

**STRAWMAN PROPOSAL FOR GENERATING
ECOLOGICAL INDICATORS FOR CALFED:
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Terry F. Young, Ph.D.
Rodney Fujita, Ph.D.
Karen Levy

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BACKGROUND

While the use of "ecological indicators" has become a popular concept within the context of CALFED discussions, the presumed purpose of the indicators varies widely. In this proposal, we are referring to a set of ecological indicators that is comprehensive and relates to all relevant levels of ecological hierarchy, consistent with the framework described in the EDF/TBI indicator report. The reason that we continue to stress the need for a comprehensive set of indicators that relates specifically to ecological health is that this set of indicators, in our view, is a fundamental prerequisite to a satisfactory CALFED package. In order to assure the environmental community that the CALFED program will actually restore the Bay-Delta-River system to a stable, healthy state, the program has to provide performance guarantees, as explained in the January 28, 1997 letter from the Environmental Water Caucus. We continue to believe that the comprehensive set of indicators is a necessary component of this package of environmental performance guarantees.

Our definition of both indicators and the purposes for which they should be used appears broader than the CALFED notion of indicators that simply mirror the existing CALFED implementation objectives -- in part because the current implementation objectives do not add up to a package that will actually result in ecosystem health. It is the comprehensive definition of indicators to which we refer in this discussion.

The purpose of this discussion draft is to demonstrate that there is a feasible method to generate the comprehensive set of indicators. This task would have been easier if it had begun earlier, both because the task takes time and because it would have provided valuable input into the development of the CALFED Ecosystem Restoration Program Plan. Nonetheless, we feel that the comprehensive set of indicators can still be developed in a reasonable timeframe. (We assume that, although EPA would take the lead in developing indicators, sufficient resources and time would be provided to EPA by CALFED.)

Because of CALFED's compressed schedule, there is a need to develop ecological indicators in a stepwise process. The task, therefore, is to define and then to develop a package of indicators (with ultimate numerical ranges corresponding to levels of restoration that would result in ecological health) that is sufficiently specific to support decision-making at several junctures in the CALFED process. Among these junctures are (not necessarily in order):

- during the draft environmental impact analysis;
- during the final environmental impact analysis;
- the points at which irreversible commitments by stakeholders are made.

In addition to each interim package of indicators (with ultimate numerical ranges), the process for refining the indicators prior to the next stage should also be developed in order to provide the assurance to all parties that the indicator package will not be sidetracked.

PROCEDURE

For the most immediate decision point -- the time when the draft environmental impact analysis would address the probability that each alternative will meet the performance criteria (of which ecological indicators are a significant part) -- we suggest that the following indicator package be developed.

First, using the habitat typology and hierarchy of scales developed in the EDF/TBI Indicator Report,¹ a list of generic "properties assessed" (similar in concept to CALFED's ecosystem elements) would be developed for each component of the typology. This would include the landscape scale, each of the ecological zones, and each habitat type within each ecological zone. For a sample list, which is not intended to be comprehensive, see Table 1.

Second, for each property assessed, determine how an indicator and an ultimate numerical range can be developed and in what timeframe. We anticipate that the properties assessed will fall into three categories with respect to indicators:

- Category A: indicators and ultimate numerical ranges can be developed with some confidence;
- Category B: indicators cannot be readily developed, but significant information is available and/or a default indicator can be developed;
- Category C: indicators will require substantial new information and analysis.

For Category A, indicators and ultimate numerical ranges should be developed. For example, one of the "properties assessed" at the zone level might refer to

¹ The habitat-level typology may benefit from a consistency check and refinement.

characteristics of the hydrograph (see Table 2). In this category, we anticipate that the indicators would not change much, and that the numerical ranges would not require extensive refinement.

The process of developing ultimate ranges should be aimed at defining restoration goals that, if achieved, would be expected to result in ecological integrity or health. The process might include several different approaches, including the proportional restoration of linked habitats (using historic extents and connectivity as a template), or defining the maximum level of floodplain and wetland restoration given immovable infrastructure (and assuming land use reform and levee setbacks consistent with good flood management). Approaches focused on defining the needs of selected individual species are needed as a check (to ensure that habitat quality needs are met and specific habitats aren't eliminated), but should be considered minimums and should not limit the development of ultimate ranges for indicators that meet the needs of additional species or functional interactions.

For Category B, a default indicator with an ultimate numerical range would be developed and a process for refining the indicator and its range would be specified. In some cases, the default indicator would be based on an analysis of the best information available, using appropriate safety factors to account for uncertainty. In other cases, the default indicator would be a related surrogate, such as Example B, Table 2. The purpose of determining a default is to assure that the results of the environmental analysis do not preclude the achievement of the final indicators and ultimate numerical ranges once they are developed. In addition to the default indicator, a process to develop a final indicator would be specified (see discussion under Category C, below).

For Category C, a process -- including a timeline and responsible parties -- would be determined for indicator development. In some cases this may require the development of a new analytical tool (such as the index in Example C1 and the sediment load in C2, Table 2), the use of models that assess the way in which ecosystem structure and function responds to changes in key physical processes, management experiments, etc.

Once this initial package of indicators is developed, it can be used to support a draft environmental impact analysis. Additional refinement of the indicators would be possible before the final impact analysis is published. Indicators are an essential prerequisite for the environmental impact analysis because they are the measuring sticks that allow one to determine impact, by showing the effect of the alternatives on the most important attributes of ecological health.

MECHANISM TO EVALUATE INDICATOR MEASUREMENTS AND REFINE INDICATORS

Following adoption of the final impact analysis and following stakeholder agreement, some entity must evaluate the results of indicator monitoring, determine whether sufficient additional scientific insight has been obtained to justify refining one or

more indicators. We suggest that this task be taken up by an Ecological Health Board composed of scientific experts. In order to make this mechanism work, the Ecological Health Board would require a defined budget and staff to support both its own deliberations and any additional analysis that might be required.