

Southwest headed for permanent drought

January 31 2011, By David Funkhouser



Aerial view of Lake Powell in Arizona. The prominent white rings surrounding the edges of the cliffs are due to steadily receding water levels.

(PhysOrg.com) -- The American Southwest has seen naturally induced dry spells throughout the past, but now human-induced global warming could push the region into a permanent drought in the coming decades, according to Lamont-Doherty scientist Richard Seager and others who have been studying the area's climate.

Seager, who focuses on climate variability and climate change, began his work studying droughts by looking into the past using sea surface temperature records gathered by ships plying the oceans in the 19th century. He and colleagues used computer models to recreate a climate history that showed periodic droughts. Focusing on North America, they also used tree rings to look back as far as the Middle Ages, when the Southwest experienced a [drought](#) lasting hundreds of years.

“You begin to see that there’s a natural cycle of droughts, large and small,” says Seager, the Palisades Geophysical Institute/Lamont research professor at Lamont-Doherty Earth Observatory. “But when you add in the human effects from rising greenhouse gases, we could be pushing subtropical regions like the American Southwest into a permanent state of aridity. There are signs it’s already underway.”

In a 2007 paper, Seager and colleagues used computer models to show the Southwest is on the verge of a transition to a more arid climate. And in the December 2010 issue of *Proceedings of the National Academy of Sciences*, Seager and Gabriel Vecchi of NOAA pinned the drying to a drop in winter precipitation and showed how this is caused by changes in atmospheric circulation and water vapor transports induced by warming temperatures.

The warming also shortens the snow season, reduces the snow mass that serves as natural storage for water, and forces an earlier spring melt, disrupting the supply system that waters much of the Southwest—the region from the western Great Plains to the Pacific, and the Oregon border to southern Mexico.

That is ominous news for a region that has seen explosive growth in population, land use and water demands in recent decades. A reduction in the flow of important water resources such as the Colorado River will have serious consequences.

“I’m curious how the Southwest is going to handle this,” Seager says.

He says the natural variations between wet and dry periods are driven mostly by the El Niño/La Niña cycle of sea surface warming and cooling in the Pacific. “The anthropogenic signal is currently small compared to the natural variability,” Seager says. “But you can see it, and it’s consistent with the climate models. It works across the whole subtropics.

Right now the human effect is small, but it will become a serious problem in the decades down the road.”

Local water system managers want to know how much [water](#) will be available in coming years, but Seager can't offer information that detailed. Still, almost all of the [climate](#) models point to a much drier region by around 2050. “You could wait to the middle of the century and say, well, did this happen, or didn't it happen?” Seager says. “But that's not a very sensible thing to do.”

Provided by Columbia University

Citation: Southwest headed for permanent drought (2011, January 31) retrieved 26 April 2024 from <https://phys.org/news/2011-01-southwest-permanent-drought.html>

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