

Facing an Uncertain Future:

California's Rise to Water Resilience: What Will It Take?



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Board**
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Sunnyvale Sustainability Speaker Series
January 29, 2020
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ATTACK OF THE

WICKED PROBLEM

HORROR BEYOND UNDERSTANDING!

UNDEFINABLE! UNKNOWNABLE! UNSTOPPABLE!

Sustainability AND Resilience are called for

...and comfort with complexity

**We need more than
resilient infrastructure**

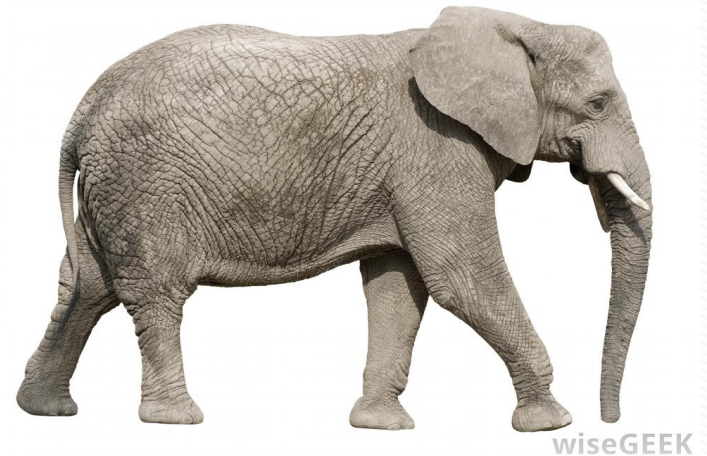
We need resilient institutions

We need more resilient relationships

...fortunately, there are signs of hope

Setting—the whole elephant

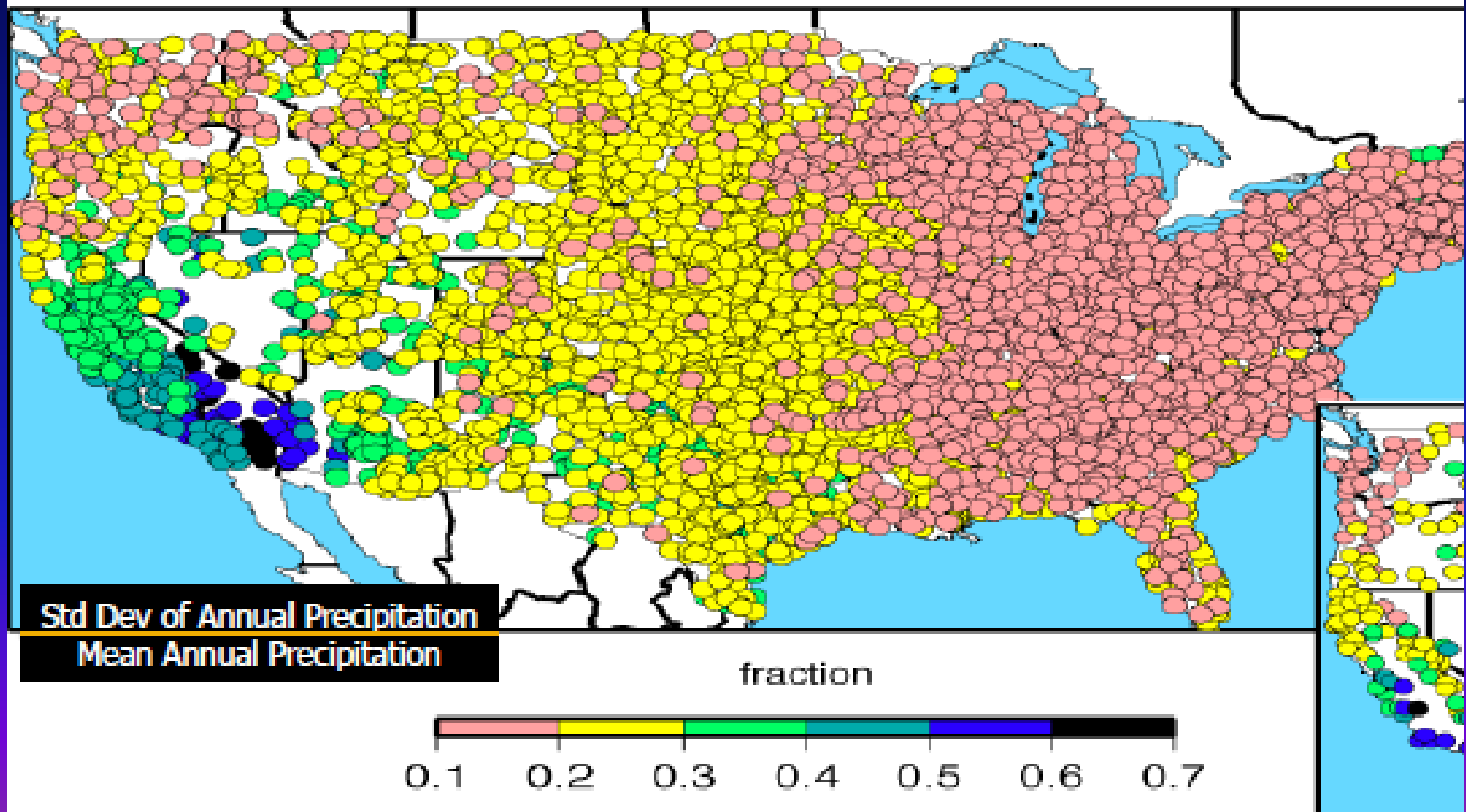
- **Most Variable hydrology**
 - Year to year
 - Location to Location
 - Time of year
- **Mix of sources**
 - Surface Water local or imported (storage/conveyance)
 - Groundwater (intensely local)
 - Every locale different mix
 - Mix of water rights varies greatly
 - Impact of drought varies greatly
- **Mix of solutions**
 - Conservation/Recycling/Stormwater/Desal
 - Integrated Water Management in regions and statewide
 - Storage, storage, storage, storage
- **Basics**
 - 39 million people→50 million
 - 169,000 square miles
 - Majority of population lives in large cities 100s of miles from water source
 - One of 5 Mediterranean large scale agricultural opportunities in world
 - Most biodiversity; losing biodiversity most rapidly
 - Institutional setting: local control; 4000+ water supply systems; 2600+ water agencies (411 “large”)



Climate change and other drivers as gamechangers

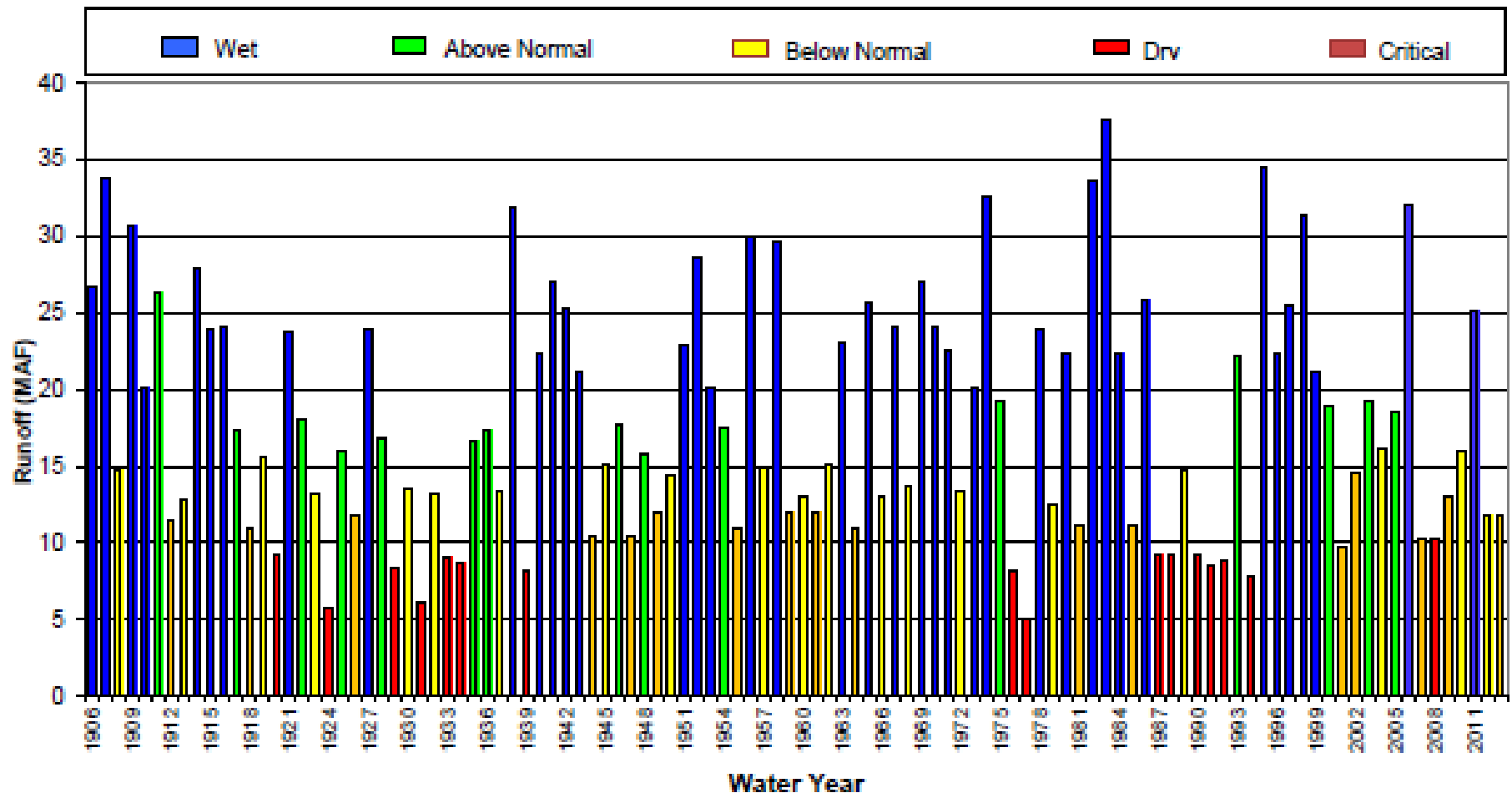
California's Precipitation is Uniquely Variable

a) COEFFICIENTS OF VARIATION OF
TOTAL PRECIPITATION, WY 1951-2008



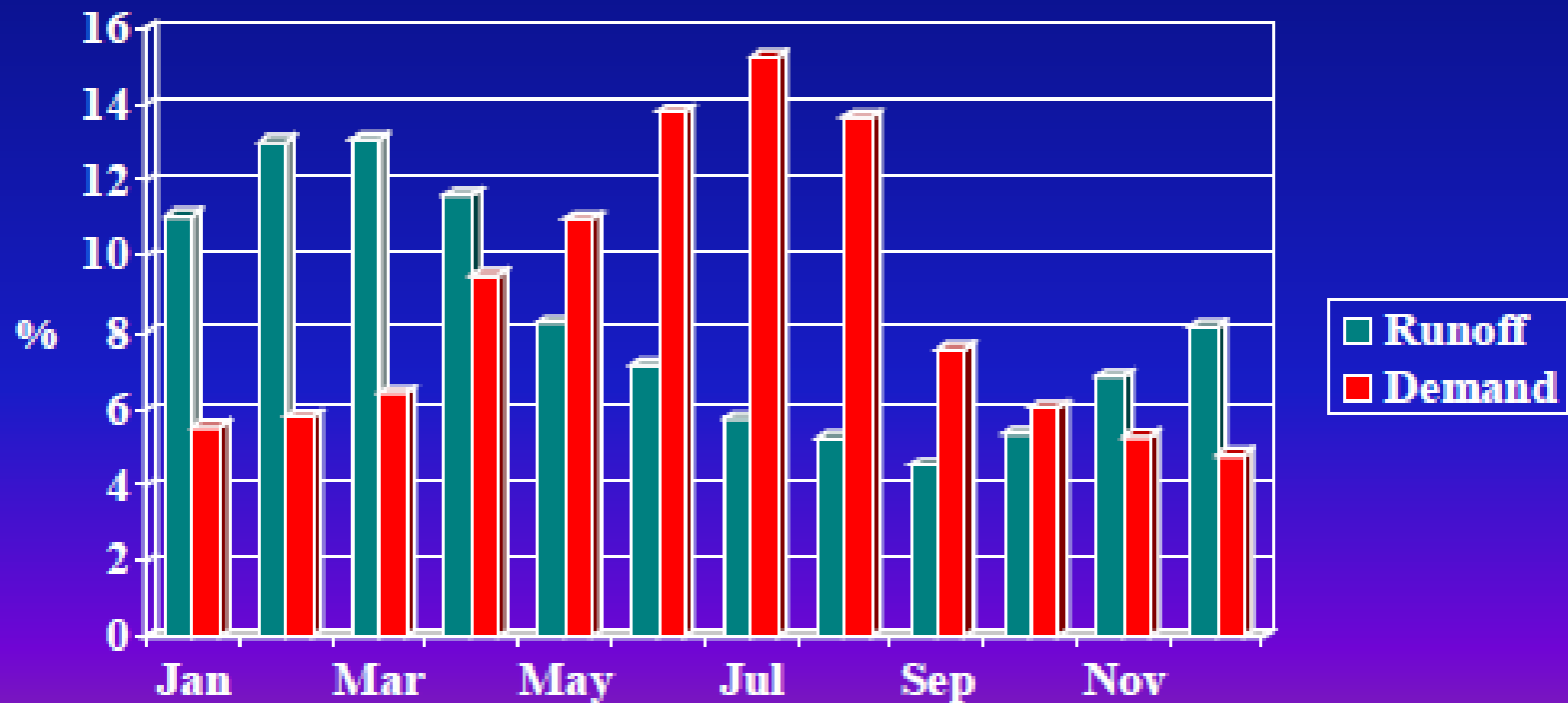
Annual Variation of Runoff

Sacramento Valley Water Year Types

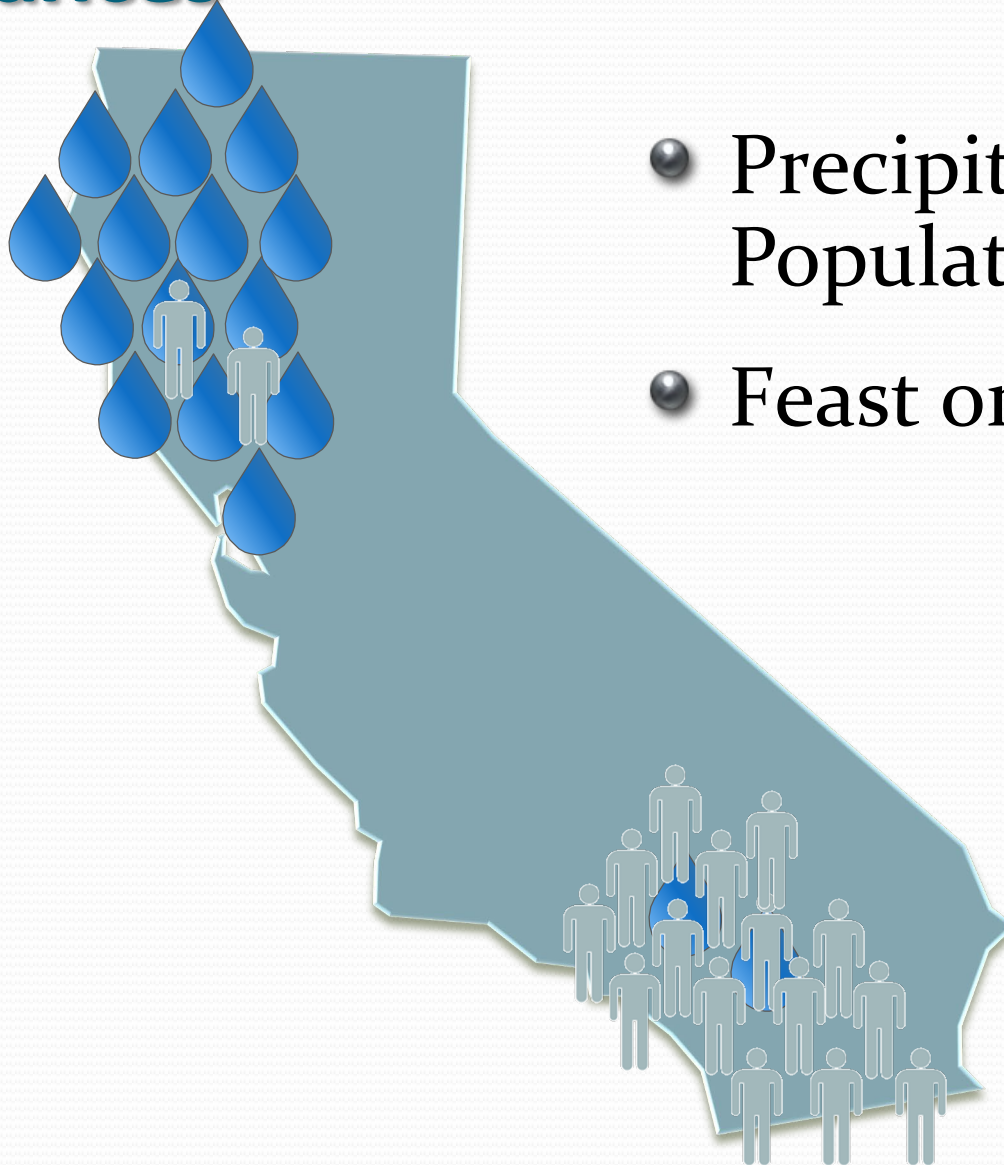


Seasonal Mismatch of Supply and Demand

- Runoff is greatest in the winter / spring.
- Demand peaks in the summer.



Managing Hydrologic and Geographic Imbalances



- Precipitation vs. Population
- Feast or Famine

And, let's not forget the Colorado River....

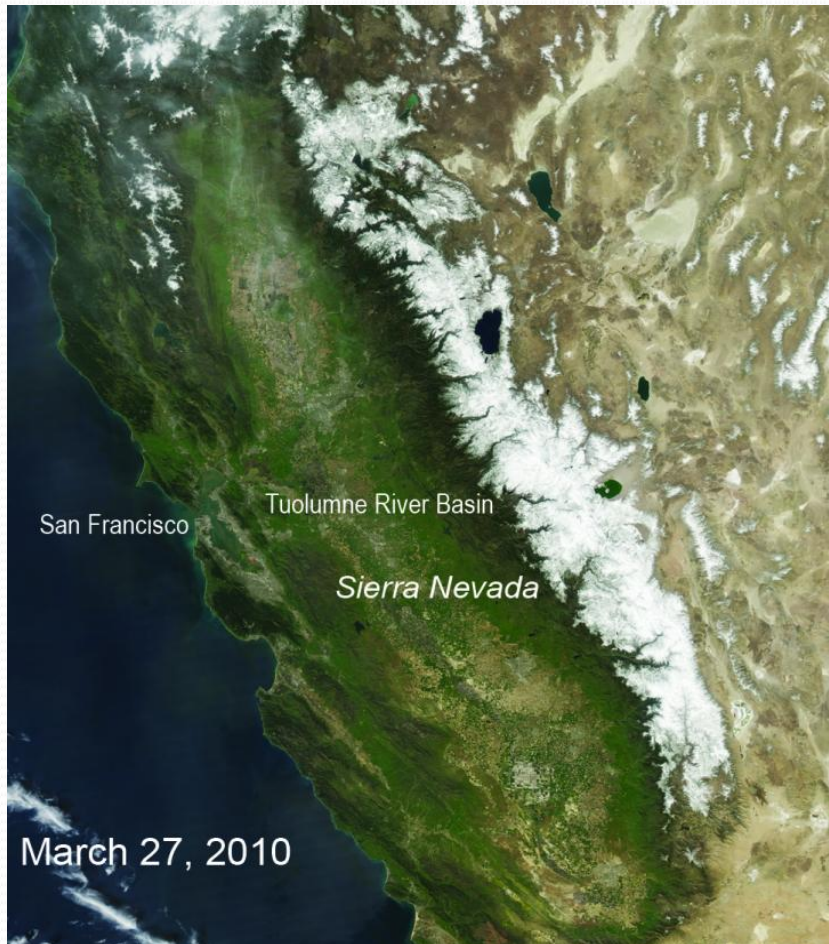
Major Water Projects

- 💧 Federal – Central Valley Project (CVP)
- 💧 State – State Water Project (SWP)
- 💧 Local – Many other projects throughout state, including Colorado River system, Hetch Hetchy, EBMUD, Owens Valley

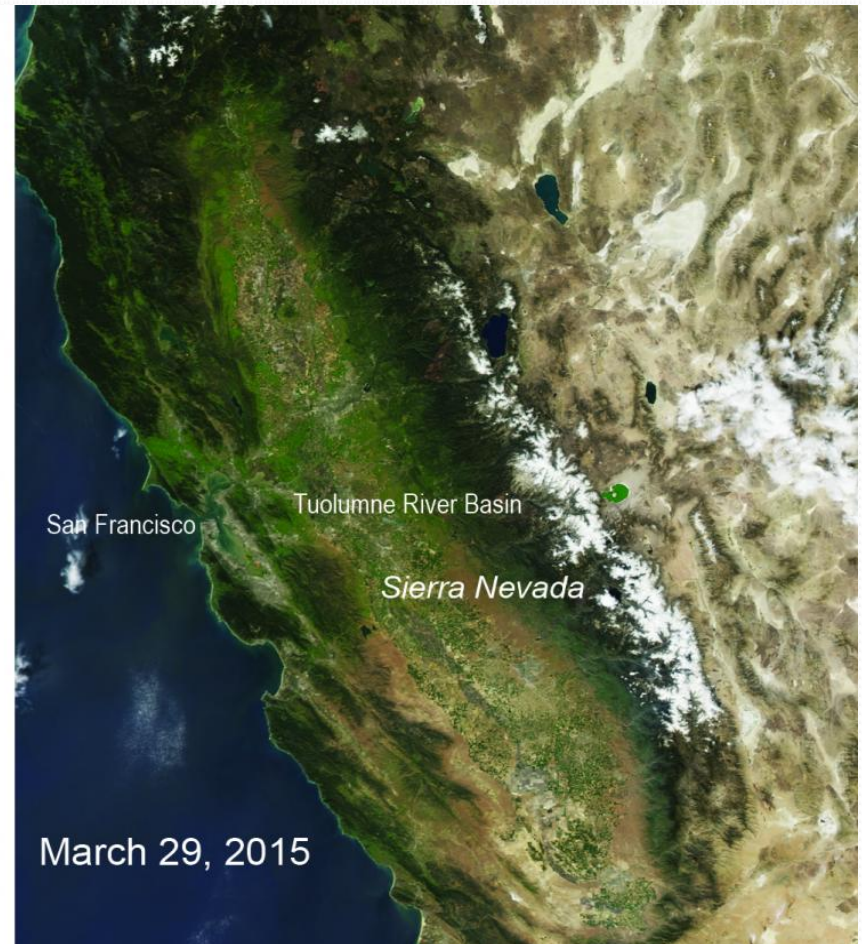
Source: Water Environment Foundation



This is California on Climate Change



March 27, 2010



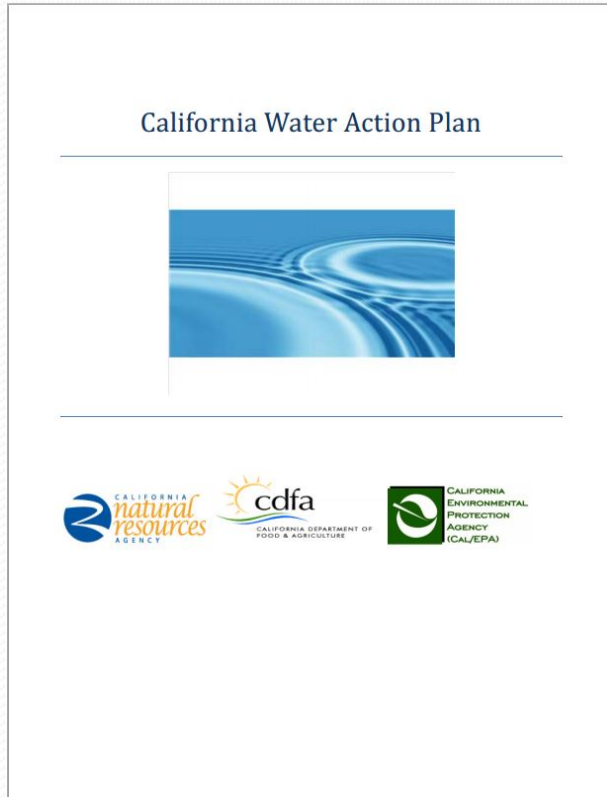
March 29, 2015

Source: NASA

Future drivers require change

- Climate change → particularly loss of snowpack
- Limitations of looking at “recorded history”
- Population growth
- Food security
- Importance of protecting nature

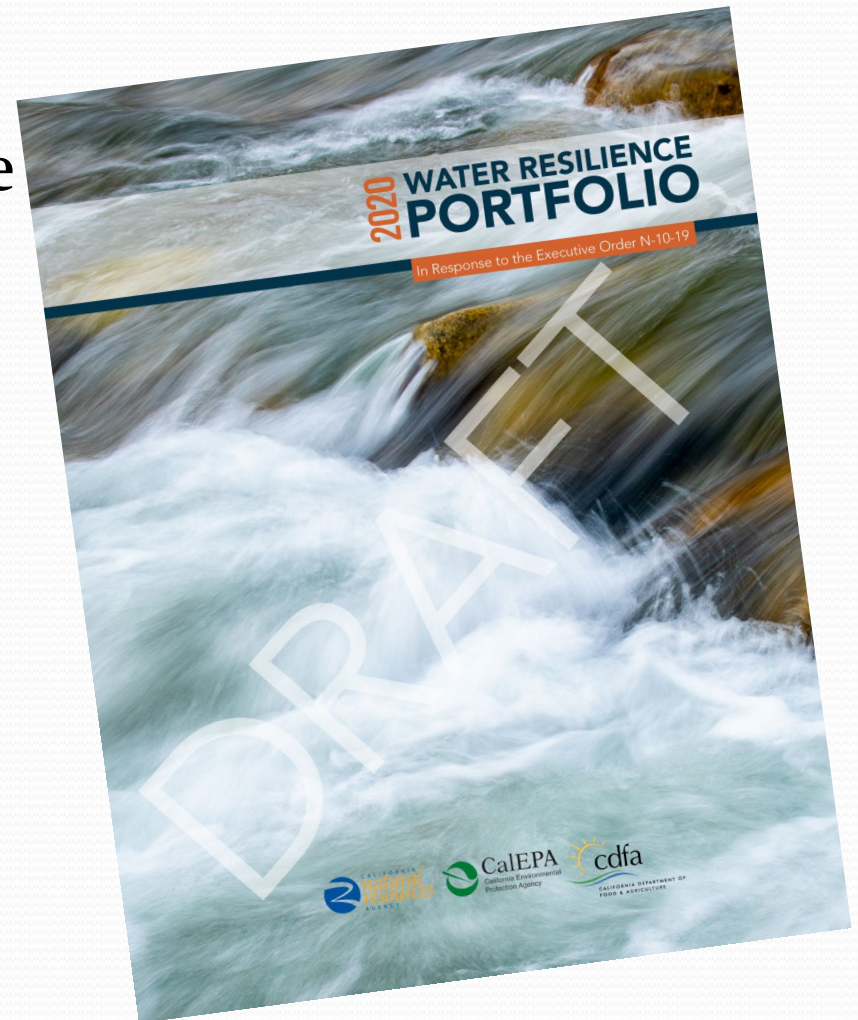
California Water Action Plan



- Make Conservation a California Way of Life
- Increase Regional Self-Reliance and Integrated Water Management Across All Levels of Government
- Achieve the Co-Equal Goals for the Delta
- Protect and Restore Important Ecosystems
- Manage and Prepare for Dry Periods
- Expand Water Storage Capacity and Improve Groundwater Management
- Provide Safe Water for All Communities
- Increase Flood Protection
- Increase Operational and Regulatory Efficiency
- Identify Sustainable and Integrated Financing Opportunities

Governor Newsom takes the baton...

- Water Resilience Portfolio out in draft; comments due February 7
- Based on portfolio approach; “All of the above” too
- Regional approach, multi-benefit, tech/innovation/data, agency integration among other emphasis



California Drought

“Beer is proof
that God loves us
and wants us to
be happy.”

Benjamin Franklin

Poor Richard's Almanac



California Drought



When the well is dry, we know the worth of water.

~ Benjamin Franklin

Recent crisis: Worst drought in modern times



January, 2013



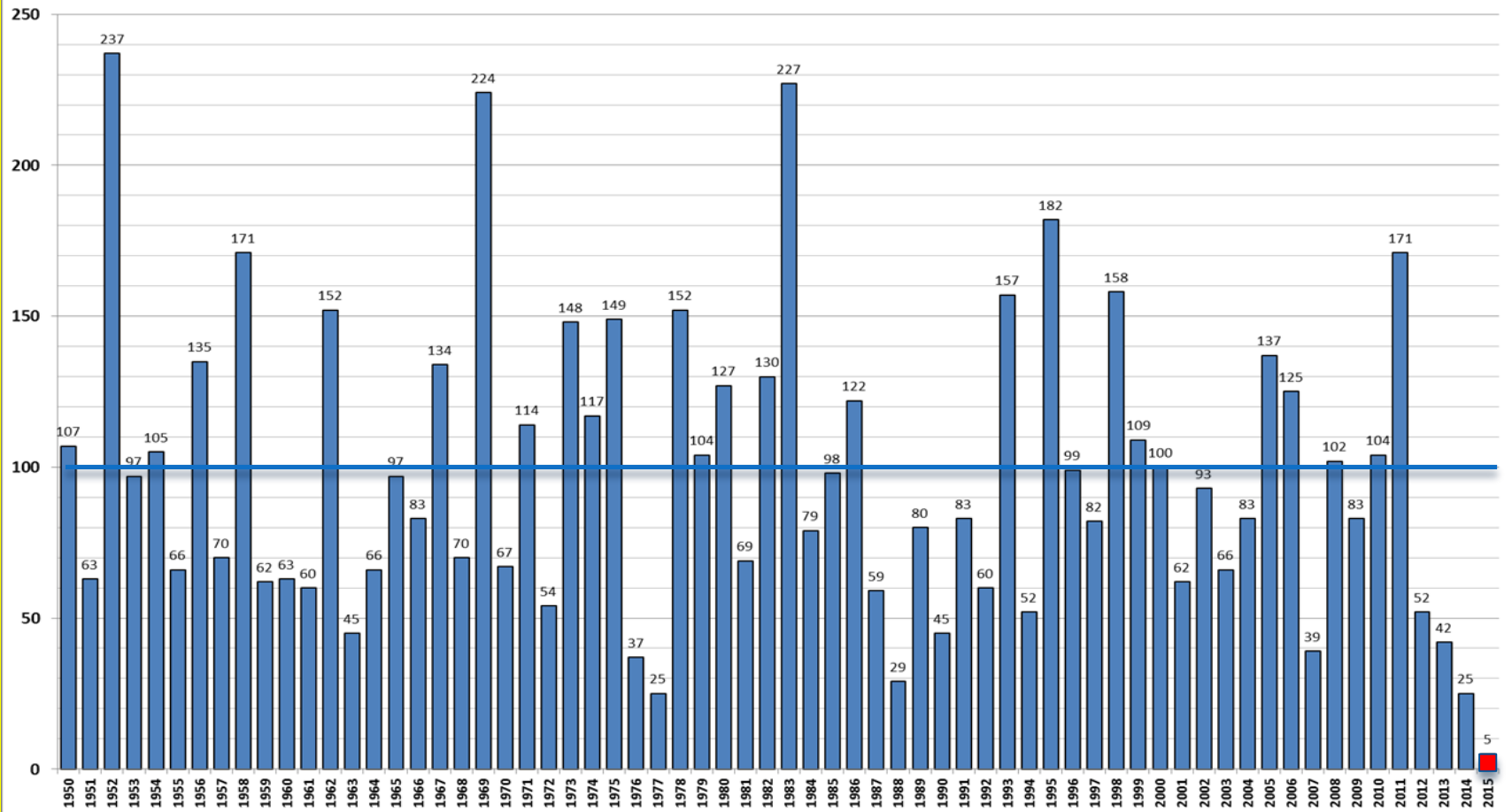
January, 2014

***Harbinger of things to come—think
Australia and Climate Change***

Credit: NASA

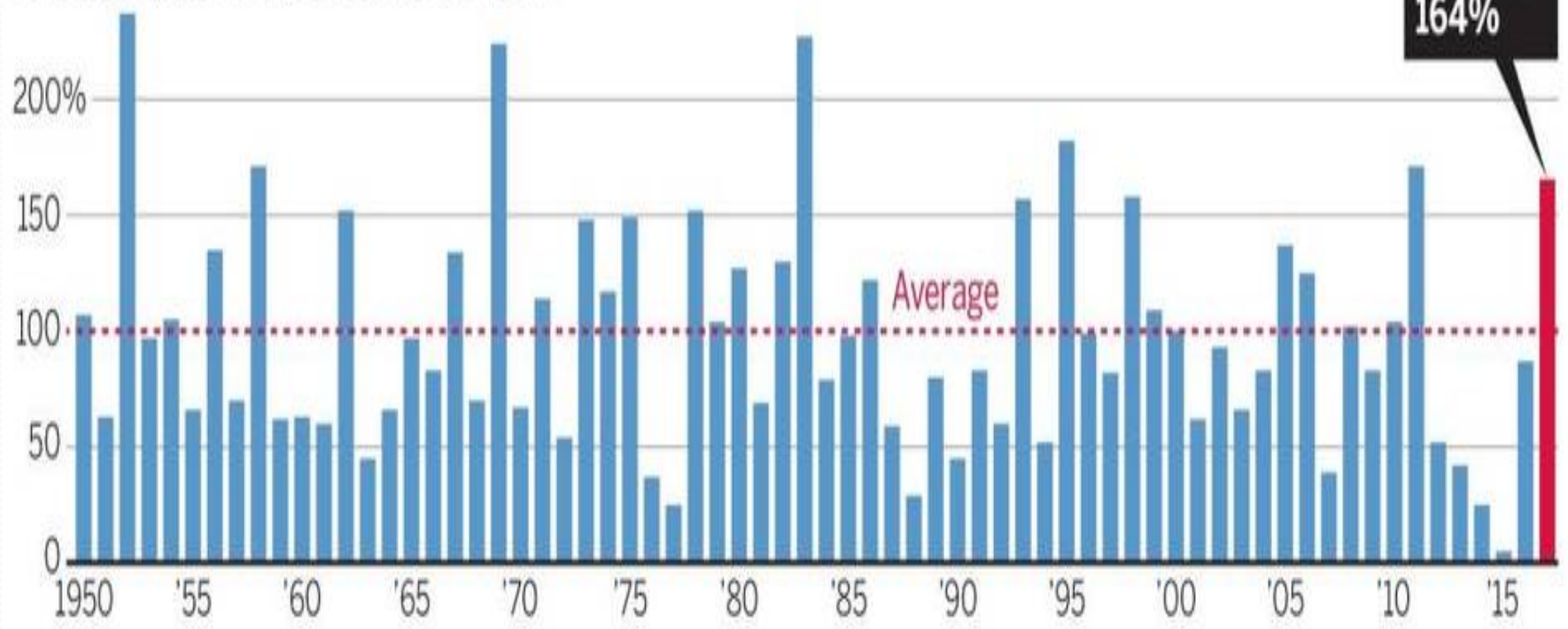
2015 Statewide Snow Water Content

April 1 Snowpack Water Content
Statewide Percent of Average



SIERRA SNOWPACK WELL ABOVE AVERAGE

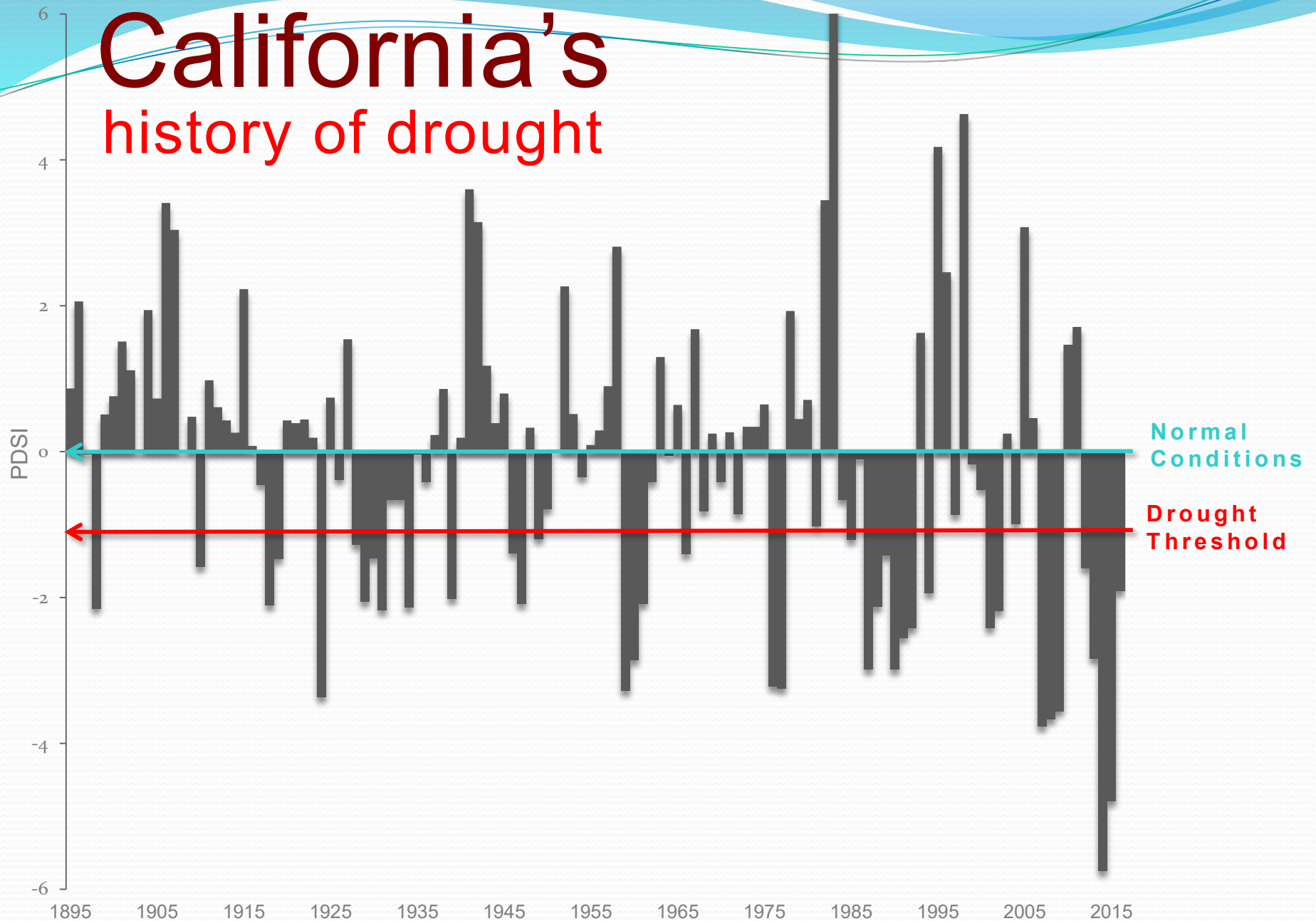
Percent of April 1 average statewide snowpack



Source: California Department of Water Resources

BAY AREA NEWS GROUP

California's history of drought





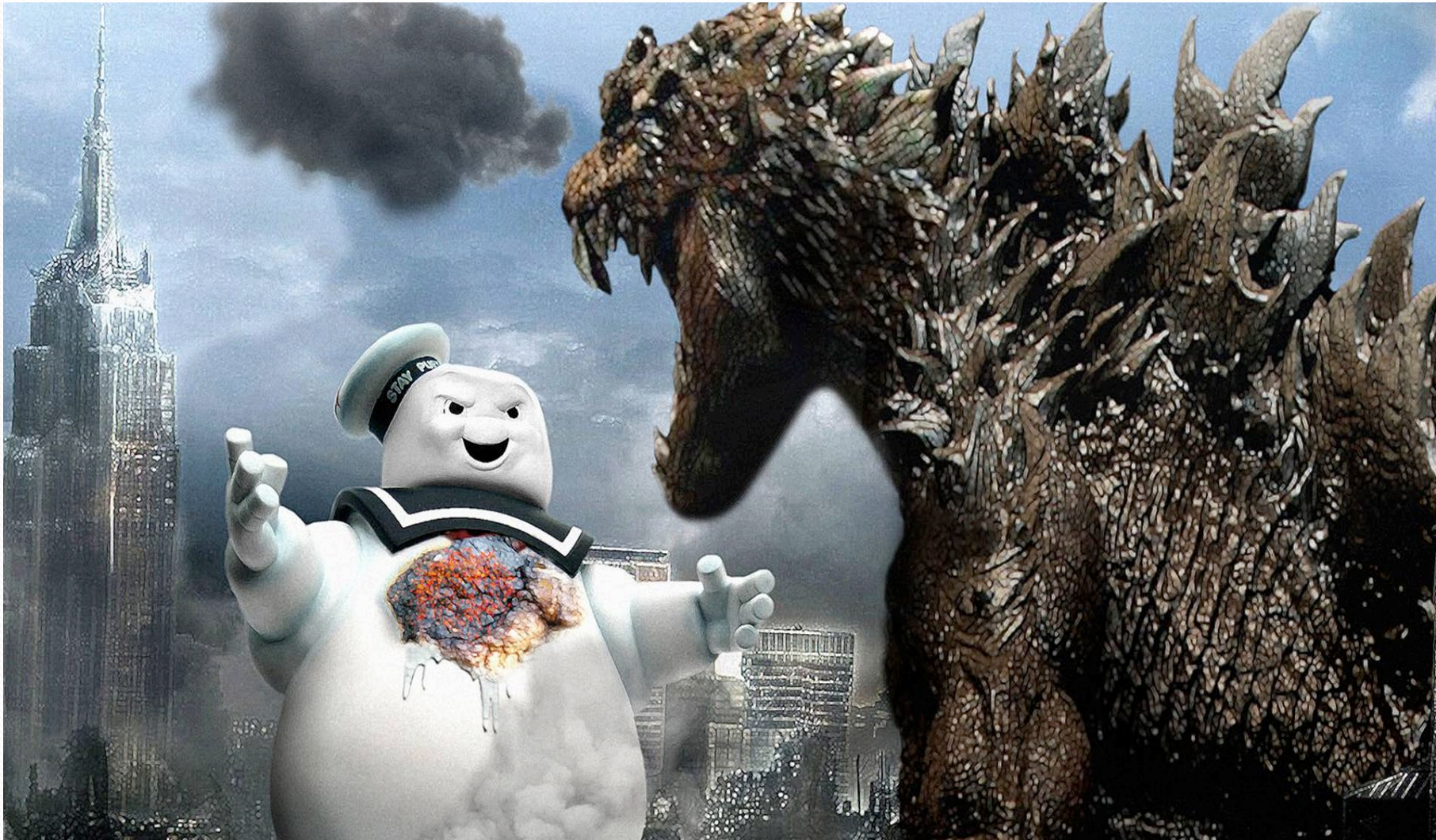
Selected impacts



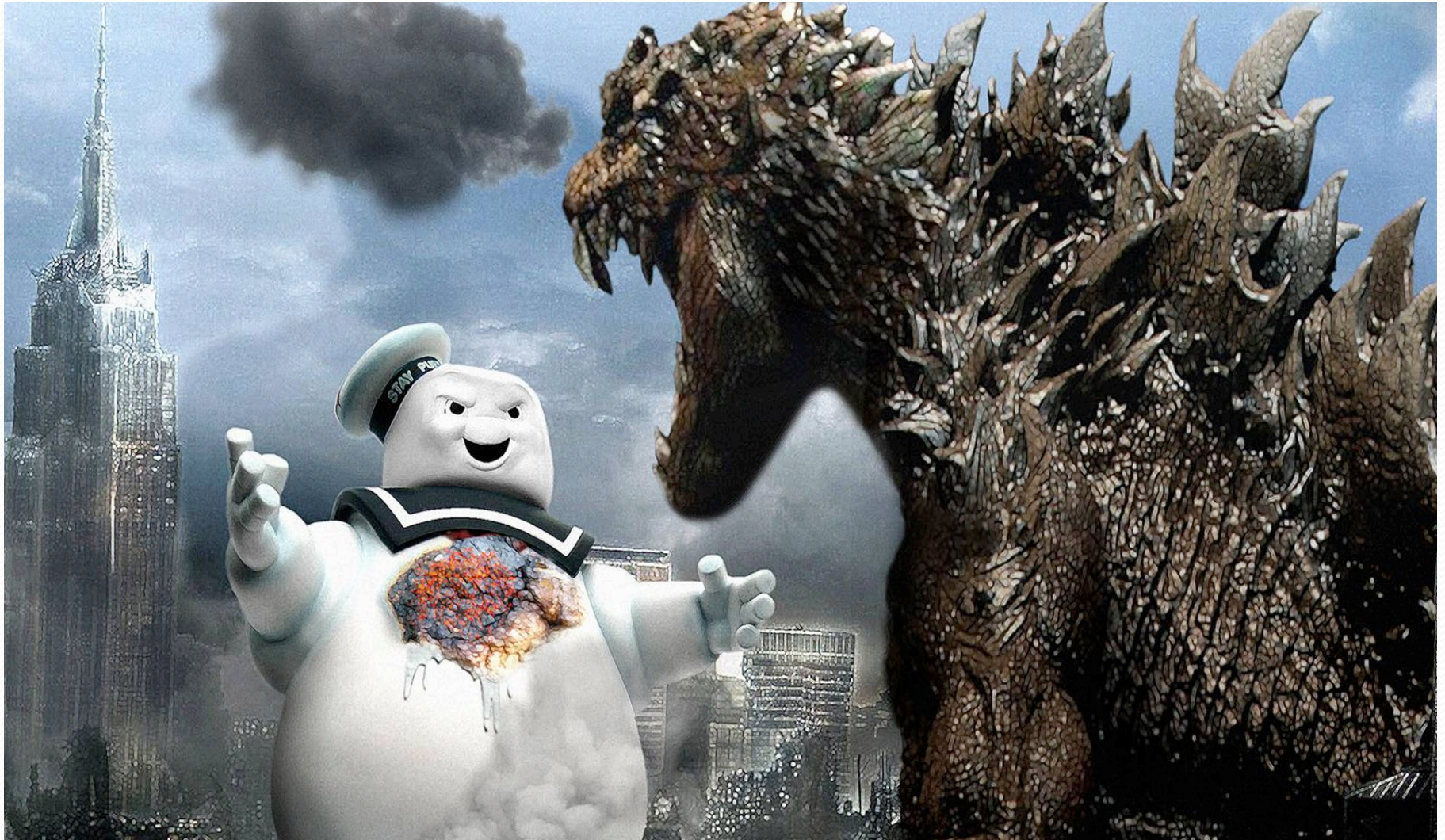
Selected Actions—



El Nino 2016: The guy on the left

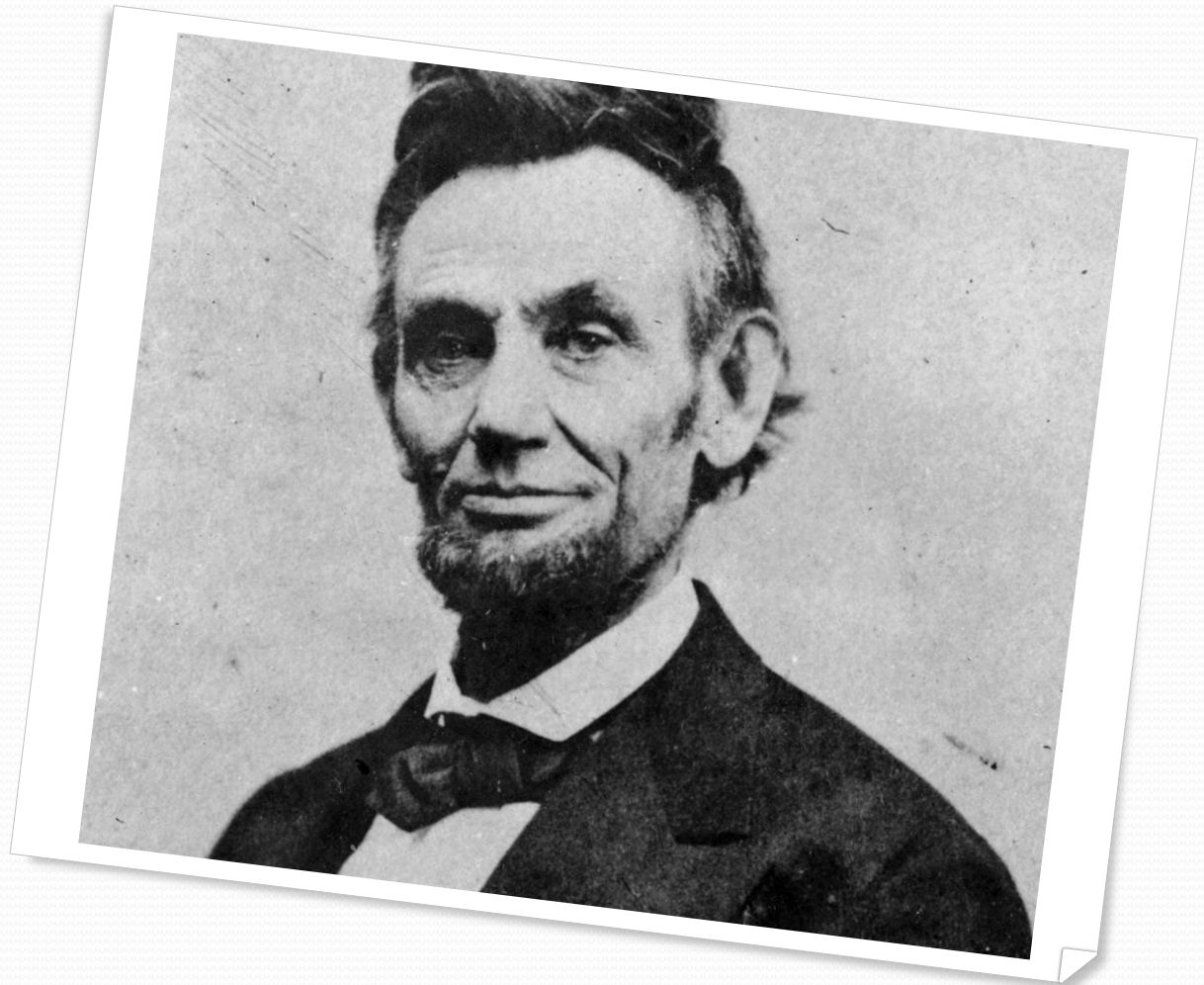


Wake up call: The guy on the right



Dealing with reality

“I am a firm believer in the people. If given the truth, they can be depended upon to meet any national crisis. The great point is to bring them the real facts, and beer.”



Ice Cube's wisdom

“I think, to
me, reality
is better
than being
fake.”

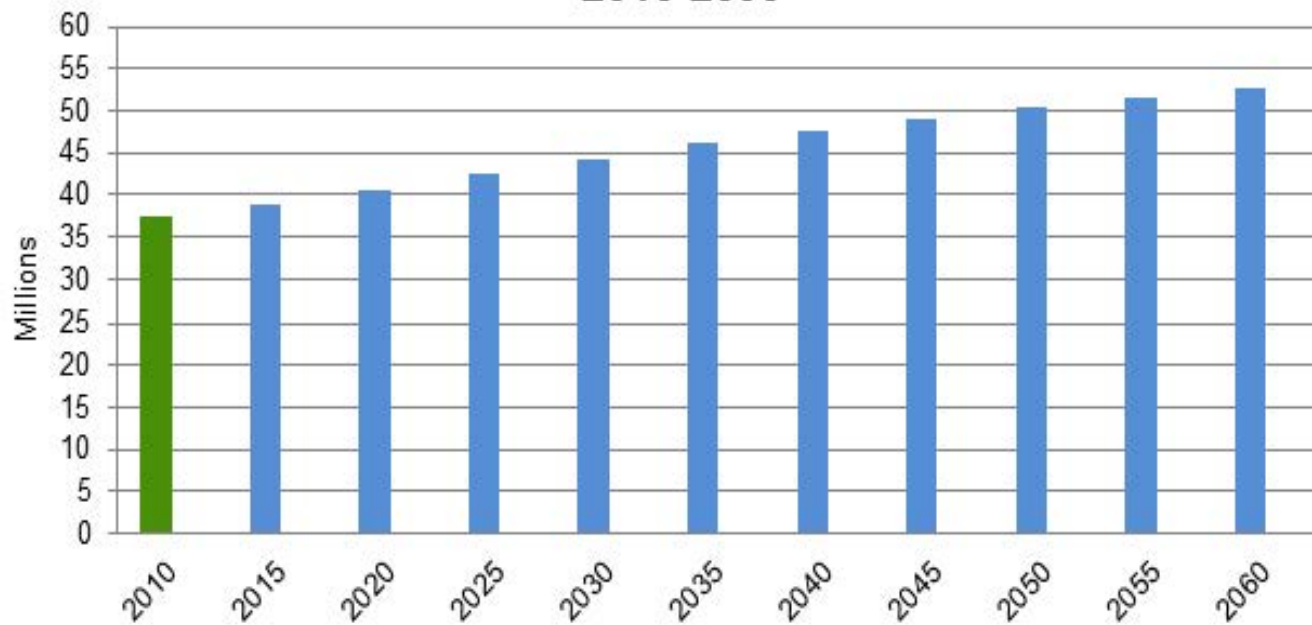


Reality: Loss of snowpack



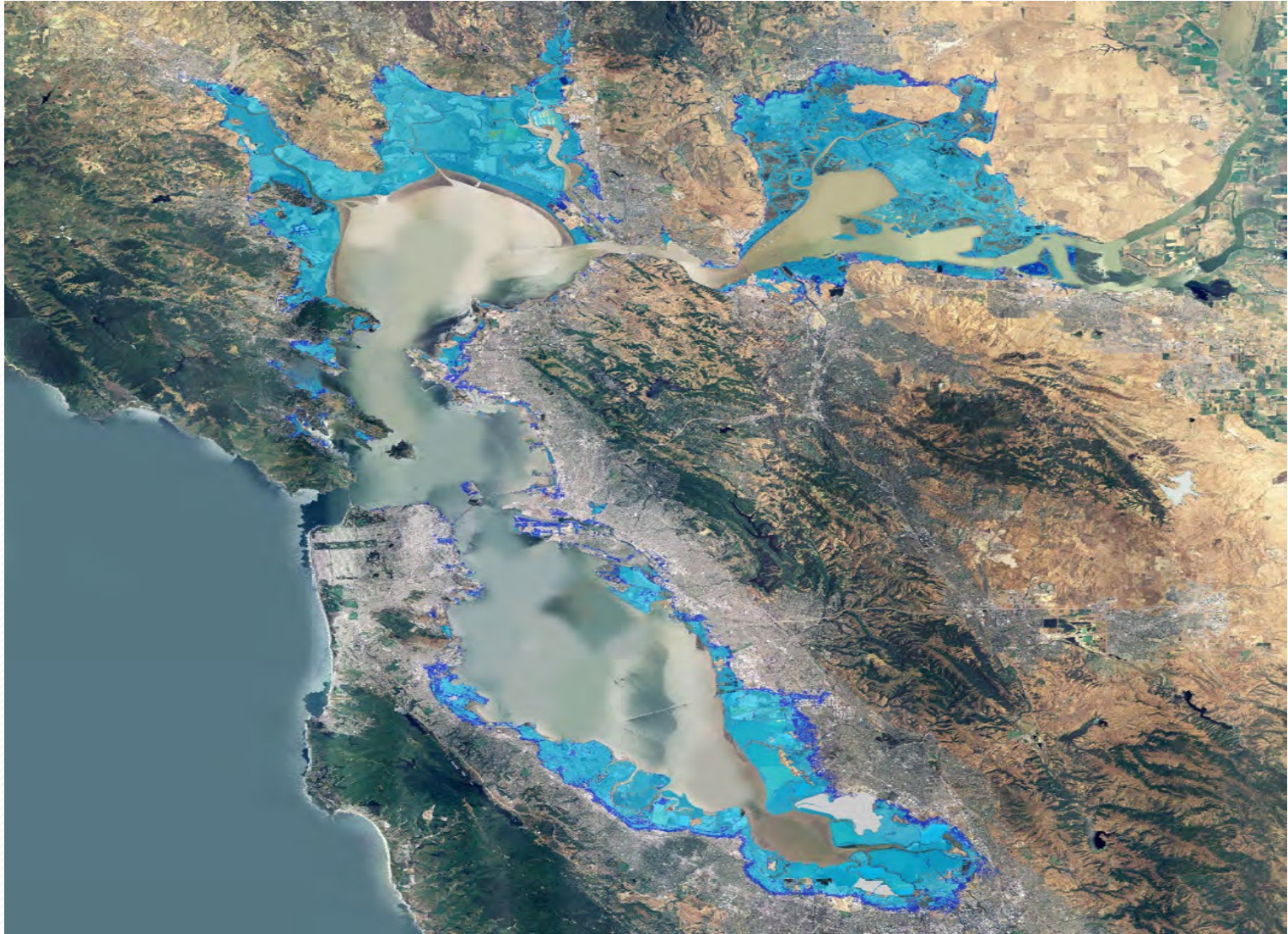
Reality: Population will rise

**Projected Growth in California's Population
2010-2060**



- Source: Department of Finance; Controller Betty Yee website

Reality: Sea Level Rise



Reality: The Delta is the central challenge



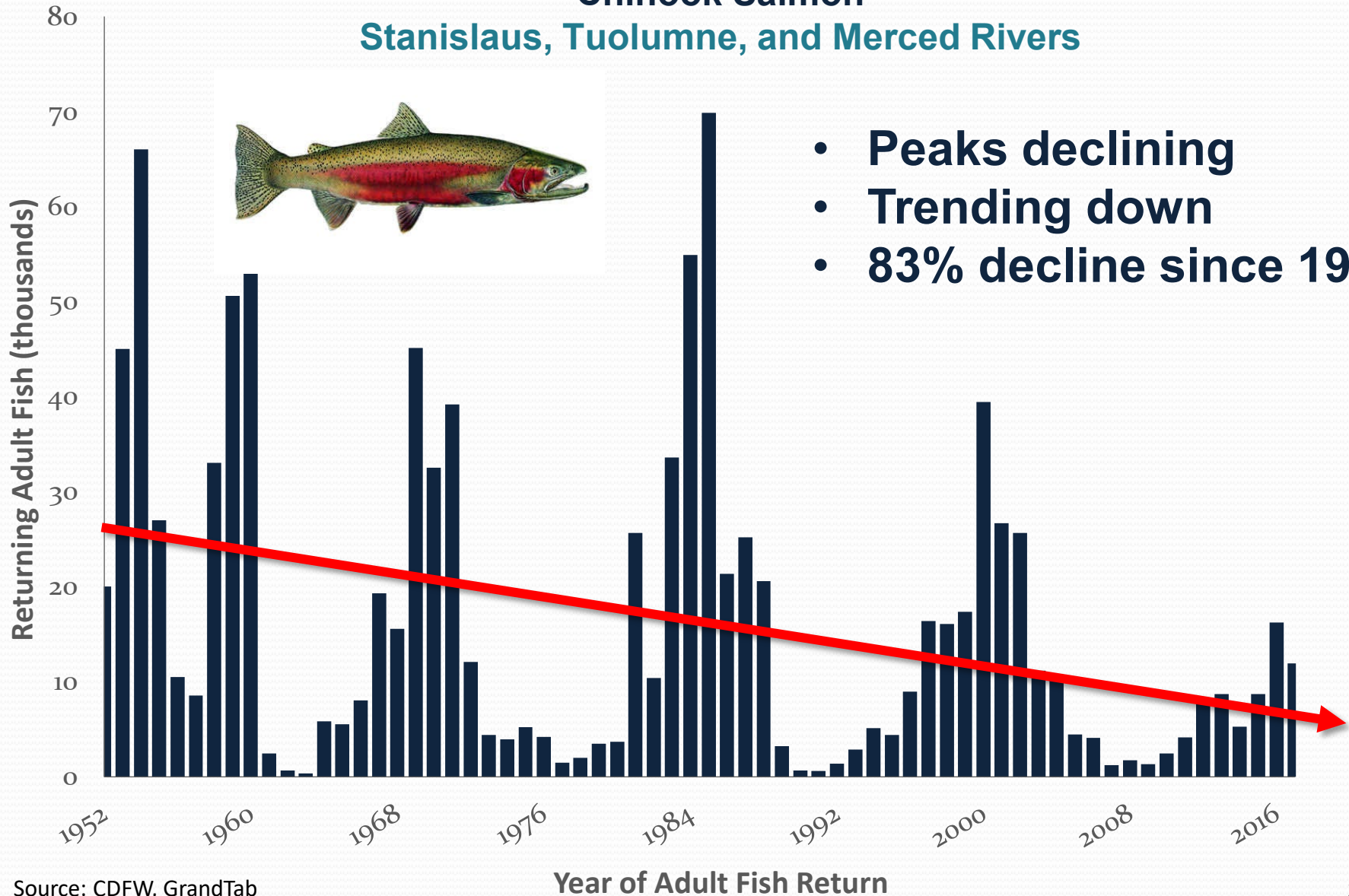
Reality: Ecosystems are in Trouble

Chinook Salmon

Stanislaus, Tuolumne, and Merced Rivers



- Peaks declining
- Trending down
- 83% decline since 1985



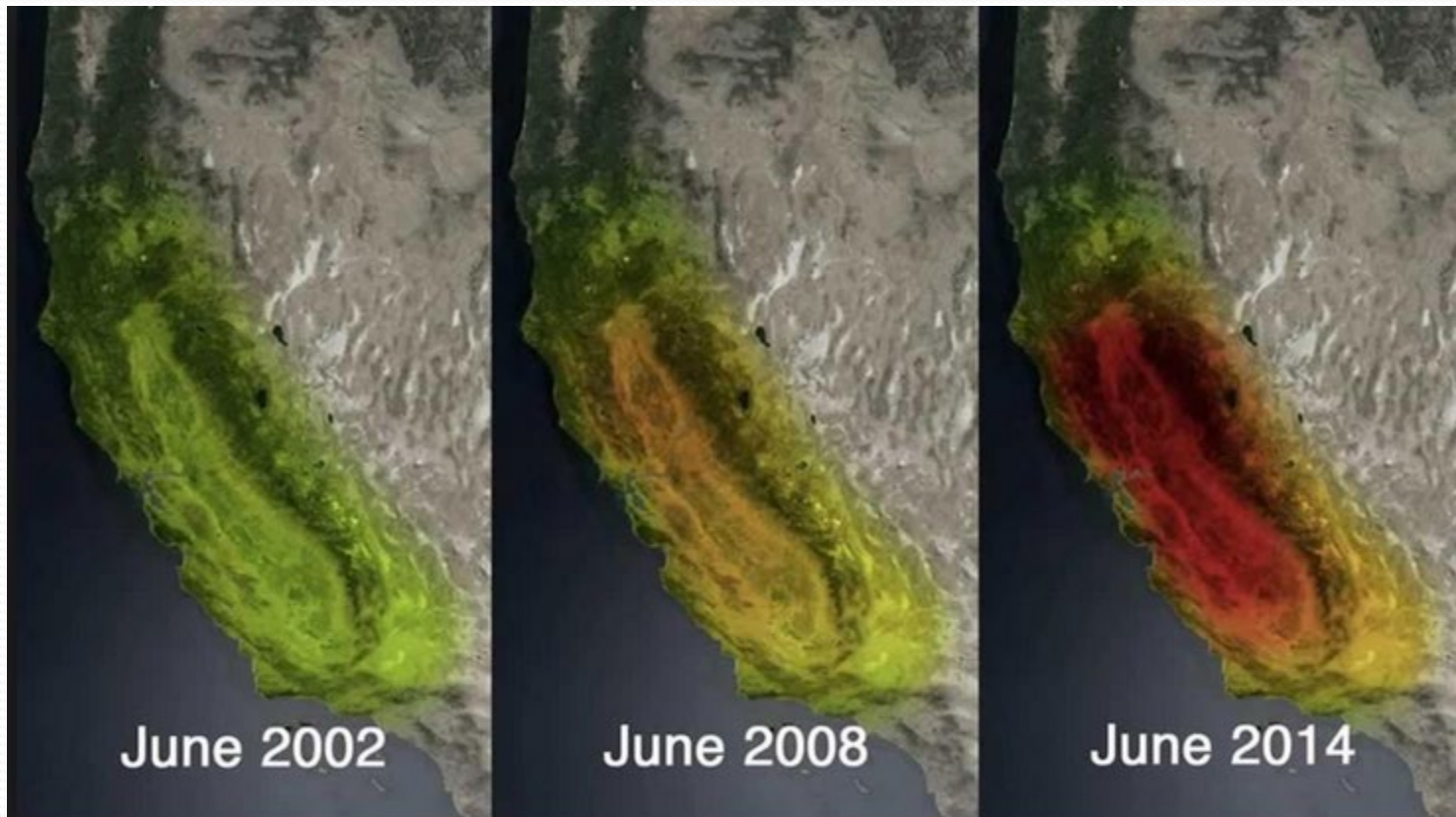
**Reality: California
agriculture is
precious resource
for all of us**



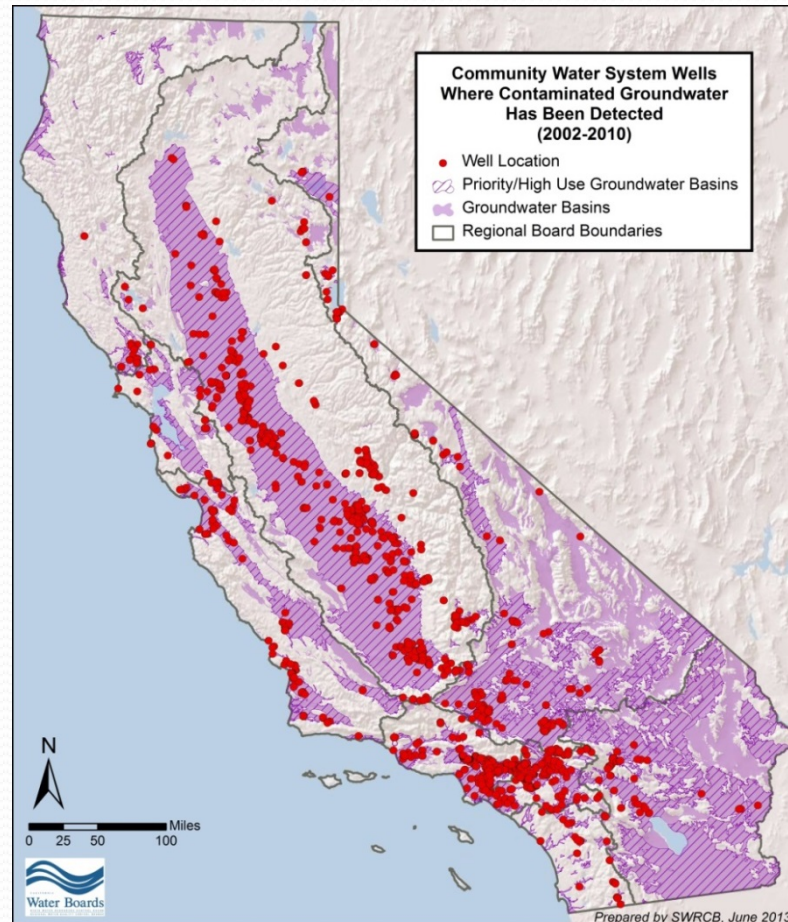
**Reality: Lack of
statewide
groundwater
management has
been a problem**



Groundwater Depletions



Reality: Community Well Systems Where Contamination has been Detected



Reality: Our infrastructure is aging and inadequate to the times



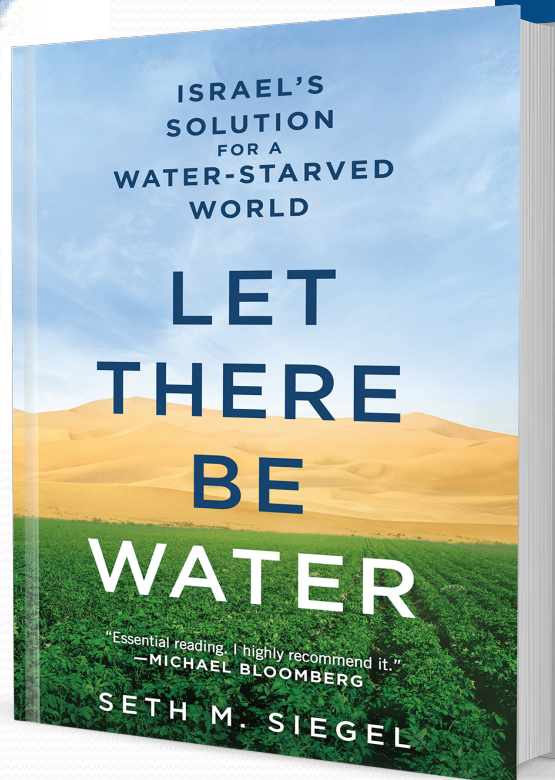
Reality: We can do something about it



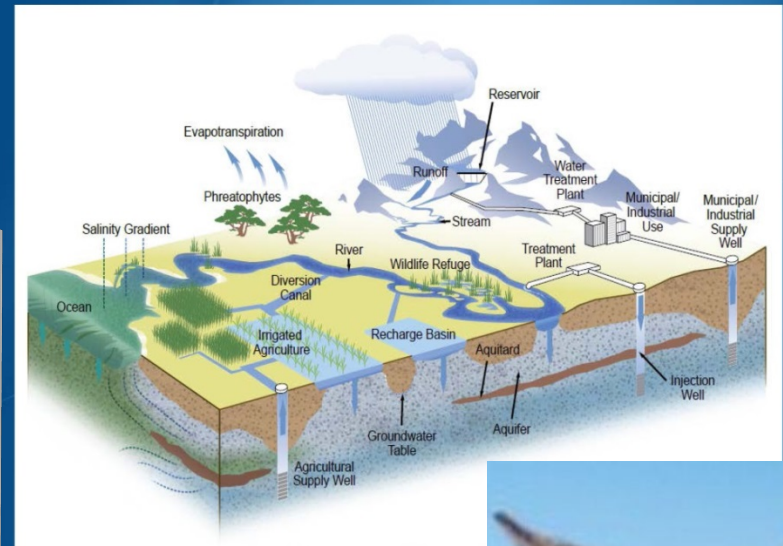
Water 4.0

The Past, Present, and Future of the World's Most Vital Resource

David Sardesh



A Call to Integrate Interconnected Systems Require Integrated Solutions



Reality: We've done a lot about it but still a long way to go

Progress

- Water conservation public response and Water Efficiency Legislation
- Safe Drinking Water legislation and funding
- Statewide Groundwater management legislation and progress
- Recycled Water paradigm shift
- Stormwater Capture acceleration
- Updated standards for preventing pollution

Much much more to do

- Water quality HUGE needs—PFAS/PFOA, Chromium 6, Lead, Nitrates, Salinity, vestigial contaminants/ongoing contaminants
- Water rights 19th century, infrastructure 20th century; problems 21st century
- Ecosystems in crisis
- Water system fragmentation/politicization
- Bay-Delta

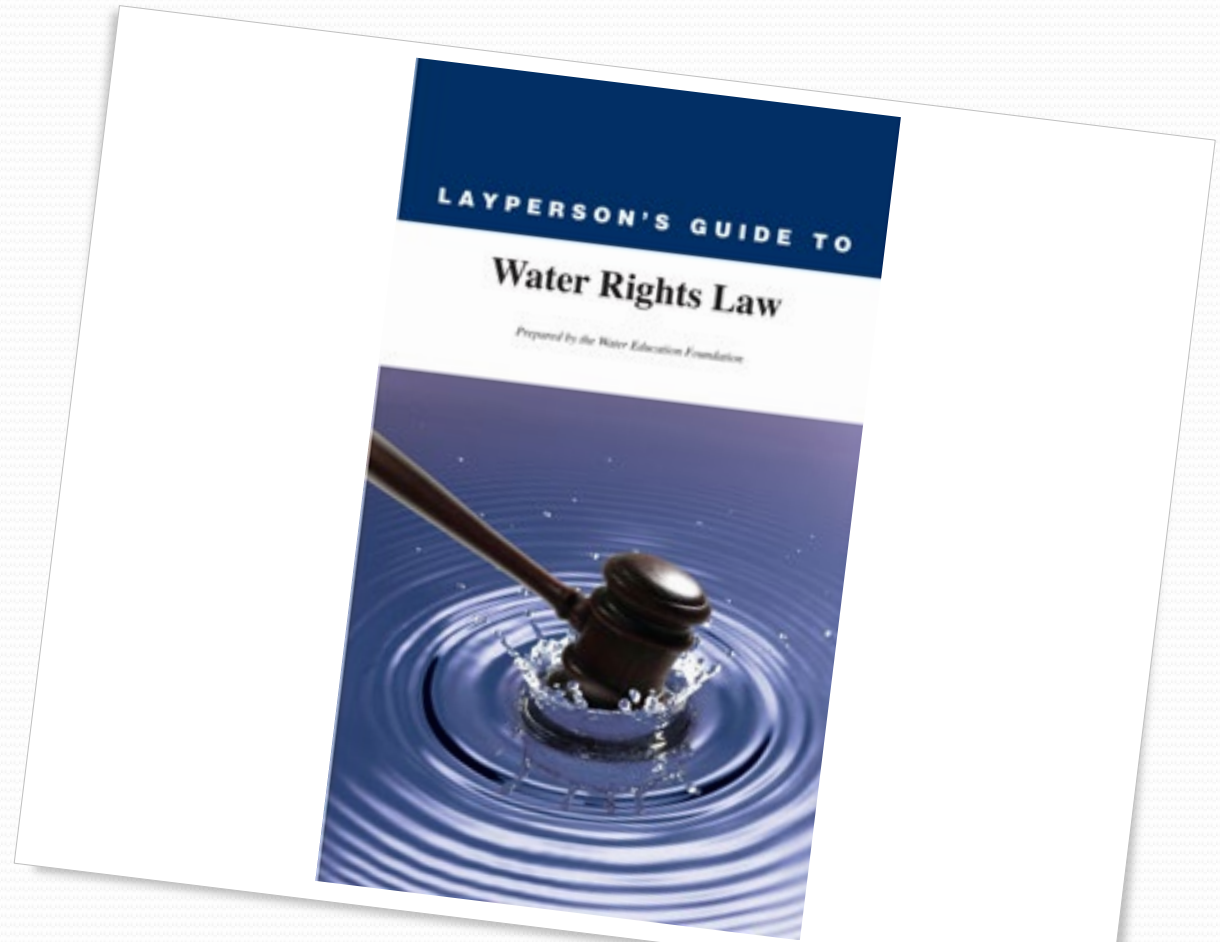
\$\$\$\$\$: Proposition 1 and progeny

- All of the above
- Requires sustainable funding
- Not there yet, but a start
- Watch for resilience bond



Water Rights

- Drought actions and follow through
- Information management
- Dispute resolution



Groundwater management

SGMA:

- Groundwater sustainability agencies (GSAs)
- Sust plans due 2020 and 2022
- Sust in 20 years
- Backstop



Safe Drinking Water

- Standard setting—
e.g., 123tcp,
chromium6
- Consolidation work
- Prop 1 grants; SRF
loans
- Irrigated Lands
Regulatory Program
- SB200 Funding to
help DACs obtain
capacity to provide
and treat clean, safe,
and affordable
drinking water



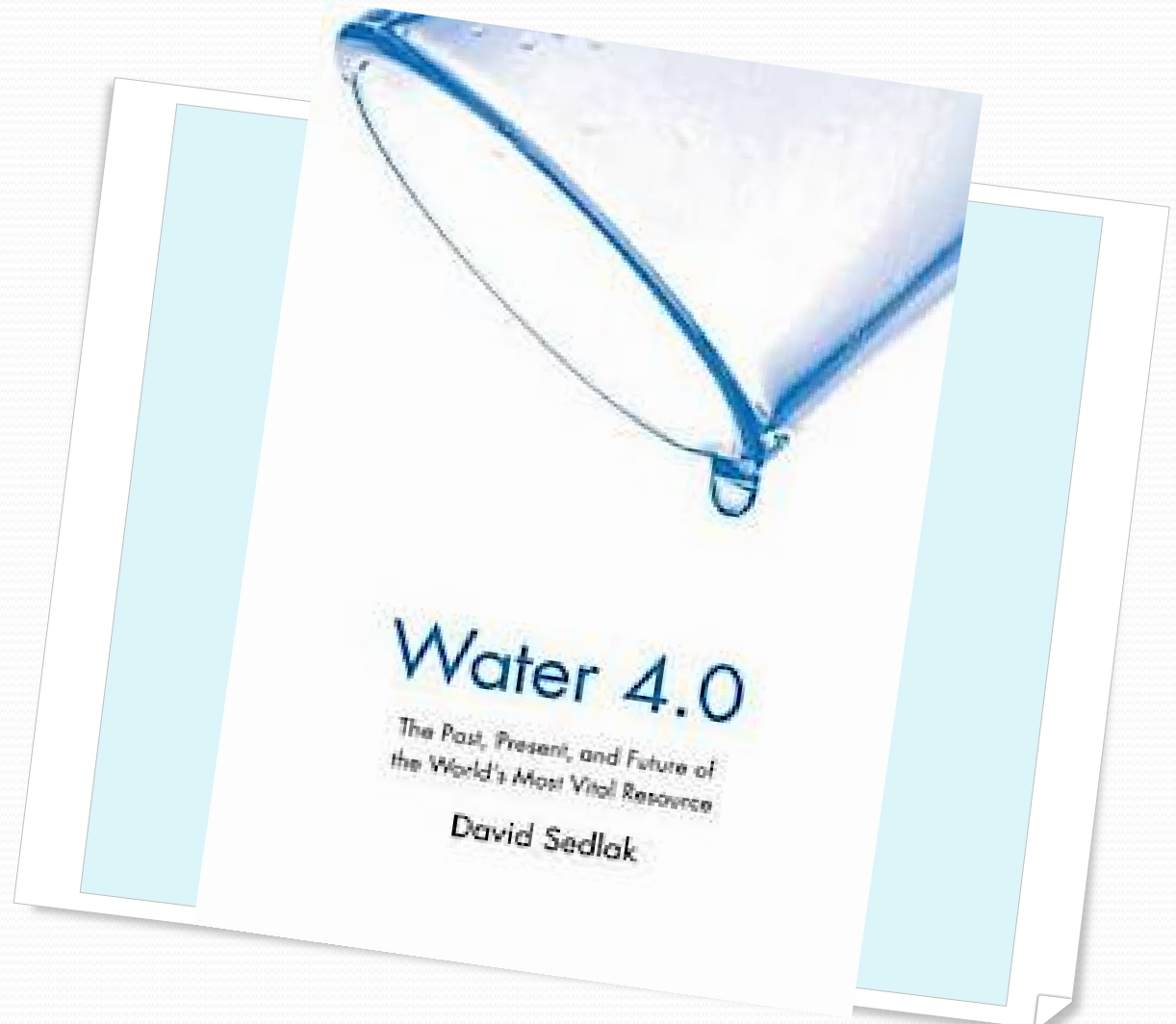
Water Conservation and Efficiency

Mandatory drought conservation: 24%!
Long term efficiency standards and targets
Leak standards and audits



Urban Resilience

- Conservation/
Efficiency
- Water Recycling
Acceleration
- Stormwater
Strategy/
Multiple Benefit
Incentives
- Desal standards
- Urban resilience
helps agriculture



**Recycled
Water—
not just
ready for
take-off; it
took off**



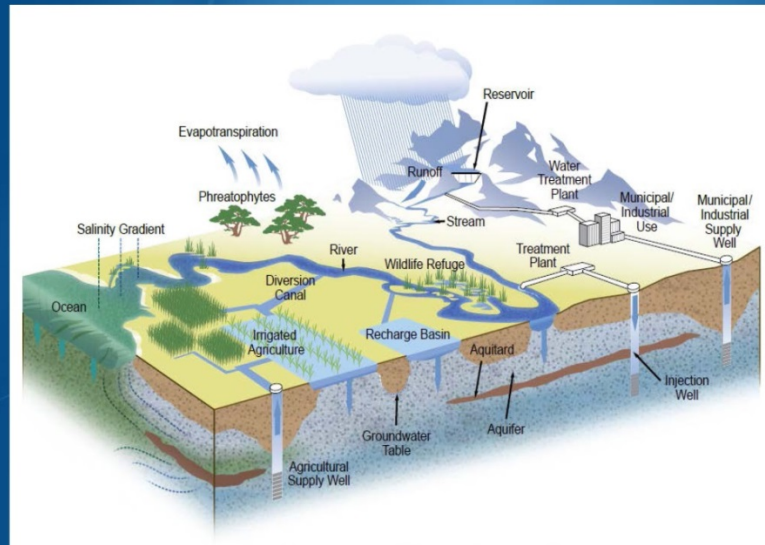
Key to future is integration and local and regional leadership

Efficiency/Recycling/Stormwater Capture/Parks+

- Santa Ana River Watershed/Orange County
- San Diego
- Los Angeles
 - LA
 - Met
 - LA County
 - WRD and more
- Sacramento writ lrg
- Santa Clara County/SF Bay agencies
- San Joaquin Valley
 - Del Puerto
 - Brackish

A Call to Integrate

Interconnected Systems Require Integrated Solutions



It started with Heal the Bay and Hyperion....



*“Our relationship with
water has to evolve.”*

Los Angeles

Mayor Eric Garcetti, October 14, 2014



VX2020 WATER CHARRETTE

JAN. 28 • 2020

WATER RESILIENCE IN 2035 AND BEYOND

THE PARADIGM OF HOW WE OPERATE WILL BE DIFFERENT...

UPDATES

TALK TO EACH OTHER
WORK TOGETHER AT ALL LEVELS

HOW ARE YOU RELATING TO OTHER SECTORS?

STREAMLINED / COLLABORATION FOR AN INTEGRATED GLOBAL PERSPECTIVE

WE HAVE A LOT OF DISPARITY IN DESIGN

INTEGRATED INVESTMENTS

OUR SYSTEMS ARE INTERWINDEN

DEVELOP LONG-TERM INTEGRATED SYSTEMS + PROJECT LONG-TERM PROBLEMS

IF YOU DON'T UNDERSTAND WATER, YOU DON'T UNDERSTAND CALIFORNIA

DRY WEATHER DIMENSIONS ARE KEEPING PEOPLE SAFER

WE CAN USE OUR EXISTING INFRASTRUCTURE

SURFACE WATER SEWER

MORE INTERWINDING OF INFRASTRUCTURE

GREEN NEW DEAL

- ENVIRONMENT
- EQUITY
- ECONOMY

WE CAN GET TO 70% LOCAL WATER BY 2035!

INVESTING IN MULTI-BENEFIT PROGRAMS

BUILD OUR NETWORK

EQUITY MORE JOBS

MEASURE IN MILL \$ PROVIDE TENS OF MILLIONS

RECYCLE 100% OF ITS WASTE WATER

BY 2035...

- 250 M GALLONS/DAY
- 160 M GALLONS NEW RECYCLED WATER

CHALLENGE IS FOR HYPERION 27%

WATER IS GOING INTO SANTA MONICA BAY AFTER ITS TREATED

SPACE FOR TREATMENT

HYPERION ADVANCED WATER PROJECT / 2022

PROJECTS MOVING FORWARD

NBR PILOT PROJECT IV, 2022

SPECIAL FEASIBILITY STUDY

RECYCLED WATER INVESTMENTS

WE PARTNER WITH EVERYONE TO PROVIDE SAFE WATER!

WRD WATER REPLENISHMENT DISTRICT

WE ARE AT ZERO REQUIREMENT FOR REPLENISHMENT PURPOSES

MWD

2015 SHOWED A DEFICIT - NEW SOURCES NEEDED TO MEET OUR TARGET

450,000 ACRE DEFICIT

RRWP

WILL FILL IN 1/3 OF THE GRIP

NEW LOCAL SOURCE OF HIGH QUALITY WATER

- ADVANCED WATER PURIFICATION

RAW WATER TRANSPORTED TO POTABLE SITES

AVAILABLE

NEEDED

METROPOLITAN COLLABORATING

OPERATIONAL IN 2035!

OPERATION NEXT - yes

RAW + TREATED WATER

LOOKING AT: TREATED WATER PLANT

TRWA

SPREADING GROUNDS

HYPERION

INFLUENCE WHOSE MIND CAN INFLUENCE OTHERS

TUNING FROM L.A. TO THE MOUNTAIN

STORE RUNOFF

PURE SPRINKLING WATER

TEACHING WATER CONSERVATION

UNUSED LOCAL WATER + AVAILABLE GROUNDWATER STORAGE = RELIANCE ON SUSTAINABLE GROUNDWATER

EFFECTIVELY USING GROUND WATER

WIN FOR ALL

1 PLAN: LA COUNTY WATER PLAN

IT'S EASY TO BRING SAFE, CLEAN, RELIABLE WATER TO EVERYONE

TELLS THE WATER STORY

DOING FOR PEOPLE

ADVOCATE TOGETHER!

CHALLENGES:

- OLD INFRASTRUCTURE
- CLIMATE CHANGE
- POPULATION GROWTH
- FRACTURED GOVERNMENTS

GET OUR RECYCLED # UP

PRIORITIZE LOCAL WATER

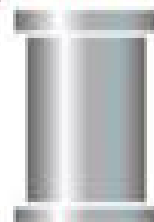
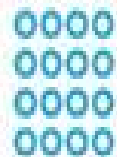
REGIONAL WATER PLAN



G | W | R | S
GROUNDWATER REPLENISHMENT SYSTEM



**Seawater
Barrier**
(36 well sites)



**Recharge
Basins in
Anaheim**

Microfiltration (MF)

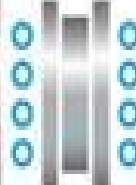
Reverse Osmosis (RO)

**Ultraviolet Light (UV)
with Hydrogen Peroxide**

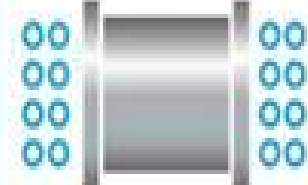
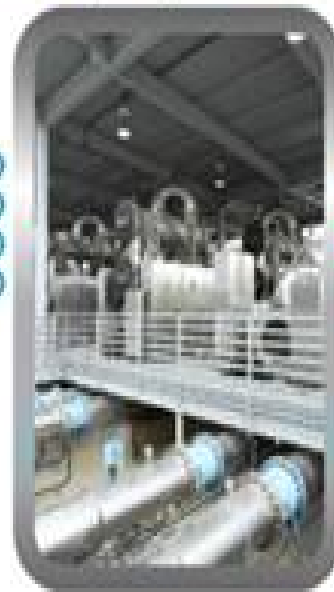
**Highly
Treated
Wastewater**



**Backwash
Sent to OCSD**



**Brine Sent
to OCSD**



Service Area



43 Cities in LA County



Over 4 Million Residents

Water Supply



50% supplied from groundwater wells



50% supplied by imported water



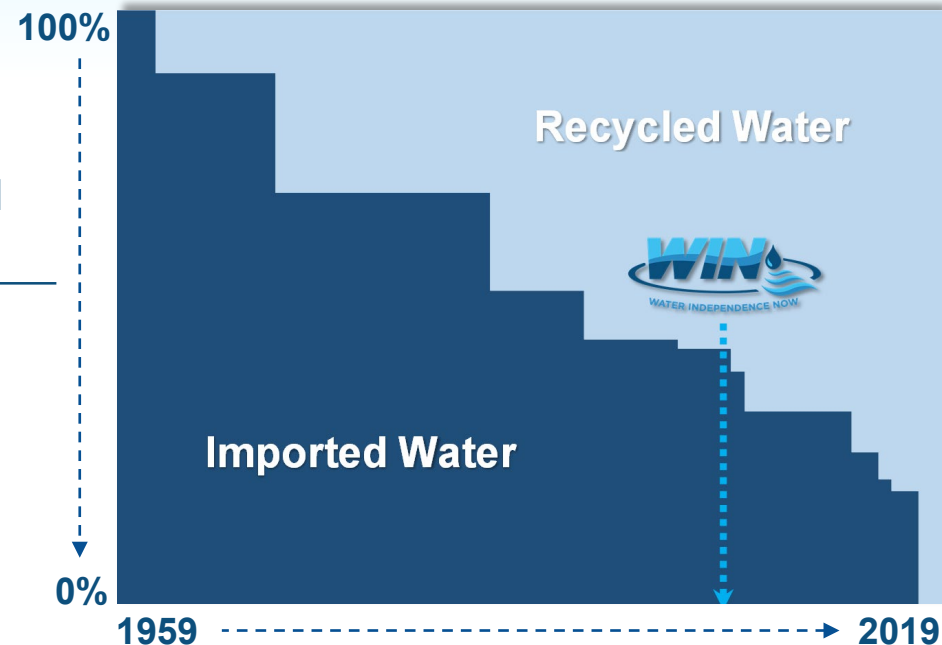
WRD recharges the groundwater basins



WRD established water independence and groundwater sustainability through:

1. Increasing Production & Use of Recycled Water

2. Capturing & Conserving Additional Stormwater



Groundwater augmentation & storage projects will be developed using local supplies to create regional water independence

Unused Local Water Supplies

Recycled Water



Stormwater

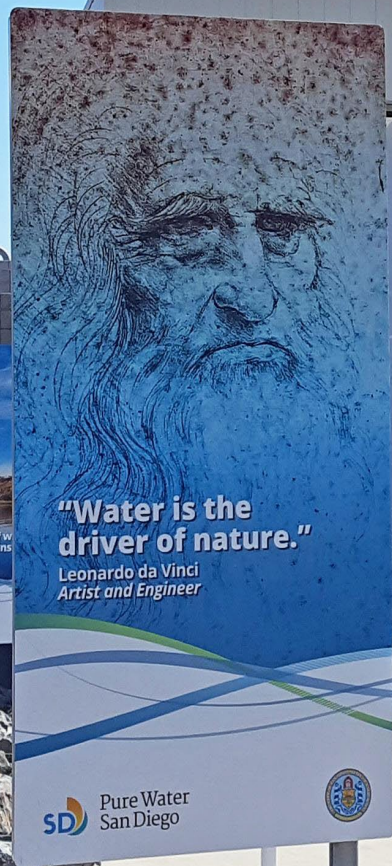


**Available
Groundwater
Storage Space
450,000 Acre-Feet**



Increased Reliance on Sustainable Groundwater

- ✓ Offset potable imported water demands
- ✓ Storage provides resiliency during dry years
- ✓ The water supply for over 4 million people is entirely locally sustainable!



"Water is the driver of nature."
Leonardo da Vinci
Artist and Engineer

SD Pure Water San Diego

Pure Water San Diego



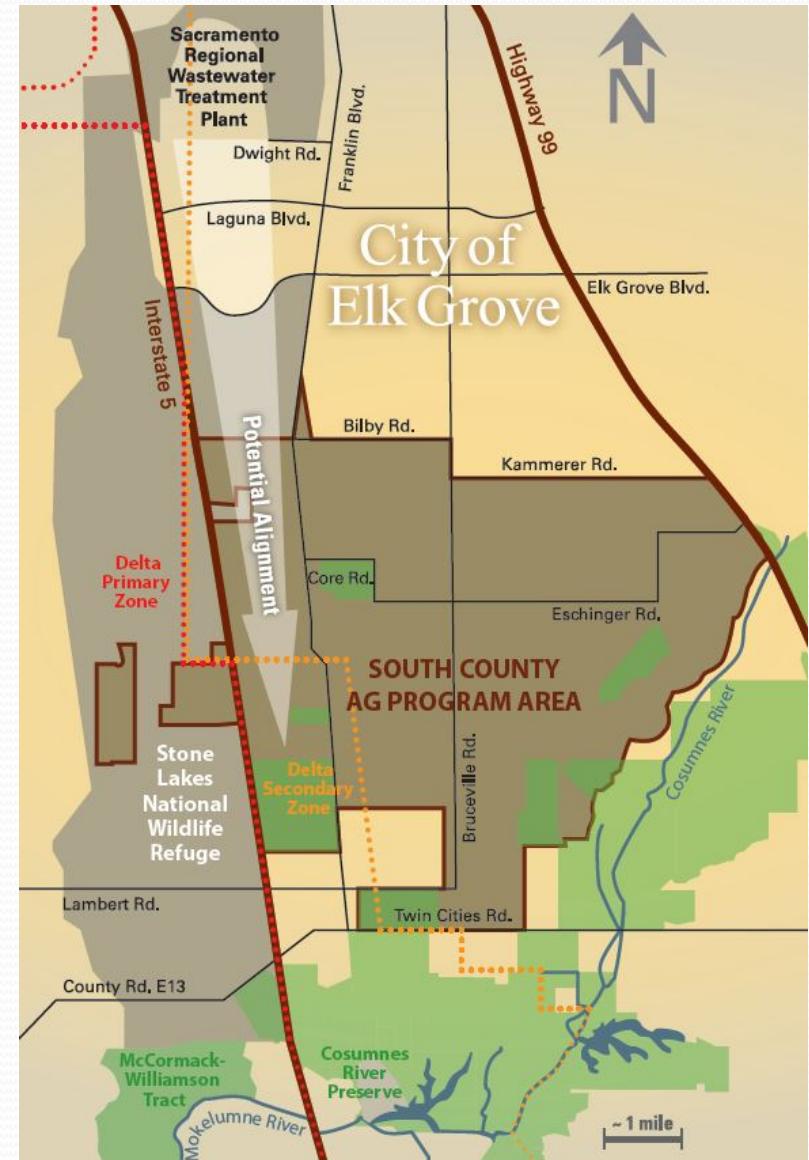
safe, reliable, **sustainable**

Goal:

producing
1/3 of our
water supply

Developing An Opportunity – The South County Ag Program

- Delivers up to 50,000 AFY of recycled water
- Irrigates up to 16,000 acres of ag and habitat lands
- Provides in-lieu recharge
- Produces multiple benefits
 - Groundwater Restoration
 - Ecosystem
 - Water Quality
 - Conjunctive use
- Has broad stakeholder support!



Groundwater Restoration Benefits

The foundation that is needed to produce all the other Public Benefits



- Restores groundwater levels up to 35 feet within 15 years
- Improves stream flows in the Cosumnes River
- Increases groundwater storage by ~ 245,000 AF in 10 years
- Helps improve regional water supply sustainability



UC DAVIS & THE DELTA SCIENCE PROGRAM PRESENT

MEETING NATURE HALFWAY ON A FLOODWAY

THE YOLO BYPASS AS A RECONCILED ECOSYSTEM

A SCIENCE SYMPOSIUM
Free and open to the public

SAVE THE DATE

TUESDAY, DEC. 9, 2014
UC DAVIS CONFERENCE CENTER
BALLROOM B
9 AM - 5 PM

The Delta Science Program | UC Davis Center For Aquatic
Biology & Aquaculture (CABA) | UC Davis Center for
Watershed Sciences

Forests and Water in the Sierra Nevada: Sierra Nevada Watershed Ecosystem Enhancement Project

Roger C. Bales, John J. Battles, Yihsu Chen, Martha H. Conklin, Eric Holst, Kevin
L. O'Hara, Philip Saksa, William Stewart

November 29, 2011



Sierra Nevada Research Institute,
UC Merced

Center for Forestry,
UC Berkeley

Environmental Defense
Fund

Urban Sustainability challenge & opportunity: Stormwater

- Problem or resource?—it is all in how you look at it
- Stakes high—multiple challenges
- Working across silos huge sea change
- Prop W

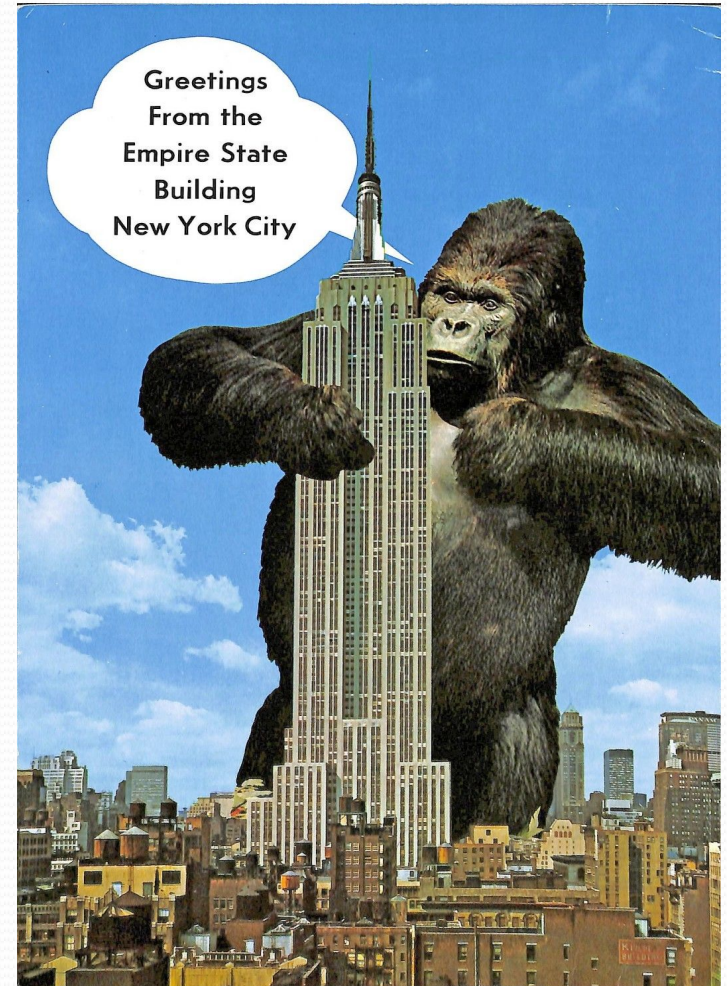
**Save the rain.
Save L.A.**
YES ON W



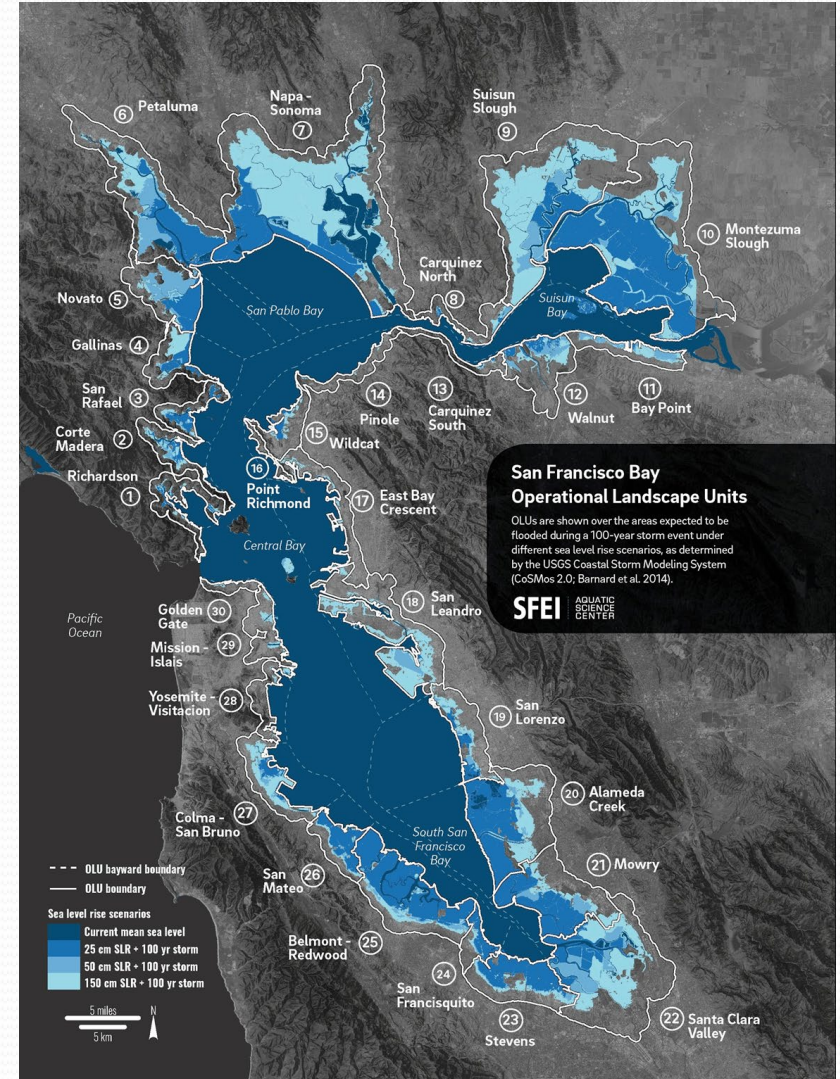
...closer to home....

Urban Sustainability challenge & opportunity : Sea Level Rise

- Bay Area analog to LA
- Prop AA--\$500 million
- 20+ Empire State Buildings
- Seawalls vs. wetland restoration



Adaptation Atlas



City and Countywide Benefits

A vision for 2100: One Resilient Shoreline

Project Assistance. Will plan, permit, design, construct and provide long-term maintenance for projects.

Funding Access. Will access and leverage state and federal funds.

Public Education. Will educate stakeholders and the public on the need for any potential revenue measures to fund the Agency or implementation of projects.

Prioritized Multi-benefit Projects. Will ensure that collaborative projects will be coordinated, won't create unintended consequences, and won't duplicate efforts.

Stormwater Detention Solutions. Will be implemented from C/CAG's plan for countywide compliance on the Municipal Regional Permit.



A Resilient Future

Accomplishing these efforts together will ensure that collectively we build our resilient future

Annual Funding

50% COUNTY

50% CITIES (BASED ON POPULATION)

County
\$750,000

Additional funding from MOU participants



CITY BREAK-DOWN (BASED ON POPULATION)

TIER	POPULATION	COST PER CITY	# OF CITIES
1	0 - 20,000	\$25,000	7
2	20,001 - 60,000	\$40,000	9
3	60,001 +	\$55,000	4

LONG TERM FUNDING

A primary objective of the agency in the first 3 years, will be to design an Investment Plan in order to establish a source of sustainable funding. The County and the City would make their annual financial contributions for three years following the Agency's formation. During this three year time period the Agency would pursue an alternative and more sustainable long term funding structure. In the event a long term funding structure is not in place within this three year period, and provided the cities and County agree, the annual funding contributions of the County and the cities will be extended for up to an additional two years.

Contact

Are you ready to leverage our opportunities to create a one shoreline resilient county? Contact **Erika Powell**, San Mateo County, epowell@smcgov.org, (650) 599-1488

www.ResilientSanMateo.org

EXECUTIVE SUMMARY

Flood and Sea Level Rise Resiliency Agency Proposal 21st Century Solutions for One Resilient Shoreline



"The sea is rising and we are not prepared. It's really time for us to pull together across city boundaries to help our citizens in the battle against rising waters and the rising costs of coping with this global threat."

To do that, San Mateo County cities must create a joint agency along with the County to ask for federal help."

*—Jackie Speler,
U.S. Congresswoman*



BAY VIEW |
CONTEXT

Why water?

Integrating natural processes



Ponds: Stacking functions

Stormwater Management

Detention, filtration, and retention meet stormwater compliance/10 yr 24 hr flow

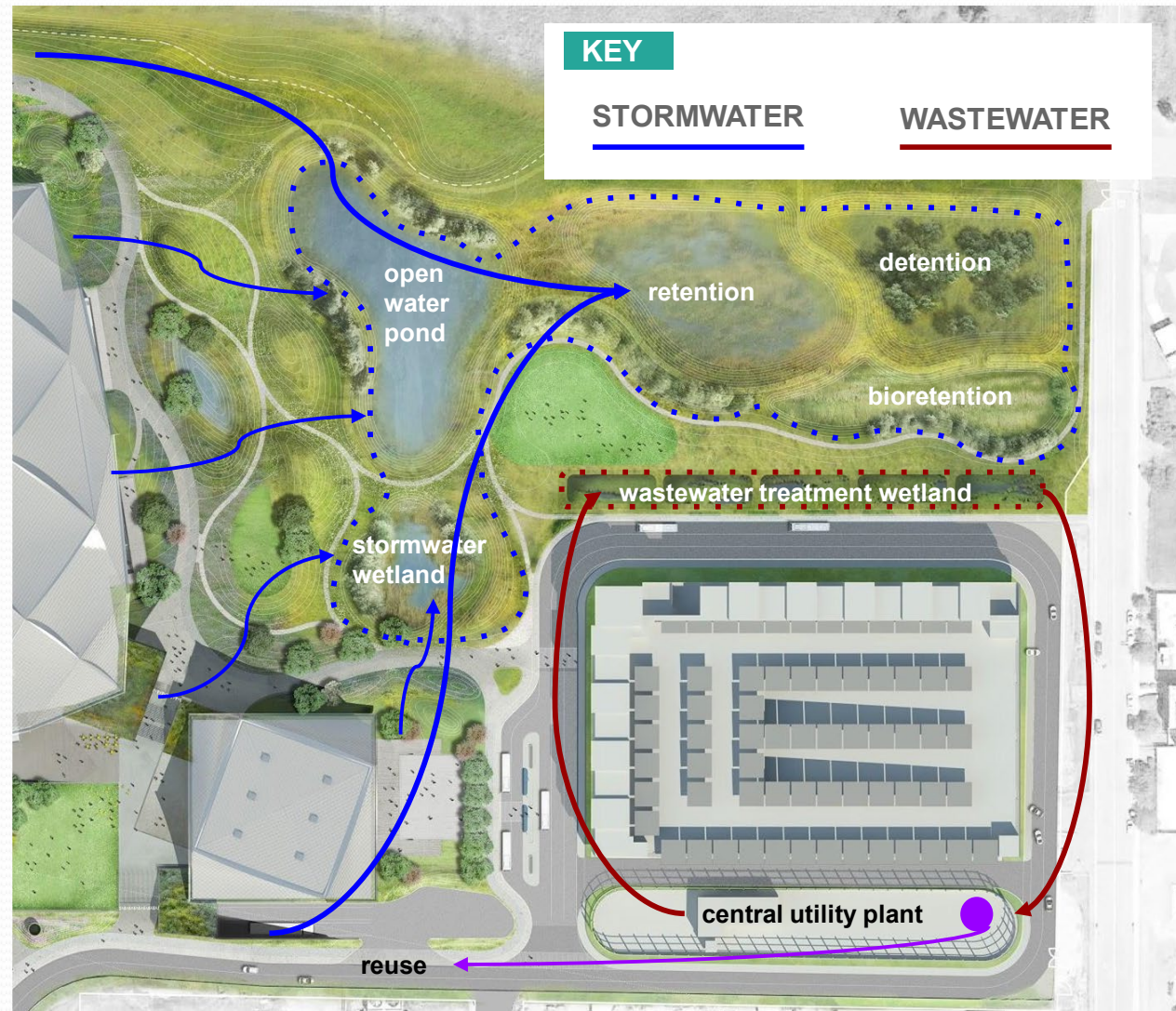
Habitat Value

Wetland typologies and management matched to seasonal site ecology

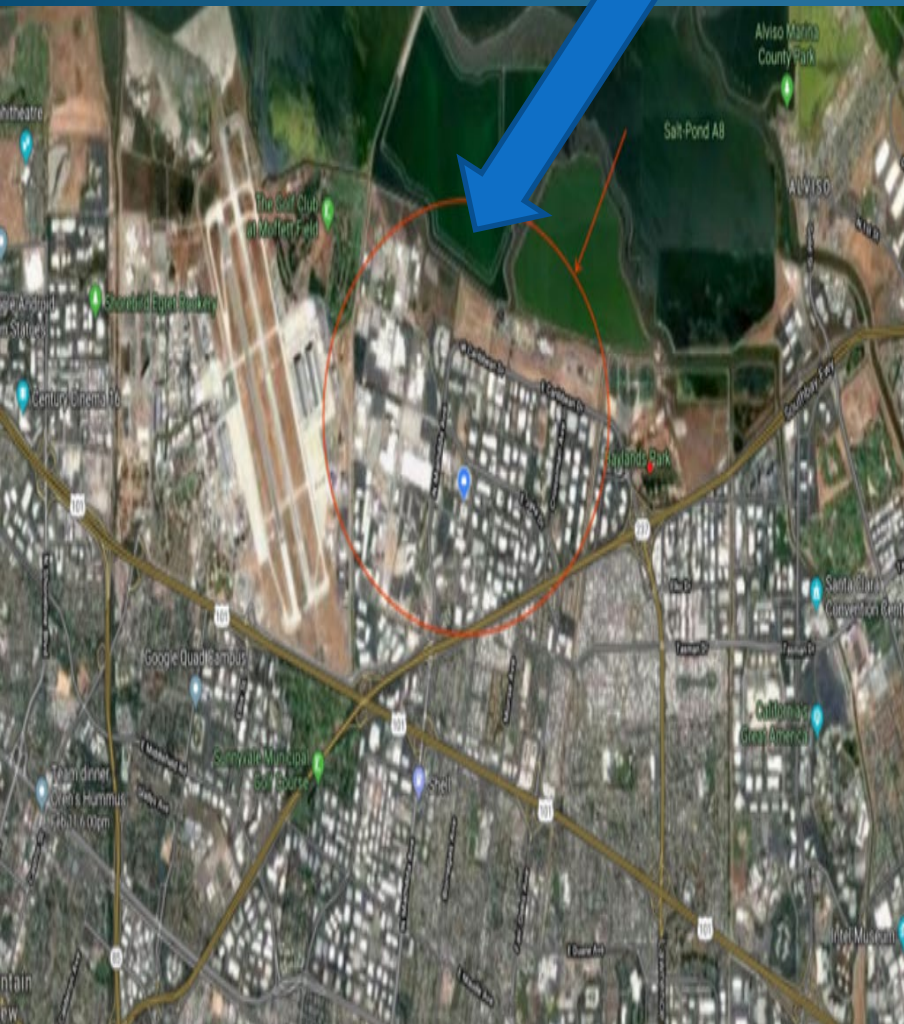
Water Reuse

Storage and blending for non-potable water quality management

Diagram courtesy of Sherwood Design Engineers and Olin.



Potential everywhere here



ONE REGIONAL TREATMENT PLANT



Regulated Ocean Discharge
Predominantly Wintertime



Non-potable Reuse
Agriculture Irrigation



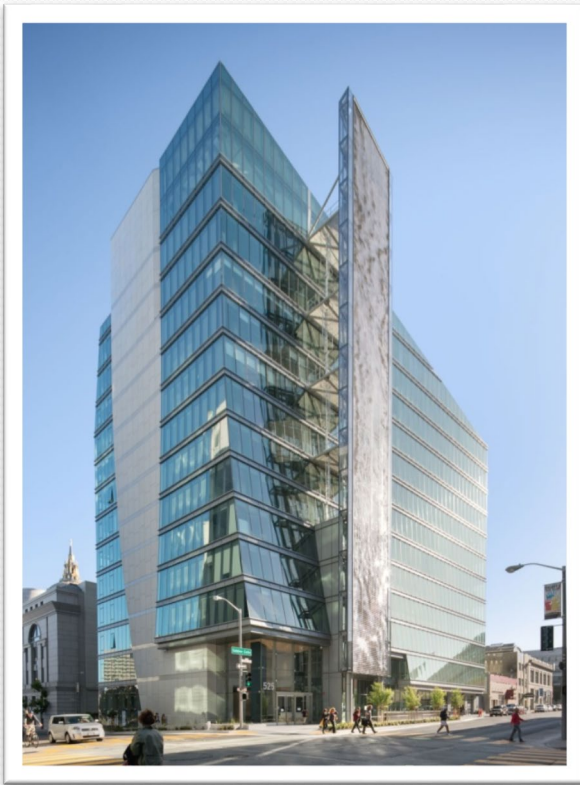
Indirect Potable Reuse
Groundwater Replenishment

WHY DO WE NEED PWM?

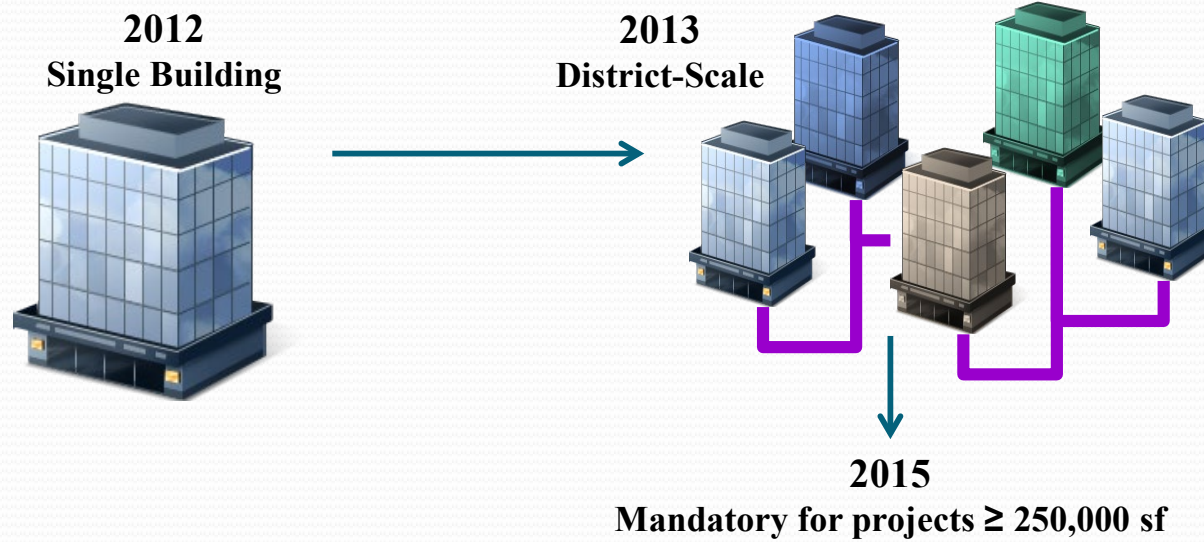
Water supply diversification and sustainability



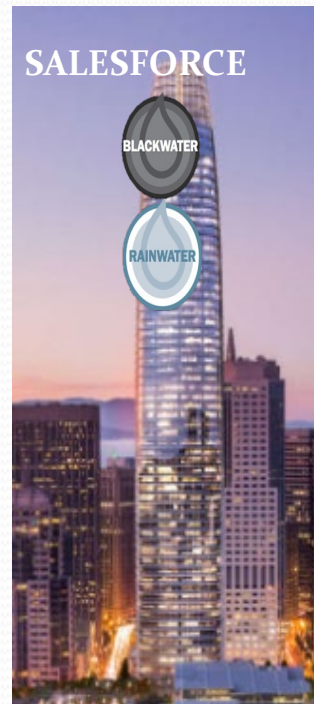
Pioneer Onsite Water Reuse at SFPUC Headquarters



An Evolving Onsite Water Reuse Program



Onsite, Decentralized Systems Integrated with Centralized Infrastructure



Turning waste water into steam

1 About 30 million gallons of runoff water is collected annually under the Powell Street BART Station.



Source: Chronicle reporting

John Blanchard / The Chronicle

And so are Data and Technology!

- Atmospheric river predictive capacity
- Measurement and reporting, especially when transparent
- Sensors
- Telemetry
- "Big Data"



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...and so is the human factor...

The Wisdom of Yogi Berra

“In theory there is no difference between theory and practice. In practice, there is.”



Resilient Institutions Needed

- Fragmentation doesn't serve us well
- We can overcome it through making relationships easier
- Need to work across traditional geographic and functional divides—because nature does
- Signs of hope there

Resilient Relationships needed

Resilient Conversations needed

- Need to break down barriers between agencies
- Need to break down barriers between agencies and private sector
- Need to break down barriers between people
- Easier said than done!

Like a chicken talking to a duck...

就像一只鸡和一只鸭子说话

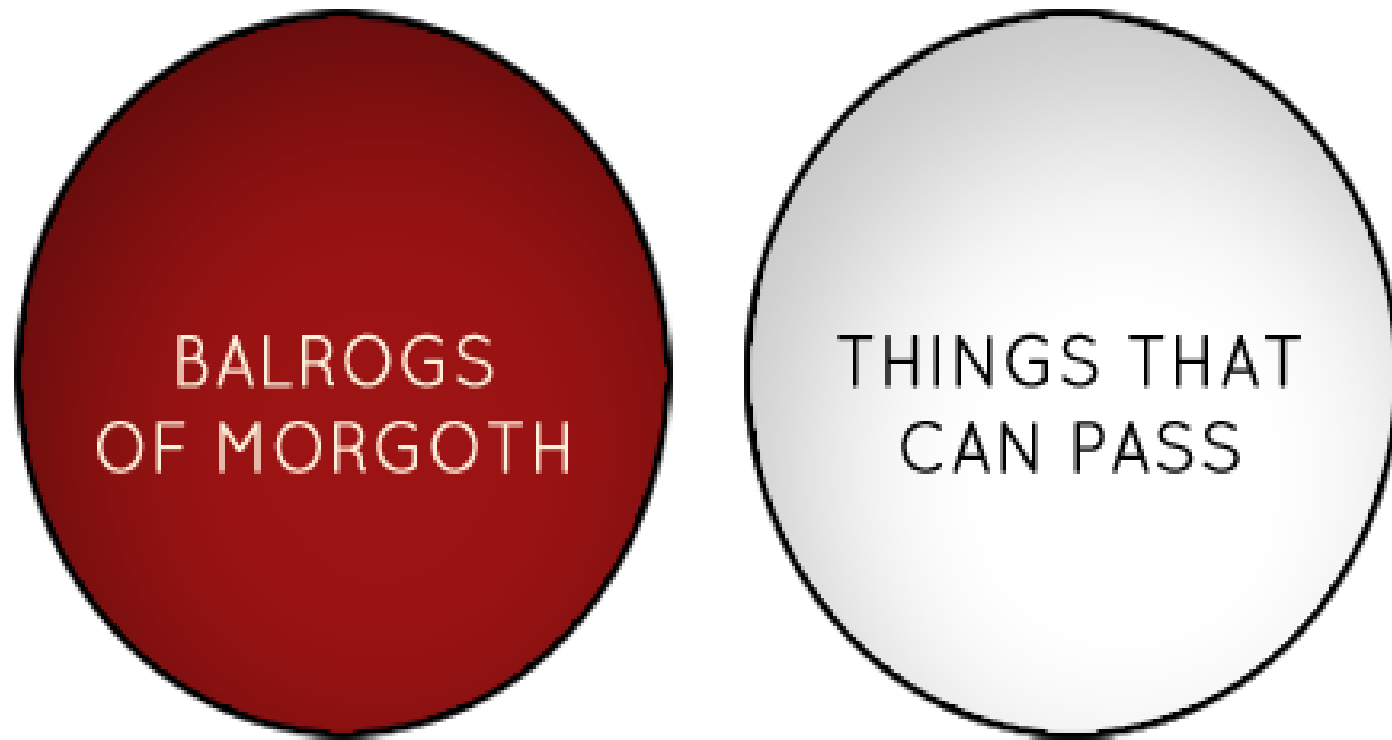


The nature of “balance”

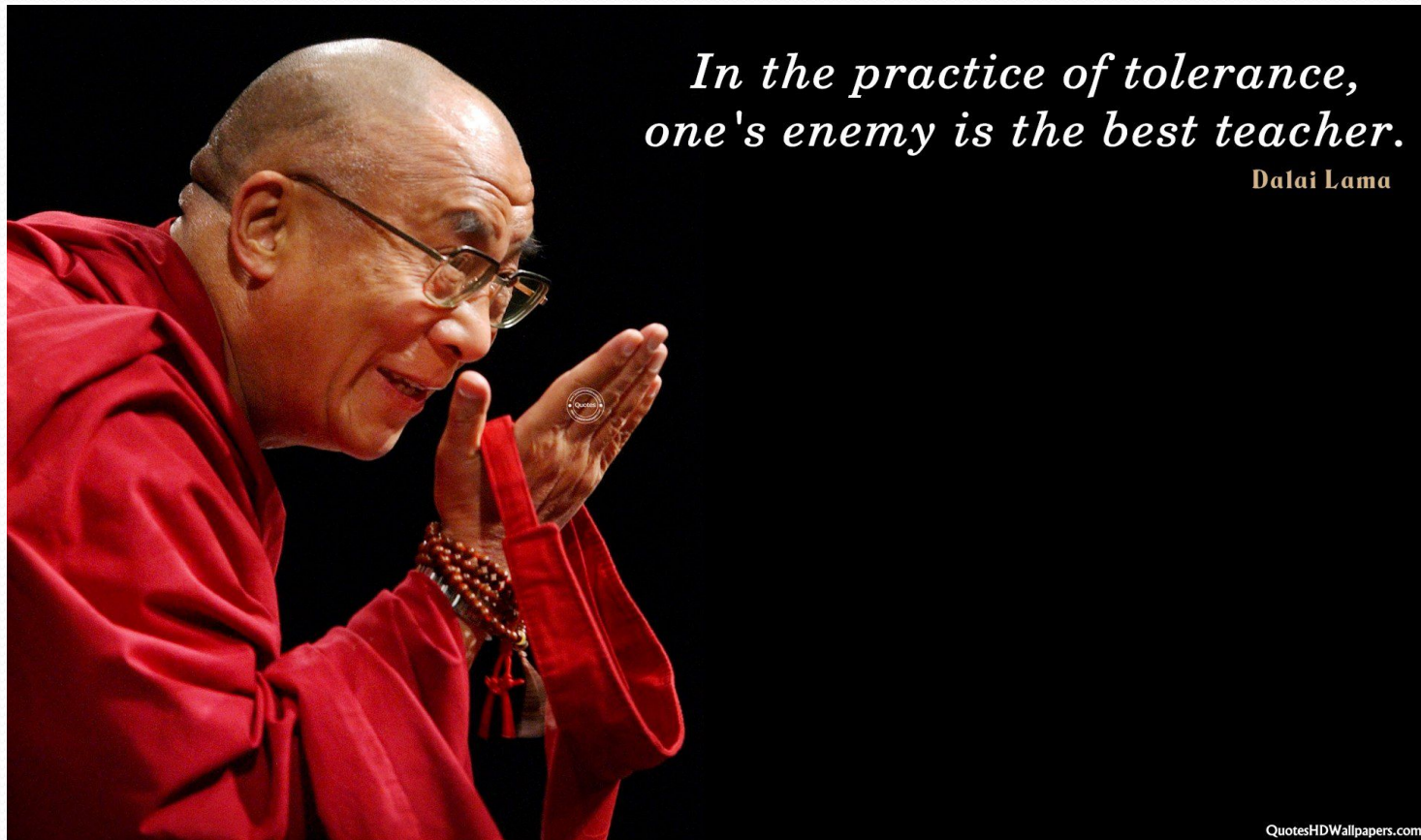


GANDALF

A VENN DIAGRAM



***If he can maintain compassion and
meet people where they are...***



*In the practice of tolerance,
one's enemy is the best teacher.*

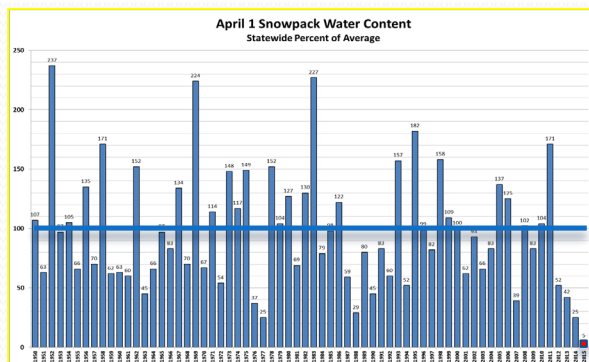
Dalai Lama

The fact is,
we can do
this



“We are all in this together.”

Governor Edmund G. Brown



How do we get there?

- Clear-eyed focus on the decades ahead vs. the decades behind us
- Focus on Reality vs. Rhetoric; Practical vs. Theoretical
- Embrace complexity
- Action over Stasis
- Convergence over Conflict
- “All of the Above” vs. “Either/Or”
- Ag and Urban, Ag and Ecosystem, North and South, the Delta and the Projects, Agriculture and Safe Drinking Water

Lawns are not essential to civilization



Like, no!!!

What each of us can do*

- Whatever you can—each of us can make a profound difference collectively
- Personally
 - Conserve, recycle, use purchasing power (to buy and not to buy)
 - Change out your landscape
 - Beyond Burgers are tasty
 - Chemicals can be friend or foe—use judiciously
- Own your power as a member of the community
 - Call on elected and appointed officials to:
 - Rise to the occasion vs. find the minimum
 - Let them know you have their back, and let them know your vote counts on it
 - Show up and be heard—*“democracy dies in darkness”*

What each of us can do*

- Learn your “watershed”—own the whole, not just what comes out your tap!
 - What you use here depletes the ecosystem in the Delta
 - Let folks know you care about that
 - Learn about where your water comes from, own its impacts and be willing to invest in more local resilience and responsibility.
 - Demand 21st century thinking and solutions.
 - Be inspired by others and push for healthy communities, healthy agriculture, and healthy ecosystem
- Engage at state and national level too. It matters!!!

What can cities do?

- Think resilience for the long view, not just sustainability in our own domain. OWN YOUR IMPACT
- Set big goals across multiple disciplines and geographic divides
- Partner with neighbors and others, e.g.,
 - C40
 - US Water Alliance
 - Water Now
- Hire, train, and encourage creative, innovative staff and give them time to think and engage with other agencies and the public
- Communicate, communicate, communicate
 - With community
 - With other jurisdictions
 - With regulators

What can businesses do?

- Own your IMPACT, audit and be state of art
- Have compassion for regulators ☺
- For early adopters:
 - ❖ Thank you for setting a high bar
- For laggards:
 - ❖ *Get it together*
- Join others to move the needle, e.g.,
 - Ceres
 - CWAC
 - CEO Mandate
 - GreenBiz
 - SVLG

What can regulators do?

- ✓ Applies to cities too
- ✓ Lean in to being a partner in getting things done on the ground
- ✓ Encourage your staff to innovate and partner
- ✓ Be open to, but smart about, market solutions and private sector partners
- ✓ Incentivize and encourage multi-agency, multi-benefit projects through financial and regulatory means
- ✓ Develop decision support tools that can be shared by all, e.g., mapping, software
- ✓ Communicate, communicate, communicate

Practice Resilient Relationships

- You have far more power than the powerful want you to know
- What you do matters
- What you say matters
- Everyone is a potentially ally in the fight to deal with climate change
- Everyone is a potential ally in making the world, and each community a more liveable, sustainable and resilient place
- It's all about "ecosystem" management, starting with your own



Few will have the greatness
to bend history itself;
but each of us can work
to change a small portion
of events, and in the total;
of all those acts will be
written the history of
this generation.

Robert F. Kennedy

www.irelandcalling.ie/robert-kennedy-quotes

Thank you




**KEEP
CALM**
there's a
**PARADIGM
SHIFT**