

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

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Sea level rise—should we worry?

**San Francisco Bay Scenarios for Sea Level Rise
SFO**



The San Francisco airport goes underwater with a one-meter rise in sea level.

Sea level rise probably isn't an issue on most people's list of top ten worries. It's usually the catastrophic or instantaneous rise in water level such as occurred in Japan during the devastating tsunami of March 11 that we notice. It certainly got our attention at the Santa Cruz harbor the next day, at least for a while.

There is also a much slower, glacial-paced rise in sea level that is beginning to be of concern to those who need to worry about the elevation of the ocean surface, which also determines the location of the shoreline. One good example is the operators of the San Francisco International Airport. The airport opened in 1927 as

Mills Field Municipal Airport on 150 acres of cow pasture leased from owner Ogden Mills. It was renamed San Francisco Municipal Airport in 1931 and Municipal was replaced by International in 1955.

The cow pasture was originally tidelands and over the years the airport was repeatedly expanded as fill was placed out into the bay. As a result, today the runways are just a little more than a foot above the highest tides.

Much of the shallow, marshland around the margins of San Francisco Bay was filled over the past century for a variety of uses that made sense at the time, including housing developments such as Foster City, freeways, stadiums and airports. Because transporting and placing engineered fill is expensive, there was no reason at the time to add more fill than was necessary to get the ground level just above the highest tides.

San Francisco's Bay Conservation and Development Commission (or BCDC), an intergovernmental agency that plans for and has permit authority for how land is used around the shoreline of San Francisco Bay, was one of the first agencies in California to get concerned about changes in sea level. In 2005 they carried out a study to determine how a sea level rise of three feet would affect the development around the bay. Based on information available at that time, three feet of sea level rise was a reasonable projection for the year 2100.

The results of this analysis came as a surprise to most people. Using topographic maps with precise elevation control, it's pretty straightforward to determine areas around the bay that would be inundated by a three-foot rise in water level.

BCDC completed a second study in 2008 and included areas that would be submerged by both a 16-inch rise in sea level, which is on the higher range of recent projections for 2050, and also 55 inches, on the higher side of the range of projections of sea level for 2100. Maps of the San Francisco Bay shoreline and areas that would be inundated with these water level increases are available on their website at:

http://www.bcdc.ca.gov/planning/climate_change/index_map.shtml. A 16-inch rise in sea level puts the SFO runways underwater.

You may be saying to yourself, no worries, I'll just use Oakland International. Well, the Oakland airport, which coincidentally also opened in 1927, was also built on former tidelands. It has a long and interesting history, including being the

departing point for Amelia Earhart's final flight in 1937. But Oakland's runways are also submerged with a 16-inch rise in sea level.

So when do we start to get concerned or should we be doing anything? Or perhaps more appropriately, should the state of California be doing anything?

If residents along the Mississippi River know floodwaters are rising and all indications are that they are going to continue to rise, they don't wait to see how high the water is going to get before they start stacking sandbags or taking other precautions.

In November 2008, Governor Arnold Schwarzenegger signed an Executive Order focused on the impacts of climate change on the state, which included a long list of 'Whereas' followed by eight directives. Seven of the eight directives dealt directly with the issue of future sea level rise. The first of these ordered the California Resources Agency (now led by John Laird) in cooperation with the Department of Water Resources, the California Energy Commission, California's coastal management agencies, and the Ocean Protection Council to request the National Academy of Sciences to convene an independent sea level rise science and policy committee made up of state, national and international experts to complete the first California Sea Level Rise Assessment Report.

The governors of Oregon and Washington along with the U.S. Geological Survey, the Army Corps of Engineers and NOAA also signed onto this request as sponsors of the study. After requesting nominations for the committee members from a wide variety of scientists, public officials, agency staff and others, a long list of nominees was reviewed and vetted by the National Academy of Sciences, and a committee of 13 individuals was selected. The committee includes physical oceanographers, coastal geologists and geophysicists, glaciologists and meteorologists, climatologists and coastal engineers. They represent universities and federal agencies in ten different states.

The National Academy of Sciences was established by an Act of Congress and signed by President Abraham Lincoln in 1863, at the height of the Civil War. It calls upon the National Academy to investigate, examine, experiment, and report upon any subject of science, whenever called upon to do so by any department of the government.

Since 1863, the nation's leaders have turned to the National Academy for advice on scientific and technological issues that frequently pervade policy decisions.

Most of the science policy and technical work is conducted by the National Research Council (NRC), which was created specifically for this purpose and which provides a public service by working outside the framework of government and politics to ensure independent advice on issues of science, technology and medicine.

The NRC enlists committees of the nation's top scientists, engineers and other experts, all of whom volunteer their time to study specific concerns. The results of their deliberations have inspired some of the nation's most significant and lasting efforts to improve the health, education and welfare of the nation's people.

There is a view long-held by some that science will lose its integrity, and scientists will lose their impartial reputation, if scientists stray into the domain of public policy. This can be quite comforting to some scientists because it limits their personal responsibility to their technical field of expertise. It can also be comfortable to those in the policy arena because science often presents evidence that can be perceived as a threat to vested interests.

The committees set up by the National Research Council to look into critical and timely issues are excellent examples of how science can contribute in an impartial and objective way to helping to resolve many of the pressing societal issues we face as a state and nation today. The NRC West Coast Sea Level Rise Committee held their first meeting in January at the Seymour Marine Discovery Center at Long Marine Laboratory.

More to come on California and sea level rise.