Drought Preparedness Lessons from California

Jeanine Jones

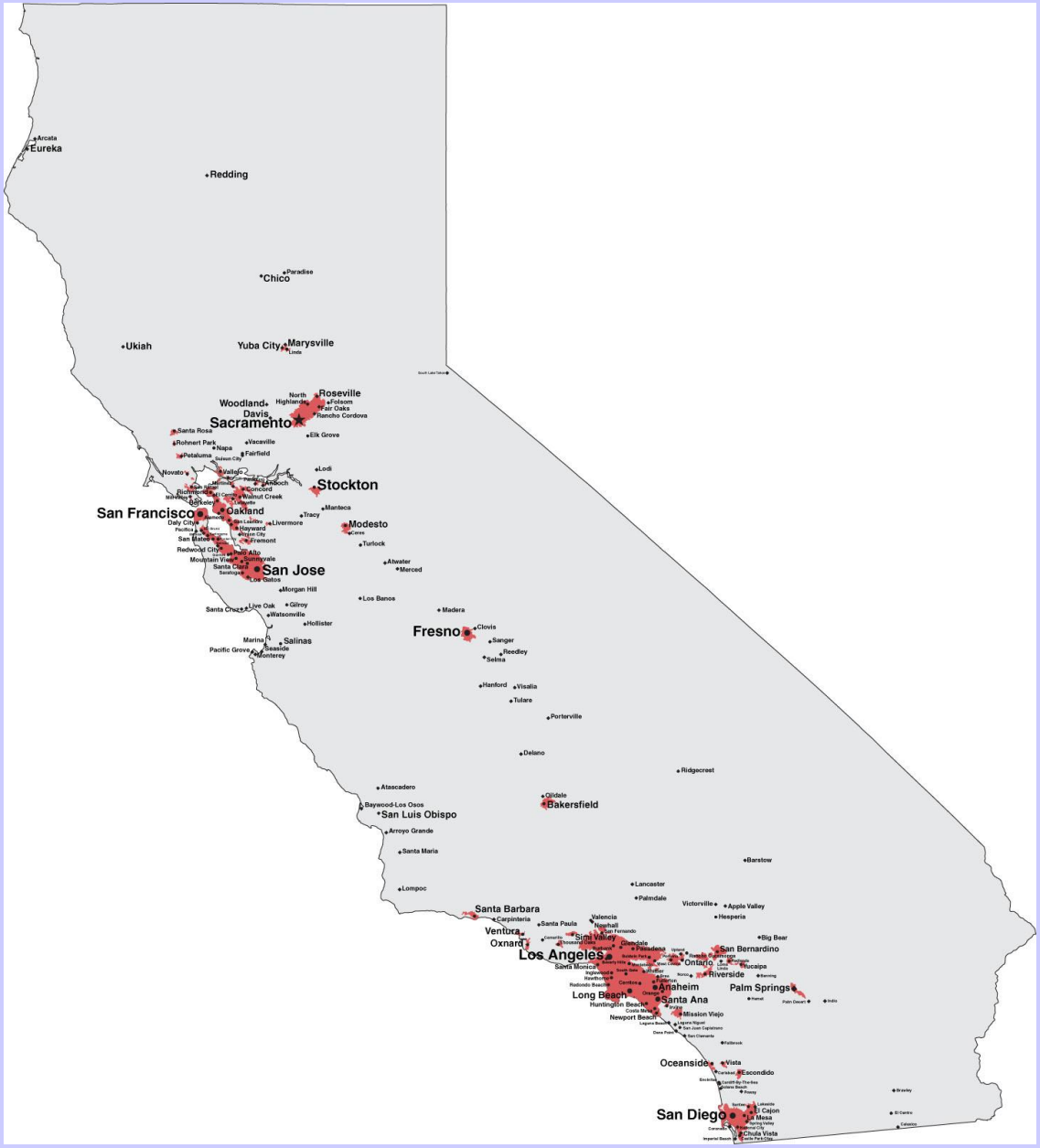
Outline

- Overview – setting, historical droughts & impacts
- Drought planning requirements
- At-risk areas
- State financial assistance
- Conclusions


Major Rivers
State Projects
Federal Projects
Local Projects
Redding
Sacramento
San Francisco
Fresno
Los Angeles
San Diego

Background

- Estimated 2008 population of 38 million
- Projected 2020 population of 44 million
- Top agricultural production state in the nation for more than 50 years.
- About 9 million acres of irrigated cropland


Arcata
Eureka
Redding
Paradise
Chico
Ukiah
Yuba City
Marysville
Linda
Roseville
North Highlands
Folsom
Fair Oaks
Rancho Cordova
Woodland
Davis
Sacramento
Elk Grove
Santa Rosa
Rohnert Park
Napa
Vacaville
Petaluma
Fairfield
Novato
Vallejo
Lodi
Antioch
Stockton
Concord
Walnut Creek
Berkeley
Oakland
Manteca
Tracy
San Francisco
Daly City
Livermore
Hayward
Fremont
Modesto
Ceres
Turlock
Redwood City
Palo Alto
Mountain View
Sunnyvale
Santa Clara
San Jose
Los Gatos
Atwater
Merced
Morgan Hill
Los Banos
Madera
Gilroy
Live Oak
Santa Cruz
Watsonville
Hollister
Clovis
Fresno
Sanger
Reedley
Selma
Marina
Salinas
Seaside
Pacific Grove
Monterey
Hanford
Visalia
Tulare
Porterville
Delano
Ridgecrest
Atascadero
Baywood-Los Osos
San Luis Obispo
Arroyo Grande
Santa Maria
Lompoc
Glidale
Bakersfield
Barstow
Lancaster
Palmdale
Victorville
Apple Valley
Hesperia
Big Bear
Santa Barbara
Carpinteria
Santa Paula
Valencia
Newhall
Ventura
Oxnard
Simi Valley
Glendale
Pasadena
San Bernardino
Los Angeles
Santa Monica
Ontario
Rancho Cucamonga
Riverside
Anaheim
Palm Springs
Long Beach
Huntington Beach
Santa Ana
Irvine
Newport Beach
Mission Viejo
Oceanside
Vista
Escondido
San Diego
El Cajon
Chula Vista
El Centro


Klamath Mountains
Modoc Plateau
Cascade Range
Central Valley
Sierra Nevada
Great Basin
Coast Range
Mojave Desert
Transverse Ranges
Colorado River Desert
Peninsular Ranges

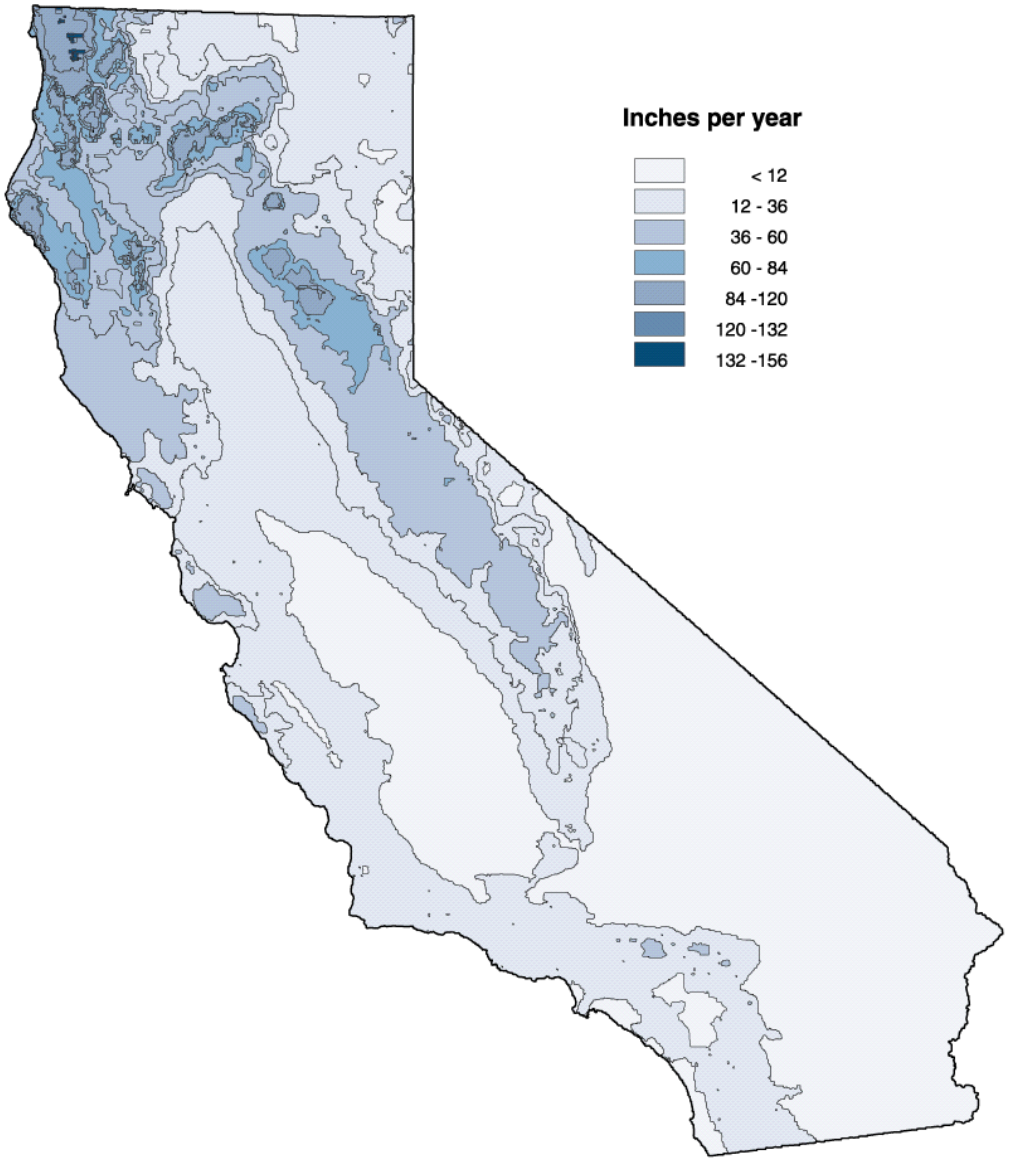
Hydrology Overview

- Average annual runoff from precipitation falling on California is 71 MAF
- Average annual surface water supplies are the 71 MAF of in-state runoff plus 7 MAF from flows in interstate rivers, for a total of 78 MAF
- More than 70% of the surface runoff occurs in Northern California, while more than 70% of the needs for water occur in Southern California

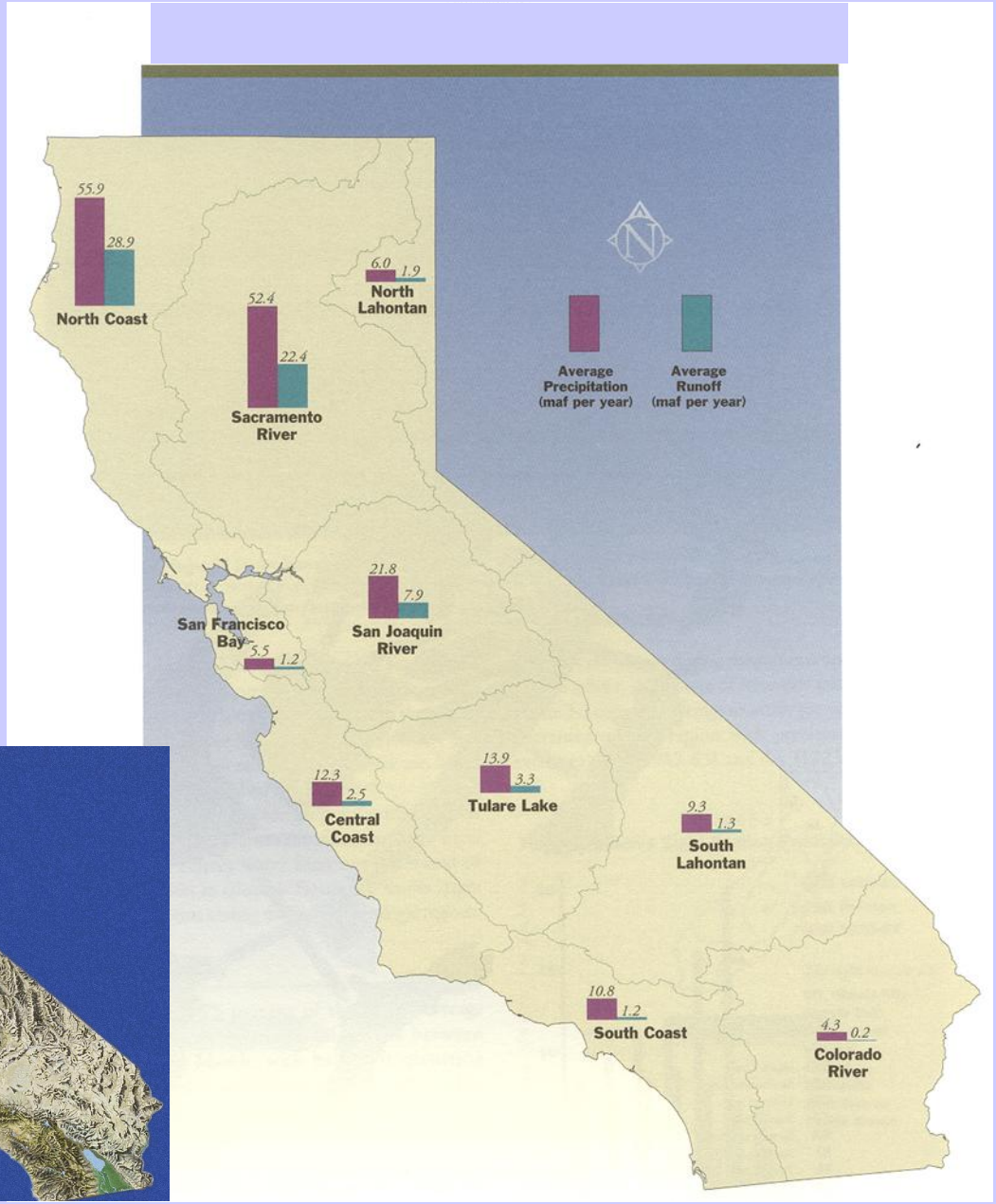
Importance of Sierra Snowpack

- Sierra Nevada runoff supplies – directly or indirectly (through groundwater recharge) a majority of California's urban and agricultural water needs
- Relies on complicated system of operating Sierran reservoirs to provide both water storage and flood control capacity

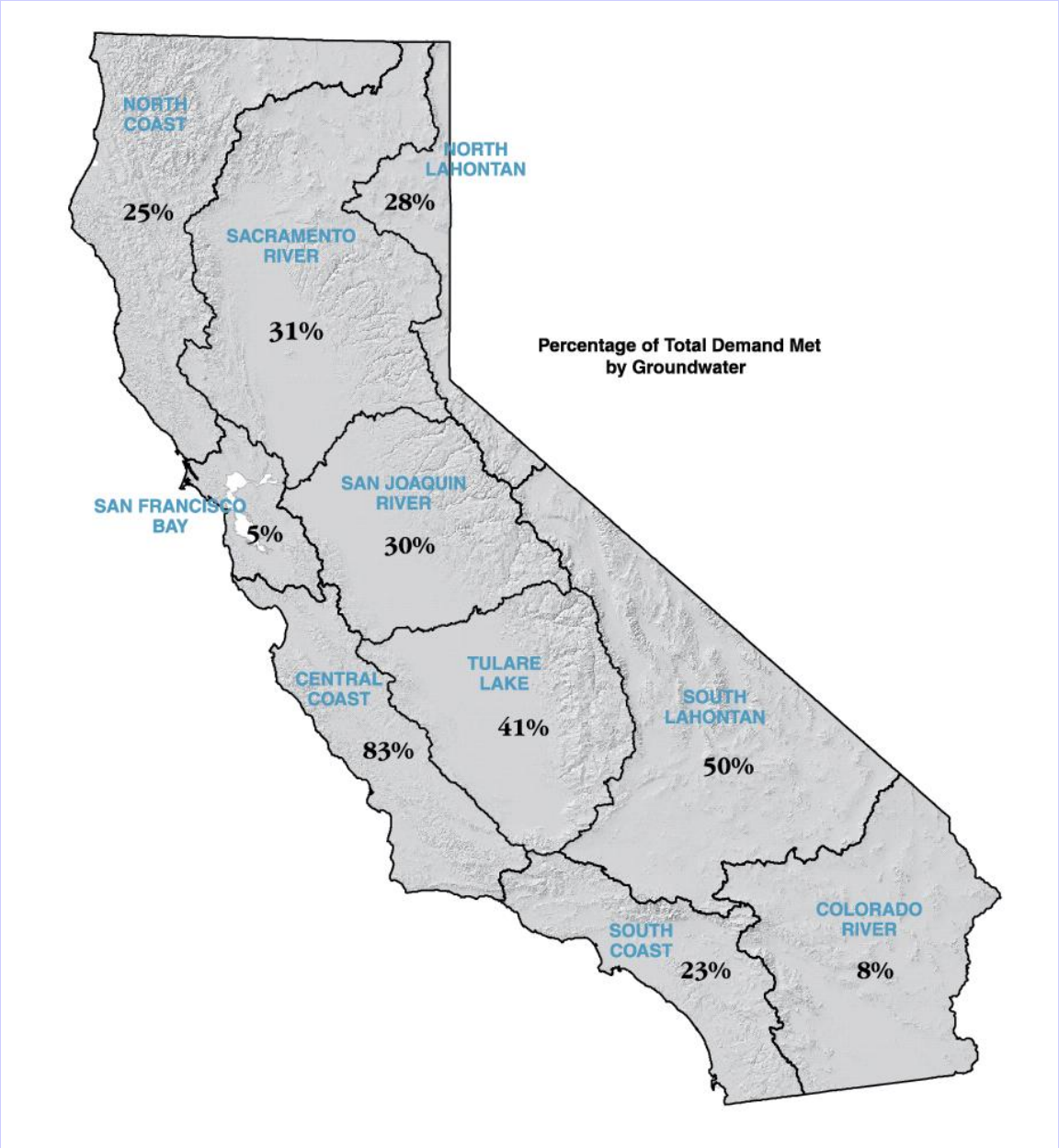
Mean Annual Precipitation in California, 1961 to 1990



Distribution of Average Annual Precipitation and Runoff



Agricultural and Urban Demand Supplied by Groundwater in Each Hydrologic Region



California's 20th Century Statewide Droughts

- 1918-20
- 1922-24
- 1929-34
- 1947-50
- 1959-61
- 1976-77
- 1987-92

1976-77

- State population about 22 million
- 1977 – driest year of record for statewide runoff
- 47 of 58 counties declared local emergencies
- Marin County emergency pipeline across San Rafael Bridge

1987-92 Drought Background

- Population about 30 million in 1990
- 23 counties declared local emergencies
- SWP & CVP made full deliveries during first four years of drought
- SWP cut to 0% agricultural & 30% urban in 1991 (however full Colorado River Aqueduct supply)

1987-92 Drought Impacts

- San Francisco's system dropped to 25% of storage capacity in 1991
- Extreme cutbacks in Santa Barbara area, construction of emergency pipeline
- Severe rationing/water haulage in some small communities in North Coast, Central Coast, and Sierra Nevada foothill areas

1987-92 Drought Response

- DWR drought water bank
- System interconnections (e.g. San Francisco)
- Large urban water agencies' voluntary or mandatory conservation goals in 15%-30% range

Local Drought – Southern California, 1999-2003

- 2002 – driest year of record for Los Angeles and San Diego
- Water haulage in small mountain communities – e.g. Idyllwild
- Small system & private residential wells go dry in interior foothill areas, no large system impacts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Drought Planning & Preparedness

- Local agency integrated resource management plans, agencies serving > 3,000 AF annually, or 3,000 customers
- Urban water management plans
  - Last updates were due in 2005

Urban Water Management Plans

- Reliability of the water supply & vulnerability to seasonal or climatic shortage, for:
  - Average water year
  - Single dry water year
  - Multiple dry water years

UWMPS – con't

- Water shortage contingency analysis of:
  - Staged response actions to be taken by water supplier for shortages up to 50% reduction in supply
  - Specific water supply conditions associated with each stage
- Actions to prepare for/respond to a catastrophic interruption of water supplies

At-Risk Areas

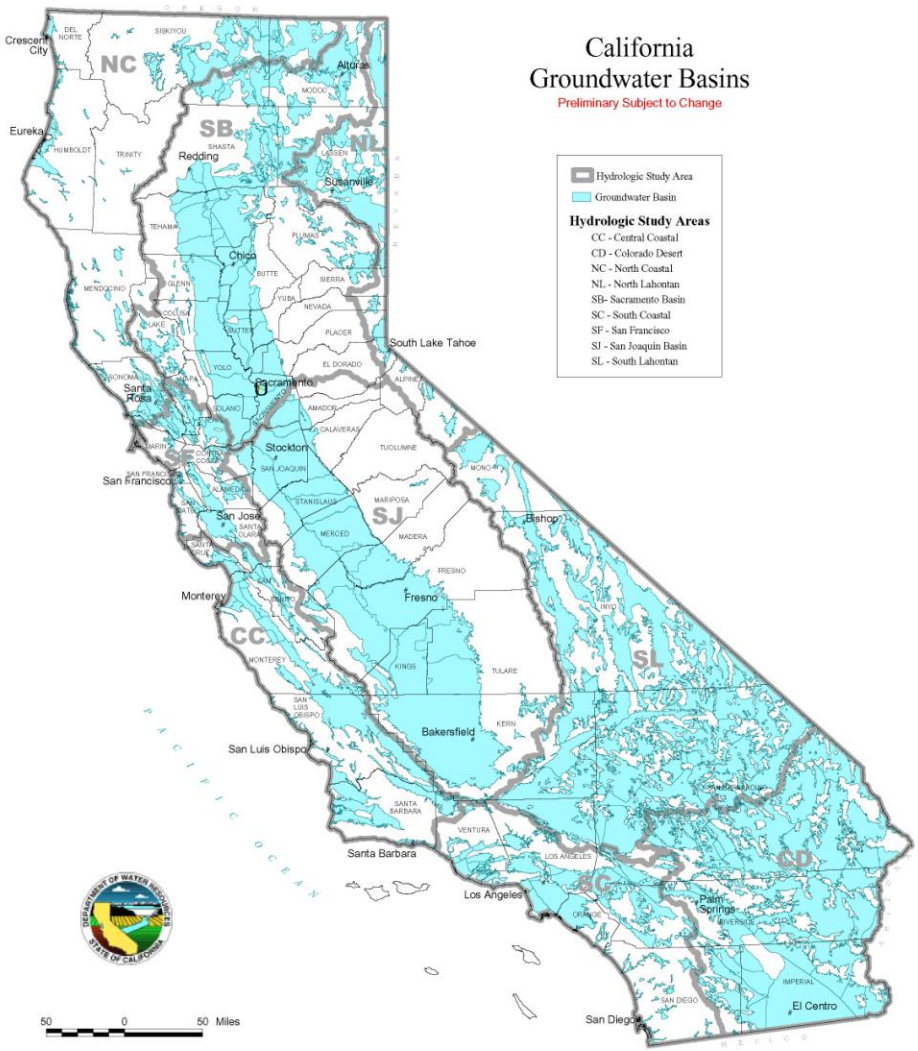
- Isolated rural communities
- Systems on fractured rock groundwater
- Small groundwater basins w/ minimal recharge/storage capacities

Large Urban Water Systems

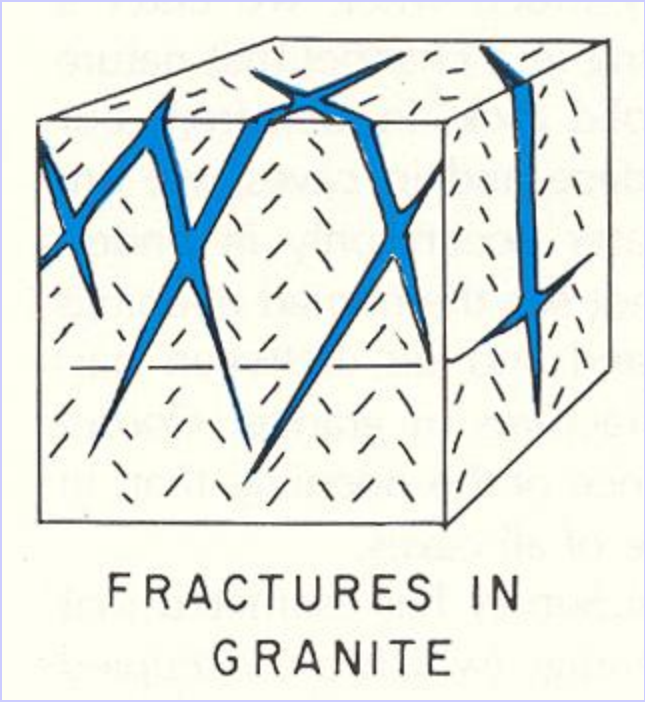
- Normally, minimal impacts in early years of a drought
- Often have diversified supplies
- Have access to tools such as water transfers
- Have large rate bases

Small Water Systems/Rural Areas

- Impacted soonest and to greatest extent by droughts
- Typically operate with little margin for error
- Public health & safety impacts -- lack of water for human consumption, sanitation, fire protection
- Private single-family residential well owners (est. ~ 2%-3% of state population)


California
Groundwater Basins
Preliminary Subject to Change
Hydrologic Study Area
Groundwater Basin
Hydrologic Study Areas
CC - Central Coastal
CD - Colorado Desert
NC - North Coastal
NL - North Lahontan
SB- Sacramento Basin
SC - South Coastal
SF - San Francisco
SJ - San Joaquin Basin
SL - South Lahontan
NC
SB
NL
SF
SJ
CC
SL
SC
CD
Crescent City
Eureka
Redding
Alturas
Susanville
Chico
South Lake Tahoe
Sacramento
Santa Rosa
Stockton
San Francisco
San Jose
Monterey
Fresno
Bishop
Bakersfield
San Luis Obispo
Santa Barbara
Los Angeles
Palm Springs
El Centro
San Diego
PACIFIC OCEAN
50 0 50 Miles

Fractured Rock Groundwater



Common Small System Outcomes

- Local emergency declaration
- Truck haulage of water
- System abandonment by owner/operator

Improving Small System Reliability

- Financial assistance
- Capacity building
- Infrastructure improvements
- System consolidation
- Land use planning

State Financial Assistance -- Recent Bond Acts

- Proposition 204 (1996) -- $995M
- Proposition 12 (2000) -- $2.1B
- Proposition 13 (2000) -- $1.97B
- Proposition 50 (2002) -- $3.44B
- Proposition 1E (2006) – $4.09B
- Proposition 84 (2006) -- $5.4B

Recent Bond Acts – General Points

- Major funding for ecosystem restoration activities
- Special provisions for CALFED Bay-Delta program
- Statutory provisions for individual programs can vary across different bond acts as well as within the same bond act
- Every bond measure is different
- Very limited funding for small water systems

Recent Bond Acts – Examples of Funded Activities

- Ecosystem restoration, including land & water acquisition, fish screening, fish passage
- Water use efficiency
- Groundwater conjunctive use & storage
- Water recycling
- Seawater & brackish groundwater desalting

In Conclusion

- Storage and conveyance infrastructure is key to large-scale drought response
- Small water systems are at higher risk
- Advance planning facilitates institutional arrangements (e.g. water transfers)
- Substantial state financial assistance being provided to help local agency water supply reliability


Emergency Well Drilling Project
funded by:
O.E.S.
in cooperation with

ABSTRACT
Drought Preparedness Lessons from California

Jeanine Jones, Interstate Resources Manager
California Department of Water Resources

Background and setting
►Present California population – 38 million
►Irrigated acreage – about 9 million acres
►Average annual surface water runoff of 71 MAF, plus 7 MAF of surface supply from interstate rivers
►Groundwater supports about 30% of water uses in average years
►More than 70% of surface runoff occurs in Northern California, while more than 70% of needs for water occur in Southern California
► Extensive system of federal, state, and local water storage and conveyance infrastructure enables movement of water around the state
► Most major water using regions of the state connected to regional-scale infrastructure

Statewide Droughts
►1977 was single driest year of California's hydrologic record, and served as a wake-up call for water managers throughout the state to prepare for drought.
► 1987-92 was most recent prior multi-year statewide drought
► Presently experiencing 2 consecutive dry years (2007-08); impacts of dry hydrologic conditions substantially exacerbated by Endangered Species Act restrictions on water project diversions to protect listed fish species.
► Governor's Executive Order on drought issued in June is response to dry hydrology and diversion restrictions

Lessons learned from 1977 & 1987-92
► Large water systems need emergency interties/interconnections with neighboring systems
► Being connected to regional water infrastructure is key to drought management and to response measures such as water transfers
► Extensive public outreach and education are important for achieving targeted levels of water conservation
►A state-run drought water bank can mitigate impacts of drought and help local agencies meet critical water needs
► Small water systems and residences on private wells experience the earliest and most severe drought impacts, and have the least response capacity
► Risk is highest for small systems on unreliable groundwater sources (e.g. fractured rock groundwater)
► Residential well drilling skyrockets during drought; residents with private wells can experience long waits to restore/replace dry wells

► Institutionally difficult to provide assistance to small water systems

Drought Planning

►Statutory requirement for water providers supplying more than 3,000 AF annually or serving more than 3,000 customers to prepare urban water management plans (UWMPs) and submit them to CDWR

►Receipt of many forms of state financial assistance is contingent upon UWMP completion

► UWMPs must contain a water shortage contingency plan element

► No specific drought planning requirement for small water systems, but Safe Drinking Water Act emergency plans can function as a de facto drought plan

► Initial state legislation enacted to require local land use agencies to consult with local water agencies in approval of large new developments

State financial assistance

►California's voters approved $18 billion in water-related general obligation bonds since 1996, including for water supply, water-related ecosystem restoration, and flood management projects

►State funding a catalyst for many large-scale local agency groundwater storage projects

► Recent bonds emphasize the need for integrated regional water management planning at the local level; substantial state funding should help local agencies improve their water supply reliability

Bio for Jeanine Jones

Jeanine Jones serves as the California Department of Water Resources' Interstate Resources Manager. She was previously DWR's Drought Preparedness Manager; her more than 25 years experience with DWR includes directing DWR's statewide planning program and working on varied interstate water negotiations. She has published numerous technical articles, taught water-related courses for UC Berkeley Extension, and serves on the Western States Water Council, Colorado River Board of California, and Border Governors' Conference Water Worktable. She is a registered professional engineer in California and Nevada.