

## 63 trillion gallons of groundwater lost in drought, study finds

The ongoing drought in the western United States has caused so much loss of groundwater that the Earth, on average, has lifted up about 0.16 inches over the last 18 months, according to a new study.

The situation was even worse in the snow-starved mountains of California, where the Earth rose up to 0.6 inches.

Researchers from UC San Diego's Scripps Institution of Oceanography and the U.S. Geological Survey estimated the groundwater loss from the start of 2013 to be 63 trillion gallons — the equivalent of flooding four inches of water across the United States west of the Rocky Mountains.

The study, published online Thursday by the journal *Science*, offers a grim accounting of the drought's toll.

"We found that it's most severe in California, particularly in the Sierras," said coauthor Duncan Agnew, professor of geophysics at UC San Diego's Scripps Institution of Oceanography. "It's predominantly in the Coast Ranges and the Sierras showing the most uplift, and hence, that's where we believe is the largest water loss."

8

That's also about how much ice is lost from the Greenland ice cap every year from global warming.

Scientists came to this conclusion by studying data collected from hundreds of GPS sensors across the western United States, installed primarily to detect small changes in the ground due to earthquakes.

But the GPS data can also be used to show very small changes in elevation. Groundwater is very heavy, and its weight depresses the Earth's upper crust. Remove the weight, and the crust springs upward — and GPS sensors can detect how much higher the land has risen as a result of loss of groundwater.

The highest uplift of the Earth occurred in California's mountains because there is so much water underneath them, Agnew said. The uplift was less in Nevada and the Great Basin.

"You can only lose water where there's water to lose," Agnew said.

According to the study, data showed the period of land lifting up as beginning in 2013, and continues to this day.

**For news about earthquakes and more, follow [@ronlin](#) on Twitter.**

Copyright © 2014, [Los Angeles Times](#)