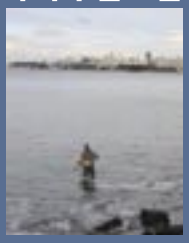
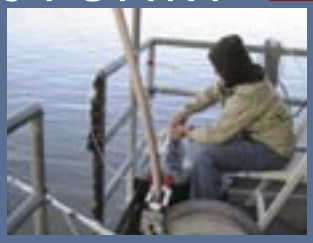
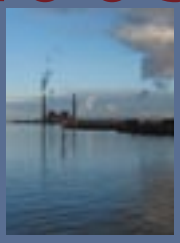
PULSE OF THE ESTUARY 2005


Fact Sheet

Bottomline

"The integrity of the water" -- that strangely poetic phrase buried in the legalese of the Clean Water Act -- is what's really at stake for all those charged with monitoring, regulating and preventing aquatic pollution. But "integrity" is not an easy goal to attain, at last in the realm of San Francisco Bay water quality. Pesticides, fuels, metals and flame retardants -- to name only a few of the pollutants lingering on as legacies long after banning, or building up as a result of new activities or substitutions -- are widespread in the San Francisco Bay environment.

Checking the ups and downs of various Bay pollutants year after year is the job of the San Francisco Estuary Institute's Regional Monitoring Program for Trace Substances. Since 1993, program scientists in boats, waders, wetsuits and labs have been tracking those pollutants singled out by government regulators as impairing or threatening to impair the benefits people and wildlife gain from using the region's waters. The results of this sampling and important findings from other programs are summarized in an annual report called the "Pulse of the Estuary." Some of the key points of the latest report, released in May 2005, appear in this fact sheet.

Worrisome New Pollutants

Research indicates that the levels of flame retardants in tern eggs and Bay Area women are among the highest yet reported in the world. These polybrominated dephenyl ethers, or PBDEs, lurk in mattresses, hair dryers, carpets, cars, TVs, pajamas and house dust, among other things. Due to evidence showing PBDEs in humans and the environment doubling every 4-6 years nationwide, and climbing within the Bay food web, the RMP began monitoring this emerging threat in 2002. Results show that flame retardants are widely distributed in Bay water, surface sediments, and clams. Though in 2003 California became the first state to ban two of the three major types of PBDEs, flame retardants promise to join the ranks of "legacy" pollutants such as PCBs and DDT that will stick around in the ecosystem for decades. No PBDE water quality guidelines or limits yet exist. In 2002, however, the San Francisco Bay Regional Water Quality Control Board placed these flame retardants on their non- "watch list" Of potential threats to Bay water quality.

Pyrethroid pesticides are also an emerging concern. While California agriculture's use of the most popular among these pesticides –permethrin -- dropped during the 1990s, newer formulas, some of which are 20 times more toxic than their predecessors, have picked up the slack. They're also moving into the home and garden pest control slot recently occupied by diazinon and chlorpyrifos. Manufacturers and regulators withdrew these two latter pesticides (organophosphates) from the consumer market due in part to their toxicity in watersheds.

Meanwhile, runoff, discharges and fallout from the skies continue to carry old pollutants into the Bay. Long banned pesticides used to kill fleas, mosquitoes and termites (such as DDT and dieldrin) continue to accumulate in sport fish, particularly the fatty shiner surfperch and white croaker. Add mercury, dioxin, and PCBs (other legacy pollutants still hanging around in the Bay watershed) and health risk officials begin suggesting no more than a certain number of meals of locally-caught fish per month. Consumption advisories for fish reeled in from the Bay were issued in 1994, and remain in place today based on ongoing RMP monitoring. It's clear most legacy pollutants won't be going away anytime soon. Levels of mercury in striped bass, for example, have not gone down in 30 years. Beyond continued vigilance to curb runoff and erosion from legacy hot spots, and ongoing management of waste discharges, there is no quick fix for this problem.

Minimizing Restoration Risks

As the region gears up to restore thousands of acres of tidal wetlands, 16,500 acres of which will come from retired salt ponds, managers and scientists are worried about water quality impacts. While wetlands can sequester and filter pollutants, they can also produce and export methyl mercury -- a highly bioavailable form generated from the mercury deposited on the bayfloor as a byproduct of the Gold Rush a century ago. At the same time, inviting the tides into long subsided areas may liberate not only mercury, but also other legacy pollutants buried in the sediments. In a national study by the U.S. Geological Survey, wetland density was the single most important watershed scale factor associated with methyl mercury production. These concerns must be weighed against the many other benefits of wetland creation to endangered wildlife and ecosystem health.

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Scientists suggest that the prudent course of action is serious food web and water quality monitoring, coupled with active adaptive management, as project engineers open tide gates, plants root, sediments move, and birds fish for food in the new marshes.

Closer scrutiny at how much sediment flows in and out of the Bay -- a sediment budget -- can help inform not only restoration efforts, but also planning for dredging and pollutant management. The fate of sediments as they settle, erode, suspend, and resettle on the Bayfloor is tied inextricably to the fate of the pollutants -- pollutants often grab onto particles. A comparison between sediment budgets for 1955-1990 and for 1995-2002 showed decreasing sediment inflow from Central Valley rivers (inflow now appears greater from local tributaries than from the Delta) and increasing amounts leaving the Bay due to sand mining and upland disposal of dredged materials (once dumped back in the Bay off Alcatraz). Bayfloor erosion is on the rise, as a result. As the subsided salt ponds are being restored, they will act as a major new sediment sink in the topography of the bay floor and shore. Finding ways to modify restoration projects, dredged material disposal practices and sand mining to maximize sediment deposition and minimize pollutant mobilization could tip the balance in terms of ecosystem health.

Perils for Young Fish

Recent surveys of fish populations in the Delta have detected a mysterious collapse in numbers of many species. Exposure to toxic chemicals is one possible factor under consideration as contributing to the declines. Other possible causes include invasive species that may have impacted the food chain from the bottom up, and operation of the Delta plumbing system sending water south or to the Bay Area. Several recent studies have suggested that it is plausible that pollutant concentrations in the Estuary may be high enough to reduce survival of the sensitive early life stages of fish. Research on Sacramento splittail suggests that selenium may be causing abnormal swimming behavior and developmental abnormalities like lost tails, curved spines, and protruding eyes. With such deformities, they are unlikely to survive to adulthood. This study, and another of white sturgeon, suggest there may be enough selenium in the Bay food web to reduce survival of the young of two important native fish species in the Estuary. The natives aren't the only ones suffering from pollutants in their watery habitat and food, nor are the wild fish better off than the hatchery fish as in other ecosystems. A recent study found Sacramento River striped bass had much higher body burdens of PCBs, PBDEs, and pesticides than bass raised in local hatcheries. In lab experiments, larvae from the hatchery also outgrew and outlived larvae from the river, and the pollutant burdens are thought to be the cause. In 2005 the RMP is initiating a multi-year investigation of the potential impacts of pollutants on shiner surfperch, a Bay fish species considered to be a good indicator of potential pollutant impacts on Bay fish populations in general.

Lessons and Ambitions

The RMP team have subjected their program to the same level of scrutiny that their mud and water samples get in the lab. The Program underwent major reviews and resulting modifications in 1997 and 2003. In the most recent review, managers took a hard look at lessons learned during more than a decade of monitoring and special study results, and came up with a list of more than 50 conclusions.

One lesson learned, for example, is that quite often those factors limiting attainment of pollutant standards and beneficial use of the region's waters are non-chemical -- exotic species, habitat alterations, freshwater diversions and the like. Thus the protection and restoration of beneficial uses now requires a different and larger set of tools than those used to deal with pollutants of concern. In another general lesson learned, it has become clear that the capacity of the Estuary to degrade, bury or dilute has historically been greatly exceeded for pollutants such as mercury and PCBs. Emerging and as yet unregulated pollutants such as flame retardants promise to tax the Estuary's capacity further. This makes it even more important than ever to cut new inputs of legacy pollutants down to levels the Estuary can assimilate.

These kinds of lessons are reshaping the questions the S.F. Bay Regional Water Quality Control Board is asking the RMP to answer. In response, RMP managers have updated their old objectives and set one new one: to forecast pollutant trends and ecosystem recovery. The new objectives, and a spate of new questions RMP is retooling itself to answer, reflect fundamental shifts in how water quality and associated beneficial uses are managed. To address these shifts, water quality monitoring must better link to restoration and watershed assessments and monitoring must prove itself invaluable to cost effective management in a time of shrinking budgets for environmental protection.