UC San Diego

WATER TOWN HALL
OCT 25, 2022

Resource Management & Planning

UC San Diego

SETTING THE STAGE

STEPHEN JACKSON

ASSOCIATE VICE CHANCELLOR, RESOURCE MANAGEMENT & PLANNING

WELCOME

- John Dilliott, Director, Utilities & Sustainability
- Garrett McGurk, Hydrology Engineer, Center for Western Weather and Water Extremes, Scripps Institution of Oceanography
- David Boggs, Landscape Construction & Irrigation Superintendent, Facilities Management
- Michelle Perez, Manager, Utilities & Sustainability
- Kimberly O'Connell, EH&S Environmental Affairs Division Manager
- Jen Bowser, Sustainability Engagement Manager, UC San Diego Sustainability
- Josue Canizales, UC San Diego Sustainability Green Programs Intern
- Leslie Ngo, UC San Diego Aquaholics Anonymous Intern

LAND ACKNOWLEDGEMENT

The UC San Diego community holds great respect for the land and the original people of the area where our campus is located. The university is built on the unceded territory of the Kumeyaay Nation. Today, the Kumeyaay people continue to maintain their political sovereignty and cultural traditions as vital members of the San Diego community. We acknowledge their tremendous contributions to our region and thank them for their stewardship.

BEFORE WE BEGIN

This webinar is being recorded.

Recordings and Q&A can be viewed on the Climate & Sustainability Town Halls webpage: https://sustain.ucsd.edu/about/town-halls.html

Strategic Energy Plan Update

QUESTIONS

- Were submitted during registration
- Can be submitted in the Zoom Q&A feature

We'll answer as many questions live as time allows.

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UPDATE ON STRATEGIC ENERGY PLAN

JOHN DILLIOTT
DIRECTOR, UTILITIES & SUSTAINABILITY

GREEN HYDROGEN'S ROLE IN A CLEAN ENERGY FUTURE

Campus Energy Profile

- 78% complex space: Research, medical/clinical, supercomputing
- 22% non-complex space: Housing, classrooms, administrative

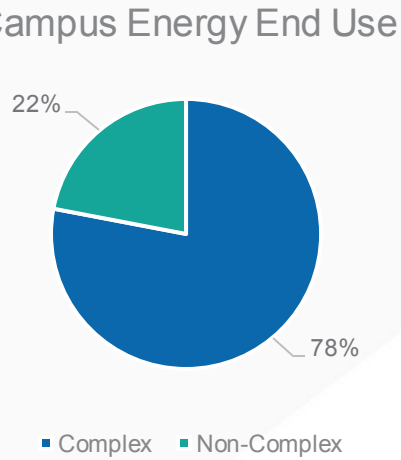
~65% of comfort heating and hot-water load can be served with electric heat recovery chilling technology, which represents ~40% of overall thermal load.

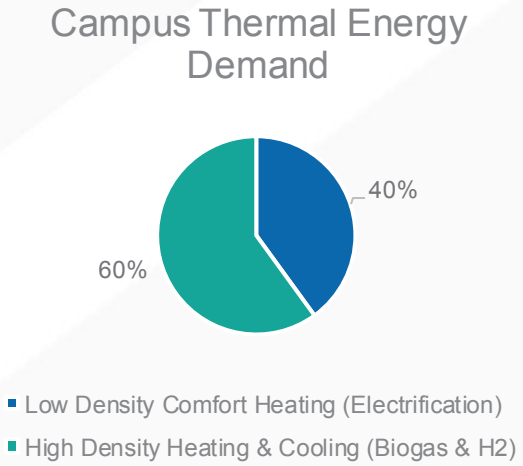
Green H2 can play a role.

Potential UC San Diego H2 Blending Pilot Project is key to regulatory approval in California with a potential emissions reduction equivalent to taking 1.5M cars off the road.

FOR IMMEDIATE RELEASE
Heather.Purcell@gobiz.ca.gov
Willie.Rudman@gobiz.ca.gov
October 6, 2022

California Launches Statewide Alliance to Establish Federally Co-Funded Hydrogen Hub



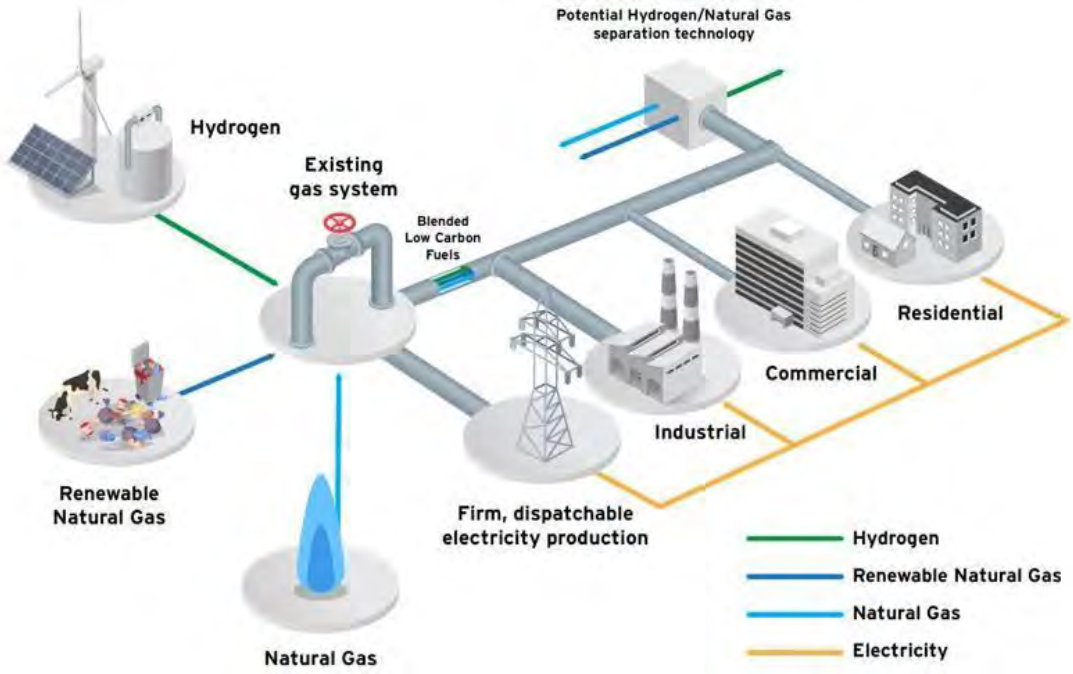


About Hydrogen Blending

Hydrogen 101

- **Simplest** and **most abundant** element in the universe
- **Rarely** found in its **pure form**
- **Chemical processes** are needed to **extract hydrogen**…
  - … from **fossil fuels:**
    + **98%+** of the current production.
    + Releases **CO_2** as a byproduct.
  - … from **water**: **Electrolysis**.
    + **Carbon-free** process if **renewable energy** is used
- **Does not release CO_2** when used as a **Fuel.**

Hydrogen Blending



Injecting hydrogen in the natural gas system can lower the emissions of multiple sectors and kickstart the development of the clean hydrogen industry in California.

Hydrogen Blending Pilots

- In 2019, the **California Public Utility Commission** (CPUC) **mandated SDG&E** and other gas utilities to define a **Hydrogen Blending Standard**.
- CPUC also engaged **UC Riverside** to conduct a study on the potential **impacts of hydrogen blending** in California's natural gas system.
  - One of the **key recommendations** is that **utilities** should implement **"real world" hydrogen blending pilots**.
- In this context, **SDG&E**, **SoCalGas**, and **Southwest Gas** are proposing to conduct three **hydrogen blending pilots**.
  - Modeled after the successful UK **HyDeploy**[1] project, demonstrating hydrogen blends of up to 20% in collaboration with a local university.

Notes: [1] https://hydeploy.co.uk/

Proposed Hydrogen Blending Pilots

SDG&E + UC San Diego	*Location to tbd (PE Pipe)*
SoCalGas + UC Irvine	*Mesa Region Buildings (Steel and PE Pipe)*
Southwest Gas	*Truckee Ops Center and CHP Office (PE Pipe)*

The pilots will provide key operational information to inform the creation of a safe hydrogen blending standard.

Safety

Safety is top priority. Efforts to be taken before, during and post-project include:

- Relevant **considerations**:
  - Hydrogen is a **well-known commodity** that has been **used for decades** in many industrial applications.
  - **Successful international** projects set strong precedent for **safe hydrogen blending up to 20%** (e.g., UK HyDeploy, Hawai'i, Hong Kong, Singapore).

- Project equipment and design will meet all national and international **safety and operational standards**.
- Safety assessment will be conducted by an **independent hydrogen safety consultant**.
- **Hydrogen safety training** for relevant SDG&E and UC San Diego personnel.
- Testing protocols contemplate **gradual increase** in **hydrogen blending percentages**.
- **Continuous monitoring** of the project through a SCADA system.
- **High frequency inspections and operational tests** of all project equipment and building appliances.

H_2 Blending Project Development

Project plans were developed on a wealth of data and lessons learned from research, demonstration and larger-scale projects worldwide.

- Implements recommendations set forth by UC Riverside on behalf of the CPUC to **conduct "real world" demonstrations utilizing the actual natural gas infrastructure with 5-20% H_2 gas blends over extended periods**

- Modeled after the successful UK *HyDeploy* project, demonstrating **H_2 blends of up to 20% can be safely delivered to and used by customers without changes to the gas system or end use equipment**

Real world H_2 blending demonstrations occurring around the globe.

Project	Country	Year	Blending Vol%	Trial/Project Size
HyDeploy	UK	2019	20	1500 residentials
East Neuk Power	UK	2020	20	15 GWh energy annually
Aberdeen Vision	UK	2020	2–20	300 residentials
HyNet Northwest	UK	2021	100	30 TWh energy annually
HyNTS Hydrogen Flow Loop	UK	2021	30	-
H21	UK	2018	100	6.4 TWh energy annually
Hy4Heat	UK	2018	100	-
HySpirit	UK	2019	100	-
Zero 2050 South Wale	UK	2020	100	-
Decarbonisation Pathway	UK	2020	100	-
GRHYD	France	2014	20	200 residentials
THyGA	EU	2019	10–100	100 residentials and commercials
WindGas Falkenhagen	Germany	2013	2	-
WindGas Hamburg	Germany	2015	2	-
HyP SA	Australia	2021	5	700 residentials
HyP Gladstone	Australia		10	800 residentials and industrials
HyP Murry Valley	Australia	2021	10	40,000 residentials
Jemena West Sydney	Australia	2018	2	259 residentials
Fort Saskatchewan	Canada	2020	5	2000 residentials
Cummins-Enbridge	Canada	2018	2	3600 residentials

H_2 is **already included in natural gas mixes** in some parts of the world. **Local demonstration is required to evaluate California natural gas infrastructure.**

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ATMOSPHERIC RIVERS AND FORECAST INFORMED RESERVOIR OPERATIONS

GARRETT MCGURK

HYDROLOGY ENGINEER, CENTER FOR WESTERN WEATHER AND WATER EXTREMES, SCRIPPS INSTITUTION OF OCEANOGRAPHY

CW3E

Center for Western Weather and Water Extremes

SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO

Mission

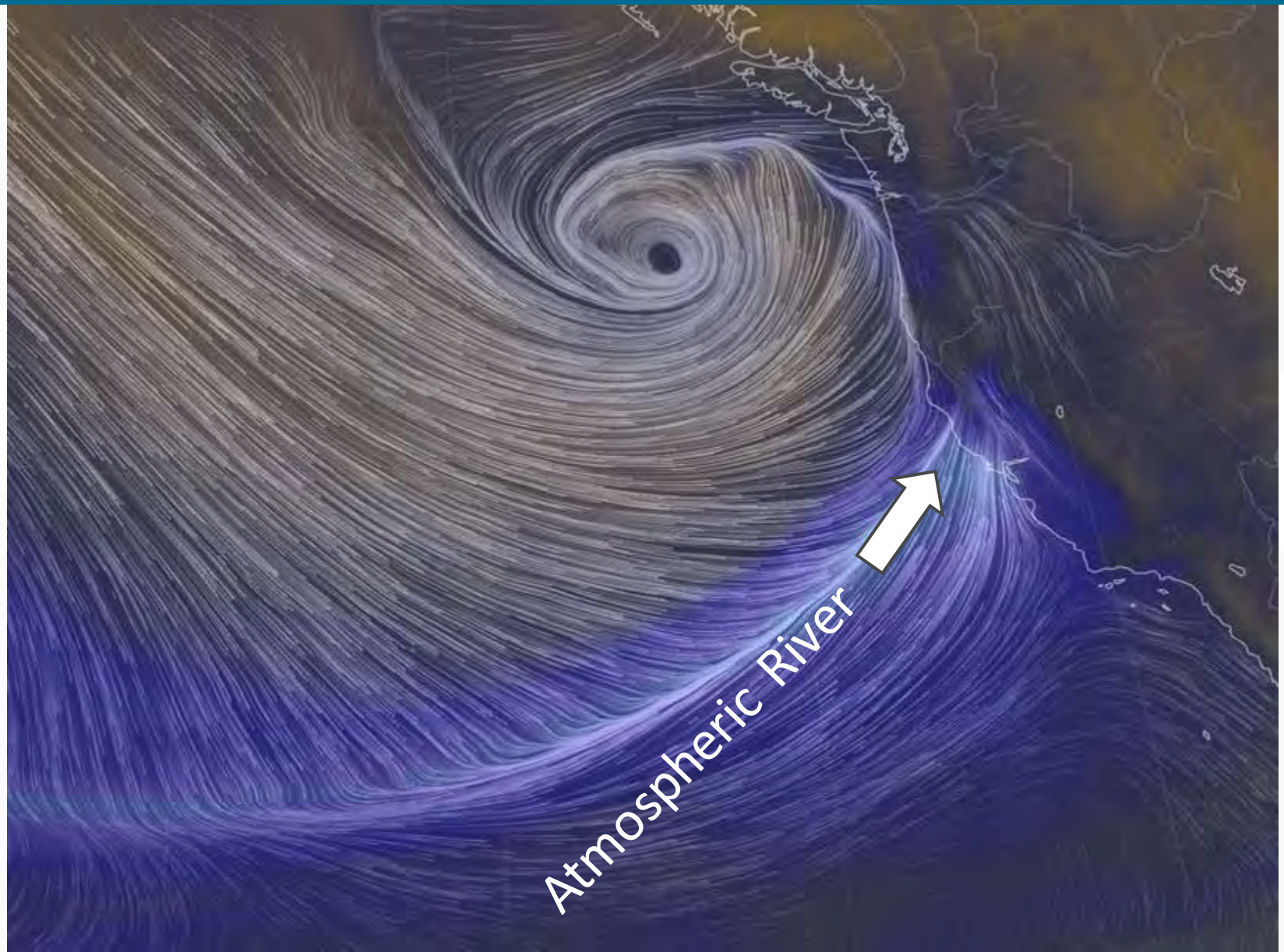
Provide 21st Century water cycle science, technology, education, and outreach to support effective policies and practices that address the impacts of extreme weather and water events on the environment, people, and economy of Western North America.

Photo: Andrew Innerarity/DWR

Photo: Jason Ince/DWR

UC San Diego | SCRIPPS INSTITUTION OF OCEANOGRAPHY

BACKGROUND ON ATMOSPHERIC RIVERS



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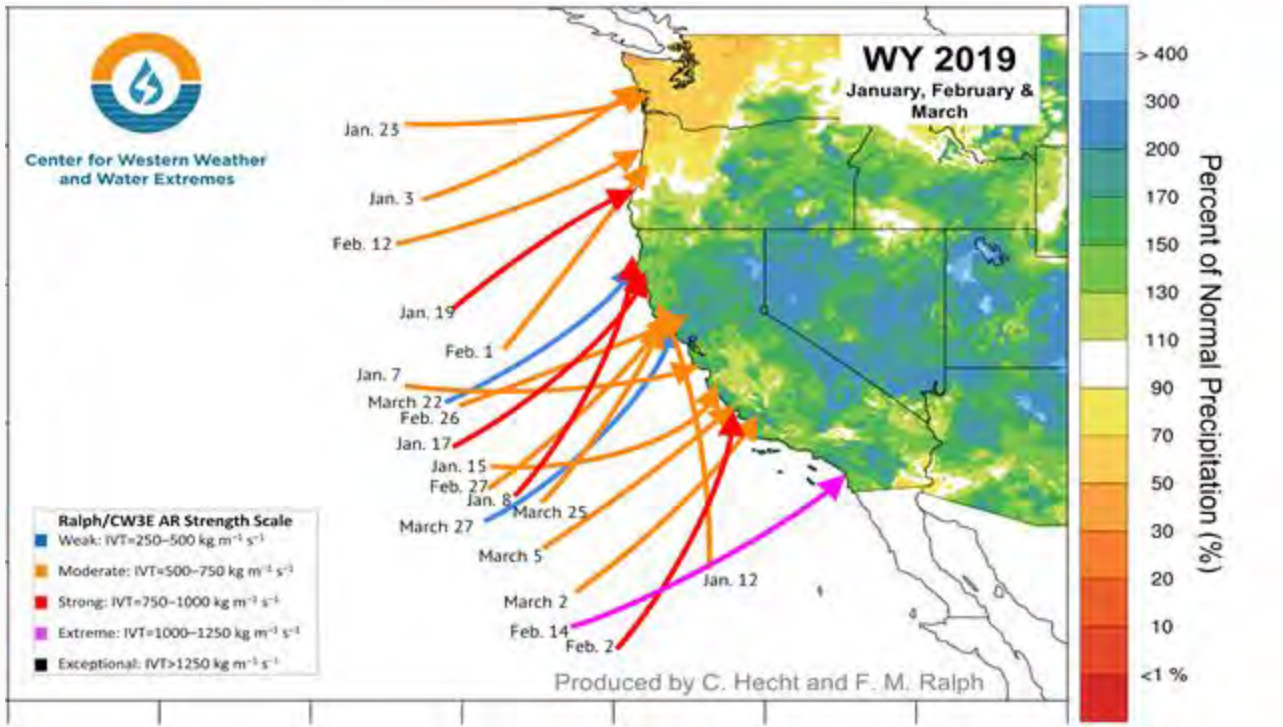
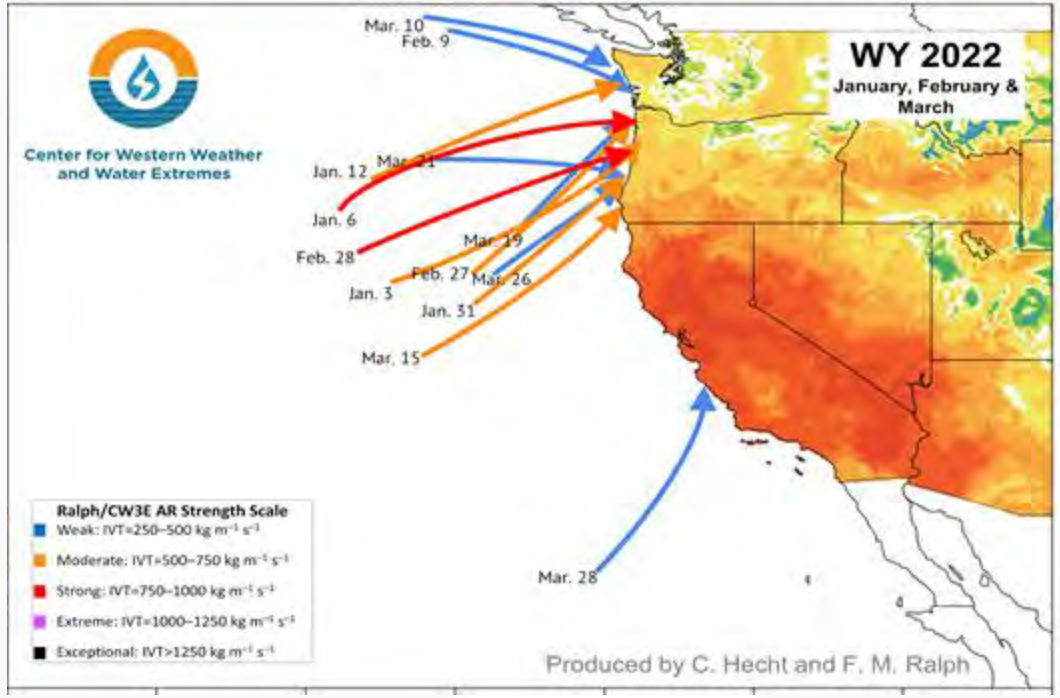
AR LANDFALLS WET AND DRY YEARS





A lack of ARs can lead to drought

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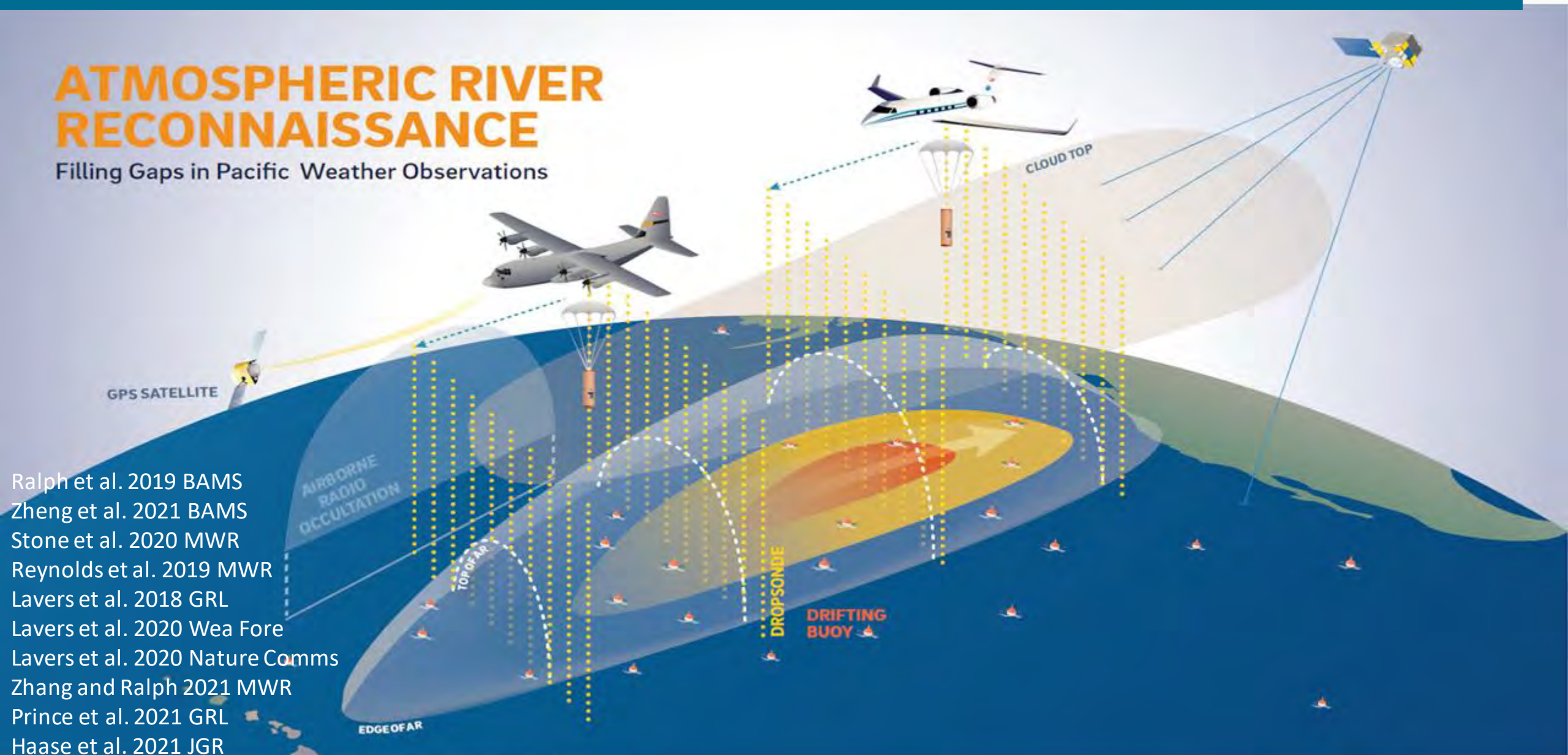
CW3E ATMOSPHERIC RIVER RESEARCH



Ralph et al. 2019 BAMS
Zheng et al. 2021 BAMS
Stone et al. 2020 MWR
Reynolds et al. 2019 MWR
Lavers et al. 2018 GRL
Lavers et al. 2020 Wea Fore
Lavers et al. 2020 Nature Comms
Zhang and Ralph 2021 MWR
Prince et al. 2021 GRL
Haase et al. 2021 JGR

CW3E LAND-BASED OBSERVATIONS

Soil Moisture Station

Surface Meteorology Station

Weather Balloon Launch

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CW3E FIELD HYDROLOGY

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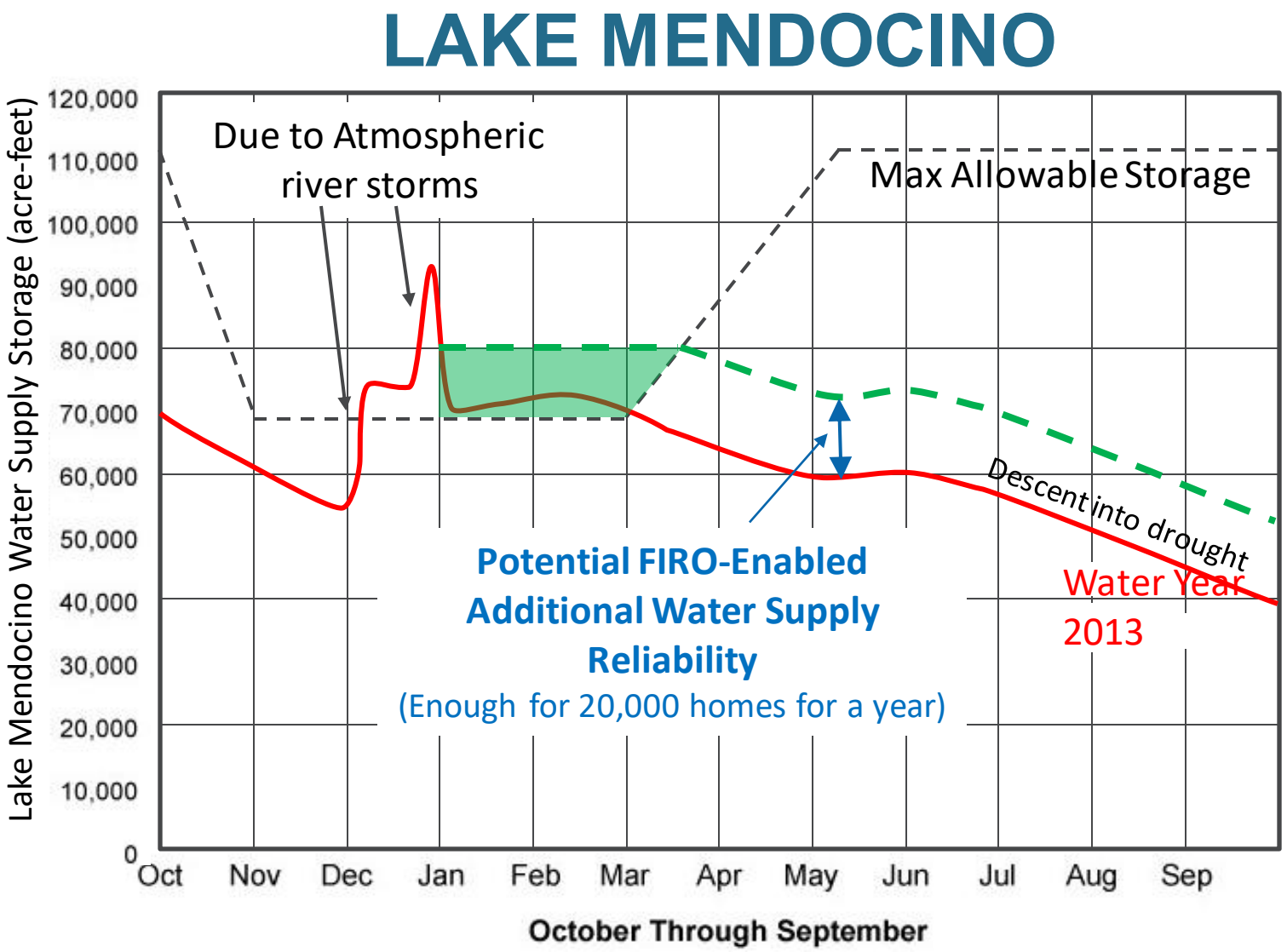
FORECAST-INFORMED RESERVOIR OPERATIONS – MOTIVATION

Hypothetical estimate of extra water retained unless an atmospheric river storm is predicted to hit the watershed; requires reliable AR prediction at 5-day lead time



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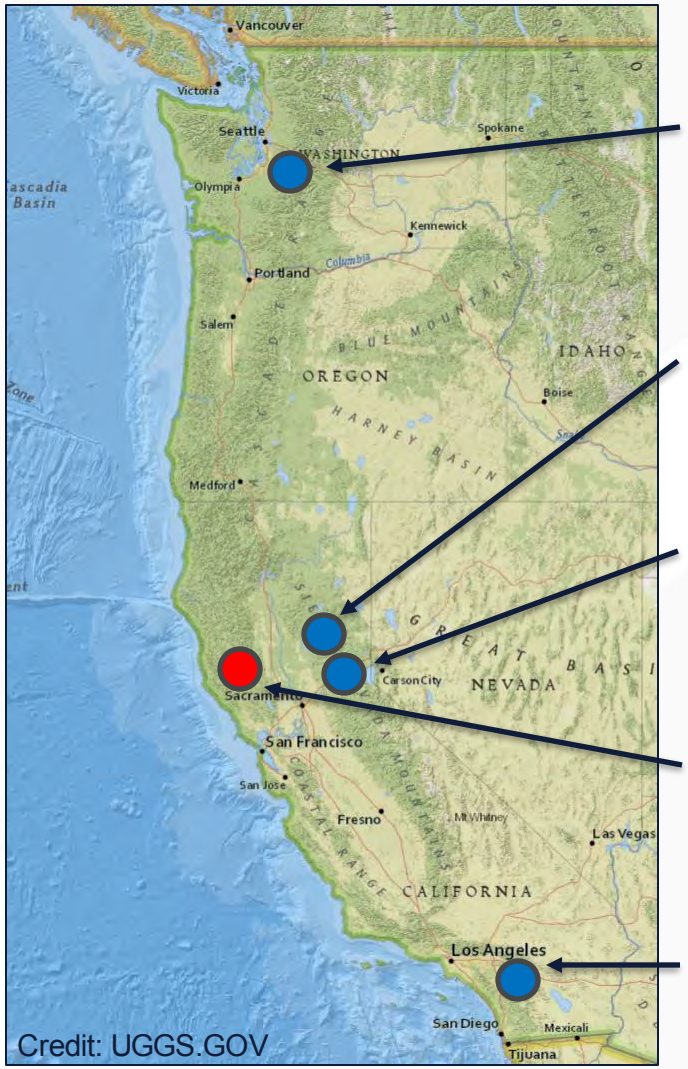
Co-Chairs, Lake Mendocino FIRO:
F. Martin Ralph, Jay Jasperse

FIRO PROJECT LOCATIONS



Howard Hanson Dam – 106 TAF
Green River, Seattle District USACE

Oroville Dam – 3500 TAF
Feather River, CA Dept. of Water Resources

New Bullards Bar Dam – 996 TAF
Yuba River, Yuba Water Agency

Lake Mendocino Dam – 111 TAF
East Fork Russian River, San Francisco District USACE

Prado Dam – 170 TAF
Santa Ana River, Los Angeles District USACE

- FIRO Prototype Demonstrated
- FIRO Planning Underway
  Major deviation to be requested

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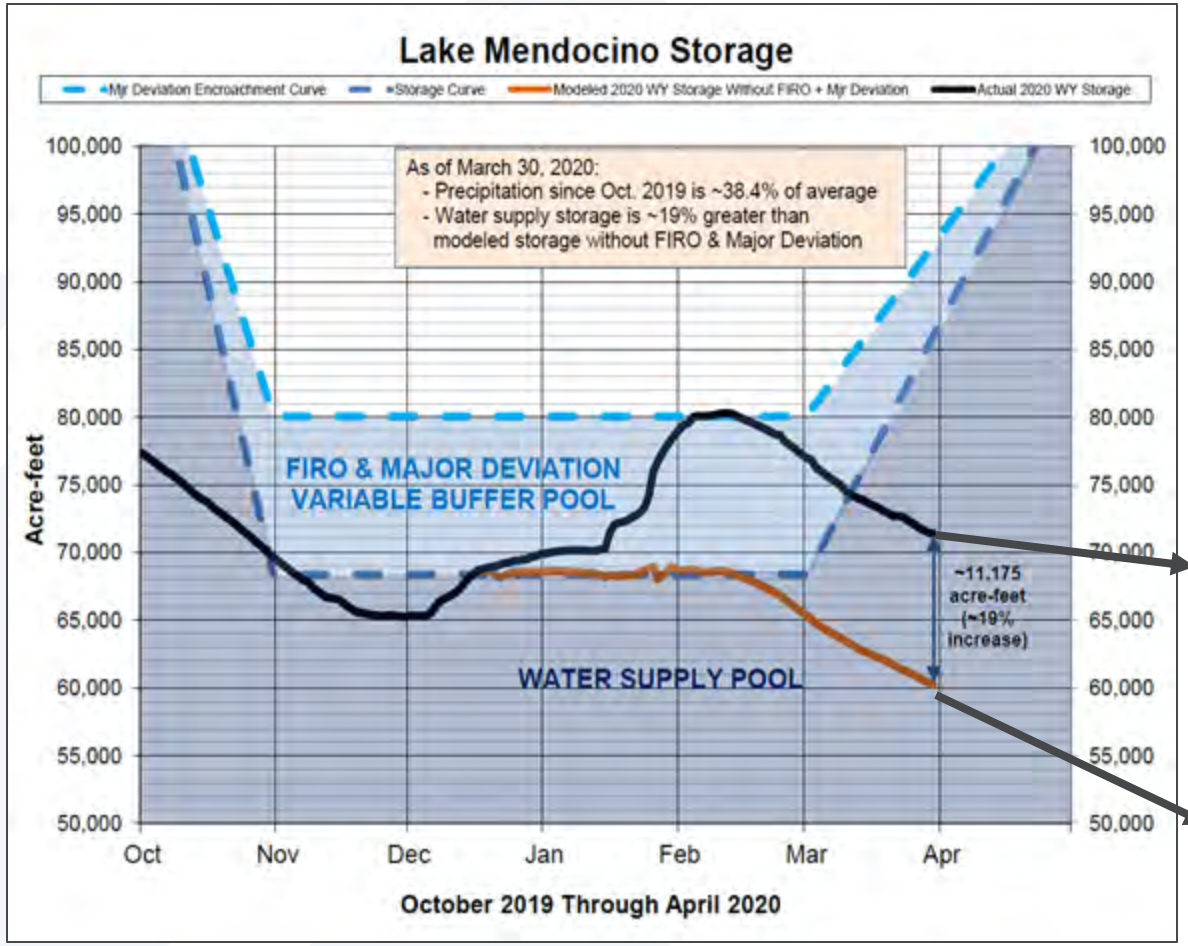
FORECAST-INFORMED RESERVOIR OPERATIONS – IN ACTION

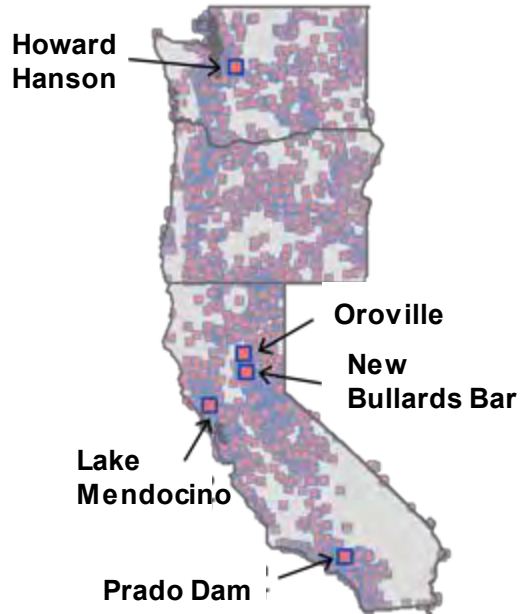
FIRO allowed additional water to be retained in Lake Mendocino based on forecasts where improvements were facilitated in part by AR Recon



Co-Chairs, Lake Mendocino FIRO:
F. Martin Ralph Jay Jasperse

21 April 2021 – Gov. Newsom declares a drought emergency from Lake Mendocino, and notes that the reservoir holds 50% more water than it would have without FIRO

~19% increase in water supply as of April 1



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RESEARCH AND OPERATIONS PARTNERSHIPS

Atmospheric River Reconnaissance

NCEP/NWS, ECMWF, NRL, NCAR, CU Boulder, Plymouth State Univ., SUNY Albany, NWS Western Region, NOAA AOC, Air Force, Northern Ill. Univ.

AR Forecasting (West-WRF & AR-AFS)

NCEP/NWS, San Diego Super Computing

Forecast Informed Reservoir Operations (FIRO)

USACE, USACE-ERDC, NOAA/NWS, Local Water Agencies, California Department of Water Resources, Environmental Agencies (RAOP is determined via the Steering Committees)

Advance Quantitative Precipitation Information (AQPI)

NOAA, Sonoma Water, CA Department of Water Resources, Colorado State Univ, local participating agencies (LPAC)

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F. Martin (Marty) Ralph
gmcgurk@ucsd.edu
Garrett McGurk

UC San Diego

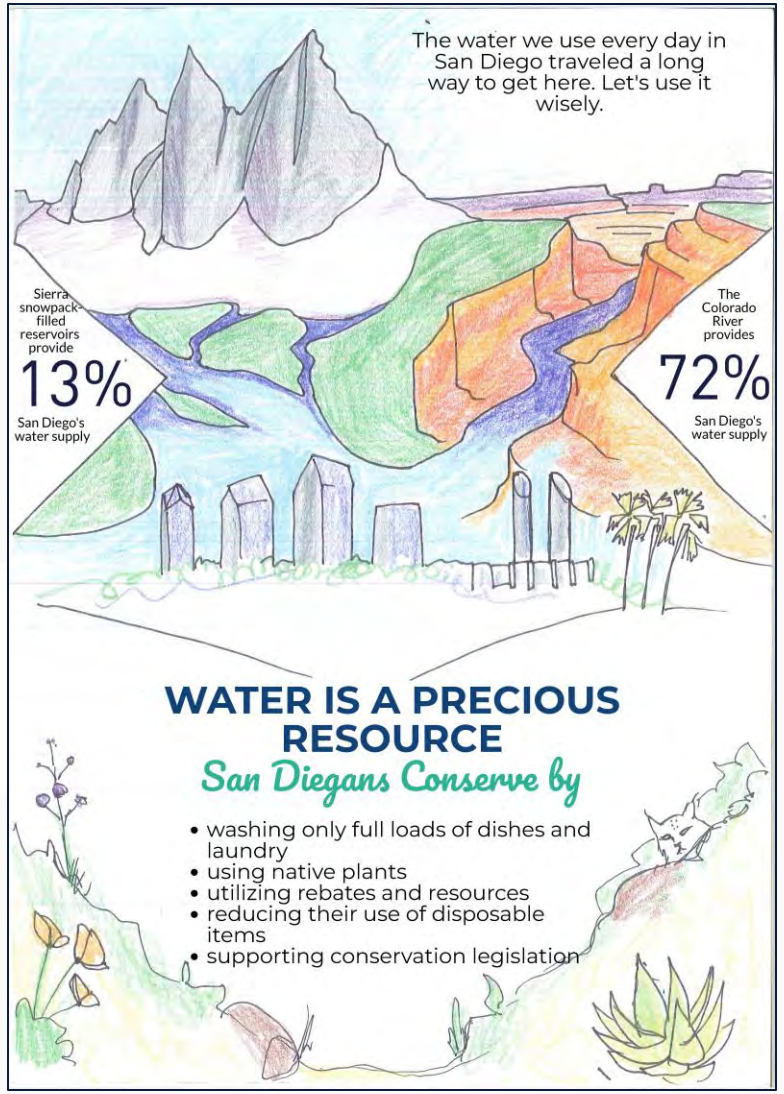
OVERVIEW OF WATER USE

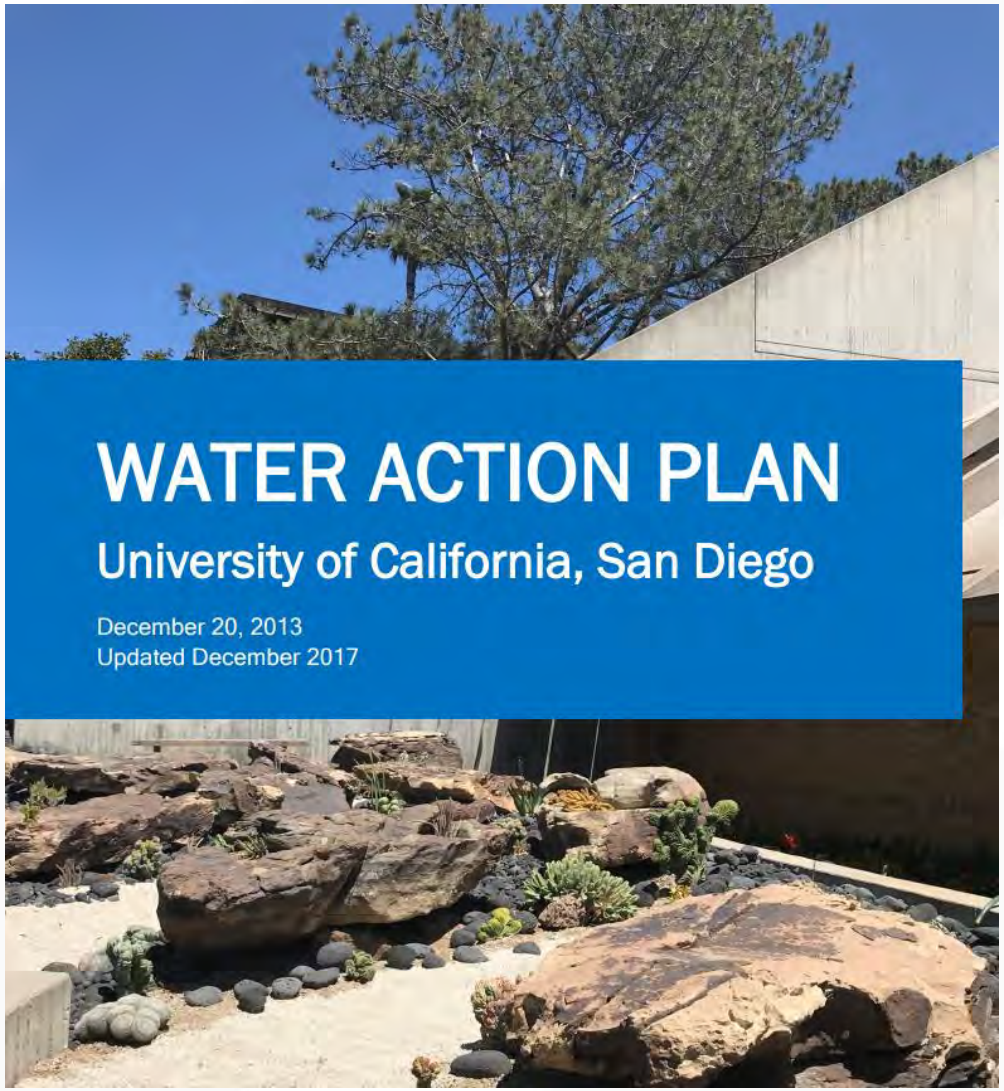
MICHELLE PEREZ
MANAGER, UTILITIES & SUSTAINABILITY

A SMALL CITY – LA JOLLA CAMPUS

- Campus population over 50,000…and growing
- Research, clinical and residential spaces—two-to-three times water density of commercial office buildings
- 1,200 acres, over 15 million square feet of buildings

WATER GOALS AND PLANNING

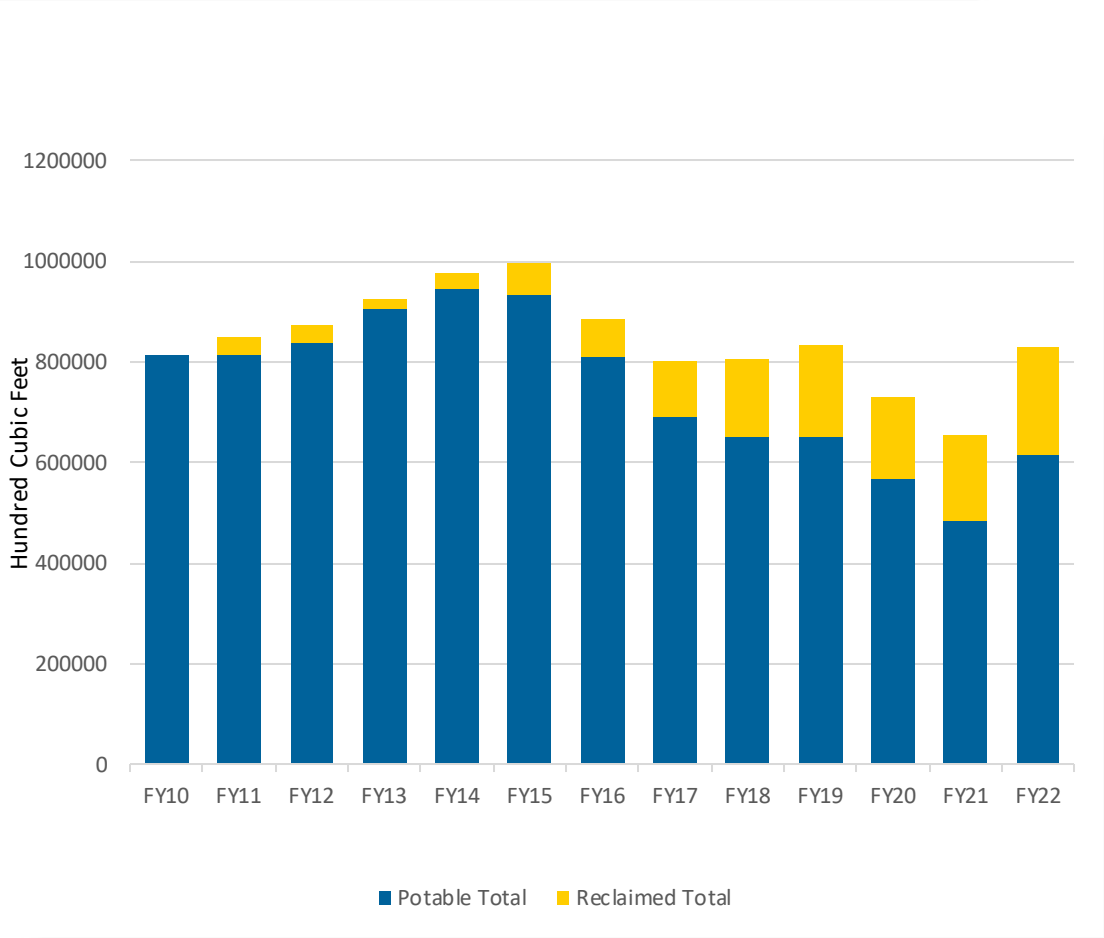


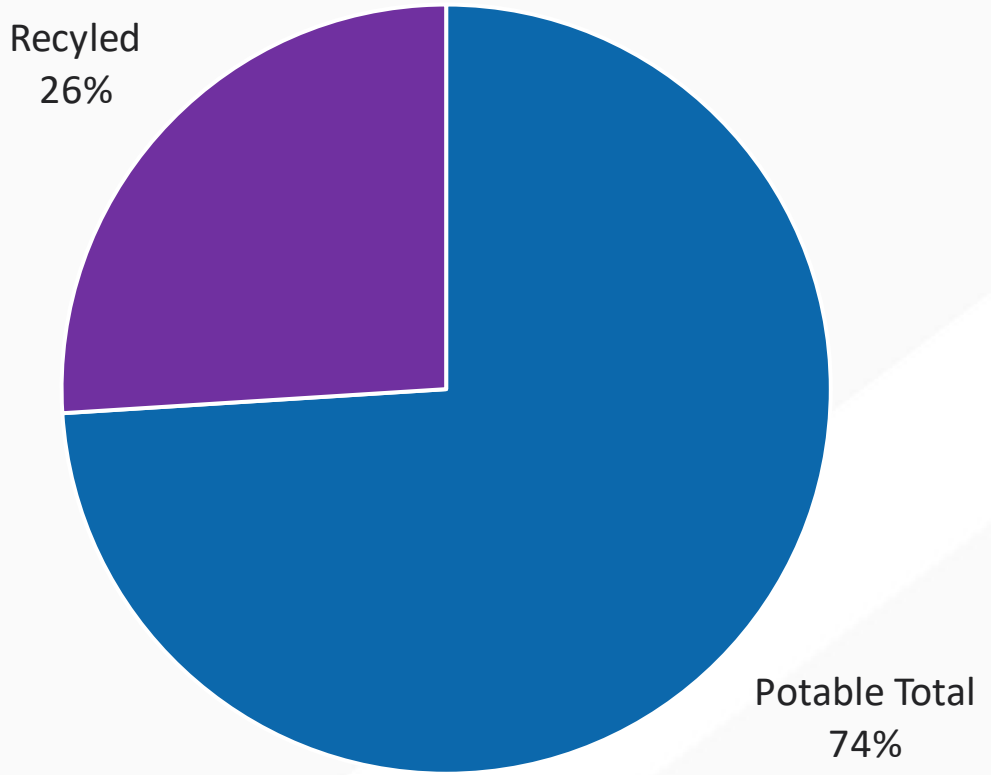


WATER METERING

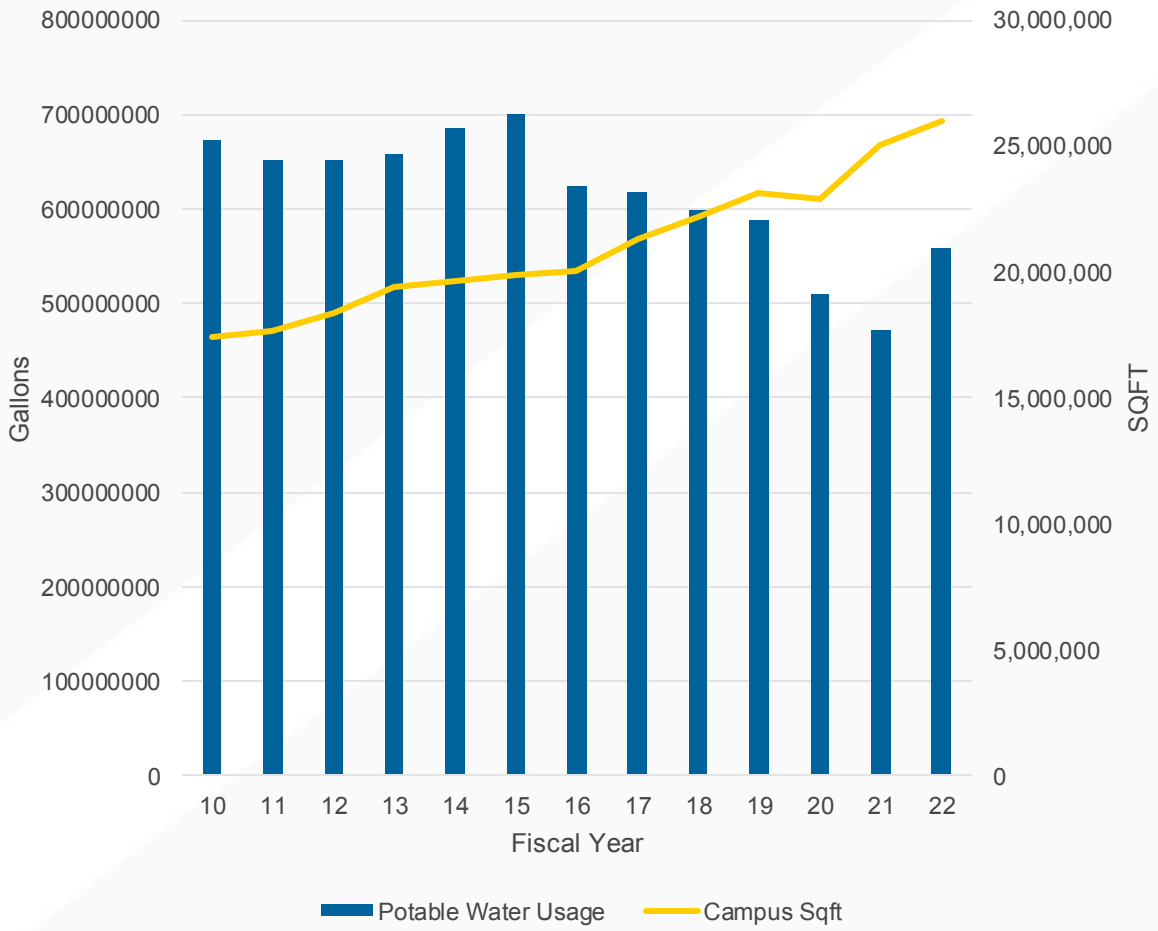
- Nearly all campus irrigation and building connections are metered.
- Real-time usage data is sent to a central interface
  - Register leaks, allowing UC San Diego Meter Shop to report issues
  - Track usage that can be compared to historic and baseline water use
  - Allow UC San Diego to target high-use areas for efficiency projects

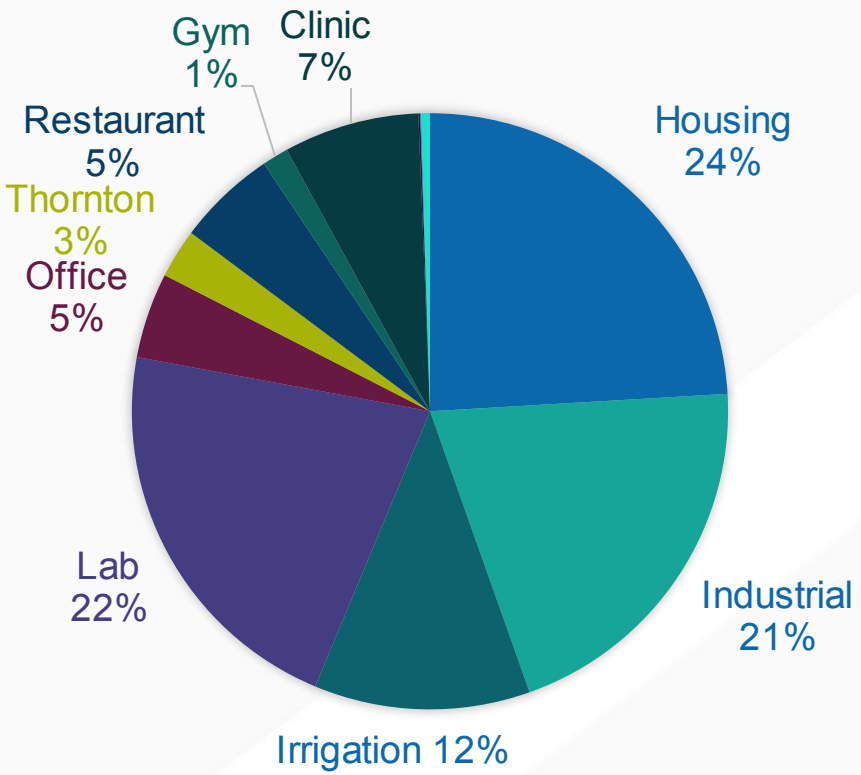
TRACKING OVERALL WATER CONSUMPTION



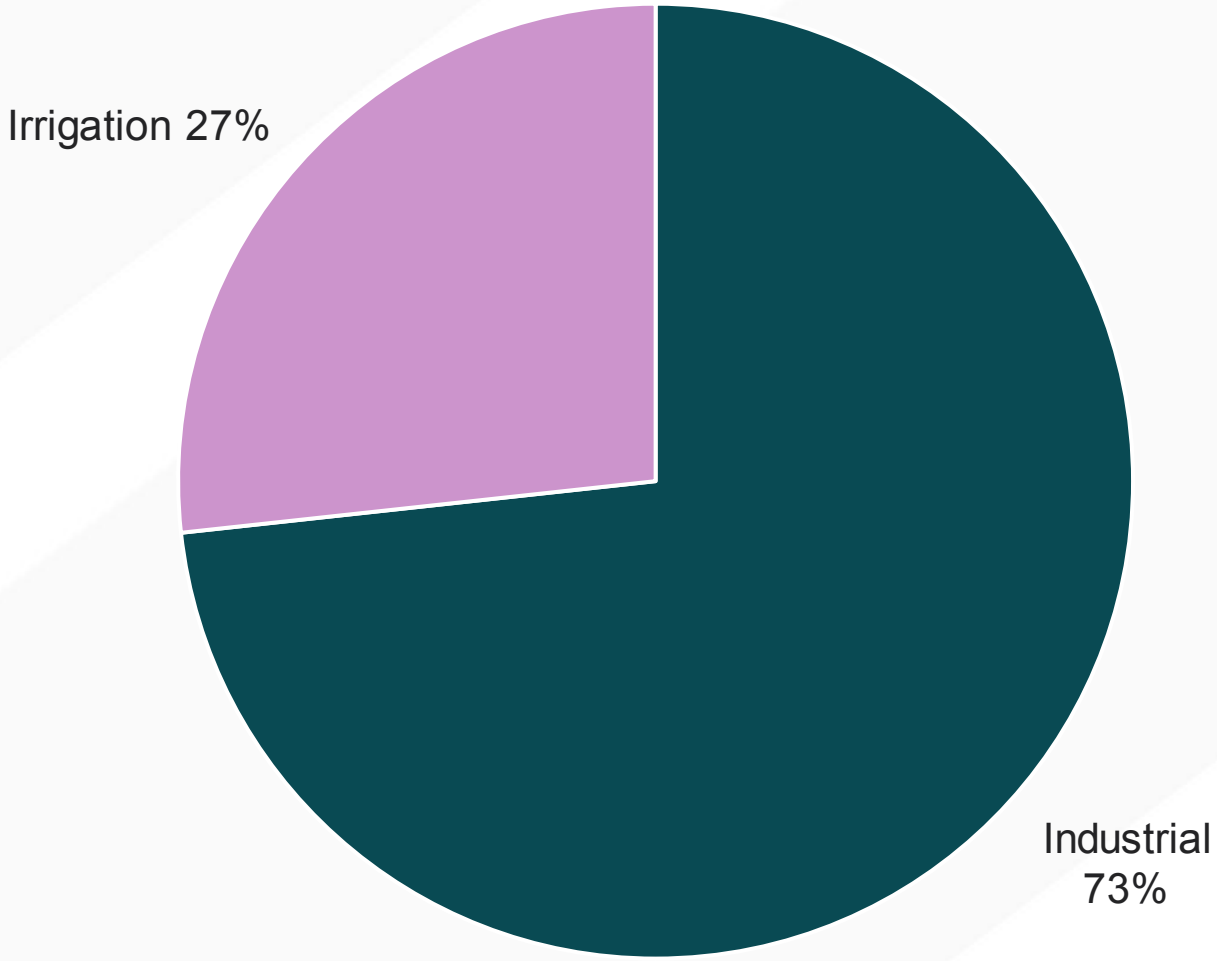


TRACKING POTABLE WATER CONSUMPTION





TRACKING RECYCLED WATER CONSUMPTION



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LANDSCAPE WATER USE

DAVID BOGGS

SUPERINTENDENT, LANDSCAPE SERVICES

DESIGN STANDARDS

LEED – Leadership in Energy and Environmental Design

- Awards points for reducing water use with drought-tolerant plants

MWELO – Model Water Efficiency Landscape Ordinance (California)

- Sets water-use limitations achieved by using drought-tolerant plants and efficient irrigation
- Allows some accommodations for turf use in recreational areas

LOW-INPUT LANDSCAPES

Climate appropriate plants –
Mediterranean climate

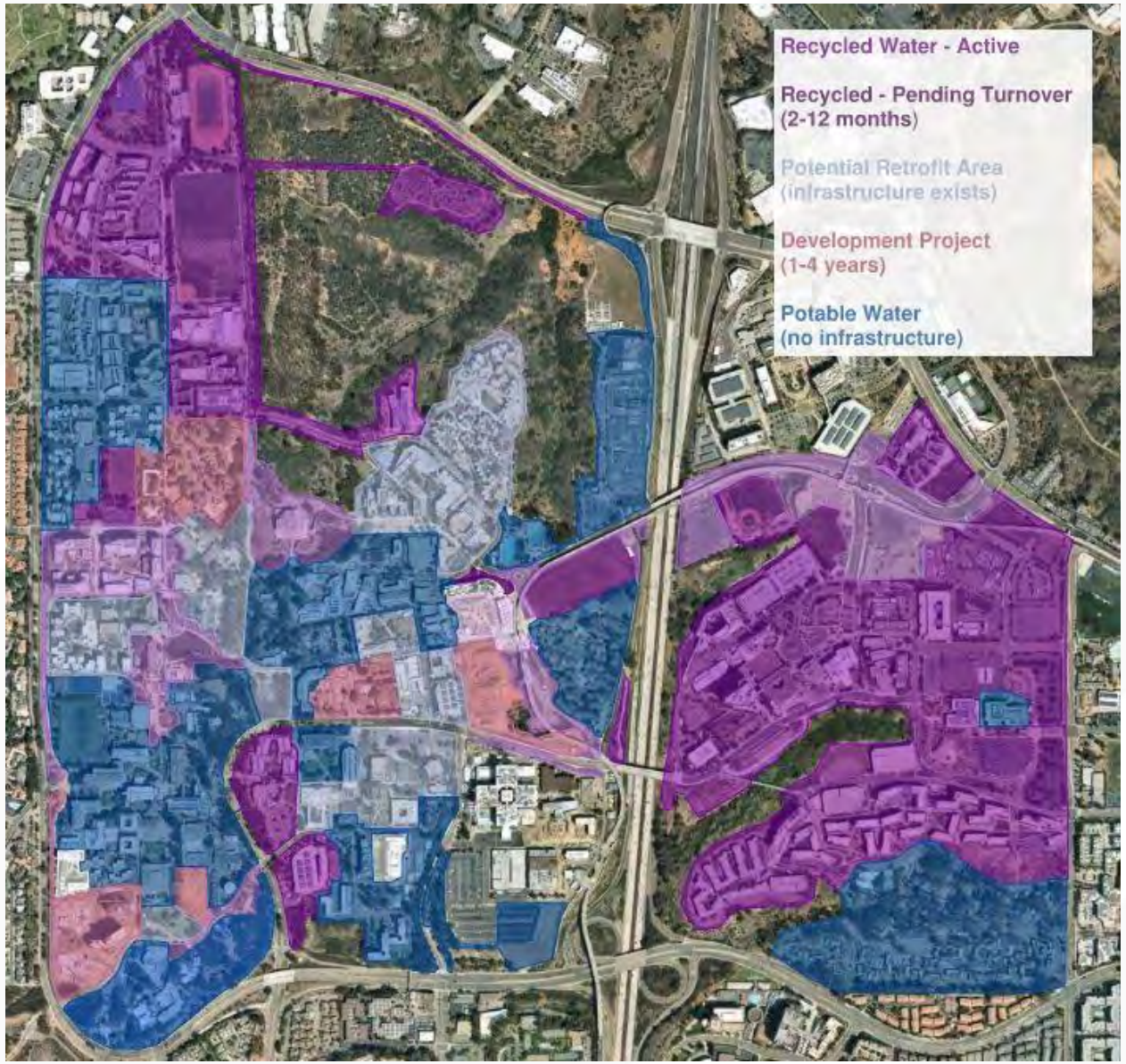
Designed for:

- Aesthetics
- Recreation
- Relaxation
- Physical and mental health (more on that later!)

RECYCLED WATER

- 45% of total landscape water usage — Anticipated to exceed potable irrigation use within the next year
- Includes:
  - Athletic fields
  - La Jolla Medical Center
  - New and renovated landscapes
- Areas irrigated by recycled water are not subject to drought restrictions but have a separate set of regulations.

RECYCLED WATER VS. POTABLE WATER IRRIGATION MAP



RECYCLED WATER EXPANSION

Redevelopment projects:

- Theater District Living and Learning Neighborhood
- Pepper Canyon West
- Triton Center
- Ridge Walk

Retrofit projects:

- Geisel Library
- School Of Medicine

Implementation and city inspections require building water shut off. No city infrastructure at Scripps.

ARTIFICIAL TURF

DROUGHT RESTRICTIONS

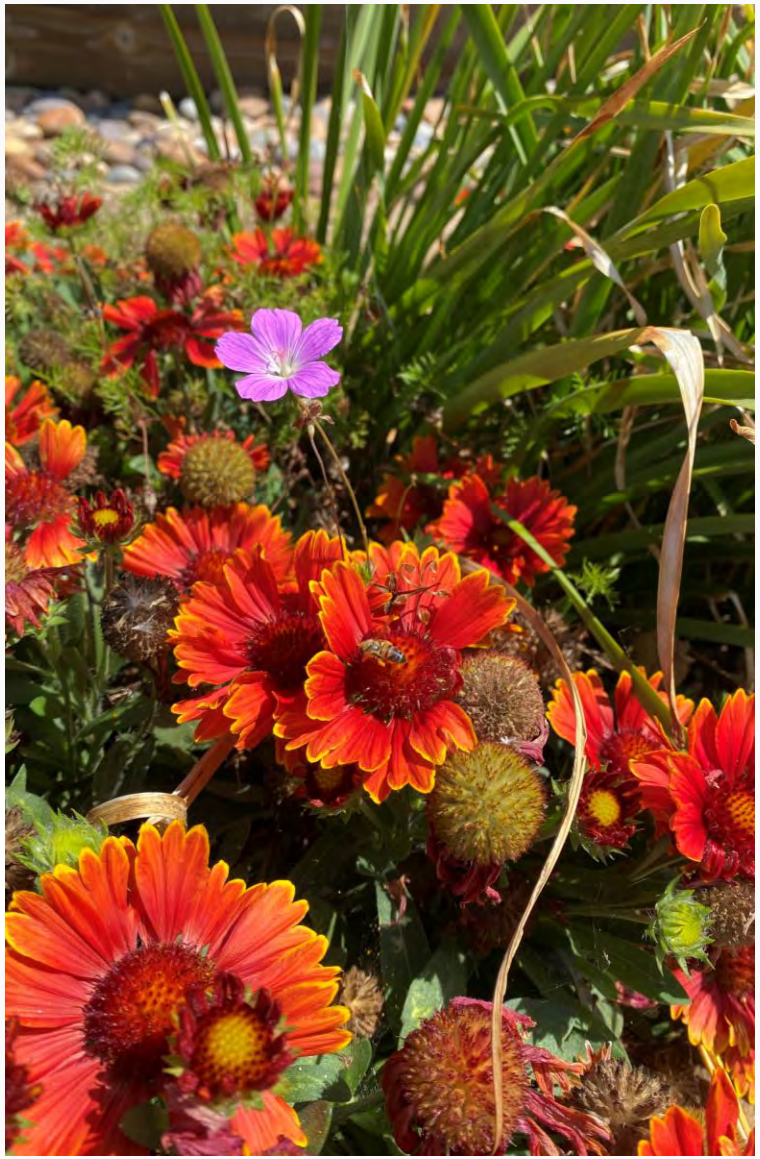
New CA drought restrictions:

- Campus has implemented most of the restrictions previously.
- City of San Diego captures most of these restrictions.
- Restrictions include no irrigation of "non-functional" turf.
- UCSD has been removing turf areas that are considered "non-functional" for several years and is evaluating additional areas.

EFFICIENT IRRIGATION TECHNOLOGY

- Central Control System
  - Weather-based irrigation
  - Flow monitoring
  - Leak detection and elimination
- Low-volume rotary nozzles
- Drip irrigation

PHYSICAL AND MENTAL HEALTH BENEFITS



Landscape Services Mission Statement:

To maintain an aesthetically pleasing campus landscape conducive to learning and working.

Studies have shown green spaces lead to:

- Improved physical fitness
- Reduction in depression
- Social interaction
- Stress reduction
- Improved memory, attention and creativity
- Reduced mental fatigue

UC SAN DIEGO IRRIGATION TEAM

Experienced team of irrigation professionals manages:

- 300 controllers
- 6,000 valves
- Over 100,000 sprinklers
- Miles of pipe and drip lines
- Over 1,200 acres

Numerous industry certifications:

- QWEL
- Rain Bird Factory Trained

UC San Diego

WATER QUALITY AND PROTECTION

KIMBERLY O'CONNELL
MANAGER, ENVIRONMENTAL AFFAIRS

RECYCLED WATER IN PLANT COOLING TOWERS

AIR-HANDLING UNIT CONDENSATE COLLECTION AND REUSE

Plumbing retrofits for research buildings to collect water for reuse:

- Air-handing unit condensate
- Reverse-osmosis treatment systems reject water
- Water softener reject water

Year	Water Collected for Reuse from 4 Buildings
2019	1,842,606 gallons
2020	1,721,148 gallons
2021	2,704,561 gallons
2022	2,252,976 gallons

TURF REMOVAL/STORMWATER TREATMENT PROJECTS

RIDGE WALK RAIN GARDEN

RIDGE WALK RAIN GARDEN: BEFORE

RIDGE WALK RAIN GARDEN: AFTER

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GROVE SITE TURF REMOVAL AND STORMWATER TREATMENT

The campus replaced an asphalt road used for parking and a turf area with a stormwater treatment detention basin and drought-tolerant landscaping.

GROVE SITE BEFORE AND AFTER

THE GROVE STORM WATER TREATMENT BASIN

EDUCATIONAL SIGNS AT THE GROVE SITE

SCHOLARS LANE SITE BEFORE AND AFTER

SCHOLARS LANE SITE AFTER

SCHOLARS LANE STORMWATER TREATMENT IN ACTION

ENGAGEMENT

UC San Diego

WATER CONSERVATION

JOSUE CANIZALES
GREEN PROGRAMS INTERN

LESLIE NGO
AQUAHOLICS ANONYMOUS CHAIR

DID YOU KNOW?

Bathroom water use accounts for up to 70% of indoor residential water consumption.

DID YOU KNOW?

Flushing the toilet multiple times a day uses more water

than showering OR washing your clothes.

DID YOU KNOW?

Older toilet models can use up
to 6 gallons per flush.

Replace your toilet with a low-flow model,
or consider purchasing a Toilet Tank Bank
to displace the water or DIY it with a
plastic water bottle filled with water.

WHAT YOU CAN DO

Taking a six-minute shower seven days a week uses roughly 4,500 gallons of water per year.

A five-minute shower reduces annual water use up to approximately 3,800 gallons, saving up to about 750 gallons.

WHAT YOU CAN DO

You can also reduce your water consumption by:

turning off the tap when brushing teeth and when lathering your hands and body

collecting cold water as the faucet or shower heats up to water plants

WHAT YOU CAN DO

Dishwashers manufactured after May 2013 cannot exceed five gallons of water use per cycle as regulated by the Department of Energy.

Handwashing dishes could use up to 27 gallons of water.

WHAT YOU CAN DO

Save water when dishwashing by:

scraping off food instead of pre-rinsing

using the two-basin method when hand washing dishes

running the dishwasher at full capacity

using the normal cycle setting instead of using the heavy cycle setting

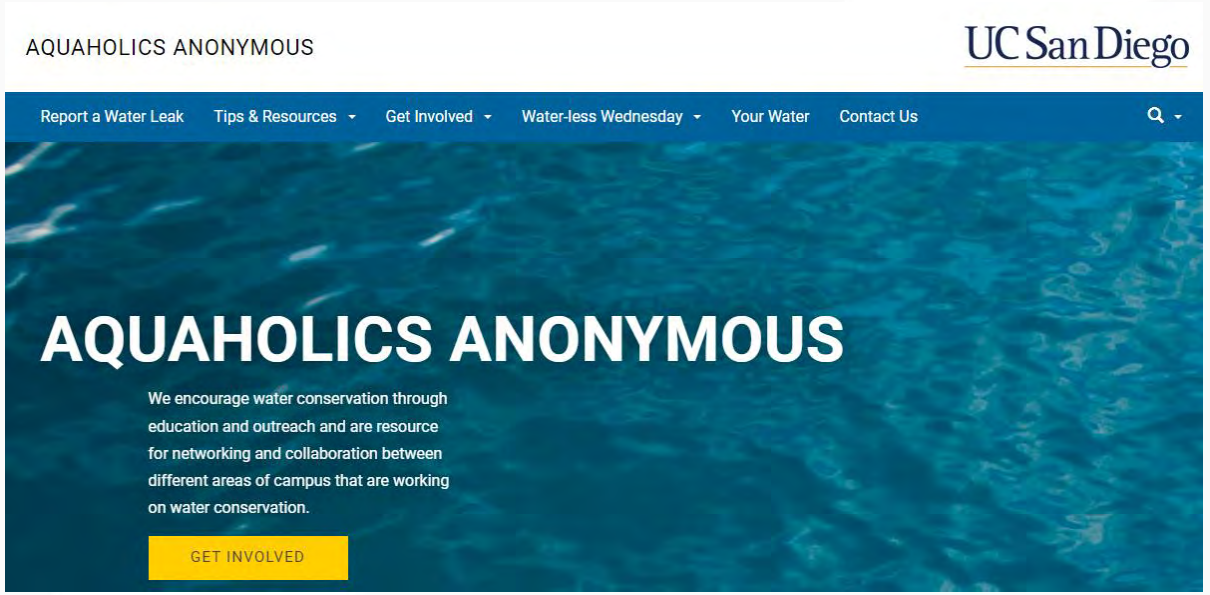
WHAT YOU CAN DO

Report water leaks to

Facilities Management Customer Relations

(858) 534-2930 or email wsc@ucsd.edu.

WATER CONSERVATION EDUCATION AND OUTREACH



AQUAHOLICS ANONYMOUS™
conserve water. sustain life at UCSD

AQUAholics Anonymous™
conserve water - sustain life at UC San Diego

Take the Pledge! Help us save water!

UC San Diego is one of the largest water users in San Diego

With over 80 percent of San Diego County's water imported, you can help conserve our precious resource by making every drop count

Please indicate which of the following activities you will add to your daily routine to conserve water:

Activity	Weekly Water Savings	Pledge
Soak pots and pans instead of having the water run while scraping	2 gal/min	_____
Not to leave water running while rinsing dishes	10 gallons	_____
Run dish washer only when the load is full	5 gallons	_____
Turn off water while brushing teeth (twice daily)	10 gallons	_____
Wash only full loads of clothes	15 gallons	_____
Shorten Daily Shower by 2 minutes	35 gallons	_____
Use a broom instead of a hose to clean outdoors	13 gal/min	_____
Total Weekly Water Savings		_____

I _____ Commit to saving _____ gallons per week

What is your affiliation with UC San Diego?

____ Student ____ Faculty ____ Staff

Department _____

aquaholics.ucsd.edu

UC San Diego

NEXT STEPS:
YOUR CHANCE TO GET INVOLVED

JEN BOWSER
SUSTAINABILITY ENGAGEMENT MANAGER

NEXT STEPS

Feedback

- We aim to get representation from our diverse campus community.
- You can express your comments, ideas and questions via survey that we will send after the town hall.

Future Town Halls Covering Various Sustainability Topics

UC San Diego