

Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Distinguished Professor of Earth and Planetary Sciences, UC Santa Cruz.

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A Dry December**

A general rule of survival is that a person can live 3 minutes without air, 3 days without water and 3 weeks without food. And water shortages seem to be coming more often in many places around the world. By 2025, which is only 7 years away, an estimated 1.8 billion people (one in every four) will live in areas plagued by water scarcity, with about two-thirds of the world's population living in water-stressed regions.

One-sixth of an inch, 4.2 millimeters, or the thickness of three pennies; That's how much rain we got in Santa Cruz in December. But on the positive side the winter is still relatively young, and Loch Lomond, our only reservoir, is 91.6% full, thanks to last year's heavy rainfall.

Where does this December fit in the big picture of things? We have reasonably good rainfall records going back to 1893, and on average, December brings about 5.4 inches. This December was the 2nd driest on record. Back in 1989 just 5 hundredths of an inch of rain fell, the thickness of a single penny.

Throughout this 124-year history, the city received less than 2" of December rain in 22 different years and less than 1" of rain in 9 years. In contrast, 16 different Decembers we were treated to over 11" of rain. In the last month of 1955, the city

received over 21 inches of precipitation, and much of downtown was flooded as a result.

So what can we expect next? Some have said that only tourists and fools predict the weather. And while we do have a lot of satellites up there keeping watch and lots of different climate models, the message from the U.S. Weather Service as this winter started was that it might be drier than normal, might be normal or could be wetter than normal. That pretty well covers all the bases, and provides some perspective on how well we can predict what's coming months in advance.

Our weather folks have announced that we shouldn't start worrying yet because January, February and March are our big rainfall months. Well, that's partly true, but December is also pretty important. Since 1893 this month has provided 18% of our annual water from the clouds on average. January has brought 21%, February 18% and March 14%. So December is tied with February as our 2nd wettest month.

Is an extremely dry December indicative of what might follow in January through April of the next year? Not so much it turns out. During those 22 very dry years when December saw less than 2 inches of rain, in 45% of the years we received above average rainfall in the next four months, and 55% of the time we got less than average. Take your pick for this year and your guess is as good as anyone's.

And as long as we're talking about records, while the 2017 numbers aren't in yet, 2016 set a record as the 3rd year in a row when the average global temperature was the hottest on record. Extending our global heat records back further, 16 of the hottest 17 years on record since we began seriously collecting global temperatures in 1880 have all taken place since 2001.

I think overall there aren't too many places on the planet that are rejoicing with this increased warming. Certainly the declining snowpack in the Sierras isn't making the ski industry or any skiers happy. That snow is also where up to one-third of California's water is stored. It's then slowly released in the spring and summer months when we need it for the state's huge agricultural industry, as well as our over 39 million people.

The 2012-2015 drought cost California's economy \$2.74 billion (\$1.84 billion in agriculture alone) and 21,000 jobs. Many farms received no water from the state water system. This is serious business.

The climate is changing and it will have some grim impacts on the state and the planet that we are just beginning to feel. The time for denial is over. This isn't about politics, it's about survival. We need to make major commitments nationally and globally now to do everything we can to mitigate climate change and its inevitable impacts. California continues to be a leader in these efforts and has been setting examples and standards for other states and the nation, but we can't do it all on our own.