CALIFORNIA DEPARTMENT OF WATER RESOURCES

CA Climate Vulnerability Assessment and Evaluating Adaptation Strategies

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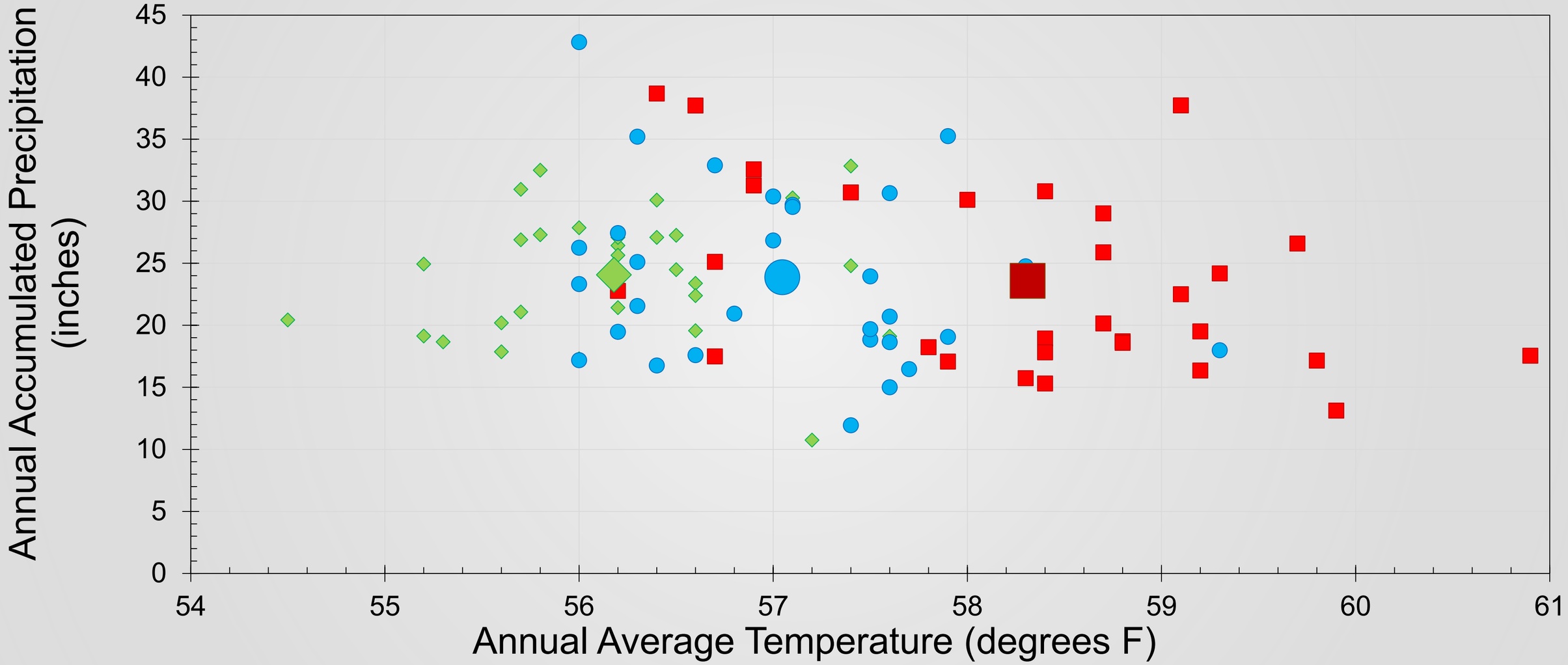
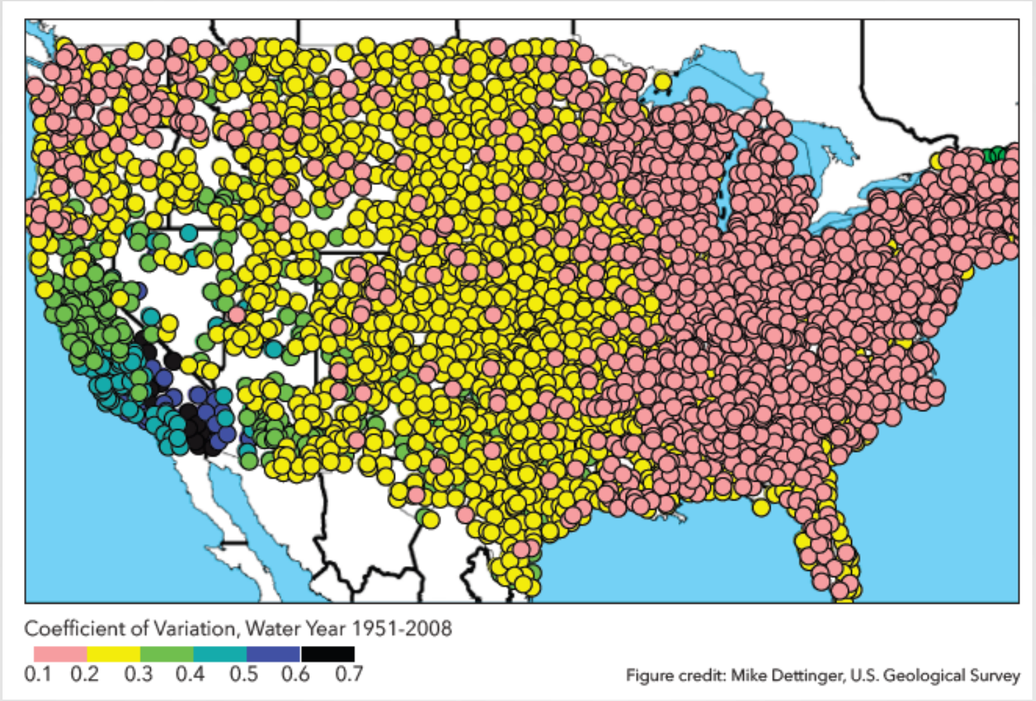
April 19th, 2024
Imagine our Future North Bay

CA Temperature and Precipitation

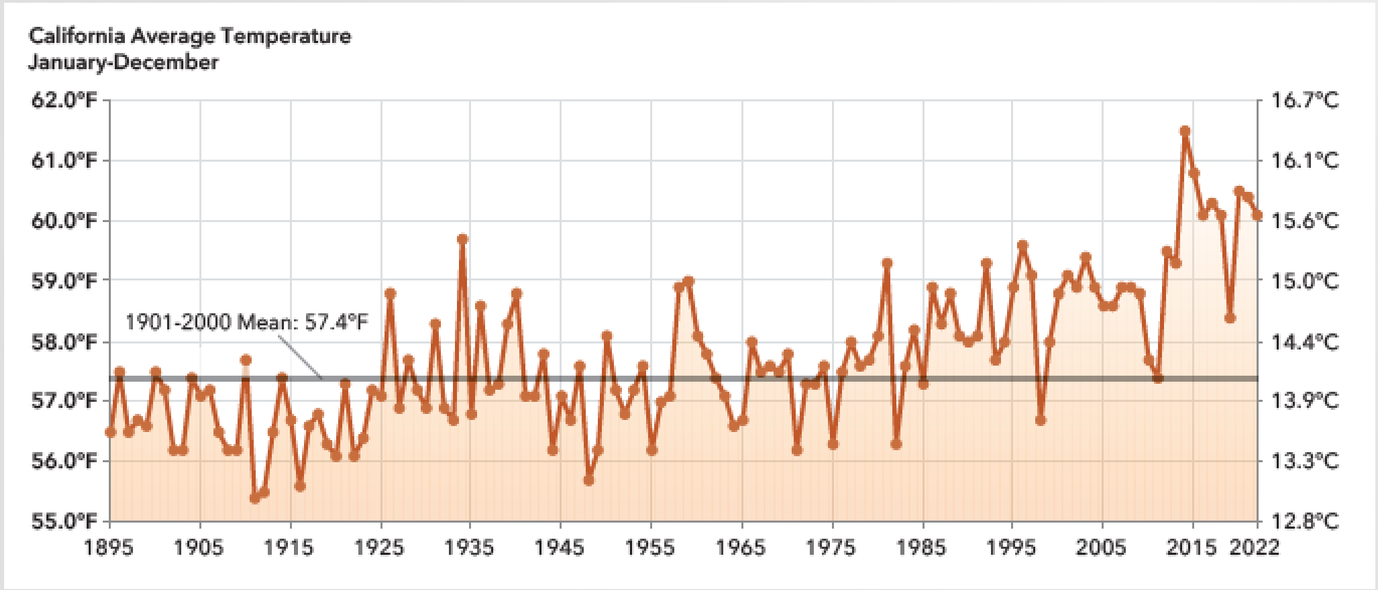


CALIFORNIA DEPARTMENT OF
WATER RESOURCES

Climate Current and Future Conditions



Further increases in precipitation variability, leading to more frequent and severe droughts and floods



By Late Century

Average Annual Maximum Daily Temperature is projected to increase by

5.6° – 8.8°F (3.1° – 5.0°C)

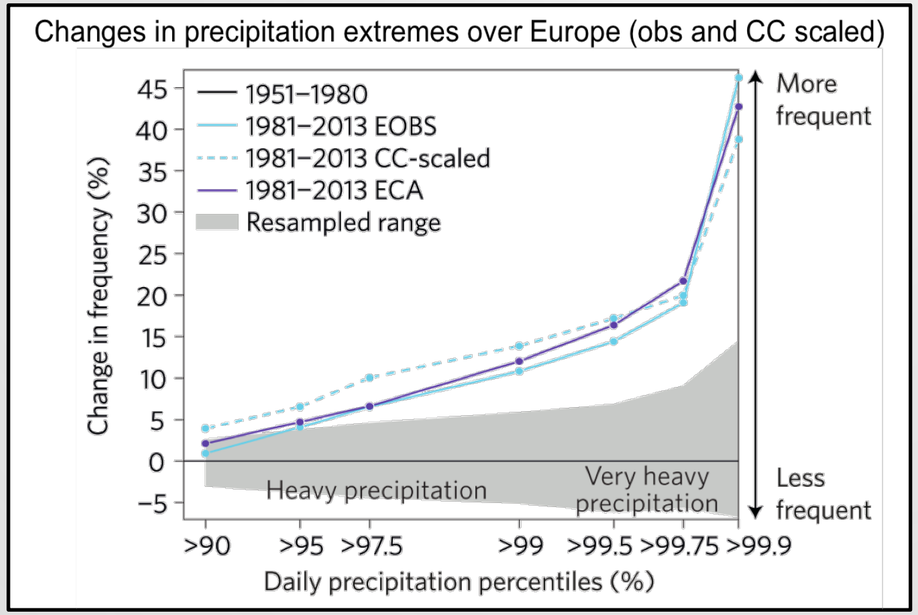
Projected changes in the intensity of extreme precipitation

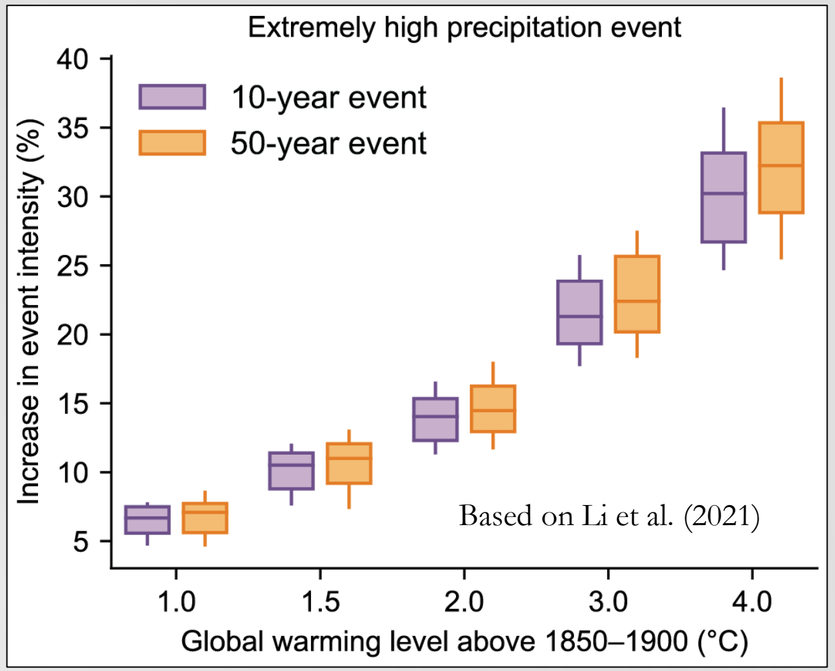
PERSPECTIVE
PUBLISHED ONLINE: 26 OCTOBER 2016 | DOI: 10.1038/NCLIMATE3110
nature climate change

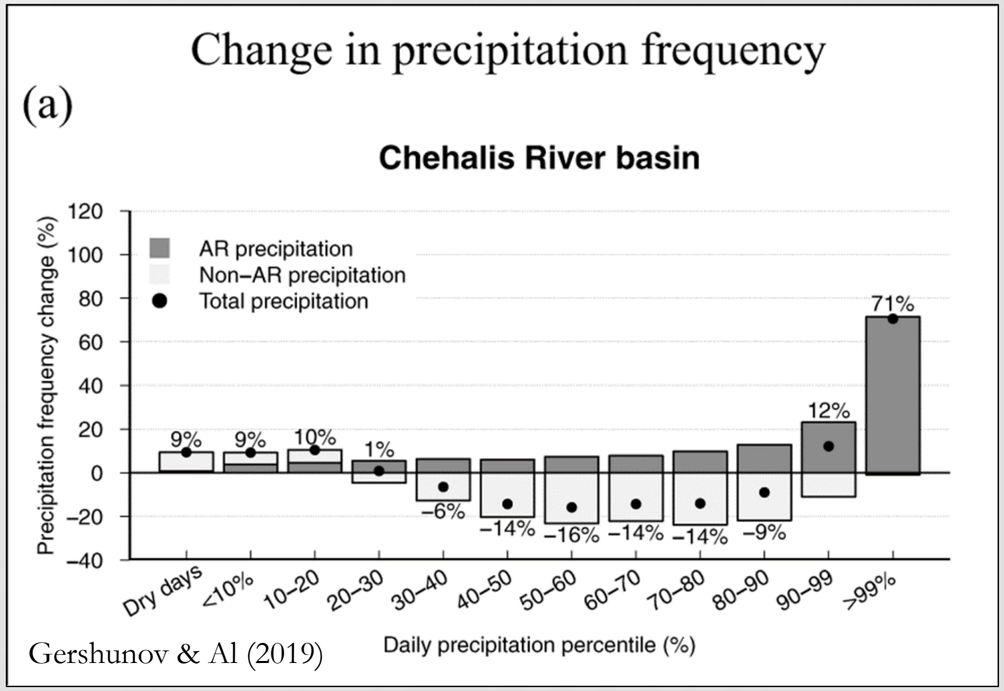
Observed heavy precipitation increase confirms theory and early models

E. M. Fischer* and R. Knutti

Theory – Clausius-Clapeyron (1834)
Models – Extreme and average precipitation change differ under warming (1980s)
Observations – trends in extreme precipitation are detectable (2000s)







Climate Vulnerabilities across all Water Sectors

Forest and Wildfire Management

Rising temperatures, extended periods of dryness, and increasing wildfire potential will further stress and challenge management of headwater forests and lands and impact public health and safety.

Hydropower

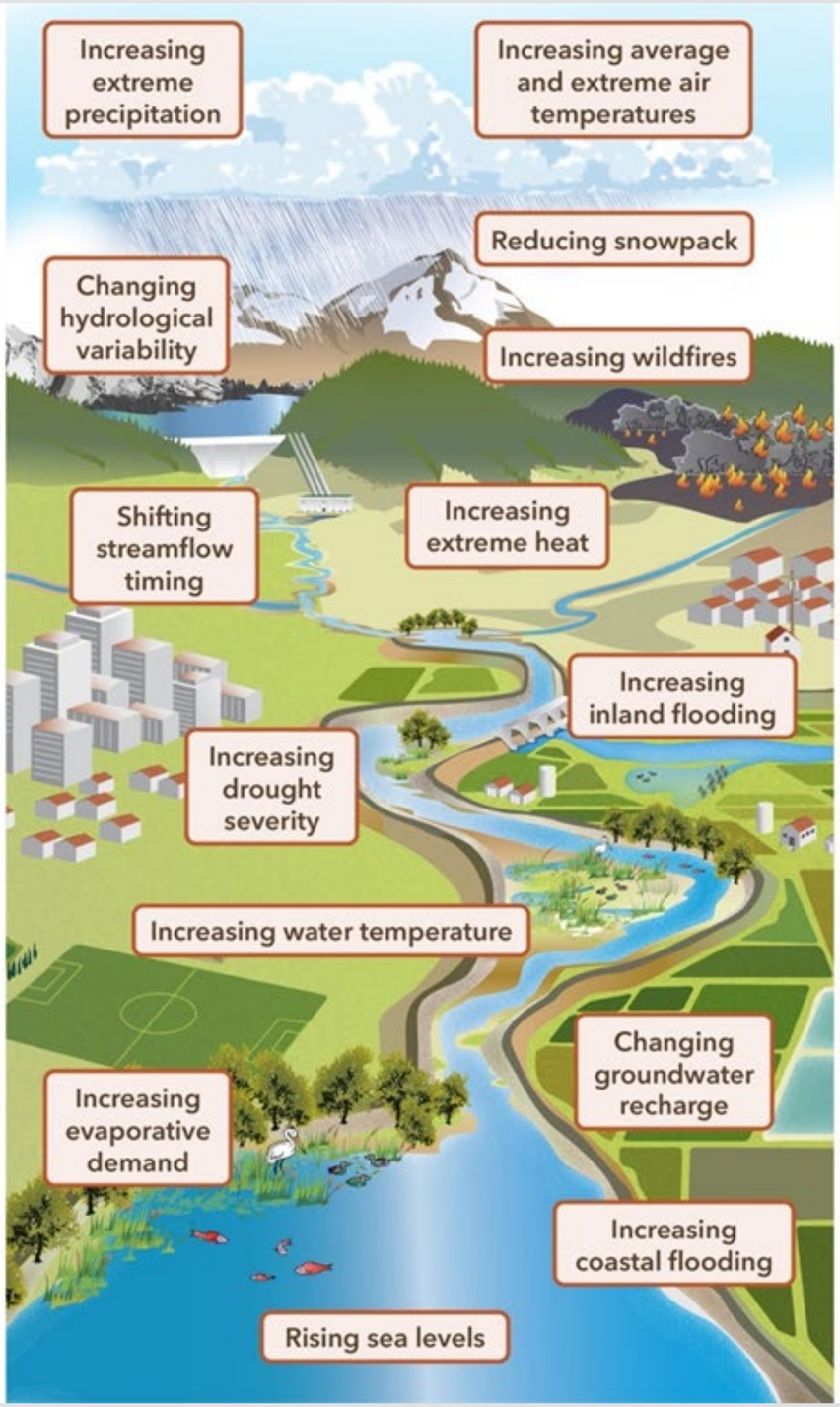
Changing snowpack and melt timing, increasing peak electrical demands, and extreme heat events will challenge hydropower management.

Ecosystems

Higher temperatures, changing hydrology, rising sea levels will change habitats for many species and the pace of ecosystem adaptation will be challenged.

Groundwater

Changing recharge patterns, seawater intrusion in coastal aquifers, and increasing demands will continue to put pressures on groundwater systems.



Water Supply

Changing hydrological patterns including reduced snowpack, earlier melt, extended droughts, and increasing evaporative demands will stress reservoir operations and impact overall availability of water supplies.

Flood Management

More intense precipitation events, specifically atmospheric rivers, less snow-more rain, flood-after-fire events, and rising sea levels will contribute to greater flood risk in inland and coastal areas.

Water Quality

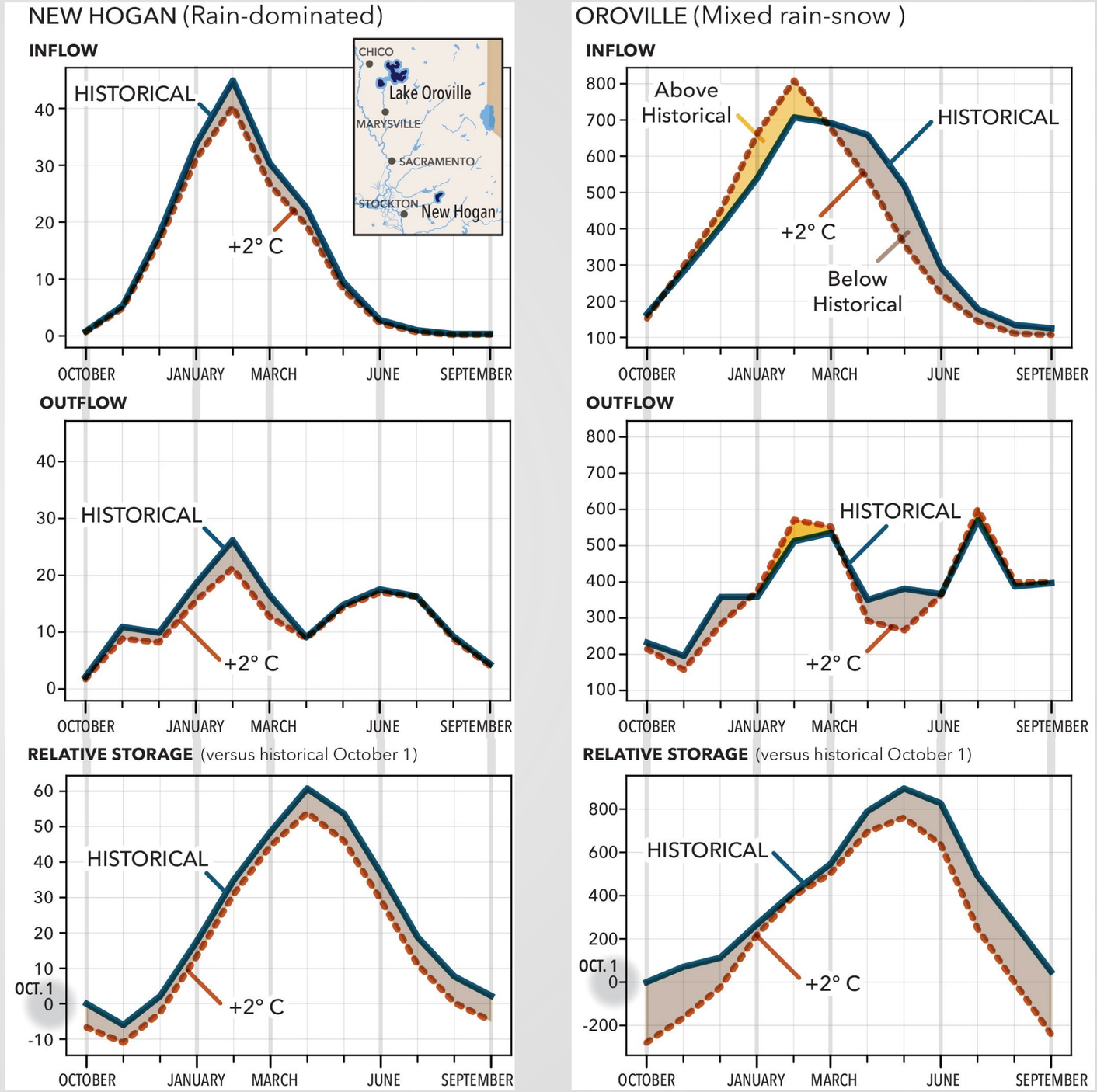
Increasing temperature, reduced spring and summer streamflow, extreme runoff and flood-after-fire events will continue to challenge water quality management.

Recreation

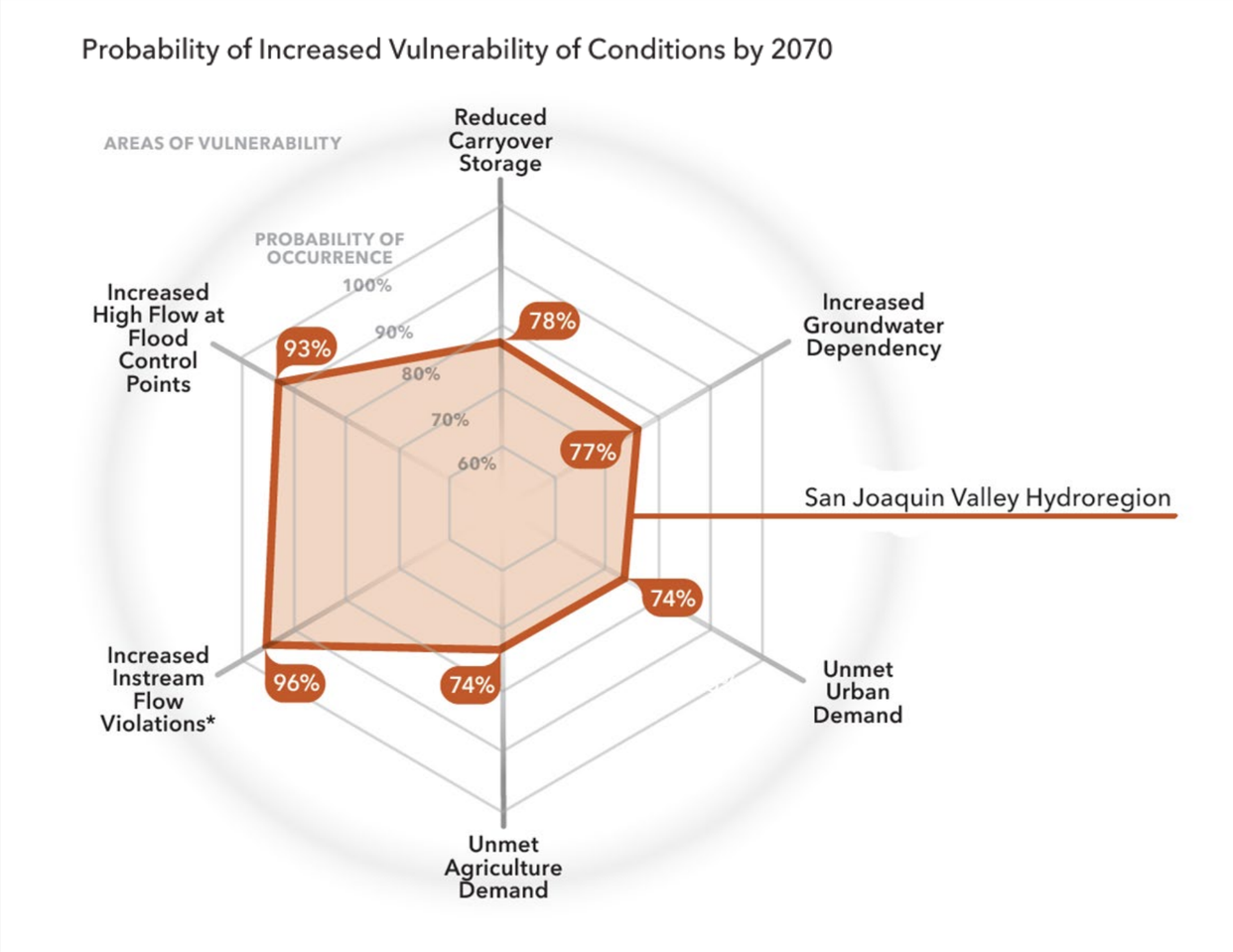
Changing snowpack, changing river and streamflows, more variability in lake levels, and rising sea levels will stress recreational resources.

Quantifying Climate Impacts

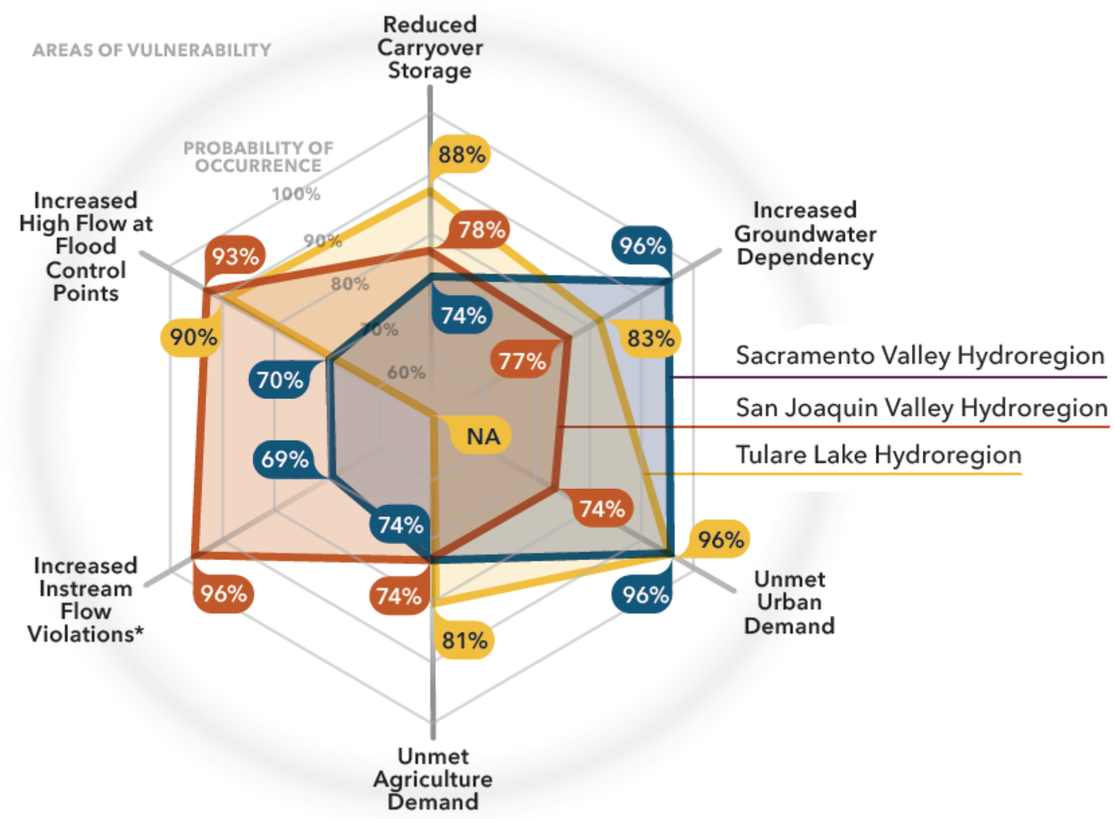
- Changes in inflow have significant effects on reservoirs' storage and outflow
- Water managers will need to reevaluate and adaptively manage how major infrastructure systems are operated in the future

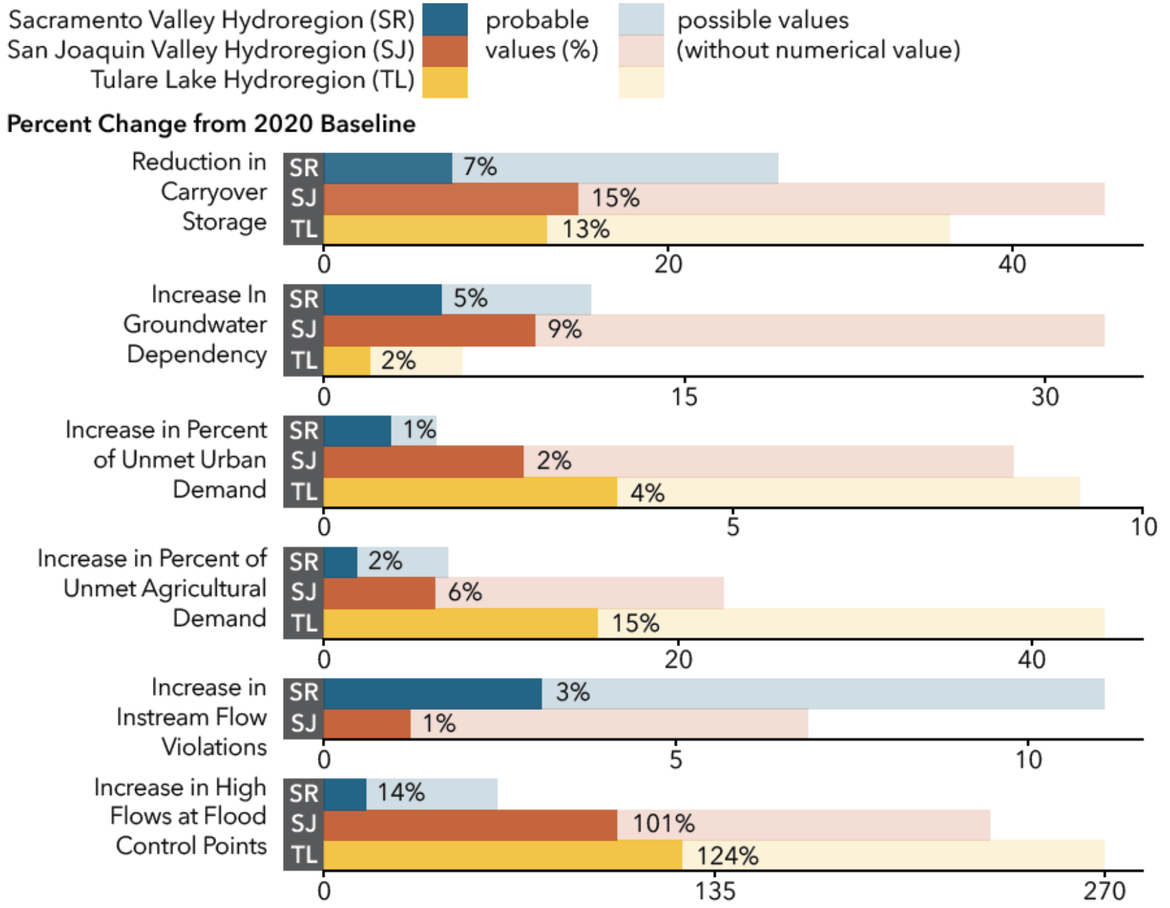


California Water Plan: Future Scenarios



California Water Plan: Future Scenarios





Increase Vulnerability

What is the California Department of Water Resources doing about it?

Advancing State and Internal Policies

- Water Resilience Portfolio, Water Supply Strategies, Executive Order,...

- DWR's Climate Action Plan:

  Phase I: Greenhouse Gas (GHG) Emissions Reduction Plan

  Phase II: Consistent, high-quality climate change analysis across all DWR programs

  Phase III: Vulnerability Assessment and Adaptation Plan

Using Climate Projections at DWR

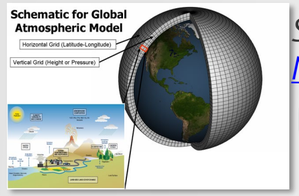
“Top Down” or **Downscaling** Approach

Select a Couple of General Circulation Model (GCM) Projections

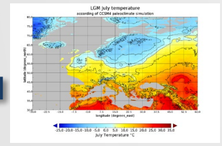
Downscaling, Hydrologic Modeling

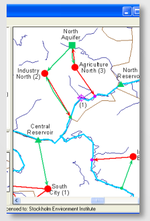
Operations and Planning Models

Conditional System Performance Projections

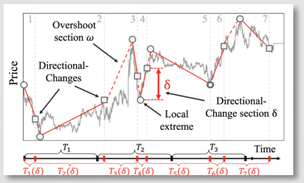


Source: *NOAA GFDL*





Source: *SEI WEAP*



Original method of developing climate change plans

There are 100’s of Global Climate projections

→ Pick a scenario or set of scenarios to localize and use as the “future”

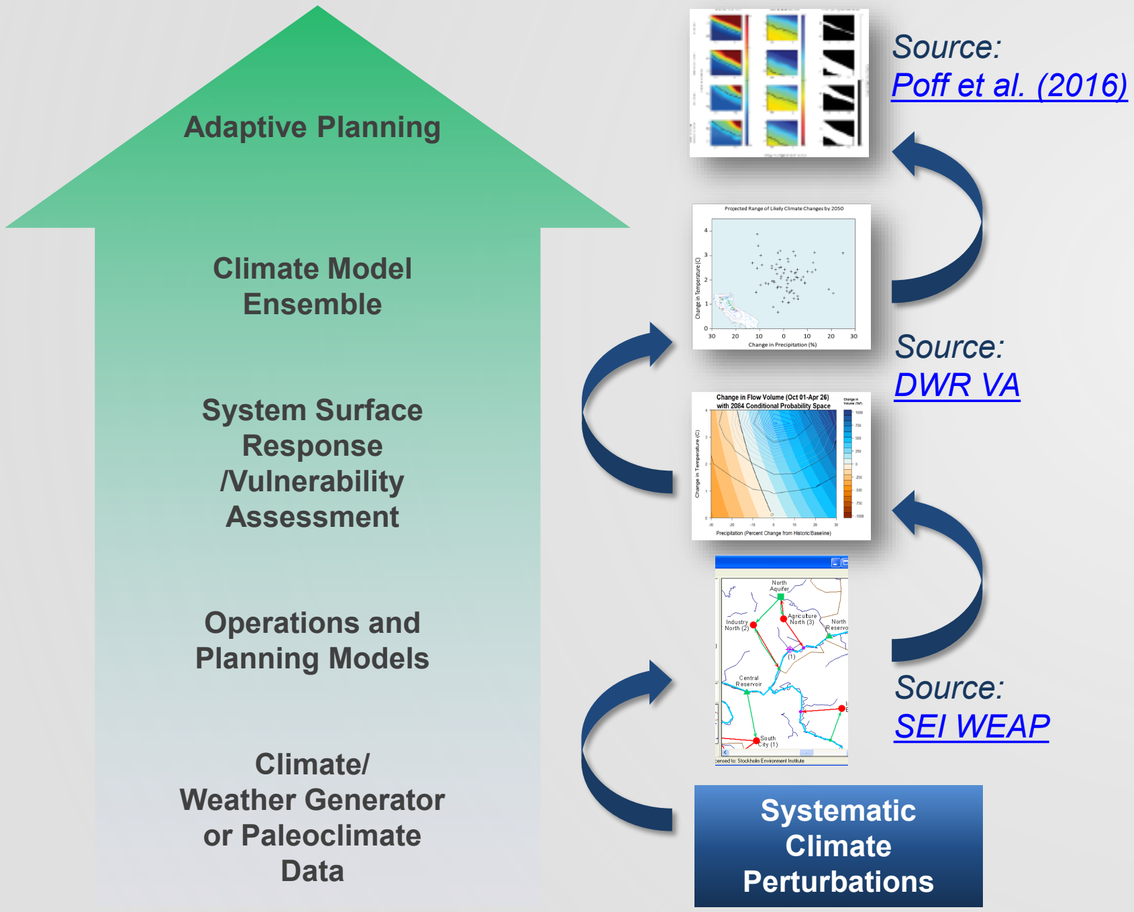
→ Predict future performance of your water system

→ Determine vulnerabilities and adapt as indicated

- Did we cover the full range of uncertainty to be prepared?
- Would the results be different if a different set of projections or method were used?
- How likely is this future, what is the risk?

Using Climate Projections at DWR

"Bottom Up" or **Decision Scaling** Approach



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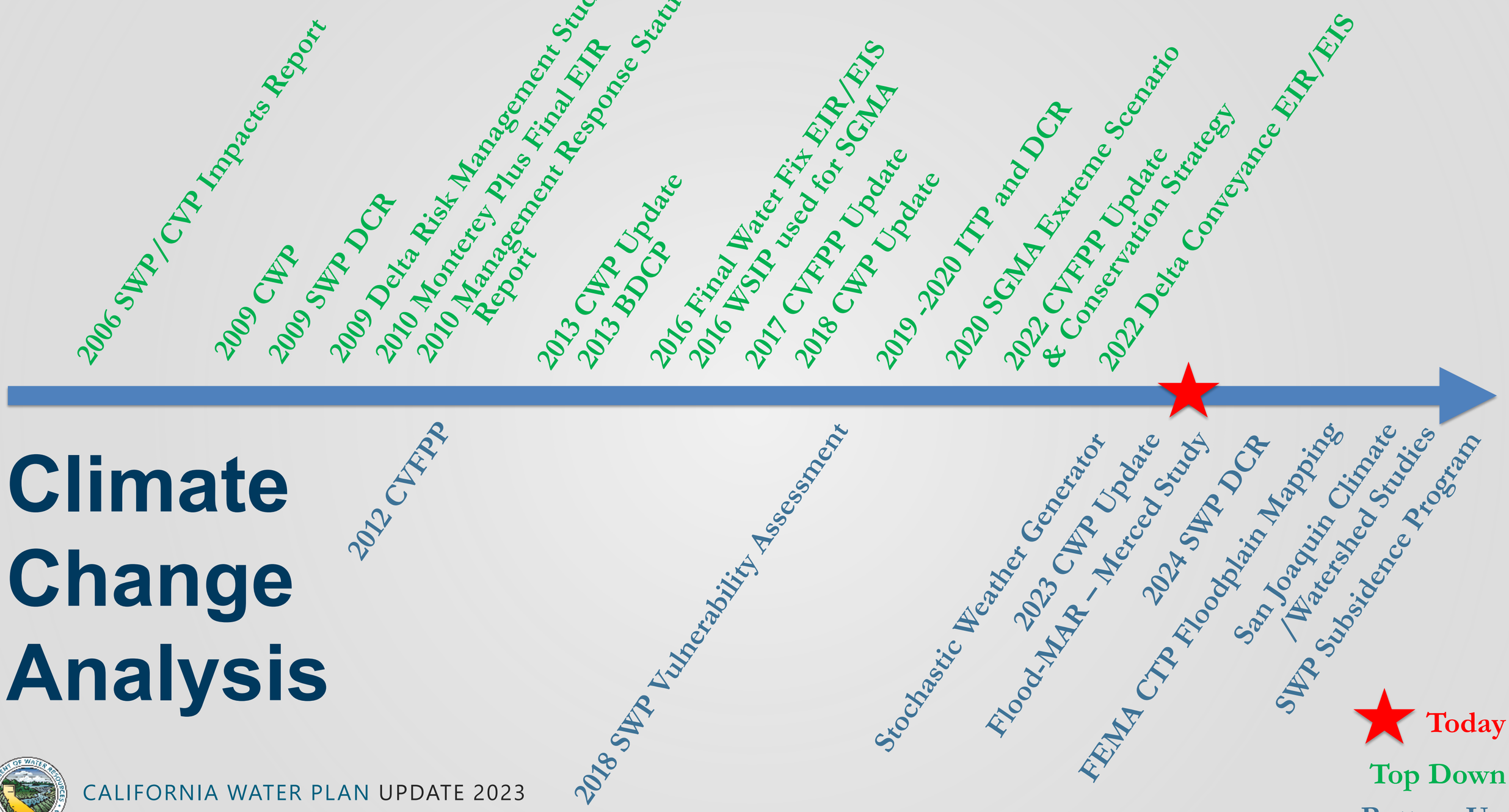
A way to prepare when you aren't sure what's coming (Stress Test)

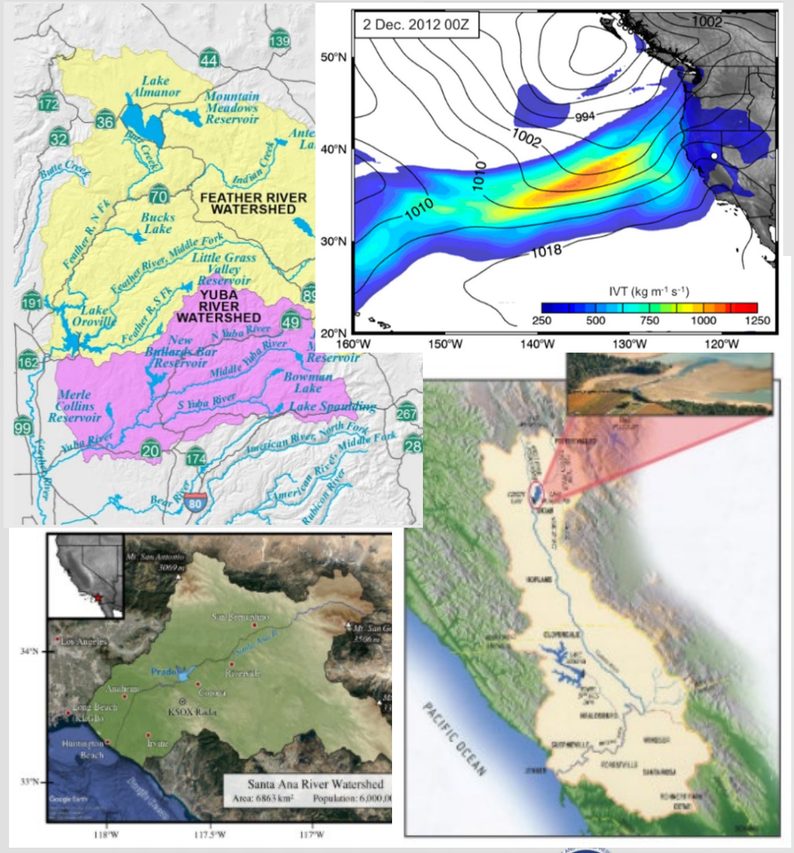
- → Determine the sensitivity of a water system to a range of stress (weather or climate possibilities). **Where is our system vulnerable?**
- → Determine what threshold of performance is unacceptable or 'breaks' the system. **Find tipping points.**
- → Determine how likely that is to happen. **Incorporate original climate projections to assess the risk of these "unacceptable outcomes."**
- → **ADAPT!** Take decision(s) toward what is "most" likely and/or "most" acceptable based on this risk assessment.

Climate Change Analysis

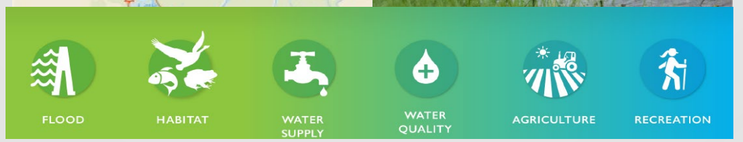


Advancing Resilient and Adaptive Actions

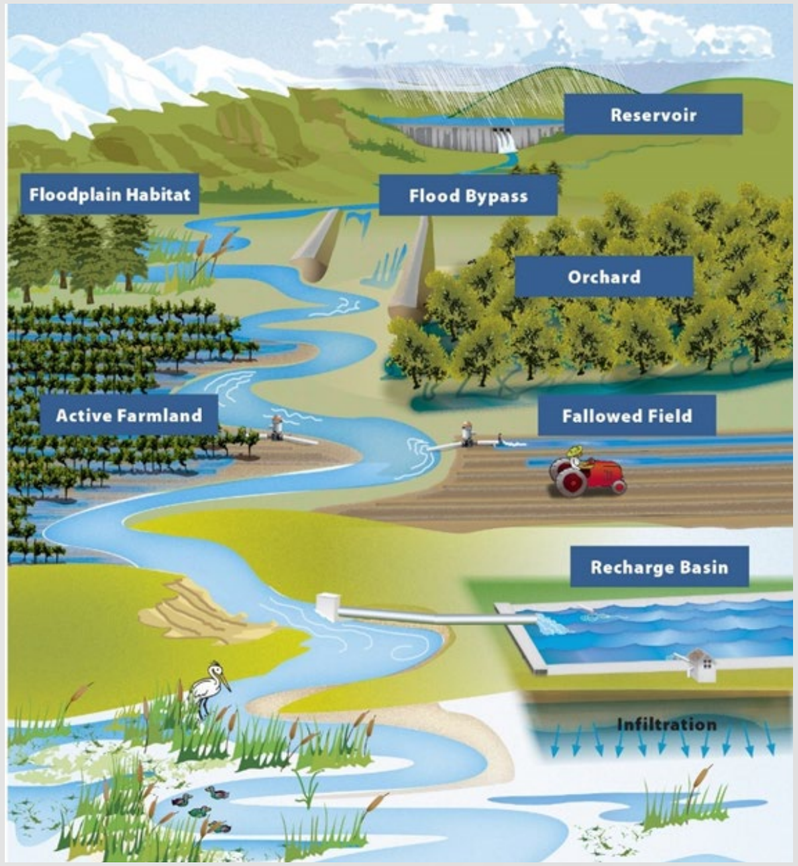
Forecast Inform Reservoir Operation



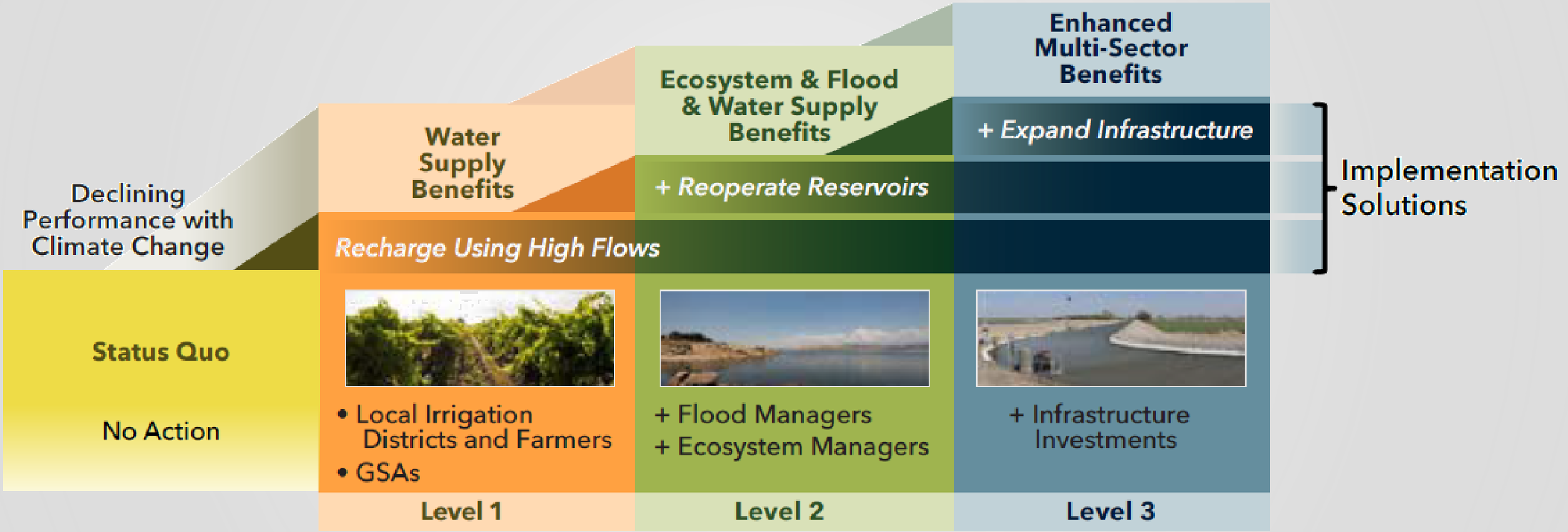
Multi-Benefit Bypass Improvements



Flood-Managed Aquifer Recharge (MAR)

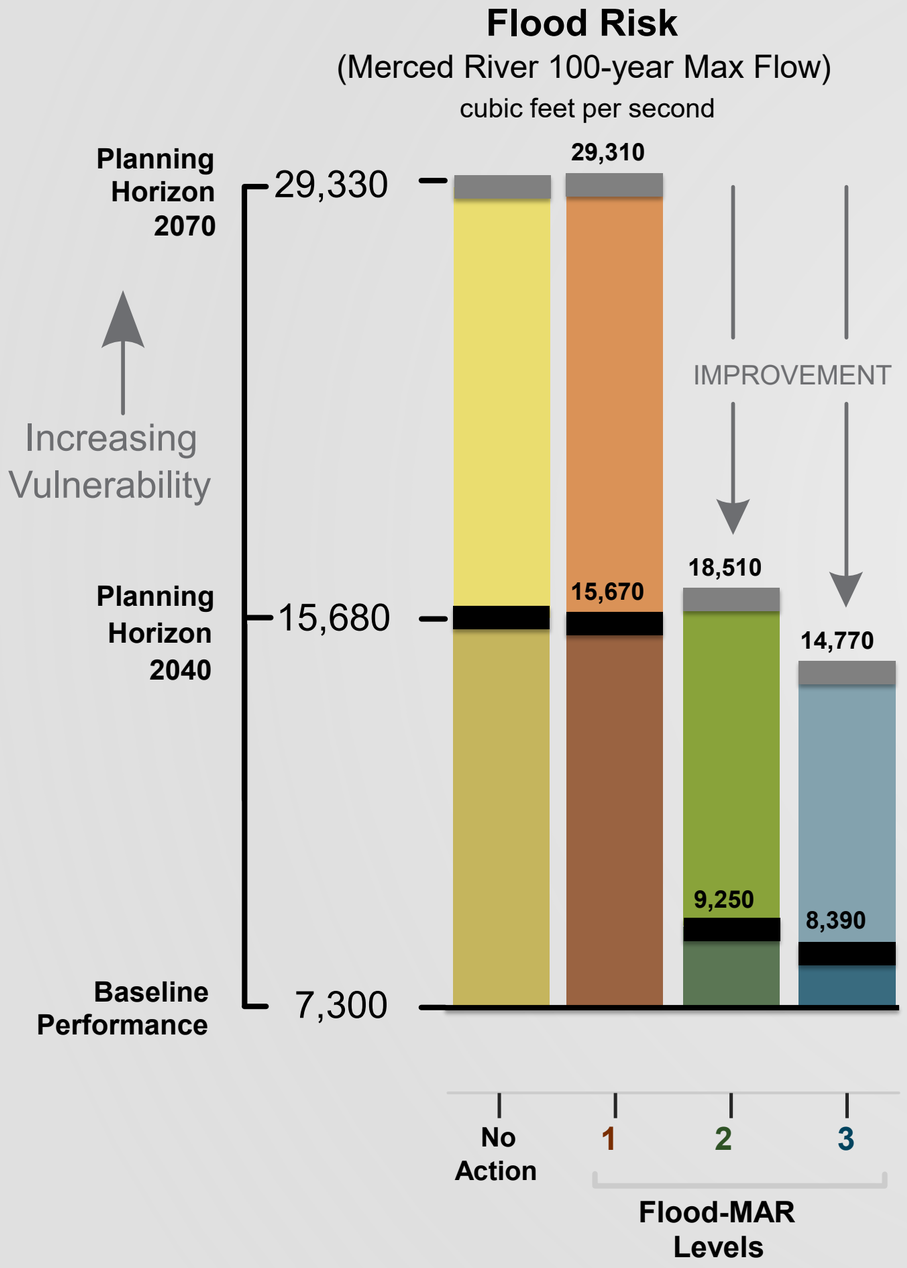


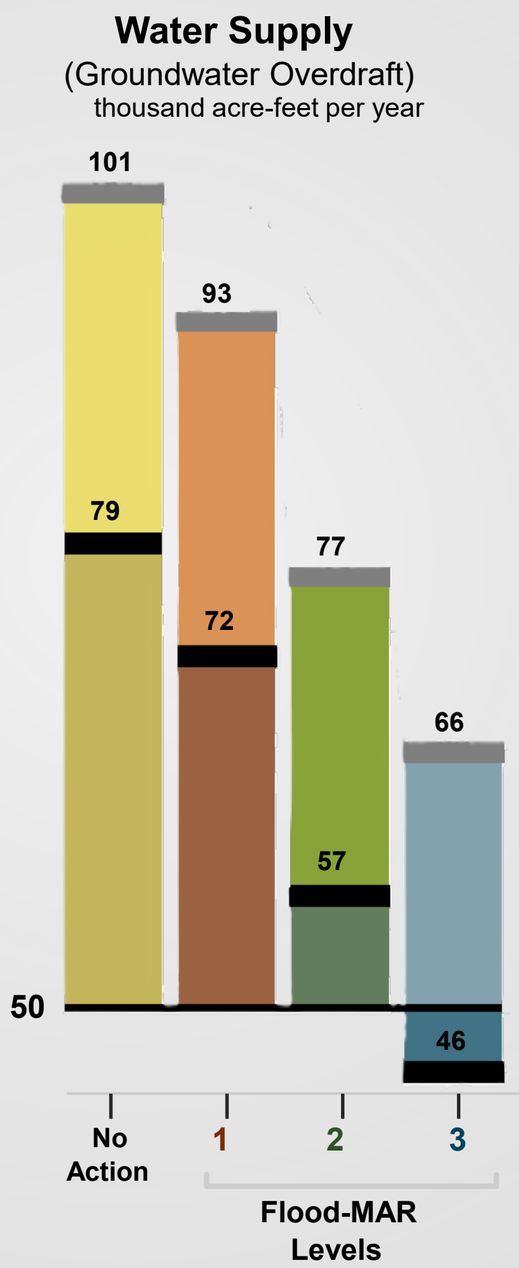
Flood-MAR Adaptation Strategies

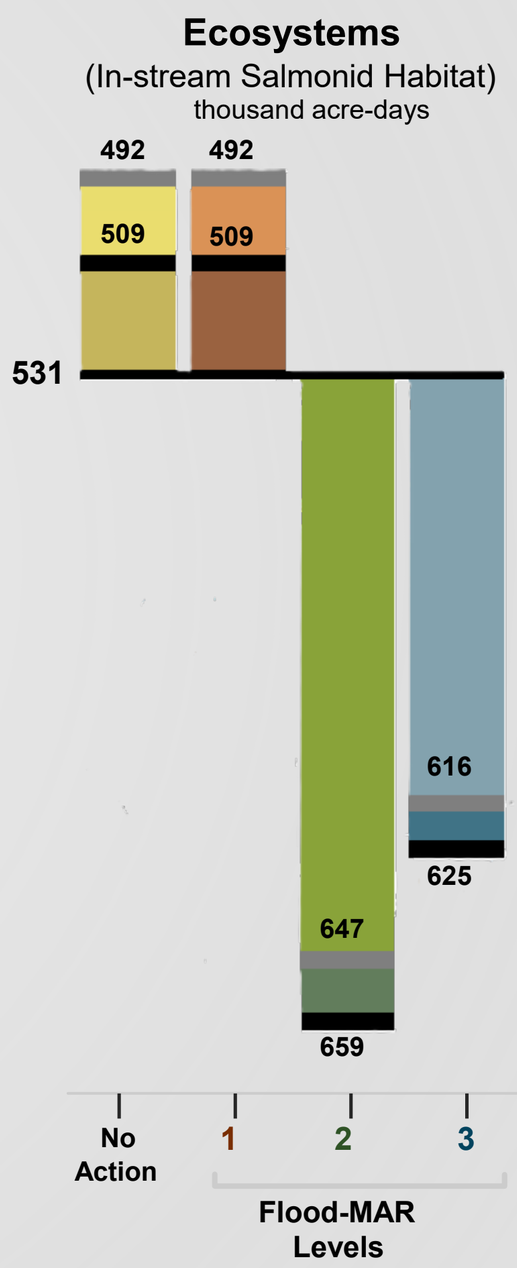


Note: GSAs = groundwater sustainability agencies.

Merced Study Key Results







References

- Hydroclimate Reports: https://water.ca.gov/Programs/Flood-Management/Flood-Data/Climatology-and-Meteorology
- California Water Plan Update: https://water.ca.gov/Programs/California-Water-Plan/Update-2023
- Climate Change Data for California: https://cal-adapt.org/
- DWR's Climate Change Program: https://water.ca.gov/Programs/All-Programs/Climate-Change-Program
- Flood-MAR Activities: https://water.ca.gov/programs/all-programs/flood-mar

Thank you!

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