Making Conservation a California Way of Life

How forthcoming efficiency standards may impact urban trees and parklands

CALIFORNIA Water Boards

Office of Research, Planning and Performance

Agenda

1:00 – 1:10PM	Introduction and background
1:10 – 1:25PM	Presentation on residential outdoor water use
1:25 – 2:10PM	Review of methods & presentation of results
2:10 – 2:30 PM	Comments and questions
2:30 – 2:40 PM	Break (10 min)
2:40 – 3:25 PM	Panel discussion on adaptation measures
3:25 – 3:35 PM	Comments and questions
3:35 – 3:50 PM	Presentation on urban greening funding opportunities
3:50 – 4:00 PM	Comments, questions, and wrap-up

Logistics

- Ensure your screen name reflects name and affiliation
- Chat is disabled
- To ask a question: use Q&A box
- Participants will be invited to unmute once called upon
- For phone callers: *9 to raise hand, *6 to speak
- Meeting is being recorded
    - Recording will be posted to the Water Efficiency Legislation program page: bit.ly/we_leg

Mary Yang

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Planning and Performance
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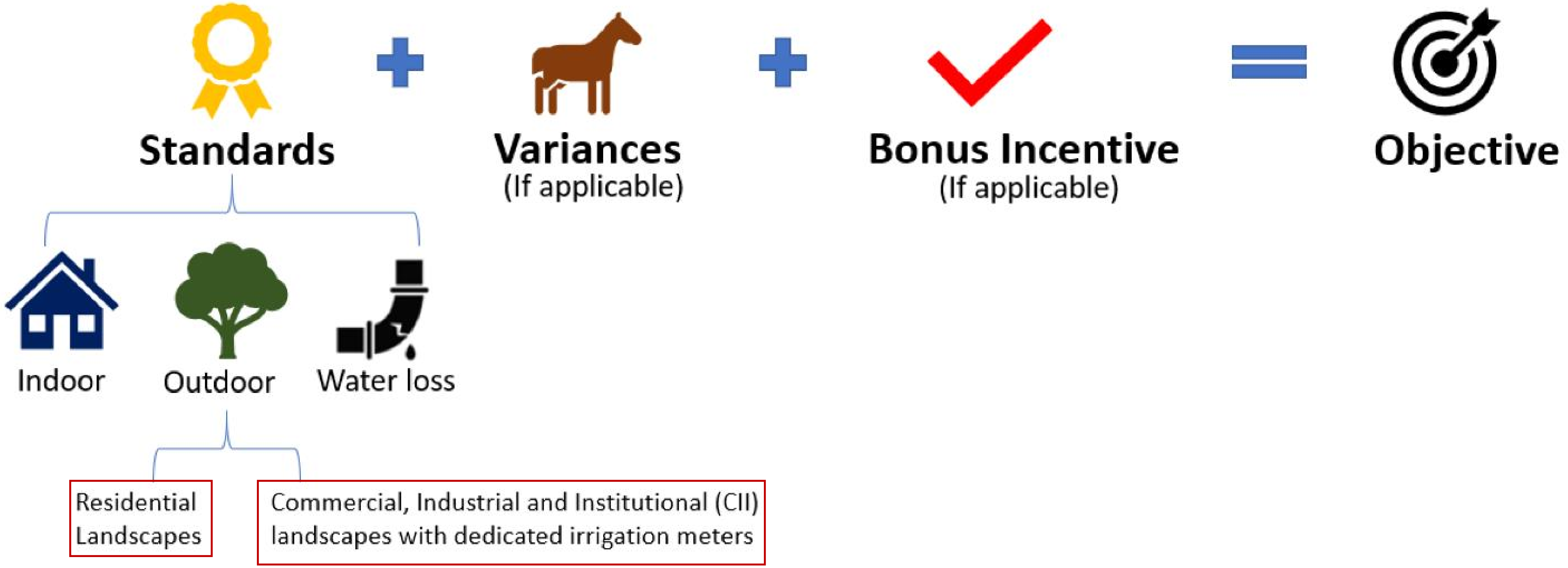
Implementing AB 1668 and SB 606



Wastewater, parklands, and trees

CWC Section 10609.2(c)

(c) When adopting the standards under this section, the board shall consider the policies of this chapter and the proposed efficiency standards’ ***effects on local wastewater management, developed and natural parklands, and urban tree health***. The standards and potential effects shall be identified by May 30, 2022. The board shall allow for public comment on potential effects identified by the board under this subdivision.

Trends in Residential Outdoor Water Use

How forthcoming efficiency standards may impact urban trees and parklands

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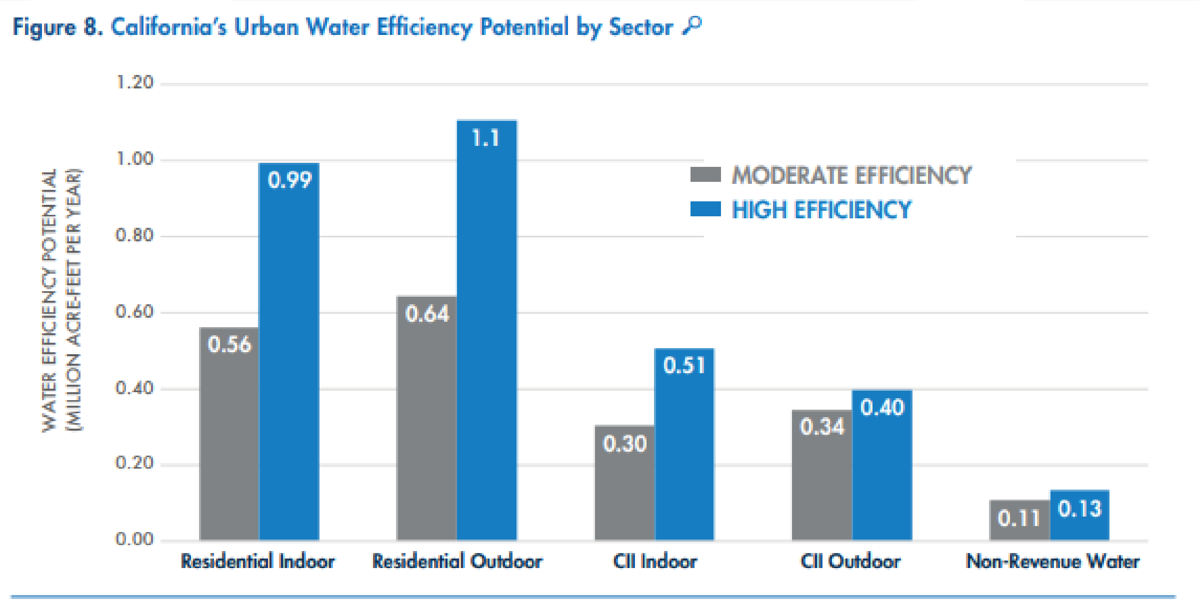
Significant water savings potential in the outdoor sector

- About 50% of residential water use is used outdoors
  - Majority is lost due to overwatering or evaporation
- Moderate landscape conversions could save 1 million AFY, and more extensive landscape conversions could save 1.5 million AFY (Cooley et al., 2022)



Source: Pacific Institute

Background on Outdoor Standards

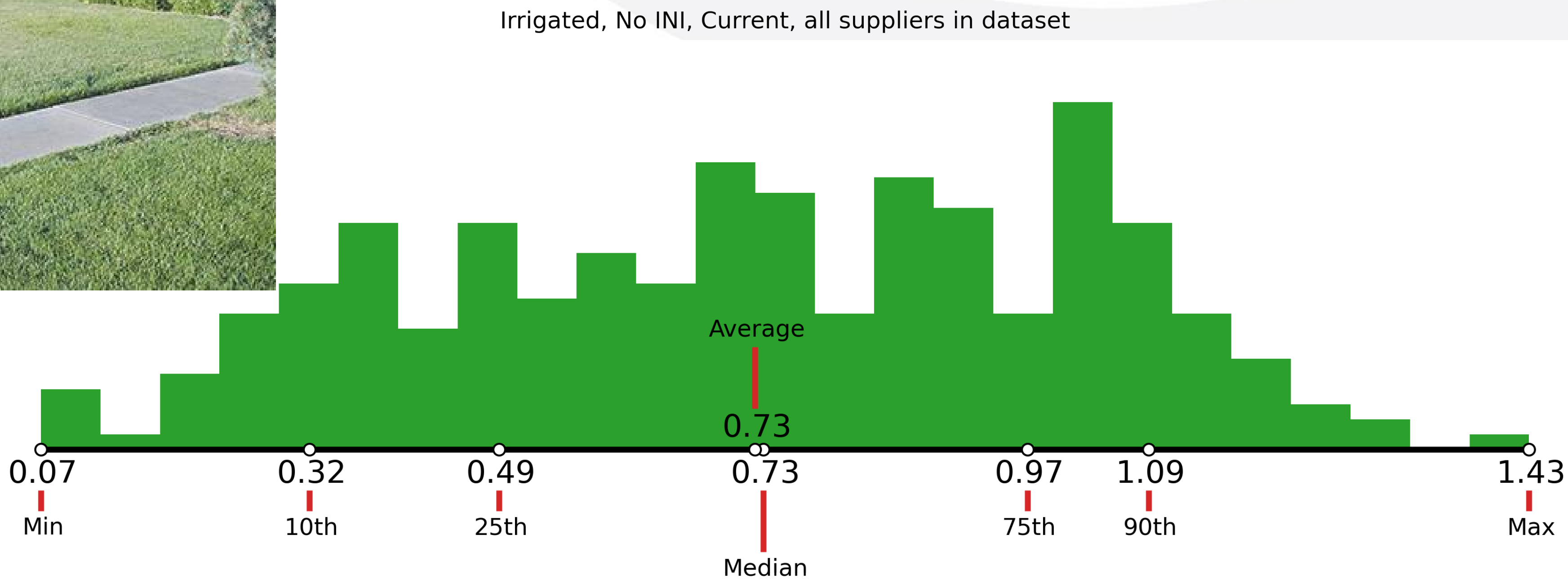
The outdoor standards shall incorporate the principles of the model water efficient landscape ordinance (MWELO).

OWU = (ETo – Peff)*0.62*ETF*LAs

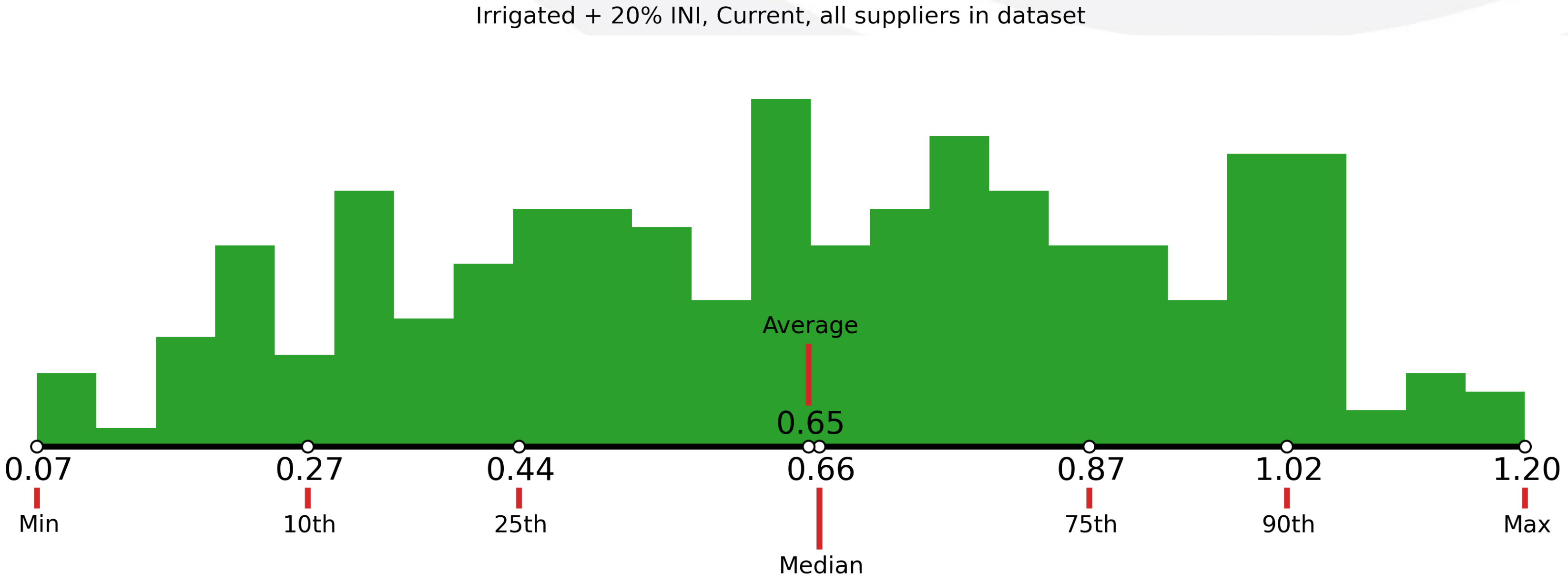
- OWU = Outdoor water use (gallons)
- ETo = Reference evapotranspiration (inches)
- Peff = Effective precipitation (inches)
- ETF = Supplier level ET factor (unitless) (the standard)
- LAs = Landscape area for a water supplier (square feet)
- 0.62 = Unit conversion factor

Statewide average ETF is 73%

example: moderately well-irrigated warm season turf



Statewide average ETF is 65% when the 20% INI buffer is included



How potential water use efficiency standards may affect urban trees and parklands

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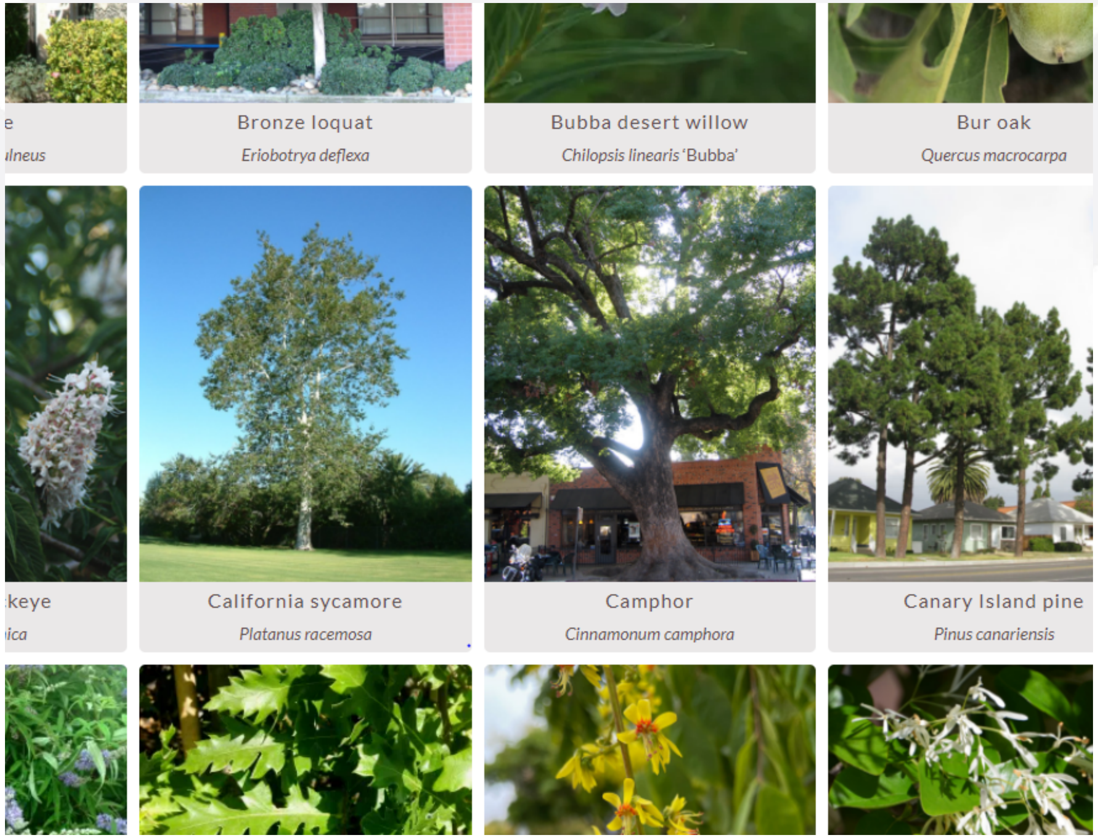
Why trees and parklands are important

- Save energy
- Reduce stormwater runoff
- Improve water quality
- Improve air quality
- Improve public health
- Provide wildlife habitat



Source: Sacramento Tree Foundation

Benefits of efficient outdoor water use

- Protects water quality
- Protects human health
- Lowers household bills
- Creates healthy soils
- Reduces short-lived climate pollutants
- Protects air quality and reduces noise pollution
- Protects biodiversity and supports ecosystems

Key findings

- Turf was the largest component of vegetation water demand for all months in all climate zones.
- Many of the most common urban tree species in California are rated as medium-water use, suggesting these trees may need substantial irrigation during dry summer months.
- In all climate zones, the greatest percentage of low water-use trees was in the largest (i.e., oldest) class size, suggesting that planting low water-use trees has not been prioritized.

Risk levels for urban trees under three scenarios

Risk Level	Scenario 1 Indoor std. = 50 GPCD Outdoor std. = 0.70	Scenario 2 Indoor std. = 42 GPCD Outdoor std. = 0.62	Scenario 3 Indoor std. = 35 GPCD Outdoor std. = 0.55
No risk	247	135	89
Low risk	88	99	66
Moderate risk	35	134	198
High risk	3	5	20

Economic and Environmental Effects of AB 1668-SB 606

Effects on urban trees and parklands

August 12, 2022

Erik Porse, PhD, OWP at Sacramento State | UCLA
Joanna Solins, PhD, UC Davis
Julia Skrovan, UCLA California Center for Sustainable Communities
Robert Cudd, UCLA California Center for Sustainable Communities




WATER PROGRAMS Sacramento State

UCLA Institute of the Environment and Sustainability

Full Project Scope

Key sectors:

- Urban Retail Water Suppliers: costs & benefits, low-income communities
- Wastewater: conveyance, treatment, and reuse
  - Odor & corrosion, water quality, recycled water production potential
- Developed and natural parklands within service areas
  - Effects of irrigation regimes on vegetation
- Urban trees
  - Effects of irrigation regimes on health and number of trees

Full Project Team

Expertise in urban water supply, wastewater management, urban ecology, and economics related to AB 1668-SB 606

WATER PROGRAMS Sacramento State

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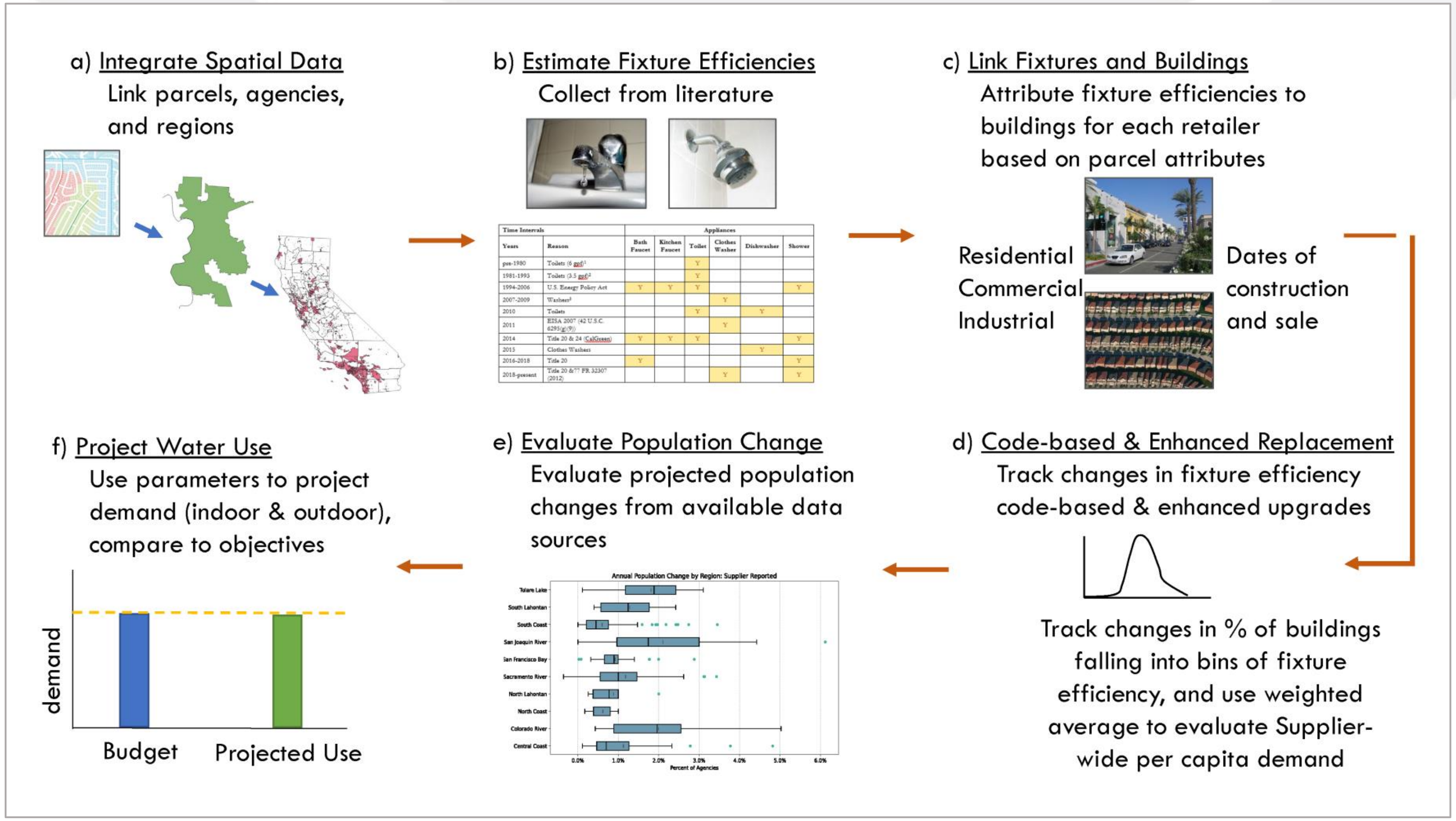
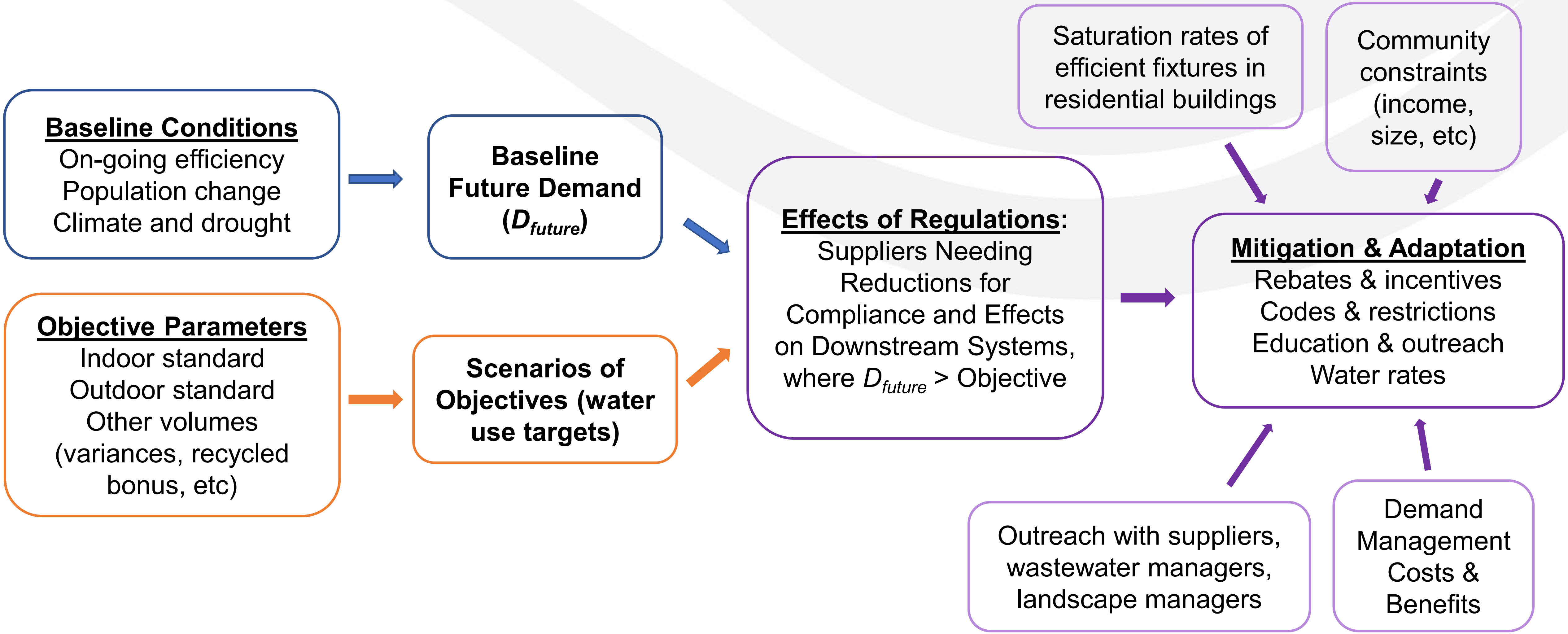
Erick Eschker, PhD
Jonathan Sander

Baseline: Future Indoor and Outdoor Demand

- Estimated a “baseline” of what would happen in the absence of regulations through 2030
  - Parcel data
  - Evaluate existing conservation and estimated saturation rates of efficient indoor fixtures
  - Code-based & enhanced replacement of indoor fixtures
  - Turf replacement



Evaluating Mitigation and Adaptation Actions



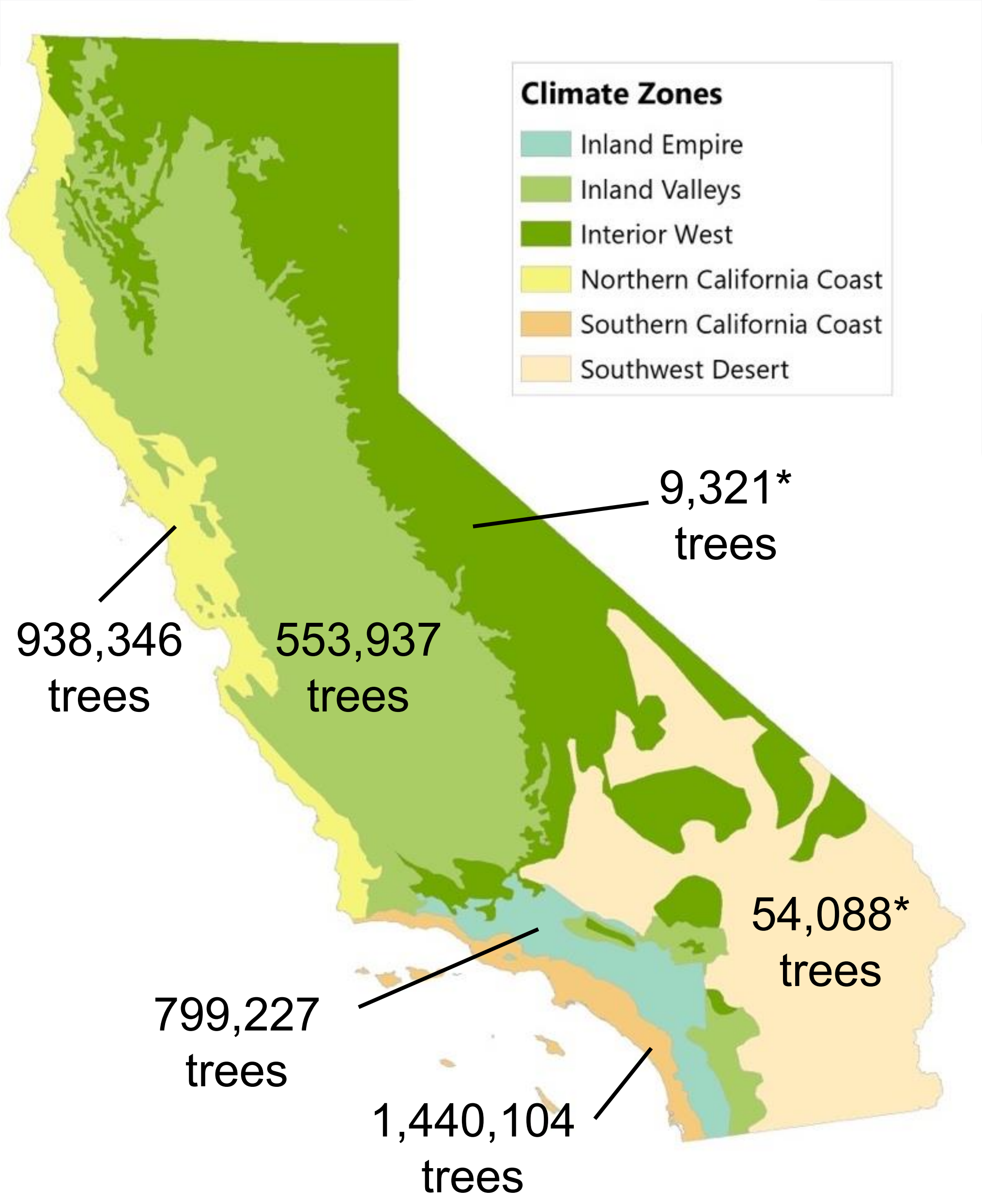
Evaluating effects on residential urban trees

Approach:

1) Characterize California's urban forests

2) Assess effects of different irrigation practices on tree water stress

3) Evaluate risks to trees for Suppliers
   i. Estimate water demand of urban vegetation in residential areas
   ii. Compare vegetation water demand to baseline outdoor water use and predicted changes under objectives



*Includes non-residential trees

Characterizing urban forests with tree inventories

- Data sources:
  - Cal Poly SLO – urban tree companies
  - USFS – curated municipal inventories
  - Municipal inventories from Internet sources
- More than 3.5 million residential trees

Map source: McPherson *et al*. 2016, *Urban Forestry & Urban Greening*

Tree inventories suggest that:

- California's urban forests are diverse
  - Over 1,000 species total
  - Over 450 species with ≥ 100 individuals
- Most trees are medium-water-use species
  - Fewer small trees were low-water-use species
  - Substantial water inputs required to maintain future urban forests
  - Greater risk of negative impacts from reduced irrigation

Source: Bruce Dupree/Alabama Extension

Assessing effects of changing irrigation practices on tree water stress

Lawn

Drip Irrigation

Source: UC Davis Arboretum and Public Garden

Unirrigated

Source: San Gabriel Valley Tribune

Effect of yard irrigation on mature street trees

London planetree
(*Platanus acerifolia*)

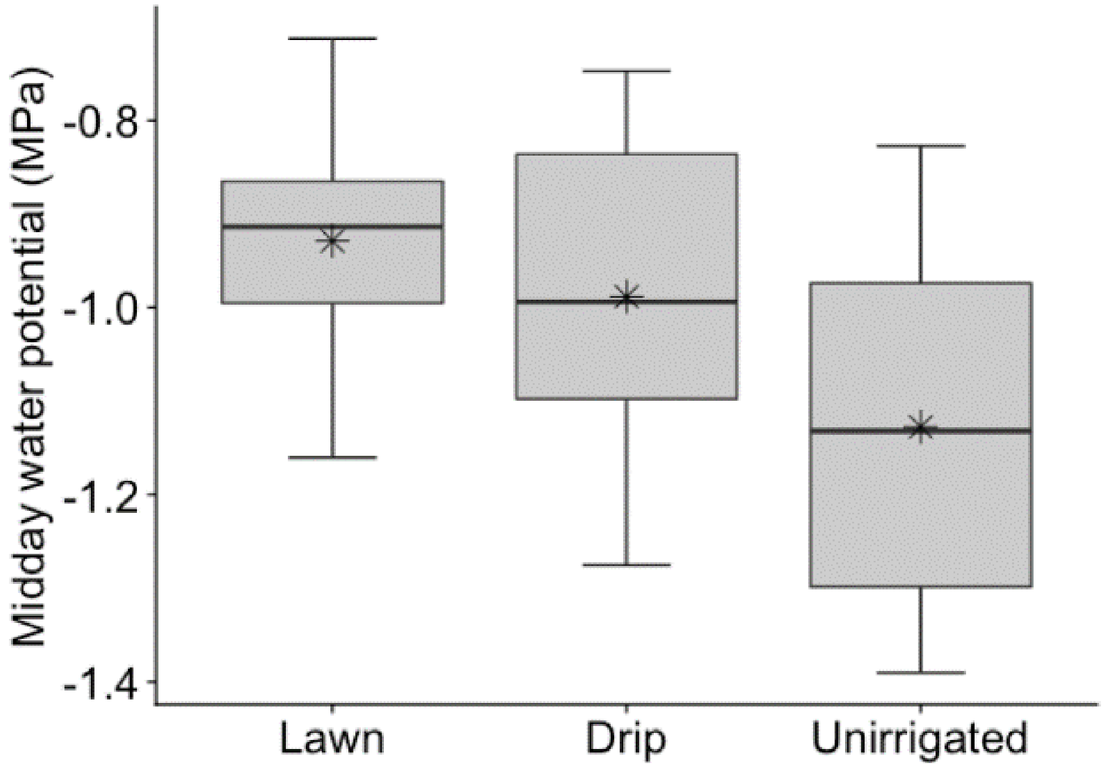
Water potential measurements

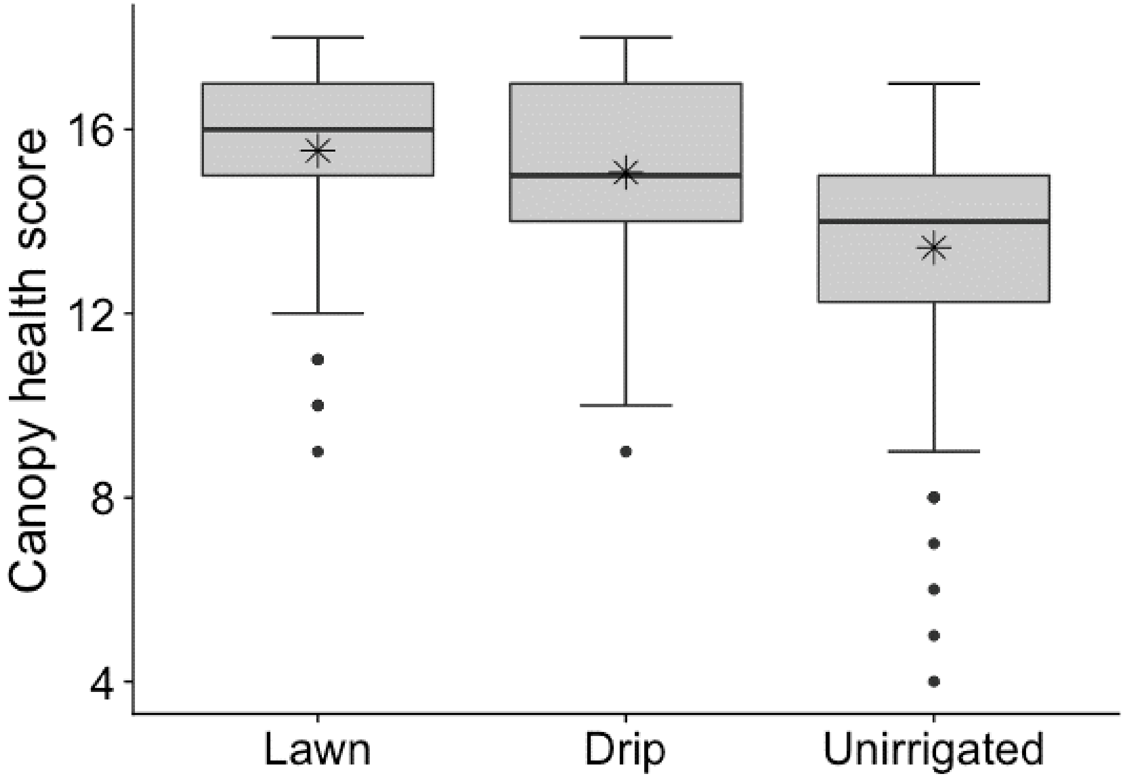
- Instantaneous water stress
- 24 trees in Davis

Visual canopy health scores

- Longer term water stress
- 414 trees, Davis & Sacramento

Water stress and canopy health were similar for trees in front of drip irrigated yards and lawns





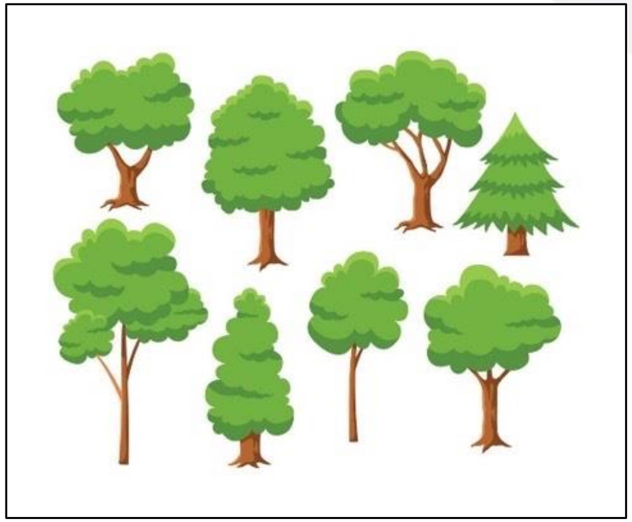
Evaluating risks to trees for Suppliers statewide

- Calculate residential vegetation water demand
  - Bottom-up method: Plant transpiration
  - Considerable data requirements
  - Acceptable available data

- Compare to outdoor water use
  - Baseline outdoor water use
  - Predicted reductions due to AB1668-SB606

Calculating Residential Vegetation Water Demand

Trees



+

Turf

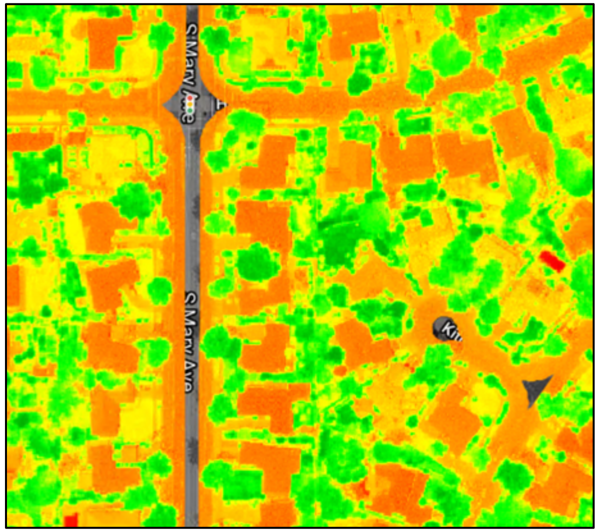
- Models of urban tree and turf water demand developed from field studies
- Water demand = transpiration under fully irrigated conditions

Litvak *et al*. 2017, *Water Resources Research*

Calculating Residential Vegetation Water Demand

Step 1. Calculate area of residential vegetation

1. Define residential areas
2. Calculate total vegetated area (NDVI)
3. Calculate tree canopy area (US Tree Map, point estimates)



Calculating Residential Vegetation Water Demand

Step 2. Calculate water demand of **turf**

Water demand = k_{mc}*ET_o

Unshaded turf area

Shaded turf area

Litvak *et al*. 2017, *Water Resources Research*

Calculating Residential Vegetation Water Demand

Step 3. Calculate water demand of **trees**

Water demand = $E_{broadleaf} + E_{conifer} + E_{palm}$

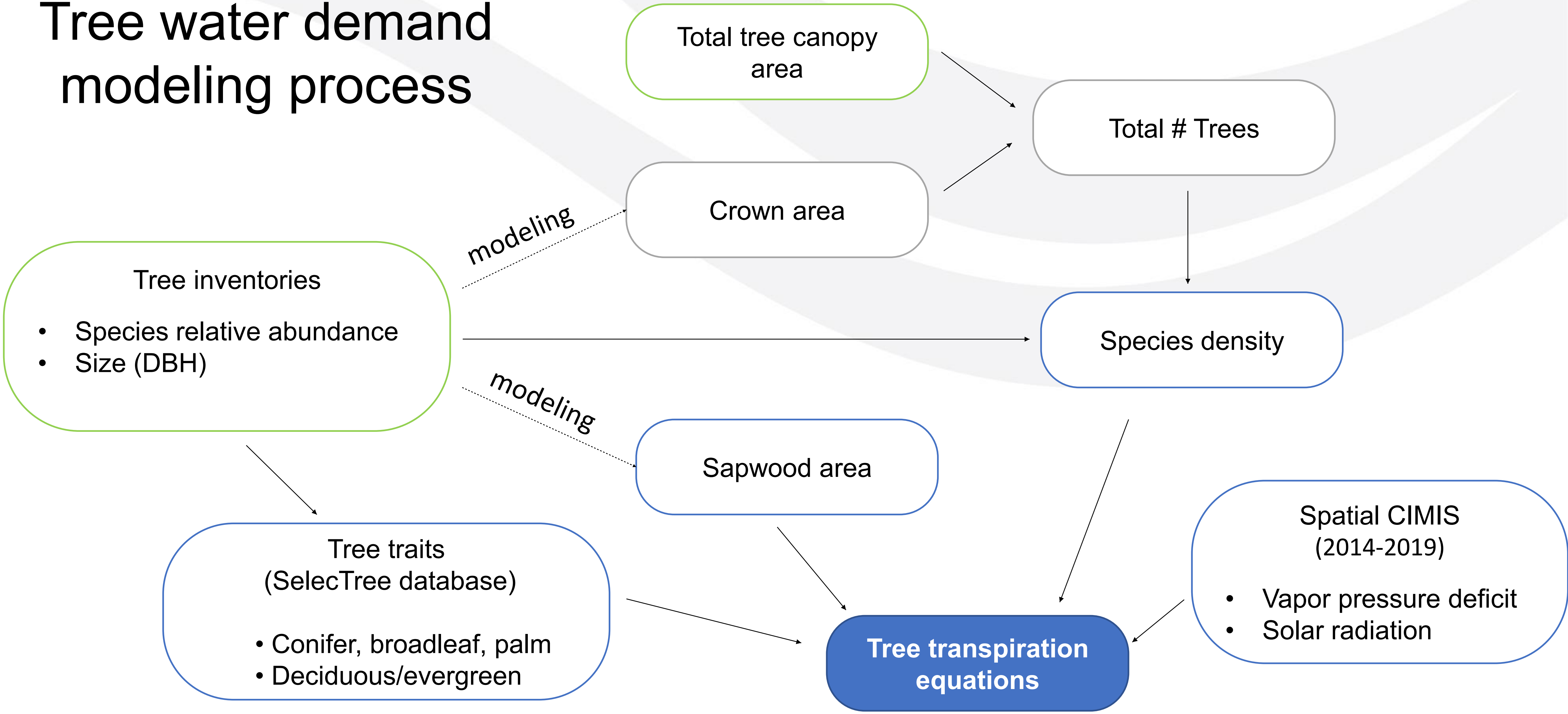
E = transpiration

Data needs for each Supplier:

- Total # residential trees
- Relative abundance of each species
- Size (DBH) distribution of each species
- Type and deciduous/evergreen
- Mean sapwood area of broadleaf trees and conifers
- VPD and solar radiation

Litvak *et al*. 2017, *Water Resources Research*

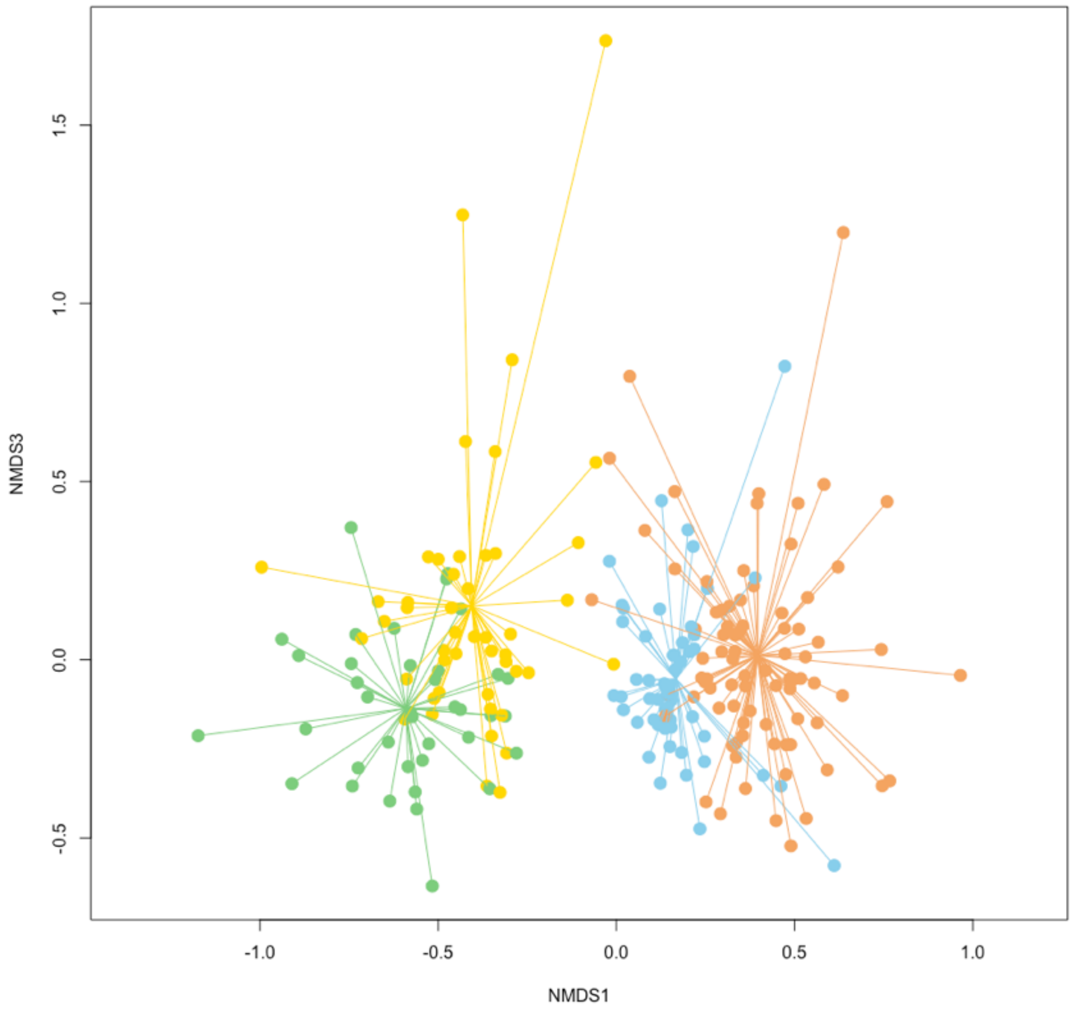
Tree water demand modeling process

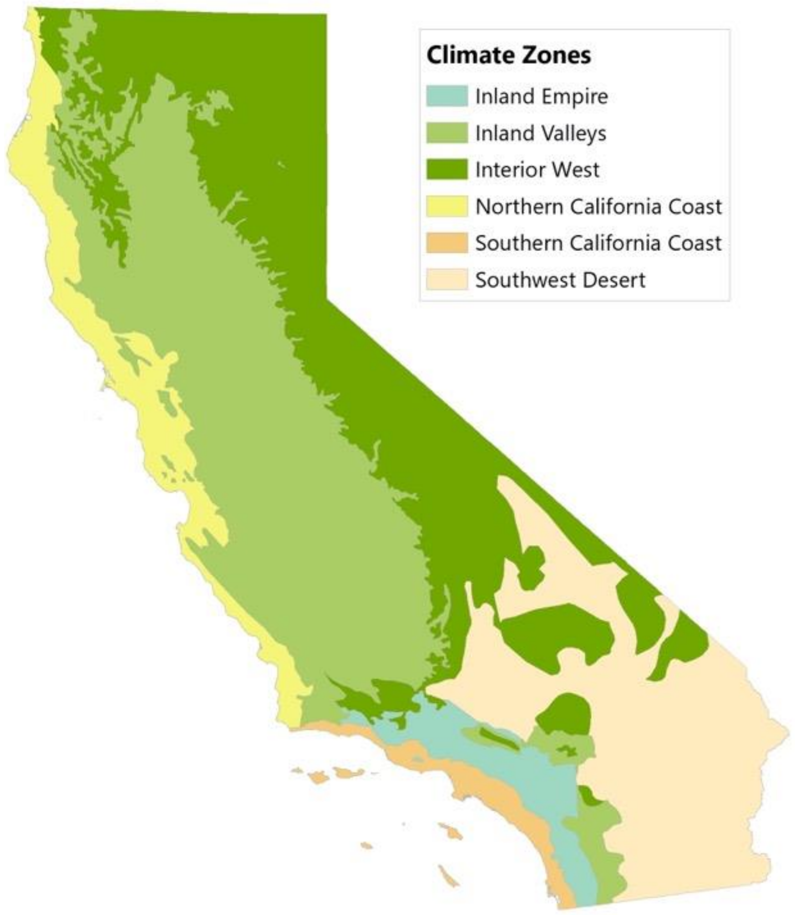


Approach for Suppliers without tree inventory data

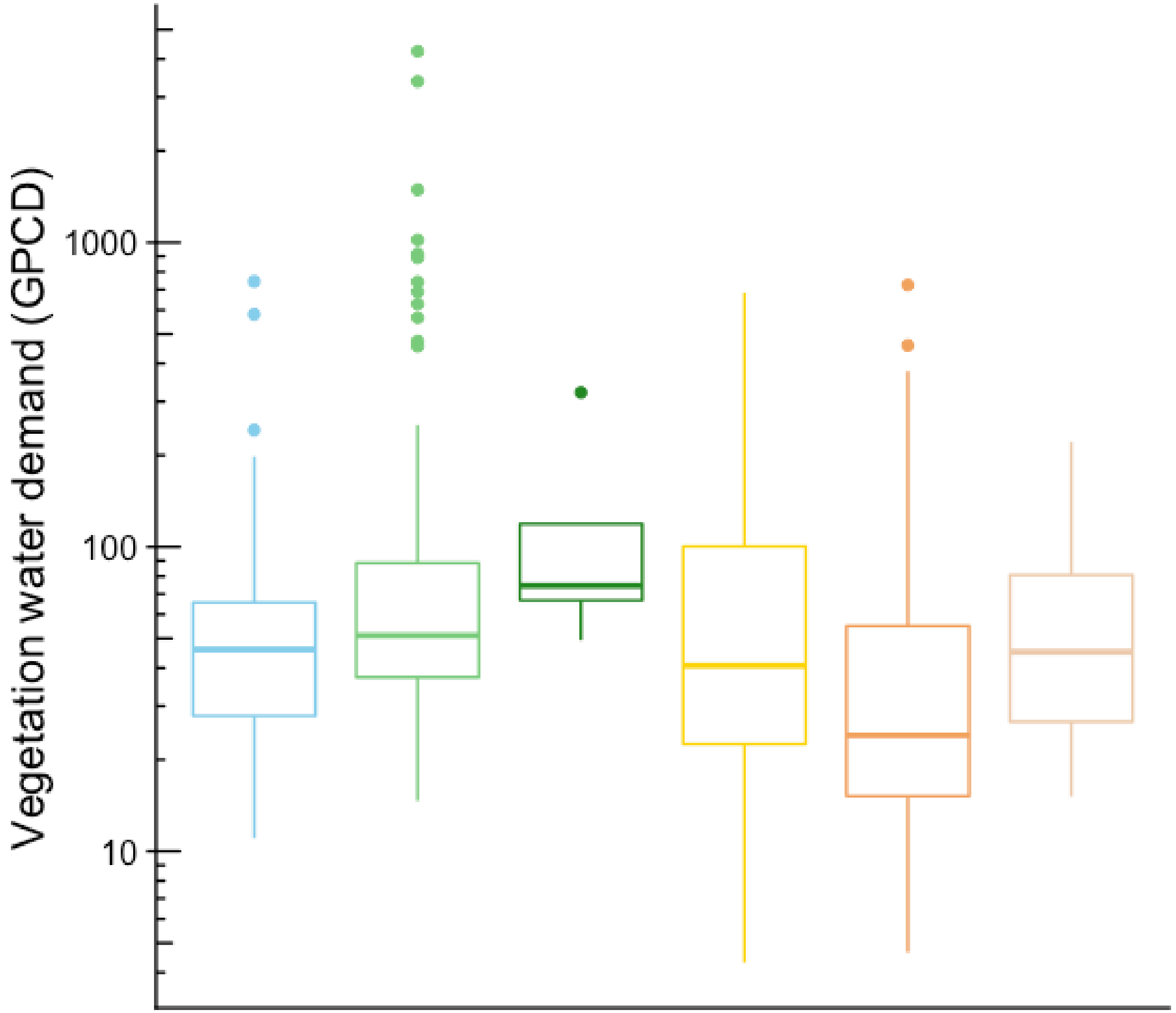
- Tree species composition tends to separate by climate zone

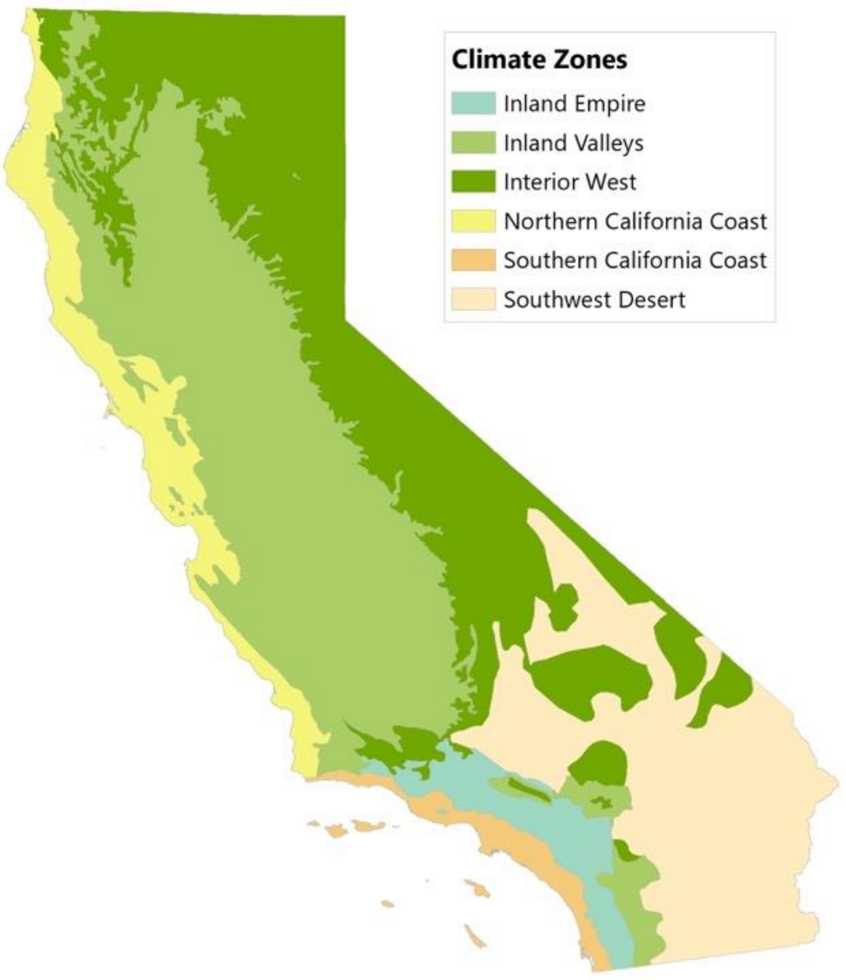
- Model unknown urban forests by climate zone, using joint species distribution modeling



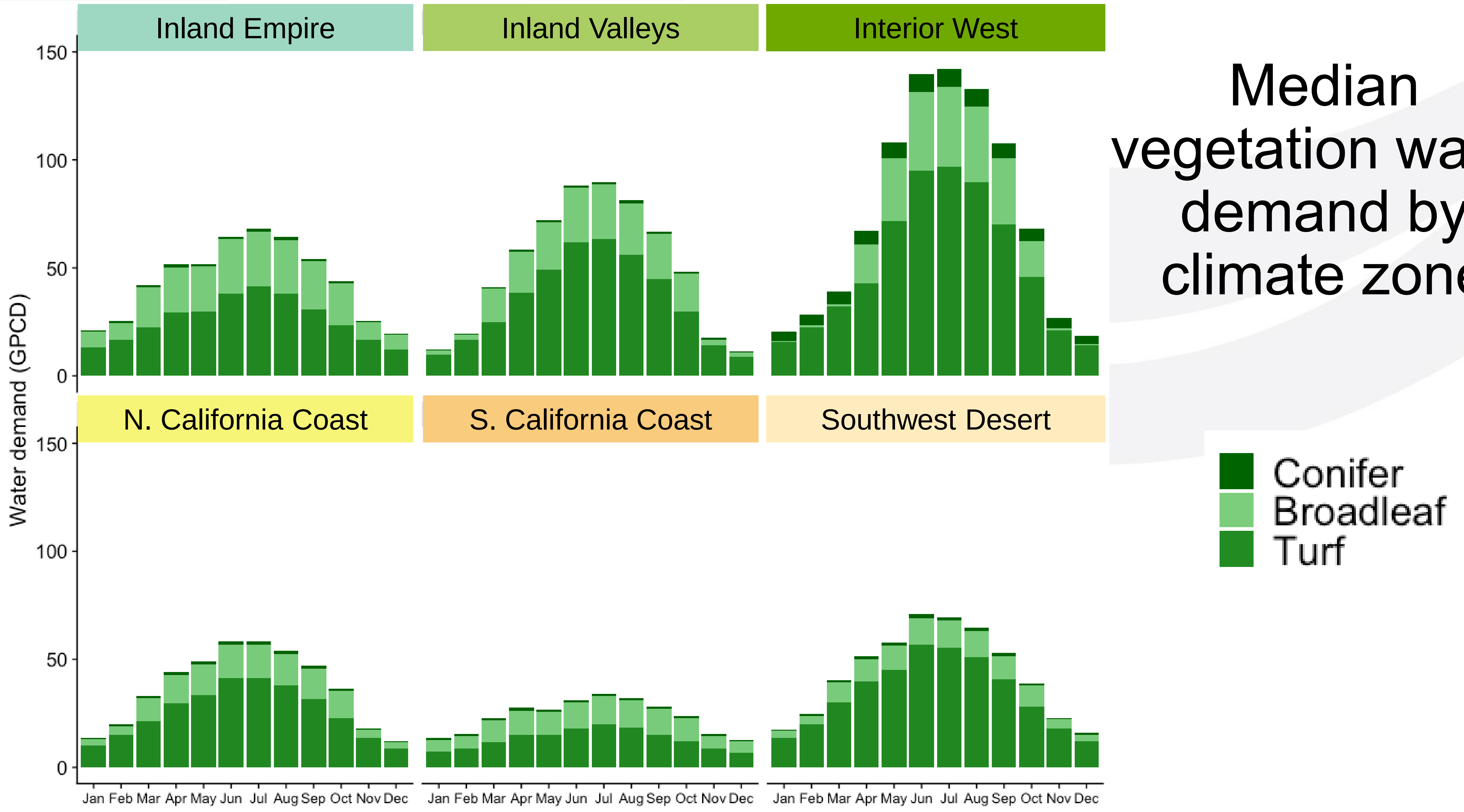


Annual per capita vegetation water demand

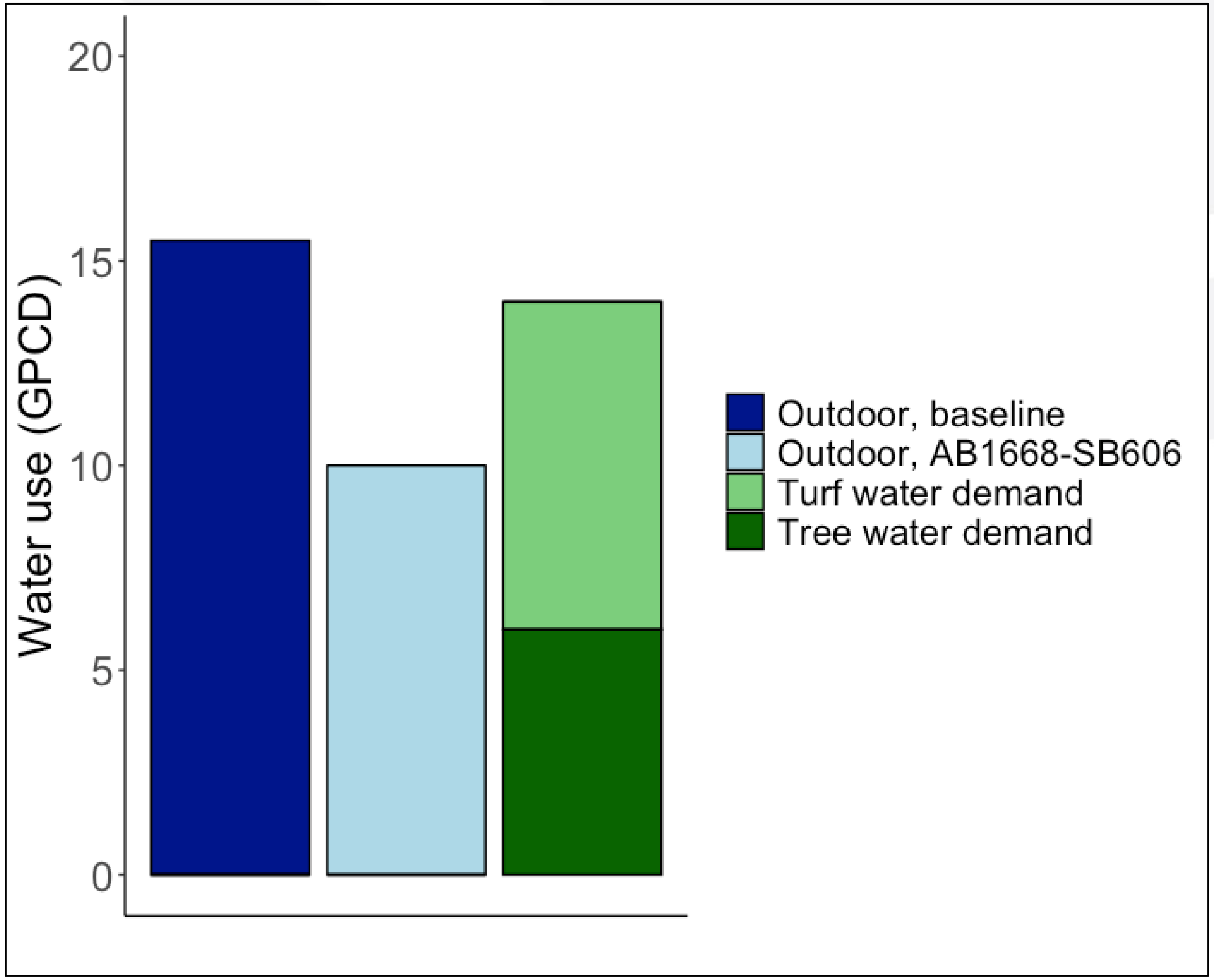




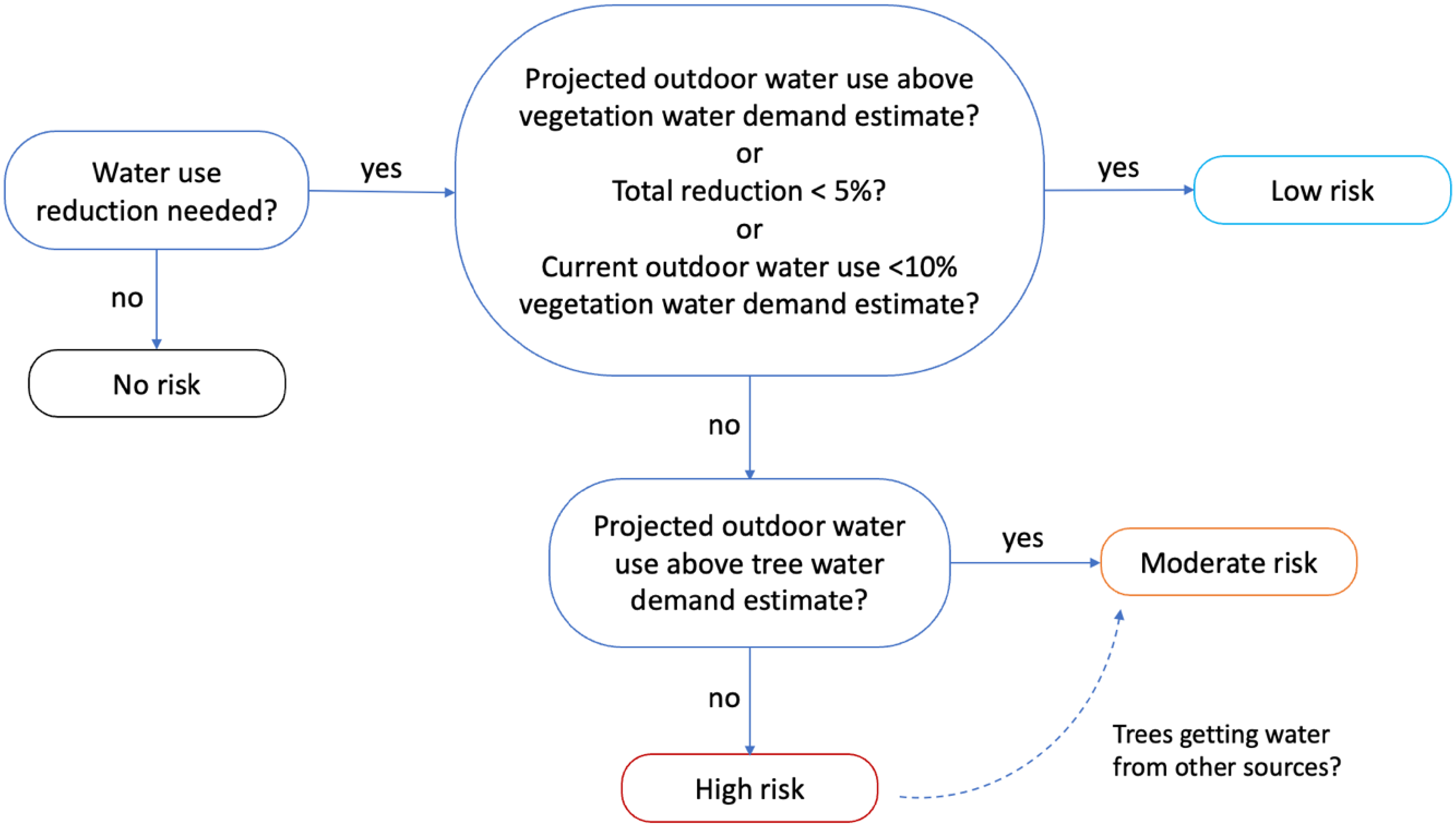
Median vegetation water demand by climate zone



Risk assessment for residential trees: Vegetation water demand vs. outdoor water use



Risk assessment for residential trees



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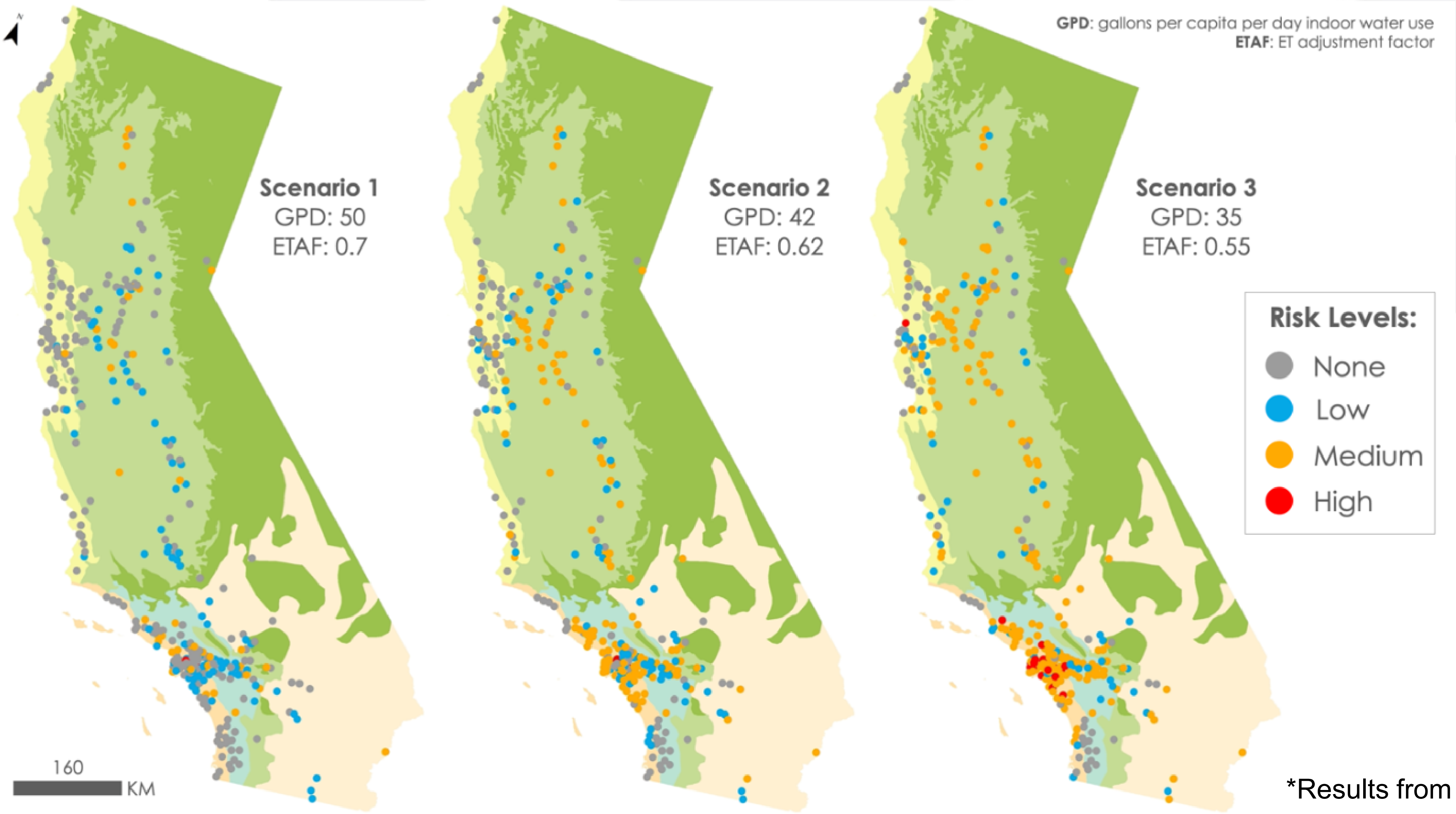
Risk levels for urban trees under three scenarios*



*Results from Jan 2022 report

Summary

- Low-water-use tree species have not been prioritized in California's urban forests
  - Planting climate appropriate trees now could reduce water needs of future urban forests
- Mature trees can be negatively affected by a lack of irrigation
  - Efficient irrigation could save water without harming existing trees
- Most areas will have enough water for existing trees under the new standards, but not necessarily for turf
  - Transitions to non-turf landscaping choices should consider trees' water needs
  - Shading turf reduces its water use
  - Expected changes from baseline may vary with climatic and behavioral uncertainty

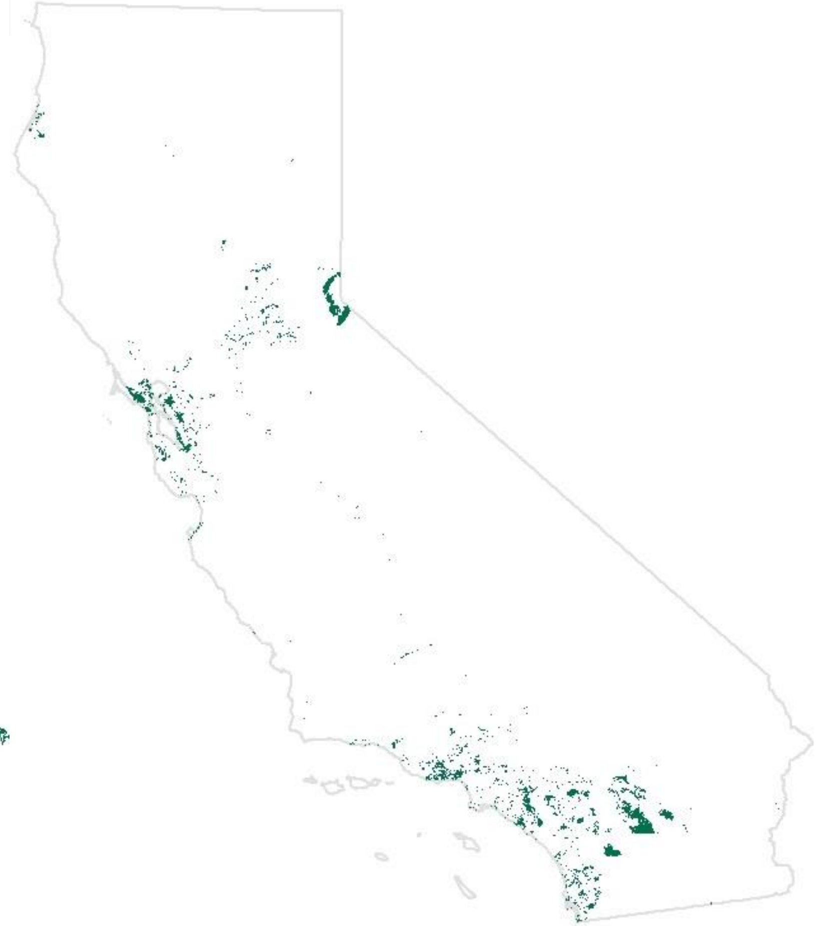
Evaluating Effects on Urban Parklands

- Evaluate parklands within urban retail water supplier boundaries
- Identify case study agencies
- Outreach & semi-structured interviews with park managers
- Analyze interview findings

California Protected Areas Database

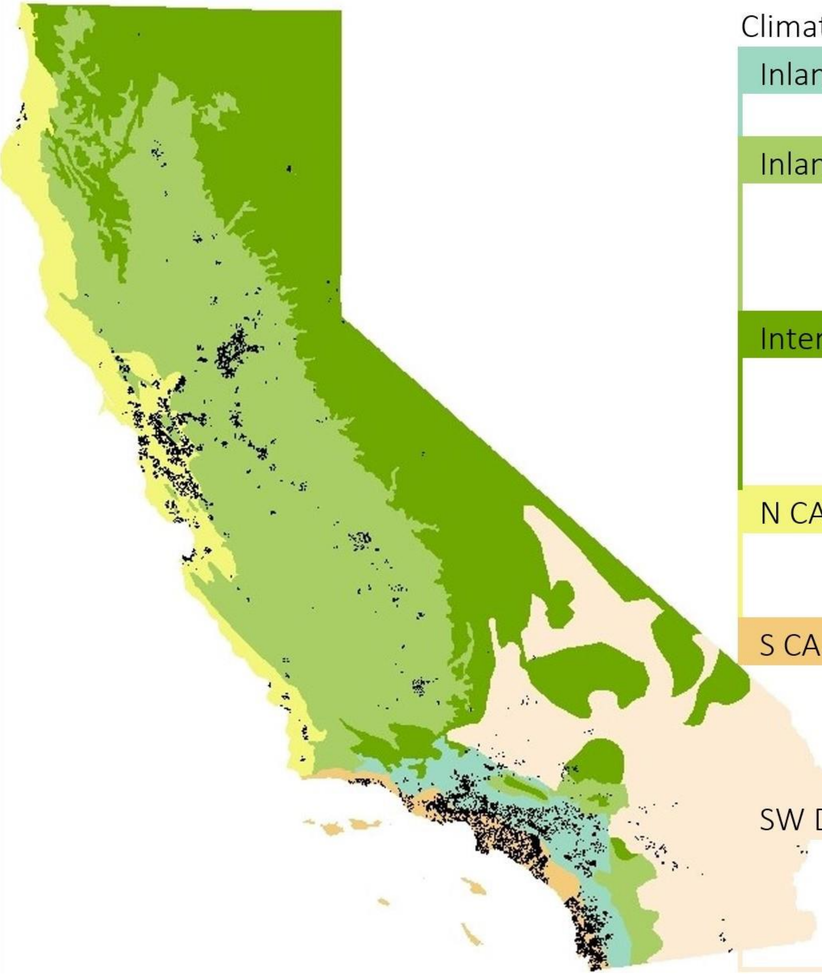
All CPAD acres
~50M

CPAD acres in retailer boundaries
~1.4M



FID	46
ACCESS_TYP	Open Access
UNIT_ID	190
UNIT_NAME	Augustus Hawkins Natural Park
SUID_NMA	15707
AGNCY_ID	1188
AGNCY_NAME	Los Angeles, City of
AGNCY_LEV	City
AGNCY_TYP	City Agency
MNG_AGENCY	Los Angeles, City of
MNG_AG_LEV	City
MNG_AG_TYP	City Agency
PARK_URL	
COUNTY	Los Angeles
ACRES	8.369
LABEL_NAME	Augustus Hawkins Natural Park
YR_EST	0
DES_TP	Local Park

Park Outreach & Case Studies



Climate Zone (CZ)	URWS	Parks in CZ	Acres in CZ	% Parks in CZ	% Acres in CZ	% Acres in City/ County
Inland Empire	40	52	3,361	3%	5%	0%
	3	41	623	2%	1%	2%
Inland Valleys	2	55	1,650	2%	4%	2%
	2	88	1,287	4%	3%	2%
	4	207	3,595	8%	8%	6%
	10	15	7,095	1%	15%	1%
Interior West	1	9	203	20%	36%	2%
	1	5	118	11%	21%	1%
	1	7	29	13%	4%	0%
	1	9	88	17%	12%	0%
N CA Coast	3	196	2,650	10%	5%	9%
	3	182	1,577	9%	3%	1%
	1	28	104	1%	0%	2%
S CA Coast	7	32	4,804	1%	4%	0%
	10	460	20,732	15%	16%	13%
	2	118	1,917	4%	2%	6%
	3	43	821	1%	1%	7%
SW Desert	1	13	93	6%	4%	1%
	1	10	243	4%	8%	0%
	1	21	67	9%	2%	1%
	1	15	129	6%	4%	3%

Outreach with city and county agencies to target urban parklands.

Climate change & water scarcity	Economics, population demands & changes
- Climate change adaptation is taken very seriously by some parks departments, less so by others, but not yet a budgetary priority for most.	- Anxiety exists over water rate increases in park departments that rely heavily on urban water retailers. - The public takes drought mitigation seriously, yet also wants verdant, healthy vegetation in parks. - Water consumption is thought of in dollars; not in terms of what as "sufficient" for specific vegetation.
Drought-tolerant landscaping	**Water measurement & rationalization**

- Standard measures to reduce parklands water consumption are neither simple nor cheap:
  - converting parks to "drought tolerant landscaping"
  - installing drip/bubbler irrigation
  - switching to recycled water
	- The presence of dedicated outdoor meters depends on administrative organization, water source, & age of the park infrastructure
	- Automatic irrigation systems help save water & labor, but must be supervised & maintained.
	- In some locations, water delivery infrastructure needs repair.

Parks – Final Thoughts

- Mitigating drought & transitioning to climate-appropriate landscapes are expensive & complicated tasks

- A purely technological approach is often prohibitively expensive and unlikely to yield desired reductions in park water consumption

- Integrated landscape management plans that make use of local climate projections are necessary. So is new thinking about how to create aesthetically pleasing landscapes that eliminate the thirstiest forms of land cover.

Economic Impacts

- Assumed economic impacts for municipal trees for Suppliers in "Moderate" risk (135) and "High" (5) risk categories
  - Costs and benefits for residential trees were captured elsewhere as direct impacts to Suppliers (landscape conversion)

Economic Impacts for Scenario 2 ("Preferred" Option):

Action	Unit Cost *	Total Cost **
Education and outreach focused on urban tree irrigation and planting	$20,000/year/Supplier	$2.8 million/year
Update urban tree inventories	$600,000/inventory	$83 million (through 2030)
Update urban forestry management plans	$50,000/plan	$7 million (through 2030)

* Unit costs derived from literature and municipal tree inventories in California (2011-2020)

** Nominal costs, which do not consider inflation

Fiscal Considerations

- Variances and municipal tree planting programs
  - If water use variances are provided for urban trees, must consider:
    - Benefits and costs of planting and maintenance
    - Fiscal impacts for municipalities
  - Need more rigorous data collection and validation

Benefit/Cost Description	Unit Cost * (low)	Unit Cost * (high)	Source
Tree planting cost	$200/tree	$400/tree	Municipal urban forestry management plans (UFMPs) in California (2011-2020)
Tree annual maintenance cost	$20/tree	$60/tree	
Tree removal cost	$1,000/tree	$2,000/tree	
Irrigation of newly-planted trees	$300/tree for each of first three years		
Estimated annual “ecoservices” benefit	$14/tree	$64/tree	UFORE model inputs, as reported in UFMPs

* Nominal unit costs as reported, derived from municipal tree inventories in California (2011-2020)

Takeaways

- Evaluated effects of water use objectives on urban landscapes and trees, which incorporated a baseline of forecasted changes
- Mature shade trees may be affected by water use reductions, but risk to existing tree canopies in many of California’s urban areas is low/moderate
  - Can often be mitigated through efficient irrigation practices
- Climate-appropriate landscapes and low-water-use tree species have not been prioritized in California’s urban areas
- Effects on urban parklands depend on their designation under the AB 1668-SB 606 framework, but urban parkland managers face multiple challenges
  - Fiscal constraints, public perceptions, and drought
  - Need for better integrated landscape planning with climate change

Special Thanks

CalWEP, Alliance for Water Efficiency

Urban retail water supply community

Wastewater management community, including CASA, SCAP, BACWA, CVCWA, CWEA

Urban parkland management community

Dongyue Li, Ruth Engel, Dennis Lettenmaier, Tom Gillespie (UCLA)

Matthew Ritter, G. Andrew Fricker (Cal Poly SLO)

Diane Pataki (Arizona State), Liza Litvak (University of Utah)

Questions?

To ask a question: use Q&A box or raise your hand
For phone callers: *9 to raise hand, *6 to speak

10 minute Break

Panel discussion on adaptation measures

CALIFORNIA
Water Boards

Office of Research, Planning and Performance


POLLINATOR
Posse
PollinatorPosse.org

PARDON OUR WEEDS

WE ARE PRESERVING POLLINATOR HABITATS

IN OUR EFFORTS TO SUPPORT WILDLIFE HABITAT, WE ARE PRESERVING POLLINATOR LARVAL FOOD PLANTS (MANY ARE CONSIDERED WEEDS). WE WELCOME YOUR PARTICIPATION!

TO VOLUNTEER AND OBTAIN MORE INFORMATION PLEASE CONTACT:

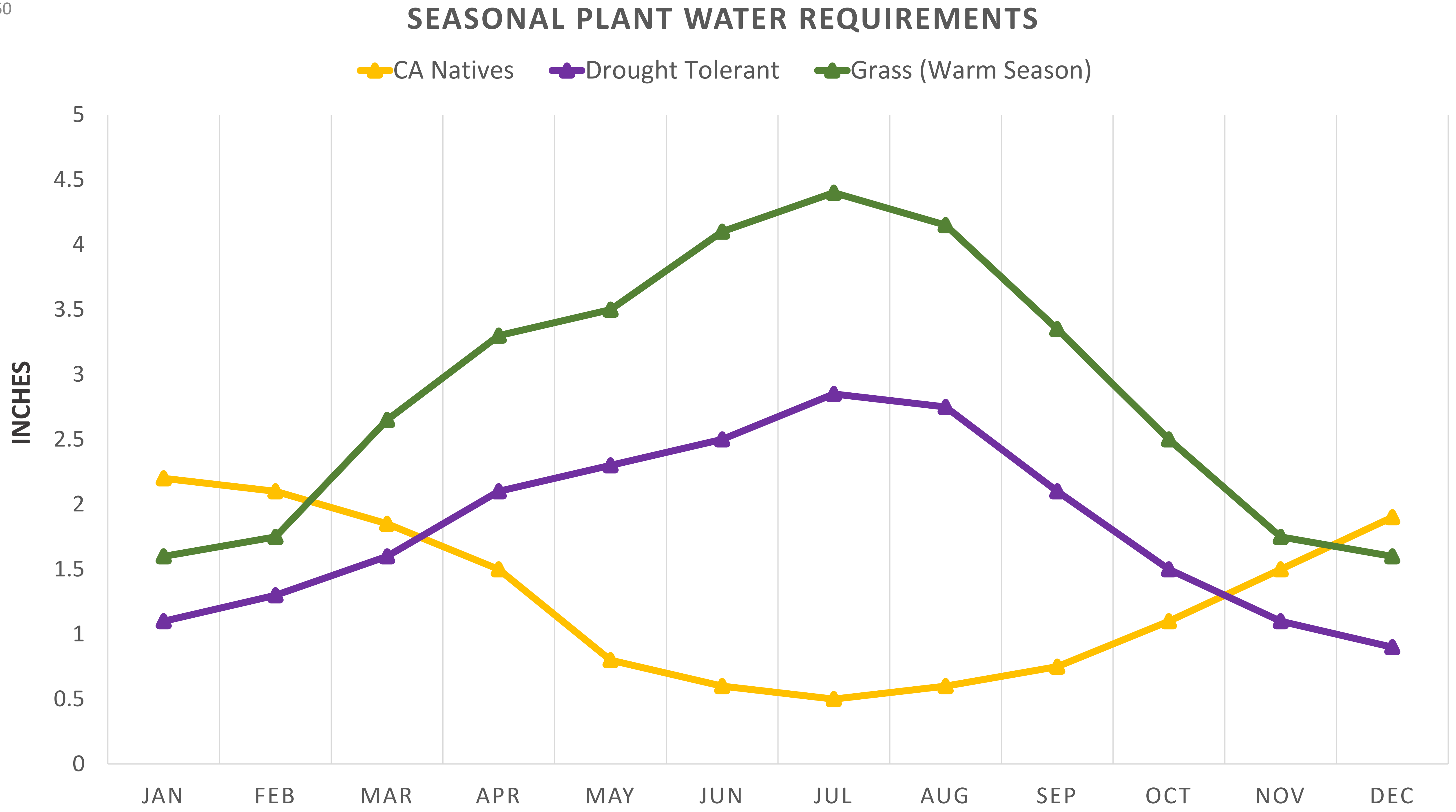
gardensatlakemerritt.org/ or pollinatorposse.org


LARGE TREES FOR RAPTURES
PLANTS ARE ABLE TO REACH MATURE HEIGHT
NESTING BOXES
HOST PLANTS
LOTS OF NECTAR!!!!!
BARE DIRT
WATERSOURCE
SHELTER AND PLACE TO RAISE YOUNG
WOOD SNAGS


ALL YOU NEED IS LOVE
LOVE is all YOU

moulton niguel water district

Lindsey Stuvick, Water Efficiency Manager
August 12, 2022


SEASONAL PLANT WATER REQUIREMENTS
CA Natives
Drought Tolerant
Grass (Warm Season)
INCHES
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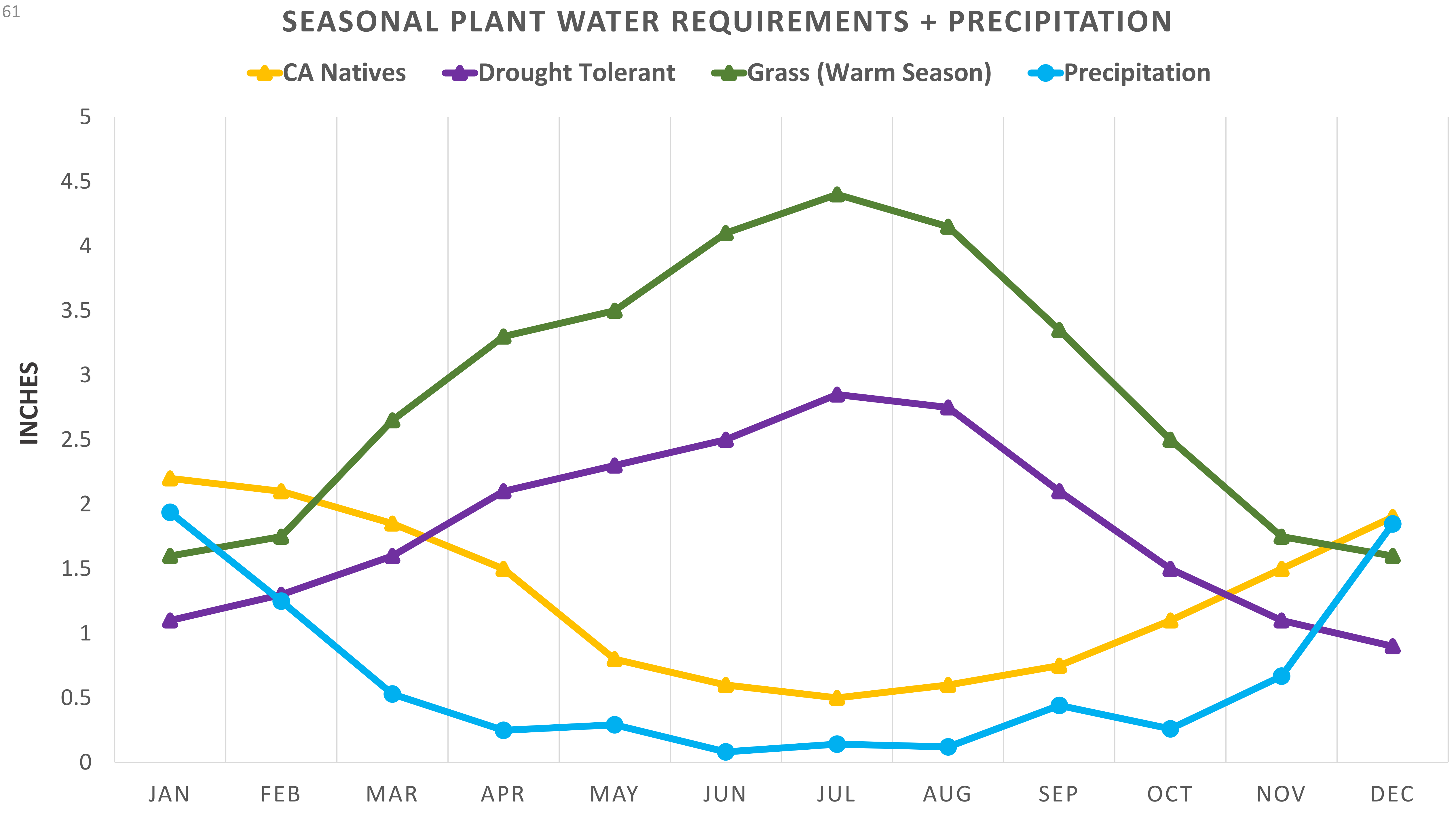
SEASONAL PLANT WATER REQUIREMENTS + PRECIPITATION
CA Natives
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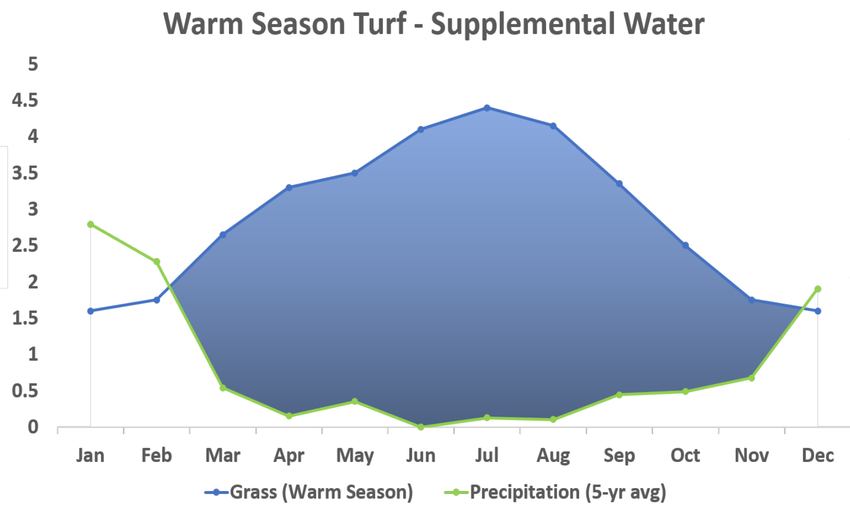
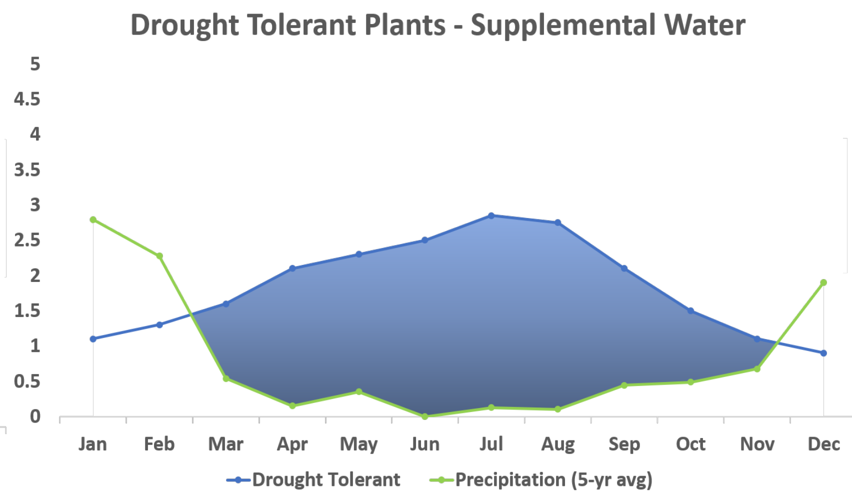
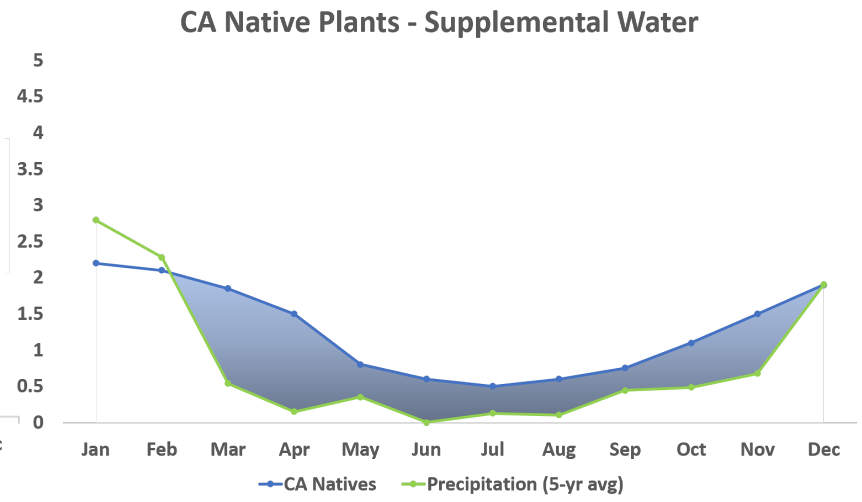
Comparison of Supplemental Water Needs





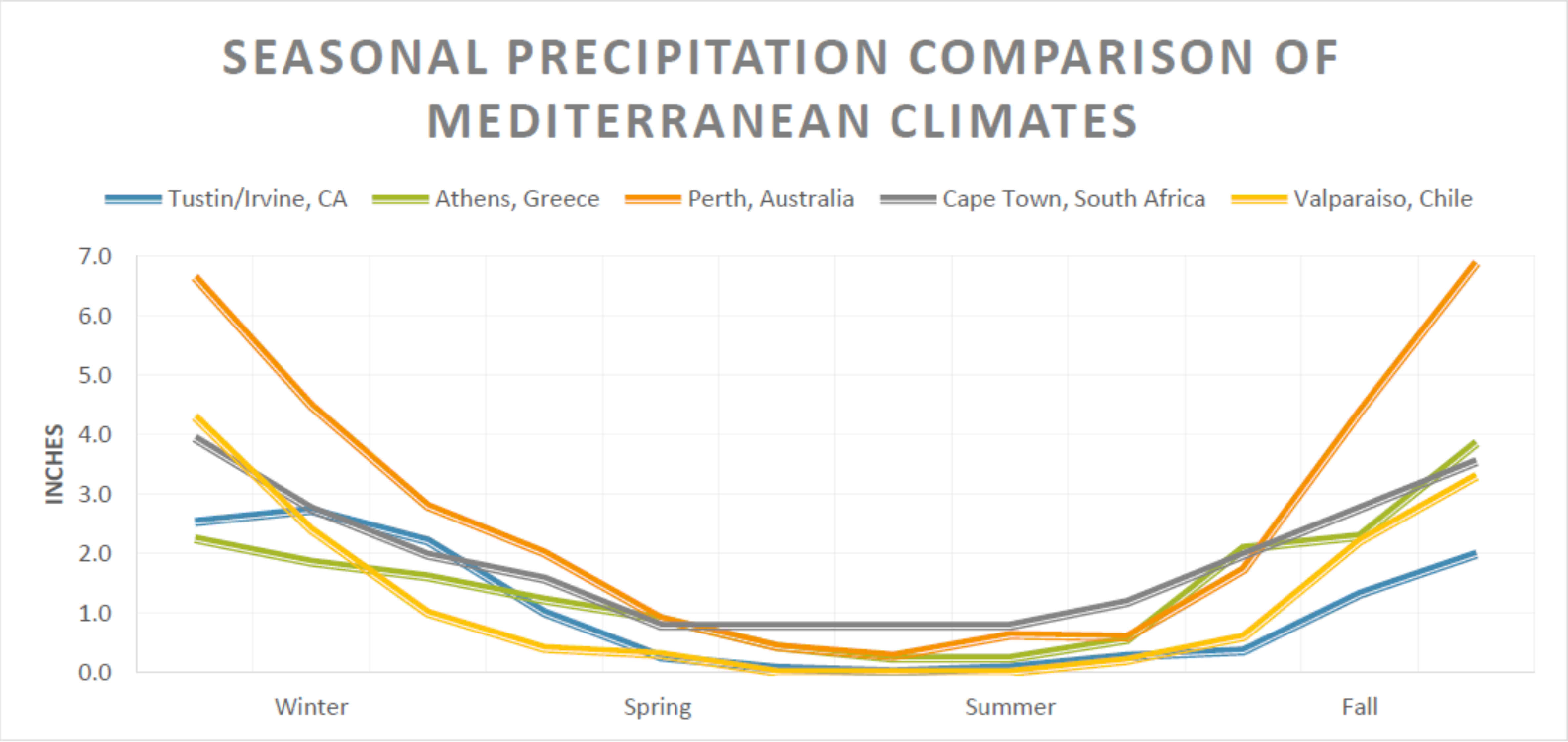


- Bermuda
- St. Augustine
- Buffalo grass

- Cosmos
- Euryops
- Hibiscus

- Cleveland sage
- California fuchsia
- Wooly blue curls

Mediterranean Regions Across the Globe

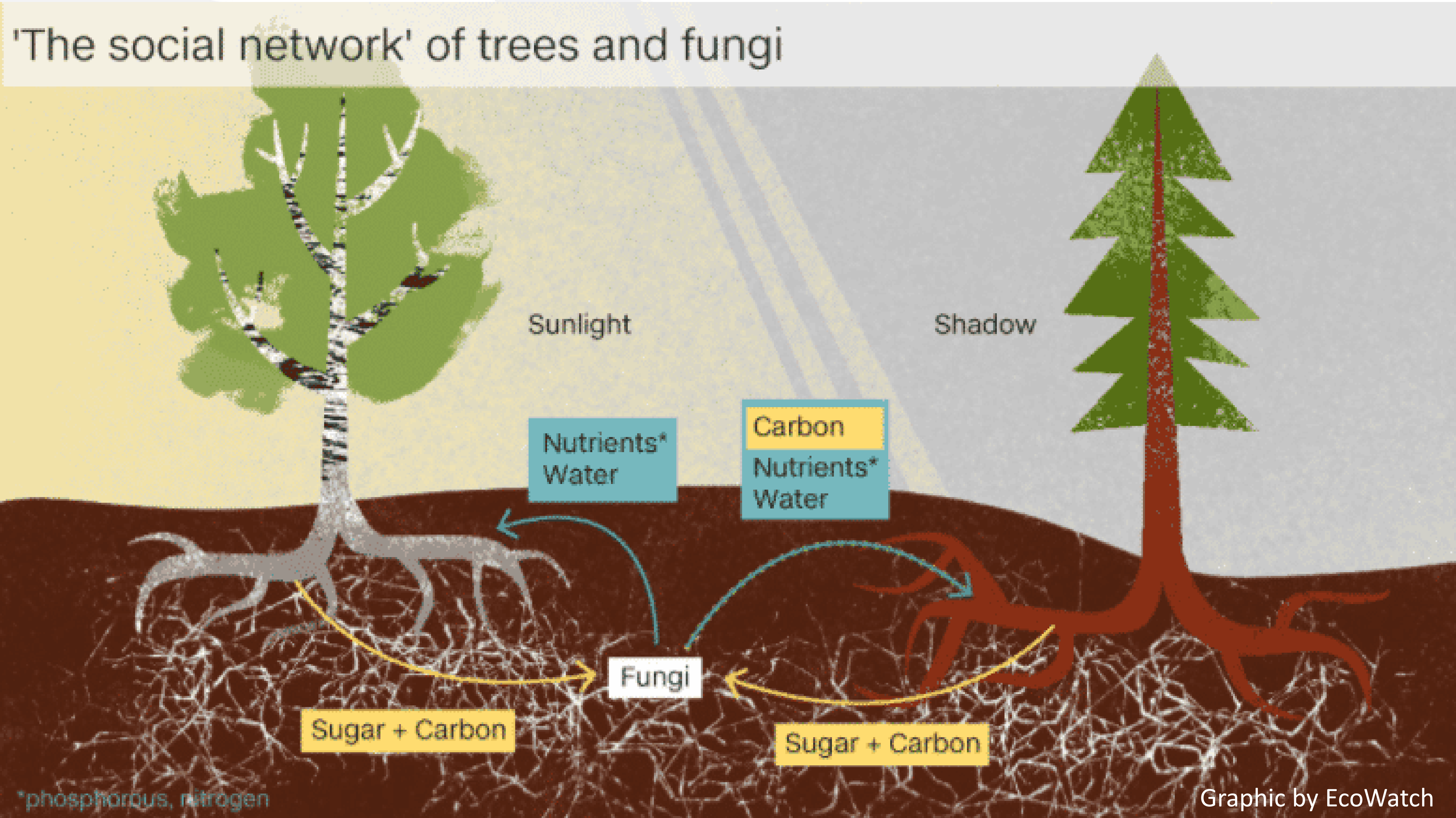

SEASONAL PRECIPITATION COMPARISON OF MEDITERRANEAN CLIMATES
Tustin/Irvine, CA
Athens, Greece
Perth, Australia
Cape Town, South Africa
Valparaiso, Chile
INCHES
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Winter
Spring
Summer
Fall

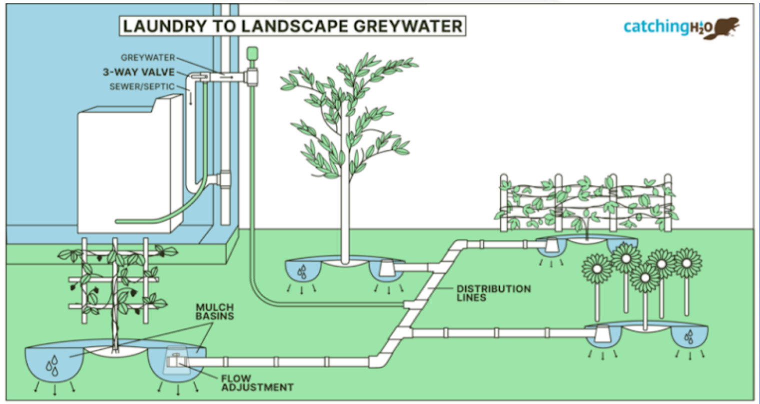
Brook Sarson

CEO, CatchingH2O

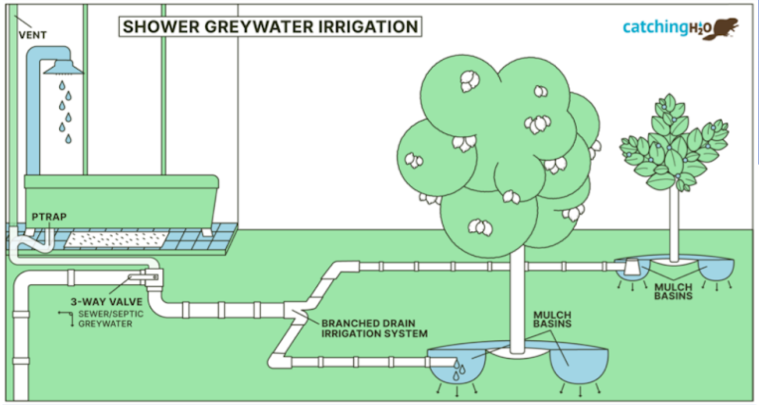
Technical Advisor, Accelerate Resilience L.A.


Rainwater
Harvesting
HarvestingRainwater.com
Graphic by Brad Lancaster


'The social network' of trees and fungi
Sunlight
Shadow
Nutrients*
Water
Carbon
Nutrients*
Water
Fungi
Sugar + Carbon
Sugar + Carbon
*phosphorous, nitrogen
Graphic by EcoWatch

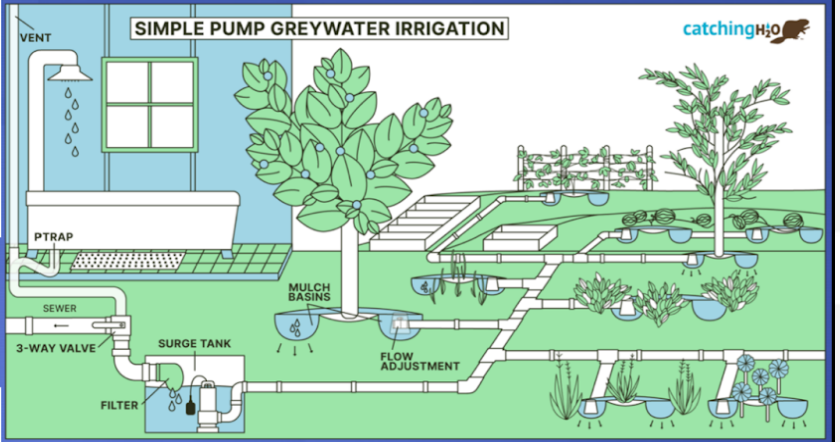


$250 - $1500

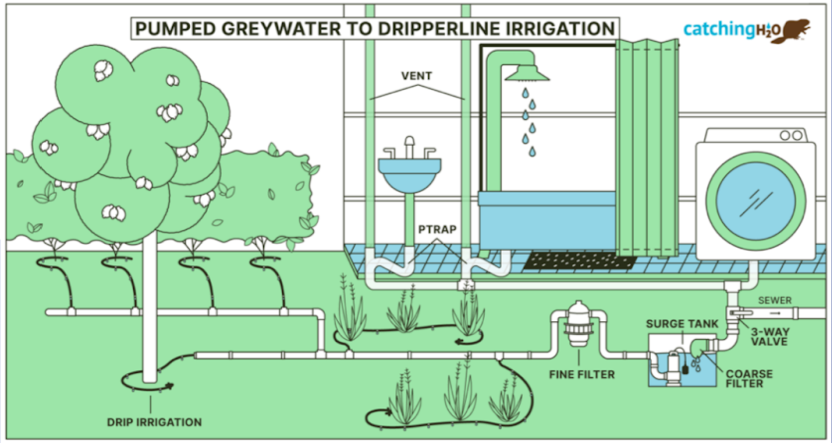


$750 - $3500

$2500 - $4500



$4500 - $10,500



Questions?

To ask a question: use Q&A box or raise your hand

For phone callers: *9 to raise hand, *6 to speak

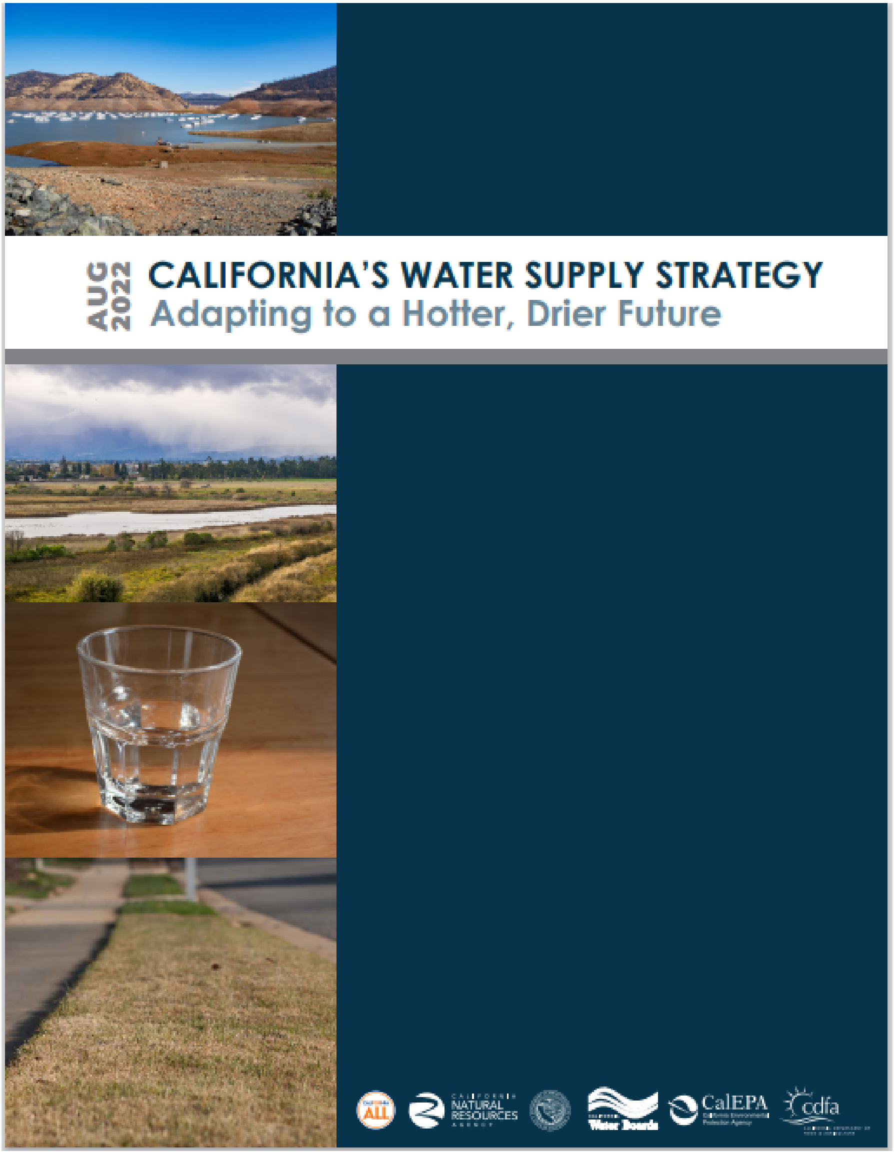
Urban greening funding opportunities

CALIFORNIA
Water Boards

Office of Research, Planning and Performance

[California’s Water Supply Strategy, Adapting to a Hotter, Drier Future]

Funding available



CAL FIRE Urban and Community Forestry

Presented to the State Water Resources Control Board

Making Conservation a California Way of Life

Funding opportunities for urban forestry and urban greening

August 12, 2022

Walter Passmore, State Urban Forester – Resource Protection and Improvement

CAL FIRE Urban & Community Forestry Program

The mission of the California Department of Forestry and Fire Protection's Urban Forestry Program is to lead the effort to advance the development of sustainable urban and community forests in California. Trees provide energy conservation, reduction of storm-water runoff, extend the life of surface streets, improve local air, soil and water quality, reduce atmospheric carbon dioxide, improve public health, provide wildlife habitat and increase property values. In short, they improve the quality of life in our urban environments which, increasingly, are where Californians live, work, and play. The program also administers State and Federal grants throughout California communities to advance urban forestry efforts.

- Technical assistance and advice
- Public and professional education
- Public events
- Local and regional advocacy
- Networking and partnerships
- Technology transfer
- Grants
- Conduit to national programs

Program Highlights

- Staff of 10, six field specialists, one environmental scientist (education and outreach specialist), one program manager, two supervisors
- Websites = www.ufei.org and www.fire.ca.gov
  - SelecTree/CA Big Trees Register/Urban Tree Key/Inventory
- CA ReLeaf Network = 80+ Community Groups
- Grant Programs (FY 2021-22 $30 million to 40 awards, Urban and Community Forestry Grant Programs (ca.gov))
  - Urban Forest Expansion and Improvement (37,159 trees)
  - Management Activities (13 cities)
  - Workforce development (13 groups will train more than 1,000 people)
- Tree City USA awards – 165 cities, 7 Tree Line Utilities, 14 Tree Campus Higher Education
- Applied Research & Demonstration

Urban Forest Benefits

- GHG storage and avoided emissions
- Energy Conservation
- Air Quality
- Conserving Runoff
- Water quality improvement
- Economic (property value +)
- Public Health
- Jobs
- Much more…..

Focus on the benefits gained from implementing a systematic approach of using vegetation to solve problems in urban areas.

Types of Urban Forestry Grant Projects

- **<u>Urban Forest Expansion and Improvement</u>**
  - ❑ Urban tree planting projects and associated costs
  - ❑ Purchase and improve unused neighborhood parcels

- **<u>Urban Forest Management Activities</u>**
  - ❑ Urban forest management plans
  - ❑ Tree or urban forest related policies and ordinances
  - ❑ Urban tree inventories
  - ❑ Urban forest mapping and analysis

- **<u>Urban Forestry Education and Workforce Development</u>**
  - ❑ Educate, train, and employ people in urban forestry or a closely related profession.
  - ❑ Equip and develop local people to improve their urban forest and associated ecosystems

U&CF Program history and forecast

- Foundational services
  - Grants
  - Technical Assistance
  - Education and outreach
- Focus issues forecast
  - Canopy cover distribution and density
  - Equity
  - Green schoolyards
  - Increasing resilience to extreme heat, climate change, air quality, health impacts, and other issues

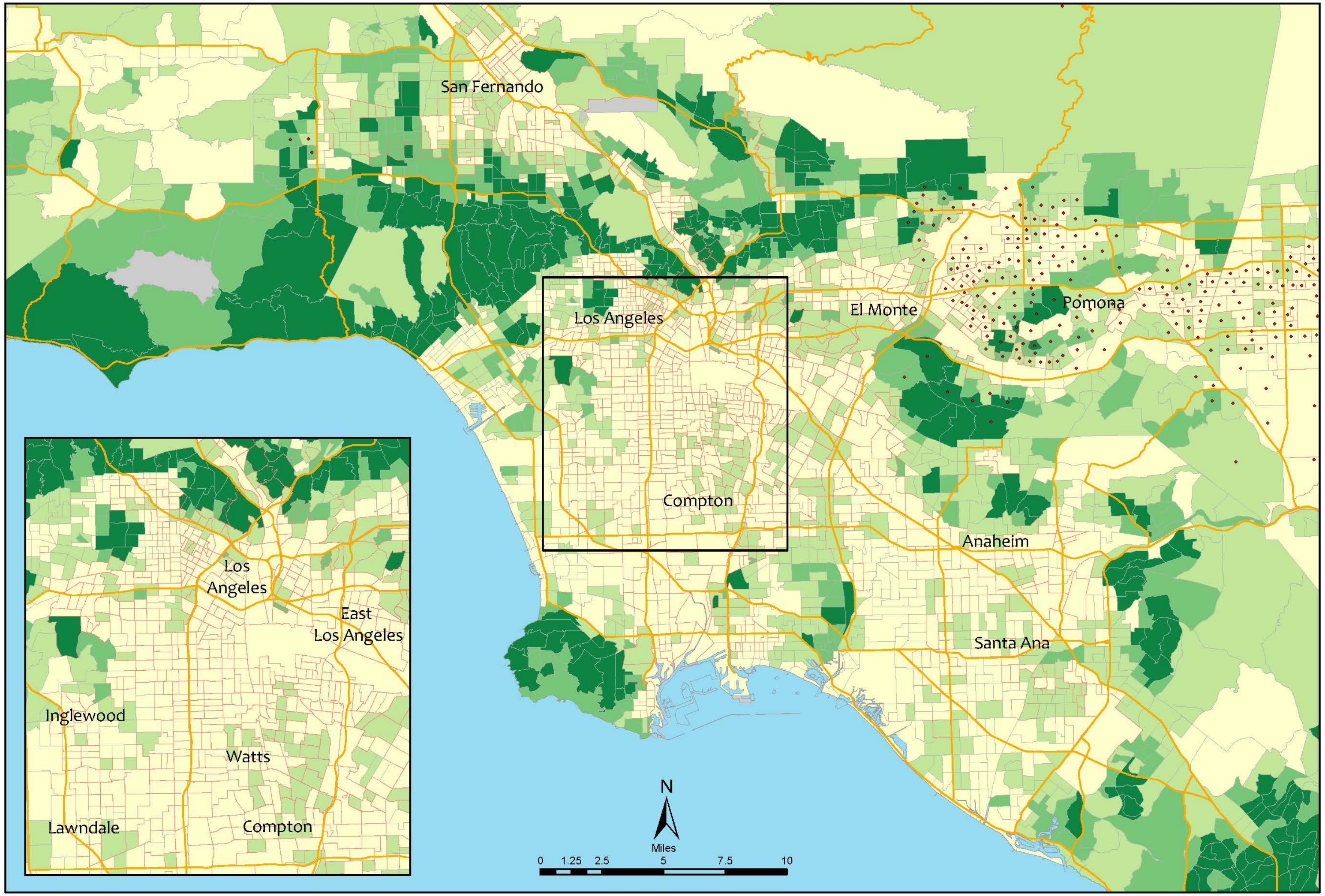

CELEBRATE
CITY OF FONTANA
TREE CITY USA
Arbor Day Foundation


25 10:52 AM





LA Urban Area Tree Canopy and Disadvantaged Communities by Census Tract



Urban Tree Cover: 0 - 9% | 10 - 15 % | 16 - 20 % | Over 20 %

Disadvantaged Community | Temperature > 90° for at least 75 days of the year | Roads

Data Sources: Disadvantaged Community data derived from CalEnviroScreen v 2.0; Tree Canopy Cover derived from EarthDefine, 2012; Days over 90 data derived from PRISM 2004 - 13 average.

Thank You!

Walter Passmore, State Urban Forester
CA Dept. of Forestry & Fire Protection (*CAL FIRE*)
P.O. Box 944246 Sacramento, CA 94244-2460
(916) 214-5420
walter.passmore@fire.ca.gov

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Where to find more information

- State Water Resources Control Board
  - Water Conservation Portal www.waterboards.ca.gov/water_issues/programs/conservation_portal/
  - About SB 606 & AB 1668:
    - www.waterboards.ca.gov/water_issues/programs/conservation_portal/california_statutes.html
  - About the rulemaking process:
    - www.waterboards.ca.gov/water_issues/programs/conservation_portal/regs/water_efficiency_legislation.html
- Department of Water Resources
  - Primer of 2018 Legislation on Water Conservation and Drought Planning
  - About urban water use efficiency, including SB 606 & AB 1668:
    - https://water.ca.gov/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency
  - Sharepoint site with materials for DWR workgroup members only:
    - https://cawater.sharepoint.com/sites/dwr-wusw/SitePages/Home.aspx

Previous Workshops

- December 2&3, 2021 (Wastewater, trees, and parklands methods)
- May 11, 2022 (Wastewater results)
- Can be found at: https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/regs/water_efficiency_legislation.html#task5-deliverables

Thank you!

Contact: ORPP-WaterConservation@waterboards.ca.gov with questions