CONTAMINANTS

Small Fish Test Helps Target PCB Clean Up

Jay Davis didn't expect much from a pilot test for PCBs in silversides and topsmelt that live on the edges of the San Francisco Bay. The monitoring program he heads only ran the test on these small fish, which rarely grow more than 3-4 inches long, because it was simple to piggyback on an existing study of mercury in the same fish samples. "I thought it wouldn't really be a big deal," says Davis, who is lead scientist for the Bay Regional Monitoring Program (RMP). PCBs, a toxicant linked to cancer, accumulate in fat as bigger creatures eat littler ones, so Davis assumed concentrations would be lower in small fish than in larger sport fish. The pilot study revealed the opposite was true. "This is why we do measurements," he says.

Based on results from pilot tests on samples from six sites, the RMP expanded its testing to 35 sites and confirmed earlier results. Small fish (Mississippi silverside, *Menidia audens* and topsmelt, *Atherinops affini*) had PCB concentrations up to 1,300 parts per billion — 10 times more than the most contaminated sport fish (including striped bass, *Morone saxatilis*, which have an advisory against eating them and can reach up to two feet long).

This surprising finding gives us new insights into the ecology of the Bay. "We think this means small fish on the margins are not part of the sport fish food web," Davis says. "Otherwise concentrations in sport fish would be higher." The sport fish food web includes cormorants and seals. These small fish likely belong to a second food web, however, that includes least terns (*Sternula antillarum*) and other fish-eating species that forage on the edge of the Bay.

While PCBs were banned in 1979, these toxic chemicals are still a problem today. This is partly because they last a long time in the environment, and partly because those in use in the late '70s were grandfathered in and some of these are still in use now, mostly in electrical capacitors and transformers. PCBs stick to soil and hitchhike on sediment that washes into the Bay, forming contaminated hotspots. While much of the PCB-laden sediment migrated downstream in the past, some continues to wash down today from contaminated sites upstream.

The highly contaminated small fish came from known PCB hotspots such as Oakland Harbor and Richmond's Stege Marsh, which is downstream of an electrical yard. Unlike sport fish, which swim the open waters of the Bay and so move in and out of PCB hotspots, small fish on the edges tend to stay in one place. This means small fish in hotspots are continuously exposed.

The newly-discovered link between PCBs and small fish — which is presented in the RMP's recent report on PCBs in the Bay — will help inform management actions and controls. Such actions may derive from initiatives such as watershed planning and implementation of the Total Maximum Daily Load (TMDL) for PCBs regionwide by state water quality regulators. "The current PCBs TMDL is based on a very simple model of the Bay as a big box of uniformly mixed water and sediment," Davis says. "The new report is the basis for a new model that also includes lots of little boxes on the edge."

PCBs build up on the edge because these shallow waters, which are a foot or less deep at the lowest tides, don't mix much with the rest of the Bay. Davis likens the situation to a bathtub ring of hotspots around Bay margins.

"This is where the action is, not only where contaminants come in but also where management can most readily make a difference," says Davis.

Most of the PCBs currently washing into hotspots on the Bay margins likely come from urban runoff or stormwater, which drains into creeks and channels that feed into the Bay. "PCB levels are quite low in discharges from municipal water treatment plants, which leaves municipal stormwater [as a likely source]," says Janet O'Hara, an engineer at the San Francisco Bay Regional Water Quality Control Board who heads implementation of the PCBs TMDL. "The small fish work gives us more ways to monitor PCBs." Monitoring is key in assessing the success of upstream cleanup efforts.

The RMP's new PCBs report will also inform the upcoming revision of the Municipal Regional Stormwater Permit, which helps implement the PCBs TMDL. "We like the report's emphasis on doing more source control, such as identifying and cleaning up contaminated properties," says Jonathan Konnan, an engineer at EOA, Inc., an Oakland-based company that helps local governments in the Bay Area manage stormwater pollution. "For example, you can use the history of land use to find likely suspects and follow up by collecting sediment and soil samples in the field."

Identifying and decontaminating upstream PCB sources has the potential to payoff relatively quickly, as clean new sediment covers the contaminated old sediment on the edges of the Bay. Says Davis, "It's conceivable that PCB levels could drop significantly in small fish in less than 10 years." **RM**

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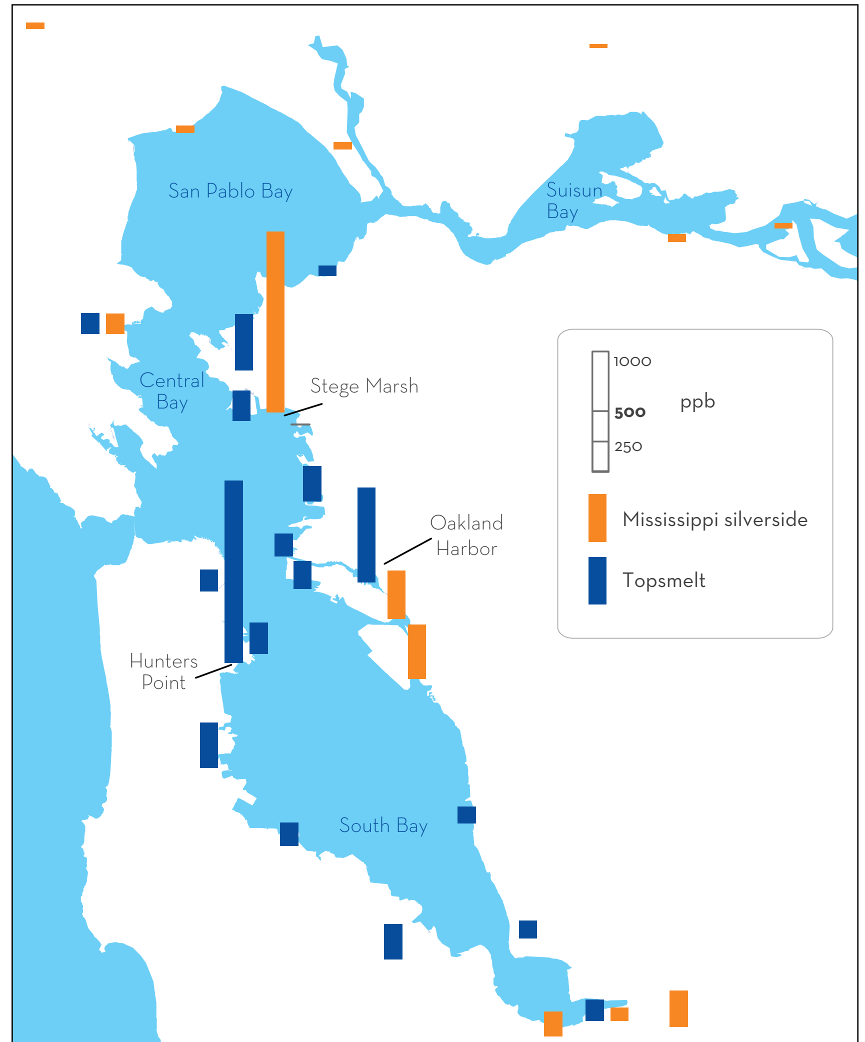
MORE INFO? SFEI PCBs Report www.sfei.org/news_items/pcb-synthesis-report



PCBs by weight (ppb wet weight) in small fish in 2010. Fish collection and mercury study conducted by Ben Greenfield and Rachel Allen, SFEI. Source: SFEI

Darell Slotton and Shaun Ayers drag a bay hot spot for small fish, so they can be tested for mercury, PCBs and other contaminants. Photos courtesy Rachel Allen.

STORM WATER

Newcomb – Not Just LID

Low Impact Development (LID), as it turns out, can have huge impacts on communities. The community around the 1700-block of Newcomb Avenue in San Francisco, for example, no longer floods during storms. And its redevelopment has had myriad unforeseen benefits to local residents.

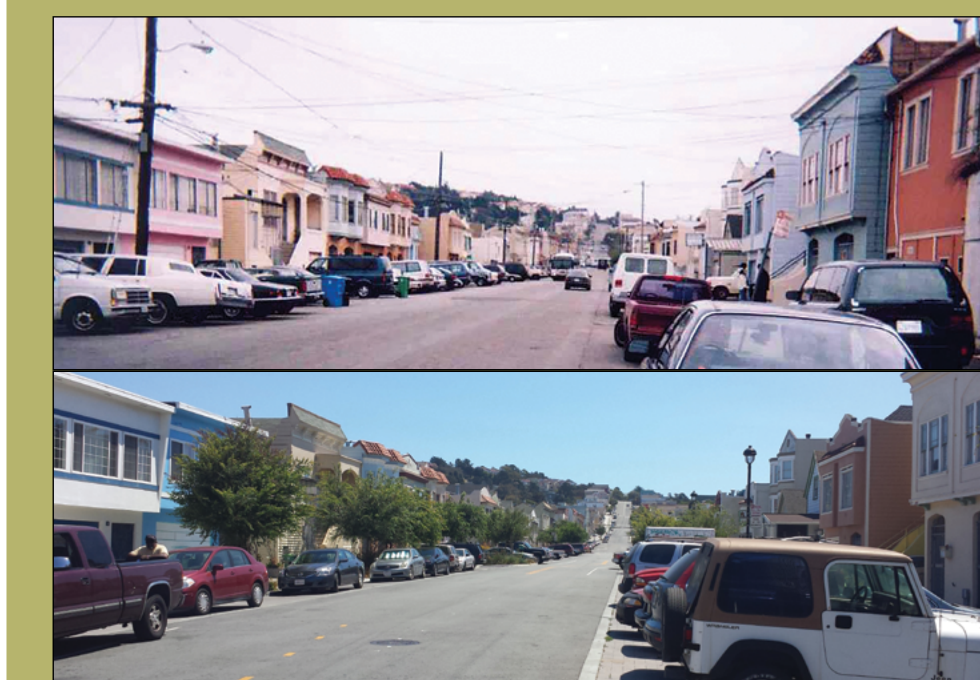
The project began in 2009. The community began meeting in homes and garages to discuss goals and desired outcomes for their block. By organizing themselves and attending Redevelopment Agency meetings, this small group of San Francisco residents received a Community Challenge Grant to make improvements.

Architecture for Humanity subsequently offered to design the block for residents. Their design featured a traffic calming chicane, streetlights, permeable paving stones, and an array of native gardens and trees. Based on the designs, the Redevelopment Agency, the City of San Francisco, and the USEPA (through a San Francisco Estuary Partnership grant) all contributed funds to pay for the nearly $1.7 million project.

Though construction ended in 2012 residents continue to meet. The process they went through to win the grant, not to mention the physical changes to their block, created a new sense of community. Sandi Michellotti, a resident on Newcomb, worked hand in hand with her neighbors: "The block is very close now. We go to dinner or out together some evenings, and one neighbor even helped me find a second part time job... We have grown to depend on one another."

Today, Newcomb Avenue no longer floods during storms because the water now has someplace to go other than sheeting across concrete into drains. Instead it filters through 20,891 square feet of permeable surface, 23 new trees, and a plethora of drought tolerant plants.

While professionals speaking of LID normally focus on the benefits of storm water treatment, groundwater recharge, drought tolerant landscaping, and a reduction of sewer flows, the improvements to street-life may be of equal value. The islands of lush green in a sea of grey provide residents with a closer connection to their urban environment by linking it to their natural one. **JM**



Newcomb Street before and after the low impact development project curbing flooding. Photos by San Francisco Planning Department (top) and James Muller (bottom).