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

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The Ocean Impacts of Desalination Pt. 2

Anything involving use of the ocean can raise environmental concerns today. The two marine issues usually raised about desalination are: 1) the effects of taking in large volumes of seawater, and 2) the impacts of releasing the brine left after the seawater has passed through the reverse osmosis process that separates the salt from the water.

I used a comparison two weeks ago between the desal plant original proposed for Santa Cruz and Soquel (which would have pumped about 5 million gallons a day from the coastal ocean), and the Moss Landing Power Plant, that has used about 1.2 billion gallons a day, or 240 times as much water, for nearly 70 years.

This comparison was used simply to compare the volumes of seawater pumped in daily, not to compare the nature of the effluent or water released from each plant, which are clearly different. The common element to both a power plant and a desalination plant is that both would entrain the microscopic plankton in the seawater pumped from the ocean. These would not survive the trip through either facility.

The plankton includes the eggs and larvae of a number of marine organisms including finfish and shellfish, the phytoplankton (the microscopic floating plants like diatoms) and the zooplankton (krill and similar organisms). These vary in their abundance depending upon the specific location, time of year and water depth, although most of the plankton is concentrated in the upper 150 feet of the ocean.

A field study done near Mitchell's Cove along West Cliff, one possible intake site for the proposed desalination plant, showed that the average percentage entrainment for fish larvae over a 13-month period was 0.02 percent, and for shrimp and crab larvae the average percentage entrainment was 0.007 percent. These are very low values and the consultant's conclusion was that these do not represent a significant source of mortality for these species.

Most marine organisms lay huge numbers of eggs to insure some offspring survive, simply because very few reach maturity as they become food for lots of other things swimming around out there. Market squid typically lay 2,000 to 3,000 eggs; a lingcod may lay 50,000 to 170,000 eggs, and a female Dungeness crab can produce 2.5 million eggs. You can imagine what a successful crab season we would have if all those eggs from a single female made it through to adult size. Survival rates are very, very low, however, typically less than 0.01%.

Nonetheless, these small and localized entrainment effects can be reduced by using smaller-sized intake screens, by placing intakes in deeper water to avoid most of the plankton, by using multiple intake ports, or by using subsurface intake wells beneath the beach or buried in the sand on the seafloor.

Back to brine disposal, which is an issue raised by several readers. The average salinity of seawater is 3.5% by weight, or if we evaporated 100 pounds of seawater, we would get 3.5 pounds of salt. Put another way, this is the equivalent of 8 tablespoons of salt in a gallon of water. While this doesn't seem like much, it makes seawater undrinkable and pretty much unusable for any agricultural or horticultural uses.

After passing through a desalination facility about one-half of the water (2.5 million gallons) is now fresh and ready for use. The other half contains about twice as much dissolved salt as the original seawater, or about 7 percent.

While most marine organisms would probably not be happy forever in an aquarium with a salinity of 7%, the coastal ocean is not a small aquarium and there is a simple solution for diluting the salt content to bring the "brine" back down to normal ocean salinity.

The Santa Cruz Waste Water Treatment Facility processes about 10 million gallons of our wastewater on average every day. After treatment, the water, which has a salinity of near zero, is pumped through an ocean outfall and discharged about a mile offshore from Natural Bridges.

By combining 2.5 million gallons of brine with the effluent from the treatment plant we can use the same discharge pipe and release water with salinity equal to that of the offshore ocean.

Making one final comparison with the Moss Landing power plant, it releases 1.2 billion gallons of water daily with a temperature about 20 degrees Fahrenheit warmer than the offshore ocean. This does have effects on local marine life.

California also has a number of regulatory agencies and requirements in place that both power plants and desalination facilities need to comply with that address both intake and discharge issues.
Monterey Bay is a highly productive environment that supports a healthy commercial and recreational fishery, and is widely known for the diversity and abundance of its marine life. It's important to know what have we learned from studies of the Moss Landing Power Plant.