

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

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Fresh Water-A drop in the bucket

What may be surprising and not particularly good news, is that about 96.5% of all of the water on Earth is in the oceans, is salty, and not terribly useful to us. Of the remaining 3.5%, about half is frozen as ice sheets, glaciers, and permafrost, much of this out of our reach in Antarctica and Greenland. Although there were proposals decades ago to wrap large icebergs from Antarctica in plastic wrap and tow them to the thirsty people, lawns and golf courses of southern California, I think there is about as much chance of that happening today as there is of Santa Cruz getting 6 inches of rain in August.

Unfortunately, this only leaves about 1.7% of all the water on Earth for us to fight over, which is what we have done in California and a lot of other arid or semi-arid regions across the west. Mark Twain is often quoted as saying over 100 years ago that in California, “Whiskey’s for drinking, water’s for fighting over.” There is a long-standing argument, however, about whether Mark Twain really made this statement. Whether he did or didn’t doesn’t matter, it’s been true for over a century in California. On the eastern side of the Sierras, there was armed conflict in the early years of the 1900s over Los Angeles stealing the water from Owens Valley in what became known as the California Water Wars.

Of the approximately 1.7% of water present on Earth as liquid fresh water, 1.68% resides below the land surface as ground water, 0.014% is present in lakes (about half salty and half fresh) and swamps, and 0.002% resides in the atmosphere or exists as soil moisture. The rivers of the world hold the rest, a grand total of 0.0002% of all of the water on Earth.

Yet it has been this smallest reservoir of H₂O on the planet, this drop in the bucket (or to be more precise, 1/3 of a teaspoon of fresh water in a 2 gallon bucket of the world’s total water), which most of the world’s people have depended upon for as long as civilization has existed. This is true for the city of Santa Cruz, the state of California, and much of the nation and the world. Whether pumping water directly from rivers as the city of Santa Cruz does from the San Lorenzo River or north

coast streams, or taking water from lakes or reservoirs (Loch Lomond on Newell Creek, for example), these are almost all rivers that have been dammed.

Throughout California, we built over 500 dams on coastal streams alone throughout the last century, forgetting hundreds of others in the Sierras and Central Valley. While these dams were often built for multiple purposes, in virtually every case, water supply was an important benefit. The city of Santa Cruz depends upon streams for about 97% of our water supply, while the state of California typically gets about 60% of its water from rivers, the rest from groundwater.

The streams of the world get their water from rainfall, snowmelt, or groundwater seepage, all of which comes ultimately from precipitation. This water is all part of the hydrologic cycle, which starts with evaporation, primarily from the oceans, and which leaves the salt behind. As this moisture or water vapor rises into the atmosphere, it cools and the moisture condenses to form water droplets, or if cold enough, ice crystals, and then falls as precipitation, much of this over the ocean, but also over the continents. This natural distillation or desalting process gives us the supply of fresh water that the lives of the Earth's 7.1 billion people are totally dependent upon. We can live for weeks without food, but only a few days without water.