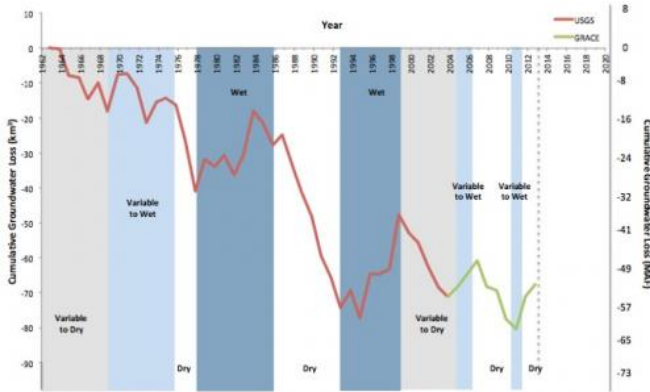


# Satellites show 'total' California water storage at near-decade low

3 February 2014



This image shows cumulative groundwater losses (cubic km and million acre-ft) in California's Central Valley since 1962. The red line shows data from USGS calibrated groundwater model simulations from 1962-2003. The green line shows satellite-based estimates of groundwater storage losses produced by the UCCHM at UC Irvine. Background colors represent periods of drought (white), of variable to dry conditions (grey), of variable to wet conditions (light blue) and wet conditions (blue). Groundwater depletion mostly occurs during drought; and progressive droughts are lowering groundwater storage to unsustainable levels. After Figure B9 from USGS Professional Paper 1766. USGS data courtesy of Claudia Faunt. Satellite data courtesy of NASA and the National Center for Atmospheric Research. Credit: UCCHM, after Figure B9 from Faunt, 2009. USGS data courtesy of Claudia Faunt.

Updates to satellite data show that California's Sacramento and San Joaquin River basins are at near decade-low water storage levels. These and other findings on the State's dwindling water resources were documented in an advisory report released today from the UC Center for Hydrologic Modeling (UCCHM) at the University of California, Irvine.

Responding to Governor Jerry Brown's recent declaration of a drought emergency in California, a

team of UCCHM researchers has updated its research on the state's two largest river basins, and the source of most its water. The region also encompasses the Central Valley, the most productive agriculture region in the country. The Central Valley depends entirely on the surface and [groundwater](#) resources within the river basins to meet its irrigation needs and to produce food for the nation.

Using satellite data from NASA's Gravity Recovery and Climate Experiment (GRACE) mission, the researchers, led by UCCHM Director and UC Irvine Professor Jay Famiglietti, found that as of November 2013, total water storage in the river basins—the combination of all of the snow, surface water, soil moisture and groundwater, and an integrated measure of basin-wide water availability—had declined to its lowest point in nearly a decade. GRACE data for the record-dry 2013-2014 winter months were not yet available for analysis.

The data show particularly steep water losses between November 2011 and November 2013, the early phase of the current drought. Famiglietti and fellow UCCHM researchers estimate that the basins have already lost 10 cubic kilometers of fresh water in each of the last two years—equivalent to virtually all of California's urban and household water use each year. "That's the steepest decline in total water storage that we've seen in California since the GRACE mission was launched in 2002," Famiglietti said.

The researchers noted that snowpack, surface water and soil moisture storage in the [river basins](#) were all at their lowest points in nearly a decade, illustrating a growing threat to [groundwater supplies](#) in the Central Valley, and highlighting the urgent need to manage them sustainably. Groundwater is typically viewed as a strategic reserve that supplements sparse [surface water](#) supplies in times of drought.

By combining their satellite-based estimates of 10 years (October 2003 – November 2013) of Central Valley groundwater storage changes with long-term estimates of groundwater losses from the U. S. Geological Survey, the researchers noted that steep declines in groundwater storage are typical during droughts, when Central Valley farmers are forced to rely more heavily on groundwater to meet irrigation demands.

The advisory report underscores that the rates of declining groundwater storage during drought almost always outstrip rates of groundwater replenishment during wet periods, and raises fears about the impact of long-term groundwater depletion on sustaining a reliable water supply in the current, record-setting drought. The team's previous 2011 study estimated that the Central Valley lost 20 cubic kilometers of groundwater during the 2006-2010 drought.

Historically, drought conditions and [groundwater depletion](#) in the Central Valley are responsible for widespread land subsidence, reductions in planted acreage, higher food costs and ecological damage.

Famiglietti notes that if the [drought](#) continues "Central Valley groundwater levels will fall to all-time lows." Stephanie Castle, a UCCHM researcher who contributed to the report, believes that groundwater supplies should be more actively managed. Castle states that "the path of groundwater use that we are on threatens the sustainability of future water supplies for all Californians." She noted that several communities within the state are on track to run out of water within the next few months.

**More information:** View/download the full report here: [www.ucchm.org/publications](http://www.ucchm.org/publications)

Provided by UC Center for Hydrologic Modeling  
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