Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Director, Institute of Marine Sciences, UC Santa Cruz.

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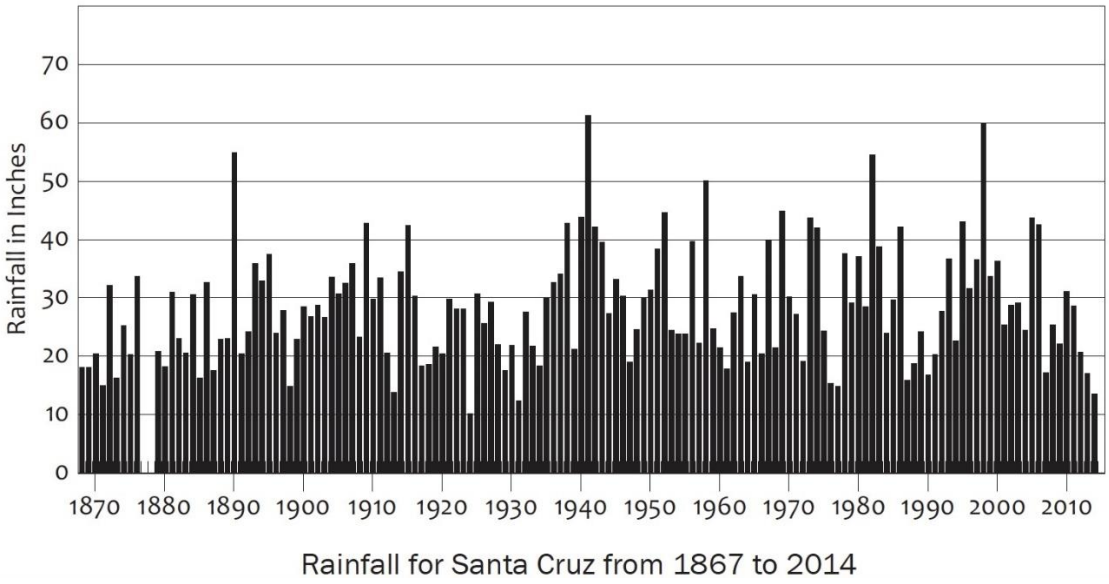
The Winter of 2017- How does it compare?



Rainfall for Santa Cruz from 1867 to 2014

Santa Cruz can never be accused of being boring or predictable. We have gone from water rationing drought to damaging flooding in a few months' time. Weather is complicated stuff and only fools and tourists try to predict it in advance.

This has not been a good year for Highway 17 commuters, or for those people living in low-lying areas like Felton Grove. We are somewhat above average in our annual rainfall (by February 17 Santa Cruz had received nearly 38 inches), but the winter isn't over yet.

One somewhat confusing aspect of rainfall data is that it may be reported in calendar years (January to December), but most often in what are known as water

years, October 1 of one year to September 30 of the next year (which is how the Sentinel reports rainfall). This way, a very wet winter is captured by a single water year.

For the nearly 150 years that we have been measuring rainfall in the city of Santa Cruz, we have averaged about 30 inches annually. And while 2016-17 has been a wet winter, particularly after 5 relatively dry years, how does it stack up with the big winters of the past 150 years?

Santa Cruz actually has suffered through two years where rainfall was right around 60 inches. The 1941 water year drenched Santa Cruz with 61.26 inches, and just 9 years ago in 1998, 59.82 inches fell.

There were two additional years when we had between 50 and 60 inches (1890 and 1983), and eight years with between 40 and 50 inches. So as of mid-February of this year, depending upon how much more rain we get, we may or may not rank as one of the ten wettest years.

As someone said a week or so ago, whoever is doing the rain dance can stop now.

For those living in Bonny Doon, Boulder Creek or Ben Lomond, it's abundantly clear that they get a whole lot more precipitation that downtown Santa Cruz- on average about twice as much. This year they have been deluged with 70 to 75 inches.

All of our precipitation starts out life as water molecules evaporated from our ocean backyard. With warming, that water vapor rises, and gets moved around by

winds. Cooling as it rises the water vapor condenses to liquid water again. As the rain clouds move inland over the mountains from the coast, they continue to rise, cool, and the moisture condenses and falls as rain.

Everything else being equal, which it rarely is, we can expect greater rainfall at higher elevations. Along the coast, Davenport, Santa Cruz, Soquel, and Aptos average between about 25 and 30 inches annually, with the higher parts of the Santa Cruz Mountains getting twice that much.

One important variable in how much impact or devastation any particular year's rainfall can have on the county (flooding, mud flows, landslides and road closures) is how it is distributed throughout the year.

We get about 90% of our precipitation between November and March. If we could spread out our 30 inches of average annual rainfall evenly over those 5 months, we would get less than a quarter of an inch per day. Even in our wettest winter in 1941, spreading 60 inches out evenly would only produce 0.4 inches per day. Our streams, hillsides and storm drains could handle that quite easily.

The problems come when the rain is concentrated in shorter time periods, as it has been this winter. In January, 15.72 inches fell in the city. Surprisingly, this was only the 5th wettest January on record. Over 19 inches fell in January of 1909 and also in 1940. The wettest December was in 1955 when 21 inches of rain fell in the city. Heavy rainfall higher in the San Lorenzo Valley headed downstream causing the Christmas flood downtown. This was the worst ever to inundate the city and led ultimately to the construction of the flood control project that bisects the city today.