From: Gfredlee@aol.com
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To: rwoodard@goldeneye.water.ca.gov
Subject: Re: Comments on CALFED Volume III Ecosystem Restoration Plan Monitoring ← Re:

to be frustrating for many years because of the difficulty in trying to relate morphological changes in fish to environmental factors. A number of groups have been working on this problem for many years with limited success. It does not mean it should not be done. It should be understood, however, that fish condition monitoring is necessary for problem identification, but will not likely yield useful results in the near term other than problem identification.

Page 105, "Key focused-Research Topic Areas," mentions in item 2, "Pilot-level water and sediment contaminants ..." The issue of sediment monitoring for chemical constituents and toxicity is an issue that I have focused on for over 30 years. I have conducted over $2 million in research on this topic and have published over 50 papers and reports dealing with various aspects of it. While there is need for studies on sediment impacts on water quality, to conduct a routine monitoring program of chemical concentrations of constituents and sediments is of limited utility. Even toxicity measurements in sediments, while far more reliable than chemical concentration measurements for identifying toxic conditions, still do not provide interpretable results with respect to the significance of chemical constituents in sediments that impact the beneficial uses of the waterbody in which the sediments are located. Last fall I presented an invited paper, Lee, G.F. and Jones-Lee A., "Evaluation of the Water Quality Significance of the Chemical Constituents in Aquatic Sediments: Coupling Sediment Quality Evaluation Results to Significant Water Quality Impacts," In: WEFTEC '96, Surface Water Quality and Ecology I & II, Vol 4, pp 317-328, Proc. Water Environ. Fed. Annual Conference (1996), in which I discussed the interpretation of sediment toxicity issues relative to water quality - use impairment impacts and natural toxicity of sediments. This paper is available as a downloadable file from my web site (http://members.aol.com/gfredlee/gfl.htm).

Based on my experience, CALFED needs to carefully formulate a sediment quality investigation program that properly incorporates what is well known in the field today with how chemical constituents in sediments potentially impact the beneficial use of a waterbody. CALFED needs to develop a program that begins to address the highly significant data gaps that exist between measurement of a characteristic of a sediment and the beneficial use of the waterbodies in which the sediments are located. CALFED water quality sediment programs should be based on an effects-based approach rather than a chemical approach. The US EPA and Corps of Engineers, as part of managing open water disposal of contaminated dredged sediments, adopted an effects-based approach in the late 1970s. The approach has been reaffirmed a number of times by both agencies. It has been through public Federal

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Register review and is an effective, reliable approach for assessing the potential impacts of chemical constituents in sediments. There are peer review guidance manuals on various testing procedures that are used to evaluate the effects of constituents in sediments that are jointly developed by the US EPA and Corps of Engineers. This is a far more reliable approach than the chemically-based approach. While bureaucratically simpler to implement, the chemically-based approach is technically invalid and can readily result in massive waste of public and private funds in sediment constituent control that will have no impact on the beneficial uses of the waterbody in which the sediments are located. I have published a number of papers on these issues which are available from my web site.

Page 105, under "Key Focused-Research Topic Areas," item 3, "Development and implementation of biomarkers..." indicates that CALFED plans to devote resources to this area. CALFED should proceed cautiously with devoting resources to trying to use biomarkers as a tool to identify adverse impacts of chemicals to aquatic life. The biomarker concept and approach has been around since the late 1960s. I have been following the use of biomarkers for assessing impacts of chemicals on aquatic organisms since the 1960s. While this is an area of interest, it is not one that should receive a lot of CALFED funding. A couple of years ago the ASTM held a three day conference devoted to a review of what is known about the reliability of biomarkers as an indicator of water quality/ecosystem impacts of chemical constituents, this resulted in the symposium proceedings entitled, Environmental Toxicology and Risk Assessment: Biomarkers and Risk Assessment, Fifth Volume, STP 1306 (1996). The consensus of the group at the meeting was that while biomarkers are of interest, they are years away from being a reliable tool to evaluate the potential for chemical constituents to adversely impact aquatic organisms, ecosystems or water quality. Basically, biomarkers are now only useful to indicate that there has been an exposure to a chemical. What the biomarker response means is largely unknown and is not likely to be elucidated in time to be of much value to at least the first 10 years of CALFED.

Page 105, right column, Sub-Program Element Descriptions, the development of wetlands and riparian habitat. As an individual who did some of the first, if not the first work ever done on chemical characteristics of fresh water wetlands and who has been involved in wetlands water quality issues over the last 30 years, I am strongly supportive of work in this area. However, great caution must be exercised to be sure that the monitoring programs properly evaluate the chemical/biochemical characteristics of wetlands. There is considerable misconception about these areas and especially how such areas handle potential pollutants. Generally wetland areas tend to be able to detoxify, immobilize or otherwise render inert large amounts of potentially harmful chemical constituents. They can, however, be overloaded. Further, in evaluating wetlands, it is important to look at the annual cycle and not just the growing season. Large amounts of materials that are taken up by vegetation during the growing season are released in short periods of high

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flow during the late winter/early spring.

Another area of concern is the use of contaminated dredged sediments for shallow water habitat development. I have submitted a proposal to CALFED to work with CALFED management and others in developing a program where contaminated dredged sediments could potentially be used for shallow water habitat development. This will require an intensive monitoring program to be certain that the contaminants in the sediments do not adversely affect aquatic as well as terrestrial life and other aspects of Delta water quality. If the proposal is funded, I will be able to assist in these areas as an active participant. As discussed in the proposal, I have considerable experience and expertise in wetlands development from contaminated sediments through the work I have done over the years with the Corps of Engineers in their Dredged Material Research Program.

Page 106, right column, Sub-Program: Estuary Primary Productivity and Nutrient Monitoring indicates that "particulate, dissolved, and total organic carbon" will be measured. In addition, there is need to characterize the organic carbon with respect to its suitability as a food source. Much of the organic carbon that is present in the Delta and in many aquatic systems is a residue after bacteria, etc. have made use of all the degradable components. Even a simple BOD test would be useful to determine how much of the organic carbon is in fact degradable/useable as food.

The bulleted items under the Sub-Program include dissolved nitrogen. In addition, soluble orthophosphate, organic nitrogen and total phosphate should be measured. While, in general, the Delta primary production appears to be limited by available nitrogen in the form of nitrate and ammonia, there is potential for some parts of the Delta and estuary to have surplus nitrate and ammonia compared to available phosphorus. By measuring the soluble orthophosphate and the total phosphate, it is possible to predict the algal available phosphorus. This is of potential importance since it may be possible to limit excessive algal growth in some parts of the Delta by limiting the phosphorus input to the Delta from domestic wastewater sources. Development of this type of data will enable a proper evaluation of this approach to be made.

In addition to measuring chlorophyll, presumably from planktonic algae, there is also need to assess the amount of attached algae and macrophytes. Some parts of the Delta are experiencing prolific growths of non-planktonic aquatic plants. It is important to gain some information on this biomass since it will directly compete with the planktonic algae for nutrients. Someone highly familiar with data of this type should review the USGS data that has been collected over the years as part of their standard cruises to determine what additional information is needed to understand the issues. This is an area in which I could be of assistance if there is interest.

Page 107, under "Key Focused Research Areas," there is need to examine the

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productivity of algae attached to surfaces. Also, since wetland areas can have appreciable nitrogen fixation occur on the surface of macrophytes and emergent plants, consideration should be given to assessment to nitrogen fixation in the Delta as a source of nutrients.

In the 1970s, I was asked by the US EPA to develop a water quality monitoring program for hazardous chemicals in the Great Lakes. When I moved back to California in 1989, I updated that program and expanded its scope in the form of a report entitled, "Guidance for Conducting Water Quality Studies for Developing Control Programs for Toxic Contaminants in Wastewaters and Stormwater Runoff" (1992). This report discusses many of the key issues that need to be considered in formulating a technically valid, cost effective water quality and ecosystem monitoring program for the Delta. The report is available as a downloadable file from my web site. Another source of information on developing monitoring programs is the National Research Council's "Assessment of Marine Monitoring: Managing Troubled Waters," 1990. It also provides guidance on the issues that should be considered by CALFED in formulating the Delta's Water Quality Monitoring Program.

Over the past year and a half, I have been active in the Sacramento River Watershed Program where a considerable part of my time has been devoted to discussion of issues that should be considered in formulating a water quality monitoring program for the Sacramento River system. Many of the same issues that have been addressed as part of that system have direct appliability to the Delta system as well. A number of my comments on issues that should be considered in developing a comprehensive monitoring program for the Sacramento River system are available from my web site.

Overall, I feel that there is need for further refinement of the Ecosystem Restoration Program Plan Vision for Ecosystem Monitoring to address the various issues I have raised in these comments. I would be happy to discuss these with anyone interested and be of assistance to the extent that I can.

Please contact me if you have questions on these comments.

Sincerely yours,

Fred

G. Fred Lee, PhD, DEE

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