California drought – making a water-secure world

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1. Current drought
2. Long-term drought
3. Water security

http://www.fishwithjd.com/2013/11/21/sad-times-for-folsom-lake/1folsom/
Sierra Nevada Snowpack
January 2013 and 2014
Winter precipitation outlook for Dec-Jan-Feb

El Niño: 80% probability for 2014-15 winter (based on IRI)

Slight chance of wetter than average winter in Southern California

Equal chance of wet, average, or dry winter in Northern California
Atmospheric Rivers

- California’s largest storms and floods are due to Atmospheric Rivers
- ~10 ARs make landfall per winter
- Bring intense, warm precipitation events
Estimated water deliveries from State Water Project during historically dry periods

Source: DWR
Paleoclimate record shows 10-20 year events in last millenium

Long-term drought should be part of California’s water planning
How Bad Is This Drought?

- California hasn’t been this dry since around the time of Columbus, more than 500 years ago.
- Sierra Nevada runoff was ~70% of normal during the 1928-1934 Dust Bowl Drought
- January 2014 snowpack in the northern section of the Sierra is 6% of average levels.
- Much of the state’s development over the last 150 years came during a wet era, we now may be in a dry period
Mining ground water

Source: USGS & UCI Center for Hydrologic Modeling
Mining ground water

30%-40% CA consumptive water use comes from groundwater

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Some of the most severe recorded land subsidence in history occurred in the western San Joaquin Valley near Mendota, where the land surface has subsided nearly 30 feet.

30%-40% CA consumptive water use comes from groundwater.
Making a water-secure world – the three I’s

INFRASTRUCTURE  ->  INSTITUTIONS

Better & more-accessible INFORMATION
Envisioning a new water information system for California

*Current (historical) practice* – uncertainty can be high

New, mature technology available now: blending data from satellites, aircraft, low-cost wireless sensor networks, advanced modeling tools – developed by UC
American R. basin hydrologic observatory (in progress)
Water management translates into managing ecosystem services, i.e. managing forests, wetlands, rivers.
Some recurring questions around water & forests

1. How different were forests prior to fire suppression vs. today?
2. What was the historical water yield prior to fire suppression?
3. What will be the water yield w/ climate warming, vs. today?

Photos from G. Gruell
Some concluding points

1. Sustained forest management that provides measurable benefits for water supply will require investment, verification & maintenance
   - **Next step**: do scalable demonstration project in Sierra Nevada

2. Better information is a critical foundation for water security, especially in a warming & more-variable climate
   - **Next step**: incorporate research products into scalable water information system

3. Drought management is a critical water security issue for California
   - **Next step**: continue research to build the knowledge & technology to meet emerging challenges