa	Wigginsia pauciareolata
Mammillaria polythele polythele	Neoregelia zonata	Peperomia obtusifolia	Protea eximia	Rudbeckia sp	Stenocereus pruinosus	Tillandsia caulescens	Tillandsia humilis	Tillandsia occulta	Tillandsia streptophylla	Yucca elata
Mammillaria pringlei	Nephrolepis obliterata	Peperomia sp	Protea sp	Rumex acetosa	Stenocereus thurberi	Tillandsia cauligera	Tillandsia Hybrid	Tillandsia paleacea	Tillandsia stricta	Yucca elephantipes
Mammillaria rekoii	Nephrolepis sp	Persea americana	Prunus armeniaca	Russelia equisetiformis	Stephanotis floribunda	Tillandsia chapeuensis	Tillandsia incarnata	Tillandsia paraensis	Tillandsia sucrei	Yucca filamentosa
Mammillaria rhodantha	Nerium oleander	Petunia axilaris	Prunus caroliniana	Sabal palmetto	Stetsonia coryne	Tillandsia chiapensis	Tillandsia intermedia	Tillandsia pardoii	Tillandsia tectorum	Yucca gloriosa
Mammillaria schiedeana	Nerium sp	Petunia hybrida	Prunus domestica	Sabal sp	Stetsonia sp	Tillandsia chusgonensis	Tillandsia ionantha	Tillandsia paucifolia	Tillandsia tenuifolia	Yucca linearifolia
Mammillaria schwarzii	Nolina recurvata	Petunia sp	Prunus persica	Salvia apiana	Tillandsia nicolai	Tillandsia coccensis	Tillandsia ixioidea	Tillandsia peiranoi	Tillandsia tomekii	Yucca pallida
Mammillaria scrippsiana	Nolina sp	Petunia x hybrida	Prunus sp	Salvia argentea	Strelitzia reginae	Tillandsia coinaensis	Tillandsia jalisco-monticola	Tillandsia plagiotropica	Tillandsia tricholepis	Yucca rostrata
Mammillaria sempervivi	Olea europaea	Philodendron cordatum	Psidium sp	Salvia greggii	Strelitzia sp	Tillandsia compressa	Tillandsia jonesii	Tillandsia plumosa	Tillandsia tricolor	Yucca schottii
Mammillaria senilis	Olea sp	Philodendron erubescens	Pteris albolineata	Salvia officinalis	Stromanthe sp	Tillandsia concolor	Tillandsia jucunda	Tillandsia pohliana	Tillandsia umbellata	Yucca sp
Mammillaria sp	Opuntia chlorotica	Philodendron ornatum	Punica granatum	Salvia rosmarinus	Sutera hybrid	Tillandsia confertiflora	Tillandsia juncea	Tillandsia polita	Tillandsia usneoides	Zamia floridana
Mammillaria spinosissima	Opuntia engelmannii	Philodendron selloum	Punica sp	Sanseveria Sp	Syagrus romanzoffiana	Tillandsia confinis	Tillandsia juncifolia	Tillandsia polystachia	Tillandsia velickiana	Zamia furfuracea
Mammillaria spinosissima pilcayensis	Opuntia linguiformis	Philodendron sp	Pygmaeocereus bylesianus	Sanseveria laurentii	Syagrus sp	Tillandsia copalaensis	Tillandsia kegeliana	Tillandsia pretiosa	Tillandsia vernicosa	Zamioculcas sp
Mammillaria spinosissima subsp pilcayensis	Opuntia microdasys	Philodendron spiritus-sancti	Pyrus calleryana	Sanseveria sp	Syngonium sp	Tillandsia copanensis	Tillandsia kegeliana	Tillandsia pretiosa	Tillandsia vernicosa	Zamioculcas zamiifolia
Mammillaria standleyi	Opuntia sp	Phlebodium aureum	Pyrus kawakami	Sanseveria trifasciata	Tacitus bellus	Tillandsia crocata	Tillandsia kirschneckii	Tillandsia propagulifera	Tillandsia vicientina	Zauschneria sp
Mammillaria supertexta	Opuntia subulata	Phlebodium sp	Pyrus sp	Sanseveria zeylandica	Tagetes erecta	Tillandsia cyanea	Tillandsia klausii	Tillandsia pruinosa	Tillandsia werdermannii	
Mammillaria vetula	Oreocereus celsianus	Phlox divaricata	Quercus sp	Sanseveria spp	Tagetes sp	Tillandsia diagiutensis	Tillandsia koehresiana	Tillandsia pucaraensis	Tillandsia xiphioides	
Mammillaria zeilmanniana	Oreocereus sp	Phoenix canariensis	Quercus suber	Sarcocaulon herrei	Tecoma sp	Tillandsia didisticha	Tillandsia krukoffiana	Tillandsia pueblensis	Tillandsia zacapanensis	
Mammilloydia candida	Oreocereus trollii	Phoenix dactylifera	Quercus virginiana	Schefflera arboricola	Thelocactus bicolor	Tillandsia disticha	Tillandsia kurt-horstii	Tillandsia punctulata	Tillandsia houston	
Mangifera sp	Othonna sp	Phoenix roebelenii	Quesnelia sp	Schefflera sp	Thelocactus maddowellii	Tillandsia dorotheae	Tillandsia kuzmae	Tillandsia purpurea	Tipuna tipu	
Maranta sp	Pachira aquatica	Photinia fraseri	Quesnelia testudo	Schinus molle	Tillandsia achyrostachys	Tillandsia dura	Tillandsia latifolia	Tillandsia raackii	Titanopsis calcarea	
Matucana haynei	Pachira sp	Photinia fraseri	Racinaea crispata	Schinus sp	Tillandsia acostae	Tillandsia duratii	Tillandsia leiboldiana	Tillandsia rauschii	Trachelospermum jasminoides	
Melaleuca alternifolia	Pachycereus marginatus	Phyllostachys sp	Racinaea pugiformis	Scoparia dulcis	Tillandsia acosta-solisii	Tillandsia edithae	Tillandsia leonamiana	Tillandsia rectangula	Trachelospermum sp	
Melaleuca armillaris	Pachycereus pringlei	Pilosocereus chrysacanthus	Racinaea sp	Sedeveria sp	Tillandsia aeranthos	Tillandsia edithae	Tillandsia leucolepis	Tillandsia recurvata	Trachycarpus fortunei	
Melaleuca diosmifolia	Pachyphytum sp	Pilosocereus gounellei	Racinaea spiculosa	Sedum morganianum	Tillandsia albertiana	Tillandsia ehlersiana	Tillandsia lindenii	Tillandsia recurvifolia	Trachycarpus sp	
Melaleuca fufgens	Pachyphytum species	Pilosocereus leucocephalus	Racinaea albida	Sedum nussbaumerianum	Tillandsia albida	Tillandsia espinosae	Tillandsia loliacea	Tillandsia reducta	Tradescantia crassula	
Melaleuca sp	Pachypodium brevicaule	Pilosocereus magnificus	Radermachera sinica	Sedum sp	Tillandsia alvareziae	Tillandsia exserta	Tillandsia lorentziana	Tillandsia reichenbachii	Tylecodon wallichii	
Melocactus azureus	Pachypodium densiflorum	Pilosocereus pachycladus	Ranunculus aculis	Sedum x rubrotinctum	Tillandsia ampla	Tillandsia extensa	Tillandsia lotteae	Tillandsia retrorsa	Uebelmannia pectinifera	
Melocactus curvispinus	Pachypodium geayi	Pilosocereus pachycladus pachycladus	Ranunculus sp	Selaginella kraussiana	Tillandsia andreaana	Tillandsia fasciculata	Tillandsia macbrideana	Tillandsia rodrigueziana	Ulmus parvifolia	
Melocactus matanzanus	Pachypodium lamerei	Pilosocereus piauhensis	Ranunculus spp	Sempervivum arachnoideum	Tillandsia araujei	Tillandsia festucoides	Tillandsia magnispica	Tillandsia roezlii	Vaccinium corymbosum	
Melocactus violaceus	Pachypodium namaquanum	Pilosocereus royerii	Rebutia arenacea	Sempervivum sp	Tillandsia argentina	Tillandsia filifolia	Tillandsia magnusiana	Tillandsia roland-gosselini	Verbena hybrida	
Melocactus azureus	Pachypodium sp	Pinus pinea	Rebutia canigueralii	Senecio herreianus	Tillandsia baileyi	Tillandsia flabellata	Tillandsia mallemontii	Tillandsia roland-gosselinii	Verbena sp	
Micranthocereus dolichospermaticus	Pachyveria haagii	Pistacia lentiscus	Rebutia fiebrigii	Senecio peregrinus	Tillandsia balbisiana	Tillandsia flagellata	Tillandsia marconae	Tillandsia roseoscapa	Verbena xhybrida	
Micranthocereus estevesii	Pachyveria sp	Pittosporum sp	Rebutia heliosa	Senecio radicans	Tillandsia bandensis	Tillandsia flavobraceata	Tillandsia matudae	Tillandsia rothii	Vigna sp	
Microsorium sp	Pandorea jasminoides	Pittosporum tobira	Rebutia mentosa	Senecio rowleyanus	Tillandsia barclayana	Tillandsia flexuosa	Tillandsia mauryana	Tillandsia rotundata	Vigna sp	
Monstera deliciosa	Parodia buiningii	Platanus racemosa	Rebutia minuscula	Senecio scaposus	Tillandsia barthlottii	Tillandsia floribunda	Tillandsia mazatlanensis	Tillandsia rubroviolacea	Viola cornuta	
Monstera sp	Parodia chrysacanthion	Platanus sp	Rebutia neocumingii	Senecio sp	Tillandsia bergeri	Tillandsia fragrans	Tillandsia melanocrater	Tillandsia scaligera	Viola wittrockiana	
Morus rubra	Parodia crassigibba	Platycerium sp	Rebutia senilis	Senecio spathulatus	Tillandsia beutelspacheri	Tillandsia fuchsi	Tillandsia mereliana	Tillandsia scaposa	Vriesea appenii	
Musa sp	Parodia erubescens	Plectranthus sp	Rhaphiolepis sp	Senecio species	Tillandsia brachycaulos	Tillandsia funkiana	Tillandsia mima	Tillandsia botatzlii	Vriesea botafogensis	
Musa zebrina	Parodia haselbergii	Pleiospilos nelli	Rhapidophyllum hystrix	Senecio sp	Tillandsia brenneri	Tillandsia gardneri	Tillandsia minasgeraisensis	Tillandsia schiedeana	Vriesea chontalensis	
Myoporum parvifolium	Parodia herteri	Pleiospilos sp	Rhipsalis burchellii	Solanum bicolor	Tillandsia bryoides	Tillandsia geminiflora	Tillandsia mitlaensis	Tillandsia schusteri	Vriesea corcovadensis	
Myrtus sp	Parodia leninghausii	Pleiospilos sp	Rhipsalis teres	Solanum lycopersicum	Tillandsia buchlohii	Tillandsia gilliesii	Tillandsia mollis	Tillandsia secunda	Vriesea espinosae	
Nandina domestica	Parodia magnifica	Plumeria rubra	Rhoeo sp	Solanum melongena	Tillandsia bulbosa	Tillandsia glabrior	Tillandsia mooreana	Tillandsia seleriana	Vriesea guttata	
Nematanthus gregarius	Parodia mammulosa	Plumeria sp	Rhus sp	Solanum sp	Tillandsia butzii	Tillandsia graomogolensis	Tillandsia multicaulis	Tillandsia setacea	Vriesea hitchcockiana	
Nematanthus hybrid	Parodia schumanniana	Polatiscia chichipe	Rosa banksiae	Solenostemon sp	Tillandsia cacticola	Tillandsia grossipicata	Tillandsia myriantha	Tillandsia simulata	Vriesea philippocoburgii	

Central Valley crops, for comparison

Appendix: Acreage of crops grown in the Central Valley (San Joaquin Valley and Sacramento Valley combined).

The list is based on the USDA Agricultural Census and Survey 2012, which is currently the most recent year with a detailed list of crops (available online at: <https://quickstats.nass.usda.gov/>).

The percentages of each crop as well as the cumulative % are estimates of the proportion of the total acreage in the Central Valley. Non-irrigated acreage may be included for some field crops. Rice was excluded from the list. The crops included in this report are written in bold typeface.

List of Central Valley crops				
#	Commodity	Acreage	% of total	Cumulative %
1	Almonds	736719	13.15	13.15
2	Grapes	586993	10.47	23.62
3	Wheat, Winter & Spring, excl. Durum	552759	9.86	33.48
4	Hay, Alfalfa	498767	8.90	42.38
5	Corn, Silage	464365	8.29	50.67
6	Cotton	350765	6.26	56.93
7	Processing Tomatoes	274712	4.90	61.83
8	Walnuts	227729	4.06	65.90
9	Hay, Small Grain	226858	4.05	69.94
10	Corn, Grain	195113	3.48	73.43
11	Pistachios	175541	3.13	76.56
12	Haylage, excl. Alfalfa	169010	3.02	79.57
13	Oranges	157350	2.81	82.38
14	Haylage, Alfalfa	72795	1.30	83.68
15	Barley	65500	1.17	84.85
16	Hay, excl. Small Grain & Alfalfa	52435	0.94	85.79
17	Sunflower	46914	0.84	86.62
18	Peaches	44641	0.80	87.42
19	Wheat, Durum	42327	0.76	88.17
20	Sorghum, Silage	39252	0.70	88.88
21	Prunes	36480	0.65	89.53
22	Beans, Dry, excl. Lima	35715	0.64	90.16
23	Carrots	34280	0.61	90.78
24	Olives	32517	0.58	91.36
25	Pomegranates	28852	0.51	91.87
26	Tomatoes, Fresh Market	28671	0.51	92.38

Central Valley crops (continued)				
#	Commodity	Acreage	% of total	Cumulative %
27	Cherries	28541	0.51	92.89
28	Potatoes	25799	0.46	93.35
29	Melons, Cantaloupe	25592	0.46	93.81
30	Onions	21927	0.39	94.20
31	Safflower	21723	0.39	94.59
32	Oats	21051	0.38	94.96
33	Tangerines	20386	0.36	95.33
34	Sweet Potatoes	17506	0.31	95.64
35	Garlic	17496	0.31	95.95
36	Plums	17131	0.31	96.26
37	Nectarines	16803	0.30	96.56
38	Sweet Corn	14822	0.26	96.82
39	Grasses & Legumes Totals, Seeds *	13683		
40	Beans, Dry Lima	12912	0.23	97.05
41	Sorghum, Grain	12514	0.22	97.27
42	Triticale	11431	0.20	97.48
43	Melons, Watermelon	9301	0.17	97.64
44	Asparagus	7215	0.13	97.77
45	Hay, Wild **	7171		
46	Cucumbers	6908	0.12	97.90
47	Lemons	6882	0.12	98.02
48	Apricots	6850	0.12	98.14
49	Peppers, Bell	6365	0.11	98.26
50	Apples	5990	0.11	98.36
51	Lettuce, Head	5920	0.11	98.47
52	Pears	5616	0.10	98.57
53	Melons, Honeydew	5458	0.10	98.67
54	Broccoli	5121	0.09	98.76
55	Figs	4068	0.07	98.83
56	Pumpkins	4039	0.07	98.90
57	Squash	4014	0.07	98.97
58	Beans, Snap	3564	0.06	99.04

From: Nitrogen concentrations in harvested plant parts - A literature overview, Dr. Daniel Geisseler, 2016

Central Valley crops (continued)				
#	Commodity	Acreage	% of total	Cumulative %
59	Vegetables, Other	3381	0.06	99.10
60	Blueberries	3121	0.06	99.15
61	Kiwifruit	2721	0.05	99.20
62	Grapefruit	2695	0.05	99.25
63	Persimmons	2139	0.04	99.29
64	Onions, Green	1869	0.03	99.32
65	Plum-Apricot Hybrids	1832	0.03	99.35
66	Lettuce, Romaine	1808	0.03	99.39
67	Beans, Green, Lima	1655	0.03	99.42
68	Pecans	1298	0.02	99.44
69	Tangelos	1221	0.02	99.46
70	Lettuce, Leaf	1086	0.02	99.48
71	Spinach	975	0.02	99.50
72	Eggplant	954	0.02	99.51
73	Cabbage	807	0.01	99.53
74	Strawberries	787	0.01	99.54
75	Peppers, Chile	687	0.01	99.56
76	Daikon	594	0.01	99.57
77	Beets	521	0.01	99.57
78	Brussels Sprouts	481	0.01	99.58
79	Tree Nuts, Other	364	0.01	99.59
80	Parsley	329	0.01	99.60
81	Wild Rice	263	<0.01	99.60
82	Avocados	253	<0.01	99.61
83	Radishes	243	<0.01	99.61
84	Chestnuts	131	<0.01	99.61
85	Blackberries	103	<0.01	99.61
86	Greens, Kale	98	<0.01	99.62
87	Peas, Chinese	90	<0.01	99.62
88	Berries, Other	89	<0.01	99.62
89	Peas, Green, excl. Southern	83	<0.01	99.62
90	Greens, Mustard	60	<0.01	99.62
91	Herbs	54	<0.01	99.62
92	Okra	53	<0.01	99.62

Central Valley crops (continued)				
#	Commodity	Acreage	% of total	Cumulative %
93	Peas, Green, Southern	44	<0.01	99.62
94	Turnips	43	<0.01	99.62
95	Artichokes	36	<0.01	99.63
96	Cauliflower	32	<0.01	99.63
97	Greens, Turnip	22	<0.01	99.63
98	Raspberries	22	<0.01	99.63
99	Peanuts	20	<0.01	99.63
100	Boysenberries	19	<0.01	99.63
101	Greens, Collard	13	<0.01	99.63
102	Celery	6	<0.01	99.63
103	Watercress	6	<0.01	99.63
104	Mint	5	<0.01	99.63
105	Horseradish	3	<0.01	99.63
106	Rhubarb	2	<0.01	99.63

* Not included, because category includes many different species

** Not included, because not likely to be irrigated

Variety of container sizes



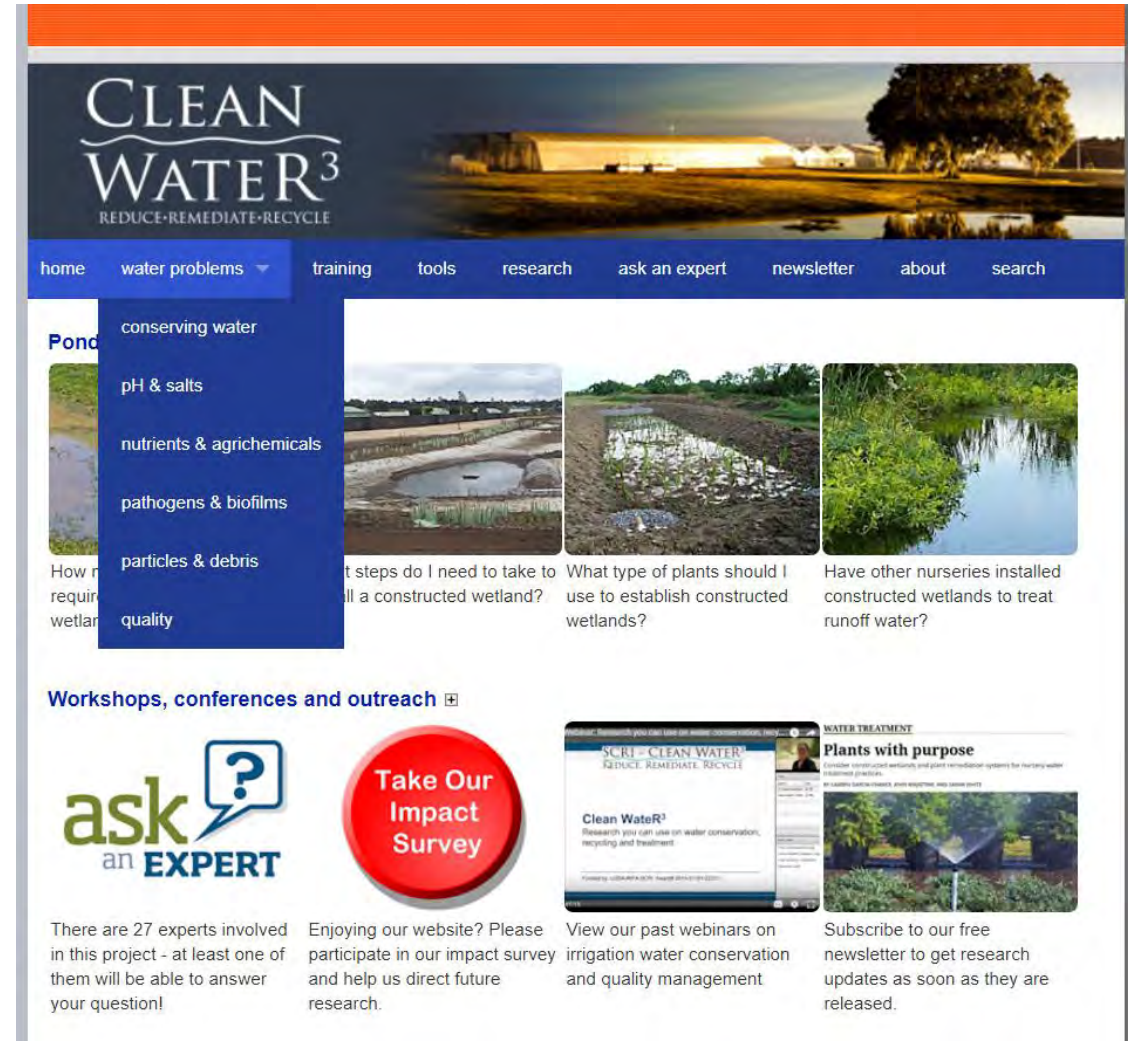
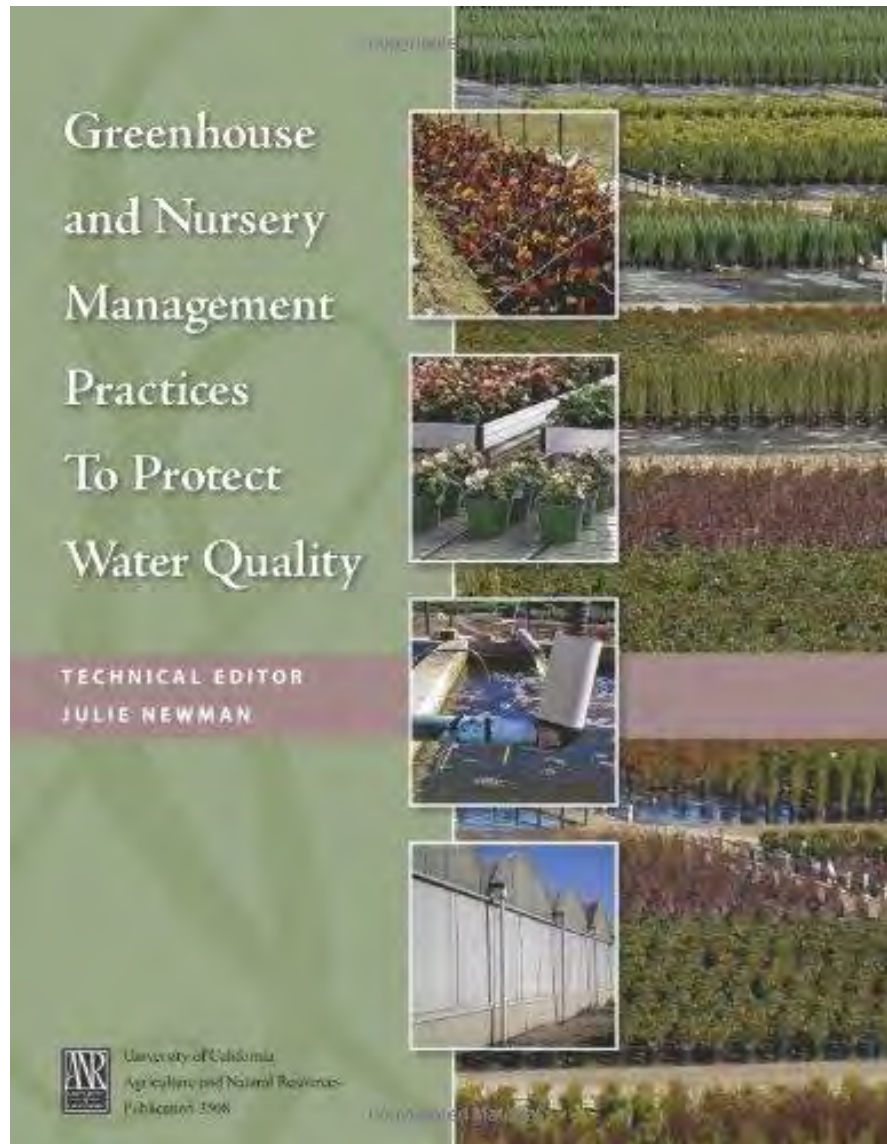
American Standard for Nursery Stock (ANSI Z60.1-2014)

1.1.3.1 Container class volume ranges

Table 1 – Container class volume ranges			
Container class specification	Container volume range		Box size equivalent
	Cubic Inches Min - Max	Cubic Centimeters Min - Max	
#SP1	6 ½ - 8	106 - 131	
#SP2	13 - 15	213 - 246	
#SP3	20 - 30	328 - 492	
#SP4	51 - 63	836 - 1033	
#SP5	93 - 136	1524 - 2229	
#1	152 - 251	2492 - 4115	
#2	320 - 474	5246 - 7770	
#3	628 - 742	10285 - 12164	
#5	785 - 1242	12860 - 20360	
#7	1337 - 1790	21913 - 29343	
#10	2080 - 2646	34090 - 43376	
#15	2768 - 3696	45376 - 60589	
#20	4520 - 5152	74096 - 84457	20-inch box
#25	5775 - 6861	94669 - 112472	24-inch box
#45	9356 - 11,434	153317 - 187377	36-inch box
#65	13514 - 16517	221456 - 246051	42-inch box
#95/100	20790 - 25410	340686 - 416394	48-inch box



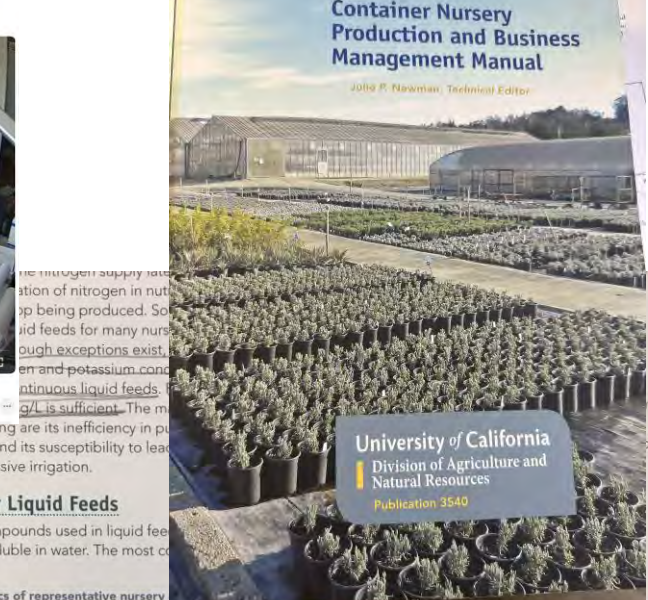
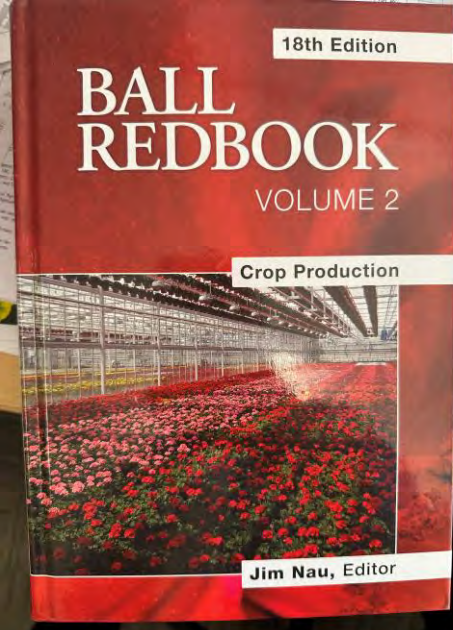
There are practices to protect water quality





1:2	SME	PourThru	Indication
0 to 0.3	0 to 0.8	0 to 1.0	Very Low
0.3 to 0.8	0.8 to 2.0	1.0 to 2.6	Low
0.8 to 1.3	2.0 to 3.5	2.6 to 4.6	Normal
1.3 to 1.8	3.5 to 5.0	4.6 to 6.5	High
1.8 to 2.3	5.0 to 6.0	6.6 to 7.8	Very High
> 2.3	> 6.0	> 7.8	Extreme





5 klux). Low light
ce flowering, and
are not daylength
er long days.

2–24°C) days and
plants are estab-
–50°F (7–10°C)

nights to promote flowering. When flowering begins,
keep night temperatures below 60°F (16°C) to main-
tain flowering.

Fertilize two times a week with 150–200 ppm
alternating between 20-10-20 and 15-0-15. Increase
the rate to 200–300 ppm as plants become estab-
lished. If high salts become a problem, irrigate with
clear water every third watering. Be sure to maintain
fertilizer levels for trailing snapdragons, as low nutri-
tion levels inhibit plant branching. When spikes begin
to elongate, reduce fertilizer applications to increase
postharvest life.

To help control diseases, avoid wetting foliage: If
you must water overhead, make sure all foliage is dry
well before nightfall.

Pinch vegetative snapdragons once roots have
reached the edge of the container. No additional
pinching should be necessary.

The crop time from transplanting a liner to a
flowering 4" (10 cm) pot is six to eight weeks on all

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Allow tray... Increase fertilizer to 100–150 ppm weekly from
20-10-20 alternating with 14-0-14. Avoid ammo-
nium-based fertilizers if growing below 65°F (18°C).
Supplement with magnesium once or twice during
Stage 3 using magnesium sulfate (16 oz./100 gal. [1.2
g/l]) or magnesium nitrate. Occasionally leach with
clear water to reduce salts. Apply fungicides at the
lowest recommended rate to control *Pythium*, rhizo-
tonia, and *Thielaviopsis*.

Harden plugs prior to transplant or sale by lower-
ing soil temperatures to 60–62°F (16–17°C). Allow
medium to dry thoroughly between watering. Continue
to maintain light levels at 1,000–2,500 f.c. (11–27
klux). Feed with 100–150 ppm from 14-0-14 weekly.

A 288-plug tray will take from four to six weeks
from sowing to be ready to transplant to larger
containers.

Cuttings

Stick unrooted cuttings in Oasis wedges or a sterile
medium with a pH of 5.6–5.8. Rooting hormone is
not necessary unless the cuttings are not supple. Main-
tain substrate temperatures of 68–72°F (20–22°C)
and air temperatures of 75–80°F (24–26°C) days
and 68–70°F (20–22°C) nights. Provide 500–1,000
f.c. (5.4–11 klux) of light, and apply a foliar feed of

If sticking c
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containers.

Bedding Growing

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Forms of Nitrogen for Liquid Feeds

The nitrogen-containing compounds used in liquid feeds
must, of course, be highly soluble in water. The most co

Table 6.2. Growth characteristics of representative nursery

Species	Shoot nutrient concentrations				Water use (L)	Recommended liquid feed concentrations		
	Dry wt (g)	N (%)	P (%)	K (%)		N (mg/L)	P (mg/L)	K (mg/L)
<i>Acer palmatum</i>	5.93	2.50	0.67	2.66	4.7	25	8	23
<i>Acorus 'Ogon'</i>	25.10	2.87	0.39	3.73	13.0	49	—	—
<i>Angelonia angustifolia</i>	13.10	3.29	0.49	2.70	3.4	116	17	92
<i>Aptenia cordifolia</i>	26.76	3.25	1.10	7.75	11.3	68	23	160
<i>Argyranthemum frutescens 'Bright Carmine'</i>	21.35	3.20	0.91	5.90	5.6	107	31	199
<i>Armeria maritime</i>	11.36	2.19	0.43	4.38	8.6	29	6	55
<i>Berberis thunbergii 'Crimson Pygmy'</i>	16.04	1.70	0.25	1.82	7.8	38	5	36
<i>Buxus microphylla 'Winter Gem'</i>	18.02	2.28	0.20	1.74	12.1	32	3	23
<i>Calibrachoa 'Superbells Red'</i>	8.60	3.46	0.42	3.35	2.7	97	13	83
<i>Capsicum annuum 'Sweet California Wonder'</i>	21.70	3.97	0.49	2.69	2.9	223	29	232
<i>Caryopteris × clandonensis 'Longwood Blue'</i>	15.30	3.98	0.67	4.30	3.2	184	23	127
<i>Coleus 'Tilt A Whirl'</i>	11.20	3.65	0.57	4.34	2.1	179	29	186
<i>Coreopsis auriculata nana</i>	19.68	2.98	0.47	4.84	5.6	88	15	125
<i>Coreopsis grandiflora 'Early Sunrise'</i>	47.41	2.91	0.37	4.99	11.2	89	22	150
<i>Cosmos 'Sonata Pink'</i>	28.10	1.98	0.50	1.91	3.5	253	37	295
<i>Cuphea hyssopifolia 'Lavender Lace'</i>	5.50	4.44	0.56	4.36	2.9	45	7	25
<i>Dianthus deltoides</i>	20.63	2.98	0.98	3.41	7.8	64	24	80
<i>Dianthus 'Wink'</i>	5.30	2.19	0.62	2.15	3.0	25	7	23
<i>Diascia integririma</i>	17.50	3.46	0.55	4.00	8.2	68	11	79
<i>Echinacea purpurea</i>	14.90	3.03	0.39	2.73	4.3	112	16	123
<i>Euonymus fortunei 'Gracilis'</i>	12.65	2.80	0.61	2.15	5.9	45	11	40
<i>Euonymus fortunei 'Green and Gold'</i>	16.99	2.49	0.30	1.99	12.6	29	4	22
<i>Euryops pectinatus 'Viridis'</i>	25.47	3.62	0.56	4.98	9.3	83	13	123
<i>Gazania 'Majestic Yellow'</i>	19.77	3.62	0.57	6.32	10.1	66	11	114
<i>Hedera helix 'Thorndale'</i>	6.60	3.28	0.36	3.63	2.3	48	8	55
<i>Hemerocallis 'Stella de Oro'</i>	53.67	3.05	0.47	3.94	8.9	140	24	149
<i>Heuchera sanguinea</i>	46.40	2.78	0.40	2.19	10.8	108	16	88
<i>Hydrangea macrophylla 'Nikko Blue'</i>	24.00	2.20	0.23	2.12	11.1	38	—	—
<i>Hypericum calycinum</i>	36.61	1.87	0.34	2.11	16.6	42	8	45
<i>Hypoestes phyllostachya 'Red Splash Select'</i>	19.96	3.75	0.54	4.22	6.7	94	15	119
<i>Iberis sempervirens 'Snowflake'</i>	8.30	2.96	0.34	4.69	3.3	70	7	66

(continued on the following page)

Registration



UCNFA Roundtable: Nitrogen Reporting Regulations For Nurseries and Floriculture






This is an opportunity for Regional Water Quality Control Board representatives, third party groups and coalitions representatives, UC academics and nursery growers to discuss goals and challenges of the "East San Joaquin order" regulations for nurseries and floriculture.

There is no cost, but registration is required.



REGISTER

Register by Nov 15th

-  **DATE OF EVENT:**
Nov 15, 2023
- TIME OF EVENT:**
10:00 am - 12:00 pm
-  **LOCATION:**
Zoom
-  **CONTACT INFORMATION:**
Loren Oki -
lroki@ucdavis.edu
-  **PRICE PER REGISTRATION:**
\$0.00
-  **LAST DAY TO REGISTER ONLINE:**
Wednesday, November 15, 2023



Get involved!

Thank you!

Gerardo “Gerry” Spinelli

UC Cooperative Extension San Diego

Production Horticulture Advisor for Nurseries and Floriculture

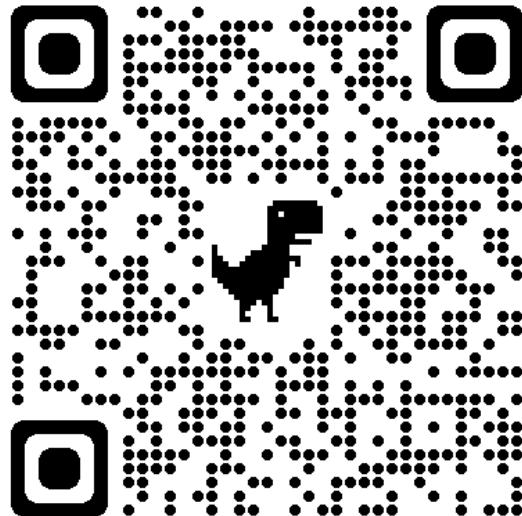
[**gspinelli@ucdavis.edu**](mailto:gspinelli@ucdavis.edu)

(530) 304-3738



*Please take
a minute to
fill out the
evaluation.*

*Your feedback
is valuable!*



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Nurseries and Floriculture Program