

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

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**Climate, Weather, and California Agriculture**

The Earth's changing climate isn't just a matter of the oceans and atmosphere getting a little warmer. It's about our weather, our agriculture and water supplies, among other things, which most California residents became painfully aware of during the four-year drought that just ended. Many farmers literally got no water from the state water project in some of those years because there wasn't any water available.

Groundwater tables have dropped dramatically. State legislation was recently passed requiring, for the first time, that aquifers or groundwater basins come into equilibrium with no more water being pumped out than is being recharged through rainfall and streams. The state's aquifers are going to take years to recover, however.

Fifteen of the sixteen warmest years we have experienced since we began keeping records in California in 1880 have all occurred in this century. Climate science strongly suggests warmer temperatures in the future mean we can expect more precipitation in California to fall as rain instead of snow, so the Sierra snowpack we depend upon for about 30% of our water won't be storing as much of that moisture.

More rainfall will be concentrated in the winter months, which translates into more downstream flooding. Summers will experience higher temperatures more often and this likely means more and longer droughts, probably accompanied by more forest and brush fires.

Agriculture in California is a huge business and we literally feed the entire United States, no matter which state you live in. The rest of the nation cannot survive without us. California leads the country in the production of 66 different food crops, producing 48% of the US produce. We grow 99% of the nation's artichokes, 99% of the walnuts, 97% of the kiwis, 97% of the plums, 95% of the celery, 95% of the garlic, 94% of the tomatoes, 89% of the cauliflower, 71% of the spinach and 69% of the carrots, to name a few of the 66.

We could go on down the list but the picture of California's role and importance in feeding the nation is clear. But this amazing productivity is dependent on three key things: fertile soil, warm weather, and water, lots of water. It also depends upon people who are available and willing to pick those crops.

It has become increasingly clear that our changing climate is more than likely to have a profound on California's agriculture production and our ability to feed the nation, not only because of uncertainties in the availability of water, but also because of temperature changes that affect many crops that are delicately attuned to certain temperature ranges.

Many fruit and nut trees, such as cherries, apples, apricots, walnuts, and almonds, for example, require cold weather during the winter and early spring in order to stimulate the trees to flower and produce good yields of fruits and nuts. These trees

need a certain number of hours at cold temperatures — or “winter chill” — in order to blossom and produce optimally.

With continuing temperature increases in California, achieving enough winter chill will become increasingly more difficult in places like California’s Central Valley. Without enough hours of cold weather, crop yields can be significantly reduced or even fail altogether.

And why is all of this happening and the prognosis for the future so problematic? When 15 of the hottest years of the last 135 years have been in the 21st century, it’s pretty clear that our climate has been changing and its likely going to continue to change.

The time for debating whether climate change is occurring or why it’s changing has passed. We really only have three choices: mitigation, adaptation and suffering. We are already doing some of each; the question for the future is what the mix will be. The more mitigation we do, the less adaptation and suffering will be required.

During the darkest days of World War II, Winston Churchill said to the English people— “Sometimes its not enough to do your best. Sometimes you need to do what is required”. We all need to do what is required to save the planet and ourselves from the impacts of climate change.