

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

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**Droughts and Megadroughts**

In July I was comparing water-rationing rules with a friend from Manhattan Beach, wondering which city had the most stringent limitations. Out of curiosity I asked “How much rain did you get this past winter?” It took a few seconds for him to answer, and then with a grim look on his face he replied with, “It didn’t rain in Manhattan Beach this winter”.

The local rainfall in the greater Los Angeles area actually has little impact on their overall water supply, however, as it all comes from somewhere else, and has for decades. Los Angeles has always been a desert, masquerading as a tropical island with their lush gardens, lawns and golf courses, all thanks to imported water. But it did make me feel a little better for an instant, living in Santa Cruz, where we recorded a grand total of 13.27 inches of rain this year. That was the glass half-full reaction; the half-empty side of the picture is that it's the 3rd year in a row of significantly below average precipitation, and has been one of the driest years, if not the driest, since record keeping began here 150 years ago. 2014 is also on track to also be the warmest year on record in California.

The definition of drought is “a prolonged period of abnormally low rainfall”. A new term has been added to our weather conversations in recent years, megadrought, defined as “a prolonged drought lasting two decades or longer”. This is a word most water suppliers would rather not think about.

We are now in the midst of what is being labeled as the worst drought in the western U.S. since we started keeping track of these events about 150 years ago. The parched area now covers a dozen states and nearly 600 counties, from southern Texas to the northern Rockies, and includes grazing and farm land that produce a third of the country’s beef cattle and half of its fruit, vegetables and winter wheat.

California has been hit the hardest, however. As of October, nearly 60 percent of the state is officially in an “exceptional” drought: — the highest level of aridity, with 82% of the state in the next driest state, “extreme” — and those folks who

watch the weather for a living aren't seeing any clouds with silver linings in the near future.

Not surprising to long-time California residents, droughts are not new or uncommon. We get these dry periods every decade or two. The last local drought extended from 1996 to 1991, when Santa Cruz averaged just 19.5 inches annually for those 5 years, compared to our long-term average of just over 30 inches. The 1975-1976 drought was even drier but shorter, averaging less than 15 inches per year. For the past 3 years, we averaged 17.6 inches.

If you really want to get concerned and lose sleep, the pre-historic record has preserved far more serious droughts in the distant past, megadroughts in today's terminology. But this was before California was home to 38 million people and our farms and fields were providing fruits, vegetables and livestock to the nation. In the early years of the last century, if there wasn't enough water where we wanted a city or farm, we built dams, canals and pipelines to move the state's water to where we needed it. And more often than not, we fought over who had the rights to the water. Between 1860 and 2000, 1400 larger dams (over 25 feet high) were built on California's rivers; that's an average of 10 per year or almost one every month for 140 years.

Rainfall records in the state only go back about 150 years at most, but dendrochronology, or the study of tree rings, has allowed us to look further back in time. Just like putting on a few extra pounds around your waist when you eat well on a vacation, trees suck up moisture when there is plenty to go around, and use that extra water to grow thicker rings.

Bristlecone pines, which can live to be 4000-5000 years old, and survive in the White Mountains of southeastern California, are living history books in which the records of our pre-historic rainfall have been preserved. These trees contain the evidence that over the last 1000 years the state has been through multiple droughts that have lasted 10-20 years. And these are mild events compared to a 240-year long megadrought that began in 850. Following about 50 years of more normal rainfall, the southwest lapsed into another extended drought that lasted at least 180 years. History can tell us something we may have forgotten.