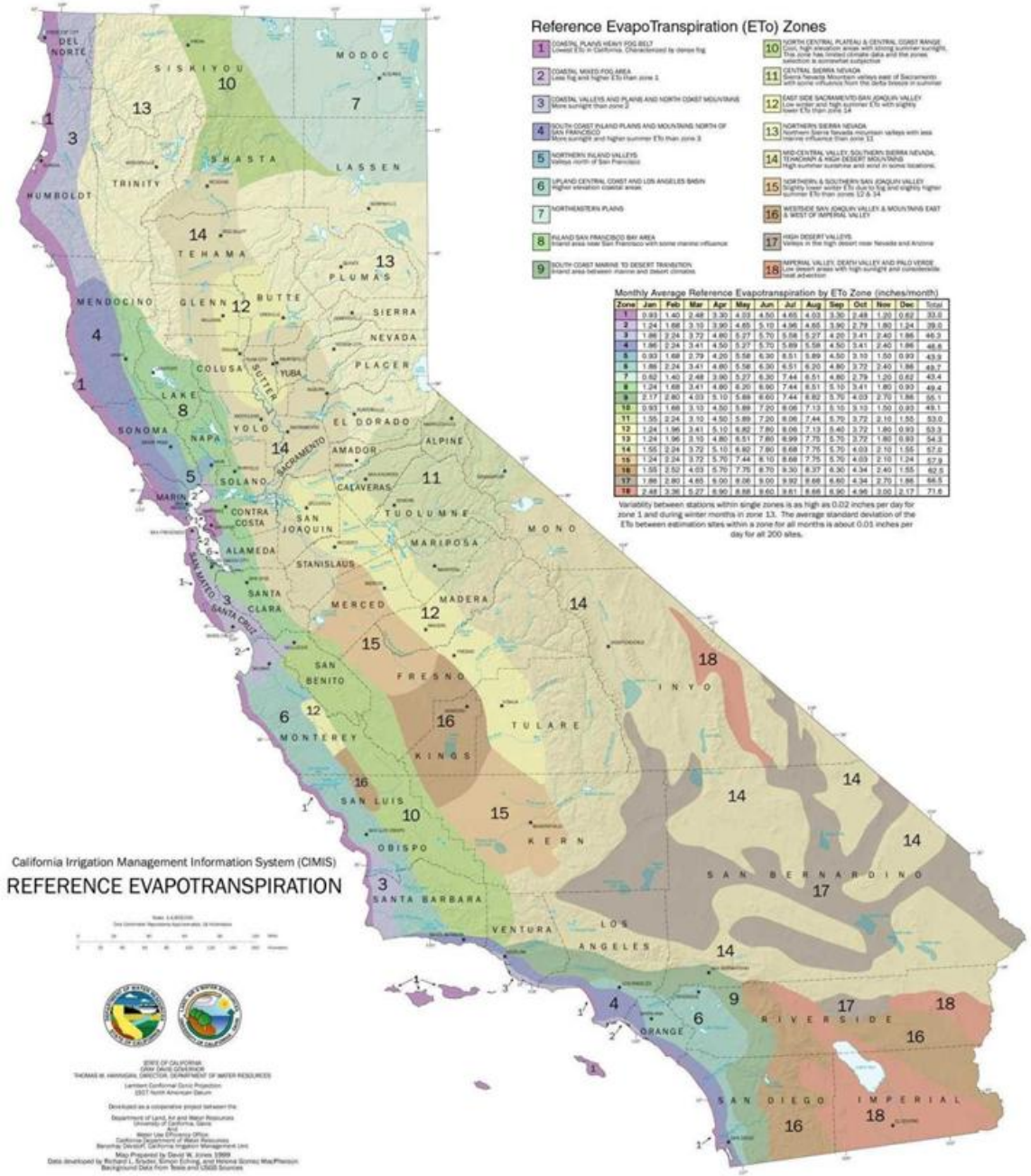
ADECE Agência de Desenvolvimento do Estado do Ceará

Governo do Estado do Ceará
Secretaria do Desenvolvimento Econômico

Missão Califórnia na Gestão da Água no Setor Agropecuário (Maio de 2018)

13-22 de Maio de 2018


Reference EvapoTranspiration (ETo) Zones
1 COASTAL PLAINS HEAVY FOG BELT
Lowest ETo in California. Characterized by dense fog.
2 COASTAL MIXED FOG AREA
Less fog and higher ETo than zone 1.
3 COASTAL VALLEYS AND PLAINS AND NORTH COAST MOUNTAINS
More sunlight than zone 2.
4 SOUTH COAST INLAND PLAINS AND MOUNTAINS NORTH OF SAN FRANCISCO
More sunlight and higher summer ETo than zone 3.
5 NORTHERN INLAND VALLEYS
Valleys north of San Francisco.
6 UPLAND CENTRAL COAST AND LOS ANGELES BASIN
Higher elevation coastal areas.
7 NORTHEASTERN PLAINS
8 INLAND SAN FRANCISCO BAY AREA
Inland area near San Francisco with some marine influence.
9 SOUTH COAST MARINE TO DESERT TRANSITION
Inland area between marine and desert climates.
10 NORTH CENTRAL PLATEAU & CENTRAL COAST RANGE
Cool, high elevation areas with strong summer sunlight. This zone has limited climate data and the zones selection is somewhat subjective
11 CENTRAL SIERRA NEVADA
Sierra Nevada Mountain valleys east of Sacramento with some influence from the delta breeze in summer
12 EAST SIDE SACRAMENTO-SAN JOAQUIN VALLEY
Low winter and high summer ETo with slightly lower ETo than zone 14
13 NORTHERN SIERRA NEVADA
Northern Sierra Nevada mountain valleys with less marine influence than zone 11.
14 MID-CENTRAL VALLEY, SOUTHERN SIERRA NEVADA, TEHACHAPI & HIGH DESERT MOUNTAINS
High summer sunshine and wind in some locations.
15 NORTHERN & SOUTHERN SAN JOAQUIN VALLEY
Slightly lower winter ETo due to fog and slightly higher summer ETo than zones 12 & 14
16 WESTSIDE SAN JOAQUIN VALLEY & MOUNTAINS EAST & WEST OF IMPERIAL VALLEY
17 HIGH DESERT VALLEYS
Valleys in the high desert near Nevada and Arizona
18 IMPERIAL VALLEY, DEATH VALLEY AND PALO VERDE
Low desert areas with high sunlight and considerable heat advection
Monthly Average Reference Evapotranspiration by ETo Zone (inches/month)
Zone Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Total
1 0.93 1.40 2.48 3.30 4.03 4.50 4.65 4.03 3.30 2.48 1.20 0.62 33.0
2 1.24 1.68 3.10 3.90 4.65 5.10 4.96 4.65 3.90 2.79 1.80 1.24 39.0
3 1.86 2.24 3.72 4.80 5.27 5.70 5.58 5.27 4.20 3.41 2.40 1.86 46.3
4 1.86 2.24 3.41 4.50 5.27 5.70 5.89 5.58 4.50 3.41 2.40 1.86 46.8
5 0.93 1.68 2.79 4.20 5.58 6.30 6.51 5.89 4.50 3.10 1.50 0.93 43.9
6 1.86 2.24 3.41 4.80 5.58 6.30 6.51 6.20 4.80 3.72 2.40 1.86 49.7
7 0.62 1.40 2.48 3.90 5.27 6.30 7.44 6.51 4.80 2.79 1.20 0.62 43.4
8 1.24 1.68 3.41 4.80 6.20 6.90 7.44 6.51 5.10 3.41 1.80 0.93 49.4
9 2.17 2.80 4.03 5.10 5.89 6.60 7.44 6.82 5.70 4.03 2.70 1.86 55.1
10 0.93 1.68 3.10 4.50 5.89 7.20 8.06 7.13 5.10 3.10 1.50 0.93 49.1
11 1.55 2.24 3.10 4.50 5.89 7.20 8.06 7.44 5.70 3.72 2.10 1.55 53.0
12 1.24 1.96 3.41 5.10 6.82 7.80 8.06 7.13 5.40 3.72 1.80 0.93 53.3
13 1.24 1.96 3.10 4.80 6.51 7.80 8.99 7.75 5.70 3.72 1.80 0.93 54.3
14 1.55 2.24 3.72 5.10 6.82 7.80 8.68 7.75 5.70 4.03 2.10 1.55 57.0
15 1.24 2.24 3.72 5.70 7.44 8.10 8.68 7.75 5.70 4.03 2.10 1.24 57.9
16 1.55 2.52 4.03 5.70 7.75 8.70 9.30 8.37 6.30 4.34 2.40 1.55 62.5
17 1.86 2.80 4.65 6.00 8.06 9.00 9.92 8.68 6.60 4.34 2.70 1.86 66.5
18 2.48 3.36 5.27 6.90 8.68 9.60 9.61 8.68 6.90 4.96 3.00 2.17 71.6
Variability between stations within single zones is as high as 0.02 inches per day for zone 1 and during winter months in zone 13. The average standard deviation of the ETo between estimation sites within a zone for all months is about 0.01 inches per day for all 200 sites.
California Irrigation Management Information System (CIMIS)
REFERENCE EVAPOTRANSPIRATION
DEL NORTE
SISKIYOU
MODOC
HUMBOLDT
TRINITY
SHASTA
LASSEN
MENDOCINO
GLENN
BUTTE
TEHAMA
PLUMAS
SIERRA
NEVADA
COLUSA
SUTTER
YUBA
PLACER
LAKE
SONOMA
NAPA
YOLO
EL DORADO
SACRAMENTO
AMADOR
ALPINE
SOLANO
CALAVERAS
MARIN
CONTRA COSTA
SAN JOAQUIN
TUOLUMNE
ALAMEDA
STANISLAUS
MARIPOSA
MONO
SAN MATEO
SANTA CLARA
MERCED
MADERA
SANTA CRUZ
SAN BENITO
FRESNO
INYO
MONTEREY
TULARE
KINGS
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
VENTURA
LOS ANGELES
ORANGE
RIVERSIDE
SAN DIEGO
IMPERIAL


Del Norte
Crescent City
Yreka
Siskiyou
Modoc
Alturas
Eureka
Weaverville
Humboldt
Trinity
Redding
Shasta
Lassen
Susanville
Red Bluff
Tehama
Quincy
Plumas
Mendocino
Glenn
Willows
Butte
Oroville
Sierra
Downieville
Ukiah
Lakeport
Colusa
Yuba City
Marysville
Yuba
Nevada
Nevada City
Placer
Lake
Sutter
Auburn
Yolo
Woodland
Placerville
Sacramento
El Dorado
Markleeville
Sonoma
Napa
Santa Rosa
Amador
Alpine
Jackson
Solano
Fairfield
San Andreas
Bridgeport
Marin
San Rafael
Martinez
Stockton
Calaveras
Sonora
Contra Costa
San Francisco
Oakland
San Joaquin
Tuolumne
Alameda
Modesto
Mariposa
Mono
Redwood City
Stanislaus
Merced
San Jose
San Mateo
Santa Clara
Madera
Santa Cruz
Fresno
Hollister
Independence
Salinas
San Benito
Inyo
Hanford
Visalia
Monterey
Kings
Tulare
San Luis Obispo
Bakersfield
Kern
Santa Barbara
Ventura
San Bernardino
Los Angeles
Riverside
Orange
Santa Ana
San Diego
Imperial
El Centro
County Seat
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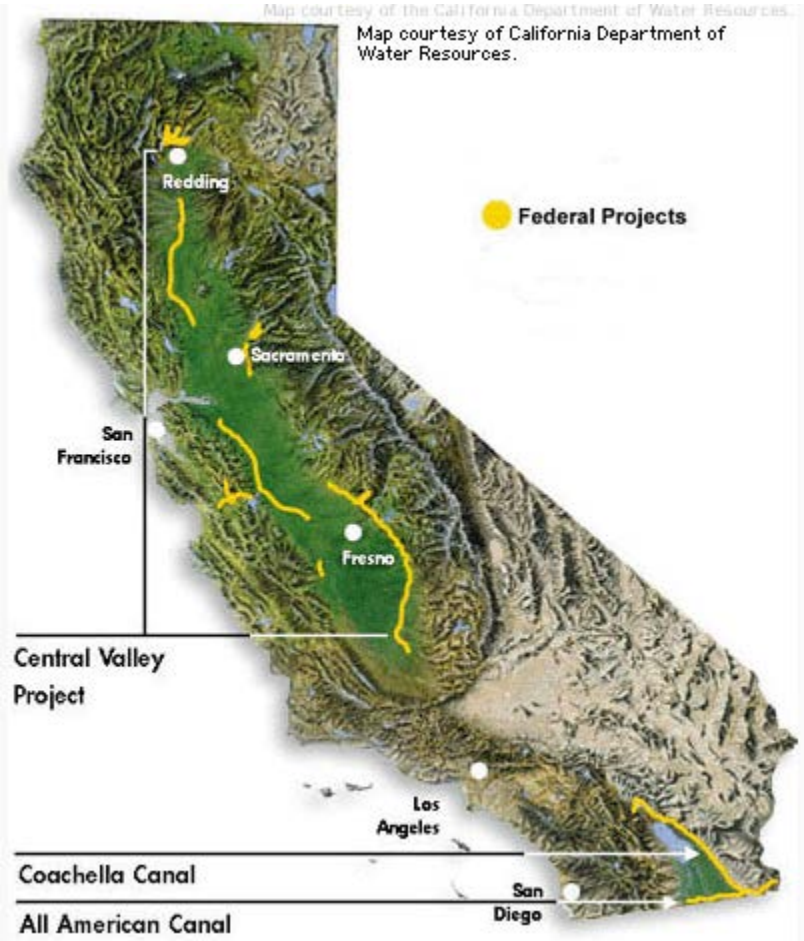
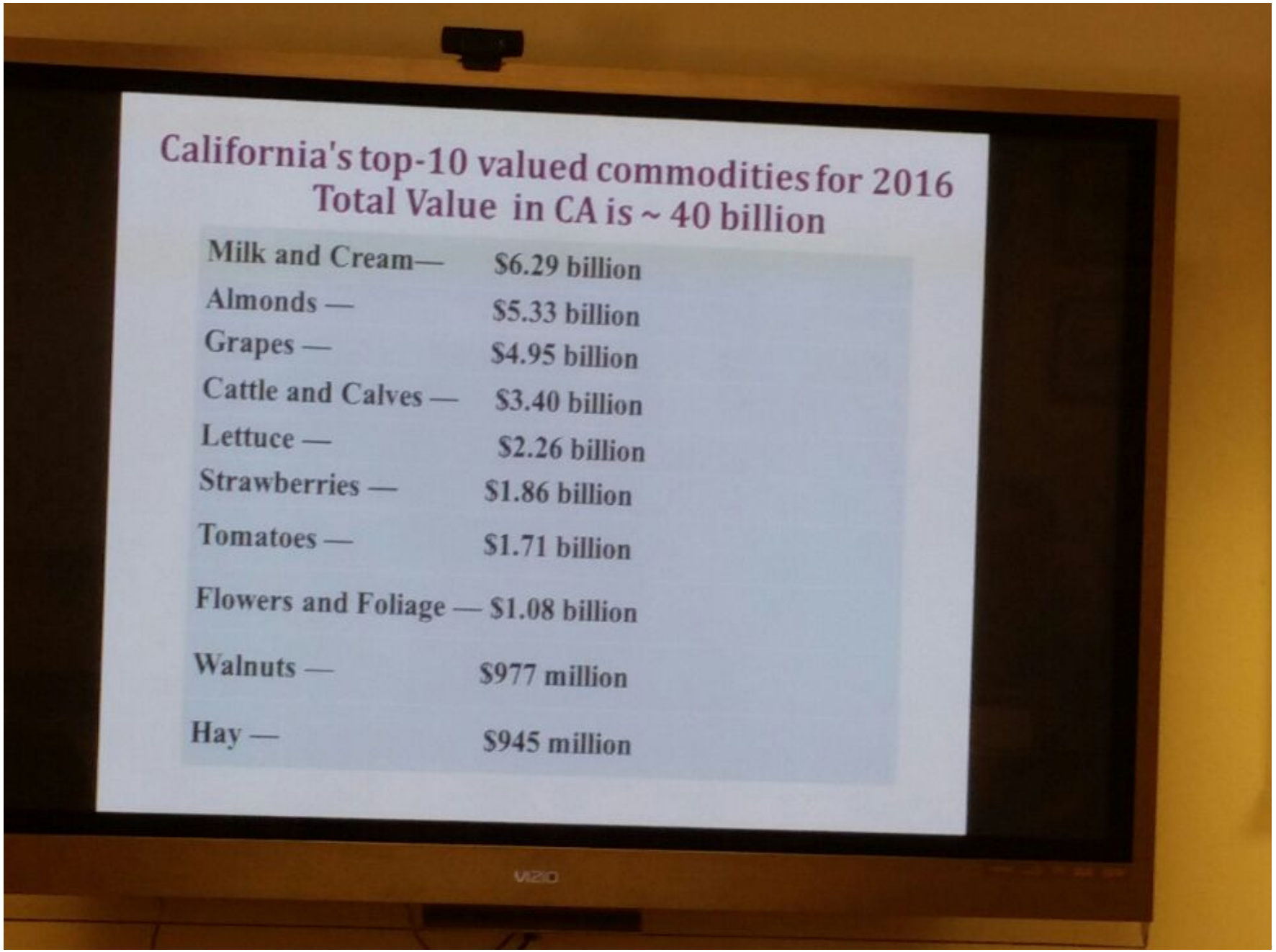

Map courtesy of California Department of Water Resources.
Federal Projects
Redding
Sacramento
San Francisco
Fresno
Los Angeles
San Diego
Central Valley Project
Coachella Canal
All American Canal


Map courtesy of California Department of Water Resources.
State Projects
Redding
Sacramento
San Francisco
Fresno
Los Angeles
San Diego
California State Water Project


State Water Project
Federal Water Project
Local Water Project
Tule Lake
Clear Lake Reservoir
Trinity Reservoir
Shasta Lake
Whiskeytown Lake
Redding
Antelope Lake
Corning Canal
Tehama-Colusa Canal
Frenchman Lake
Black Butte Lake
Lake Oroville
Lake Davis
Stony Gorge Reservoir
New Bullards Bar Reservoir
East Park Reservoir
Lake Mendocino
Englebright Reservoir
Indian Valley Reservoir
Glenn-Colusa Canal
Lake Sonoma
Folsom Lake
Lake Berryessa
Sacramento
Auburn Folsom South Canal
Putah S Canal
Camanche Reservoir
North Bay Aqueduct
Mokelumne Aqueduct
New Hogan Reservoir
New Melones Lake
Stockton
Contra Costa Canal
Hetch Hetchy Reservoir
Los Vaqueros Reservoir
San Francisco
Don Pedro Lake
Lake McClure
Lake Crowley
Lake Del Valle
Hetch Hetchy Aqueduct
South Bay Aqueduct
Delta-Mendota Canal
Pacheco Conduit
Madera Canal
Tinemaha Reservoir
Santa Clara Conduit
Millerton Lake
Pine Flat Reservoir
Hollister Conduit
San Luis Reservoir
Fresno
Los Banos Reservoir
San Luis Canal
Lake Kaweah
Friant-Kern Canal
Coalinga Canal
Lake Success
Hawes Reservoir
San Antonio Reservoir
Nacimiento Reservoir
Isabella Lake
Los Angeles Aqueduct
Cross Valley Canal
California Aqueduct Coastal Branch
Twitchell Reservoir
Quail Lake
Pyramid Lake
Aqueduct
Lake Cachuma
Castaic Lake
Colorado River Aqueduct
Santa Barbara
Lake Casitas
Bouquet Reservoir
Silverwood Lake
California Aqueduct East Branch Extension
Los Angeles
Crafton Hills Reservoir
Lake Perris
Lake Mathews
Diamond Valley Lake
Coachella Canal
San Diego Aqueducts
San Vicente Reservoir
All American Canal
Lower Otay Reservoir
San Diego

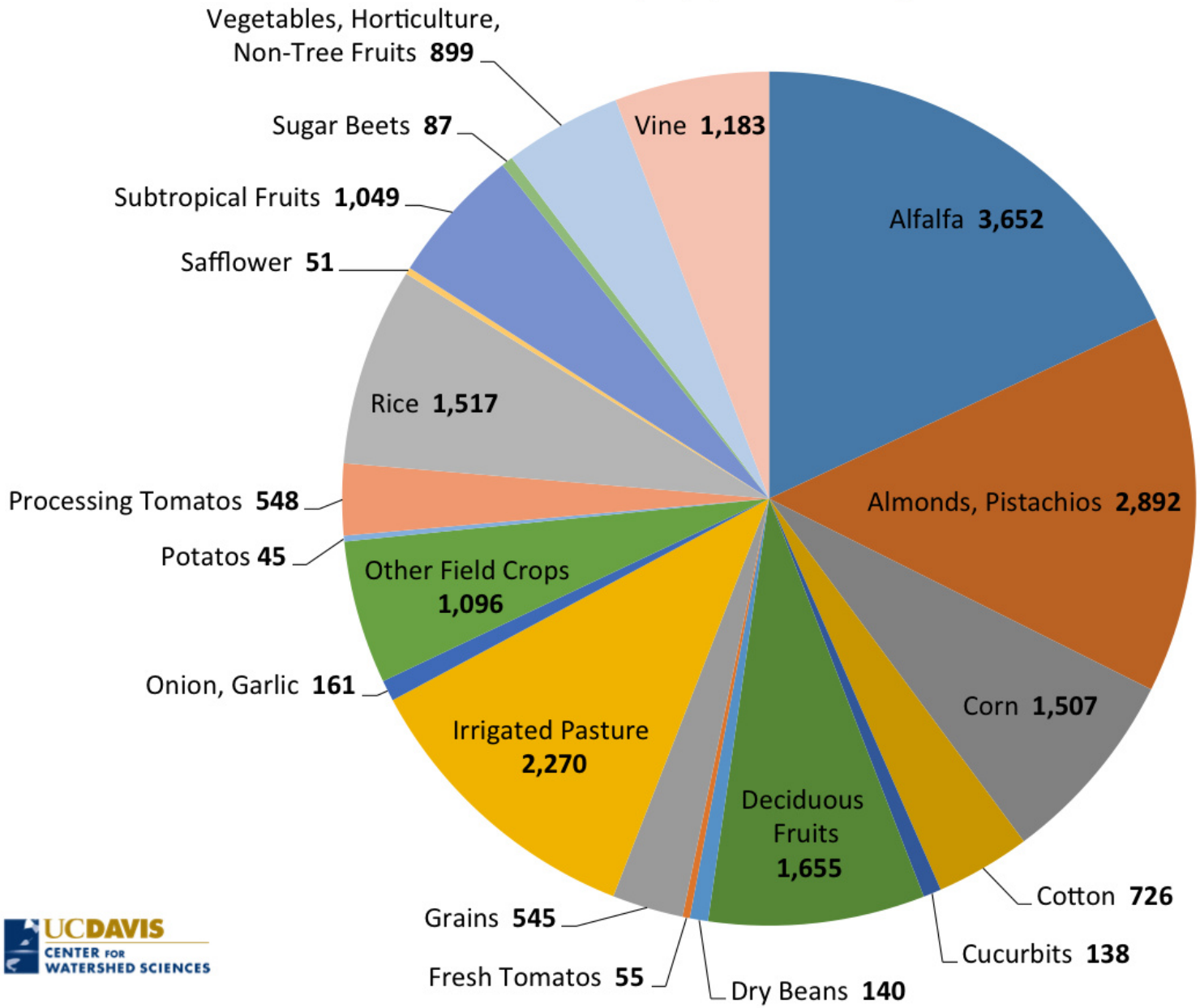
CALIFÓRNIA

- Clima predominantemente (semi) árido;
- Quinta maior economia do mundo;
- Produz 50% de frutas e vegetais e é o maior estado norte americano em produção de produtos lácteos;
- Possui aproximadamente 10 milhões de hectares de terras propícias para agricultura;
- Desse total, 52% são pastagens e 37% (4 milhões de hectares) são terras de cultivo irrigado;
- A agricultura irrigada necessita de aproximadamente 27 bilhões de m^3 de águas superficiais e subterrâneas;
- Prevê-se um aquecimento climático significativo, que poderá ter um impacto negativo no abastecimento de água disponível e exigir mudanças / regulamentação das práticas / políticas de


California's top-10 valued commodities for 2016
Total Value in CA is ~ 40 billion
Milk and Cream— $6.29 billion
Almonds — $5.33 billion
Grapes — $4.95 billion
Cattle and Calves — $3.40 billion
Lettuce — $2.26 billion
Strawberries — $1.86 billion
Tomatoes — $1.71 billion
Flowers and Foliage — $1.08 billion
Walnuts — $977 million
Hay — $945 million
VIZIO

Crop Water Use

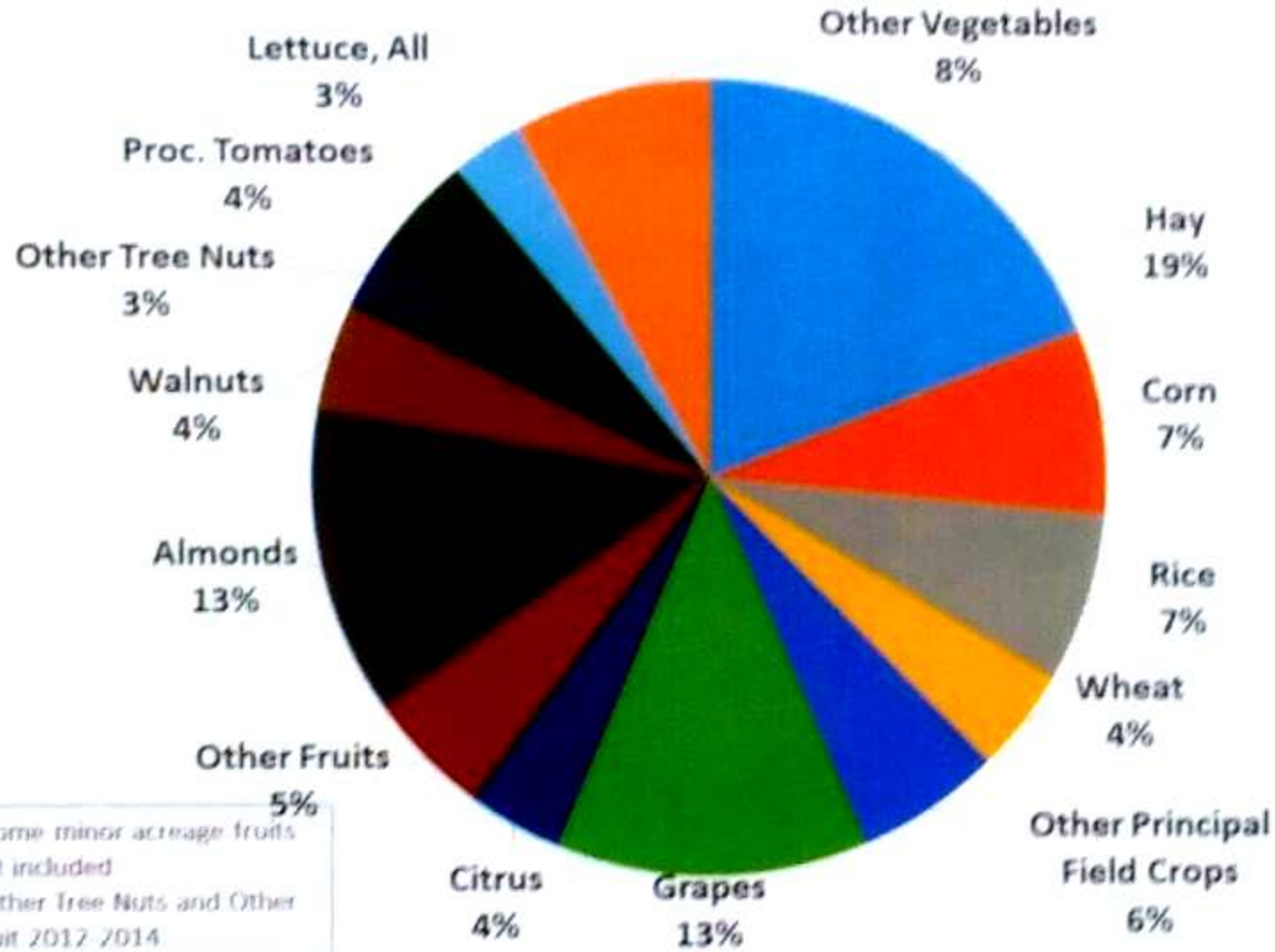
(Net, 1,000's Acre-Feet)



UCDAVIS CENTER FOR WATERSHED SCIENCES

California Crops Acreage, 2013-2015

Average total crop acres = 6.9 million



*Some minor acreage fruits not included
Other Tree Nuts and Other Fruit 2012-2014

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Agriculture and Natural Resources

UC DAVIS
UNIVERSITY OF CALIFORNIA

Study Tour in California for Brazilian Water Scientists

Locations: UCDavis, Sierra Foothills, San Joaquin Valley, Central Coast
Dates: May 14-22, 2018
Organizers:
Daniele Zaccaria -LAWR Department – UC Davis
Richard L. Snyder -LAWR Department – UC Davis
Lynn Wunderlich – UC Cooperative Extension Central Sierra, Placerville, CA
Khaled Bali – UC Kearney Agricultural Research and Extension Center, Parlier, CA
Ben Faber - UC Cooperative Extension Ventura and Santa Barbara Counties, Ventura, CA
Andre Biscaro– UC Cooperative Extension Ventura County, Ventura, CA
Michael Cahn – UC Cooperative Extension, Salinas and Monterey Counties, Salinas, CA
Participants and affiliations:
- Silvio Lima (Adece)
- Rodrigo Vieira (CODEVASF - San Francisco nas Parnaiba Rivers Development Company)
- Fernando Tangerino (UNESP – University of San Paulo)
- Silas Alencar (CENTEC Institute)
- Fábio Miranda (Embrapa)
- Afranio Montenegro (Embrapa)

- 3 colleges
- 1 professional school
- 9 Research and Extension Centers
- 8 statewide programs
- Cooperative Extension Programs in every county
- 276 Cooperative Extension advisors and specialists

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Agriculture and Natural Resources


Intermountain REC
Research and Extension Center
UC Cooperative Extension
UC Campuses
Sierra Foothill REC
Hopland REC
UC Davis
UCD Vet Med
UC Berkeley
Kearney REC
West Side REC
Lindcove REC
Hansen REC
UC Riverside
South Coast REC
Desert REC

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Study Tour in California for Brazilian Water Scientists

Monday 14 May
4:00 pm - Arrival of participants in Davis and accommodation at local hotel
6:30 pm – Meeting at Hallmark Inn in Davis and group dinner

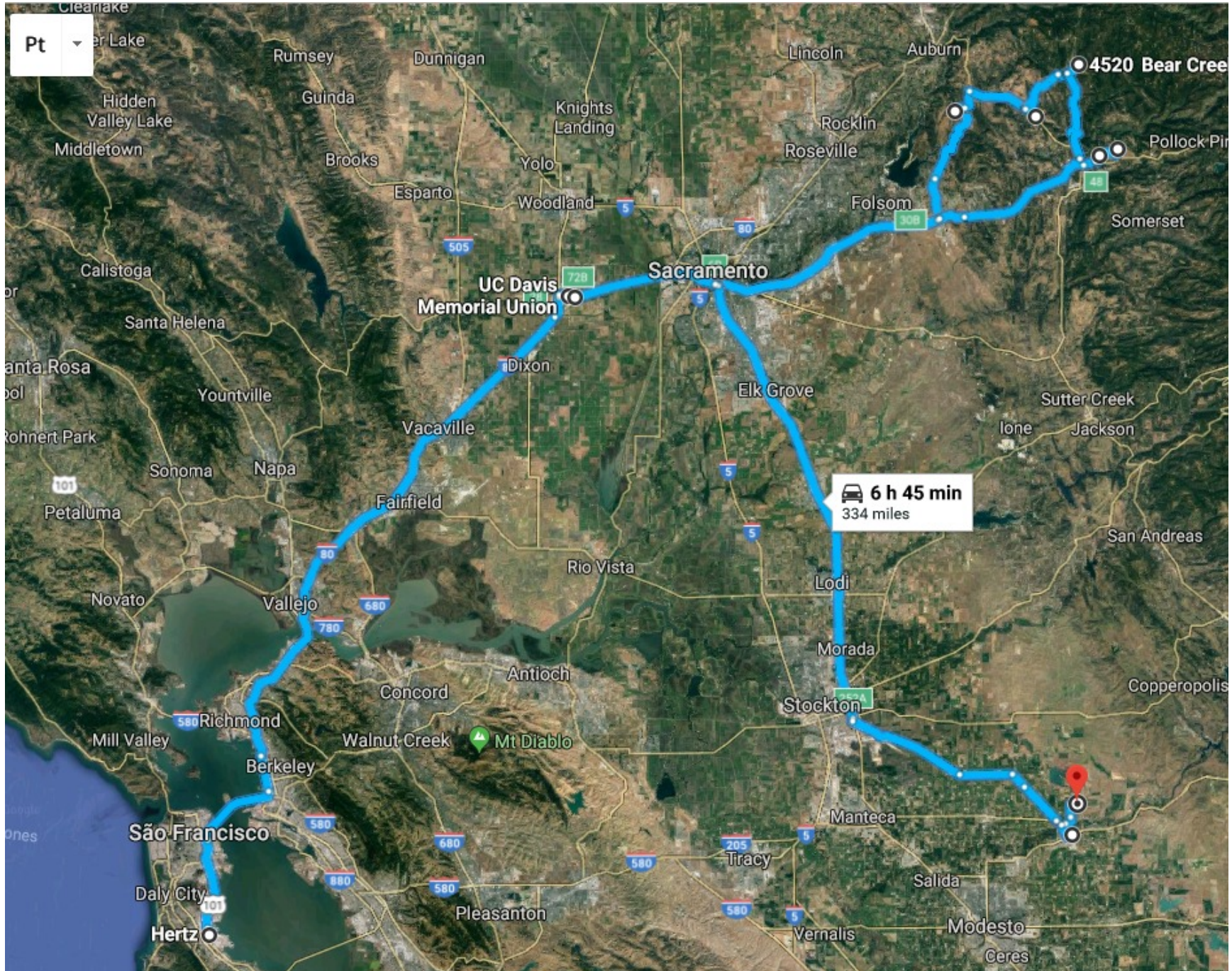
Tuesday 15 May – Field visits to research projects in the Sierra Foothills
9:00– 10:30 – Travel from Davis to Pilot Hills, CA
10:30 - 12:00–Vineyards ET with slope/aspect using the Residual of Energy Balance at Safari Vineyards - Pilot Hill, CA
Arrival at Safari Vineyards
Brief introduction by L. Wunderlich(UCCE Farm Advisor) about the Central Sierra agricultural area and on-going UCCE projects and extension activities
Visit of research plots at Safari Vineyards and discussion on project findings - (L. Wunderlich, R. Snyder,D. Zaccaria)

12:00–13:30 -Travel to Placerville and lunch at local restaurant.

13:45 -15:00 - Visit of Boeger Winery (http://www.boegerwinery.com/)
Vineyard tourand tasting and with Greg Boeger, owner/manager and with winemakers.

15:15 – 16:00 - Visit of Lava Cap Winery (http://www.lavacap.com/)

16:15 – 17:45 – Travel from the Sierra Foothills to Davis and hotel accommodation


Pt
4520 Bear Cree
Pollock Pi
Somerset
Folsom
Roseville
Rocklin
Auburn
Lincoln
Sacramento
UC Davis
Memorial Union
Dixon
Vacaville
Fairfield
Elk Grove
Sutter Creek
Jackson
Ione
6 h 45 min
334 miles
San Andreas
Rio Vista
Lodi
Morada
Stockton
Manteca
Tracy
Salida
Modesto
Ceres
Vernalis
Copperopolis
Antioch
Concord
Walnut Creek
Mt Diablo
Richmond
Berkeley
Mill Valley
São Francisco
Daly City
Hertz
Pleasanton
Vallejo
Novato
Petaluma
Sonoma
Napa
Yountville
Santa Helena
Calistoga
Middletown
Hidden
Valley Lake
Guinda
Rumsey
Dunnigan
Knights
Landing
Yolo
Woodland
Esparto
Brooks

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Study Tour in California for Brazilian Water Scientists

Wednesday 16 June – Field visits in Oakdale, Parlier, Lemon Cove & Strathmore

7:00 – 9:00 – Travel from Davis to Oakdale, CA
9:00 - 11:00 - Visit to Oakdale Irrigation District and water distribution structuresof Rubicon Water
11:00 – 13:00 – Travel from Oakdale to Parlier, CA
13:00 – 15:00 – Visit to research projects at the UC Kearney Research and Extension Center with Khaled Bali (UCCE Irrigation Specialist)
15:00 – 16:00 – Travel from Parlier to Lemon Cove/Strathmore, CA
16:00 – 17:30– Visit to research project on Citrus ET in Lemon Cove/Strathmore with Milo Gorden (Citrus Farm Manager)
17:30 – 18:00 – Travel from Lemon Cove/Strathmore to Visalia, CA and hotel accommodation.
19:00 - Dinner at local restaurant

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Study Tour in California for Brazilian Water Scientists

Thursday 17 May – Field visits in Ventura County

8:30 –9:00- Travel from Visalia to Lemoore, CA
9:00 – 9:45 – Visit to research project on Pistachio ET and Salinity in Lemoore
9:45 – 13:00 – Travel to Ventura, CA
13:00 - 16:30 – Visit to research projects on Avocado, Citrus and Strawberry with Ben Faber and Andre Biscaro(UCCE Farm Advisors)
16:30 – 18:30 – Travel to San Luis Obispo, CA and hotel accommodation
19:00 – Dinner at local restaurant

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Friday 18 May

8:30 – 10:30 – Travel from San Luis Obispo to Salinas, CA
10:30 – 12:30 - Visit to research projects on vegetable crops with Michael Cahn
12:30 – 13:30 – Lunch Break
13:30 – 14:00 – Travel to Watsonville, CA
14:00 – 16:30 – Visit to the water treatment and distribution facilities of the Pajaro Valley Water Management Agency (https://www.pvwater.org/) with Brian Lockwood (PVWMA Senior Hydrologist)
16:30 – 17:00 - Travel to Santa Cruz and hotel accommodation

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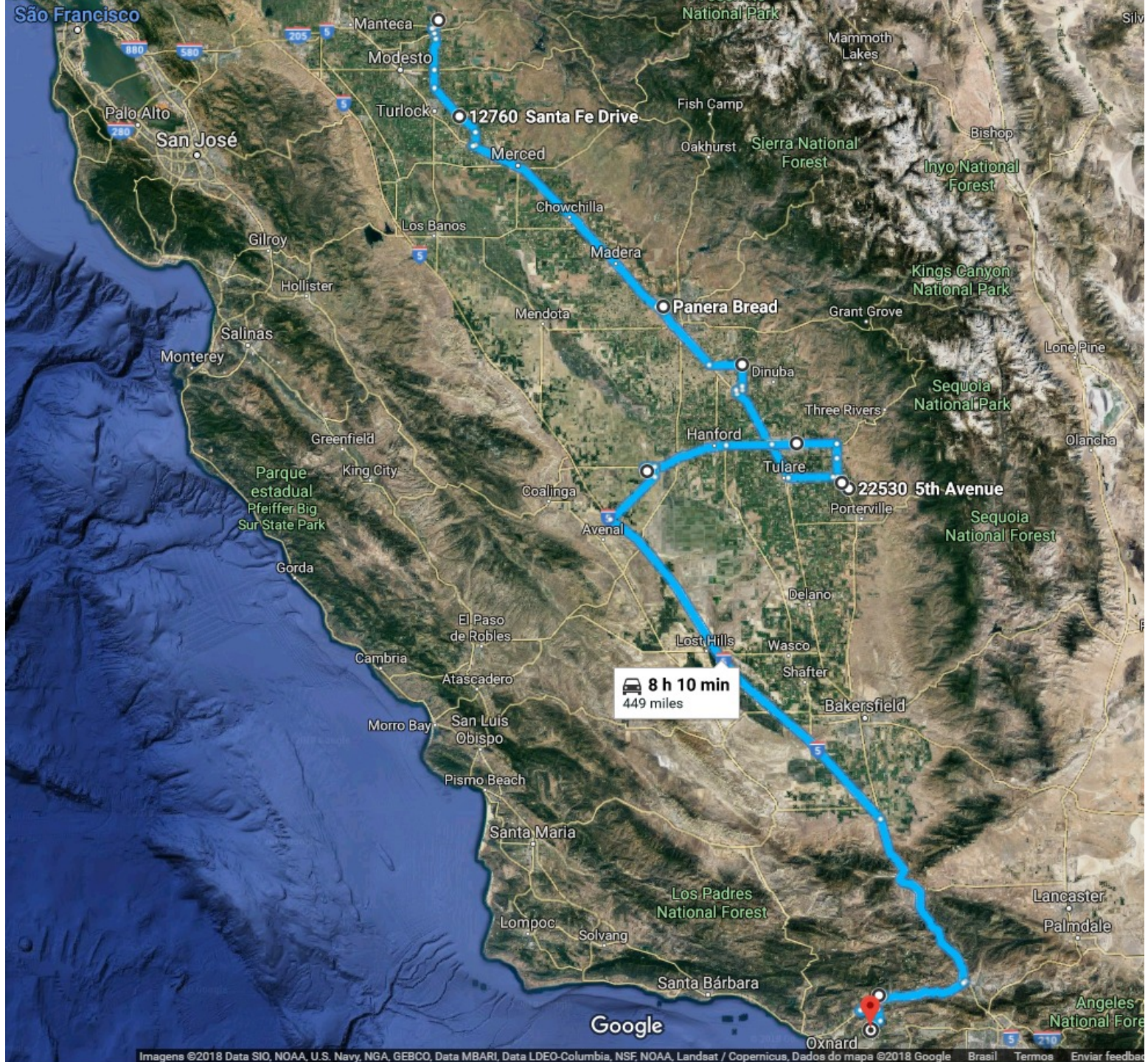
Saturday 19 May
9:30 - 11:00 – Travel from Santa Cruz to Half Moon Bay, CA
11:00 – 14:00 – Visit and lunch in Half Moon Bay
14:00 – 16:30 – Travel from Half Moon Bay to Davis and hotel accommodation

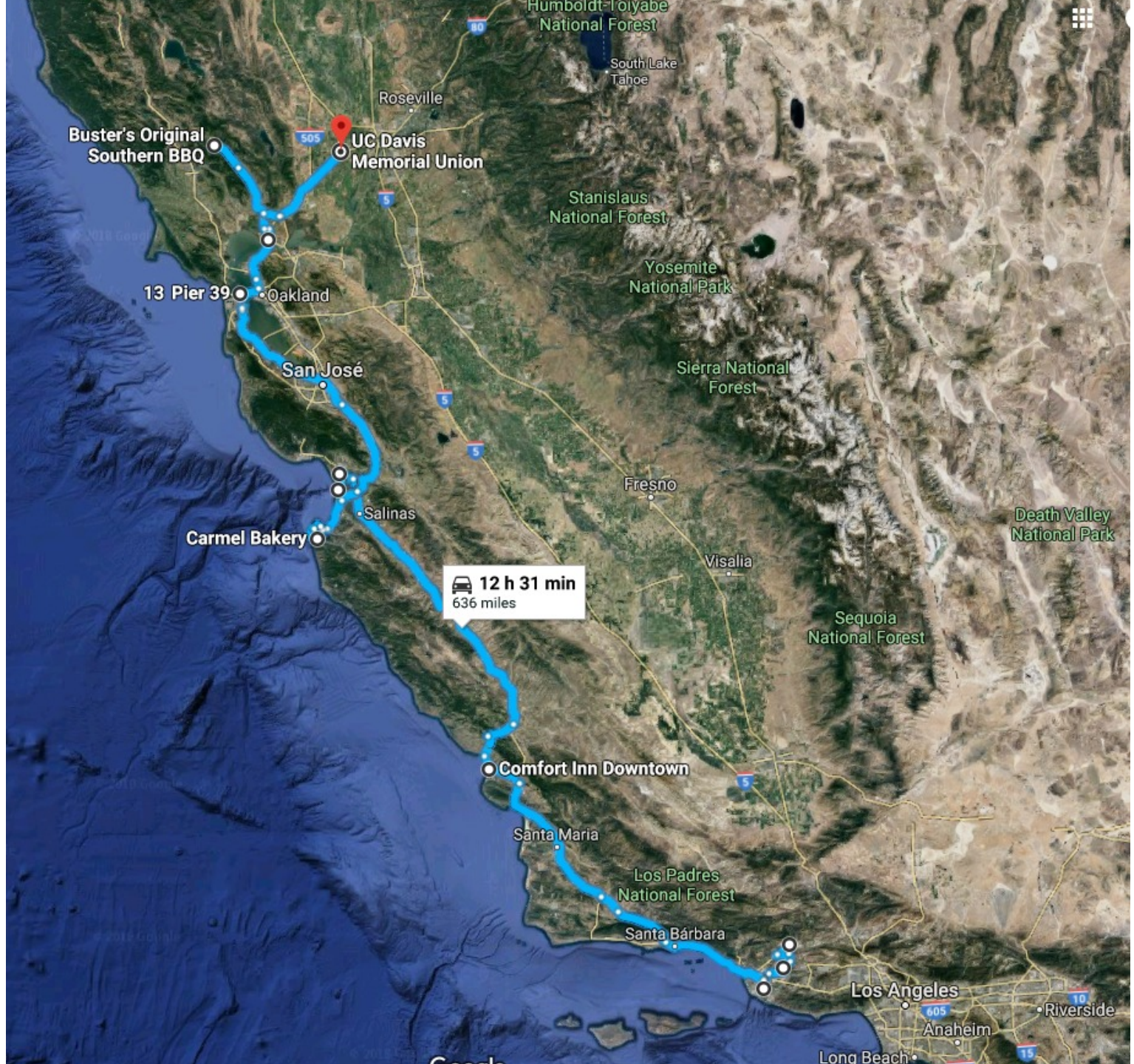
Sunday 20 May
10:00 – 11:30 – Travel to St. Helena, CA
11:30 –13:00 – Lunch in Santa Helena
13:30 – 16:00 - Wine tasting at wineries in Napa/Sonoma valleys
16:00 – 18:00 – Travel back to Davis and hotel accommodation


São Francisco
Manteca
Modesto
Turlock
12760 Santa Fe Drive
Merced
Palo Alto
San José
Gilroy
Los Banos
Chowchilla
Madera
Hollister
Panera Bread
Mendota
Salinas
Monterey
Dinuba
Three Rivers
Hanford
Tulare
22530 5th Avenue
Porterville
Greenfield
King City
Coalinga
Avenal
Parque estadual Pfeiffer Big Sur State Park
Gorda
Delano
El Paso de Robles
Lost Hills
Wasco
Cambria
Atascadero
Shafter
Bakersfield
Morro Bay
San Luis Obispo
Pismo Beach
Santa Maria
Los Padres National Forest
Lompoc
Solvang
Santa Bárbara
Oxnard
Lancaster
Palmdale
Mammoth Lakes
Fish Camp
Oakhurst
Sierra National Forest
Bishop
Inyo National Forest
Kings Canyon National Park
Grant Grove
Lone Pine
Sequoia National Park
Olancha
Sequoia National Forest
8 h 10 min
449 miles
Google
Imagens ©2018 Data SIO, NOAA, U.S. Navy, NGA, GEBCO, Data MBARI, Data LDEO-Columbia, NSF, NOAA, Landsat / Copernicus, Dados do mapa ©2018 Google
Brasil
Termos
Enviar feedback


ARCO
ampm
NOW OPEN
Is Growing FOOD
Wasting Water ?


California's Future
DEPENDS ON WATER
BUILD DAMS NOW
Is Growing Food a
Waste of Water ?


PARAMOUNT CITRUS
Ventura Farming Office
4421 Berylwood Road
4421


Humboldt-Toiyabe National Forest
South Lake Tahoe
Roseville
Buster's Original Southern BBQ
UC Davis Memorial Union
Stanislaus National Forest
Yosemite National Park
13 Pier 39
Oakland
San José
Sierra National Forest
Fresno
Salinas
Carmel Bakery
Death Valley National Park
Visalia
12 h 31 min
636 miles
Sequoia National Forest
Comfort Inn Downtown
Santa Maria
Los Padres National Forest
Santa Bárbara
Los Angeles
Riverside
Anaheim
Long Beach

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Study Tour in California for Brazilian Water Scientists

Monday 21 May

10:00 – 11:00 –Meeting of the group with prof. Jan Hopmans (UC Davis associate Dean, International Program Office) at Envir. Hort. 1107
And CII Meeting in Woodland


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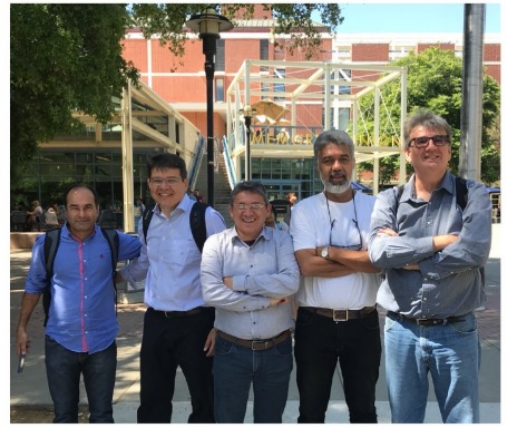
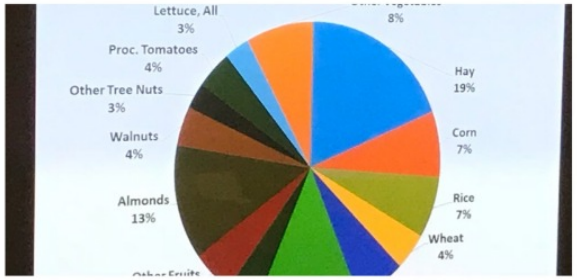
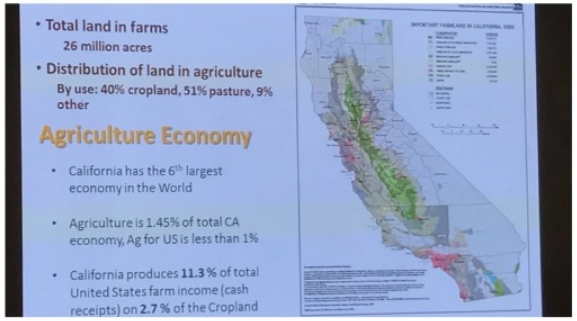



UC DAVIS


Lettuce, All
3%
Proc. Tomatoes
4%
Other Tree Nuts
3%
Walnuts
4%
Almonds
13%
Hay
19%
Corn
7%
Rice
7%
Wheat
4%


Coagulation, Flocculation, and Sedimentation
Bringing the Pieces Together


• Total land in farms
26 million acres
• Distribution of land in agriculture
By use: 40% cropland, 51% pasture, 9% other
Agriculture Economy
• California has the 6th largest economy in the World
• Agriculture is 1.45% of total CA economy, Ag for US is less than 1%
• California produces 11.3 % of total United States farm income (cash receipts) on 2.7 % of the Cropland





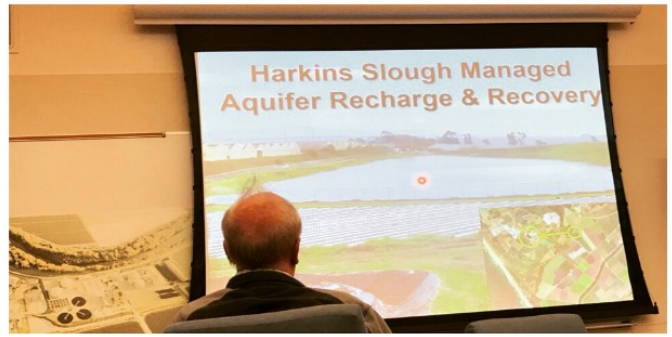

Farms
100% ALL NATURAL
PISTACHIO
CHEWY BITES
OVER 50% PISTACHIOS
pistachios + blueberry infused cranberries with coconut
with maple brown rice syrup
• GLUTEN & DAIRY FREE • NON-GMO
• GOOD SOURCE OF DIETARY FIBER • 5g OF PROTEIN PER SERVING
6
Farms
100% ALL NATURAL
PISTACHIO
CHEWY BITES
OVER 50% PISTACHIOS
Heart Healthy
pistachios + cranberries
6 PACK
NET WT. 4.23 OZ (120g) (6 PACK)



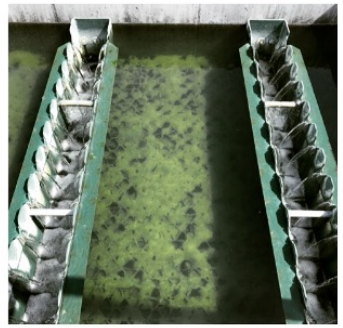







Harkins Slough Managed
Aquifer Recharge & Recovery


Coagulation, Flocculation, and Sedimentation
Bringing the Pieces Together



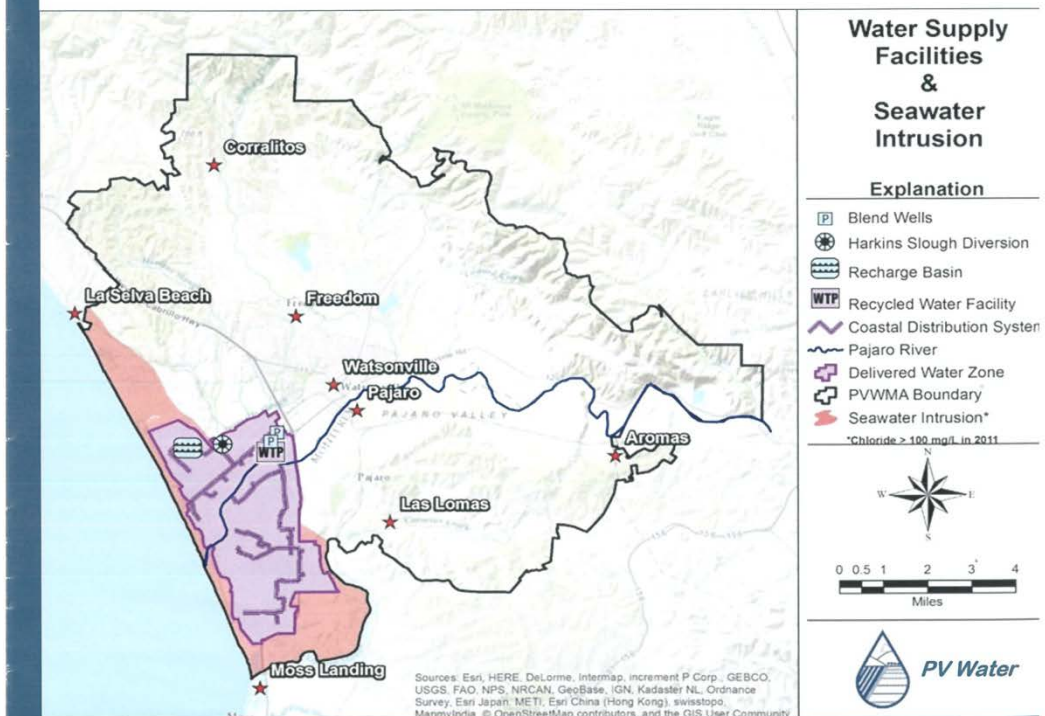

Shedding Some Light
on the Subject
UV Disinfection


CITY OF WATSONVILLE
WATER RESOURCES CENTER


Coagulation, Flocculation, and Sedimentation
Bringing the Pieces Together


Recycling the Water

The Pajaro Valley Water Management Agency (PV Water), *a Groundwater Sustainability Agency*, works to achieve sustainable water resources in our agriculturally rich groundwater basin. Located adjacent to the Monterey Bay, the Pajaro Valley produces nearly $1 billion of conventional and organic, high-value fruit, vegetable, and flower crops annually, and is home to the City of Watsonville (City) and a few small towns. Chronic groundwater overdraft threatens the Valley's water resources by causing groundwater storage depletion and seawater intrusion. PV Water partnered with the City to construct and operate the Watsonville Area Water Recycling Facility (Facility) as a key component in its stakeholder developed program to eliminate groundwater overdraft and halt seawater intrusion.



População: Aproximadamente 52 mil hab

Cap. de Produção: Aproximadamente 5milhões de m3/ano

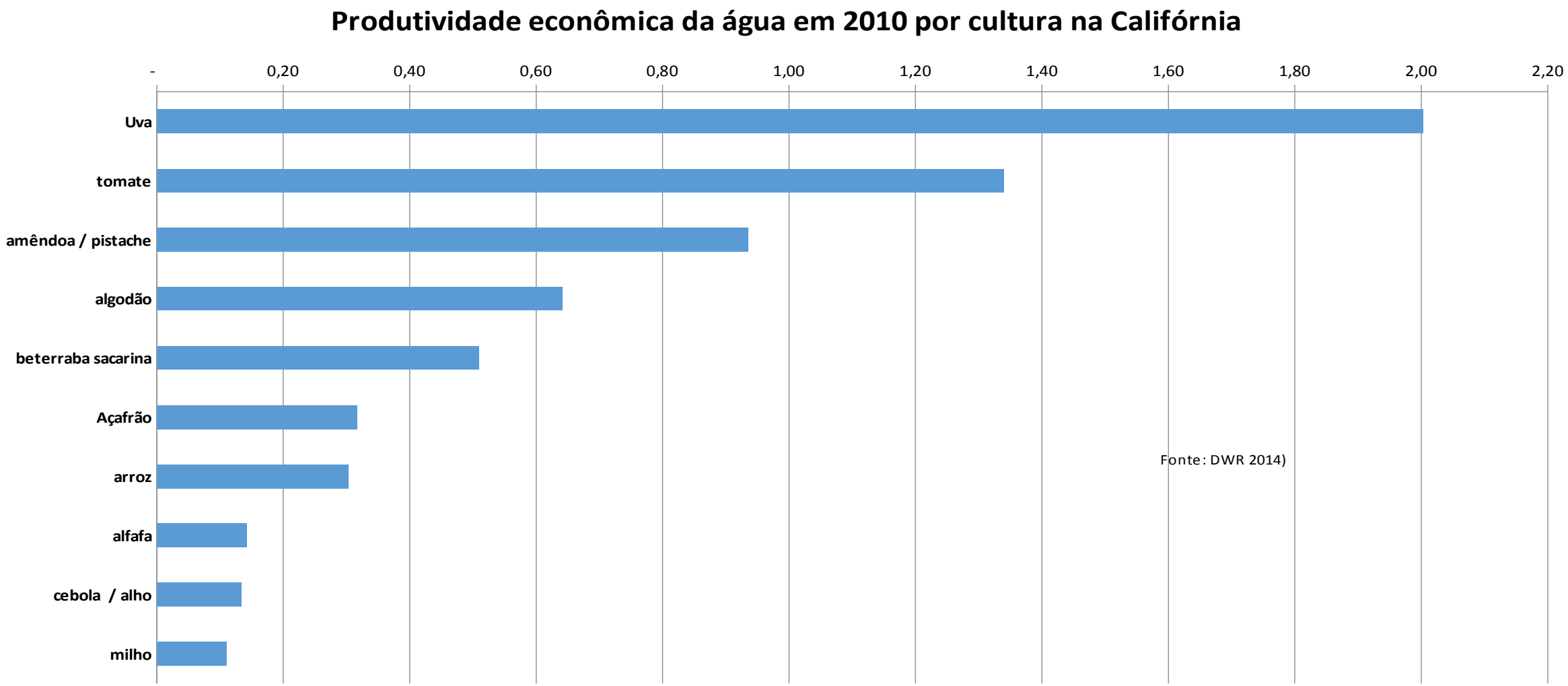
Cap. de armazenamento: Aproximadamente 9.500 m3

Vazão de aproximadamente 0,2 m3/s

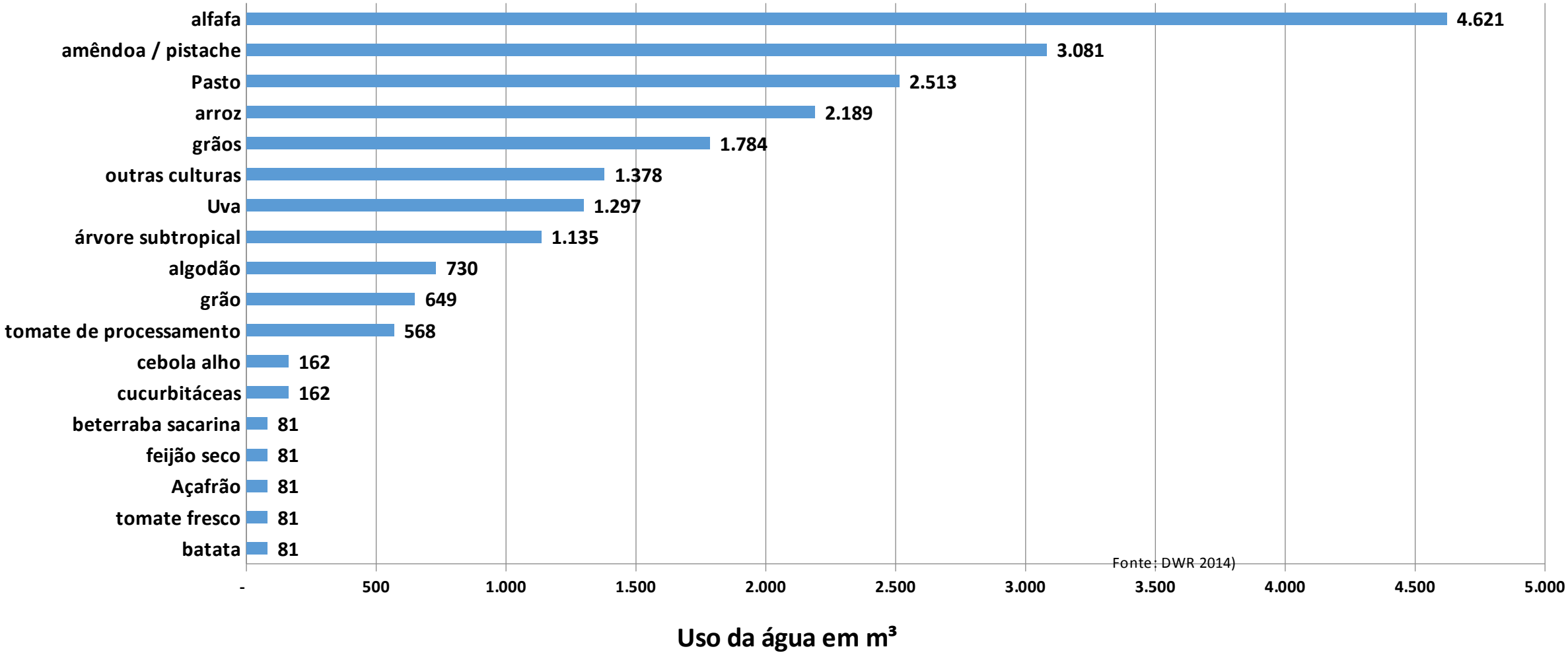

POVERTY IN DEVELOPING WORLD
Improving agricultural performance will be central to addressing the poverty and food insecurity challenge


riculture
nd in agriculture
land, 51% pasture, 9%
Economy
he 6th largest
World
45% of total CA
r US is less than 1%
uces 11.3 % of total
arm income (cash
% of the Cropland
e Farms


Recycling the Water


Produtividade econômica da água em 2010 por cultura na Califórnia
-
0,20
0,40
0,60
0,80
1,00
1,20
1,40
1,60
1,80
2,00
2,20
Uva
tomate
amêndoa / pistache
algodão
beterraba sacarina
Açafrão
arroz
alfafa
cebola / alho
milho
Fonte: DWR 2014)
Produtividade economica da água por cultura ($ por m³)

Água aplicada para as culturas na Califórnia em 2010



ADECE Agência de Desenvolvimento do Estado do Ceará

Governo do Estado do Ceará
Secretaria do Desenvolvimento Econômico

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OBRIGADO!

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