Highlights of The Pulse of the Estuary
Presentation at the RMP Annual Meeting
March 9, 2001
Michael May

Note: Not an exact transcript.

Good morning. I'd like to start my presentation by giving you an idea of what we are trying to accomplish with The Pulse of the Estuary, the philosophy behind it. Then I will present some of the main results.

The creation of the Pulse was driven by a few ideas, such as:
• RMP results are worthy of a larger audience. They can and should be made more accessible to more people. [Graphic #1] In the non-technical group are those people who don't have any interest in details such as the best species to use in toxicity tests, or what guidelines to use. They want us to figure these things out, to make appropriate choices and provide the results that follow.
• The entire monitoring/management cycle should be addressed in the same document.
Typically, one finds monitoring results in one document, and management actions and plans in actions in other documents. This is a real world representation of the fact that these processes are not linked as well as they should be, or at least that they appear to not be linked as well as they should be. The Pulse tries to look at contamination issues from start to finish, to layout a logical sequence that we all hope is what actually takes place [Graphic #2]:

1. Monitor. Monitoring occurs, based on a concern that there could be problems that need attention.
2. Learn, Find. A contamination problem is identified.
Above all else, the RMP should serve to identify situations that should be acted upon (problems).
3. Fix. Management works to resolve the problem, aided by monitoring information.
4. Confirm fix. Monitoring continues to determine if the management action was effective.

The role the RMP plays in this cycle-that's where the value of the program to the broader community can be seen, beyond providing jobs for a couple dozen people. So we are trying in the Pulse to examine the whole cycle.

One of the primary needs in the Pulse was to find ways to simply depict the overall level of contamination in the Estuary. Here is one such depiction, a map of overall water quality over the last 7 years [Graphic #3]. This is a combination of data for all contaminants. Combining all contaminants—does this give us something meaningful? I would contend that this is one of the most meaningful single maps on water quality that we have. What is this really showing?

Well, to determine the values for each location, all samples from that location were individually compared to all applicable guidelines-guidelines for trace elements such as mercury and copper, and organic contaminant guidelines such as Total DDTs and Total PCBs. By the way, we are now using the latest guidelines, known as the California Toxics Rule. Most metals are measured on a dissolved basis-the particles, and any contaminants bound to them are filtered out before the measurement-the idea being, as mentioned in the Toxics Rule, that the particle-bound contaminants are not bioavailable and thus the dissolved measurement more accurately represents the ecological threat.

If, for a given sample, there were any guideline exceedances, that sample was tallied in one group, what we could call the "contaminated" group. If there were no exceedances, that sample was considered "clean." The proportion of clean versus contaminated samples is displayed on this map. Let's look at the Golden Gate sampling station, with a value of a little over 40%. 40% of the water samples from that location had some water quality issue, in the form of guidelines exceedances. Conversely, 60% of the samples were "clean." And isn't this the fundamental question: Is the water clean, or not? The particular contaminants in the water is really a secondary concern, as is the cause of a roof leak; the first question is, is the roof leaking or not? Looking at some other location around the Bay, we can se at places like the Petaluma River and the South Bay sloughs, the water sampled has never been clean. Now to be fair, I must point out something: The South Bay, for example, is one of the few places were we sample so far upstream. Note the areas where we have no sampling stations [highlight the east bay shore and west bay shore]. If we sampled in these areas, the South Bay sloughs and these other areas may very well not stick out so prominently. They may still, but they may not. So keep that in mind. We are likely going to place more stations in these zones in the future as we work to collect better data for identifying sources of contamination; I think you will hear about these plans later today.

Now, in spite of the usefulness of the previous map for getting an overall idea of water quality, specific information on specific contaminants is important. So, we developed the following map. [Graphic #4] Here, for each location, if there is a contaminant that exceeds its guideline more than 90% of the time-in more than 90% of the samples-that contaminant is listed. So, what can this tell us? First, it's clear that PCBs are the biggest culprit as far as exceedances. It's also clear that the South Bay sloughs and Petaluma River seem to have the worst problem, with several contaminants each exceeding guidelines more than 90% of the time. It's interesting to note Grizzly Bay. Note that the 1st map tells us that some contaminant is exceeded in 100% of the samples. Yet this map shows us that there is no contaminant that exceeds its guidelines more than 90% of the time. This tells us that, for Grizzly Bay, for one sample it's one thing, and for another sample its something else; there is a lot of variation in what contaminates the water there.

Now, I'd like to show you another "overall" map, this time for sediment [Graphic #5]. The same type of compilation here, compare each sample to all guidelines, except in this case, all trace element guideline exceedances were ignored. We decided to do this because the Estuary is a special case when it comes to trace metals. which naturally has a lot of several trace elements, such as nickel, in the soils and rocks of the watersheds. The Estuary has always had a lot of these metals. Some like nickel and chromium do not appear to be causing harm, and thus these national guidelines are not really applicable to our Estuary. The organics guidelines, however, should be applicable, and are used to create this map. What we see is that, even while we ignore the trace elements, nearly all sediment sampling locations contained contaminated sediment nearly all the time. Most of the sites that have exceedances in only 80 or 90% of the samples are locations with coarse sediment, which will, all else being equal, always have lower contaminant levels simply because there is less surface area for the contaminants to bind to.

Looking at the contaminant map [Graphic #6], to see which contaminants are exceeded in more than 90% of the samples, we see a much more active situation than with water. Note that the trace elements are shown but grayed out, given the uncertainty with the guidelines. I'll ignore them here. First, note that for all locations, the organochlorine pesticide Dieldrin is over guideline in more than 90% of the samples. Next notice that DDTs are a real issue in many locations, and chlordanes and PCBs in the sediments of the South Bay sloughs.

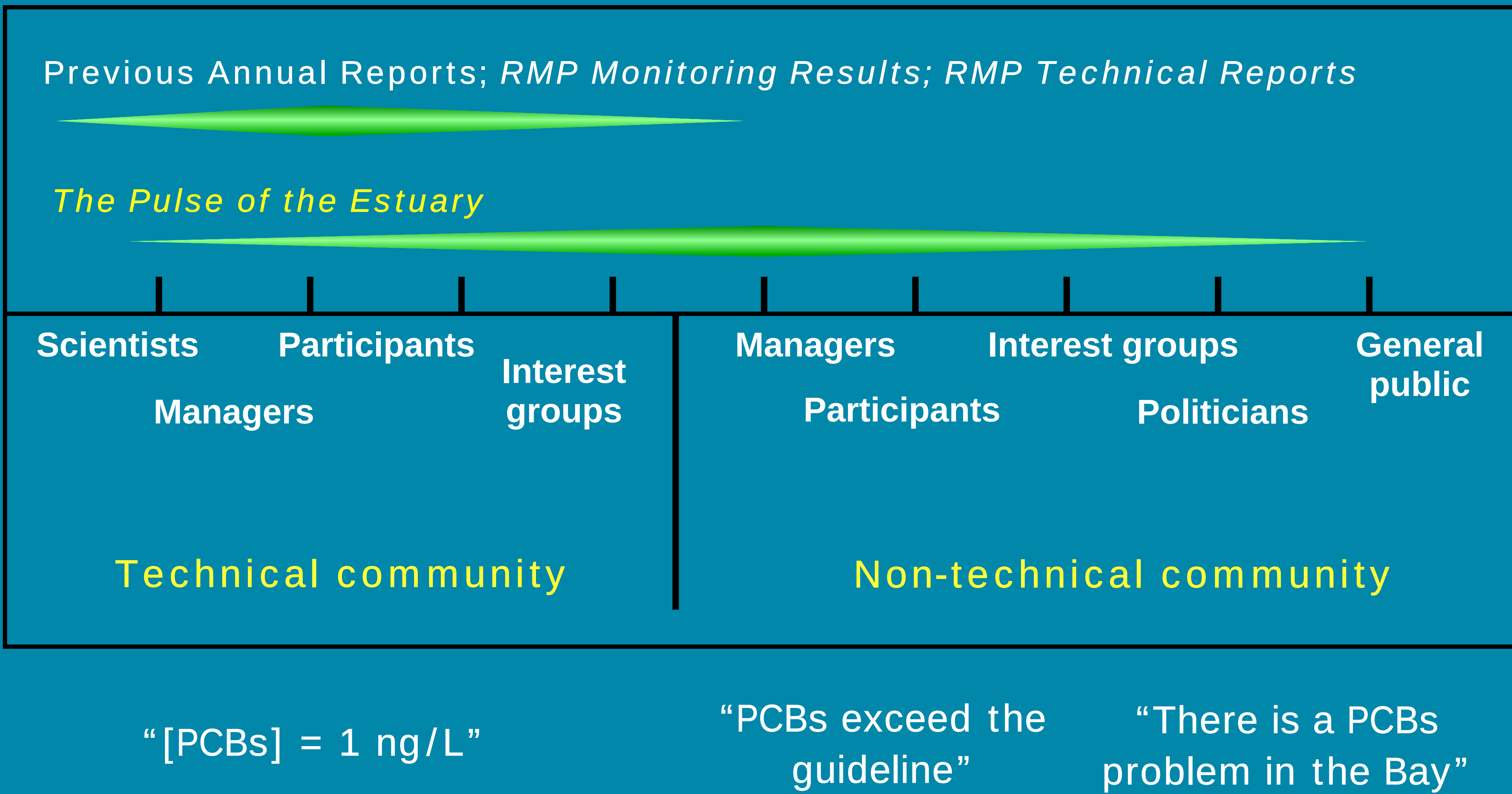
Now for sediments, there is a sort of two-tier system of guidelines: The more conservative or more protective "Effect Range Low" guidelines (or ERLs), and the less conservative Effect Range Median guidelines or ERMs. If you have heard of these but still don't really know how they are determined, there is a good explanation in volume 2, number 2 of the RMP News newsletter, which you can get on our web site (www.sfei.org). There is the idea that perhaps we should be basing our sediment quality map on the ERM guidelines. Let's see what happens if we compare our sediment data to the ERM guidelines. [Graphic #7]. A much better picture, except if you are looking at the South Bay sloughs (it's the chlordanes, by the way, that are mainly responsible for the South Bay ERM exceedances.) Maybe we should focus on comparing to ERMs and showing this map as the overall sediment picture. I would disagree, for this reason. [Graphic #8]. This is a map of sediment toxicity test results-take a sediment sample to the lab, put some critters in with the sediment. The sediment from many places in the Estuary is toxic to lab organisms a fair amount of the time. This is not proven harm in the Estuary itself, but it's an indication of potential harm that should be taken very seriously. So I would argue that the situation is not as benign as the ERM comparison suggests.

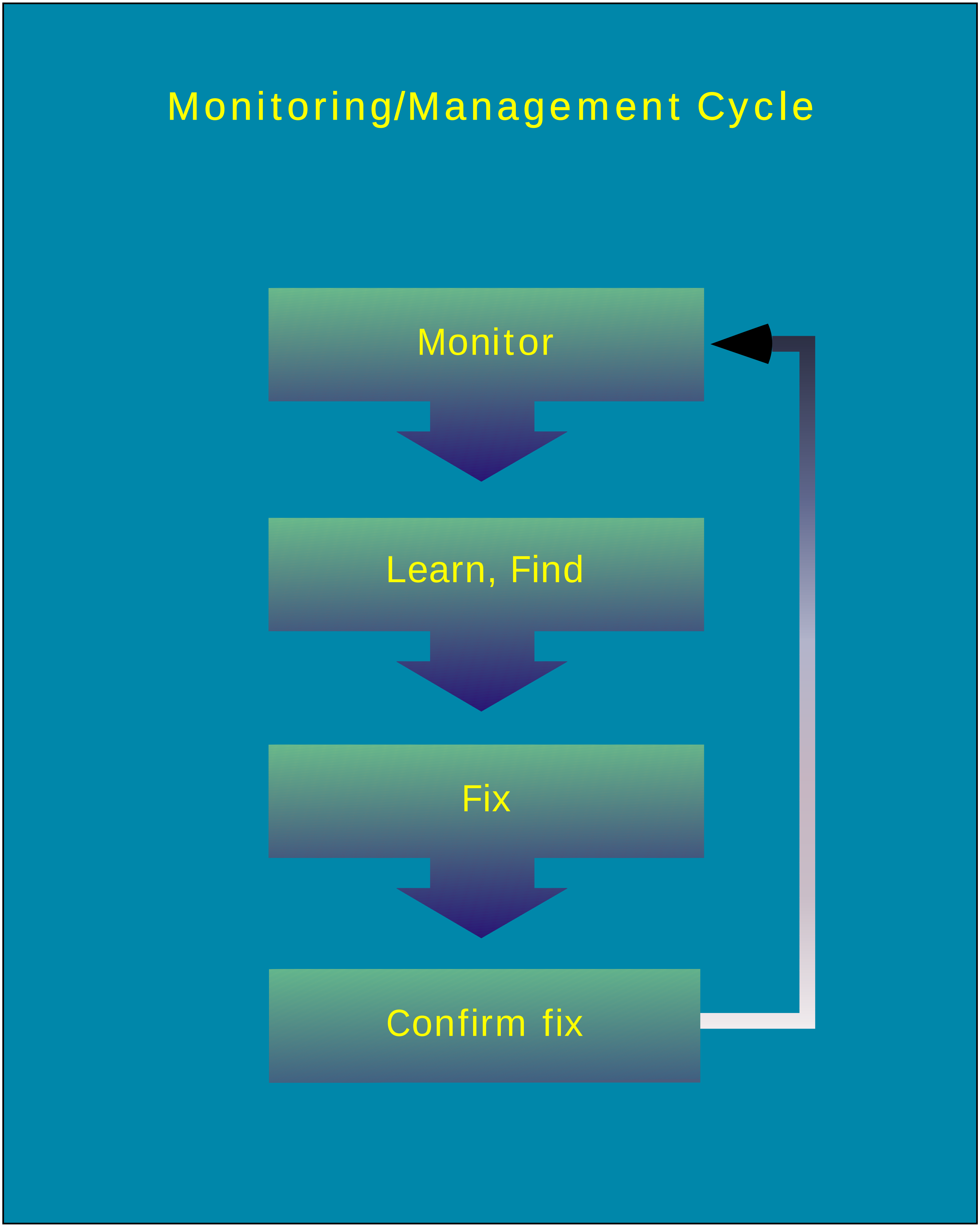
Now at this point, let me mention probably the greatest shortcoming of all of these maps. They rely heavily-obviously-on the guidelines, and that those guidelines accurately represent a true threshold of potential harm to the environment or ourselves. Guidelines are difficult to set, and are not perfect. These maps are only as good as the guidelines.

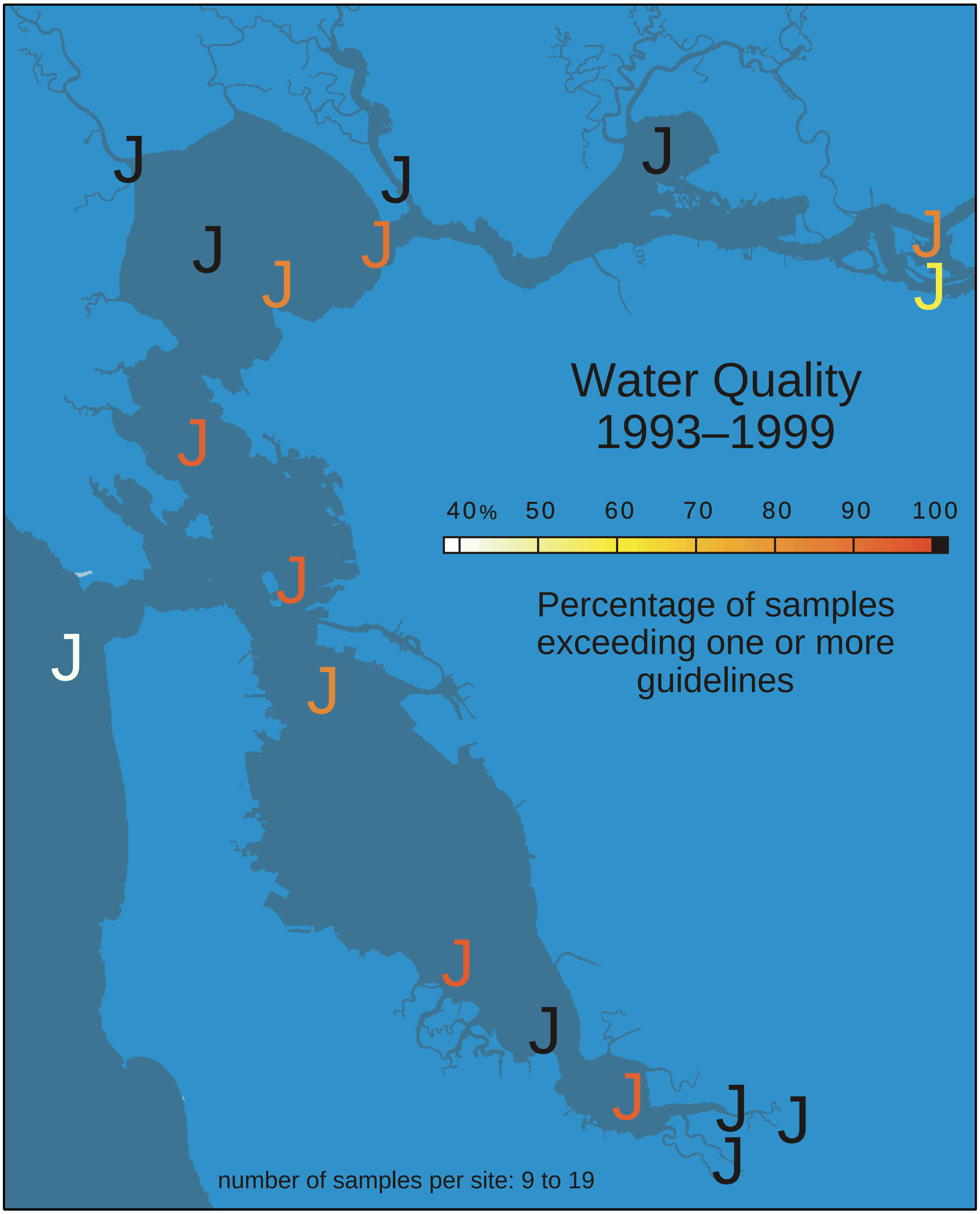
Now, all I have shown up to this point has been what could be called status maps, combining all years into one. What about trends over the past seven years of RMP monitoring? Well, the simple answer is that there are none. There is a trend here for one contaminant at one location, a trend there, but really, for the contaminants that we are most concerned about, we have seen no decreasing-or increasing- trend. Now, in an environment as variable as the Estuary, seven years is really not much time for a trend to emerge the noise. It would have to be a fairly rapid trend to do so. So, the good news is, thins are not rapidly getting worse, the bad news is things are not rapidly getting better either. As we continue monitoring, we hope that some genuine trends-downward trends-will appear.

Work to display RMP data in summarized yet meaningful ways continues. Additional products of this work will appear in future editions of The Pulse of the Estuary. Thank you.

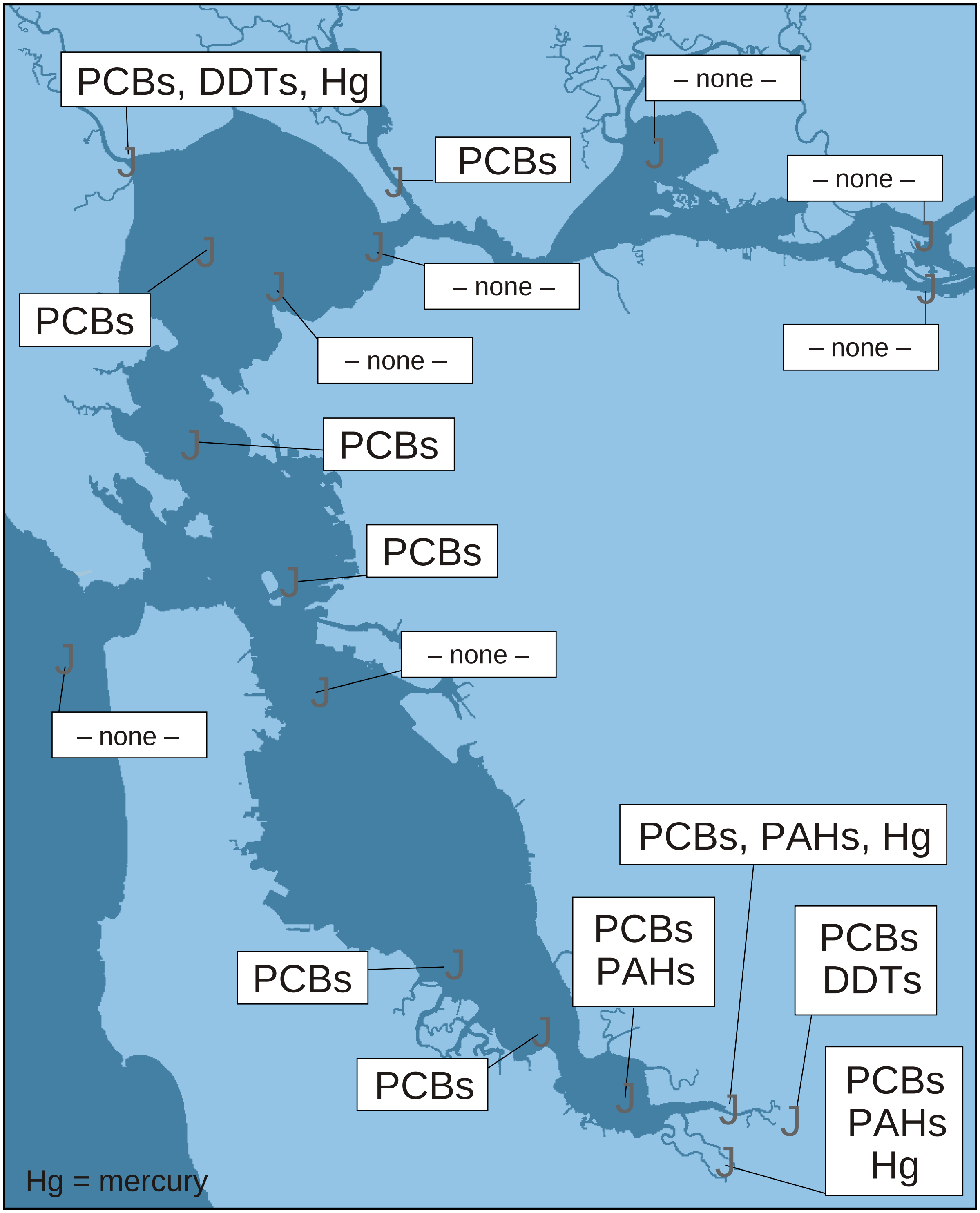
Audiences for RMP Monitoring Results



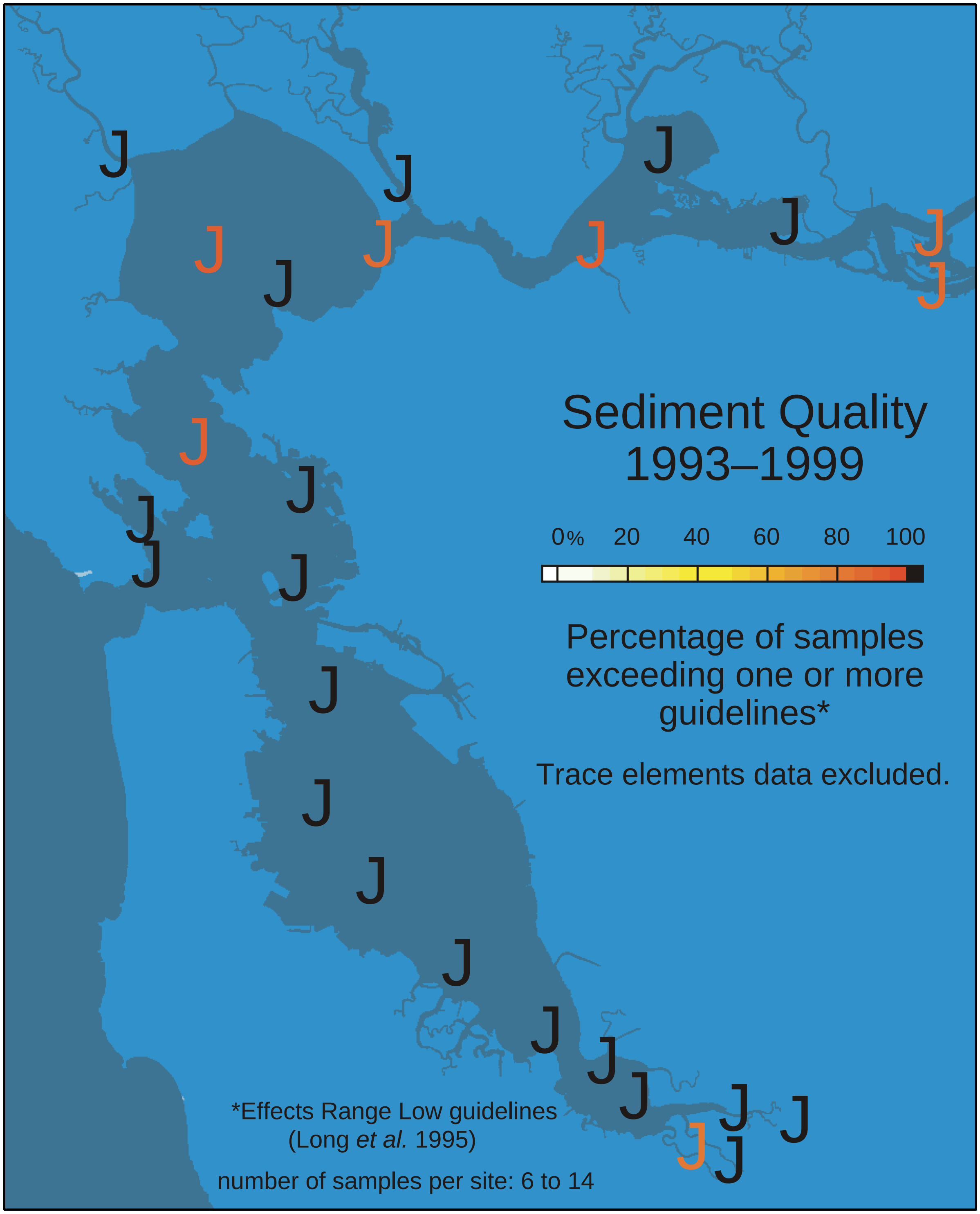

Monitoring/Management Cycle
Monitor
Learn, Find
Fix
Confirm fix

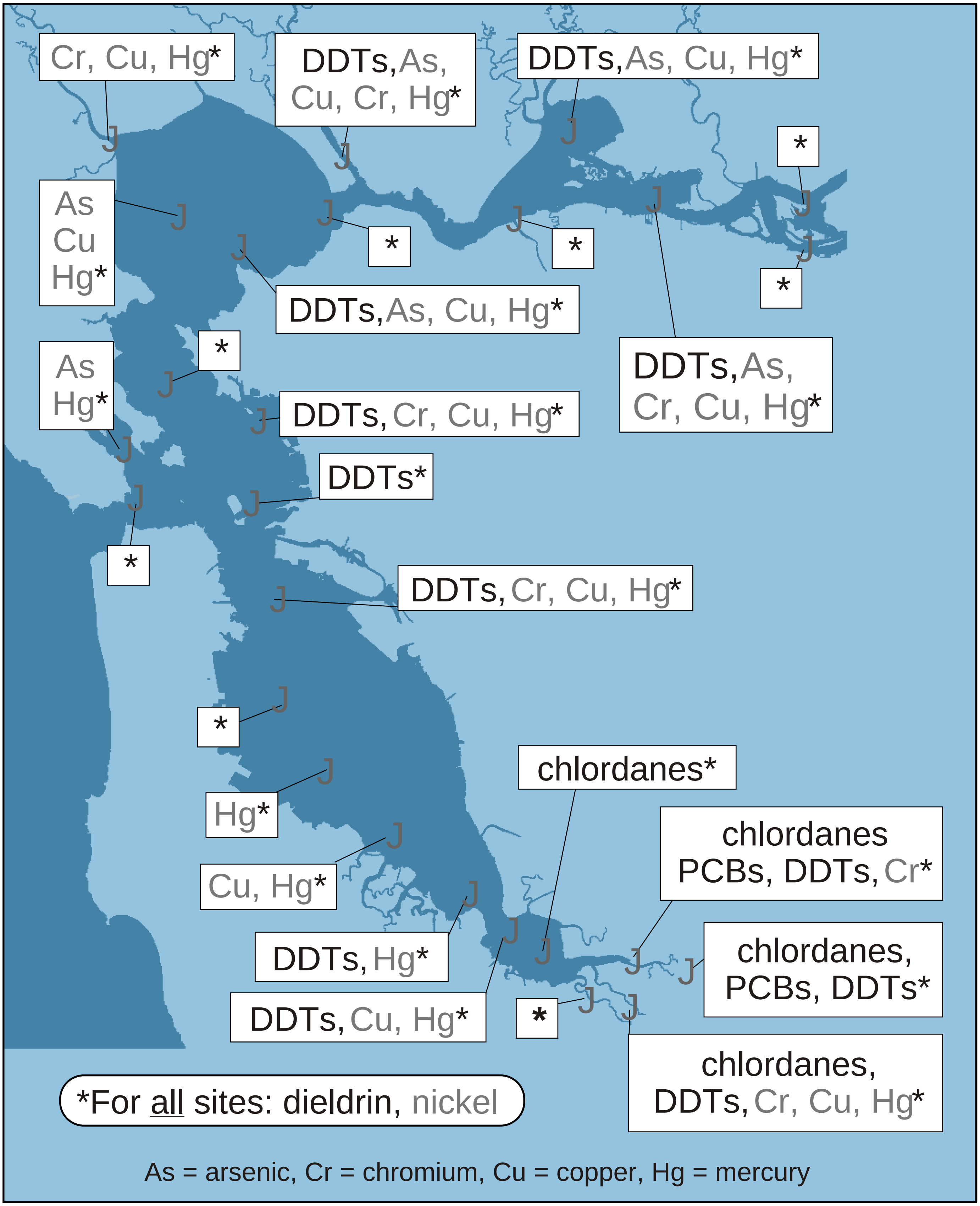


Water Quality
1993–1999
40% 50 60 70 80 90 100
Percentage of samples exceeding one or more guidelines
number of samples per site: 9 to 19

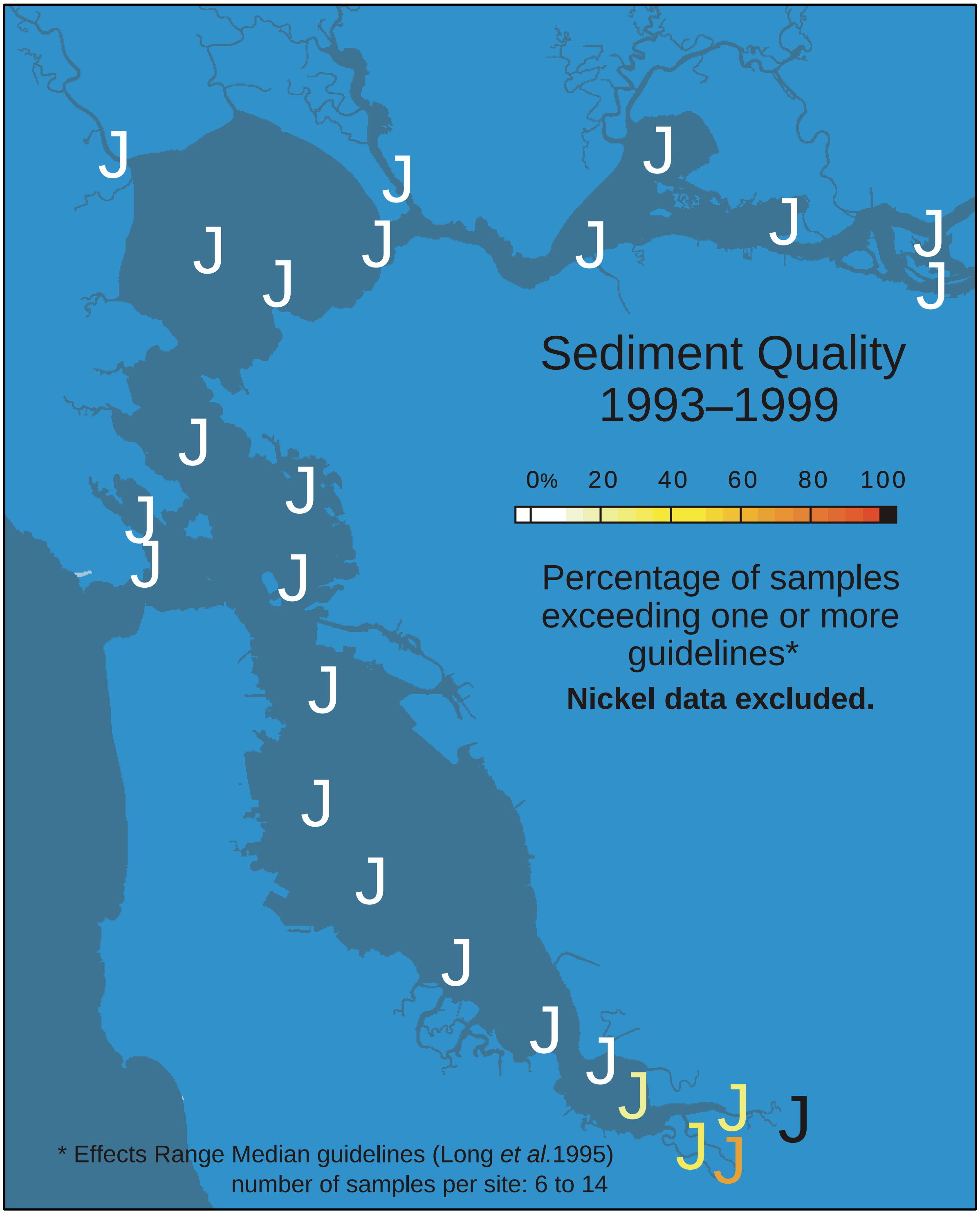


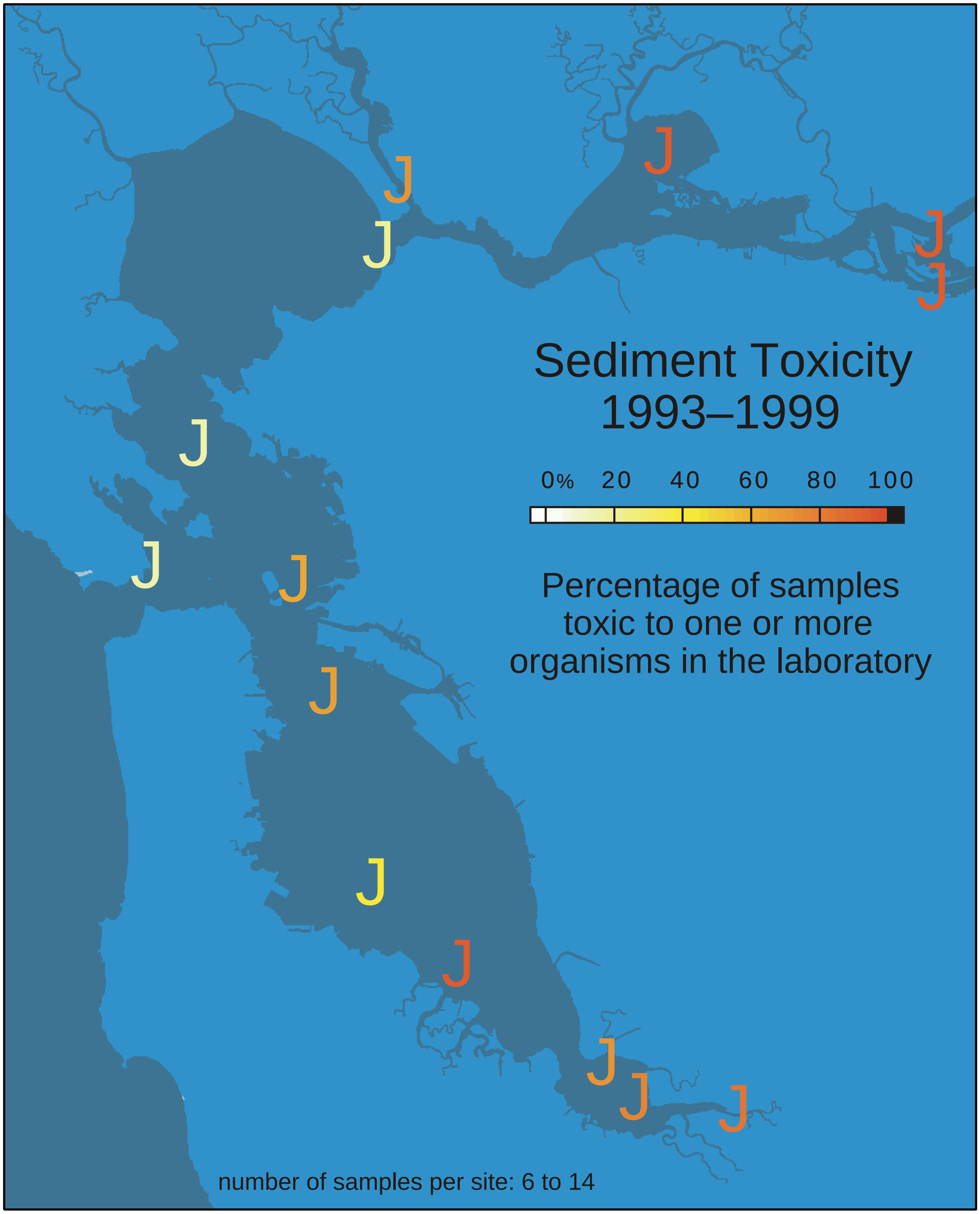
Contaminants that exceed guidelines in more than 90% of samples, by location


Sediment Quality
1993–1999
0% 20 40 60 80 100
Percentage of samples exceeding one or more guidelines*
Trace elements data excluded.
*Effects Range Low guidelines
(Long *et al.* 1995)
number of samples per site: 6 to 14



Contaminants that exceed guidelines in more than 90% of samples, by location


Sediment Quality
1993–1999
0% 20 40 60 80 100
Percentage of samples exceeding one or more guidelines*
Nickel data excluded.
* Effects Range Median guidelines (Long et al.1995)
number of samples per site: 6 to 14


Sediment Toxicity
1993–1999
0% 20 40 60 80 100
Percentage of samples
toxic to one or more
organisms in the laboratory
number of samples per site: 6 to 14